aws

User Guide

EC2 Image Builder

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EC2 Image Builder: User Guide

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What is Image Builder?

EC2 Image Builder is a fully managed AWS service that helps you to automate the creation, management, and deployment of customized, secure, and up-to-date server images. You can use the AWS Management Console, AWS Command Line Interface, or APIs to create custom images in your AWS account.

You own the customized images that Image Builder creates in your account. You can configure pipelines to automate updates and system patching for the images that you own. You can also run a stand-alone command to create an image with the configuration resources that you've defined.

The Image Builder pipeline wizard can guide you through the steps to create a custom image, as follows:

Step 1: Specify pipeline details

- Name your pipeline and add tags.
- Define metadata and vulnerability scan settings.
- Set up a schedule for your pipeline.

Step 2: Customize your image

You can select an existing recipe or create a new one.

- Choose a base image for your customizations.
- Add to or remove software from your base image.
- Customize settings and scripts with build components.
- Select test components to run.

Step 3: Define your workflow

An image workflow defines the sequence of steps that Image Builder performs during the build and test stages of the image creation process. This is part of the overall Image Builder workflow framework.

Step 4: Configure build infrastructure

- Select an IAM role to associate with the instance profile for instances that Image Builder launches during the image creation process.
- Select one or more instance types that can be applied at launch.
- Select an Amazon Simple Notification Service (SNS) Topic to receive notifications from Image Builder.
- Specify VPC, subnet, and security groups that apply for the image creation process.
- Select troubleshooting settings such as where Image Builder writes logs, and whether to terminate the build instance on failure (default) or keep it running for further troubleshooting.

Step 5: Define image distribution

- Select AWS Regions where Image Builder distributes your Amazon Machine Image (AMI) or container image.
- If your Image Builder pipeline creates an AMI, Image Builder also supports the following configuration:
  - Select a KMS key to use for encryption.
  - Configure AMI sharing across AWS accounts and Organizations.
  - Associate a License Manager self-managed license with your distributed image.
  - Configure a launch template for your image.

Features of Image Builder

EC2 Image Builder provides the following features:

Increase productivity and reduce operations for building compliant and up-to-date images

Image Builder reduces the amount of work involved in creating and managing images at scale by automating your build pipelines. You can automate your builds by providing your build execution schedule preference. Automation reduces the operational cost of maintaining your software with the latest operating system patches.

Increase service uptime

Image Builder provides access to test components that you can use to test your images before deployment. You can also create custom test components with AWS Task Orchestrator and Executor (AWSTOE), and use those. Image Builder distributes your image only if all of the configured tests have succeeded.

Raise the security bar for deployments

Image Builder allows you to create images that remove unnecessary exposure to component security vulnerabilities. You can apply AWS security settings to create secure, out-of-the-box images that meet industry and internal security criteria. Image Builder also provides collections of settings for companies in regulated industries. You can use these settings to help you quickly and easily build compliant images for STIG standards. For a complete list of STIG components available through Image Builder, see Amazon managed STIG hardening components for Image Builder.

Centralized enforcement and lineage tracking

Using built-in integrations with AWS Organizations, Image Builder enables you to enforce policies that restrict accounts to run instances only from approved AMIs.

Simplified sharing of resources across AWS accounts

EC2 Image Builder integrates with AWS Resource Access Manager (AWS RAM) to allow you to share certain resources with any AWS account or through AWS Organizations. EC2 Image Builder resources that can be shared are:

- Components
- Images
- Image recipes
- Container recipes

For more information, see Share Image Builder resources with AWS RAM.

Supported operating systems

Image Builder supports the following operating system versions:

Operating system/distribution	Supported versions
Amazon Linux	2 and 2023

Operating system/distribution	Supported versions
CentOS	7 and 8
CentOS Stream	8
macOS	12.x (Monterey), 13.x (Ventura), 14.x (Sonoma), 15.x (Sequoia), 26.x (Tahoe)
Red Hat Enterprise Linux (RHEL)	7, 8, 9, and 10
SUSE Linux Enterprise Server (SUSE)	12, 15 and 16
Ubuntu	18.04 LTS, 20.04 LTS, 22.04 LTS, and 24.04 LTS
Windows Server	2012 R2, 2016, 2019, 2022, and 2025

Supported image formats

For your custom images that create an Amazon Machine Image (AMI), you can choose an existing AMI as a starting point. For Docker container images, you can choose from public images hosted on DockerHub, existing container images in Amazon ECR, or Amazon-managed container images as your starting point.

Default quotas

To view the default quotas for Image Builder, see Image Builder Endpoints and Quotas.

AWS Regions and Endpoints

To view the service endpoints for Image Builder, see Image Builder Endpoints and Quotas.

Concepts

The following terms and concepts are central to your understanding and use of EC2 Image Builder.

AMI

An Amazon Machine Image (AMI) is the basic unit of deployment in Amazon EC2, and is one of the types of images you can create with Image Builder. An AMI is a pre-configured virtual machine image that contains the operating system (OS) and preinstalled software to deploy EC2 instances. For more information, see Amazon Machine Images (AMI).

Image pipeline

An image pipeline provides an automation framework for building secure AMIs and container images on AWS. The Image Builder image pipeline is associated with an image recipe or container recipe that defines the build, validation, and test phases for an image build lifecycle.

An image pipeline can be associated with an infrastructure configuration that defines where your image is built. You can define attributes, such as instance type, subnets, security groups, logging, and other infrastructure-related configurations. You can also associate your image pipeline with a distribution configuration to define how you would like to deploy your image.

Managed image

A managed image is a resource in Image Builder that consists of an AMI or container image, plus metadata, such as version and platform. The managed image is used by Image Builder pipelines to determine which base image to use for the build. In this guide, managed images are sometimes referred to as "images," however, an image is not the same as an AMI.

Image recipe

An Image Builder image recipe is a document that defines the base image and the components that are applied to the base image to produce the desired configuration for the output AMI image. You can use an image recipe to duplicate builds. Image Builder image recipes can be shared, branched, and edited using the console wizard, the AWS CLI, or the API. You can use image recipes with your version control software to maintain shareable, versioned image recipes.

Container recipe

An Image Builder container recipe is a document that defines the base image and the components that are applied to the base image to produce the desired configuration for the output container image. You can use a container recipe to duplicate builds. You can share, branch, and edit Image Builder image recipes by using the console wizard, the AWS CLI, or the API. You can use container recipes with your version control software to maintain shareable, versioned container recipes.

Base image

The base image is the selected image and operating system used in your image or container recipe document, along with the components. The base image and the component definitions combined produce the desired configuration for the output image.

Components

A component defines the sequence of steps required to either customize an instance prior to image creation (a **build component**), or to test an instance that was launched from the created image (a **test component**).

A component is created from a declarative, plain-text YAML or JSON document that describes the runtime configuration for building and validating, or testing an instance that is produced by your pipeline. Components run on the instance using a component management application. The component management application parses the documents and runs the desired steps.

After they are created, one or more components are grouped together using an image recipe or container recipe to define the plan for building and testing a virtual machine or container image. You can use public components that are owned and managed by AWS, or you can create your own. For more information about components, see How Image Builder uses the AWS Task Orchestrator and Executor application to manage components.

Component document

A declarative, plain-text YAML or JSON document that describes configuration for a customization you can apply to your image. The document is used to create a build or test component.

Runtime stages

EC2 Image Builder has two runtime stages: **build** and **test**. Each runtime stage has one or more phases with configuration defined by the component document.

Configuration phases

The following list shows the phases that run during the **build** and **test** stages:

Build stage:

Build phase

An image pipeline begins with the build phase of the build stage when it runs. The base image is downloaded, and configuration that is specified for the build phase of the component is applied to build and launch an instance.

Validate phase

After Image Builder launches the instance and applies all of the build phase customizations, the validation phase begins. During this phase, Image Builder ensures that all of the customizations work as expected, based on the configuration that the component specifies for the validate phase. If the instance validation succeeds, Image Builder stops the instance, creates an image, and then continues to the test stage.

Test stage:

Test phase

During this phase, Image Builder launches an instance from the image that it created after the validation phase completed successfully. Image Builder runs test components during this phase to verify that the instance is healthy and functions as expected.

Container host test phase

After Image Builder runs the test phase for all of the components that you selected in the container recipe, Image Builder runs this phase for container workflows. The container host test phase can run additional tests that validate container management and custom runtime configurations.

Workflow

Workflows define the sequence of steps that Image Builder performs when it creates a new image. All images have build, test, and distribution workflows.

Workflow types

`BUILD`

Covers build stage configuration for every image created.

`TEST`

Covers test stage configuration for every image created.

`DISTRIBUTION`

Covers distribution stage configuration for every image created.

Pricing

There is no cost to use EC2 Image Builder to create custom AMI or container images. However, standard pricing applies for other services that are used in the process. The following list includes the usage of some AWS services that can incur costs when you create, build, store, and distribute your custom AMI or container images, depending on your configuration.

- Launching an EC2 instance
- Storing logs on Amazon S3
- Validating images with Amazon Inspector
- Storing Amazon EBS Snapshots for your AMIs
- Storing container images in Amazon ECR
- Pushing and pulling container images into and out of Amazon ECR
- If Systems Manager Advanced Tier is turned on, and Amazon EC2 instances run with on-premises activation, you might be charged for resources through Systems Manager

Related AWS services

EC2 Image Builder uses other AWS services to build images, depending on your Image Builder recipe configuration. For more information about product and service integration for your custom images, see Integrate products and services in Image Builder.

How EC2 Image Builder works

When you use the EC2 Image Builder console to create a custom image pipeline, the system guides you through the following steps.

1. **Specify pipeline details** – Enter information about your pipeline, such as a name, description, tags, and a schedule to run automated builds. You can choose manual builds, if you prefer.
2. **Choose recipe** – Choose between building an AMI, or building a container image. For both types of output images, you enter a name and version for your recipe, select a base image, and choose components to add for building and testing. You can also choose automatic versioning, to ensure that you always use the latest available Operating System (OS) version for your base image. Container recipes additionally define Dockerfiles, and the target Amazon ECR repository for your output Docker container image.

> **Note**
>
> Components are the building blocks that are consumed by an image recipe or a container recipe. For example, packages for installation, security hardening steps, and tests. The selected base image and components make up an image recipe.

3. **Define infrastructure configuration** – Image Builder launches EC2 instances in your account to customize images and run validation tests. The Infrastructure configuration settings specify infrastructure details for the instances that will run in your AWS account during the build process.
4. **Define distribution settings** – Choose the AWS Regions to distribute your image to after the build is complete and has passed all its tests. The pipeline automatically distributes your image to the Region where it runs the build, and you can add image distribution for other Regions.

The images that you build from your custom base image are in your AWS account. You can configure your image pipeline to produce updated and patched versions of your image by entering a build schedule. When the build is complete, you can receive notification through Amazon Simple Notification Service (SNS). In addition to producing a final image, the Image Builder console wizard generates a recipe that can be used with existing version control systems and continuous integration/continuous deployment (CI/CD) pipelines for repeatable automation. You can share and create new versions of your recipe.

Section contents

- AMI elements
- Component management
- Resource names and ARNs
- Resources created
- Distribution
- Sharing Resources
- Compliance

AMI elements

An Amazon Machine Image (AMI) is a preconfigured virtual machine (VM) image that contains the OS and software to deploy EC2 instances.

An AMI includes the following elements:

- A template for the root volume of the VM. When you launch an Amazon EC2 VM, the root device volume contains the image to boot the instance. When instance store is used, the root device is an instance store volume created from a template in Amazon S3. For more information, see Amazon EC2 Root Device Volume.
- When Amazon EBS is used, the root device is an EBS volume created from an EBS snapshot.
- Launch permissions that determine the AWS accounts that can launch VMs with the AMI.
- Block device mapping data that specifies the volumes to attach to the instance after launch.
- A unique resource identifier for each Region, for each account.
- Metadata payloads such as tags, and properties, such as Region, operating system, architecture, root device type, provider, launch permissions, storage for the root device, and signing status.
- An AMI signature for Windows images to protect against unauthorized tampering. For more information, see Instance Identity Documents.

Component management

EC2 Image Builder uses a component management application AWS Task Orchestrator and Executor (AWSTOE) that helps you orchestrate complex workflows, modify system configurations, and test your systems with YAML-based script components. Because AWSTOE is a standalone application, it does not require any additional setup. It can run on any cloud infrastructure and on premises. To get started using AWSTOE as a standalone application, see Manual set up to develop custom components with AWSTOE.

Image Builder uses AWSTOE to perform all on-instance activities. These include building and validating your image before taking a snapshot, and testing the snapshot to ensure that it functions as expected before creating the final image. For more information about how Image Builder uses AWSTOE to manage its components, see Use components to customize your Image Builder image. For more information about creating components with AWSTOE, see How Image Builder uses the AWS Task Orchestrator and Executor application to manage components.

Image testing

You can use AWSTOE test components to validate your image, and ensure that it functions as expected, prior to creating the final image.

Generally, each test component consists of a YAML document that contains a test script, a test binary, and test metadata. The test script contains the orchestration commands to start the test binary, which can be written in any language supported by the OS. Exit status codes indicate the test outcome. Test metadata describes the test and its behavior; for example, the name, description, paths to test binary, and expected duration.

Resource names and ARNs

When you create an Image Builder resource, Image Builder generates the resource ARN from a normalized form of the name that you provide. Understanding this normalization helps you avoid unexpected naming conflicts when you create similarly named resources. Normalization converts the name to lowercase and replaces spaces and underscores with hyphens. For example, a component named `My Component_v2` appears in its ARN as `my-component-v2`.

Normalization applies to all Image Builder resource types, including components, recipes, images, image pipelines, infrastructure configurations, distribution configurations, lifecycle policies, and workflows.

Resource names must be unique to your account in each AWS Region. Because the ARN is based on the normalized name, names that differ only in case, spaces, or underscores conflict with each other. For example, you can't create an image recipe named `my recipe` if you already have one named `My_Recipe` with the same version. When names conflict, the create request fails with a `ResourceAlreadyExistsException` error. For versioned resources, the name combines with the semantic version to determine uniqueness. Resources that support build versions, such as components and workflows, instead create a new build version when you reuse a name and version with changed content.

Resources created

When you create a pipeline, no resources external to Image Builder are created, unless the following is true:

- When an image is created through the pipeline schedule
- When you choose **Run Pipeline** from the **Actions** menu in the Image Builder console

- When you run either of these commands from the API or AWS CLI: **StartImagePipelineExecution** or **CreateImage**

The following resources are created during the image build process:

AMI image pipelines

- EC2 instance (*temporary*)
- Systems Manager Inventory Association (through Systems Manager State Manager if `EnhancedImageMetadata` is Enabled) on the EC2 instance
- Amazon EC2 AMI
- The Amazon EBS Snapshot associated with Amazon EC2 AMI

Container image pipelines

- Docker container running on an EC2 instance (*temporary*)
- Systems Manager Inventory Association (through Systems Manager State Manager) `EnhancedImageMetadata` is Enabled) on the EC2 instance
- Docker container image
- Dockerfile

After the image has been created, all of the temporary resources are deleted.

Distribution

EC2 Image Builder can distribute AMIs or container images to any AWS Region. The image is copied to each Region that you specify in the account used to build the image.

For AMI output images, you can define AMI launch permissions to control which AWS accounts are permitted to launch EC2 instances with the created AMI. For example, you can make the image private, public, or share with specific accounts. If you both distribute the AMI to other Regions, and define launch permissions for other accounts, the launch permissions are propagated to the AMIs in all of the Regions in which the AMI is distributed.

You can also use your AWS Organizations account to enforce limitations on member accounts to launch instances only with approved and compliant AMIs. For more information, see Managing the AWS accounts in Your Organization.

To update your distribution settings using the Image Builder console, follow the steps to Create a new image recipe version from the console, or Create a new container recipe version with the console.

Sharing Resources

To share components, recipes, or images with other accounts or within AWS Organizations, see Share Image Builder resources with AWS RAM.

Compliance

For Center for Internet Security (CIS) Benchmarks, EC2 Image Builder uses Amazon Inspector to perform assessments for exposure, vulnerabilities, and deviations from best practices and compliance standards. For example, Image Builder assesses unintended network accessibility, unpatched CVEs, public internet connectivity, and remote root login activation. Amazon Inspector is offered as a test component that you can choose to add to your image recipe. For more information about Amazon Inspector, see the *Amazon Inspector User Guide*. For more information, see Center for Internet Security (CIS) Benchmarks.

Image Builder provides STIG hardening components to help you more efficiently build compliant images for baseline STIG standards. These STIG components scan for misconfigurations and run a remediation script. There are no additional charges for using STIG-compliant components. For a complete list of STIG components available through Image Builder, see Amazon managed STIG hardening components for Image Builder.

Semantic versioning in Image Builder

Image Builder uses semantic versioning to organize resources and ensure that they have unique IDs. The semantic version has four nodes:

<major>.<minor>.<patch>/<build>

You can assign values for the first three, and can filter on all of them.

Semantic versioning is included in each object's Amazon Resource Name (ARN), at the level that applies to that object as follows:

1. Versionless ARNs and Name ARNs do not include specific values in any of the nodes. The nodes are either left off entirely, or they are specified as wildcards, for example: x.x.x.

2. Version ARNs have only the first three nodes: <major>.<minor>.<patch>
3. Build version ARNs have all four nodes, and point to a specific build for a specific version of an object.

Assignment: For the first three nodes you can assign any positive integer value, or zero, with an upper limit of 2^30-1, or 1073741823 for each node. Image Builder automatically assigns the build number to the fourth node.

Patterns: You can use any numeric pattern that adheres to the assignment requirements for the nodes that you can assign. For example, you might choose a software version pattern, such as 1.0.0, or a date, such as 2021.01.01.

Selection: With semantic versioning, you have the flexibility to use wildcards (x) to specify the most recent versions or nodes when selecting the base image or components for your recipe. When you use a wildcard in any node, all nodes to the right of the first wildcard must also be wildcards.

For example, given the following recent versions: 2.2.4, 1.7.8, and 1.6.8, version selection using wildcards produces the following results:

- `x.x.x` = 2.2.4
- `1.x.x` = 1.7.8
- `1.6.x` = 1.6.8
- `x.2.x` is not valid, and produces an error
- `1.x.8` is not valid, and produces an error

Wildcard versioning in lifecycle policies

You can use wildcard patterns for semantic versions in lifecycle policy recipe selection to target multiple versions of a recipe with a single policy. This simplifies lifecycle management by eliminating the need to create separate policies for each recipe version.

The following wildcard patterns are supported for lifecycle policy recipe versions:

- `x.x.x` – Matches all versions of the recipe.
- `1.x.x` – Matches all minor and patch versions within major version 1.
- `1.0.x` – Matches all patch versions within version 1.0.

When a lifecycle policy with wildcard patterns runs, Image Builder resolves the wildcards to all matching recipe versions at execution time. This creates an immutable list of versions for that execution. New recipe versions created after the policy execution begins are automatically included in the next scheduled execution.

For more information about creating lifecycle policies with wildcard versioning, see Create lifecycle policies.

Using version references

Version references are ready-to-use ARN strings that incorporate wildcard patterns based on the semantic version of the resource you created or retrieved. Instead of writing custom code to parse ARNs and insert wildcards, Image Builder does this work for you.

When you create or retrieve Image Builder resources, Image Builder automatically provides pre-constructed ARNs with wildcard version patterns in the `latestVersionReferences` object. This eliminates the need to manually parse and reconstruct ARNs when you want to reference resources using wildcard versioning patterns.

For example, when you create a component with version `1.2.3`, Image Builder returns:

```
{
    "componentBuildVersionArn": "arn:aws:imagebuilder:us-west-2:123456789012:component/
my-component/1.2.3/1",
    "latestVersionReferences": {
        "latestVersionArn": "arn:aws:imagebuilder:us-west-2:123456789012:component/my-
component/x.x.x",
        "latestMajorVersionArn": "arn:aws:imagebuilder:us-
west-2:123456789012:component/my-component/1.x.x",
        "latestMinorVersionArn": "arn:aws:imagebuilder:us-
west-2:123456789012:component/my-component/1.2.x",
        "latestPatchVersionArn": "arn:aws:imagebuilder:us-
west-2:123456789012:component/my-component/1.2.3"
    }
}
```

Available version reference patterns

The `latestVersionReferences` object contains four ARN patterns:

- latestVersionArn (x.x.x) - Always resolves to the absolute latest version.
- atestMajorVersionArn (1.x.x) - Resolves to the latest minor and patch versions within a major version.
- latestMinorVersionArn (1.2.x) - Resolves to the latest patch version within a specific minor version.
- latestPatchVersionArn (1.2.3) - References a specific semantic version and resolves to the latest build version for resources that support multiple build versions.

Resources that return version references

Version references are returned by `Create` and `Get` APIs for all versioned Image Builder resources:

- Components - `CreateComponent`, `GetComponent`
- Image recipes - `CreateImageRecipe`, `GetImageRecipe`
- Container recipes - `CreateContainerRecipe`, `GetContainerRecipe`
- Images - `CreateImage`, `GetImage`
- Workflows - `CreateWorkflow`, `GetWorkflow`

Note: For Image Builder-managed workflows, only `latestVersionArn (x.x.x)` is returned, since Image Builder requires you to always use the latest version of Image Builder-managed workflows.

Get set up to build custom images with Image Builder

Before you build images with EC2 Image Builder, verify that you've met the following prerequisites to create an image pipeline. Unless specifically stated otherwise, these prerequisites are required for all types of pipelines.

Prerequisites

- Image Builder service-linked role
- Configuration requirements
- Container repository for container image pipelines
- Dedicated host for macOS images
- IAM prerequisites
- Systems Manager Agent prerequisites

After you've met the prerequisites, you can manage EC2 Image Builder from any of the following interfaces.

- EC2 Image Builder console
- Image Builder commands in the AWS CLI
- EC2 Image Builder API Reference
- AWS SDKs and Tools

Image Builder service-linked role

EC2 Image Builder uses a service-linked role to grant permissions to other AWS services on your behalf. You don't need to manually create a service-linked role. When you create your first Image Builder resource in the AWS Management Console, the AWS CLI, or the AWS API, Image Builder creates the service-linked role for you. For more information about the service-linked role that Image Builder creates in your account, see Use IAM service-linked roles for Image Builder.

Configuration requirements

- Image Builder supports AWS PrivateLink. For more information about configuring VPC endpoints for Image Builder, see Image Builder and AWS PrivateLink interface VPC endpoints.

- The instances that Image Builder uses to build container images must have internet access to download the AWS CLI from Amazon S3, and to download a base image from the Docker Hub repository, if applicable. Image Builder uses the AWS CLI to get the Dockerfile from the container recipe, where it is stored as data.
- The instances that Image Builder uses to build images and run tests must have access to the Systems Manager service. Installation requirements depend on your operating system.

  To see the installation requirements for your base image, choose the tab that matches your base image operating system.

  Linux

  For Amazon EC2 Linux instances, Image Builder installs the Systems Manager Agent on the build instance if it is not already present, and removes it before creating the image.

  Windows

  Image Builder does not install the Systems Manager Agent on Amazon EC2 Windows Server build instances. If your base image did not come preinstalled with the Systems Manager Agent, you must launch an instance from your source image, manually install Systems Manager on the instance, and create a new base image from your instance.

  To manually install the Systems Manager agent on your Amazon EC2 Windows Server instance, see Manually install Systems Manager Agent on EC2 instances for Windows Server in the *AWS Systems Manager User Guide*.

Container repository for container image pipelines

For container image pipelines, the recipe defines the configuration for the Docker images that are produced and stored in the target container repository. You must create the target repository before you create the container recipe for your Docker image.

Image Builder uses Amazon ECR as its target repository for container images. To create an Amazon ECR repository, follow the steps described in Creating a repository in the *Amazon Elastic Container Registry User Guide*.

Dedicated host for macOS images

Amazon EC2 Mac instances require a Dedicated Host running on a metal instance type. Before you create a custom macOS image, you must Allocate a Dedicated Host to your account. For more information about Mac instances and a list of instance types that natively support the macOS operating system, see Amazon EC2 Mac instances in the *Amazon EC2 User Guide*.

When you've created a Dedicated Host, you can configure settings in the infrastructure configuration resource for your image. The infrastructure configuration includes placement properties where you can specify the host, host placement group, or Availability Zone where the instances that launch from your image should go.

IAM prerequisites

The IAM role that you associate with your instance profile must have permissions to run the build and test components included in your image. The following IAM role policies must be attached to the IAM role that is associated with the instance profile:

- EC2InstanceProfileForImageBuilder
- EC2InstanceProfileForImageBuilderECRContainerBuilds
- AmazonSSMManagedInstanceCore

If you configure logging, the instance profile specified in your infrastructure configuration must have `s3:PutObject` permissions for the target bucket (`arn:aws:s3:::BucketName/*`). For example:

JSON

```
{
 "Version":"2012-10-17",
 "Statement": [
  {
   "Sid": "UploadFileToS3Bucket",
   "Effect": "Allow",
   "Action": "s3:PutObject",
   "Resource": "arn:aws:s3:::bucket-name/*"
  }
 ]
```

```
}
```

Attach policy

The following steps guide you through the process of attaching the IAM policies to an IAM role to grant the preceding permissions.

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, choose **Policies**.
3. Filter the list of policies with **EC2InstanceProfileForImageBuilder**
4. Select the bullet next to the policy, and from the **Policy actions** dropdown list, select **Attach**.
5. Select the name of the IAM role to which to attach the policy.
6. Choose **Attach policy**.
7. Repeat steps 3-6 for the **EC2InstanceProfileForImageBuilderECRContainerBuilds** and **AmazonSSMManagedInstanceCore** policies.

> **Note**
>
> If you want to copy an image created with Image Builder to another account, you must create the `EC2ImageBuilderDistributionCrossAccountRole` role in all of the target accounts, and attach the Ec2ImageBuilderCrossAccountDistributionAccess policy managed policy to the role. For more information, see Share Image Builder resources with AWS RAM.

Systems Manager Agent prerequisites

EC2 Image Builder runs AWS Systems Manager (Systems Manager) Agent on the EC2 instances it launches to build and test your image. Image Builder collects additional information about the instance used during the build phase with Systems Manager Inventory. This information includes the operating system (OS) name and version, as well as the list of packages and their respective versions as reported by your operating system.

To opt out of collecting this information, select the method that matches your preferred environment:

- **Image Builder console** – Deselect the **Enable enhanced metadata collection** check box.
- **AWS CLI** – Specify the `--no-enhanced-image-metadata-enabled` option
- **Image Builder API or SDKs** – Set the `enhancedImageMetadataEnabled` parameter to `false`.

Image Builder uses RunCommand to send actions to your build and test instance as part of the image build and test workflow. You can't opt out of the use of RunCommand to send actions to your build and test instance.

Learn how to create custom images with Image Builder tutorials

There are many ways to build custom images and components with EC2 Image Builder. Tutorials help you learn about key Image Builder concepts. Each tutorial presents a use case with steps that you can follow for the first time. The instructions use defaults where possible to assist with learning the overall process. After you use one of the tutorials, you can explore more ways to customize your own images.

Build your first image

The following tutorials show you how to build your first image with the Image Builder console wizard. At the end of the tutorial you'll have created the following set of Image Builder resources. The final step in the tutorial is to clean up the resources you created.

- An image recipe for your Amazon Machine Image (AMI) or a container recipe for your container image.
- An infrastructure configuration resource with default settings.
- A distribution settings resource with default settings that distributes the output to the source Region (your account in the Region that you use to run the console wizard).
- An image pipeline that uses the listed resources to build your output image with the default image build workflows.
- An output AMI or container image.

Console wizard tutorials

- Pipeline wizard: Create AMI
- Pipeline wizard: Create container image

Create a custom component with input parameters

The following tutorial shows you how to create a custom component that defines input parameters, and then set the values from your Image Builder recipe.

Custom component with parameters

Use Systems Manager parameters with Image Builder

The following tutorial shows you how to create an AWS Systems Manager Parameter Store parameter and use it in an image recipe.

Use a base image parameter in your recipe

You can also use Parameter Store parameters in AMI distribution settings to store your output image ID, and in custom components. For more information, see Create and update AMI distribution configurations for distributions, and Use Systems Manager Parameter Store parameters for custom components.

Deploy sample projects with infrastructure as code

When you're ready to define your image resources as code, the Image Builder samples repository on GitHub provides complete sample projects for common use cases. The samples cover scenarios such as golden AMI pipelines, cross-account distribution, and private VPC builds. For more information, see Explore Image Builder sample projects on GitHub.

Tutorial: Create an image pipeline with output AMI from the Image Builder console wizard

This tutorial walks you through creating an automated pipeline to build and maintain a customized EC2 Image Builder image using the **Create image pipeline** console wizard. To help you move through the steps efficiently, default settings are used when they are available, and optional sections are skipped.

Create image pipeline workflow

- Step 1: Specify pipeline details
- Step 2: Choose recipe
- Step 3: Define infrastructure configuration - optional
- Step 4: Define distribution settings - optional
- Step 5: Review
- Step 6: Clean up

Step 1: Specify pipeline details

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. To begin creating your pipeline, choose **Create image pipeline**.
3. In the **General** section, enter your **Pipeline name** (*required*).

   > **Tip**
   >
   > Enhanced metadata collection is turned on by default. To ensure compatibility between components and base images, keep it turned on.

4. In the **Build schedule** section, you can keep the defaults for the **Schedule options**. Note that the **Time zone** shown for the default schedule is Universal Coordinated Time (UTC). For more information about UTC time, and to find the offset for your time zone, see Time Zone Abbreviations – Worldwide List.

   For **Dependency update settings**, choose the **Run pipeline at the scheduled time if there are dependency updates** option. This setting causes your pipeline to check for updates before starting the build. If there are no updates, it skips the scheduled pipeline build.

   > **Note**
   >
   > To ensure that your pipeline recognizes dependency updates and builds as expected, you must use semantic versioning (x.x.x) for your base image and components. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

5. Choose **Next** to proceed to the next step.

Step 2: Choose recipe

1. Image Builder defaults to **Use existing recipe** in the **Recipe** section. For your first time through, choose the **Create new recipe** option.
2. In the **Image type** section, choose the **Amazon Machine Image (AMI)** option to create an image pipeline that will produce and distribute an AMI.
3. In the **General** section, enter the following required boxes:

- **Name** – your recipe name
- **Version** – your recipe version (use the format *<major>.<minor>.<patch>*, where major, minor, and patch are integer values). New recipes generally start with `1.0.0`.

4. In the **Source image** section, keep the default values for **Select image**, **Image Operating System (OS)**, and **Image origin**. This results in a list of Linux AMIs that are managed by Amazon. For this tutorial, select the `Amazon Linux 2 x86` image.

   a. From the **Image name** dropdown, choose an image.

   b. Keep the default for **Auto-versioning options** (**Use latest available OS version**).

   > **Note**
   >
   > This setting ensures that your pipeline uses semantic versioning for the base image, to detect dependency updates for automatically scheduled jobs. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

5. In the **Instance configuration** section, keep the default values for the **Systems Manager agent**. This results in Image Builder keeping the Systems Manager agent after the build and tests are complete, to include the Systems Manager agent in your new image.

   Keep **User data** blank for this tutorial. You can use this area at other times to provide commands, or a command script to run when you launch your build instance. However, it replaces any commands that Image Builder might have added to ensure that Systems Manager is installed. When you do use it, make sure that the Systems Manager agent is preinstalled on your base image, or that you include the install in your user data.

6. In the **Components** section, you can choose to not add any components and proceed. If you want to add components, in the **Build components** panel, choose **Add build components**, and select `Amazon managed` from the component owner filter list. This opens a selection panel on the right side of the console interface where you can browse and filter the components that are available.

   For this tutorial, choose a component that updates Linux with the latest security updates, as follows:

   a. Filter the results by entering the word `update` in the search bar that's located at the top of the panel.

b. Select the check box for the `update-linux` build component.

c. Keep the default for **Versioning options** (**Use latest version available**).

> **Note**
>
> This setting ensures that your pipeline uses semantic versioning for the selected component, to detect dependency updates for automatically scheduled jobs. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

d. Choose **Add to recipe** to add the component to your recipe. This closes the component selection panel.

e. Back in the **Build components** panel, the component that you added is displayed.

7. **Reorder components (optional)**

If you've chosen more than one component to include in your image, you can use the drag-and-drop action to rearrange them into the order in which they should run during the build process.

> **Note**
>
> CIS hardening components don't follow the standard component ordering rules in Image Builder recipes. The CIS hardening components always run last to ensure that the benchmark tests run against your output image.

a. Repeat the prior steps to add the `update-linux-kernel-5` component to your recipe.

b. The component you just added has an input parameter for the kernel version. To expand settings for **Versioning options** or **Input parameters**, you can choose the arrow next to the name of the setting. To expand all of the settings for all selected components, you can toggle the **Expand all** switch off and on. For more information about using input parameters in your components, and setting them in your recipes, see Tutorial: Create a custom component with input parameters.

c. Choose one of the components, and drag it up or down to change the order in which the components will run.

d. To remove the `update-linux-kernel-5` component, choose X from the upper right corner of the component box.

   Repeat this step to remove any other components you might have added, leaving only the `update-linux` component selected.

8. Choose **Next** to proceed to the next step.

Step 3: Define infrastructure configuration - optional

Image Builder launches EC2 instances in your account to customize images and run validation tests. The Infrastructure configuration settings specify infrastructure details for the instances that will run in your AWS account during the build process.

In the **Infrastructure configuration** section, the **Configuration options** default to `Create infrastructure configuration using service defaults`. This creates an IAM role and associated instance profile for the EC2 build and test instances that are used to configure your image. For more information about infrastructure configuration settings, see CreateInfrastructureConfiguration in the *EC2 Image Builder API Reference*.

For this tutorial, we are using the default settings.

> **Note**
>
> To specify a subnet to use for a private VPC, you can create your own custom infrastructure configuration, or use settings that you have already created.

- Choose **Next** to proceed to the next step.

Step 4: Define distribution settings - optional

Distribution configurations include the output AMI name, specific Region settings for encryption, launch permissions, and AWS accounts, organizations, and organizational units (OUs) that can launch the output AMI, and license configurations.

In the **Distribution settings** section, the **Configuration options** default to `Create distribution settings using service defaults`. This option will distribute the output

AMI to the current Region. For more information about configuring your distribution settings, see Manage Image Builder distribution settings.

For this tutorial, we are using the default settings.

- Choose **Next** to proceed to the next step.

Step 5: Review

The **Review** section displays all of the settings you have configured. To edit information in any given section, choose the **Edit** button located in the top right corner of the step section. For example, if you want to change your pipeline name, choose the **Edit** button in the top right corner of the **Step 1: Pipeline details** section.

1. When you have reviewed your settings, choose **Create pipeline** to create your pipeline.
2. You can see success or failure messages at the top of the page, as your resources are created for distribution settings, infrastructure configuration, your new recipe, and the pipeline. To see details for a resource, including the resource identifier, choose **View details**.
3. After you have viewed the details for a resource, you can view details about other resources by choosing the resource type from the navigation pane. For example, to see details for your new pipeline, choose **Image pipelines** from the navigation pane. If your build was successful, your new pipeline is displayed in the **Image pipelines** list.

Step 6: Clean up

Your Image Builder environment, just like your home, needs regular maintenance to help you find what you need, and complete your tasks without wading through clutter. Make sure to regularly clean up temporary resources that you created for testing. Otherwise, you might forget about those resources, and then later, not remember what they were used for. By then, it might not be clear if you can safely get rid of them.

> **Tip**
>
> To prevent dependency errors when you delete resources, make sure to delete your resources in the following order:
>
> 1. Image pipeline

2. Image recipe
3. All remaining resources

To clean up the resources that you created for this tutorial, follow these steps:

Delete the pipeline

1. To see a list of the build pipelines created under your account, choose **Image pipelines** from the navigation pane.
2. Select the check box next to **Pipeline name** to select the pipeline that you want to delete.
3. At the top of the **Image pipelines** panel, on the **Actions** menu, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete the recipe

1. To see a list of the recipes created under your account, choose **Image recipes** from the navigation pane.
2. Select the check box next to **Recipe name** to select the recipe that you want to delete.
3. At the top of the **Image recipes** panel, on the **Actions** menu, choose **Delete recipe**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete infrastructure configuration

1. To see a list of the infrastructure configurations created under your account, choose **Infrastructure configuration** from the navigation pane.
2. Select the check box next to **Configuration name** to select the infrastructure configuration that you want to delete.
3. At the top of the **Infrastructure configurations** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete distribution settings

1. To see a list of the distribution settings created under your account, choose **Distribution settings** from the navigation pane.

2. Select the check box next to **Configuration name** to select the distribution settings that you created for this tutorial.
3. At the top of the **Distribution settings** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete the image

Follow these steps to verify that you have deleted any image that was created from the tutorial pipeline. This tutorial is not likely to create an image unless enough time has elapsed since you created your pipeline that it runs, according to the build schedule.

1. To see a list of the images created under your account, choose **Images** from the navigation pane.
2. Choose the image **Version** for the image that you want to remove. This opens the **Image build versions** page.
3. Select the check box next to the **Version** for any image that you want to delete. You can select more than one image version at a time.
4. At the top of the **Image build versions** panel, choose **Delete version**.
5. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Tutorial: Create an image pipeline with output Docker container image from the Image Builder console wizard

This tutorial walks you through creating an automated pipeline to build and maintain a customized EC2 Image Builder Docker image using the **Create image pipeline** console wizard. To help you move through the steps efficiently, default settings are used when they are available, and optional sections are skipped.

Create image pipeline workflow

- Step 1: Specify pipeline details
- Step 2: Choose recipe
- Step 3: Define infrastructure configuration - optional
- Step 4: Define distribution settings - optional
- Step 5: Review

- Step 6: Clean up

Step 1: Specify pipeline details

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. To begin creating your pipeline, choose **Create image pipeline**.
3. In the **General** section, enter your **Pipeline name** (*required*).
4. In the **Build schedule** section, you can keep the defaults for the **Schedule options**. Note that the **Time zone** shown for the default schedule is Universal Coordinated Time (UTC). For more information about UTC time, and to find the offset for your time zone, see Time Zone Abbreviations – Worldwide List.

   For **Dependency update settings**, choose the **Run pipeline at the scheduled time if there are dependency updates** option. This setting causes your pipeline to check for updates before starting the build. If there are no updates, it skips the scheduled pipeline build.

   > **Note**
   >
   > To ensure that your pipeline recognizes dependency updates and builds as expected, you must use semantic versioning (x.x.x) for your base image and components. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

5. Choose **Next** to proceed to the next step.

Step 2: Choose recipe

1. Image Builder defaults to **Use existing recipe** in the **Recipe** section. For your first time through, choose the **Create new recipe** option.
2. In the **Image type** section, choose the **Docker image** option to create a container pipeline that will produce a Docker image and distribute it to Amazon ECR repositories in target Regions.
3. In the **General** section, enter the following required boxes:

   - **Name** – your recipe name
   - **Version** – your recipe version (use the format *<major>.<minor>.<patch>*, where major, minor, and patch are integer values). New recipes generally start with `1.0.0`.

4. In the **Source image** section, keep the default values for **Select image**, **Image Operating System (OS)**, and **Image origin**. This results in a list of Amazon Linux 2 container images, managed by Amazon, for you to choose from for your base image.

   a. From the **Image name** dropdown, choose an image.

   b. Keep the default for **Auto-versioning options** (**Use latest available OS version**).

   > **Note**
   >
   > This setting ensures that your pipeline uses semantic versioning for the base image, to detect dependency updates for automatically scheduled jobs. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

5. In the **Components** section, you can choose to not add any components and proceed. If you want to add components, in the **Build components – Amazon Linux** panel, you can browse through the components listed on the page. Use the pagination control in the upper right corner to navigate through additional components that are available for your base image OS. You can also search for specific components, or create your own build component using the Component manager.

   For this tutorial, choose a component that updates Linux with the latest security updates, as follows:

   a. Filter the results by entering the word `update` in the search bar that's located at the top of the panel.

   b. Select the check box for the `update-linux` build component.

   c. Scroll down, and in the upper right corner of the **Selected components** list, choose **Expand all** .

   d. Keep the default for **Versioning options** (**Use latest available component version**).

   > **Note**
   >
   > This setting ensures that your pipeline uses semantic versioning for the selected component, to detect dependency updates for automatically scheduled jobs. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

If you had selected a component that has input parameters, you would also see the parameters in this area. Parameters are not covered in this tutorial. For more information about using input parameters in your components, and setting them in your recipes, see Tutorial: Create a custom component with input parameters.

Reorder components (optional)

If you have chosen more than one component to include in your image, you can use the drag-and-drop action to rearrange them into the order in which they should run during the build process.

> **Note**
>
> CIS hardening components don't follow the standard component ordering rules in Image Builder recipes. The CIS hardening components always run last to ensure that the benchmark tests run against your output image.

1. Scroll back up to the list of available components.
2. Select the check box for the `update-linux-kernel-mainline` build component (or any other component of your choice).
3. Scroll down to the **Selected components** list, to see that there are at least two results.
4. Newly added components might not have their versioning expanded. To expand **Versioning options**, you can either choose the arrow next to **Versioning options**, or you can toggle the **Expand all** switch off and on to expand versioning for all of the selected components.
5. Choose one of the components, and drag it up or down to change the order in which the components will run.
6. To remove the `update-linux-kernel-mainline` component, choose X from the upper right corner of the component box.
7. Repeat the previous step to remove any other components you might have added, leaving only the `update-linux` component selected.

6. In the **Dockerfile template** section, select the **Use example** option. In the **Content** panel, notice the contextual variables where Image Builder places build information or scripts, based on your container image recipe.

By default, Image Builder uses the following contextual variables in your Dockerfile.

parentImage (required)

At build time, this variable resolves to the base image for your recipe.

Example:

```
FROM
{{{ imagebuilder:parentImage }}}
```

environments (required if components are specified)

At build time, this variable resolves to the Dockerfile directives that stage your components in the build context. These directives copy the component scripts into the image and set the environment variables that those scripts use. It prepares the environment but doesn't run the components that you specify. Place this variable before the `components` variable.

Example:

```
{{{ imagebuilder:environments }}}
```

components (optional)

At build time, this variable resolves to the command that runs the build and test component scripts for the components that the container recipe includes, and then removes those scripts from the image. This is the variable that runs your components. Place it after the `environments` variable.

Example:

```
{{{ imagebuilder:components }}}
```

7. In the **Target repository** section, specify the name of the Amazon ECR repository that you created as a prerequisite for this tutorial. This repository is used as the default setting for the distribution configuration in the Region where the pipeline runs (Region 1).

> **Note**
>
> The target repository must exist in Amazon ECR for all target Regions prior to distribution.

8. Choose **Next** to proceed to the next step.

Step 3: Define infrastructure configuration - optional

Image Builder launches EC2 instances in your account to customize images and run validation tests. The Infrastructure configuration settings specify infrastructure details for the instances that will run in your AWS account during the build process.

In the **Infrastructure configuration** section, the **Configuration options** default to `Create infrastructure configuration using service defaults`. This creates an IAM role and associated instance profile that are used by build instances to configure your container images. You can also create your own custom infrastructure configuration, or use settings that you have already created. For more information about infrastructure configuration settings, see CreateInfrastructureConfiguration in the *EC2 Image Builder API Reference*.

For this tutorial, we are using the default settings.

- Choose **Next** to proceed to the next step.

Step 4: Define distribution settings - optional

Distribution settings consist of the target Regions, and the target Amazon ECR repository name. Output Docker images are deployed to the named Amazon ECR repository in each Region.

In the **Distribution settings** section, the **Configuration options** default to `Create distribution settings using service defaults`. This option will distribute the output Docker image to the Amazon ECR repository specified in your container recipe for the Region where your pipeline runs (Region 1). If you choose `Create new distribution settings`, you can override the ECR repository for the current Region, and add more Regions for distribution.

For this tutorial, we are using the default settings.

- Choose **Next** to proceed to the next step.

Step 5: Review

The **Review** section displays all of the settings you have configured. To edit information in any given section, choose the **Edit** button located in the top right corner of the step section. For example, if you want to change your pipeline name, choose the **Edit** button in the top right corner of the **Step 1: Pipeline details** section.

1. When you have reviewed your settings, choose **Create pipeline** to create your pipeline.
2. You can see success or failure messages at the top of the page, as your resources are created for distribution settings, infrastructure configuration, your new recipe, and the pipeline. To see details for a resource, including the resource identifier, choose **View details**.
3. After you have viewed the details for a resource, you can view details about other resources by choosing the resource type from the navigation pane. For example, to see details for your new pipeline, choose **Image pipelines** from the navigation pane. If your build was successful, your new pipeline is displayed in the **Image pipelines** list.

Step 6: Clean up

Your Image Builder environment, just like your home, needs regular maintenance to help you find what you need, and complete your tasks without wading through clutter. Make sure to regularly clean up temporary resources that you created for testing. Otherwise, you might forget about those resources, and then later, not remember what they were used for. By then, it might not be clear if you can safely get rid of them.

Tip

To prevent dependency errors when you delete resources, make sure to delete your resources in the following order:

1. Image pipeline
2. Image recipe
3. All remaining resources

To clean up the resources that you created for this tutorial, follow these steps:

Delete the pipeline

1. To see a list of the build pipelines created under your account, choose **Image pipelines** from the navigation pane.
2. Select the check box next to **Pipeline name** to select the pipeline that you want to delete.
3. At the top of the **Image pipelines** panel, on the **Actions** menu, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete the container recipe

1. To see a list of the container recipes created under your account, choose **Container recipes** from the navigation pane.
2. Select the check box next to **Recipe name** to select the recipe that you want to delete.
3. At the top of the **Container recipes** panel, on the **Actions** menu, choose **Delete recipe**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete infrastructure configuration

1. To see a list of the infrastructure configurations created under your account, choose **Infrastructure configuration** from the navigation pane.
2. Select the check box next to **Configuration name** to select the infrastructure configuration that you want to delete.
3. At the top of the **Infrastructure configurations** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete distribution settings

1. To see a list of the distribution settings created under your account, choose **Distribution settings** from the navigation pane.
2. Select the check box next to **Configuration name** to select the distribution settings that you created for this tutorial.
3. At the top of the **Distribution settings** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete the image

Follow these steps to verify that you have deleted any image that was created from the tutorial pipeline. This tutorial is not likely to create an image unless enough time has elapsed since you created your pipeline that it runs, according to the build schedule.

1. To see a list of the images created under your account, choose **Images** from the navigation pane.
2. Choose the image **Version** for the image that you want to remove. This opens the **Image build versions** page.
3. Select the check box next to the **Version** for any image that you want to delete. You can select more than one image version at a time.
4. At the top of the **Image build versions** panel, choose **Delete version**.
5. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Tutorial: Create a custom component with input parameters

You can manage Image Builder components, including creating and setting component parameters, directly from the EC2 Image Builder console, from the AWS CLI, or from the Image Builder API or SDKs. In this section, we'll cover creating and using parameters in your component, and setting component parameters through the Image Builder console and AWS CLI commands at runtime.

> **Important**
>
> Component parameters are plain text values, and are logged in AWS CloudTrail. We recommend that you use AWS Secrets Manager or the AWS Systems Manager Parameter Store to store your secrets. For more information about Secrets Manager, see What is Secrets Manager? in the *AWS Secrets Manager User Guide*. For more information about AWS Systems Manager Parameter Store, see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

Use parameters in your YAML component document

To build a component, you must provide a YAML or JSON application component document. The document contains the code that runs during the phases and steps that you define to provide

customization for your image. The recipe that references the component can set the parameters to customize the values at runtime, with default values that take effect if the parameter is not set to a specific value.

Create a component document with input parameters

This section shows you how to define and use input parameters in your YAML component document.

To create a YAML application component document that uses parameters and runs commands in your Image Builder build or test instances, follow the steps that match your image operating system:

Linux

Create a YAML component document

Use a file editing tool to create a component document file. Documentation examples use a file named *hello-world-test.yaml* that includes the following content:

```
# Document Start
#
name: "HelloWorldTestingDocument-Linux"
description: "Hello world document to demonstrate parameters."
schemaVersion: 1.0
parameters:
  - MyInputParameter:
      type: string
      default: "It's me!"
      description: This is an input parameter.
phases:
  - name: build
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo "Hello World! Build phase. My input parameter value is
 {{ MyInputParameter }}"

  - name: validate
    steps:
      - name: HelloWorldStep
```

```
        action: ExecuteBash
        inputs:
          commands:
            - echo "Hello World! Validate phase. My input parameter value is
 {{ MyInputParameter }}"

  - name: test
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo "Hello World! Test phase. My input parameter value is
 {{ MyInputParameter }}"
# Document End
```

> **Tip**
>
> Use a tool like this online YAML Validator, or a YAML lint extension in your code environment to verify that your YAML is well-formed.

Windows

Create a YAML component document

Use a file editing tool to create a component document file. Documentation examples use a file named *`hello-world-test.yaml`* that includes the following content:

```
# Document Start
#
name: "HelloWorldTestingDocument-Windows"
description: "Hello world document to demonstrate parameters."
schemaVersion: 1.0
parameters:
  - MyInputParameter:
      type: string
      default: "It's me!"
      description: This is an input parameter.
phases:
  - name: build
    steps:
```

```
      - name: HelloWorldStep
        action: ExecutePowerShell
        inputs:
          commands:
            - Write-Host "Hello World! Build phase. My input parameter value is
 {{ MyInputParameter }}"

  - name: validate
    steps:
      - name: HelloWorldStep
        action: ExecutePowerShell
        inputs:
          commands:
            - Write-Host "Hello World! Validate phase. My input parameter value is
 {{ MyInputParameter }}"

  - name: test
    steps:
      - name: HelloWorldStep
        action: ExecutePowerShell
        inputs:
          commands:
            - Write-Host "Hello World! Test phase. My input parameter value is
 {{ MyInputParameter }}"
# Document End
```

Tip

Use a tool like this online YAML Validator, or a YAML lint extension in your code environment to verify that your YAML is well-formed.

macOS

Create a YAML component document

Use a file editing tool to create a component document file. Documentation examples use a file named *`hello-world-test.yaml`* that includes the following content:

```
# Document Start
#
name: "HelloWorldTestingDocument-macOS"
```

```
description: "Hello world document to demonstrate parameters."
schemaVersion: 1.0
parameters:
  - MyInputParameter:
      type: string
      default: "It's me!"
      description: This is an input parameter.
phases:
  - name: build
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo "Hello World! Build phase. My input parameter value is
 {{ MyInputParameter }}"

  - name: validate
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo "Hello World! Validate phase. My input parameter value is
 {{ MyInputParameter }}"

  - name: test
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo "Hello World! Test phase. My input parameter value is
 {{ MyInputParameter }}"
# Document End
```

Tip

Use a tool like this online YAML Validator, or a YAML lint extension in your code environment to verify that your YAML is well-formed.

For more information about the phases, steps, and syntax for AWSTOE application component documents, see Use documents in AWSTOE. For more information about parameters and their requirements, see the Parameters section of the **Define and reference variables in AWSTOE** page.

Create a component from the YAML component document

Whatever method you use to create an AWSTOE component, the YAML application component document is always required as a baseline.

- To create a component directly from your YAML document with the Image Builder console, see Create a custom component from the console.
- To create a component from the command line with the Image Builder **create-component** command, see Create a custom component from the AWS CLI. Replace the YAML document name in those examples with the name of your Hello World YAML document (*`hello-world-test.yaml`*).

Set component parameters in an Image Builder recipe from the console

Setting component parameters works the same for image recipes and container recipes. When you create a new recipe, or a new version of a recipe, you choose which components to include from the **Build components** and **Test components** lists. The component lists include components that are applicable for the base operating system you chose for your image.

After you select a component, it is displayed in the **Selected components** section, directly under the component lists. Configuration options are shown for each component that is selected. If your component has input parameters defined, they are displayed as an expandable section called **Input parameters**.

The following parameter settings are shown for each parameter that's defined for your component:

- **Parameter name** (*not editable*) – The name of the parameter.
- **Description** (*not editable*) – The parameter description
- **Type** (*not editable*) – The data type for the parameter value.
- **Value** – The value for the parameter. If you are using this component for the first time in this recipe, and a default value was defined for the input parameter, the default value appears in the **Value** box with greyed-out text. If no other value is entered, Image Builder uses the default value.

Use a base image parameter in your recipe

When you create a recipe for image customizations, there are several ways to identify the base image that you start with. If you specify the Amazon Machine Image (AMI) ID for your base image and that base image is updated, its AMI ID might change and you would need to update your recipe to match.

Instead of changing your recipe each time the base image ID changes, you can define an AWS Systems Manager Parameter Store parameter (SSM parameter) to store the value of your base image AMI ID, and then use the parameter to specify the base image in your recipe. For AWS managed AMIs, you can use a public parameter for the latest version.

This tutorial walks you through the process of creating an AMI ID parameter and using it in an image recipe. Image Builder steps in this tutorial are console-based.

Contents

- Step 1: Find or create a Parameter Store parameter
- Step 2: Configure IAM permissions (optional)
- Step 3: Create an Image Recipe that uses the parameter

Step 1: Find or create a Parameter Store parameter

The process for this step depends on the type of AMI that you specify for your base image. For AWS managed AMIs, you can use a public parameter that refers to the current version. Some parameters might not be available in all AWS Regions.

To begin, open the tab that corresponds to your AMI.

AWS managed AMI

If your base image is an AWS managed AMI, you can use public parameters to specify the AMI ID, rather than creating your own parameter. To find the public parameter for your AMI, see Discovering public parameters in the *AWS Systems Manager User Guide*.

Custom AMI

To create an AMI ID parameter, follow the instructions for Creating Parameter Store parameters in Systems Manager with the console, AWS CLI, or PowerShell. Provide the following values to ensure that the parameter value is an AMI ID.

Parameter tier: `Standard`

Type: `String`

Data type: Select `aws:ec2:image`. When you specify this type, the system validates the value that's entered to ensure that it's an AMI ID.

Value: Enter a valid AMI ID (for example, ***ami-1234567890abcdef1***).

Step 2: Configure IAM permissions (optional)

To use a Systems Manager Parameter Store parameter (SSM parameter), whether public or private, the following Systems Manager Parameter Store actions must be specified in an IAM role, with the parameter listed as a resource. The Image Builder service-linked role grants permission to get public parameters, or to get or update private parameters that have an `/imagebuilder/` prefix. For private parameters that don't have that prefix, you can add permission to your execution role.

- `ssm:GetParameter` – This action allows you to use an SSM parameter to specify the base image in your recipe.
- `ssm:PutParameter` – This action allows you to store the output AMI ID in an SSM parameter during distribution. Policy definition looks the same, but this tutorial does not include the put action in the example policy.

1. **Create a custom role (optional)**

   When you create a pipeline or use the create-image command in the AWS CLI, you can only specify one Image Builder execution role. If you have defined an Image Builder workflow execution role, you would add any additional feature permissions to that role. Otherwise, you would create a new custom role that includes the required permissions. If you already have a custom execution role defined, you can skip this step.

   > **Important**
   >
   > We recommend that you don't pass the AWSServiceRoleForImageBuilder service-linked role as your execution role. Instead, create a custom IAM role and attach the EC2ImageBuilderExecutionPolicy AWS managed policy. This policy grants the same permissions that Image Builder needs to call AWS services on your behalf. Using a custom role gives you full control over the permissions that Image Builder uses. It also

keeps your service control policies (SCPs) and resource control policies (RCPs) in effect for operations that Image Builder performs on your behalf.

Follow the process for Creating a role to delegate permissions to an AWS service in the *AWS Identity and Access Management User Guide*.

2. **Add permissions to your custom role**

   To add the SSM parameter permissions to your custom role, follow the Update the permissions policy for a role process in the *AWS Identity and Access Management User Guide*.

   The following policy example shows the `ssm:GetParameter` action with a parameter that's created in your account.

   JSON

```
{
 "Version":"2012-10-17",
 "Statement": [
  {
   "Sid": "PrivateParameterCustomRole",
   "Effect": "Allow",
   "Action": "ssm:GetParameter",
   "Resource": "arn:aws:ssm:*:111122223333:parameter/parameter-name"
  }
 ]
}
```

For more information about public parameter resources, see Calling AMI public parameters in the *AWS Systems Manager User Guide*.

Step 3: Create an Image Recipe that uses the parameter

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Image recipes**, then choose **Create image recipe** from the list page.
3. Fill out the **Base image** section, as follows:

a. Choose the **Use custom AMI** option. This displays additional fields where you can enter the AMI ID or an SSM parameter that contains the AMI ID.

b. Choose the **SSM parameter** option.

c. In the **SSM parameter** field, enter the parameter name or Amazon Resource Name (ARN) of the parameter that you created in Step 1. If you enter the name, it will ***not*** have the prefix in the console.

4. Complete the remaining recipe configuration as needed.

> **Note**
>
> If you set the parent image through other interfaces, such as the AWS CLI, the parameter name must have a prefix of `ssm:` (for example, `ssm:/ImageBuilder-Tutorial/BaseAMI`.

Explore Image Builder sample projects on GitHub

The EC2 Image Builder team maintains the Image Builder samples repository on GitHub. The repository contains complete, deployable sample projects that show how to implement common use cases with infrastructure as code. Samples are available as AWS CloudFormation (CloudFormation) templates, AWS Cloud Development Kit (AWS CDK) applications, Terraform modules, and AWS Task Orchestrator and Executor (AWSTOE) component documents.

Each sample is self-contained, with its own README that covers prerequisites, deployment steps, how the sample works, testing, and cleanup. The tutorials in this chapter show you the image building process from the console. The sample projects show you the same concepts expressed as code that you can deploy, inspect, and adapt.

The repository includes samples for the following areas:

- **Getting started** – The smallest complete image pipeline, provided as both a CloudFormation template and an AWS CDK application in the `quick-start` sample.
- **Use-case kits** – Complete pipelines for common scenarios, such as a golden AMI pipeline with scheduled patching and Auto Scaling group refresh. Other kits cover cross-account AMI distribution, private VPC builds, lifecycle cleanup policies, and container base image pipelines that publish to Amazon Elastic Container Registry.

- **Image workflows** – Custom workflow samples that add human approval gates to the build and distribution stages, and integrate AWS Step Functions for out-of-band AMI validation.
- **Platform coverage** – Golden image pipelines for Windows Server, macOS, and Linux.
- **Components and debugging** – AWSTOE component patterns such as reboot-and-resume and build-time secrets. Also includes a script that tests component documents locally. A debugging walkthrough diagnoses a build that fails on purpose.

For the full list of samples, see the index in the repository README on GitHub. The samples are licensed under MIT-0, and the team reviews issues and pull requests on a best-effort basis.

Use components to customize your Image Builder image

Image Builder uses the AWS Task Orchestrator and Executor (AWSTOE) component management application to orchestrate complex workflows. Build and test components that work with the AWSTOE application are based on YAML documents that define the scripts to customize or test your image. For AMI images, Image Builder installs components and the AWSTOE component management application on its Amazon EC2 build and test instances. For container images, the components and AWSTOE component management application are installed inside of the running container.

Image Builder uses AWSTOE to perform all on-instance activities. There is no additional setup required to interact with AWSTOE when you run Image Builder commands or use the Image Builder console.

> **Note**
>
> When a component that is managed by Amazon reaches the end of its support lifespan, it is no longer maintained. About four weeks before this occurs, any accounts that are using the component receive notification, and a list of the affected recipes in their account from their AWS Health Dashboard. To learn more about AWS Health, see AWS Health User Guide.

Workflow stages for building a new image

The Image Builder workflow for building new images includes the following two distinct stages.

1. **Build stage** (pre-snapshot) – During the build stage, you make changes to the Amazon EC2 build instance that's running your base image, to create the baseline for your new image. For example, your recipe can include components that install an application or modify the operating system firewall settings.

   The following phases from your component document run during the build stage:

   - build
   - validate

   After this stage completes successfully, Image Builder creates a snapshot or container image that it uses for the test stage and beyond.

2. **Test stage** (post-snapshot) – During the test stage, there are some differences between images that create AMIs and container images. For AMI workflows, Image Builder launches an EC2 instance from the snapshot that it created as the final step of the build stage. Tests run on the new instance to validate settings and ensure that the instance is functioning as expected. For container workflows, the tests run on the same instance that was used for building.

   The following phase from your component document runs for every component that is included in the recipe during the image build test stage:

   - test

   This component phase applies to both Build and Test component types. After this stage completes successfully, Image Builder can create and distribute your final image from the snapshot or the container image.

> **Note**
>
> While the AWSTOE application framework allows you to define many phases in a component document, Image Builder has strict rules about what phases it runs, and during which stages it runs them. For a component to run during the image build stage, the component document must define at least one of these phases: `build` or `validate`. For a component to run during the image test stage, the component document must define the `test` phase, and no other phases.
> Since Image Builder runs the stages independently, chaining references in component documents cannot cross stage boundaries. You cannot chain a value from a phase that runs in the build stage to a phase that runs in the test stage. You can, however, define input parameters to the intended target, and pass in values through the command line. For more information about setting component parameters in your Image Builder recipes, see Tutorial: Create a custom component with input parameters.

To assist with troubleshooting on your build or test instance AWSTOE creates a log folder that contains the input document and log files to track what's happening each time a component runs. If you configured an Amazon S3 bucket in your pipeline configuration, the logs are also written there. For more information about YAML documents and log output, see Use the AWSTOE component document framework for custom components.

> **Tip**
>
> When you have many components to keep track of, tagging helps you to identify a specific component or version based on the tags you've assigned to it. For more information about tagging your resources using Image Builder commands in the AWS CLI, see the Tag resources section of this guide.

This section covers how to list, view, create, and import components, using the Image Builder console or commands in the AWS CLI.

Topics

- List and view component details
- Use AWS Marketplace components to customize your image
- Use managed components to customize your Image Builder image
- Develop custom components for your Image Builder image
- How Image Builder uses the AWS Task Orchestrator and Executor application to manage components

List and view component details

This section describes how you can find information and view details for the components that you use in your EC2 Image Builder recipes.

Component details

- List Image Builder components
- List component build versions from the AWS CLI
- Get component details from the AWS CLI
- Get component policy details from the AWS CLI

List Image Builder components

You can use one of the following methods to list and filter Image Builder components.

AWS Management Console

To display a list of components in the AWS Management Console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Select **Components** from the navigation pane. By default, Image Builder shows a list of components that your account owns.
3. You can optionally filter on component ownership. To see components that you don't own, but have access to, expand the owner type dropdown list and select one of the values. The owner type list is located in the search bar, next to the search text box. You can select from the following values:

   - **AWS Marketplace** – Components that are associated directly with an AWS Marketplace product subscription.
   - **Quick start (Amazon managed)** – Publicly available components that Amazon creates and maintains.
   - **Owned by me** – Components that you created. This is the default selection.
   - **Shared with me** – Components that others created and shared with you from their account.
   - **Third party managed** – Components that a third party owns that you subscribed to in AWS Marketplace.

AWS CLI

The following example shows how to use the **list-components** command to return a list of Image Builder components that your account owns.

```
aws imagebuilder list-components
```

You can optionally filter on component ownership. The owner attribute defines who owns the components that you want to list. By default, this request returns a list of components that your account owns. To filter the results by component owner, specify one of the following values with the `--owner` parameter when you run the **list-components** command.

Component owner values

- `AWSMarketplace`

- Amazon
- Self
- Shared
- ThirdParty

The following examples show the **list-components** command with the --owner parameter to filter results.

```
aws imagebuilder list-components --owner Self
{
    "requestId": "012a3456-b789-01cd-e234-fa5678b9012b",
    "componentVersionList": [
        {
            "arn": "arn:aws:imagebuilder:us-west-2:123456789012:component/sample-
component01/1.0.0",
            "name": "sample-component01",
            "version": "1.0.0",
            "platform": "Linux",
            "type": "BUILD",
            "owner": "123456789012",
            "dateCreated": "2020-09-24T16:58:24.444Z"
        },
        {
            "arn": "arn:aws:imagebuilder:us-west-2:123456789012:component/sample-
component01/1.0.1",
            "name": "sample-component01",
            "version": "1.0.1",
            "platform": "Linux",
            "type": "BUILD",
            "owner": "123456789012",
            "dateCreated": "2021-07-10T03:38:46.091Z"
        }
    ]
}
```

```
aws imagebuilder list-components --owner Amazon
```

```
aws imagebuilder list-components --owner Shared
```

```
aws imagebuilder list-components --owner ThirdParty
```

When you list components with the `--owner AWSMarketplace` value, you can filter the results by product code. Specify the `productCodes` filter with a value in the format `marketplace:`*`productCodeId`*, as shown in the following example:

```
aws imagebuilder list-components --owner AWSMarketplace --filters
 name=productCodes,values=marketplace:examplecode123
```

> **Note**
>
> Image Builder returns AWS Marketplace component ARNs under the `aws-marketplace` namespace, with an owner of `AWSMarketplace`. When you call **get-component** for an AWS Marketplace component, the response includes the owner but omits the component data. The component data is available only when the calling build instance is entitled to the product.

List component build versions from the AWS CLI

The following example shows how to use the **list-component-build-versions** command to list component build versions that have a specific semantic version. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

```
aws imagebuilder list-component-build-versions --component-version-arn
 arn:aws:imagebuilder:us-west-2:123456789012:component/example-component/1.0.1
{
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "componentSummaryList": [
        {
            "arn": "arn:aws:imagebuilder:us-west-2:123456789012:component/
examplecomponent/1.0.1/1",
            "name": "examplecomponent",
            "version": "1.0.1",
            "platform": "Linux",
            "type": "BUILD",
            "owner": "123456789012",
            "description": "An example component that builds, validates and tests an
 image",
```

```
            "changeDescription": "Updated version.",
            "dateCreated": "2020-02-19T18:53:45.940Z",
            "tags": {
                "KeyName": "KeyValue"
            }
        }
    ]
}
```

Get component details from the AWS CLI

The following example shows how to use the **get-component** command to get component details when you specify the component's Amazon Resource Name (ARN).

```
aws imagebuilder get-component --component-build-version-arn arn:aws:imagebuilder:us-
west-2:123456789012:component/example-component/1.0.1/1
   {
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11112",
    "component": {
        "arn": "arn:aws:imagebuilder:us-west-2:123456789012:component/
examplecomponent/1.0.1/1",
        "name": "examplecomponent",
        "version": "1.0.1",
        "type": "BUILD",
        "platform": "Linux",
        "owner": "123456789012",
        "data": "name: HelloWorldTestingDocument\ndescription: This is hello world
 testing document... etc.\"\n",
        "encrypted": true,
        "dateCreated": "2020-09-24T16:58:24.444Z",
        "tags": {}
    }
}
```

Get component policy details from the AWS CLI

The following example shows how to use the **get-component-policy** command to get details of a component policy when you specify the component's ARN.

```
aws imagebuilder get-component-policy --component-arn arn:aws:imagebuilder:us-
west-2:123456789012:component/example-component/1.0.1
```

Use AWS Marketplace components to customize your image

In addition to a large selection of images created by Independent Software Vendors (ISVs), the AWS Marketplace offers components that you can use to customize your own Image Builder images. You must subscribe to these AWS Marketplace components before you can use them in your image recipe to build a new image.

When you specify an AWS Marketplace component in an image recipe, Image Builder validates the subscription and performs dependency checks to ensure that you have the resources that you need to use it. When validation succeeds, Image Builder creates secure downloads for the component and its artifacts for use by image pipeline builds.

Image Builder discovers AWS Marketplace catalog metadata using its own service credentials, so you don't need to grant Image Builder additional permissions to discover AWS Marketplace components. However, your account must be subscribed to a product before you can use its components in a recipe.

Discover AWS Marketplace components

You can discover AWS Marketplace software components to use in your recipes from the **Discover products** page in the Image Builder console, as follows.

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. From the navigation pane, choose **Discover products** in the **AWS Marketplace** section.
3. Select the **Components** tab. This tab lists all of the AWS Marketplace products that use the delivery option that includes associated components in AWS Marketplace.
4. To search for specific software products that include components, you can enter part of the name in the search bar or filter by `Status`, `Operating System`, `Publisher`, or `Categories`. The search bar also contains pagination controls for your results.

Results

Each AWS Marketplace product has its own detail panel that includes the following information.

The AWS Marketplace product name and logo

The software product name is linked to the product detail in AWS Marketplace. You can select the link to learn more about the product in AWS Marketplace. Alternatively, you can view a summary of subscription options and subscribe directly from the search results with the **View subscription options** button if you've already done your research.

Version

This contains the primary version of the component.

Operating system

The operating system that the component is designed to run on.

Publisher

The publisher of the component. This is linked to the publisher detail page in AWS Marketplace. The publisher detail page opens in a new tab in your browser.

Categories

One or more AWS Marketplace product categories that apply for the component.

Status

Shows whether you are subscribed to this product. If you're not subscribed, you can choose **View subscription options** to see a summary of the subscription options for the AWS Marketplace product, and optionally subscribe directly from the Image Builder console.

Associated components

If the AWS Marketplace product has one or more versions that are included with your subscription, they are shown in the **Associated components** section. The section is collapsed initially, and displays a count of the associated components. You can expand the section to see more details.

Note

The Center for Internet Security (CIS) component that's associated with their AWS Marketplace image product is not shown in the **Discover products** results. If you subscribe to their image product, the associated component is shown in the **Subscriptions** page, and as a third-party component in the **Create image recipe** dialog. For more information about the component, see CIS hardening components.

Subscribe to AWS Marketplace components

After you've found an AWS Marketplace product with components that you want to use in your recipes, you can subscribe to it directly from the Image Builder console, as follows, or you can subscribe from the AWS Marketplace console.

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. From the navigation pane, choose **Discover products** in the **AWS Marketplace** section.
3. Select the **Components** tab. This tab lists all of the AWS Marketplace products that use the delivery option that includes associated components in AWS Marketplace.
4. To search for a specific AWS Marketplace product, enter part of the name in the search bar. If you know the publisher, but not the exact product name or how to spell it, you can also filter by `Publisher` to get a list of products that the publisher has available.
5. Select the product that you want to subscribe to from the results list, and choose **View subscription options**. This shows a summary of subscription options for the AWS Marketplace product.
6. Select **Subscribe** to subscribe to the product without leaving the Image Builder console. You are notified that the subscription is being processed. After you're subscribed, the **Status** is updated to `Subscribed`.

For more information about the AWS Marketplace products that you're currently subscribed to, see the console steps described in AWS Marketplace subscriptions in Image Builder.

Use an AWS Marketplace component in an Image Builder image recipe

You can use AWS Marketplace components in your Image Builder image recipes the same way that you use other types of components. For most of the components that are associated with an AWS Marketplace image product, the ownership category is `AWS Marketplace`. For example, to use a build component from an AWS Marketplace product that you've subscribed to, choose **Add build components**, and select `AWS Marketplace` from the list. This opens a selection panel on the right side of the console interface that lists AWS Marketplace components.

> **Note**
>
> If you're looking for the CIS hardening component, select `Third party managed`, from the ownership list instead of `AWS Marketplace`.

Important

A recipe that includes one or more AWS Marketplace components must also include at least one build component. Image Builder returns an error if you create a recipe that references AWS Marketplace components but has no build component. Container recipes don't support AWS Marketplace components. For more information, see Container recipe constraints.

For more information about how to select, arrange, and configure parameters for your components, see Create a new version of an image recipe.

Use managed components to customize your Image Builder image

Managed components are created by AWS, sometimes in partnership with a third-party organization, such as the Center for Internet Security (CIS), for example. When you use managed components in your image or container recipes, Amazon provides the latest component versions that have patches and other updates applied. To get a list of components, or to get component information, see List and view component details.

The following list of featured AWS managed components includes a component that's available for you to use when you subscribe to CIS hardened AMIs through the AWS Marketplace.

Featured components

- Distributor package managed component application install for Image Builder Windows images
- CIS hardening components
- Amazon managed STIG hardening components for Image Builder

Distributor package managed component application install for Image Builder Windows images

AWS Systems Manager Distributor helps you package and publish software to AWS Systems Manager managed nodes. You can package and publish your own software or use Distributor to find and publish AWS-provided agent software packages. For more information about Systems

Manager Distributor, see AWS Systems Manager Distributor in the *AWS Systems Manager User Guide*.

Managed components for Distributor

The following Image Builder managed components use AWS Systems Manager Distributor to install application packages on Windows instances.

- The `distributor-package-windows` managed component uses AWS Systems Manager Distributor to install application packages that you specify on your Windows image build instance. To configure parameters when you include this component in your recipe, see Configure `distributor-package-windows` as a standalone component.
- The `aws-vss-components-windows` component uses AWS Systems Manager Distributor to install the `AwsVssComponents` package on your Windows image build instance. To configure parameters when you include this component in your recipe, see Configure `aws-vss-components-windows` as a standalone component.

For more information about how to use managed components in your Image Builder recipe, see Create a new version of an image recipe for image recipes or Create a new version of a container recipe for container recipes. For more information about the `AwsVssComponents` package, see Create a VSS application-consistent snapshot in the *Amazon EC2 User Guide*.

Prerequisites

Before you use Image Builder components that rely on Systems Manager Distributor to install application packages, you must ensure that the following prerequisites are met.

- Image Builder components that use Systems Manager Distributor to install application packages on your instance need permission to call the Systems Manager API. Before you use the components in an Image Builder recipe, you must create the IAM policy and role that grant permission. To configure permissions, see Configure Systems Manager Distributor permissions.

> **Note**
>
> Image Builder doesn't currently support Systems Manager Distributor packages that reboot the instance. For example, the `AWSNVMe`, `AWSPVDrivers`, and `AwsEnaNetworkDriver` Distributor packages reboot the instance, and so are not allowed.

Configure Systems Manager Distributor permissions

The `distributor-package-windows` component and other components that use it, such as `aws-vss-components-windows`, require additional permission on the build instance to run. The build instance must be able to call the Systems Manager API to begin a Distributor installation and poll for the result.

Follow these procedures in the AWS Management Console to create a custom IAM policy and role that grant permission for Image Builder components to install Systems Manager Distributor packages from the build instance.

Step 1: Create a policy

Create an IAM policy for Distributor permissions.

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose **Policies**, and then choose **Create policy**.
3. On the **Create policy** page, choose the **JSON** tab, and then replace the default content with the following JSON policy, substituting partition, Region, and account ID as necessary, or using wildcards.

   JSON

```
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Sid": "AllowDistributorSendCommand",
            "Effect": "Allow",
            "Action": "ssm:SendCommand",
            "Resource": [
                "arn:aws:ssm:*::document/AWS-ConfigureAWSPackage",
                "arn:aws:ec2:*:111122223333:instance/*"
            ]
        },
        {
            "Sid": "AllowGetCommandInvocation",
            "Effect": "Allow",
            "Action": "ssm:GetCommandInvocation",
            "Resource": "*"
```

```
        }
    ]
}
```

4. Choose **Review policy**.
5. For **Name**, enter a name to identify the policy, such as *InvokeDistributor* or another name that you prefer.
6. (Optional) For **Description**, enter a description of the role's purpose.
7. Choose **Create policy**.

Step 2: Create a role

Create an IAM role for Distributor permissions.

1. From the IAM console navigation pane, choose **Roles**, and then choose **Create role**.
2. Under **Select type of trusted entity**, choose **AWS service**.
3. Immediately under **Choose the service that will use this role**, choose **EC2**, and then choose **Next: Permissions**.
4. Under **Select your use case**, choose **EC2**, and then choose **Next: Permissions**.
5. In the list of policies, select the check box next to **AmazonSSMManagedInstanceCore**. (Type `SSM` in the search box if you need to narrow the list.)
6. In this list of policies, choose the box next to **EC2InstanceProfileForImageBuilder**. (Type `ImageBuilder` in the search box if you need to narrow the list.)
7. Choose **Next: Tags**.
8. (Optional) Add one or more tag key value pairs to organize, track, or control access for this role, and then choose **Next: Review**.
9. For **Role name**, enter a name for the role, such as *InvokeDistributor* or another name that you prefer.
10. (Optional) For **Role description**, replace the default text with a description of this role's purpose.
11. Choose **Create role**. The system returns you to the **Roles** page.

Step 3: Attach the policy to the role

The final step to set up your Distributor permissions is to attach the IAM policy to the IAM role.

1. From the **Roles** page in the IAM console, choose the role that you just created. The role **Summary page** opens.
2. Choose **Attach policies**.
3. Search for the policy that you created in the previous procedure and select the check box next to the name.
4. Choose **Attach policy**.

Use this role in the Image Builder Infrastructure Configuration resource for any image that includes components that use Systems Manager Distributor. For more information, see Create an infrastructure configuration.

Configure `distributor-package-windows` as a standalone component

To use the `distributor-package-windows` component in a recipe, set the following parameters that configure the package to install.

> **Note**
>
> Before you use the `distributor-package-windows` component in a recipe, you must ensure that all of the Prerequisites are met.

- **Action** (Required) – Specify whether to install or uninstall the package. Valid values include `Install` and `Uninstall`. The value defaults to `Install`.
- **PackageName** (Required) – The name of the Distributor package to install or uninstall. For a list of valid package names, see Find Distributor packages.
- **PackageVersion** (Optional) – The version of the Distributor package to install. PackageVersion defaults to the recommended version.
- **AdditionalArguments** (Optional) – A JSON string that contains the additional parameters to provide to your script to install, uninstall, or update a package. For more information, see **additionalArguments** in the aws:configurePackage **Inputs** section of the **Systems Manager Command document plugin reference** page.

Configure `aws-vss-components-windows` as a standalone component

When you use the `aws-vss-components-windows` component in a recipe, you can optionally set the `PackageVersion` parameter to use a specific version of the `AwsVssComponents` package. When you leave out this parameter, the component defaults to use the recommended version of the `AwsVssComponents` package.

> **Note**
>
> Before you use the `aws-vss-components-windows` component in a recipe, you must ensure that all of the Prerequisites are met.

Find Distributor packages

Amazon and third parties provide public packages that you can install with Systems Manager Distributor.

To view available packages in the AWS Management Console, log into the AWS Systems Manager console and choose **Distributor** from the navigation pane. The **Distributor** page shows all of the packages that are available to you. For more information about listing available packages with the AWS CLI, see View packages (command line) in the *AWS Systems Manager User Guide*.

You can also create your own private Systems Manager Distributor packages. For more information, see Create a package in the *AWS Systems Manager User Guide*.

CIS hardening components

The Center for Internet Security (CIS) is a community-driven nonprofit organization. Their cybersecurity experts work together to develop IT security guidelines that safeguard public and private organizations against cyber threats. Their globally recognized set of best practices, known as CIS Benchmarks, help IT organizations around the world to securely configure their systems. For trending articles, blog posts, podcasts, webinars, and whitepapers, see CIS Insights on the *Center for Internet Security* website.

CIS Benchmarks

CIS creates and maintains a set of configuration guidelines, known as the CIS Benchmarks, which provide configuration best practices for specific technologies, including operating systems, cloud platforms, applications, databases, and more. CIS Benchmarks are recognized as an industry

standard by organizations and standards such as PCI DSS, HIPAA, DoD Cloud Computing SRG, FISMA, DFARS, and FEDRAMP. To learn more, see CIS Benchmarks on the *Center for Internet Security* website.

CIS hardening components

When you subscribe to a CIS Hardened Image in AWS Marketplace, you also get access to the associated hardening component that runs a script to enforce CIS Benchmarks Level 1 guidelines for your configuration. The CIS organization owns and maintains CIS hardening components to ensure that they reflect the latest guidelines.

> **Note**
>
> CIS hardening components don't follow the standard component ordering rules in Image Builder recipes. The CIS hardening components always run last to ensure that the benchmark tests run against your output image.

Amazon managed STIG hardening components for Image Builder

Security Technical Implementation Guides (STIGs) are the configuration hardening standards created by the Defense Information Systems Agency (DISA) to secure information systems and software. To make your systems compliant with STIG standards, you must install, configure, and test a variety of security settings.

Image Builder provides STIG hardening components to help you more efficiently build compliant images for baseline STIG standards. These STIG components scan for misconfigurations and run a remediation script. There are no additional charges for using STIG-compliant components.

> **Important**
>
> With few exceptions, unless specified through parameters, STIG hardening components do not install third-party packages. If third-party packages are already installed on the instance, and if there are related STIGs that Image Builder supports for that package, the hardening component applies them.

This page lists all STIGs that Image Builder supports that are applied to the EC2 instances that Image Builder launches when you build and test a new image. If you want to apply additional STIG

settings to your image, you can create a custom component to configure it. For more information about custom components and how to create them, see Use components to customize your Image Builder image.

When you create an image, the STIG hardening components log whether supported STIGs are applied or skipped. We recommend that you review the Image Builder logs for your images that use STIG hardening components. For more information about how to access and review Image Builder logs, see Troubleshoot pipeline builds.

Compliance levels

- **High (Category I)**

  The most severe risk. Includes any vulnerability that can result in loss of confidentiality, availability, or integrity.

- **Medium (Category II)**

  Includes any vulnerability that can result in loss of confidentiality, availability, or integrity, but the risks can be mitigated.

- **Low (Category III)**

  Any vulnerability that degrades measures to protect against loss of confidentiality, availability, or integrity.

Topics

- Windows STIG hardening components
- STIG version history log for Windows
- Linux STIG hardening components
- STIG version history log for Linux
- SCAP compliance validator component

Windows STIG hardening components

AWSTOE Windows STIG hardening components are designed for standalone servers and apply Local Group Policy. STIG-compliant hardening components install and update the Department of Defense (DoD) certificates. They also remove unnecessary certificates to maintain STIG compliance.

Currently, STIG baselines are supported for the following versions of Windows Server: 2012 R2, 2016, 2019, 2022, and 2025.

This section lists current settings for each of the Windows STIG hardening components, followed by a version history log.

Windows STIG Low (Category III)

The following list contains STIG settings that the hardening component applies to your infrastructure. If a supported setting isn't applicable for your infrastructure, the hardening component skips that setting, and moves on. For example, some STIG settings might not apply to standalone servers. Organization-specific policies can also affect which settings the hardening component applies, such as a requirement for administrators to review document settings.

For a complete list of Windows STIGs, see the STIGs Document Library. For information about how to view the complete list, see STIG Viewing Tools.

- **Windows Server 2025 STIG Version 1 Release 1**

  V-278082, V-278083, V-278084, V-278085, V-278098, V-278104, V-278110, and V-278231
- **Windows Server 2022 STIG Version 2 Release 7**

  V-254335, V-254336, V-254337, V-254338, V-254351, V-254357, V-254363, and V-254481
- **Windows Server 2019 STIG Version 3 Release 7**

  V-205691, V-205819, V-205858, V-205859, V-205860, V-205870, V-205871, and V-205923
- **Windows Server 2016 STIG Version 2 Release 10**

  V-224916, V-224917, V-224918, V-224919, V-224931, V-224942, and V-225060
- **Windows Server 2012 R2 MS STIG Version 3 Release 5**

  V-225250, V-225318, V-225319, V-225324, V-225327, V-225328, V-225330, V-225331, V-225332, V-225333, V-225334, V-225335, V-225336, V-225342, V-225343, V-225355, V-225357, V-225358, V-225359, V-225360, V-225362, V-225363, V-225376, V-225392, V-225394, V-225412, V-225459, V-225460, V-225462, V-225468, V-225473, V-225476, V-225479, V-225480, V-225481, V-225482, V-225483, V-225484, V-225485, V-225487, V-225488, V-225489, V-225490, V-225511, V-225514, V-225525, V-225526, V-225536, and V-225537
- **Microsoft .NET Framework 4.0 STIG Version 2 Release 7**

No STIG settings are applied to the Microsoft .NET Framework for Category III vulnerabilities.

- **Windows Firewall STIG Version 2 Release 2**

  V-241994, V-241995, V-241996, V-241999, V-242000, V-242001, V-242006, V-242007, and V-242008

- **Internet Explorer 11 STIG Version 2 Release 6**

  V-223056 and V-223078

- **Microsoft Edge STIG Version 2 Release 4 (Windows Server 2022 and 2025 only)**

  V-235727, V-235731, V-235751, V-235752, and V-235765

- **Microsoft Defender STIG Version 2 Release 7**

  No STIG settings are applied to the Microsoft Antivirus for Category III vulnerabilities.

Windows STIG Medium (Category II)

The following list contains STIG settings that the hardening component applies to your infrastructure. If a supported setting isn't applicable for your infrastructure, the hardening component skips that setting, and moves on. For example, some STIG settings might not apply to standalone servers. Organization-specific policies can also affect which settings the hardening component applies, such as a requirement for administrators to review document settings.

For a complete list of Windows STIGs, see the STIGs Document Library. For information about how to view the complete list, see STIG Viewing Tools.

> **Note**
>
> The Windows STIG Medium hardening components include all listed STIG settings that AWSTOE applies for Windows STIG Low hardening components, in addition to the STIG settings that are listed specifically for Category II vulnerabilities.

- **Windows Server 2025 STIG Version 1 Release 1**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

V-278015, V-278016, V-278019, V-278020, V-278021, V-278022, V-278023, V-278024, V-278025, V-278026, V-278033, V-278034, V-278035, V-278036, V-278037, V-278038, V-278039, V-278047, V-278048, V-278049, V-278050, V-278051, V-278052, V-278053, V-278054, V-278055, V-278056, V-278057, V-278058, V-278059, V-278060, V-278061, V-278062, V-278063, V-278064, V-278065, V-278066, V-278067, V-278068, V-278069, V-278070, V-278071, V-278072, V-278073, V-278074, V-278075, V-278076, V-278077, V-278078, V-278079, V-278080, V-278086, V-278088, V-278089, V-278091, V-278092, V-278093, V-278094, V-278095, V-278096, V-278097, V-278102, V-278103, V-278105, V-278106, V-278107, V-278108, V-278109, V-278111, V-278112, V-278113, V-278114, V-278115, V-278116, V-278117, V-278118, V-278119, V-278120, V-278122, V-278123, V-278124, V-278126, V-278127, V-278129, V-278130, V-278131, V-278165, V-278168, V-278169, V-278170, V-278171, V-278174, V-278180, V-278181, V-278182, V-278183, V-278184, V-278185, V-278187, V-278188, V-278189, V-278192, V-278193, V-278194, V-278195, V-278198, V-278199, V-278200, V-278201, V-278202, V-278203, V-278204, V-278205, V-278206, V-278209, V-278210, V-278211, V-278212, V-278213, V-278214, V-278218, V-278220, V-278221, V-278222, V-278223, V-278226, V-278227, V-278228, V-278229, V-278230, V-278232, V-278233, V-278234, V-278235, V-278236, V-278237, V-278238, V-278239, V-278240, V-278241, V-278243, V-278244, V-278245, V-278247, V-278248, V-278249, V-278251, V-278252, V-278253, V-278254, V-278255, V-278256, V-278257, V-278258, V-278259, V-278260, V-278261, V-278262, V-279916, V-279917, V-279918, V-279919, V-279920, V-279921, V-279922, and V-279923

- **Windows Server 2022 STIG Version 2 Release 7**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-254247, V-254269, V-254270, V-254271, V-254272, V-254273, V-254274, V-254275, V-254276, V-254277, V-254278, V-254285, V-254286, V-254287, V-254288, V-254289, V-254290, V-254291, V-254292, V-254296, V-254297, V-254298, V-254299, V-254300, V-254301, V-254302, V-254303, V-254304, V-254305, V-254307, V-254309, V-254311, V-254312, V-254313, V-254314, V-254315, V-254316, V-254319, V-254320, V-254321, V-254322, V-254323, V-254324, V-254325, V-254326, V-254327, V-254328, V-254329, V-254330, V-254331, V-254332, V-254333, V-254334, V-254339, V-254341, V-254342, V-254344, V-254345, V-254346, V-254347, V-254348, V-254349, V-254350, V-254355, V-254356, V-254358, V-254359, V-254360, V-254361, V-254362, V-254364, V-254365, V-254366, V-254367, V-254368, V-254369, V-254370, V-254371, V-254372, V-254373,

V-254375, V-254376, V-254377, V-254379, V-254380, V-254382, V-254383, V-254384, V-254431, V-254433, V-254434, V-254435, V-254436, V-254438, V-254439, V-254440, V-254442, V-254443, V-254444, V-254445, V-254447, V-254448, V-254449, V-254450, V-254451, V-254452, V-254453, V-254454, V-254455, V-254456, V-254459, V-254460, V-254461, V-254462, V-254463, V-254464, V-254468, V-254470, V-254471, V-254472, V-254473, V-254476, V-254477, V-254478, V-254479, V-254480, V-254482, V-254483, V-254484, V-254485, V-254486, V-254487, V-254488, V-254489, V-254491, V-254493, V-254494, V-254495, V-254497, V-254498, V-254499, V-254501, V-254502, V-254503, V-254504, V-254505, V-254506, V-254507, V-254508, V-254509, V-254510, V-254511, V-254512, V-278942, V-278943, V-278944, V-278945, V-278946, V-278947, V-278948, and V-278949

- **Windows Server 2019 STIG Version 3 Release 7**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-205625, V-205626, V-205627, V-205629, V-205630, V-205633, V-205634, V-205635, V-205636, V-205637, V-205638, V-205639, V-205640, V-205641, V-205642, V-205643, V-205644, V-205648, V-205649, V-205650, V-205651, V-205652, V-205655, V-205656, V-205659, V-205660, V-205662, V-205671, V-205672, V-205673, V-205675, V-205676, V-205678, V-205679, V-205680, V-205681, V-205682, V-205683, V-205684, V-205685, V-205686, V-205687, V-205688, V-205689, V-205690, V-205692, V-205693, V-205694, V-205697, V-205698, V-205708, V-205709, V-205712, V-205714, V-205716, V-205717, V-205718, V-205719, V-205720, V-205722, V-205730, V-205731, V-205733, V-205747, V-205748, V-205749, V-205751, V-205752, V-205754, V-205755, V-205756, V-205758, V-205759, V-205760, V-205761, V-205762, V-205763, V-205764, V-205765, V-205766, V-205767, V-205768, V-205769, V-205770, V-205771, V-205772, V-205773, V-205774, V-205775, V-205776, V-205777, V-205778, V-205779, V-205780, V-205781, V-205782, V-205783, V-205784, V-205795, V-205796, V-205797, V-205798, V-205801, V-205808, V-205809, V-205810, V-205811, V-205812, V-205813, V-205814, V-205815, V-205816, V-205817, V-205821, V-205822, V-205823, V-205824, V-205825, V-205826, V-205827, V-205828, V-205830, V-205832, V-205833, V-205835, V-205836, V-205837, V-205838, V-205842, V-205861, V-205863, V-205865, V-205866, V-205867, V-205868, V-205869, V-205872, V-205873, V-205874, V-205909, V-205910, V-205911, V-205912, V-205915, V-205916, V-205917, V-205918, V-205920, V-205921, V-205922, V-205925, V-257503, V-278934, V-278935, V-278936, V-278937, V-278938, V-278939, V-278940, and V-278941

- **Windows Server 2016 STIG Version 2 Release 10**

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

V-224850, V-224851, V-224852, V-224853, V-224854, V-224855, V-224856, V-224857, V-224858, V-224859, V-224866, V-224867, V-224868, V-224869, V-224870, V-224871, V-224872, V-224873, V-224877, V-224878, V-224879, V-224880, V-224881, V-224882, V-224883, V-224884, V-224885, V-224886, V-224888, V-224890, V-224892, V-224893, V-224894, V-224895, V-224896, V-224897, V-224900, V-224901, V-224902, V-224903, V-224904, V-224905, V-224906, V-224907, V-224908, V-224909, V-224910, V-224911, V-224912, V-224913, V-224914, V-224915, V-224920, V-224921, V-224922, V-224924, V-224925, V-224926, V-224927, V-224928, V-224929, V-224930, V-224935, V-224936, V-224937, V-224938, V-224939, V-224940, V-224941, V-224943, V-224944, V-224945, V-224946, V-224947, V-224948, V-224949, V-224951, V-224952, V-224953, V-224955, V-224956, V-224957, V-224959, V-224960, V-224962, V-224963, V-224965, V-224966, V-224967, V-224968, V-224969, V-224987, V-224988, V-224989, V-224995, V-224996, V-224997, V-224998, V-224999, V-225000, V-225001, V-225002, V-225003, V-225004, V-225005, V-225008, V-225009, V-225010, V-225011, V-225013, V-225014, V-225015, V-225016, V-225017, V-225018, V-225019, V-225020, V-225021, V-225022, V-225023, V-225024, V-225026, V-225027, V-225028, V-225029, V-225030, V-225031, V-225032, V-225033, V-225034, V-225035, V-225038, V-225039, V-225040, V-225041, V-225042, V-225043, V-225047, V-225049, V-225050, V-225051, V-225052, V-225055, V-225056, V-225057, V-225058, V-225059, V-225061, V-225062, V-225063, V-225064, V-225065, V-225066, V-225067, V-225068, V-225070, V-225072, V-225073, V-225074, V-225076, V-225077, V-225078, V-225080, V-225081, V-225082, V-225083, V-225084, V-225085, V-225086, V-225087, V-225088, V-225089, V-225092, V-225093, and V-257502

- **Windows Server 2012 R2 MS STIG Version 3 Release 5**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-225239, V-225259, V-225260, V-225261, V-225263, V-225264, V-225265, V-225266, V-225267, V-225268, V-225269, V-225270, V-225271, V-225272, V-225273, V-225275, V-225276, V-225277, V-225278, V-225279, V-225280, V-225281, V-225282, V-225283, V-225284, V-225285, V-225286, V-225287, V-225288, V-225289, V-225290, V-225291, V-225292, V-225293, V-225294, V-225295, V-225296, V-225297, V-225298, V-225299, V-225300, V-225301, V-225302, V-225303, V-225304, V-225305, V-225314, V-225315, V-225316, V-225317, V-225325, V-225326, V-225329, V-225337, V-225338, V-225339,

V-225340, V-225341, V-225344, V-225345, V-225346, V-225347, V-225348, V-225349, V-225350, V-225351, V-225352, V-225353, V-225356, V-225367, V-225368, V-225369, V-225370, V-225371, V-225372, V-225373, V-225374, V-225375, V-225377, V-225378, V-225379, V-225380, V-225381, V-225382, V-225383, V-225384, V-225385, V-225386, V-225389, V-225391, V-225393, V-225395, V-225397, V-225398, V-225400, V-225401, V-225402, V-225404, V-225405, V-225406, V-225407, V-225408, V-225409, V-225410, V-225411, V-225413, V-225414, V-225415, V-225441, V-225442, V-225443, V-225448, V-225452, V-225453, V-225454, V-225455, V-225456, V-225457, V-225458, V-225461, V-225463, V-225464, V-225469, V-225470, V-225471, V-225472, V-225474, V-225475, V-225477, V-225478, V-225486, V-225494, V-225500, V-225501, V-225502, V-225503, V-225504, V-225506, V-225508, V-225509, V-225510, V-225513, V-225515, V-225516, V-225517, V-225518, V-225519, V-225520, V-225521, V-225522, V-225523, V-225524, V-225527, V-225528, V-225529, V-225530, V-225531, V-225532, V-225533, V-225534, V-225535, V-225538, V-225539, V-225540, V-225541, V-225542, V-225543, V-225544, V-225545, V-225546, V-225548, V-225549, V-225550, V-225551, V-225553, V-225554, V-225555, V-225557, V-225558, V-225559, V-225560, V-225561, V-225562, V-225563, V-225564, V-225565, V-225566, V-225567, V-225568, V-225569, V-225570, V-225571, V-225572, V-225573, and V-225574

- **Microsoft .NET Framework 4.0 STIG Version 2 Release 7**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-225223, V-225230, V-225235, and V-225238

- **Windows Firewall STIG Version 2 Release 2**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-241989, V-241990, V-241991, V-241993, V-241998, V-242003, V-242004, and V-242005

- **Internet Explorer 11 STIG Version 2 Release 6**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-223015, V-223017, V-223018, V-223019, V-223020, V-223021, V-223022, V-223023, V-223024, V-223025, V-223026, V-223027, V-223028, V-223029, V-223030, V-223031, V-223032, V-223033, V-223034, V-223035, V-223036, V-223037, V-223038, V-223039,

V-223040, V-223041, V-223042, V-223043, V-223044, V-223045, V-223046, V-223048, V-223049, V-223050, V-223051, V-223052, V-223053, V-223054, V-223055, V-223057, V-223058, V-223059, V-223060, V-223061, V-223062, V-223063, V-223064, V-223065, V-223066, V-223067, V-223068, V-223069, V-223070, V-223071, V-223072, V-223073, V-223074, V-223075, V-223076, V-223077, V-223079, V-223080, V-223081, V-223082, V-223083, V-223084, V-223085, V-223086, V-223087, V-223088, V-223089, V-223090, V-223091, V-223092, V-223093, V-223094, V-223095, V-223096, V-223097, V-223098, V-223099, V-223100, V-223101, V-223102, V-223103, V-223104, V-223105, V-223106, V-223107, V-223108, V-223109, V-223110, V-223111, V-223112, V-223113, V-223114, V-223115, V-223116, V-223117, V-223118, V-223119, V-223120, V-223121, V-223123, V-223125, V-223126, V-223127, V-223128, V-223129, V-223130, V-223131, V-223132, V-223133, V-223134, V-223135, V-223136, V-223137, V-223138, V-223139, V-223140, V-223141, V-223142, V-223143, V-223144, V-223145, V-223146, V-223147, V-223148, V-223149, V-250540, and V-250541

- **Microsoft Edge STIG Version 2 Release 4 (Windows Server 2022 and 2025 only)**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-235720, V-235721, V-235723, V-235724, V-235725, V-235726, V-235728, V-235729, V-235730, V-235732, V-235733, V-235734, V-235735, V-235736, V-235737, V-235738, V-235739, V-235740, V-235741, V-235742, V-235743, V-235744, V-235745, V-235746, V-235747, V-235748, V-235749, V-235750, V-235754, V-235756, V-235760, V-235761, V-235763, V-235764, V-235766, V-235767, V-235768, V-235769, V-235770, V-235771, V-235772, V-235773, V-235774, and V-246736

- **Microsoft Defender STIG Version 2 Release 7**

  Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities, plus:

  V-213427, V-213429, V-213430, V-213431, V-213432, V-213433, V-213434, V-213435, V-213436, V-213437, V-213438, V-213439, V-213440, V-213441, V-213442, V-213443, V-213444, V-213445, V-213446, V-213447, V-213448, V-213449, V-213450, V-213451, V-213454, V-213455, V-213456, V-213457, V-213458, V-213459, V-213460, V-213461, V-213462, V-213463, V-213464, V-213465, V-213466, V-278647, V-278648, V-278649, V-278650, V-278651, V-278652, V-278653, V-278654, V-278655, V-278656, V-278658,

V-278659, V-278660, V-278661, V-278662, V-278668, V-278669, V-278672, V-278674, V-278675, V-278676, V-278677, V-278678, V-278679, V-278680, and V-278863

Windows STIG High (Category I)

The following list contains STIG settings that the hardening component applies to your infrastructure. If a supported setting isn't applicable for your infrastructure, the hardening component skips that setting, and moves on. For example, some STIG settings might not apply to standalone servers. Organization-specific policies can also affect which settings the hardening component applies, such as a requirement for administrators to review document settings.

For a complete list of Windows STIGs, see the STIGs Document Library. For information about how to view the complete list, see STIG Viewing Tools.

> **Note**
>
> The Windows STIG High hardening components include all listed STIG settings that AWSTOE applies for Windows STIG Low and Windows STIG Medium hardening components, in addition to the STIG settings that are listed specifically for Category I vulnerabilities.

- **Windows Server 2025 STIG Version 1 Release 1**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

  V-278040, V-278099, V-278100, V-278101, V-278121, V-278125, V-278128, V-278196, V-278215, V-278216, V-278217, V-278219, V-278225, V-278242, V-278246, and V-278250

- **Windows Server 2022 STIG Version 2 Release 7**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

  V-254250, V-254293, V-254352, V-254353, V-254354, V-254374, V-254378, V-254381, V-254446, V-254466, V-254467, V-254469, V-254474, V-254475, V-254492, V-254496, and V-254500

- **Windows Server 2019 STIG Version 3 Release 7**

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

V-205653, V-205654, V-205663, V-205711, V-205713, V-205724, V-205725, V-205750, V-205753, V-205757, V-205802, V-205804, V-205805, V-205806, V-205849, V-205908, V-205914, and V-205919

- **Windows Server 2016 STIG Version 2 Release 10**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

  V-224831, V-224874, V-224932, V-224933, V-224934, V-224954, V-224958, V-224961, V-225025, V-225045, V-225046, V-225048, V-225053, V-225054, V-225071, V-225079, and V-225091

- **Windows Server 2012 R2 MS STIG Version 3 Release 5**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

  V-225274, V-225354, V-225364, V-225365, V-225366, V-225390, V-225396, V-225399, V-225444, V-225449, V-225491, V-225492, V-225493, V-225496, V-225497, V-225498, V-225505, V-225507, V-225547, V-225552, and V-225556

- **Microsoft .NET Framework 4.0 STIG Version 2 Release 7**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for the Microsoft .NET Framework. No additional STIG settings apply for Category I vulnerabilities.

- **Windows Firewall STIG Version 2 Release 2**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

  V-241992, V-241997, and V-242002

- **Internet Explorer 11 STIG Version 2 Release 6**

  V-252910

- **Microsoft Edge STIG Version 2 Release 4 (Windows Server 2022 and 2025 only)**

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

V-235758 and V-235759

- **Microsoft Defender STIG Version 2 Release 7**

  Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities, plus:

  V-213426, V-213428, V-213452, and V-213453

STIG version history log for Windows

This section logs Windows hardening component version history for the quarterly STIG updates. To see the changes and published versions for a quarter, choose the title to expand the information.

2026 Q1 changes - 3/10/2026:

Added support for Windows Server 2025 and updated all applicable STIGs to first quarter 2026.

STIG-Build-Windows

- Windows Server 2025 STIG Version 1 Release 1
- Windows Server 2022 STIG Version 2 Release 7
- Windows Server 2019 STIG Version 3 Release 7
- Windows Server 2016 STIG Version 2 Release 10
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 7
- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 8
- Microsoft Edge STIG Version 2 Release 4 (Windows Server 2022 and 2025 only)

2025 Q3 changes - 9/04/2025 (no changes):

There were no changes for Windows component STIGS for the 2025 third quarter release.

2025 Q2 changes - 06/26/2025:

Updated STIG versions and applied STIGS for the 2025 Q2 release as follows:

STIG-Build-Windows-Low version 2025.2.x

- Windows Server 2022 STIG Version 2 Release 4
- Windows Server 2019 STIG Version 3 Release 4
- Windows Server 2016 STIG Version 2 Release 10
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 6
- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 5
- Microsoft Edge STIG Version 2 Release 2 (Windows Server 2022 only)

STIG-Build-Windows-Medium version 2025.2.x

- Windows Server 2022 STIG Version 2 Release 4
- Windows Server 2019 STIG Version 3 Release 4
- Windows Server 2016 STIG Version 2 Release 10
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 6
- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 5
- Microsoft Edge STIG Version 2 Release 2 (Windows Server 2022 only)
- Defender STIG Version 2 Release 4

STIG-Build-Windows-High version 2025.2.x

- Windows Server 2022 STIG Version 2 Release 4
- Windows Server 2019 STIG Version 3 Release 4
- Windows Server 2016 STIG Version 2 Release 10
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 6

- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 5
- Microsoft Edge STIG Version 2 Release 2 (Windows Server 2022 only)
- Defender STIG Version 2 Release 4

2025 Q1 changes - 05/04/2025:

Updated STIGS for Internet Explorer 11 STIG Version 2 Release 5 for all STIG components for the 2025 first quarter release.

- STIG-Build-Windows-Low version 2025.1.x
- STIG-Build-Windows-Medium version 2025.1.x
- STIG-Build-Windows-High version 2025.1.x

2024 Q4 changes - 02/04/2025:

Updated STIG versions and applied STIGS for the 2024 Q4 release as follows:

STIG-Build-Windows-Low version 2024.4.0

- Windows Server 2022 STIG Version 2 Release 2
- Windows Server 2019 STIG Version 3 Release 2
- Windows Server 2016 STIG Version 2 Release 9
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 2
- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 5
- Microsoft Edge STIG Version 2 Release 2 (Windows Server 2022 only)

STIG-Build-Windows-Medium version 2024.4.0

- Windows Server 2022 STIG Version 2 Release 2
- Windows Server 2019 STIG Version 3 Release 2
- Windows Server 2016 STIG Version 2 Release 9
- Windows Server 2012 R2 MS STIG Version 3 Release 5

- Microsoft .NET Framework 4.0 STIG Version 2 Release 2
- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 5
- Microsoft Edge STIG Version 2 Release 2 (Windows Server 2022 only)
- Defender STIG Version 2 Release 4

STIG-Build-Windows-High version 2024.4.0

- Windows Server 2022 STIG Version 2 Release 2
- Windows Server 2019 STIG Version 3 Release 2
- Windows Server 2016 STIG Version 2 Release 9
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 2
- Windows Firewall STIG Version 2 Release 2
- Internet Explorer 11 STIG Version 2 Release 5
- Microsoft Edge STIG Version 2 Release 2 (Windows Server 2022 only)
- Defender STIG Version 2 Release 4

2024 Q3 changes - 10/04/2023 (no changes):

There were no changes for Windows component STIGS for the 2024 third quarter release.

2024 Q2 changes - 05/10/2024 (no changes):

There were no changes for Windows component STIGS for the 2024 second quarter release.

2024 Q1 changes - 02/06/2024 (no changes):

There were no changes for Windows component STIGS for the 2024 first quarter release.

2023 Q4 changes - 12/04/2023 (no changes):

There were no changes for Windows component STIGS for the 2023 fourth quarter release.

2023 Q3 changes - 10/04/2023 (no changes):

There were no changes for Windows component STIGS for the 2023 third quarter release.

2023 Q2 changes - 05/03/2023 (no changes):

There were no changes for Windows component STIGS for the 2023 second quarter release.

2023 Q1 changes - 03/27/2023 (no changes):

There were no changes for Windows component STIGS for the 2023 first quarter release.

2022 Q4 changes - 02/01/2023:

Updated STIG versions and applied STIGS for the 2022 Q4 release as follows:

STIG-Build-Windows-Low version 2022.4.x

- Windows Server 2022 STIG Version 1 Release 1
- Windows Server 2019 STIG Version 2 Release 5
- Windows Server 2016 STIG Version 2 Release 5
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 2
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 2 Release 3
- Microsoft Edge STIG Version 1 Release 6 (Windows Server 2022 only)

STIG-Build-Windows-Medium version 2022.4.x

- Windows Server 2022 STIG Version 1 Release 1
- Windows Server 2019 STIG Version 2 Release 5
- Windows Server 2016 STIG Version 2 Release 5
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 2
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 2 Release 3
- Microsoft Edge STIG Version 1 Release 6 (Windows Server 2022 only)
- Defender STIG Version 2 Release 4 (Windows Server 2022 only)

STIG-Build-Windows-High version 2022.4.x

- Windows Server 2022 STIG Version 1 Release 1
- Windows Server 2019 STIG Version 2 Release 5
- Windows Server 2016 STIG Version 2 Release 5
- Windows Server 2012 R2 MS STIG Version 3 Release 5
- Microsoft .NET Framework 4.0 STIG Version 2 Release 2
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 2 Release 3
- Microsoft Edge STIG Version 1 Release 6 (Windows Server 2022 only)
- Defender STIG Version 2 Release 4 (Windows Server 2022 only)

2022 Q3 changes - 09/30/2022 (no changes):

There were no changes for Windows component STIGS for the 2022 third quarter release.

2022 Q2 changes - 08/02/2022:

Updated STIG versions and applied STIGS for the 2022 Q2 release.

STIG-Build-Windows-Low version 1.5.x

- Windows Server 2019 STIG Version 2 Release 4
- Windows Server 2016 STIG Version 2 Release 4
- Windows Server 2012 R2 MS STIG Version 3 Release 3
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 1 Release 19

STIG-Build-Windows-Medium version 1.5.x

- Windows Server 2019 STIG Version 2 Release 4
- Windows Server 2016 STIG Version 2 Release 4
- Windows Server 2012 R2 MS STIG Version 3 Release 3
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1

- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 1 Release 19

STIG-Build-Windows-High version 1.5.x

- Windows Server 2019 STIG Version 2 Release 4
- Windows Server 2016 STIG Version 2 Release 4
- Windows Server 2012 R2 MS STIG Version 3 Release 3
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 1 Release 19

2022 Q1 changes - 08/02/2022 (no changes):

There were no changes for Windows component STIGS for the 2022 first quarter release.

2021 Q4 changes - 12/20/2021:

Updated STIG versions and applied STIGS for the 2021 fourth quarter release.

STIG-Build-Windows-Low version 1.5.x

- Windows Server 2019 STIG Version 2 Release 3
- Windows Server 2016 STIG Version 2 Release 3
- Windows Server 2012 R2 MS STIG Version 3 Release 3
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 1 Release 19

STIG-Build-Windows-Medium version 1.5.x

- Windows Server 2019 STIG Version 2 Release 3
- Windows Server 2016 STIG Version 2 Release 3
- Windows Server 2012 R2 MS STIG Version 3 Release 3
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1

- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 1 Release 19

STIG-Build-Windows-High version 1.5.x

- Windows Server 2019 STIG Version 2 Release 3
- Windows Server 2016 STIG Version 2 Release 3
- Windows Server 2012 R2 MS STIG Version 3 Release 3
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 2 Release 1
- Internet Explorer 11 STIG Version 1 Release 19

2021 Q3 changes - 09/30/2021:

Updated STIG versions and applied STIGS for the 2021 third quarter release.

STIG-Build-Windows-Low version 1.4.x

- Windows Server 2019 STIG Version 2 Release 2
- Windows Server 2016 STIG Version 2 Release 2
- Windows Server 2012 R2 MS STIG Version 3 Release 2
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 1 Release 7
- Internet Explorer 11 STIG Version 1 Release 19

STIG-Build-Windows-Medium version 1.4.x

- Windows Server 2019 STIG Version 2 Release 2
- Windows Server 2016 STIG Version 2 Release 2
- Windows Server 2012 R2 MS STIG Version 3 Release 2
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 1 Release 7
- Internet Explorer 11 STIG Version 1 Release 19

STIG-Build-Windows-High version 1.4.x

- Windows Server 2019 STIG Version 2 Release 2
- Windows Server 2016 STIG Version 2 Release 2
- Windows Server 2012 R2 MS STIG Version 3 Release 2
- Microsoft .NET Framework 4.0 STIG Version 2 Release 1
- Windows Firewall STIG Version 1 Release 7
- Internet Explorer 11 STIG Version 1 Release 19

Linux STIG hardening components

This section contains information about Linux STIG hardening components, followed by a version history log. If the Linux distribution doesn't have STIG settings of its own, the hardening component applies RHEL settings.

The Linux components have optional input parameters that help you customize the following behaviors for your Linux instance.

- **Level (string)** If no value is specified, the default is `High` and will apply all aplicable Low, Medium, and High configurations.
- **InstallPackages (string)** If the value is `No`, the component does not install any additional software packages. If the value is `Yes`, the component installs additional software packages that are required for maximum compliance. The default is `No`.
- **SetDoDConsentBanner (string)** If the value is `No`, the DoD consent banner is not shown when you attach to an instance that has one of the STIG Linux components installed. If the value is `Yes`, the DoD consent banner is shown before you log in when you attach to an instance that has one of the STIG Linux components installed. You must acknowledge the banner before you can log in. The default is `No`.

  For an example of the consent banner, see the Disclaimer Department of Defense Privacy and Consent Notice that appears when you access the DLA Document Services website.

The hardening component applies supported STIG settings to the infrastructure based on the Linux distribution, as follows:

Red Hat Enterprise Linux (RHEL) 7 STIG settings

- RHEL 7
- CentOS 7
- Amazon Linux 2 (AL2)

RHEL 8 STIG settings

- RHEL 8
- CentOS 8

RHEL 9 STIG settings

- RHEL 9
- CentOS Stream 9

Linux STIG Low (Category III)

The following list contains STIG settings that the hardening component applies to your infrastructure. If a supported setting isn't applicable for your infrastructure, the hardening component skips that setting, and moves on. For example, some STIG settings might not apply to standalone servers. Organization-specific policies can also affect which settings the hardening component applies, such as a requirement for administrators to review document settings.

For a complete list, see the STIGs Document Library. For information about how to view the complete list, see STIG Viewing Tools.

RHEL 7 STIG Version 3 Release 15

- **RHEL 7/CentOS 7/AL2**

  V-204452, V-204576, and V-204605

RHEL 8 STIG Version 2 Release 6

- **RHEL 8/CentOS 8**

  V-230241, V-230269, V-230270, V-230281, V-230285, V-230346, V-230381, V-230395, V-230468, V-230469, V-230485, V-230486, V-230491, V-230494, V-230495, V-230496, V-230497, V-230498, V-230499, and V-244527

RHEL 9 STIG Version 2 Release 7

- **RHEL 9/CentOS Stream 9**

  V-257782, V-257824, V-258138, V-258037, V-257880, V-258069, V-258076, V-258067, V-257946, V-257947, V-257795, V-257796, and V-258173

Amazon Linux 2023 STIG Version 1 Release 2

V-274141

SLES 12 STIG Version 3 Release 4

V-217108, V-217113, V-217140, V-217198, V-217209, V-217211, V-217212, V-217213, V-217214, V-217215, V-217216, V-217236, V-217237, V-217238, V-217239, V-217282, and V-255915

SLES 15 STIG Version 2 Release 6

V-234811, V-234850, V-234868, V-234873, V-234905, V-234907, V-234908, V-234909, V-234933, V-234934, V-234935, V-234936, V-234955, V-234963, V-234967, and V-255921

Ubuntu 18.04 STIG Version 2 Release 15

V-219163, V-219164, V-219165, V-219172, V-219173, V-219174, V-219175, V-219178, V-219179, V-219180, V-219210, V-219301, V-219327, V-219332, and V-219333

Ubuntu 20.04 STIG Version 2 Release 4

V-238202, V-238203, V-238221, V-238222, V-238223, V-238224, V-238226, V-238234, V-238235, V-238237, V-238308, V-238323, V-238357, V-238362, and V-238373

Ubuntu 22.04 STIG Version 2 Release 7

V-260472, V-260476, V-260479, V-260480, V-260481, V-260520, V-260521, V-260549, V-260550, V-260551, V-260552, V-260581, and V-260596

Ubuntu 24.04 STIG Version 1 Release 4

V-270645, V-270646, V-270664, V-270677, V-270690, V-270695, V-270706, V-270710, V-270734, V-270749, V-270752, V-270818, and V-270820

Linux STIG Medium (Category II)

The following list contains STIG settings that the hardening component applies to your infrastructure. If a supported setting isn't applicable for your infrastructure, the hardening component skips that setting, and moves on. For example, some STIG settings might not apply to standalone servers. Organization-specific policies can also affect which settings the hardening component applies, such as a requirement for administrators to review document settings.

For a complete list, see the STIGs Document Library. For information about how to view the complete list, see STIG Viewing Tools.

> **Note**
>
> The Linux STIG Medium hardening components include all listed STIG settings that AWSTOE applies for Linux STIG Low hardening components, in addition to the STIG settings that are listed specifically for Category II vulnerabilities.

RHEL 7 STIG Version 3 Release 15

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

- **RHEL 7/CentOS 7/AL2**

  V-204405, V-204406, V-204407, V-204408, V-204409, V-204410, V-204411, V-204412, V-204413, V-204414, V-204415, V-204416, V-204417, V-204418, V-204420, V-204422, V-204423, V-204426, V-204427, V-204431, V-204434, V-204435, V-204437, V-204449, V-204450, V-204451, V-204457, V-204466, V-204490, V-204491, V-204503, V-204507, V-204508, V-204510, V-204511, V-204512, V-204514, V-204515, V-204516, V-204517, V-204521, V-204524, V-204531, V-204536, V-204537, V-204538, V-204539, V-204540, V-204541, V-204542, V-204543, V-204544, V-204545, V-204546, V-204547, V-204548, V-204549, V-204550, V-204551, V-204552, V-204553, V-204554, V-204555, V-204556, V-204557, V-204558, V-204559, V-204560, V-204562, V-204563, V-204564, V-204565, V-204566, V-204567, V-204568, V-204572, V-204579, V-204584, V-204585, V-204587, V-204588, V-204589, V-204590, V-204591, V-204592, V-204593, V-204596, V-204597, V-204598, V-204599, V-204600, V-204601, V-204602, V-204609, V-204610, V-204611, V-204612, V-204613, V-204614, V-204615, V-204616, V-204617, V-204619, V-204622,

V-204625, V-204630, V-204631, V-204633, V-233307, V-237634, V-237635, V-251703, V-255925, V-255927, V-255928, and V-256970

RHEL 8 STIG Version 2 Release 6

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

- **RHEL 8/CentOS 8**

  V-230222, V-230228, V-230231, V-230233, V-230236, V-230237, V-230238, V-230239, V-230240, V-230240, V-230243, V-230244, V-230245, V-230246, V-230247, V-230248, V-230249, V-230250, V-230255, V-230256, V-230257, V-230258, V-230259, V-230260, V-230261, V-230262, V-230266, V-230267, V-230268, V-230271, V-230273, V-230275, V-230276, V-230277, V-230278, V-230279, V-230280, V-230282, V-230282, V-230286, V-230287, V-230288, V-230290, V-230291, V-230296, V-230298, V-230310, V-230311, V-230312, V-230313, V-230314, V-230315, V-230316, V-230318, V-230319, V-230320, V-230321, V-230322, V-230324, V-230325, V-230326, V-230327, V-230330, V-230332, V-230333, V-230335, V-230337, V-230339, V-230341, V-230343, V-230345, V-230347, V-230348, V-230352, V-230353, V-230354, V-230356, V-230357, V-230358, V-230359, V-230360, V-230361, V-230362, V-230363, V-230365, V-230366, V-230368, V-230369, V-230370, V-230372, V-230373, V-230375, V-230376, V-230377, V-230378, V-230380, V-230382, V-230383, V-230385, V-230386, V-230387, V-230389, V-230390, V-230392, V-230393, V-230394, V-230396, V-230397, V-230398, V-230399, V-230400, V-230401, V-230402, V-230403, V-230404, V-230405, V-230406, V-230407, V-230408, V-230409, V-230410, V-230411, V-230412, V-230413, V-230418, V-230419, V-230421, V-230422, V-230423, V-230424, V-230425, V-230426, V-230427, V-230428, V-230429, V-230430, V-230431, V-230432, V-230433, V-230434, V-230435, V-230436, V-230437, V-230438, V-230439, V-230444, V-230446, V-230447, V-230448, V-230449, V-230455, V-230456, V-230462, V-230463, V-230464, V-230465, V-230466, V-230467, V-230470, V-230471, V-230472, V-230473, V-230474, V-230475, V-230478, V-230480, V-230481, V-230482, V-230483, V-230488, V-230489, V-230493, V-230502, V-230503, V-230505, V-230506, V-230507, V-230523, V-230524, V-230525, V-230526, V-230527, V-230532, V-230535, V-230536, V-230537, V-230538, V-230539, V-230540, V-230541, V-230542, V-230543, V-230544, V-230545, V-230546, V-230547, V-230548, V-230549, V-230550, V-230555, V-230556, V-230557, V-230559, V-230560, V-230561, V-237640, V-237642, V-237643, V-244519, V-244523, V-244524, V-244525, V-244526, V-244528, V-244531, V-244533,

V-244535, V-244536, V-244538, V-244539, V-244542, V-244543, V-244544, V-244545, V-244547, V-244550, V-244551, V-244552, V-244553, V-244554, V-250315, V-250315, V-250315, V-250316, V-250316, V-250317, V-251707, V-251708, V-251709, V-251710, V-251711, V-251713, V-251714, V-251715, V-251716, V-251717, V-251718, V-256974, V-257258, V-257258, V-274877, V-279929, V-279930, and V-279931

RHEL 9 STIG Version 2 Release 7

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

- **RHEL 9/CentOS Stream 9**

  V-257780, V-257781, V-257783, V-257786, V-257788, V-257790, V-257791, V-257792, V-257793, V-257794, V-257797, V-257798, V-257799, V-257800, V-257801, V-257802, V-257803, V-257804, V-257805, V-257806, V-257807, V-257808, V-257809, V-257810, V-257811, V-257812, V-257813, V-257814, V-257815, V-257816, V-257817, V-257818, V-257825, V-257827, V-257828, V-257829, V-257830, V-257831, V-257832, V-257833, V-257834, V-257836, V-257838, V-257839, V-257840, V-257841, V-257842, V-257849, V-257882, V-257883, V-257884, V-257885, V-257886, V-257887, V-257888, V-257889, V-257890, V-257891, V-257892, V-257893, V-257894, V-257895, V-257896, V-257897, V-257898, V-257899, V-257900, V-257901, V-257902, V-257903, V-257904, V-257905, V-257906, V-257907, V-257908, V-257909, V-257910, V-257911, V-257912, V-257913, V-257914, V-257915, V-257916, V-257917, V-257918, V-257919, V-257920, V-257921, V-257922, V-257923, V-257924, V-257925, V-257926, V-257927, V-257928, V-257929, V-257930, V-257933, V-257934, V-257935, V-257936, V-257939, V-257940, V-257942, V-257943, V-257944, V-257948, V-257951, V-257952, V-257953, V-257954, V-257957, V-257958, V-257959, V-257960, V-257961, V-257962, V-257963, V-257964, V-257965, V-257966, V-257967, V-257968, V-257969, V-257970, V-257971, V-257972, V-257973, V-257974, V-257975, V-257976, V-257977, V-257978, V-257979, V-257980, V-257982, V-257983, V-257985, V-257987, V-257988, V-257992, V-257993, V-257994, V-257995, V-257996, V-257997, V-257998, V-257999, V-258000, V-258001, V-258002, V-258003, V-258004, V-258005, V-258006, V-258007, V-258008, V-258009, V-258010, V-258011, V-258028, V-258034, V-258035, V-258038, V-258039, V-258040, V-258041, V-258043, V-258046, V-258049, V-258052, V-258054, V-258055, V-258056, V-258057, V-258060, V-258063, V-258064, V-258065, V-258066, V-258068, V-258070, V-258071, V-258072, V-258073, V-258074, V-258075, V-258077, V-258079, V-258080, V-258081, V-258082,

V-258083, V-258084, V-258085, V-258088, V-258089, V-258090, V-258091, V-258092, V-258093, V-258095, V-258097, V-258098, V-258099, V-258100, V-258101, V-258102, V-258103, V-258104, V-258105, V-258107, V-258108, V-258109, V-258110, V-258111, V-258112, V-258113, V-258114, V-258115, V-258116, V-258117, V-258118, V-258119, V-258120, V-258121, V-258122, V-258123, V-258124, V-258125, V-258126, V-258128, V-258129, V-258130, V-258133, V-258137, V-258140, V-258141, V-258142, V-258144, V-258145, V-258146, V-258147, V-258148, V-258150, V-258151, V-258152, V-258153, V-258154, V-258156, V-258157, V-258158, V-258159, V-258160, V-258161, V-258162, V-258163, V-258164, V-258165, V-258166, V-258167, V-258168, V-258169, V-258170, V-258171, V-258172, V-258175, V-258176, V-258177, V-258178, V-258179, V-258180, V-258181, V-258182, V-258183, V-258184, V-258185, V-258186, V-258187, V-258188, V-258189, V-258190, V-258191, V-258192, V-258193, V-258194, V-258195, V-258196, V-258197, V-258198, V-258199, V-258200, V-258201, V-258202, V-258203, V-258204, V-258205, V-258206, V-258207, V-258208, V-258209, V-258210, V-258211, V-258212, V-258213, V-258214, V-258215, V-258216, V-258217, V-258218, V-258219, V-258220, V-258221, V-258222, V-258223, V-258224, V-258225, V-258226, V-258227, V-258228, V-258229, V-258232, V-258233, V-258234, V-258237, V-258239, V-258240, V-270174, V-270175, V-270176, V-270177, V-272488, and V-279936

Amazon Linux 2023 STIG Version 1 Release 2

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-273995, V-274000, V-274001, V-274002, V-274003, V-274004, V-274005, V-274006, V-274008, V-274009, V-274010, V-274011, V-274012, V-274013, V-274014, V-274017, V-274018, V-274019, V-274020, V-274021, V-274022, V-274023, V-274024, V-274026, V-274027, V-274028, V-274030, V-274031, V-274032, V-274033, V-274034, V-274035, V-274036, V-274037, V-274040, V-274041, V-274042, V-274044, V-274045, V-274047, V-274048, V-274049, V-274050, V-274051, V-274053, V-274054, V-274059, V-274061, V-274062, V-274069, V-274070, V-274071, V-274072, V-274073, V-274074, V-274075, V-274076, V-274077, V-274078, V-274079, V-274081, V-274082, V-274083, V-274084, V-274085, V-274086, V-274087, V-274088, V-274089, V-274090, V-274091, V-274092, V-274093, V-274094, V-274095, V-274096, V-274097, V-274098, V-274099, V-274100, V-274101, V-274102, V-274103, V-274104, V-274105, V-274106, V-274107, V-274108, V-274109, V-274110, V-274111, V-274112, V-274113, V-274114, V-274115, V-274116, V-274117, V-274119, V-274120, V-274121, V-274122, V-274123, V-274124, V-274125,

V-274126, V-274127, V-274128, V-274129, V-274130, V-274131, V-274132, V-274133, V-274134, V-274135, V-274136, V-274137, V-274138, V-274139, V-274140, V-274142, V-274143, V-274144, V-274145, V-274147, V-274149, V-274151, V-274152, V-274154, V-274155, V-274156, V-274157, V-274160, V-274161, V-274162, V-274163, V-274164, V-274165, V-274166, V-274167, V-274168, V-274169, V-274170, V-274173, V-274177, V-274181, V-274182, V-274185, and V-274187

SLES 12 STIG Version 3 Release 4

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-217102, V-217105, V-217105, V-217106, V-217106, V-217110, V-217116, V-217117, V-217118, V-217119, V-217120, V-217121, V-217122, V-217124, V-217125, V-217126, V-217127, V-217128, V-217130, V-217134, V-217138, V-217143, V-217147, V-217152, V-217153, V-217154, V-217155, V-217156, V-217158, V-217161, V-217163, V-217166, V-217167, V-217168, V-217169, V-217170, V-217171, V-217182, V-217183, V-217188, V-217190, V-217191, V-217194, V-217195, V-217196, V-217197, V-217200, V-217201, V-217202, V-217203, V-217204, V-217205, V-217206, V-217207, V-217208, V-217210, V-217217, V-217218, V-217223, V-217227, V-217230, V-217240, V-217241, V-217242, V-217243, V-217244, V-217245, V-217246, V-217247, V-217248, V-217249, V-217250, V-217251, V-217252, V-217253, V-217254, V-217255, V-217257, V-217258, V-217260, V-217265, V-217266, V-217267, V-217269, V-217272, V-217273, V-217274, V-217275, V-217276, V-217277, V-217278, V-217279, V-217280, V-217283, V-217284, V-217286, V-217287, V-217288, V-217289, V-217290, V-217291, V-217292, V-217293, V-217294, V-217295, V-217296, V-217299, V-217300, V-217301, V-217302, V-233308, V-237605, V-237606, V-237607, V-237608, V-237609, V-237610, V-237611, V-237612, V-237613, V-237614, V-237615, V-237616, V-237617, V-237618, V-237619, V-237620, V-237621, V-237622, V-237623, V-251720, V-251722, V-255914, and V-256981

SLES 15 STIG Version 2 Release 6

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-234802, V-234807, V-234808, V-234809, V-234813, V-234815, V-234817, V-234821, V-234822, V-234823, V-234825, V-234827, V-234828, V-234829, V-234830, V-234832, V-234833, V-234834, V-234835, V-234836, V-234837, V-234838, V-234839, V-234840, V-234841, V-234842, V-234843, V-234844, V-234845, V-234848, V-234854, V-234855,

V-234856, V-234857, V-234858, V-234861, V-234862, V-234863, V-234869, V-234870, V-234875, V-234878, V-234880, V-234881, V-234882, V-234883, V-234884, V-234885, V-234886, V-234887, V-234888, V-234889, V-234891, V-234895, V-234896, V-234897, V-234899, V-234900, V-234901, V-234902, V-234903, V-234904, V-234906, V-234910, V-234911, V-234912, V-234913, V-234914, V-234918, V-234924, V-234928, V-234932, V-234937, V-234938, V-234939, V-234940, V-234941, V-234942, V-234943, V-234944, V-234945, V-234946, V-234947, V-234948, V-234949, V-234950, V-234951, V-234952, V-234954, V-234956, V-234957, V-234958, V-234959, V-234961, V-234962, V-234964, V-234966, V-234969, V-234973, V-234975, V-234976, V-234977, V-234978, V-234979, V-234981, V-234982, V-234983, V-234991, V-235002, V-235003, V-235007, V-235008, V-235009, V-235010, V-235013, V-235014, V-235015, V-235016, V-235017, V-235018, V-235019, V-235020, V-235021, V-235022, V-235023, V-235024, V-235025, V-235026, V-235028, V-235029, V-235030, V-251724, V-255920, V-256983, and V-274879

Ubuntu 18.04 STIG Version 2 Release 15

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-219149, V-219155, V-219156, V-219160, V-219166, V-219168, V-219176, V-219181, V-219184, V-219186, V-219188, V-219189, V-219190, V-219191, V-219192, V-219193, V-219194, V-219195, V-219196, V-219197, V-219198, V-219199, V-219200, V-219201, V-219202, V-219203, V-219204, V-219205, V-219206, V-219207, V-219208, V-219209, V-219213, V-219214, V-219215, V-219216, V-219217, V-219218, V-219219, V-219220, V-219221, V-219222, V-219223, V-219224, V-219225, V-219226, V-219227, V-219228, V-219229, V-219230, V-219231, V-219232, V-219233, V-219234, V-219235, V-219236, V-219238, V-219239, V-219240, V-219241, V-219242, V-219243, V-219244, V-219250, V-219254, V-219257, V-219263, V-219264, V-219265, V-219266, V-219267, V-219268, V-219269, V-219270, V-219271, V-219272, V-219273, V-219274, V-219275, V-219276, V-219277, V-219279, V-219281, V-219287, V-219291, V-219296, V-219297, V-219298, V-219299, V-219300, V-219303, V-219304, V-219306, V-219309, V-219310, V-219311, V-219315, V-219318, V-219319, V-219323, V-219326, V-219328, V-219330, V-219331, V-219335, V-219336, V-219337, V-219338, V-219339, V-219342, V-219344, V-233779, V-233780, and V-255906

Ubuntu 20.04 STIG Version 2 Release 4

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-238200, V-238205, V-238207, V-238209, V-238210, V-238211, V-238212, V-238213, V-238220, V-238225, V-238227, V-238228, V-238229, V-238230, V-238231, V-238232, V-238236, V-238238, V-238239, V-238240, V-238241, V-238242, V-238244, V-238245, V-238246, V-238247, V-238248, V-238249, V-238250, V-238251, V-238252, V-238253, V-238254, V-238255, V-238256, V-238257, V-238258, V-238264, V-238268, V-238271, V-238277, V-238278, V-238279, V-238280, V-238281, V-238282, V-238283, V-238284, V-238285, V-238286, V-238287, V-238288, V-238289, V-238290, V-238291, V-238292, V-238293, V-238294, V-238295, V-238297, V-238298, V-238299, V-238300, V-238301, V-238302, V-238303, V-238304, V-238309, V-238310, V-238315, V-238316, V-238317, V-238318, V-238319, V-238320, V-238324, V-238325, V-238329, V-238330, V-238333, V-238334, V-238337, V-238338, V-238339, V-238340, V-238341, V-238342, V-238343, V-238344, V-238345, V-238346, V-238347, V-238348, V-238349, V-238350, V-238351, V-238352, V-238353, V-238355, V-238356, V-238359, V-238360, V-238369, V-238370, V-238371, V-238376, V-238377, V-238378, V-251505, V-255912, V-274852, and V-274853

Ubuntu 22.04 STIG Version 2 Release 7

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-260471, V-260473, V-260474, V-260475, V-260475, V-260477, V-260478, V-260485, V-260486, V-260487, V-260488, V-260489, V-260490, V-260491, V-260492, V-260493, V-260494, V-260495, V-260496, V-260497, V-260498, V-260499, V-260500, V-260505, V-260506, V-260507, V-260508, V-260509, V-260510, V-260511, V-260512, V-260513, V-260514, V-260522, V-260527, V-260528, V-260530, V-260533, V-260534, V-260535, V-260537, V-260538, V-260540, V-260542, V-260543, V-260545, V-260546, V-260547, V-260553, V-260554, V-260555, V-260556, V-260557, V-260560, V-260561, V-260562, V-260563, V-260564, V-260565, V-260566, V-260567, V-260569, V-260572, V-260573, V-260574, V-260575, V-260576, V-260582, V-260584, V-260585, V-260586, V-260588, V-260589, V-260590, V-260591, V-260594, V-260597, V-260598, V-260599, V-260600, V-260601, V-260602, V-260603, V-260604, V-260605, V-260606, V-260607, V-260608, V-260609, V-260610, V-260611, V-260612, V-260613, V-260614, V-260615, V-260616, V-260617, V-260618, V-260619, V-260620, V-260621, V-260622, V-260623, V-260624, V-260625, V-260626, V-260627, V-260628, V-260629, V-260630, V-260631, V-260632, V-260633, V-260634, V-260635, V-260636, V-260637, V-260638, V-260639, V-260640, V-260641, V-260642, V-260643, V-260644, V-260645, V-260646, V-260647, V-260648, V-260649, V-274862, V-274864, and V-274866

Ubuntu 24.04 STIG Version 1 Release 4

Includes all supported STIG settings that the hardening component applies for Category III (Low) vulnerabilities for this Linux distribution, plus:

V-270649, V-270651, V-270652, V-270653, V-270654, V-270656, V-270657, V-270659, V-270660, V-270661, V-270662, V-270663, V-270669, V-270672, V-270673, V-270674, V-270676, V-270678, V-270679, V-270680, V-270681, V-270683, V-270684, V-270685, V-270686, V-270687, V-270688, V-270689, V-270692, V-270693, V-270696, V-270697, V-270698, V-270699, V-270700, V-270701, V-270702, V-270703, V-270704, V-270705, V-270709, V-270715, V-270716, V-270718, V-270720, V-270721, V-270722, V-270723, V-270724, V-270725, V-270726, V-270727, V-270728, V-270729, V-270730, V-270731, V-270732, V-270733, V-270737, V-270739, V-270740, V-270741, V-270742, V-270743, V-270746, V-270750, V-270753, V-270755, V-270756, V-270757, V-270758, V-270759, V-270760, V-270765, V-270766, V-270767, V-270768, V-270769, V-270770, V-270771, V-270772, V-270773, V-270775, V-270776, V-270777, V-270778, V-270779, V-270780, V-270781, V-270782, V-270783, V-270784, V-270785, V-270786, V-270787, V-270788, V-270789, V-270790, V-270791, V-270792, V-270793, V-270794, V-270795, V-270796, V-270797, V-270798, V-270799, V-270800, V-270801, V-270802, V-270803, V-270804, V-270805, V-270806, V-270807, V-270808, V-270809, V-270810, V-270811, V-270812, V-270813, V-270814, V-270815, V-270821, V-270822, V-270823, V-270824, V-270825, V-270826, V-270827, V-270828, V-270829, V-270830, V-270831, V-270832, V-274870, V-274871, V-274872, and V-274873

Linux STIG High (Category I)

The following list contains STIG settings that the hardening component applies to your infrastructure. If a supported setting isn't applicable for your infrastructure, the hardening component skips that setting, and moves on. For example, some STIG settings might not apply to standalone servers. Organization-specific policies can also affect which settings the hardening component applies, such as a requirement for administrators to review document settings.

For a complete list, see the STIGs Document Library. For information about how to view the complete list, see STIG Viewing Tools.

> **Note**
>
> The Linux STIG High hardening components include all listed STIG settings that AWSTOE applies for Linux STIG Low and Linux STIG Medium hardening components, in addition to the listed STIG settings that apply specifically for Category I vulnerabilities.

RHEL 7 STIG Version 3 Release 15

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

- **RHEL 7/CentOS 7/AL2**

  V-204424, V-204425, V-204442, V-204443, V-204447, V-204448, V-204455, V-204462, V-204497, V-204497, V-204502, V-204594, V-204620, and V-204621

RHEL 8 STIG Version 2 Release 6

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

- **RHEL 8/CentOS 8**

  V-230223, V-230264, V-230283, V-230284, V-230487, V-230492, V-230533, V-230558, V-244540, V-279933, V-230265, V-230226, V-230530, V-268322, V-230529, and V-230531

RHEL 9 STIG Version 2 Release 7

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

- **RHEL 9/CentOS Stream 9**

  V-257820, V-257821, V-257826, V-257835, V-257955, V-257956, V-258059, V-258230, V-258238, V-257984, V-257986, V-258078, V-258094, V-258235, V-257784, and V-257785

Amazon Linux 2023 STIG Version 1 Release 2

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-273996, V-273997, V-273999, V-274007, V-274038, V-274039, V-274046, V-274052, V-274057, and V-274153

SLES 12 STIG Version 3 Release 4

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-217101, V-217139, V-217141, V-217142, V-217159, V-217160, V-217164, V-217264, V-217268, V-222386, and V-251721

SLES 15 STIG Version 2 Release 6

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-234800, V-234804, V-234818, V-234852, V-234859, V-234860, V-234898, V-234984, V-234985, V-234988, V-234989, V-234990, V-235031, V-235032, and V-251725

Ubuntu 18.04 STIG Version 2 Release 15

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-219157, V-219158, V-219177, V-219212, V-219308, V-219314, V-219316, and V-251507

Ubuntu 20.04 STIG Version 2 Release 4

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-238201, V-238218, V-238219, V-238326, V-238327, V-238380, and V-251504

Ubuntu 22.04 STIG Version 2 Release 7

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-260469, V-260482, V-260483, V-260523, V-260524, V-260526, V-260529, V-260539, V-260570, V-260571, V-260579, and V-279937

Ubuntu 24.04 STIG Version 1 Release 4

Includes all supported STIG settings that the hardening component applies for Categories II and III (Medium and Low) vulnerabilities for this Linux distribution, plus:

V-270647, V-270648, V-270665, V-270666, V-270708, V-270711, V-270712, V-270713, V-270714, V-270717, V-270736, V-270738, and V-279938

STIG version history log for Linux

This section logs Linux component version history. To see the changes and published versions for a quarter, choose the title to expand the information.

2026 Q1 changes - 3/10/2026:

Updated the following STIG versions, applied STIGs for the 2026 first quarter release for all compliance levels:

STIG-Build-Linux

- RHEL 8 STIG Version 2 Release 6
- RHEL 9 STIG Version 2 Release 7
- Amazon Linux 2023 STIG Version 1 Release 2
- SLES 12 STIG Version 3 Release 4
- SLES 15 STIG Version 2 Release 6
- Ubuntu 20.04 STIG Version 2 Release 4
- Ubuntu 22.04 STIG Version 2 Release 7
- Ubuntu 24.04 STIG Version 1 Release 4

2025 Q3 changes - 09/04/2025:

Added support for the SUSE Linux Enterprise Server (SLES) operating system and Amazon Linux 2023. Updated the following STIG versions and applied STIGS for the 2025 third quarter release for all compliance levels (low/medium/high):

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 4

- RHEL 9 STIG Version 2 Release 5
- Amazon Linux 2023 STIG Version 1 Release 1
- SLES 12 STIG Version 3 Release 3
- SLES 15 STIG Version 2 Release 5
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 3
- Ubuntu 22.04 STIG Version 2 Release 5
- Ubuntu 24.04 STIG Version 1 Release 2

2025 Q2 changes - 06/26/2025:

Updated the following STIG versions, applied STIGS for the 2025 second quarter release:

STIG-Build-Linux-Low version 2025.2.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 3
- RHEL 9 STIG Version 2 Release 4
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 2
- Ubuntu 22.04 STIG Version 2 Release 4
- Ubuntu 24.04 STIG Version 1 Release 1

STIG-Build-Linux-Medium version 2025.2.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 3
- RHEL 9 STIG Version 2 Release 4
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 2
- Ubuntu 22.04 STIG Version 2 Release 4
- Ubuntu 24.04 STIG Version 1 Release 1

STIG-Build-Linux-High version 2025.2.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 3
- RHEL 9 STIG Version 2 Release 4
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 2
- Ubuntu 22.04 STIG Version 2 Release 4
- Ubuntu 24.04 STIG Version 1 Release 1

2025 Q1 changes - 04/11/2025:

Updated the following STIG versions, applied STIGS for the 2025 first quarter release, and added support for Ubuntu 24.04:

STIG-Build-Linux-Low version 2025.1.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 2
- RHEL 9 STIG Version 2 Release 3
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 2
- Ubuntu 22.04 STIG Version 2 Release 3
- Ubuntu 24.04 STIG Version 1 Release 1

STIG-Build-Linux-Medium version 2025.1.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 2
- RHEL 9 STIG Version 2 Release 3
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 2
- Ubuntu 22.04 STIG Version 2 Release 3

- Ubuntu 24.04 STIG Version 1 Release 1

STIG-Build-Linux-High version 2025.1.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 2
- RHEL 9 STIG Version 2 Release 3
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 2
- Ubuntu 22.04 STIG Version 2 Release 3
- Ubuntu 24.04 STIG Version 1 Release 1

2024 Q4 changes - 12/10/2024:

Updated the following STIG versions, applied STIGS for the 2024 fourth quarter release, and added information about two new input parameters for the Linux components:

STIG-Build-Linux-Low version 2024.4.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 1
- RHEL 9 STIG Version 2 Release 2
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 1
- Ubuntu 22.04 STIG Version 2 Release 2

STIG-Build-Linux-Medium version 2024.4.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 1
- RHEL 9 STIG Version 2 Release 2
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 1

- Ubuntu 22.04 STIG Version 2 Release 2

STIG-Build-Linux-High version 2024.4.x

- RHEL 7 STIG Version 3 Release 15
- RHEL 8 STIG Version 2 Release 1
- RHEL 9 STIG Version 2 Release 2
- Ubuntu 18.04 STIG Version 2 Release 15
- Ubuntu 20.04 STIG Version 2 Release 1
- Ubuntu 22.04 STIG Version 2 Release 2

2024 Q3 changes - 10/04/2024 (no changes):

There were no changes for Linux component STIGS for the 2024 third quarter release.

2024 Q2 changes - 05/10/2024:

Updated STIG versions and applied STIGS for the 2024 second quarter release. Also added support for RHEL 9, CentOS Stream 9, and Ubuntu 22.04, as follows:

STIG-Build-Linux-Low version 2024.2.x

- RHEL 7 STIG Version 3 Release 14
- RHEL 8 STIG Version 1 Release 14
- RHEL 9 STIG Version 1 Release 3
- Ubuntu 18.04 STIG Version 2 Release 14
- Ubuntu 20.04 STIG Version 1 Release 12
- Ubuntu 22.04 STIG Version 1 Release 1

STIG-Build-Linux-Medium version 2024.2.x

- RHEL 7 STIG Version 3 Release 14
- RHEL 8 STIG Version 1 Release 14
- RHEL 9 STIG Version 1 Release 3
- Ubuntu 18.04 STIG Version 2 Release 14

- Ubuntu 20.04 STIG Version 1 Release 12
- Ubuntu 22.04 STIG Version 1 Release 1

STIG-Build-Linux-High version 2024.2.x

- RHEL 7 STIG Version 3 Release 14
- RHEL 8 STIG Version 1 Release 14
- RHEL 9 STIG Version 1 Release 3
- Ubuntu 18.04 STIG Version 2 Release 14
- Ubuntu 20.04 STIG Version 1 Release 12
- Ubuntu 22.04 STIG Version 1 Release 1

2024 Q1 changes - 02/06/2024:

Updated STIG versions and applied STIGS for the 2024 first quarter release as follows:

STIG-Build-Linux-Low version 2024.1.x

- RHEL 7 STIG Version 3 Release 14
- RHEL 8 STIG Version 1 Release 13
- Ubuntu 18.04 STIG Version 2 Release 13
- Ubuntu 20.04 STIG Version 1 Release 11

STIG-Build-Linux-Medium version 2024.1.x

- RHEL 7 STIG Version 3 Release 14
- RHEL 8 STIG Version 1 Release 13
- Ubuntu 18.04 STIG Version 2 Release 13
- Ubuntu 20.04 STIG Version 1 Release 11

STIG-Build-Linux-High version 2024.1.x

- RHEL 7 STIG Version 3 Release 14
- RHEL 8 STIG Version 1 Release 13

- Ubuntu 18.04 STIG Version 2 Release 13
- Ubuntu 20.04 STIG Version 1 Release 11

2023 Q4 changes - 12/07/2023:

Updated STIG versions and applied STIGS for the 2023 fourth quarter release as follows:

STIG-Build-Linux-Low version 2023.4.x

- RHEL 7 STIG Version 3 Release 13
- RHEL 8 STIG Version 1 Release 12
- Ubuntu 18.04 STIG Version 2 Release 12
- Ubuntu 20.04 STIG Version 1 Release 10

STIG-Build-Linux-Medium version 2023.4.x

- RHEL 7 STIG Version 3 Release 13
- RHEL 8 STIG Version 1 Release 12
- Ubuntu 18.04 STIG Version 2 Release 12
- Ubuntu 20.04 STIG Version 1 Release 10

STIG-Build-Linux-High version 2023.4.x

- RHEL 7 STIG Version 3 Release 13
- RHEL 8 STIG Version 1 Release 12
- Ubuntu 18.04 STIG Version 2 Release 12
- Ubuntu 20.04 STIG Version 1 Release 10

2023 Q3 changes - 10/04/2023:

Updated STIG versions and applied STIGS for the 2023 third quarter release as follows:

STIG-Build-Linux-Low version 2023.3.x

- RHEL 7 STIG Version 3 Release 12
- RHEL 8 STIG Version 1 Release 11

- Ubuntu 18.04 STIG Version 2 Release 11
- Ubuntu 20.04 STIG Version 1 Release 9

STIG-Build-Linux-Medium version 2023.3.x

- RHEL 7 STIG Version 3 Release 12
- RHEL 8 STIG Version 1 Release 11
- Ubuntu 18.04 STIG Version 2 Release 11
- Ubuntu 20.04 STIG Version 1 Release 9

STIG-Build-Linux-High version 2023.3.x

- RHEL 7 STIG Version 3 Release 12
- RHEL 8 STIG Version 1 Release 11
- Ubuntu 18.04 STIG Version 2 Release 11
- Ubuntu 20.04 STIG Version 1 Release 9

2023 Q2 changes - 05/03/2023:

Updated STIG versions and applied STIGS for the 2023 second quarter release as follows:

STIG-Build-Linux-Low version 2023.2.x

- RHEL 7 STIG Version 3 Release 11
- RHEL 8 STIG Version 1 Release 10
- Ubuntu 18.04 STIG Version 2 Release 11
- Ubuntu 20.04 STIG Version 1 Release 8

STIG-Build-Linux-Medium version 2023.2.x

- RHEL 7 STIG Version 3 Release 11
- RHEL 8 STIG Version 1 Release 10
- Ubuntu 18.04 STIG Version 2 Release 11
- Ubuntu 20.04 STIG Version 1 Release 8

STIG-Build-Linux-High version 2023.2.x

- RHEL 7 STIG Version 3 Release 11
- RHEL 8 STIG Version 1 Release 10
- Ubuntu 18.04 STIG Version 2 Release 11
- Ubuntu 20.04 STIG Version 1 Release 8

2023 Q1 changes - 03/27/2023:

Updated STIG versions and applied STIGS for the 2023 first quarter release as follows:

STIG-Build-Linux-Low version 2023.1.x

- RHEL 7 STIG Version 3 Release 10
- RHEL 8 STIG Version 1 Release 9
- Ubuntu 18.04 STIG Version 2 Release 10
- Ubuntu 20.04 STIG Version 1 Release 7

STIG-Build-Linux-Medium version 2023.1.x

- RHEL 7 STIG Version 3 Release 10
- RHEL 8 STIG Version 1 Release 9
- Ubuntu 18.04 STIG Version 2 Release 10
- Ubuntu 20.04 STIG Version 1 Release 7

STIG-Build-Linux-High version 2023.1.x

- RHEL 7 STIG Version 3 Release 10
- RHEL 8 STIG Version 1 Release 9
- Ubuntu 18.04 STIG Version 2 Release 10
- Ubuntu 20.04 STIG Version 1 Release 7

2022 Q4 changes - 02/01/2023:

Updated STIG versions and applied STIGS for the 2022 fourth quarter release as follows:

STIG-Build-Linux-Low version 2022.4.x

- RHEL 7 STIG Version 3 Release 9
- RHEL 8 STIG Version 1 Release 8
- Ubuntu 18.04 STIG Version 2 Release 9
- Ubuntu 20.04 STIG Version 1 Release 6

STIG-Build-Linux-Medium version 2022.4.x

- RHEL 7 STIG Version 3 Release 9
- RHEL 8 STIG Version 1 Release 8
- Ubuntu 18.04 STIG Version 2 Release 9
- Ubuntu 20.04 STIG Version 1 Release 6

STIG-Build-Linux-High version 2022.4.x

- RHEL 7 STIG Version 3 Release 9
- RHEL 8 STIG Version 1 Release 8
- Ubuntu 18.04 STIG Version 2 Release 9
- Ubuntu 20.04 STIG Version 1 Release 6

2022 Q3 changes - 09/30/2022 (no changes):

There were no changes for Linux component STIGS for the 2022 third quarter release.

2022 Q2 changes - 08/02/2022:

Introduced Ubuntu support, updated STIG versions and applied STIGS for the 2022 second quarter release as follows:

STIG-Build-Linux-Low version 2022.2.x

- RHEL 7 STIG Version 3 Release 7
- RHEL 8 STIG Version 1 Release 6
- Ubuntu 18.04 STIG Version 2 Release 6 (new)

- Ubuntu 20.04 STIG Version 1 Release 4 (new)

STIG-Build-Linux-Medium version 2022.2.x

- RHEL 7 STIG Version 3 Release 7
- RHEL 8 STIG Version 1 Release 6
- Ubuntu 18.04 STIG Version 2 Release 6 (new)
- Ubuntu 20.04 STIG Version 1 Release 4 (new)

STIG-Build-Linux-High version 2022.2.x

- RHEL 7 STIG Version 3 Release 7
- RHEL 8 STIG Version 1 Release 6
- Ubuntu 18.04 STIG Version 2 Release 6 (new)
- Ubuntu 20.04 STIG Version 1 Release 4 (new)

2022 Q1 changes - 04/26/2022:

Refactored to include better support for containers. Combined the previous AL2 script with RHEL 7. Updated STIG versions and applied STIGS for the 2022 first quarter release as follows:

STIG-Build-Linux-Low version 3.6.x

- RHEL 7 STIG Version 3 Release 6
- RHEL 8 STIG Version 1 Release 5

STIG-Build-Linux-Medium version 3.6.x

- RHEL 7 STIG Version 3 Release 6
- RHEL 8 STIG Version 1 Release 5

STIG-Build-Linux-High version 3.6.x

- RHEL 7 STIG Version 3 Release 6
- RHEL 8 STIG Version 1 Release 5

2021 Q4 changes - 12/20/2021:

Updated STIG versions, and applied STIGS for the 2021 fourth quarter release as follows:

STIG-Build-Linux-Low version 3.5.x

- RHEL 7 STIG Version 3 Release 5
- RHEL 8 STIG Version 1 Release 4

STIG-Build-Linux-Medium version 3.5.x

- RHEL 7 STIG Version 3 Release 5
- RHEL 8 STIG Version 1 Release 4

STIG-Build-Linux-High version 3.5.x

- RHEL 7 STIG Version 3 Release 5
- RHEL 8 STIG Version 1 Release 4

2021 Q3 changes - 09/30/2021:

Updated STIG versions, and applied STIGS for the 2021 third quarter release as follows:

STIG-Build-Linux-Low version 3.4.x

- RHEL 7 STIG Version 3 Release 4
- RHEL 8 STIG Version 1 Release 3

STIG-Build-Linux-Medium version 3.4.x

- RHEL 7 STIG Version 3 Release 4
- RHEL 8 STIG Version 1 Release 3

STIG-Build-Linux-High version 3.4.x

- RHEL 7 STIG Version 3 Release 4
- RHEL 8 STIG Version 1 Release 3

SCAP compliance validator component

The Security Content Automation Protocol (SCAP) is a set of standards that IT professionals can use to identify application security vulnerabilities for compliance. The SCAP Compliance Checker (SCC) is a SCAP-validated scanning tool, released by the Naval Information Warfare Center (NIWC) Atlantic. For more information, see Security Content Automation Protocol (SCAP) Compliance Checker (SCC) on the *NIWC Atlantic* website.

The AWSTOE `scap-compliance-checker-windows` and `scap-compliance-checker-linux` components download and install the SCC scanner on the pipeline build and test instances. When the scanner runs, it performs authenticated configuration scans using DISA SCAP Benchmarks, and provides a report that includes the following information. AWSTOE also writes the information to your application logs.

- STIG settings that are applied to the instance.
- An overall compliance score for the instance.

We recommend that you run SCAP validation as the final step in your build process, to ensure that you report accurate compliance validation results.

> **Note**
>
> You can review the reports with one of the STIG Viewing Tools. These tools are available online via the DoD Cyber Exchange.

The following sections describe the benchmarks that the SCAP validation components include.

scap-compliance-checker-windows version 2024.03.0

The `scap-compliance-checker-windows` component runs on the EC2 instances that Image Builder creates to build and test the image. AWSTOE logs both the report and the score that the SCC application produces.

The component performs the following workflow steps:

1. Downloads and installs the SCC application.
2. Imports the compliance benchmarks.
3. Runs validation using the SCC application.

4. Saves the compliance report and score locally on the build instance desktop.
5. Logs the compliance score from the local report to the AWSTOE application log files.

> **Note**
>
> AWSTOE currently supports SCAP compliance validation for Windows Server 2012 R2 MS, 2016, 2019, and 2022.

The SCAP compliance checker component for Windows includes the following benchmarks:

SCC Version: 5.10

2023 Q4 Benchmarks:

- U_MS_Defender_Antivirus_V2R5_STIG_SCAP_1-2_Benchmark
- U_MS_DotNet_Framework_4-0_V2R2_STIG_SCAP_1-2_Benchmark
- U_MS_IE11_V2R6_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_2012_and_2012_R2_DC_V3R5_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_2012_and_2012_R2_MS_V3R5_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Defender_Firewall_V2R3_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Server_2016_V2R7_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Server_2019_V3R2_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Server_2022_V2R2_STIG_SCAP_1-2_Benchmark
- U_CAN_Ubuntu_20-04_LTS_V1R10_STIG_SCAP_1-2_Benchmark
- U_RHEL_7_V3R15_STIG_SCAP_1-3_Benchmark
- U_RHEL_8_V1R13_STIG_SCAP_1-3_Benchmark
- U_RHEL_9_V2R1_STIG_SCAP_1-3_Benchmark

scap-compliance-checker-linux version 2021.04.0

The `scap-compliance-checker-linux` component runs on the EC2 instances that Image Builder creates to build and test the image. AWSTOE logs both the report and the score that the SCC application produces.

The component performs the following workflow steps:

1. Downloads and installs the SCC application.
2. Imports the compliance benchmarks.
3. Runs validation using the SCC application.
4. Saves the compliance report and score locally, in the following location on the build instance: `/opt/scc/SCCResults`.
5. Logs the compliance score from the local report to the AWSTOE application log files.

> **Note**
>
> AWSTOE currently supports SCAP compliance validation for RHEL 7/8 and Ubuntu 18.04/20.04. The SCC application currently supports the x86 architecture for validation.

The SCAP compliance checker component for Linux includes the following benchmarks:

SCC Version: 5.10

2023 Q4 Benchmarks:

- U_CAN_Ubuntu_20-04_LTS_V1R10_STIG_SCAP_1-2_Benchmark
- U_RHEL_7_V3R15_STIG_SCAP_1-3_Benchmark
- U_RHEL_8_V1R13_STIG_SCAP_1-3_Benchmark
- U_RHEL_9_V2R1_STIG_SCAP_1-3_Benchmark
- U_MS_Defender_Antivirus_V2R5_STIG_SCAP_1-2_Benchmark
- U_MS_DotNet_Framework_4-0_V2R2_STIG_SCAP_1-2_Benchmark
- U_MS_IE11_V2R6_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_2012_and_2012_R2_DC_V3R5_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_2012_and_2012_R2_MS_V3R5_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Defender_Firewall_V2R3_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Server_2016_V2R7_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Server_2019_V3R2_STIG_SCAP_1-2_Benchmark
- U_MS_Windows_Server_2022_V2R2_STIG_SCAP_1-2_Benchmark

SCAP version history

The following table describes important changes to the SCAP environment and settings described in this document.

Change	Description	Date
2025 Q1 SCAP Updates	• scap-compliance-checker-windows version 2024.03.0 (SCC Version: 5.10) • scap-compliance-checker-windows version 2025.01.0 (SCC Version: 5.10	April 11, 2025
2023 Q4 SCAP Updates	• scap-compliance-checker-windows version 2023.04.0 (SCC Version: 5.8) • scap-compliance-checker-windows version 2023.04.0 (SCC Version: 5.8)	December 20, 2021
2023 Q3 SCAP Updates	• scap-compliance-checker-windows version 2023.03.0 (SCC Version: 5.7.2) • scap-compliance-checker-linux version 2023.03.0 (SCC Version: 5.7.2	November 13, 2023
Added SCAP components	**Introduced the following SCAP components:** • Created scap-compliance-checker-linux version 2021.04.0 (SCC Version: 5.4.2) • Created scap-compliance-checker-linux version 2021.04.0 (SCC Version: 5.4.2)	December 20, 2021

Develop custom components for your Image Builder image

You can create your own components to customize your Image Builder images according to your exact specifications. Use the following steps to develop custom components for your Image Builder image or container recipes.

1. If you want to develop your component document and validate it locally, you can install the AWS Task Orchestrator and Executor (AWSTOE) application and set it up on your local machine. For more information, see Manual set up to develop custom components with AWSTOE.
2. Create a component document that uses the AWSTOE component document framework. For more information about the document framework, see Use the AWSTOE component document framework for custom components.
3. Specify your component document when you create a custom component. For more information, see Create a custom component with Image Builder.

Topics

- Create a YAML component document for custom components in Image Builder
- Create a custom component with Image Builder

Create a YAML component document for custom components in Image Builder

To build a component, you must provide a YAML or JSON application component document. The document contains the code that runs during the phases and steps that you define to provide customization for your image.

Some of the examples in this section create a build component that calls the `Update0S` action module in the AWSTOE component management application. The module updates the operating system. For more information about the `Update0S` action module, see UpdateOS.

The macOS operating system example uses the `ExecuteBash` action module to install and verify the `wget` utility. The `Update0S` action module doesn't support macOS. For more information about the `ExecuteBash` action module, see ExecuteBash. For more information about the phases, steps, and syntax for AWSTOE application component documents, see Use documents in AWSTOE.

Note

Image Builder determines the component type from the phases that are defined in the component document as follows:

- **Build** – This is the default component type. Anything that is not classified as a test component, is a build component. This type of component runs during the image *Build stage*. If this build component has a `test` phase defined, that phase runs during the *Test stage*.
- **Test** – To qualify as a test component, the component document must include only one phase, named `test`. For tests that are related to build component configurations, we recommend that you don't use a standalone test component. Rather, use the `test` phase in the associated build component.

For more information about how Image Builder uses stages and phases to manage component workflow in its build process, see Use components to customize your Image Builder image.

To create a YAML application component document for a sample application, follow the steps on the tab that matches your image operating system.

Linux

Create a YAML component file

Use a file editing tool to create your component document. Documentation examples use a file named *`update-linux-os.yaml`*, with the following content:

```
# Copyright 2019 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# SPDX-License-Identifier: MIT-0
#
# Permission is hereby granted, free of charge, to any person obtaining a copy of
 this
# software and associated documentation files (the "Software"), to deal in the
 Software
# without restriction, including without limitation the rights to use, copy, modify,
# merge, publish, distribute, sublicense, and/or sell copies of the Software, and to
# permit persons to whom the Software is furnished to do so.
```

```
#
# THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
 IMPLIED,
# INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A
# PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT
# HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION
# OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE
# SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
name: update-linux-os
description: Updates Linux with the latest security updates.
schemaVersion: 1
phases:
  - name: build
    steps:
    - name: UpdateOS
      action: UpdateOS
# Document End
```

Tip

Use a tool like this online YAML Validator, or a YAML lint extension in your code environment to verify that your YAML is well-formed.

Windows

Create a YAML component file

Use a file editing tool to create your component document. Documentation examples use a file named *update-windows-os.yaml*, with the following content:

```
# Copyright 2019 Amazon.com, Inc. or its affiliates. All Rights Reserved.
# SPDX-License-Identifier: MIT-0
#
# Permission is hereby granted, free of charge, to any person obtaining a copy of
 this
# software and associated documentation files (the "Software"), to deal in the
 Software
# without restriction, including without limitation the rights to use, copy, modify,
# merge, publish, distribute, sublicense, and/or sell copies of the Software, and to
# permit persons to whom the Software is furnished to do so.
#
```

```
# THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
 IMPLIED,
# INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A
# PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT
# HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION
# OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE
# SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
name: update-windows-os
description: Updates Windows with the latest security updates.
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: UpdateOS
        action: UpdateOS
# Document End
```

Tip

Use a tool like this online YAML Validator, or a YAML lint extension in your code environment to verify that your YAML is well-formed.

macOS

Create a YAML component file

Use a file editing tool to create your component document. Documentation examples use a file named *wget-macos.yaml*, with the following content:

```
name: WgetInstallDocument
description: This is wget installation document.
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: WgetBuildStep
        action: ExecuteBash
        inputs:
          commands:
            - |
```

```
            PATH=/usr/local/bin:$PATH
            sudo -u ec2-user brew install wget


- name: validate
  steps:
    - name: WgetValidateStep
      action: ExecuteBash
      inputs:
        commands:
          - |
            function error_exit {
              echo $1
              echo "{\"failureMessage\":\"$2\"}"
              exit 1
            }

            type wget
            if [ $? -ne 0 ]; then
              error_exit "$stderr" "Wget installation failed!"
            fi

- name: test
  steps:
    - name: WgetTestStep
      action: ExecuteBash
      inputs:
        commands:
          - wget -h
```

Tip

Use a tool like this online YAML Validator, or a YAML lint extension in your code environment to verify that your YAML is well-formed.

Create a custom component with Image Builder

After you've completed your component document, you can use it to create a custom component that your Image Builder recipes can use. You can create a custom component from the Image Builder console, from the API or SDKs, or from the command line. For more information about how

to create a custom component with input parameters and use it in your recipes, see Tutorial: Create a custom component with input parameters.

The following sections show you how to create components from the console or from the AWS CLI.

Contents

- Create a custom component from the console
- Create a custom component from the AWS CLI
- Import a script to create a component from the AWS CLI
- Automatic build version management
- Using version references

Create a custom component from the console

To create an AWSTOE application component from the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Select **Components** from the navigation pane. Then select **Create component**.
3. On the **Create component** page, under **Component details**, enter the following:

    a. **Image Operating system (OS)**. Specify the operating system that the component is compatible with.

    b. **Component category**. From the dropdown, select the type of build or test component that you are creating.

    c. **Component name**. Enter a name for the component.

    d. **Component version**. Enter the version number of the component.

    e. **Description**. Provide an optional description to help you identify the component.

    f. **Change description**. Provide an optional description to help you understand the changes made to this version of the component.

4. In the **Definition document** section, the default option is **Define document content**. The component document defines the actions that Image Builder performs on the build and test instances to create your image.

    In the **Content** box, enter your YAML component document content. To start with a *Hello World* example for Linux, choose the **Use example** option. To learn more about how to create a

YAML component document, or to copy and paste the *UpdateOS* example from that page, see Create a YAML component document for custom components in Image Builder.

5. After you enter the component details, select **Create component**.

> **Note**
>
> To see your new component when you create or update a recipe, apply the **Owned by me** filter to the build or test component list. The filter is located at the top of the component list, next to the search box.

6. To delete a component, from the **Components** page, select the check box next to the component that you want to delete. From the **Actions** dropdown, select **Delete component**.

Update a component

To create a new component version, follow these steps:

1. Depending on where you start:
   - From the **Components** list page – Select the check box next to the component name, then select **Create new version** from the **Actions** menu.
   - From the component detail page – Choose the **Create new version** button in the upper right corner of the heading.
2. The component information is already populated with the current values when the **Create Component** page displays. Follow the create a component steps to update the component. This ensures that you enter a unique semantic version in the **Component version**. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

Create a custom component from the AWS CLI

In this section, you'll learn how to set up and use Image Builder commands in the AWS CLI to create an AWSTOE application component, as follows.

- Upload your YAML component document to an S3 bucket that you can reference from the command line.
- Create the AWSTOE application component with the **create-component** command.

- List component versions with the **list-components** command and a name filter to see what versions already exist. You can use the output to determine what the next version should be for updates.

To create an AWSTOE application component from an input YAML document, follow the steps that match your image operating system platform.

Linux

Store your application component document in Amazon S3

You can use an S3 bucket as a repository for your AWSTOE application component source document. To store your component document, follow these steps:

- **Upload the document to Amazon S3**

  If your document is smaller than 64 KB, you can skip this step. Documents that are 64 KB or larger in size must be stored in Amazon S3.

  ```
  aws s3 cp update-linux-os.yaml s3://amzn-s3-demo-destination-bucket/my-path/update-linux-os.yaml
  ```

Create a component from the YAML document

To streamline the **create-component** command that you use in the AWS CLI, create a JSON file that contains all of the component parameters that you want to pass into the command. Include the location of the *`update-linux-os.yaml`* document that you created earlier. The `uri` key-value pair contains the file reference.

> **Note**
>
> The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API command request parameters, see the CreateComponent command in the *EC2 Image Builder API Reference*.
> To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*.

1. **Create a CLI input JSON file**

   Use a file editing tool to create a file named *create-update-linux-os-component.json*. Include the following content:

```
{
 "name": "update-linux-os",
 "semanticVersion": "1.1.2",
 "description": "An example component that updates the Linux operating system",
 "changeDescription": "Initial version.",
 "platform": "Linux",
 "uri": "s3://amzn-s3-demo-destination-bucket/my-path/update-linux-os.yaml",
 "kmsKeyId": "arn:aws:kms:us-west-2:123456789012:key/98765432-
b123-456b-7f89-0123456f789c",
 "tags": {
  "MyTagKey-purpose": "security-updates"
 }
}
```

2. **Create the component**

   Use the following command to create the component, referencing the file name for the JSON file that you created in the prior step:

```
aws imagebuilder create-component --cli-input-json file://create-update-linux-
os-component.json
```

   Note

   - You must include the `file://` notation at the beginning of the JSON file path.
   - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

Windows

Store your application component document in Amazon S3

You can use an S3 bucket as a repository for your AWSTOE application component source document. To store your component document, follow these steps:

- **Upload the document to Amazon S3**

  If your document is smaller than 64 KB, you can skip this step. Documents that are 64 KB or larger in size must be stored in Amazon S3.

  ```
  aws s3 cp update-windows-os.yaml s3://amzn-s3-demo-destination-bucket/my-path/update-windows-os.yaml
  ```

Create a component from the YAML document

To streamline the **create-component** command that you use in the AWS CLI, create a JSON file that contains all of the component parameters that you want to pass into the command. Include the location of the *update-windows-os.yaml* document that you created earlier. The `uri` key-value pair contains the file reference.

> **Note**
>
> The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API command request parameters, see the CreateComponent command in the *EC2 Image Builder API Reference*.
> To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*..

1. **Create a CLI input JSON file**

   Use a file editing tool to create a file named *create-update-windows-os-component.json*. Include the following content:

   ```
   {
    "name": "update-windows-os",
   ```

```
 "semanticVersion": "1.1.2",
 "description": "An example component that updates the Windows operating
 system.",
 "changeDescription": "Initial version.",
 "platform": "Windows",
 "uri": "s3://amzn-s3-demo-destination-bucket/my-path/update-windows-os.yaml",
 "kmsKeyId": "arn:aws:kms:us-west-2:123456789012:key/98765432-
b123-456b-7f89-0123456f789c",
 "tags": {
  "MyTagKey-purpose": "security-updates"
 }
}
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. **Create the component**

Use the following command to create the component, referencing the file name for the JSON file that you created in the prior step:

```
aws imagebuilder create-component --cli-input-json file://create-update-windows-
os-component.json
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

macOS

Store your application component document in Amazon S3

You can use an S3 bucket as a repository for your AWSTOE application component source document. To store your component document, follow these steps:

- **Upload the document to Amazon S3**

  If your document is smaller than 64 KB, you can skip this step. Documents that are 64 KB or larger in size must be stored in Amazon S3.

  ```
  aws s3 cp wget-macos.yaml s3://amzn-s3-demo-destination-bucket/my-path/wget-macos.yaml
  ```

Create a component from the YAML document

To streamline the **create-component** command that you use in the AWS CLI, create a JSON file that contains all of the component parameters that you want to pass into the command. Include the location of the *wget-macos.yaml* document that you created earlier. The `uri` key-value pair contains the file reference.

> **Note**
>
> The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API command request parameters, see the CreateComponent command in the *EC2 Image Builder API Reference*.
> To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*.

1. **Create a CLI input JSON file**

   Use a file editing tool to create a file named *install-wget-macos-component.json*. Include the following content:

   ```
   {
    "name": "install install-wget-macos-component",
   ```

```
 "semanticVersion": "1.1.2",
 "description": "An example component that installs and verifies the wget
 utility on macOS.",
 "changeDescription": "Initial version.",
 "platform": "macOS",
 "uri": "s3://amzn-s3-demo-destination-bucket/my-path/wget-macos.yaml",
 "kmsKeyId": "arn:aws:kms:us-west-2:123456789012:key/98765432-
b123-456b-7f89-0123456f789c",
 "tags": {
  "MyTagKey-purpose": "install-software"
 }
}
```

2. **Create the component**

   Use the following command to create the component, referencing the file name for the JSON file that you created in the prior step:

   ```
   aws imagebuilder create-component --cli-input-json file://install-wget-macos-
   component.json
   ```

   Note

   - You must include the `file://` notation at the beginning of the JSON file path.
   - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

AWSTOE component versioning for updates from the AWS CLI

AWSTOE component names and versions are embedded in the component's Amazon Resource Name (ARN), after the component prefix. Each new version of a component has its own unique ARN. The steps to create a new version are exactly the same as the steps to create a new component, as long as the semantic version is unique for that component name. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

To ensure that you assign the next logical version, first get a list of the existing versions for the component that you want to change. Use the **list-components** command with the AWS CLI, and filter on the name.

In this example, you filter on the name of the component that you created in the prior Linux examples. To list the component that you created, use the value of the `name` parameter from the JSON file that you used in the **create-component** command.

```
aws imagebuilder list-components --filters name="name",values="update-linux-os"
{
    "requestId": "123a4567-b890-123c-45d6-ef789ab0cd1e",
    "componentVersionList": [
        {
            "arn": "arn:aws:imagebuilder:us-west-2:1234560087789012:component/update-
linux-os/1.0.0",
            "name": "update-linux-os",
            "version": "1.0.0",
            "platform": "Linux",
            "type": "BUILD",
            "owner": "123456789012",
            "dateCreated": "2020-09-24T16:58:24.444Z"
        },
        {
            "arn": "arn:aws:imagebuilder:us-west-2:1234560087789012:component/update-
linux-os/1.0.1",
            "name": "update-linux-os",
            "version": "1.0.1",
            "platform": "Linux",
            "type": "BUILD",
            "owner": "123456789012",
            "dateCreated": "2021-07-10T03:38:46.091Z"
        }
    ]
}
```

Based on your results, you can determine what the next version should be.

Import a script to create a component from the AWS CLI

For some scenarios, it might be easier to start with a pre-existing script. For this scenario, you can use the following example.

This example assumes that you have a file called *import-component.json* (as shown). Note that the file directly references a PowerShell script called `AdminConfig.ps1` that is already uploaded to *amzn-s3-demo-source-bucket*. Currently, `SHELL` is supported for the component `format`.

```
{
"name": "MyImportedComponent",
"semanticVersion": "1.0.0",
"description": "An example of how to import a component",
"changeDescription": "First commit message.",
"format": "SHELL",
"platform": "Windows",
"type": "BUILD",
"uri": "s3://amzn-s3-demo-source-bucket/AdminConfig.ps1",
"kmsKeyId": "arn:aws:kms:us-west-2:123456789012:key/60763706-
b131-418b-8f85-3420912f020c"
}
```

To create the component from an imported script, run the following command.

```
aws imagebuilder import-component --cli-input-json file://import-component.json
```

Automatic build version management

When you create a component with the same name and semantic version as an existing component, Image Builder automatically increments the build version (for example, from /1 to /2, to /3, and so on). This allows you to make iterative updates to your components without manually managing version numbers, which is especially useful in CI/CD pipelines and infrastructure-as-code deployments. If the component content is identical to the previous build version, Image Builder returns `ResourceAlreadyExistsException` to prevent duplicate components from consuming your service quota.

Using version references

When you create or retrieve a component, Image Builder automatically provides pre-constructed ARNs with wildcard version patterns in the latestVersionReferences object. These references make it easy to use the latest versions of your components in recipes and pipelines without manually parsing ARNs.

Choosing the right version reference

- latestVersionArn (x.x.x) - Always use the absolute latest component version.

- atestMajorVersionArn (1.x.x) - Use the latest minor and patch versions within a major version.
- latestMinorVersionArn (1.2.x) - Use the latest patch version only.
- latestPatchVersionArn (1.2.3) - Reference a specific semantic version, but get the latest build version.

> **Note**
>
> To avoid unexpected charges, make sure to clean up resources and pipelines that you created from the examples in this guide. For more information about deleting resources in Image Builder, see Delete outdated or unused Image Builder resources.

How Image Builder uses the AWS Task Orchestrator and Executor application to manage components

EC2 Image Builder uses the AWS Task Orchestrator and Executor (AWSTOE) application to orchestrate complex workflows, modify system configurations, and test your images without the need for additional devops scripts or code. This application manages and runs components that implement its declarative document schema.

AWSTOE is a standalone application that Image Builder installs on its build and test instances when you create an image. You can also install it manually on EC2 instances to create your own custom components. It doesn't require any additional setup, and can also run on premises.

> **Tip**
>
> For information about component patterns and a script that validates and runs component documents locally, see the AWSTOE samples on GitHub. For more information, see Explore Image Builder sample projects on GitHub.

Contents

- AWSTOE downloads
- Supported Regions
- AWSTOE command reference
- Manual set up to develop custom components with AWSTOE

- Use the AWSTOE component document framework for custom components
- Action modules supported by AWSTOE component manager
- Configure input for the AWSTOE run command

AWSTOE downloads

To install AWSTOE, choose the download link for your architecture and platform. If you attach to a VPC endpoint for your service (Image Builder, for example), it must have a custom endpoint policy attached that includes access to the S3 bucket for AWSTOE downloads. Otherwise, your build and test instances will not be able to download the bootstrap script (`bootstrap.sh`) and install the AWSTOE application. For more information see Create a VPC endpoint policy for Image Builder.

> **Important**
>
> AWS is phasing out support for TLS versions 1.0 and 1.1. To access the S3 bucket for AWSTOE downloads, your client software must use TLS version 1.2 or later. For more information, see this AWS Security Blog post.

Architecture	Platform	Download link	Example
386	AL 2 and 2023 RHEL 7, 8, and 9 Ubuntu 16.04, 18.04, 20.04, 22.04, and 24.04 CentOS 7 and 8 SUSE 12 and 15	`https://awstoe-<region>.s3.com/latest/linux/386/awstoe`	https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/linux/386/awstoe
AMD64	AL 2 and 2023 RHEL 7, 8, and 9	`https://awstoe-<region>.s3.com/latest/linux/amd64/awstoe`	https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/linux/amd64/awstoe

Architecture	Platform	Download link	Example
	Ubuntu 16.04, 18.04, 20.04, 22.04, and 24.04 CentOS 7 and 8 CentOS Stream 8 SUSE 12 and 15		
AMD64	macOS 10.14.x (Mojave), 10.15.x (Catalina), 11.x (Big Sur), 12.x (Monterey)	`https://awstoe-region.s3.rs.com/latest/darwin/amd64/awstoe`	https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/darwin/amd64/awstoe
AMD64	Windows Server 2012 R2, 2016, 2019, and 2022	`https://awstoe-<region>.s3.com/latest/windows/amd64/awstoe.exe`	https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/windows/amd64/awstoe.exe
ARM64	AL 2 and 2023 RHEL 7, 8, and 9 Ubuntu 16.04, 18.04, 20.04, 22.04, and 24.04 CentOS 7 and 8 CentOS Stream 8 SUSE 12 and 15	`https://awstoe-<region>.s3.com/latest/linux/arm64/awstoe`	https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/linux/arm64/awstoe

Architecture	Platform	Download link	Example
ARM64	macOS 11.x (Big Sur) and later	`https://awstoe-region.s3.rs.com/latest/darwin/arm64/awstoe`	https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/darwin/arm64/awstoe

Supported Regions

AWSTOE is supported as a standalone application in all AWS Regions where EC2 Image Builder is available. When Image Builder launches in a new Region, the AWSTOE application download for that Region becomes available. For a list of the Regions where Image Builder is available, see Image Builder Endpoints and Quotas in the *AWS General Reference*.

AWSTOE command reference

AWSTOE is a command line component management application that runs on Amazon EC2 instances. When Image Builder launches an EC2 build or test instance, it installs AWSTOE on the instance. Then it runs AWSTOE commands in the AWS CLI to install or validate the components that are specified in the image or container recipe.

> **Note**
>
> Some AWSTOE action modules require elevated permissions to run on a Linux server. To use elevated permissions, prefix the command syntax with **sudo**, or run the **sudo su** command one time when you log in before running the commands linked below. For more information about AWSTOE action modules, see Action modules supported by AWSTOE component manager.

run

Use the **run** command to run the YAML document scripts for one or more component documents.

validate

Run the **validate** command to validate the YAML document syntax for one or more component documents.

awstoe run command

This command runs the YAML component document scripts in the order in which they are included in the configuration file specified by the `--config` parameter, or the list of component documents specified by the `--documents` parameter.

> **Note**
>
> You must specify exactly one of the following parameters, never both:
> --config
> --documents

Syntax

```
awstoe run [--config <file path>] [--cw-ignore-failures <?>]
      [--cw-log-group <?>] [--cw-log-region us-west-2] [--cw-log-stream <?>]
      [--document-s3-bucket-owner <owner>] [--documents <file path,file path,...>]
      [--execution-id <?>] [--log-directory <file path>]
      [--log-s3-bucket-name <name>] [--log-s3-bucket-owner <owner>]
      [--log-s3-key-prefix <?>] [--parameters name1=value1,name2=value2...]
      [--phases <phase name>] [--blocked-action-modules <module,module,...>]
      [--state-directory <directory path>] [--version <?>]
      [--help] [--trace]
```

Parameters and options

Parameters

--config *./config-example.json*

Short form: -c *./config-example.json*

The configuration file *(conditional)*. This parameter contains the file location for the JSON file that contains configuration settings for the components this command is running. If you specify **run** command settings in a configuration file, you must not specify the `--documents`

parameter. For more information about input configuration, see Configure input for the AWSTOE run command.

Valid locations include:

- A local file path (*./config-example.json*)
- An S3 URI (s3://*bucket/key*)

--cw-ignore-failures

Short form: N/A

Ignore logging failures from the CloudWatch Logs.

--cw-log-group

Short form: N/A

The LogGroup name for the CloudWatch Logs.

--cw-log-region

Short form: N/A

The AWS Region that applies to the CloudWatch Logs.

--cw-log-stream

Short form: N/A

The LogStream name for the CloudWatch Logs, that directs AWSTOE where to stream the console.log file.

--document-s3-bucket-owner

Short form: N/A

The account ID of the bucket owner for S3 URI-based documents.

--documents *./doc-1.yaml,./doc-n.yaml*

Short form: -d *./doc-1.yaml*,*./doc-n*

The component documents *(conditional)*. This parameter contains a comma-separated list of file locations for the YAML component documents to run. If you specify YAML documents for the **run** command using the --documents parameter, you must not specify the --config parameter. Do not include spaces between items in the list.

Valid locations include:

- local file paths (*./component-doc-example.yaml*).
- S3 URIs (s3://*bucket/key*).
- Image Builder component build version ARNs (arn:aws:imagebuilder:us-west-*2:123456789012*:component/*my-example-component*/2021.12.02/1).

--execution-id

Short form: -i

This is the unique ID that applies to the execution of the current **run** command. This ID is included in output and log file names, to uniquely identify those files, and link them to the current command execution. If this setting is left out, AWSTOE generates a GUID.

--log-directory

Short form: -l

The destination directory where AWSTOE stores all of the log files from this command execution. By default, this directory is located inside of the following parent directory: TOE_<DATETIME>_<EXECUTIONID>. If you do not specify the log directory, AWSTOE uses the current working directory (.).

--log-s3-bucket-name

Short form: -b

If component logs are stored in Amazon S3 (recommended), AWSTOE uploads the component application logs to the S3 bucket named in this parameter.

--log-s3-bucket-owner

Short form: N/A

If component logs are stored in Amazon S3 (recommended), this is the owner account ID for the bucket where AWSTOE writes the log files.

--log-s3-key-prefix

Short form: -k

If component logs are stored in Amazon S3 (recommended), this is the S3 object key prefix for the log location in the bucket.

--parameters *name1*=*value1*,*name2*=*value2*...

Short form: N/A

Parameters are mutable variables that are defined in the component document, with settings that the calling application can provide at runtime.

--phases

Short form: -p

A comma-separated list that specifies which phases to run from the YAML component documents. If a component document includes additional phases, those will not run.

--state-directory

Short form: -s

The file path where state tracking files are stored.

--blocked-action-modules

Short form: N/A

A comma-separated list of action modules that cannot run in the component document. If a document contains a blocked action module, validation fails before execution begins.

--version

Short form: -v

Specifies the component application version.

Options

--help

Short form: -h

Displays a help manual for using the component management application options.

--trace

Short form: -t

Enables verbose logging to the console.

Output

The **run** command produces a JSON execution summary. The following example shows output from a successful execution.

```
{
    "executionId": "12345678-abcd-efgh-1234-example12345",
    "status": "success",
    "failedStepCount": 0,
    "executedStepCount": 3,
    "ignoredFailedStepCount": 0,
    "skippedStepCount": 0,
    "failureMessage": "",
    "logUrl": "s3://my-bucket/my-prefix/12345678-abcd-efgh-1234-example12345"
}
```

The `status` field reports the overall execution result:

- `success` – All phases and steps completed successfully.
- `failed` – One or more steps failed because the `onFailure` action is `Abort`.
- `timedOut` – One or more steps exceeded their `timeoutSeconds` value.

awstoe validate command

When you run this command, it validates the YAML document syntax for each of the component documents specified by the `--documents` parameter.

Syntax

```
awstoe validate [--blocked-action-modules <module,module,...>]
      [--document-s3-bucket-owner <owner>]
      --documents <file path,file path,...> [--help] [--trace]
```

Parameters and options

Parameters

--blocked-action-modules

Short form: N/A

A comma-separated list of action modules that cannot run in the component document. If a document contains a blocked action module, validation fails.

--document-s3-bucket-owner

Short form: N/A

Source account ID of S3 URI-based documents provided.

--documents *./doc-1.yaml,./doc-n.yaml*

Short form: -d *./doc-1.yaml*,*./doc-n*

The component documents *(required)*. This parameter contains a comma-separated list of file locations for the YAML component documents to run, with no spaces between items. Valid locations include:

- local file paths (*./component-doc-example.yaml*)
- S3 URIs (s3://*bucket/key*)
- Image Builder component build version ARNs (arn:aws:imagebuilder:us-west-*2:123456789012*:component/*my-example-component*/2021.12.02/1)

Options

--help

Short form: -h

Displays a help manual for using the component management application options.

--trace

Short form: -t

Enables verbose logging to the console.

Output

The **validate** command produces a JSON validation result. The following example shows output from a successful validation.

```
{
```

```
    "validationStatus": "success",
    "message": "Validation successful."
}
```

The following example shows output when validation fails.

```
{
    "validationStatus": "failed",
    "message": "Document has 0 phases. Phases list must not be empty."
}
```

Manual set up to develop custom components with AWSTOE

The AWS Task Orchestrator and Executor (AWSTOE) application is a standalone application that creates, validates, and runs commands within a component definition framework. AWS services can use AWSTOE to orchestrate workflows, install software, modify system configurations, and test image builds.

Follow these steps to manually install the AWSTOE application and use it as a stand-alone application to develop custom components. Image Builder takes care of these steps for you, if you use the Image Builder console or AWS CLI commands to create custom components. For more information, see Create custom components with Image Builder.

Verify the signature of the AWSTOE installation download

This section describes the recommended process for verifying the validity of the installation download for AWSTOE on Linux, macOS and Windows based operating systems.

Topics

- Verify the signature of the AWSTOE installation download on Linux or macOS
- Verify the signature of the AWSTOE installation download on Windows

Verify the signature of the AWSTOE installation download on Linux or macOS

This topic describes the recommended process for verifying the validity of the installation download for the AWSTOE on Linux-based or macOS operating systems.

Whenever you download an application from the internet, we recommend that you authenticate the identity of the software publisher. Also, check that the application is not altered or corrupted

since it was published. This protects you from installing a version of the application that contains a virus or other malicious code.

If, after running the steps in this topic, you determine that the software for the AWSTOE application is altered or corrupted, do not run the installation file. Instead, contact Support For more information about your support options, see Support.

AWSTOE files for Linux-based and macOS operating systems are signed using GnuPG, an open source implementation of the Pretty Good Privacy (OpenPGP) standard for secure digital signatures. GnuPG (also known as GPG) provides authentication and integrity checking through a digital signature. Amazon EC2 publishes a public key and signatures that you can use to verify the downloaded Amazon EC2 CLI tools. For more information about PGP and GnuPG (GPG), see http://www.gnupg.org.

The first step is to establish trust with the software publisher. Download the public key of the software publisher, check that the owner of the public key is who they claim to be, and then add the public key to your *keyring*. Your keyring is a collection of known public keys. After you establish the authenticity of the public key, you can use it to verify the signature of the application.

Topics

- Installing the GPG tools
- Authenticating and importing the public key
- Verify the signature of the package

Installing the GPG tools

If your operating system is Linux, Unix, or macOS, the GPG tools are likely already installed. To test whether the tools are installed on your system, type **gpg** at a command prompt. If the GPG tools are installed, you see a GPG command prompt. If the GPG tools are not installed, you see an error message stating that the command cannot be found. You can install the GnuPG package from a repository.

To install GPG tools, select the operating system that matches your instance.

Debian-based Linux

From a terminal, run the following command:

```
apt-get install gnupg
```

Red Hat–based Linux

From a terminal, run the following command:

```
yum install gnupg
```

macOS

From a terminal, run the following command:

```
brew install gnupg
```

Authenticating and importing the public key

The next step in the process is to authenticate the AWSTOE public key and add it as a trusted key in your GPG keyring.

To authenticate and import the AWSTOE public key

1. Obtain a copy of our public GPG build key by doing one of the following:

   - Download the key from

     https://awstoe-**<region>**.s3.**<region>**.amazonaws.com/assets/awstoe.gpg. For example, https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/assets/awstoe.gpg.
   - Copy the key from the following text and paste it into a file called `awstoe.gpg`. Make sure to include everything that follows:

     ```
     -----BEGIN PGP PUBLIC KEY BLOCK-----
     Version: GnuPG v2

     mQENBF8UqwsBCACdiRF2bkZYaFSDPFC+LIkWLwFvtUCRwAHtD8KIwTJ6LVn3fHAU
     GhuK0ZH9mRrqRT2bq/xJjGsnF9VqTj2AJqndGJdDjz75YCZYM+ocZ+r5HSJaeW9i
     S5dykHj7Txti2zHe0G5+W0v7v5bPi2sPHsN7XWQ7+G2AMEPTz8PjxY//I0DvMQns
     S1e3l9hz6wCClz1l9LbBzTyHfSm5ucTXvNe88XX5Gmt37OCDM7vfli0Ctv8WFoLN
     6jbxuA/sV71yIkPm9IYp3+GvaKeT870+sn8/JOOKE/U4sJV1ppbqmuUzDfhrZUaw
     8eW8IN9A1FTIuWiZED/5L83UZuQs1S7s2PjlABEBAAG0GkFXU1RPRSA8YXdzdG9l
     QGFtYXpvbi5jb20+iQE5BBMBCAAjBQJfFKsLAhsDBwsJCAcDAgEGFQgCCQoLBBYC
     AwECHgECF4AACgkQ3r3BVvWuvFJGiwf9EVmrBR77+Qe/DUeXZJYoaFr7If/fVDZl
     6V3TC6p0J0Veme7uXleRUTFOjzbh+7e5sDX19HrnPquzCnzfMiqbp4lSoeUuNdOf
     ```

```
FcpuTCQH+M+sIEIgPno4PLl0Uj2uE1o++mxmonBl/Krk+hly8hB2L/9n/vW3L7BN
OMb1Ll9PmgGPbWipcT8KRdz4SUex9TXGYzjlWb3jU3uXetdaQY1M3kVKE1siRsRN
YYDtpcjmwbhjpu4xm19aFqNoAHCDctEsXJA/mkU3erwIRocPyjAZE2dnlkL9ZkFZ
z9DQkcIarbCnybDM5lemBbdhXJ6hezJE/b17VA0t1fY04MoEkn6oJg==
=oyze
-----END PGP PUBLIC KEY BLOCK-----
```

2. At a command prompt in the directory where you saved **awstoe.gpg**, use the following command to import the AWSTOE public key into your keyring.

```
gpg --import awstoe.gpg
```

The command returns results that are similar to the following:

```
gpg: key F5AEBC52: public key "AWSTOE <awstoe@amazon.com>" imported
gpg: Total number processed: 1
gpg:               imported: 1  (RSA: 1)
```

Make a note of the key value; you need it in the next step. In the preceding example, the key value is F5AEBC52.

3. Verify the fingerprint by running the following command, replacing *key-value* with the value from the preceding step:

```
gpg --fingerprint key-value
```

This command returns results similar to the following:

```
pub   2048R/F5AEBC52 2020-07-19
      Key fingerprint = F6DD E01C 869F D639 15E5  5742 DEBD C156 F5AE BC52
uid       [ unknown] AWSTOE <awstoe@amazon.com>
```

Additionally, the fingerprint string should be identical to F6DD E01C 869F D639 15E5 5742 DEBD C156 F5AE BC52, as shown in the preceding example. Compare the key fingerprint that is returned to the one published on this page. They should match. If they don't match, do not install the AWSTOE installation script, and contact Support.

Verify the signature of the package

After you install the GPG tools, authenticate and import the AWSTOE public key, and verify that the public key is trusted, you are ready to verify the signature of the installation script.

To verify the installation script signature

1. At a command prompt, run the following command to download the application binary:

   ```
   curl -O https://awstoe-<region>.s3.<region>.amazonaws.com/latest/
   linux/<architecture>/awstoe
   ```

   For example:

   ```
   curl -O https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/linux/amd64/
   awstoe
   ```

   Supported values for **`architecture`** can be `amd64`, `386`, and `arm64`.

2. At a command prompt, run the following command to download the signature file for the corresponding application binary from the same S3 key prefix path:

   ```
   curl -O https://awstoe-<region>.s3.<region>.amazonaws.com/latest/
   linux/<architecture>/awstoe.sig
   ```

   For example:

   ```
   curl -O https://awstoe-us-east-1.s3.us-east-1.amazonaws.com/latest/linux/amd64/
   awstoe.sig
   ```

   Supported values for **`architecture`** can be `amd64`, `386`, and `arm64`.

3. Verify the signature by running the following command at a command prompt in the directory where you saved `awstoe.sig` and the AWSTOE installation file. Both files must be present.

   ```
   gpg --verify ./awstoe.sig ~/awstoe
   ```

   The output should look something like the following:

   ```
   gpg: Signature made Mon 20 Jul 2020 08:54:55 AM IST using RSA key ID F5AEBC52
   ```

```
gpg: Good signature from "AWSTOE awstoe@amazon.com" [unknown]
gpg: WARNING: This key is not certified with a trusted signature!
gpg:          There is no indication that the signature belongs to the owner.
Primary key fingerprint: F6DD E01C 869F D639 15E5 5742 DEBD C156 F5AE BC52
```

If the output contains the phrase `Good signature from "AWSTOE <awstoe@amazon.com>"`, it means that the signature has successfully been verified, and you can proceed to run the AWSTOE installation script.

If the output includes the phrase `BAD signature`, check whether you performed the procedure correctly. If you continue to get this response, do not run the installation file that you downloaded previously, and contact Support.

The following are details about the warnings that you might see:

- **WARNING: This key is not certified with a trusted signature! There is no indication that the signature belongs to the owner.** Ideally, you would visit an AWS office and receive the key in person. However, you would most likely download it from a website. In this case, the website is an AWS website.
- **gpg: no ultimately trusted keys found.** This means that the specific key is not "ultimately trusted" by you, or by other people that you trust.

For more information, see http://www.gnupg.org.

Verify the signature of the AWSTOE installation download on Windows

This topic describes the recommended process for verifying the validity of the installation file for the AWS Task Orchestrator and Executor application on Windows-based operating systems.

Whenever you download an application from the internet, we recommend that you authenticate the identity of the software publisher and check that the application is not altered or corrupted since it was published. This protects you from installing a version of the application that contains a virus or other malicious code.

If, after running the steps in this topic, you determine that the software for the AWSTOE application is altered or corrupted, do not run the installation file. Instead, contact Support.

To verify the validity of the downloaded awstoe binary on Windows-based operating systems, make sure that the thumbprint of its Amazon Services LLC signer certificate is equal to this value:

9D CA 72 17 DA FF B8 2F E4 C4 67 77 36 2F A4 AA C9 08 82 15

> **Note**
>
> During the roll-out window for a new binary, your signer certificate might not match the new thumbprint. If your signer certificate doesn't match, verify that the thumbprint value is:
> **BA 81 25 EE AC 64 2E A9 F3 C5 93 CA 6D 3E B7 93 7D 68 75 74**

To verify this value, perform the following procedure:

1. Right-click the downloaded `awstoe.exe`, and open the **Properties** window.
2. Choose the **Digital Signatures** tab.
3. From the **Signature List**, choose **Amazon Services LLC**, and then choose **Details**.
4. Choose the **General** tab, if not already selected, and then choose **View Certificate**.
5. Choose the **Details** tab, and then choose **All** in the **Show** dropdown list, if not already selected.
6. Scroll down until you see the **Thumbprint** field and then choose **Thumbprint**. This displays the entire thumbprint value in the lower window.

   - If the thumbprint value in the lower window is identical to the following value:

     9D CA 72 17 DA FF B8 2F E4 C4 67 77 36 2F A4 AA C9 08 82 15

     then your downloaded AWSTOE binary is authentic and can be safely installed.
   - If the thumbprint value in the lower details window is not identical to the previous value, do not run `awstoe.exe`.

Get started steps

- Step 1: Install AWSTOE
- Step 2: Set AWS credentials
- Step 3: Develop component documents locally
- Step 4: Validate AWSTOE components
- Step 5: Run AWSTOE components

Step 1: Install AWSTOE

To develop components locally, download and install the AWSTOE application.

1. **Download the AWSTOE application**

   To install AWSTOE, choose the appropriate download link for your architecture and platform. For the full list of application download links, see AWSTOE downloads

   > **Important**
   >
   > AWS is phasing out support for TLS versions 1.0 and 1.1. To access the S3 bucket for AWSTOE downloads, your client software must use TLS version 1.2 or later. For more information, see this AWS Security Blog post.

2. **Verify the signature**

   The steps for verifying your download depend on the server platform where you run the AWSTOE application after you install it. To verify your download on a Linux server, see Verify the signature on Linux or macOS. To verify your download on a Windows server, see Verify the signature on Windows.

> **Note**
>
> AWSTOE is invoked directly from its download location. There is no need for a separate install step. This also means that AWSTOE can make changes to the local environment. To ensure that you isolate changes during component development, we recommend that you use an EC2 instance to develop and test AWSTOE components.

Step 2: Set AWS credentials

AWSTOE requires AWS credentials to connect to other AWS services, such as Amazon S3 and Amazon CloudWatch, when running tasks, such as:

- Downloading AWSTOE documents from a user-provided Amazon S3 path.
- Running `S3Download` or `S3Upload` action modules.
- Streaming logs to CloudWatch, when enabled.

If you are running AWSTOE on an EC2 instance, then running AWSTOE uses the same permissions as the IAM role attached to the EC2 instance.

For more information about IAM roles for EC2, see IAM roles for Amazon EC2.

The following examples show how to set AWS credentials using the `AWS_ACCESS_KEY_ID` and `AWS_SECRET_ACCESS_KEY` environment variables.

To set these variables on Linux, macOS, or Unix, use `export`.

```
export AWS_ACCESS_KEY_ID=your_access_key_id
```

```
export AWS_SECRET_ACCESS_KEY=your_secret_access_key
```

To set these variables on Windows using PowerShell, use `$env`.

```
$env:AWS_ACCESS_KEY_ID=your_access_key_id
```

```
$env:AWS_SECRET_ACCESS_KEY=your_secret_access_key
```

To set these variables on Windows using the command prompt, use `set`.

```
set AWS_ACCESS_KEY_ID=your_access_key_id
```

```
set AWS_SECRET_ACCESS_KEY=your_secret_access_key
```

Step 3: Develop component documents locally

Components are authored with plaintext YAML documents. For more information about document syntax, see Use the AWSTOE component document framework for custom components.

The following are example *Hello World* component documents to help you get started.

Linux

> Some of the Linux component examples in this guide refer to a component document file named `hello-world-linux.yml`. You can use the following document to get started with those examples.

```
name: Hello World
description: This is hello world testing document for Linux.
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo 'Hello World from the build phase.'
  - name: validate
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo 'Hello World from the validate phase.'
  - name: test
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo 'Hello World from the test phase.'
```

Windows

Some of the Windows component examples in this guide refer to a component document file named `hello-world-windows.yml`. You can use the following document to get started with those examples.

```
name: Hello World
description: This is Hello World testing document for Windows.
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: HelloWorldStep
        action: ExecutePowerShell
        inputs:
          commands:
            - Write-Host 'Hello World from the build phase.'
```

```
  - name: validate
    steps:
      - name: HelloWorldStep
        action: ExecutePowerShell
        inputs:
          commands:
            - Write-Host 'Hello World from the validate phase.'
  - name: test
    steps:
      - name: HelloWorldStep
        action: ExecutePowerShell
        inputs:
          commands:
            - Write-Host 'Hello World from the test phase.'
```

macOS

Some of the macOS component examples in this guide refer to a component document file named `hello-world-macos.yml`. You can use the following document to get started with those examples.

```
name: Hello World
description: This is hello world testing document for macOS.
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo 'Hello World from the build phase.'
  - name: validate
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
        inputs:
          commands:
            - echo 'Hello World from the validate phase.'
  - name: test
    steps:
      - name: HelloWorldStep
        action: ExecuteBash
```

```
        inputs:
          commands:
            - echo 'Hello World from the test phase.'
```

Step 4: Validate AWSTOE components

You can validate the syntax of AWSTOE components locally with the AWSTOE application. The following examples show the AWSTOE application `validate` command to validate the syntax of a component without running it.

> **Note**
>
> The AWSTOE application can validate only the component syntax for the current operating system. For example, when running `awstoe.exe` on Windows, you cannot validate the syntax for a Linux document that uses the `ExecuteBash` action module.

Linux or macOS

```
awstoe validate --documents /home/user/hello-world.yml
```

Windows

```
awstoe.exe validate --documents C:\Users\user\Documents\hello-world.yml
```

Step 5: Run AWSTOE components

The AWSTOE application can run one or more phases of specified documents using the `--phases` command line argument. Supported values for `--phases` are `build`, `validate`, and `test`. Multiple phase values can be entered as comma separated values.

When you provide a list of phases, the AWSTOE application sequentially runs the specified phases of each document. For example, AWSTOE runs the `build` and `validate` phases of `document1.yaml`, followed by the `build` and `validate` phases of `document2.yaml`.

To ensure that your logs are stored securely and retained for troubleshooting, we recommend configuring log storage in Amazon S3. In Image Builder, the Amazon S3 location for publishing

logs is specified in the infrastructure configuration. For more information about infrastructure configuration, see Manage Image Builder infrastructure configuration

If a list of phases is not provided, the AWSTOE application runs all phases in the order listed in the YAML document.

To run specific phases in single or multiple documents, use the following commands.

Single phase

```
awstoe run --documents hello-world.yml --phases build
```

Multiple phases

```
awstoe run --documents hello-world.yml --phases build,test
```

Document run

Run all phases in a single document

```
awstoe run --documents documentName.yaml
```

Run all phases in multiple documents

```
awstoe run --documents documentName1.yaml,documentName2.yaml
```

Enter Amazon S3 information to upload AWSTOE logs from a user-defined local path (recommended)

```
awstoe run --documents documentName.yaml --log-s3-bucket-name amzn-s3-demo-destination-bucket --log-s3-key-prefix S3KeyPrefix --log-s3-bucket-owner S3BucketOwner --log-directory local_path
```

Run all phases in a single document, and display all logs on the console

```
awstoe run --documents documentName.yaml --trace
```

Example command

```
awstoe run --documents s3://bucket/key/doc.yaml --phases build,validate
```

Run document with unique ID

```
awstoe run --documents documentName.yaml --execution-id user-provided-id --
phases build,test
```

Get help with AWSTOE

```
awstoe --help
```

Use the AWSTOE component document framework for custom components

To build a component using the AWS Task Orchestrator and Executor (AWSTOE) component framework, you must provide a YAML-based document that represents the phases and steps that apply for the component you create. AWS services use your component when they create a new Amazon Machine Image (AMI) or container image.

Topics

- Component document workflow
- Component logging
- Input and output chaining
- Document schema and definitions
- Document examples
- Use variables in your custom component document
- Use conditional constructs in AWSTOE
- Use comparison operators in AWSTOE component documents
- Use logical operators in AWSTOE component documents
- Use looping constructs in AWSTOE

Component document workflow

The AWSTOE component document uses phases and steps to group related tasks, and organize those tasks into a logical workflow for the component.

> **Tip**
>
> The service that uses your component to build an image might implement rules about what phases to use for their build process, and when those phases are allowed to run. This is important to consider when you design your component.

Phases

Phases represent the progression of your workflow through the image build process. For example, the Image Builder service uses `build` and `validate` phases during its *build stage* for the images it produces. It uses the `test` and `container-host-test` phases during its *test stage* to ensure that the image snapshot or container image produces the expected results before creating the final AMI or distributing the container image.

When the component runs, the associated commands for each phase are applied in the order that they appear in the component document.

Rules for phases

- Each phase name must be unique within a document.
- You can define many phases in your document.
- You must include at least one of the following phases in your document:
  - **build** – for Image Builder, this phase is generally used during the *build stage*.
  - **validate** – for Image Builder, this phase is generally used during the *build stage*.
  - **test** – for Image Builder, this phase is generally used during the *test stage*.
- Phases always run in the order that they are defined in the document. The order in which they are specified for AWSTOE commands in the AWS CLI has no effect.

Steps

Steps are individual units of work that define the workflow within each phase. Steps run in sequential order. However, input or output for one step can also feed into a subsequent step as input. This is called "chaining".

Rules for steps

- The step name must be unique for the phase.

- The step must use a supported action (action module) that returns an exit code.

  For a complete list of supported action modules, how they work, input/output values, and examples, see Action modules supported by AWSTOE component manager.

Component logging

AWSTOE creates a new log folder on the EC2 instances that are used for building and testing a new image, each time your component runs. For container images, the log folder is stored in the container.

To assist with troubleshooting if something goes wrong during the image creation process, the input document and all of the output files AWSTOE creates while running the component are stored in the log folder.

The log folder name is comprised of the following parts:

1. **Log directory** – when a service runs a AWSTOE component, it passes in the log directory, along with other settings for the command. For the following examples, we show the log file format that Image Builder uses.
   - **Linux and macOS**: `/var/lib/amazon/toe/`
   - **Windows**: `$env:ProgramFiles\Amazon\TaskOrchestratorAndExecutor\`
2. **File prefix** – This is a standard prefix used for all components: "TOE_".
3. **Run time** – This is a timestamp in YYYY-MM-DD_HH-MM-SS_UTC-0 format.
4. **Execution ID** – This is the GUID that is assigned when AWSTOE runs one or more components.

Example: */var/lib/amazon/toe/*TOE_*2021-07-01_12-34-56_UTC-0_a1bcd2e3-45f6-789a-bcde-0fa1b2c3def4*

AWSTOE stores the following core files in the log folder:

Input files

- **document.yaml** – The document that is used as input for the command. After the component runs, this file is stored as an artifact.

Output files

- **application.log** – The application log contains timestamped debug level information from AWSTOE about what's happening as the component is running.
- **detailedoutput.json** – This JSON file has detailed information about run status, inputs, outputs, and failures for all documents, phases, and steps that apply for the component as it runs.
- **console.log** – The console log contains all of the standard out (stdout) and standard error (stderr) information that AWSTOE writes to the console while the component is running.
- **chaining.json** – This JSON file represents optimizations that AWSTOE applied to resolve chaining expressions.

> **Note**
>
> The log folder might also contain other temporary files that are not covered here.

Input and output chaining

The AWSTOE configuration management application provides a feature for chaining inputs and outputs by writing references in the following formats:

```
{{ phase_name.step_name.inputs/outputs.variable }}
```

or

```
{{ phase_name.step_name.inputs/outputs[index].variable }}
```

The chaining feature allows you to recycle code and improve the maintainability of the document.

Rules for chaining

- Chaining expressions can be used only in the inputs section of each step.
- Statements with chaining expressions must be enclosed in quotes. For example:
  - **Invalid expression**: `echo {{ phase.step.inputs.variable }}`
  - **Valid expression**: `"echo {{ phase.step.inputs.variable }}"`
  - **Valid expression**: `'echo {{ phase.step.inputs.variable }}'`
- Chaining expressions can reference variables from other steps and phases in the same document. However, the calling service might have rules that require chaining expressions to operate only

within the context of a single stage. For example, Image Builder does not support chaining from the *build stage* to the *test stage*, as it runs each stage independently.

- Indexes in chaining expressions follow zero-based indexing. The index starts with zero (0) to reference the first element.

Examples

To refer to the source variable in the second entry of the following example step, the chaining pattern is `{{ build.SampleS3Download.inputs[1].source }}`.

```
phases:
  - name: 'build'
    steps:
      - name: SampleS3Download
        action: S3Download
        timeoutSeconds: 60
        onFailure: Abort
        maxAttempts: 3
        inputs:
          - source: 's3://sample-bucket/sample1.ps1'
            destination: 'C:\sample1.ps1'
          - source: 's3://sample-bucket/sample2.ps1'
            destination: 'C:\sample2.ps1'
```

To refer to the output variable (equal to "Hello") of the following example step, the chaining pattern is `{{ build.SamplePowerShellStep.outputs.stdout }}`.

```
phases:
  - name: 'build'
    steps:
      - name: SamplePowerShellStep
        action: ExecutePowerShell
        timeoutSeconds: 120
        onFailure: Abort
        maxAttempts: 3
        inputs:
          commands:
            - 'Write-Host "Hello"'
```

Document schema and definitions

The following is the YAML schema for a document.

```
name: (optional)
description: (optional)
schemaVersion: "string"

phases:
  - name: "string"
    steps:
      - name: "string"
        action: "string"
        timeoutSeconds: integer
        onFailure: "Abort|Continue|Ignore"
        maxAttempts: integer
        inputs:
```

The schema definitions for a document are as follows.

Field	Description	Type	Required
name	Name of the document.	String	No
description	Description of the document.	String	No
schemaVersion	Schema version of the document, currently 1.0.	String	Yes
phases	A list of phases with their steps.	List	Yes

The `schemaVersion` field accepts `"1.0"` or `"1"` (which normalizes to `"1.0"`). AWSTOE does not support other schema versions.

You can set the optional `disableLogging` field to `true` at the document, phase, or step level. This setting suppresses logging output for that scope. Use this setting for steps that handle sensitive data.

The schema definitions for a phase are as follows.

Field	Description	Type	Required
name	Name of the phase. Phase names must conform to the following rules: • Phase names must contain only letters, numbers, hyphens, and underscores. • Phase names must be 3 to 128 characters long. • Phase names must be unique within a document. • When used with EC2 Image Builder, at least one phase must be named `build`, `validate`, or `test`.	String	Yes
steps	List of the steps in the phase.	List	Yes

The schema definitions for a step are as follows.

Field	Description	Type	Required	Default value
name	User-defined name for the step. Step names must conform to the following rules: • Step names must contain only letters, numbers, hyphens, and underscores. • Step names must be 3 to 128 characters long. • Step names must be unique within a phase.	String		
action	Keyword pertaining to the module that runs the step.	String		
timeoutSeconds	Number of seconds that the step runs before failing or retrying. Also, supports -1 value, which	Integer	No	7,200 sec (120 mins)

Field	Description	Type	Required	Default value
	indicates infinite timeout. 0 and other negative values are not allowed.			

Field	Description	Type	Required	Default value
onFailure	Specifies what the step should do in case of failure. Valid values are as follows: • **Abort** – Fails the step after the maximum number of attempts, and stops running. Sets status for phase and document to `Failed`. • **Continue** – Fails the step after the maximum number of attempts, and continues to run remaining steps. Sets status for phase and document to `Failed`. •	String	No	Abort

Field	Description	Type	Required	Default value
	Ignore – Sets the step to `IgnoredFailure` after the the maximum number of failed attempts, and continues to run remaining steps. Sets status for phase and document to `SuccessWithIgnoredFailure`.			
maxAttempts	Maximum number of attempts allowed before failing the step.	Integer	No	1
inputs	Contains parameters required by the action module to run the step.	Dict	Yes	

Document examples

The following examples show AWSTOE component documents that perform tasks for the target operating system.

Linux

Example 1: Run a custom binary file

The following is an example document that downloads and runs a custom binary file on a Linux instance.

```
name: LinuxBin
description: Download and run a custom Linux binary file.
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: Download
        action: S3Download
        inputs:
          - source: s3://<replaceable>amzn-s3-demo-source-bucket</replaceable>/
<replaceable>myapplication</replaceable>
            destination: /tmp/<replaceable>myapplication</replaceable>
      - name: Enable
        action: ExecuteBash
        onFailure: Continue
        inputs:
          commands:
            - 'chmod u+x {{ build.Download.inputs[0].destination }}'
      - name: Install
        action: ExecuteBinary
        onFailure: Continue
        inputs:
          path: '{{ build.Download.inputs[0].destination }}'
          arguments:
            - '--install'
      - name: Delete
        action: DeleteFile
        inputs:
          - path: '{{ build.Download.inputs[0].destination }}'
```

Windows

Example 1: Install Windows updates

The following is an example document that installs all available Windows updates, runs a configuration script, validates the changes before the AMI is created, and tests the changes after the AMI is created.

```
name: RunConfig_UpdateWindows
description: 'This document will install all available Windows updates and run a
 config script. It will then validate the changes before an AMI is created. Then
 after AMI creation, it will test all the changes.'
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: DownloadConfigScript
        action: S3Download
        timeoutSeconds: 60
        onFailure: Abort
        maxAttempts: 3
        inputs:
          - source: 's3://customer-bucket/config.ps1'
            destination: 'C:\config.ps1'

      - name: RunConfigScript
        action: ExecutePowerShell
        timeoutSeconds: 120
        onFailure: Abort
        maxAttempts: 3
        inputs:
          file: '{{build.DownloadConfigScript.inputs[0].destination}}'

      - name: Cleanup
        action: DeleteFile
        onFailure: Abort
        maxAttempts: 3
        inputs:
          - path: '{{build.DownloadConfigScript.inputs[0].destination}}'

      - name: RebootAfterConfigApplied
        action: Reboot
        inputs:
```

```
        delaySeconds: 60

    - name: InstallWindowsUpdates
      action: UpdateOS

- name: validate
  steps:
    - name: DownloadTestConfigScript
      action: S3Download
      timeoutSeconds: 60
      onFailure: Abort
      maxAttempts: 3
      inputs:
        - source: 's3://customer-bucket/testConfig.ps1'
          destination: 'C:\testConfig.ps1'

    - name: ValidateConfigScript
      action: ExecutePowerShell
      timeoutSeconds: 120
      onFailure: Abort
      maxAttempts: 3
      inputs:
        file: '{{validate.DownloadTestConfigScript.inputs[0].destination}}'

    - name: Cleanup
      action: DeleteFile
      onFailure: Abort
      maxAttempts: 3
      inputs:
        - path: '{{validate.DownloadTestConfigScript.inputs[0].destination}}'

- name: test
  steps:
    - name: DownloadTestConfigScript
      action: S3Download
      timeoutSeconds: 60
      onFailure: Abort
      maxAttempts: 3
      inputs:
        - source: 's3://customer-bucket/testConfig.ps1'
          destination: 'C:\testConfig.ps1'

    - name: ValidateConfigScript
      action: ExecutePowerShell
```

```
        timeoutSeconds: 120
        onFailure: Abort
        maxAttempts: 3
        inputs:
          file: '{{test.DownloadTestConfigScript.inputs[0].destination}}'
```

Example 2: Install the AWS CLI on a Windows instance

The following is an example document that installs the AWS CLI on a Windows instance, using the setup file.

```
name: InstallCLISetUp
description: Install &CLI; using the setup file
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: Download
        action: S3Download
        inputs:
          - source: s3://aws-cli/AWSCLISetup.exe
            destination: C:\Windows\temp\AWSCLISetup.exe
      - name: Install
        action: ExecuteBinary
        onFailure: Continue
        inputs:
          path: '{{ build.Download.inputs[0].destination }}'
          arguments:
            - '/install'
            - '/quiet'
            - '/norestart'
      - name: Delete
        action: DeleteFile
        inputs:
          - path: '{{ build.Download.inputs[0].destination }}'
```

Example 3: Install the AWS CLI with the MSI installer

The following is an example document that installs the AWS CLI with the MSI installer.

```
name: InstallCLIMSI
description: Install &CLI; using the MSI installer
schemaVersion: 1.0
```

```
phases:
  - name: build
    steps:
      - name: Download
        action: S3Download
        inputs:
          - source: s3://aws-cli/AWSCLI64PY3.msi
            destination: C:\Windows\temp\AWSCLI64PY3.msi
      - name: Install
        action: ExecuteBinary
        onFailure: Continue
        inputs:
          path: 'C:\Windows\System32\msiexec.exe'
          arguments:
            - '/i'
            - '{{ build.Download.inputs[0].destination }}'
            - '/quiet'
            - '/norestart'
      - name: Delete
        action: DeleteFile
        inputs:
          - path: '{{ build.Download.inputs[0].destination }}'
```

macOS

Example 1: Run a custom macOS binary file

The following is an example document that downloads and runs a custom binary file on a macOS instance.

```
name: macOSBin
description: Download and run a binary file on macOS.
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: Download
        action: S3Download
        inputs:
          - source: s3://<replaceable>amzn-s3-demo-source-bucket</replaceable>/
<replaceable>myapplication</replaceable>
            destination: /tmp/<replaceable>myapplication</replaceable>
      - name: Enable
        action: ExecuteBash
```

```
      onFailure: Continue
      inputs:
        commands:
          - 'chmod u+x {{ build.Download.inputs[0].destination }}'
    - name: Install
      action: ExecuteBinary
      onFailure: Continue
      inputs:
        path: '{{ build.Download.inputs[0].destination }}'
        arguments:
          - '--install'
    - name: Delete
      action: DeleteFile
      inputs:
        - path: '{{ build.Download.inputs[0].destination }}'
```

Use variables in your custom component document

Variables provide a way to label data with meaningful names that can be used throughout an application. You can define custom variables with simple and readable formats for complex workflows, and reference them in the YAML application component document for an AWSTOE component.

This section provides information to help you define variables for your AWSTOE component in the YAML application component document, including syntax, name constraints, and examples.

Constants

Constants are immutable variables that cannot be modified or overridden once defined. Constants can be defined using values in the `constants` section of an AWSTOE document.

Rules for constant names

- The name must be between 3 and 128 characters in length.
- The name can only contain alphanumeric characters (a-z, A-Z, 0-9), dashes (-), or underscores (_).
- The name must be unique within the document.
- The name must be specified as a YAML string.

Syntax

```
constants:
  - <name>:
      type: <constant type>
      value: <constant value>
```

Key name	Required	Description
`name`	Yes	Name of the constant. Must be unique for the document (it must not be the same as any other parameter names or constants).
`value`	Yes	Value of the constant.
`type`	Yes	Type of the constant. Supported type is `string`.

Reference constant values in a document

You can reference constants in step or loop inputs inside of your YAML document, as follows:

- Constant references are case-sensitive, and the name must match exactly.
- The name must be enclosed within double curly braces {{ *MyConstant* }}.
- Spaces are allowed within the curly braces, and are automatically trimmed. For example, all of the following references are valid:

  {{ *MyConstant* }}, {{ *MyConstant*}}, {{*MyConstant* }}, {{*MyConstant*}}
- The reference in the YAML document must be specified as a string (enclosed in single or double quotes).

  For example: - {{ *MyConstant* }} is not valid, as it is not identified as a string.

  However, the following references are both valid: - '{{ *MyConstant* }}' and - "{{ *MyConstant* }}".

Examples

Constant referenced in step inputs

```
name: Download AWS CLI version 2
schemaVersion: 1.0
constants:
  - Source:
      type: string
      value: https://awscli.amazonaws.com/AWSCLIV2.msi
phases:
  - name: build
    steps:
      - name: Download
        action: WebDownload
        inputs:
          - source: '{{ Source }}'
            destination: 'C:\Windows\Temp\AWSCLIV2.msi'
```

Constant referenced in loop inputs

```
name: PingHosts
schemaVersion: 1.0
constants:
  - Hosts:
      type: string
      value: 127.0.0.1,amazon.com
phases:
  - name: build
    steps:
      - name: Ping
        action: ExecuteBash
        loop:
          forEach:
            list: '{{ Hosts }}'
            delimiter: ','
        inputs:
          commands:
            - ping -c 4 {{ loop.value }}
```

Parameters

Parameters are mutable variables, with settings that the calling application can provide at runtime. You can define parameters in the `Parameters` section of the YAML document.

Rules for parameter names

- The name must be between 3 and 128 characters in length.
- The name can only contain alphanumeric characters (a-z, A-Z, 0-9), dashes (-), or underscores (_).
- The name must be unique within the document.
- The name must be specified as a YAML string.

Syntax

```
parameters:
  - <name>:
      type: <parameter type>
      default: <parameter value>
      description: <parameter description>
```

Key name	Required	Description
`name`	Yes	The name of the parameter . Must be unique for the document (it must not be the same as any other parameter names or constants).
`type`	Yes	The data type of the parameter. Supported types include: `string`.
`default`	No	The default value for the parameter.
`description`	No	Describes the parameter.

Reference parameter values in a document

You can reference parameters in step or loop inputs inside of your YAML document, as follows:

- Parameter references are case-sensitive, and the name must match exactly.

- The name must be enclosed within double curly braces {{ *MyParameter* }}.
- Spaces are allowed within the curly braces, and are automatically trimmed. For example, all of the following references are valid:

  {{ *MyParameter* }}, {{ *MyParameter*}}, {{*MyParameter* }}, {{*MyParameter*}}
- The reference in the YAML document must be specified as a string (enclosed in single or double quotes).

  For example: - {{ *MyParameter* }} is not valid, as it is not identified as a string.

  However, the following references are both valid: - '{{ *MyParameter* }}' and - "{{ *MyParameter* }}".

Examples

The following examples show how to use parameters in your YAML document:

- Refer to a parameter in step inputs:

```
name: Download AWS CLI version 2
schemaVersion: 1.0
parameters:
  - Source:
      type: string
      default: 'https://awscli.amazonaws.com/AWSCLIV2.msi'
      description: The AWS CLI installer source URL.
phases:
  - name: build
    steps:
      - name: Download
        action: WebDownload
        inputs:
          - source: '{{ Source }}'
            destination: 'C:\Windows\Temp\AWSCLIV2.msi'
```

- Refer to a parameter in loop inputs:

```
name: PingHosts
schemaVersion: 1.0
parameters:
  - Hosts:
```

```
      type: string
      default: 127.0.0.1,amazon.com
      description: A comma separated list of hosts to ping.
phases:
  - name: build
    steps:
      - name: Ping
        action: ExecuteBash
        loop:
          forEach:
            list: '{{ Hosts }}'
            delimiter: ','
        inputs:
          commands:
            - ping -c 4 {{ loop.value }}
```

Override parameters at runtime

You can use the `--parameters` option from the AWS CLI with a key-value pair to set a parameter value at runtime.

- Specify the parameter key-value pair as the name and value, separated by an equals sign (<name>=<value>).
- Multiple parameters must be separated by a comma.
- Parameter names that are not found in the YAML component document are ignored.
- The parameter name and value are both required.

> **Important**
>
> Component parameters are plain text values, and are logged in AWS CloudTrail. We recommend that you use AWS Secrets Manager or the AWS Systems Manager Parameter Store to store your secrets. For more information about Secrets Manager, see What is Secrets Manager? in the *AWS Secrets Manager User Guide*. For more information about AWS Systems Manager Parameter Store, see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

Syntax

```
--parameters name1=value1,name2=value2...
```

CLI option	Required	Description
--parameters *name*=*value*,...	No	This option takes list of key-value pairs, with the parameter name as the key.

Examples

The following examples show how to use parameters in your YAML document:

- The parameter key-value pair specified in this `--parameter` option is not valid:

```
--parameters ntp-server=
```

- Set one parameter key-value pair with the `--parameter` option in the AWS CLI:

```
--parameters ntp-server=ntp-server-windows-qe.us-east1.amazon.com
```

- Set multiple parameter key-value pairs with the `--parameter` option in the AWS CLI:

```
--parameters ntp-server=ntp-server.amazon.com,http-url=https://internal-us-
east1.amazon.com
```

Use Systems Manager Parameter Store parameters

You can reference AWS Systems Manager Parameter Store parameters (SSM parameters) in your component documents by prefixing variables with `aws:ssm`. For example,

`{{ aws:ssm:/my/param }}` resolves to the value of the SSM parameter `/my/param`.

This feature supports the following SSM parameter types:

- String – Maps to the AWSTOE string type.
- StringList – Maps to the AWSTOE `stringList` type.

- SecureString – Maps to the AWSTOE string type.

For more information about the Parameter Store see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

You can also reference AWS Secrets Manager secrets using an SSM parameter `SecureString`. For example: `{{ aws:ssm:/aws/reference/secretsmanager/test/test-secret }}`. For more information, see Referencing AWS Secrets Manager secrets from Parameter Store parameters.

> **Important**
>
> Image Builder excludes `SecureString` parameter resolution from its logs. However, you are also responsible for ensuring that sensitive information is not logged through commands issued in the component document. For example, if you use the `echo` command with a secure string, the command writes a plaintext value to the log.

Required IAM permissions

To use Systems Manager parameters in your components, your instance role must have the `ssm:GetParameter` permission for the parameter resource ARN. For example:

JSON

```
{
 "Version":"2012-10-17",
 "Statement": [
  {
   "Effect": "Allow",
   "Action": "ssm:GetParameter",
   "Resource": "arn:aws:ssm:*:111122223333:parameter/ImageBuilder-*"
  }
 ]
}
```

To access encrypted values, you'll also need the following permissions:

- Add `kms:Decrypt` for `SecureString` parameters or AWS Secrets Manager values that are encrypted with a customer managed AWS KMS key.

- Add `secretsmanager:GetSecretValue` if you reference a Secrets Manager secret.

Reference an SSM parameter in a component document

The following example shows how to reference an Systems Manager Parameter Store parameter of Systems Manager parameters in a component:

```
name: UseSSMParameterVariable
description: This is a sample component document that prints out the value of an SSM
 Parameter. Never do this for a SecureString parameter.
schemaVersion: 1.0

phases:
  - name: verify
    steps:
      - name: EchoParameterValue
        action: ExecuteBash
        inputs:
          commands:
            - echo "Log SSM parameter name: /my/test/param, value {{ aws:ssm:/my/test/
param }}."
```

Dynamic runtime variable resolution for SSM parameters

AWSTOE provides the following built-in function that you can use within variable references to manipulate or transform values at runtime.

resolve function

The `resolve` function resolves a variable reference inside of another variable reference, allowing for dynamic variable name referencing. This is useful when working with SSM parameters where part of the parameter path may be variable and passed in as a document parameter.

The `resolve` function only supports dynamic resolution of the name portion of an SSM parameter.

Syntax

The `dynamic_variable` in the following example represents the name of an SSM parameter, and must be one of the following:

- An SSM parameter reference (for example, `aws:ssm:/my/param`)

- A component document parameter reference (for example, *parameter-name*)

```
{{ aws:ssm:resolve(dynamic_variable) }}
```

Example: Resolve an SSM parameter at runtime

The following example shows how to use the `resolve` function in a YAML component document:

```
name: SsmParameterTest
description: This component verifies an SSM parameter variable reference with the echo
 command.
schemaVersion: 1.0

parameters:
  - parameter-name:
      type: string
      description: "test"

phases:
  - name: validate
    steps:
      - name: PrintDynamicVariable
        action: ExecuteBash
        inputs:
          commands:
            - echo "{{ aws:ssm:resolve(parameter-name) }}"
```

Use environment variables

AWSTOE can resolve operating system environment variables that are set on the build or test instance. To reference an environment variable, prefix the variable name with `env:`. For example, `{{ env:MY_VAR }}` resolves to the value of the `MY_VAR` environment variable on the instance.

AWSTOE matches environment variable names exactly. A name can contain any characters that are valid for the operating system, including dots, spaces, and parentheses. For example, `{{ env:ProgramFiles(x86) }}` is a valid reference on Windows.

The following example shows how to reference an environment variable in a component:

```
name: UseEnvironmentVariable
```

```
description: This sample component prints out the value of an environment variable.
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: EchoEnvironmentVariable
        action: ExecuteBash
        inputs:
          commands:
            - echo "The value of SOME_VAR is {{ env:SOME_VAR }}."
```

Environment variables that Image Builder provides

When Image Builder runs a component on a build or test instance, it sets environment variables that describe the current image build. Your components read these values with the AWSTOE `env:` variable prefix described earlier in this topic.

Image Builder provides the following environment variables.

Name	Description
`IMAGE_WORKFLOW_EXECUTION_ID`	The ID of the workflow execution for the current image build.
`IMAGE_STEP_EXECUTION_ID`	The ID of the workflow step execution that is running the component.
`IMAGE_BUILD_VERSION_ARN`	The Amazon Resource Name (ARN) of the image build version that Image Builder creates.
`IMAGE_PIPELINE_ARN`	The ARN of the image pipeline. This value is an empty string when the build does not run from a pipeline.
`IMAGE_PHASE`	The current image build stage: `BUILDING` during the build stage, or `TESTING` during the test stage. This stage is distinct from the AWSTOE component document phases (`build`, `validate`, and `test`). The `IMAGE_PHASE` value never takes a component document phase name.

Name	Description
IMAGE_VERSION	The semantic version of the image (for example, 2.1.1).
IMAGE_BUILD_VERSION	The build version number of the image (for example, 1).

The following example shows how to read Image Builder environment variables in a component:

```
name: UseImageBuilderEnvironmentVariables
description: This sample component prints out Image Builder environment variable
 values.
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: EchoImageBuildValues
        action: ExecuteBash
        inputs:
          commands:
            - echo "Image phase: {{ env:IMAGE_PHASE }}."
            - echo "Image build version ARN: {{ env:IMAGE_BUILD_VERSION_ARN }}."
```

Use instance metadata (IMDS) variables

AWSTOE can resolve values from the Amazon EC2 Instance Metadata Service (IMDS) on the build or test instance. To reference a metadata value, prefix the metadata path with `aws:imds:`. The path is relative to the instance metadata `meta-data/` category. For example, `{{ aws:imds:instance-id }}` resolves to the instance ID. The reference `{{ aws:imds:placement/region }}` resolves to the AWS Region.

> **⚠ Unsupported metadata paths**
>
> AWSTOE does not support the `iam/` and `identity-credentials/` metadata paths. These paths return sensitive credential data. AWSTOE rejects references to them when it validates the component document.

For more information about instance metadata, see Use instance metadata to manage your EC2 instance in the *Amazon EC2 User Guide*.

The following example shows how to reference an IMDS value in a component:

```
name: UseInstanceMetadataVariable
description: This sample component prints out the instance ID from IMDS.
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: EchoInstanceId
        action: ExecuteBash
        inputs:
          commands:
            - echo "The instance ID is {{ aws:imds:instance-id }}."
```

Use context variables

AWSTOE provides context variables that describe the current execution and instance. To reference a context variable, prefix the key with `context:`. For example, `{{ context:accountId }}` resolves to the AWS account ID.

AWSTOE provides the following context variables.

Key	Description
`executionId`	The ID of the current AWSTOE execution.
`accountId`	The ID of the AWS account that the instance runs in.
`region`	The AWS Region that the instance runs in.
`osPlatform`	The operating system platform of the instance (for example, `linux` or `windows`).
`osName`	The operating system name (for example, `Amazon Linux` or `Ubuntu`). On Linux, AWSTOE reads this value from `/etc/os-release` .

Key	Description
`osVersion`	The operating system version (for example, 2023). On Linux, AWSTOE reads this value from `/etc/os-release` . On Windows and macOS, this value is an empty string.
`date`	The current date in UTC, in `YYYY-MM-DD` format (for example, `2026-06-15`).
`dateTime`	The current date and time in UTC, in RFC 3339 format (for example, `2026-06-15T10:30:00Z`).
`uuid`	A randomly generated version 4 UUID.
`hostname`	The hostname of the instance.
`phase`	The name of the currently running phase.
`step`	The name of the currently running step.

Note

To get the instance ID, use the IMDS variable `{{ aws:imds:instance-id }}` rather than a context variable.

The following example shows how to reference context variables in a component:

```
name: UseContextVariables
description: This sample component prints out context variable values.
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: EchoContextValues
        action: ExecuteBash
        inputs:
          commands:
```

```
            - echo "Account: {{ context:accountId }}, OS: {{ context:osName }}."
```

Use conditional constructs in AWSTOE

Conditional constructs perform different actions in your component document based on whether the specified conditional expression evaluates to `true` or `false`. You can use the `if` construct to control the flow of execution in your component document.

if Construct

You can use the `if` construct to evaluate whether a step should run or not. By default, when the `if` conditional expression evaluates to `true`, AWSTOE runs the step, and when the condition evaluates to `false`, AWSTOE skips the step. If a step is skipped, it's treated as a successful step when AWSTOE evaluates whether the phase and document ran successfully.

> **Note**
>
> An `if` statement is only evaluated one time, even if the step triggers a restart. If a step restarts, it recognizes that the `if` statement has already been evaluated, and continues where it left off.

> **Note**
>
> Conditional expressions support a maximum nesting depth of 4 levels. If you nest logical operators (`and`, `or`, `not`) beyond 4 levels deep, validation fails.

Syntax

```
if:
  <conditional expression>:
    [then: <step action>]
    [else: <step action>]
```

Key name	Required	Description
conditional expression	Yes	

Key name	Required	Description
		The conditional expression can contain exactly one of the following types of operators at the top level. • **Comparison operator** – For a list of comparison operators, and information about how they work in AWSTOE component documents, see Comparison operators. • **Logical operator** – Logical operators include `and`, `or`, and `not`, and operate on one or more comparison operators. For more information about how logical operators work in AWSTOE component documents, see Logical operators. If your expression must satisfy multiple conditions, use a logical operator to specify your conditions.
then	No	Defines the action to take if the conditional expression evaluates to `true`.

Key name	Required	Description
else	No	Defines the action to take if the conditional expression evaluates to `false`.
step action	Conditional	When you use `then` or `else`, you must specify one of the following step actions: • **Abort** – AWSTOE marks the step as failed. • **Execute** – AWSTOE runs the step. • **Skip** – AWSTOE skips the step.

Example 1: Install package

The following example steps from an AWSTOE component document use logical operators to test a parameter value and run the appropriate package manager commands to install an application if the package is unzipped.

```
- name: InstallUnzipAptGet
  action: ExecuteBash
  if:
    and:
        - binaryExists: 'apt-get'
        - not:
            binaryExists: 'unzip'
  inputs:
    commands:
        - sudo apt-get update
        - sudo apt-get install -y unzip
```

```
    - name: InstallUnzipYum
      action: ExecuteBash
      if:
        and:
            - binaryExists: 'yum'
            - not:
                binaryExists: 'unzip'
      inputs:
        commands:
            - sudo yum install -y unzip

    - name: InstallUnzipZypper
      action: ExecuteBash
      if:
        and:
            - binaryExists: 'zypper'
            - not:
                binaryExists: 'unzip'
      inputs:
        commands:
            - sudo zypper refresh
            - sudo zypper install -y unzip
```

Example 2: Skip a step

The following example shows two ways to skip a step. One uses a logical operator, and one uses a comparison operator with the `Skip` step action.

```
# Creates a file if it does not exist using not
- name: CreateMyConfigFile-1
  action: ExecuteBash
  if:
    not:
      fileExists: '/etc/my_config'
  inputs:
    commands:
      - echo "Hello world" > '/etc/my_config'

# Creates a file if it does not exist using then and else
- name: CreateMyConfigFile-2
  action: ExecuteBash
  if:
```

```
    fileExists: '/etc/my_config'
    then: Skip
    else: Execute
  inputs:
    commands:
      - echo "Hello world" > '/etc/my_config'
```

Use comparison operators in AWSTOE component documents

You can use the following comparison operators with the **Assert** action module and with conditional expressions that use the if Construct. A comparison operator can operate on a single value, for example `stringIsEmpty`, or it can compare a baseline value to a second value (variable value) to determine whether the conditional expression evaluates to `true` or `false`.

If the comparison operates on two values, the second value can be a chaining variable.

When comparing values of a different type, the following value conversions can occur prior to the comparison:

- For numeric comparisons, if the variable value is a string, AWSTOE converts the string to a number prior to the evaluation. If the conversion is not possible, the comparison returns `false`. For example, if the variable value is `"1.0"`, the conversion works, but if the variable value is `"a10"` the conversion fails.
- For string comparisons, if the variable value is a number, AWSTOE converts it to a string prior to the evaluation.

Compare strings

The following comparison operators work with strings to compare values, to test for spaces or an empty string, or to compare an input value to a regex pattern. String comparisons are not case sensitive, and they don't trim spaces from the beginning or the end of the string inputs.

String comparison operators

- stringIsEmpty
- stringIsWhitespace
- stringEquals
- stringLessThan
- stringLessThanEquals

- stringGreaterThan
- stringGreaterThanEquals
- patternMatches

stringIsEmpty

The `stringIsEmpty` operator returns `true` if the specified string doesn't contain any characters. For example:

```
# Evaluates to true
stringIsEmpty: ""

# Evaluates to false
stringIsEmpty: " "

# Evaluates to false
stringIsEmpty: "Hello."
```

stringIsWhitespace

Tests if the string specified for `stringIsWhitespace` contains only spaces. For example:

```
# Evaluates to true
stringIsWhitespace: "   "

# Evaluates to false
stringIsWhitespace: ""

# Evaluates to false
stringIsWhitespace: " Hello?"
```

stringEquals

Tests if the string specified for `stringEquals` is an exact match for the string specified in the `value` parameter. For example:

```
# Evaluates to true
stringEquals: 'Testing, testing...'
value: 'Testing, testing...'

# Evaluates to false
```

```
stringEquals: 'Testing, testing...'
value: 'Hello again.'

# Evaluates to false
stringEquals: 'Testing, testing...'
value: 'TESTING, TESTING....'

# Evaluates to false
stringEquals: 'Testing, testing...'
value: '   Testing, testing...'

# Evaluates to false
stringEquals: 'Testing, testing...'
value: 'Testing, testing...   '
```

stringLessThan

Tests if the string specified for `stringLessThan` is less than the string specified in the `value` parameter. For example:

```
# Evaluates to true
# This comparison operator isn't case sensitive
stringLessThan: 'A'
value: 'a'

# Evaluates to true - 'a' is less than 'b'
stringLessThan: 'b'
value: 'a'

# Evaluates to true
# Numeric strings compare as less than alphabetic strings
stringLessThan: 'a'
value: '0'

# Evaluates to false
stringLessThan: '0'
value: 'a'
```

stringLessThanEquals

Tests if the string specified for `stringLessThanEquals` is less than or equal to the string specified in the `value` parameter. For example:

```
# Evaluates to true - 'a' is equal to 'a'
stringLessThanEquals: 'a'
value: 'a'

# Evaluates to true - since the comparison isn't case sensitive, 'a' is equal to 'A'
stringLessThanEquals: 'A'
value: 'a'

# Evaluates to true - 'a' is less than 'b'
stringLessThanEquals: 'b'
value: 'a'

# Evaluates to true - '0' is less than 'a'
stringLessThanEquals: 'a'
value: '0'

# Evaluates to false - 'a' is greater than '0'
stringLessThanEquals: '0'
value: 'a'
```

stringGreaterThan

Tests if the string specified for `stringGreaterThan` is greater than the string specified in the `value` parameter. For example:

```
# Evaluates to false - since the comparison isn't case sensitive, 'A' is equal to
 'a'
stringGreaterThan: 'a'
value: 'A'

# Evaluates to true - 'b' is greater than 'a'
stringGreaterThan: 'a'
value: 'b'

# Evaluates to true - 'a' is greater than '0'
stringGreaterThan: '0'
value: 'a'

# Evaluates to false - '0' is less than 'a'
stringGreaterThan: 'a'
value: '0'
```

stringGreaterThanEquals

Tests if the string specified for `stringGreaterThanEquals` is greater than or equal to the string specified in the `value` parameter. For example:

```
# Evaluates to true - 'a' is equal to 'A'
stringGreaterThanEquals: 'A'
value: 'a'

# Evaluates to true - 'b' is greater than 'a'
stringGreaterThanEquals: 'a'
value: 'b'

# Evaluates to true - 'a' is greater than '0'
stringGreaterThanEquals: '0'
value: 'a'

# Evaluates to false - '0' is less than 'a'
stringGreaterThanEquals: 'a'
value: '0'
```

patternMatches

Tests if the string specified in the `value` parameter matches the regex pattern specified for `patternMatches`. The comparison uses to the Golang regexp package, which conforms to the RE2 syntax. For more information about RE2 rules, see the google / re2 repository in *GitHub*.

The following example shows a pattern match that returns `true`:

```
patternMatches: '^[a-z]+$'
value: 'ThisIsValue'
```

Compare numbers

The following comparison operators work with numbers. The values provided for these operators must be one of the following types, according to the YAML specification. Support for numeric comparisons uses the golang big package comparison operator, for example: func (*Float) Cmp.

- Integer
- Float (based on float64, which supports numbers from -1.7e+308 to +1.7e+308)
- A string that matches the following regex pattern: `^[-+]?([0-9]+[.])?[0-9]+$`

Number comparison operators

- numberEquals
- numberLessThan
- numberLessThanEquals
- numberGreaterThan
- numberGreaterThanEquals

numberEquals

Tests if the number specified for `numberEquals` is equal to the number specified in the `value` parameter. All of the following example comparisons return `true`:

```
# Values provided as a positive number
numberEquals: 1
value: 1

# Comparison value provided as a string
numberEquals: '1'
value: 1

# Value provided as a string
numberEquals: 1
value: '1'

# Values provided as floats
numberEquals: 5.0
value: 5.0

# Values provided as a negative number
numberEquals: -1
value: -1
```

numberLessThan

Tests if the number specified for `numberLessThan` is less than the number specified in the `value` parameter. For example:

```
# Evaluates to true
numberLessThan: 2
```

```
value: 1

# Evaluates to true
numberLessThan: 2
value: 1.9

# Evaluates to false
numberLessThan: 2
value: '2'
```

numberLessThanEquals

Tests if the number specified for `numberLessThanEquals` is less than or equal to the number specified in the `value` parameter. For example:

```
# Evaluates to true
numberLessThanEquals: 2
value: 1

# Evaluates to true
numberLessThanEquals: 2
value: 1.9

# Evaluates to true
numberLessThanEquals: 2
value: '2'

# Evaluates to false
numberLessThanEquals: 2
value: 2.1
```

numberGreaterThan

Tests if the number specified for `numberGreaterThan` is greater than the number specified in the `value` parameter. For example:

```
# Evaluates to true
numberGreaterThan: 1
value: 2

# Evaluates to true
numberGreaterThan: 1
value: 1.1
```

```
# Evaluates to false
numberGreaterThan: 1
value: '1'
```

numberGreaterThanEquals

Tests if the number specified for `numberGreaterThanEquals` is greater than or equal to the number specified in the `value` parameter. For example:

```
# Evaluates to true
numberGreaterThanEquals: 1
value: 2

# Evaluates to true
numberGreaterThanEquals: 1
value: 1.1

# Evaluates to true
numberGreaterThanEquals: 1
value: '1'

# Evaluates to false
numberGreaterThanEquals: 1
value: 0.8
```

Check files

The following comparison operators check the file hash or check if a file or folder exists.

File and folder operators

- binaryExists
- fileExists
- folderExists
- fileMD5Equals
- fileSHA1Equals
- fileSHA256Equals
- fileSHA512Equals

binaryExists

Tests whether an application is available in the current path. For example:

```
binaryExists: 'foo'
```

> **Note**
>
> On Linux and macOS systems, for an application named *foo*, this works the same as the following bash command: **type *foo* >/dev/null 2>&1**, where **$? == 0** indicates a successful comparison.
> On Windows systems, for an application named *foo*, this works the same as the PowerShell command **& C:\Windows\System32\where.exe /Q *foo*** where **$LASTEXITCODE = 0** indicates a successful comparison.

fileExists

Tests whether a file exists at the specified path. You can provide an absolute or relative path. If the location you specify exists and is a file, the comparison evaluates to `true`. For example:

```
fileExists: '/path/to/file'
```

> **Note**
>
> On Linux and macOS systems, this works the same as the following bash command: **-d */path/to/file***, where **$? == 0** indicates a successful comparison.
> On Windows systems, this works the same as the PowerShell command **Test-Path -Path '*C:\path\to\file*' -PathType 'Leaf'**.

folderExists

Tests whether a folder exists at the specified path. You can provide an absolute or relative path. If the location you specify exists and is a folder, the comparison evaluates to `true`. For example:

```
folderExists: '/path/to/folder'
```

> **Note**
>
> On Linux and macOS systems, this works the same as the following bash command: **-d *`/path/to/folder`***, where **$? == 0** indicates a successful comparison.
> On Windows systems, this works the same as the PowerShell command **Test-Path -Path '*`C:\path\to\folder`*' -PathType 'Container'**.

fileMD5Equals

Tests whether a file's MD5 hash equals a specified value. For example:

```
fileMD5Equals: '<MD5Hash>'
path: '/path/to/file'
```

fileSHA1Equals

Tests whether a file's SHA1 hash equals a specified value. For example:

```
fileSHA1Equals: '<SHA1Hash>'
path: '/path/to/file'
```

fileSHA256Equals

Tests whether a file's SHA256 hash equals a specified value. For example:

```
fileSHA256Equals: '<SHA256Hash>'
path: '/path/to/file'
```

fileSHA512Equals

Tests whether a file's SHA512 hash equals a specified value. For example:

```
fileSHA512Equals: '<SHA512Hash>'
path: '/path/to/file'
```

Use logical operators in AWSTOE component documents

You can use the following logical operators to add or modify conditional expressions in your component document. AWSTOE evaluates conditional expressions in the order that the conditions

are specified. For more information about comparison operators for component documents, see Use comparison operators in AWSTOE component documents.

and

With the `and` operator, you can evaluate two or more comparisons as a single expression. The expression evaluates to `true` when all of the conditions in the list are true. Otherwise, the expression evaluates to `false`.

Examples:

The following example performs two comparisons – a string and a number. Both comparisons are true, so the expression evaluates to true.

```
and:
  - stringEquals: 'test_string'
    value: 'test_string'
  - numberEquals: 1
    value: 1
```

The following example also performs two comparisons. The first comparison is false, at which point evaluation stops and the second comparison is skipped. The expression evaluates to `false`.

```
and:
  - stringEquals: 'test_string'
    value: 'Hello world!'
  - numberEquals: 1
    value: 1
```

or

With the `or` operator, you can evaluate two or more comparisons as a single expression. The expression evaluates to `true` when one of the specified comparisons is true. If none of the specified comparisons evaluate to `true`, the expression evaluates to `false`.

Examples:

The following example performs two comparisons – a string and a number. The first comparison is true, so the expression evaluates to `true` and the second comparison is skipped.

```
or:
  - stringEquals: 'test_string'
    value: 'test_string'
  - numberEquals: 1
    value: 3
```

The following example also performs two comparisons. The first comparison is false, and evaluation continues. The second comparison is true, so the expression evaluates to `true`.

```
or:
  - stringEquals: 'test_string'
    value: 'Hello world!'
  - numberEquals: 1
    value: 1
```

In the final example, both comparisons are false, so the expression evaluates to `false`.

```
or:
  - stringEquals: 'test_string'
    value: 'Hello world!'
  - numberEquals: 1
    value: 3
```

not

With the `not` operator, you can negate a single comparison. The expression evaluates to `true` if the comparison is false. If the comparison is true, then the expression evaluates to `false`.

Examples:

The following example performs a string comparison. The comparison is false, so the expression evaluates to `true`.

```
not:
  - stringEquals: 'test_string'
    value: 'Hello world!'
```

The following example also performs a string comparison. The comparison is true, so the expression evaluates to `false`.

```
not:
```

```
  - stringEquals: 'test_string'
    value: 'test_string'
```

Use looping constructs in AWSTOE

This section provides information to help you create looping constructs in the AWSTOE. Looping constructs define a repeated sequence of instructions. You can use the following types of looping constructs in AWSTOE:

- `for` constructs – Iterate over a bounded sequence of integers.
- `forEach` constructs
  - `forEach` loop with input list – Iterates over a finite collection of strings.
  - `forEach` loop with delimited list – Iterates over a finite collection of strings joined by a delimiter.

> **Note**
>
> Looping constructs support only string data types.

Looping construct topics

- Reference iteration variables
- Types of looping constructs
- Step fields
- Step and iteration outputs

Reference iteration variables

To refer to the index and value of the current iteration variable, the reference expression `{{ loop.* }}` must be used within the input body of a step that contains a looping construct. This expression cannot be used to refer to the iteration variables of the looping construct of another step.

The reference expression consists of the following members:

- `{{ loop.index }}` – The ordinal position of the current iteration, which is indexed at `0`.

- `{{ loop.value }}` – The value associated with the current iteration variable.

Loop names

All looping constructs have an optional name field for identification. If a loop name is provided, it can be used to refer to iteration variables in the input body of the step. To refer to the iteration indices and values of a named loop, use `{{ <loop_name>.* }}` with `{{ loop.* }}` in the input body of the step. This expression cannot be used to refer to the named looping construct of another step.

The reference expression consists of the following members:

- `{{ <loop_name>.index }}` – The ordinal position of the current iteration of the named loop, which is indexed at `0`.
- `{{ <loop_name>.value }}` – The value associated with the current iteration variable of the named loop.

Resolve reference expressions

The AWSTOE resolves reference expressions as follows:

- `{{ <loop_name>.* }}` – AWSTOE resolves this expression using the following logic:
  - If the loop of the currently running step matches the `<loop_name>` value, then the reference expression resolves to the looping construct of the currently running step.
  - `<loop_name>` resolves to the named looping construct if it appears within the currently running step.
- `{{ loop.* }}` – AWSTOE resolves the expression using the looping construct defined in the currently running step.

If reference expressions are used within a step that does not contain a loop, then AWSTOE does not resolve the expressions and they appear in the step with no replacement.

> **Note**
>
> Reference expressions must be enclosed in double quotes to be correctly interpreted by the YAML compiler.

Types of looping constructs

This section provides information and examples about looping construct types that can be used in the AWSTOE.

Looping construct types

- for loop
- forEach loop with input list
- forEach loop with delimited list

`for` loop

The `for` loop iterates on a range of integers specified within a boundary outlined by the start and end of the variables. The iterating values are in the set `[start, end]` and includes boundary values.

AWSTOE verifies the `start`, `end`, and `updateBy` values to ensure that the combination does not result in an infinite loop.

`for` loop schema

```
  - name: "StepName"
    action: "ActionModule"
    loop:
      name: "string"
      for:
        start: int
        end: int
        updateBy: int
inputs:
  ...
```

`for` loop input

Field	Description	Type	Required	Default
name	Unique name of the loop. It must be unique	String	No	""

Field	Description	Type	Required	Default
	compared to other loop names in the same phase.			
`start`	Starting value of iteration. Does not accept chaining expressions.	Integer	Yes	n/a
`end`	Ending value of iteration. Does not accept chaining expressions.	Integer	Yes	n/a
`updateBy`	Difference by which an iterating value is updated through addition. It must be a negative or positive non-zero value. Does not accept chaining expressions.	Integer	Yes	n/a

`for` loop input example

```
- name: "CalculateFileUploadLatencies"
  action: "ExecutePowerShell"
  loop:
    for:
```

```
        start: 100000
        end: 1000000
        updateBy: 100000
    inputs:
      commands:
        - |
          $f = new-object System.IO.FileStream c:\temp\test{{ loop.index }}.txt,
 Create, ReadWrite
          $f.SetLength({{ loop.value }}MB)
          $f.Close()
        - c:\users\administrator\downloads\latencyTest.exe --file c:\temp
\test{{ loop.index }}.txt
        - AWS s3 cp c:\users\administrator\downloads\latencyMetrics.json s3://bucket/
latencyMetrics.json
        - |
          Remove-Item -Path c:\temp\test{{ loop.index }}.txt
          Remove-Item -Path c:\users\administrator\downloads\latencyMetrics.json
```

`forEach` loop with input list

The `forEach` loop iterates on an explicit list of values, which can be strings and chained expressions.

`forEach` loop with input list schema

```
  - name: "StepName"
    action: "ActionModule"
    loop:
      name: "string"
      forEach:
        - "string"
    inputs:
  ...
```

`forEach` loop with input list input

Field	Description	Type	Required	Default
name	Unique name of the loop. It must be unique compared to	String	No	""

Field	Description	Type	Required	Default
	other loop names in the same phase.			
List of strings of `forEach` loop	List of strings for iteration. Accepts chained expressions as strings in the list. Chained expressions must be enclosed by double quotes for the YAML compiler to correctly interpret them.	List of strings	Yes	n/a

`forEach` loop with input list example 1

```
- name: "ExecuteCustomScripts"
  action: "ExecuteBash"
  loop:
    name: BatchExecLoop
    forEach:
      - /tmp/script1.sh
      - /tmp/script2.sh
      - /tmp/script3.sh
  inputs:
    commands:
      - echo "Count {{ BatchExecLoop.index }}"
      - sh "{{ loop.value }}"
      - |
        retVal=$?
        if [ $retVal -ne 0 ]; then
```

```
            echo "Failed"
          else
            echo "Passed"
         fi
```

forEach loop with input list example 2

```
- name: "RunMSIWithDifferentArgs"
  action: "ExecuteBinary"
  loop:
    name: MultiArgLoop
    forEach:
      - "ARG1=C:\Users ARG2=1"
      - "ARG1=C:\Users"
      - "ARG1=C:\Users ARG3=C:\Users\Administrator\Documents\f1.txt"
  inputs:
    commands:
      path: "c:\users\administrator\downloads\runner.exe"
      args:
        - "{{ MultiArgLoop.value }}"
```

forEach loop with input list example 3

```
- name: "DownloadAllBinaries"
  action: "S3Download"
  loop:
    name: MultiArgLoop
    forEach:
      - "bin1.exe"
      - "bin10.exe"
      - "bin5.exe"
  inputs:
    - source: "s3://bucket/{{ loop.value }}"
      destination: "c:\temp\{{ loop.value }}"
```

forEach loop with delimited list

The loop iterates over a string containing values separated by a delimiter. To iterate over the string's constituents, AWSTOE uses the delimiter to split the string into an array suitable for iteration.

forEach loop with delimited list schema

```
- name: "StepName"
  action: "ActionModule"
  loop:
    name: "string"
    forEach:
      list: "string"
      delimiter: ".,;:\n\t -_"
  inputs:
...
```

`forEach` loop with delimited list input

Field	Description	Type	Required	Default
`name`	Unique name given to the loop. It should be unique when compared t o other loop names in the same phase.	String	No	""
`list`	A string that is composed of constituent strings joined by a common delimiter character. Also accepts chained expressions. In case of chained expressions, ensure that those are enclosed by double quotes for correct	String	Yes	n/a

Field	Description	Type	Required	Default
	interpretation by the YAML compiler.			

Field	Description	Type	Required	Default
`delimiter`	Character used to separate out strings within a block. Default is the comma character. Only one delimiter character is allowed from the given list: • Dot: `"."` • Comma: `","` • Semicolon: `";"` • Colon: `":"` • New line: `"\n"` • Tab: `"\t"` • Space: `" "` • Hyphen: `"-"` • Underscore: `"_"`	String	No	Comma: `","`

Field	Description	Type	Required	Default
	Chaining expressions cannot be used.			

Note

The value of `list` is treated as an immutable string. If the source of `list` is changed during runtime, it will not be reflected during the run.

`forEach` loop with delimited list example 1

This example uses the following chaining expression pattern to refer to another step's output: `<phase_name>.<step_name>.[inputs | outputs].<var_name>`.

```
- name: "RunMSIs"
  action: "ExecuteBinary"
  loop:
    forEach:
      list: "{{ build.GetAllMSIPathsForInstallation.outputs.stdout }}"
      delimiter: "\n"
  inputs:
    commands:
      path: "{{ loop.value }}"
```

`forEach` loop with delimited list example 2

```
- name: "UploadMetricFiles"
  action: "S3Upload"
  loop:
    forEach:
      list: "/tmp/m1.txt,/tmp/m2.txt,/tmp/m3.txt,..."
  inputs:
    commands:
      - source: "{{ loop.value }}"
        destination: "s3://bucket/key/{{ loop.value }}"
```

Step fields

Loops are part of a step. Any field related to the running of a step is not applied to individual iterations. Step fields apply only at the step level, as follows:

- *timeoutSeconds* – All iterations of the loop must be run within the time period specified by this field. If the loop run times out, then AWSTOE runs the retry policy of the step and resets the timeout parameter for each new attempt. If the loop run exceeds the timeout value after reaching the maximum number of retries, the failure message of the step states that the loop run had timed out.
- *onFailure* – Failure handling is applied to the step as follows:
  - If *onFailure* is set to `Abort`, AWSTOE exits the loop and retries the step according to the retry policy. After the maximum number of retry attempts, AWSTOE marks the current step as failed, and stops running the process.

    AWSTOE sets the status code for the parent phase and document to `Failed`.

    > **Note**
    >
    > No further steps run after the failed step.

  - If *onFailure* is set to `Continue`, AWSTOE exits the loop and retries the step according to the retry policy. After the maximum number of retry attempts, AWSTOE marks the current step as failed, and continues on to run the next step.

    AWSTOE sets the status code for the parent phase and document to `Failed`.

  - If *onFailure* is set to `Ignore`, AWSTOE exits the loop and retries the step according to the retry policy. After the maximum number of retry attempts, AWSTOE marks the current step as `IgnoredFailure`, and continues on to run the next step.

    AWSTOE sets the status code for the parent phase and document to `SuccessWithIgnoredFailure`.

    > **Note**
    >
    > This is still considered a successful run, but includes information to let you know that one or more steps failed and were ignored.

- *maxAttempts* – For every retry, the entire step and all iterations are run from the beginning.

- *status* – The overall status of the running of a step.`status` does not represent the status of individual iterations. The status of a step with loops is determined as follows:
  - If a single iteration fails to run, the status of a step points to a failure.
  - If all iterations succeed, the status of a step points to a success.
- *startTime* – The overall start time of the running of a step. Does not represent the start time of individual iterations.
- *endTime* – The overall end time of the running of a step. Does not represent the end time of individual iterations.
- *failureMessage* – Includes the iteration indices that failed in case of non-timeout errors. In case of timeout errors, the message states that the loop run has failed. Individual error messages for each iteration are not provided to minimize the size of failure messages.

Step and iteration outputs

Every iteration contains an output. At the end of a loop run, AWSTOE consolidates all successful iteration outputs in `detailedOutput.json`. The consolidated outputs are a collation of values that belong to the corresponding output keys as defined in the output schema of the action module. The following example shows how the outputs are consolidated:

Output of `ExecuteBash` for Iteration 1

```
{
 "stdout":"Hello"
}
```

Output of `ExecuteBash` for Iteration 2

```
{
 "stdout":"World"
}
```

Output of `ExecuteBash` for Step

```
{
 "stdout":"Hello\nWorld"
}
```

For example, `ExecuteBash`, `ExecutePowerShell`, and `ExecuteBinary` are action modules which return STDOUT as the action module output. STDOUT messages are joined with the new line character to produce the overall output of the step in `detailedOutput.json`.

AWSTOE will not consolidate the outputs of unsuccessful iterations.

Action modules supported by AWSTOE component manager

Image building services, such as EC2 Image Builder, use AWSTOE action modules to help configure the EC2 instances that are used for building and testing customized machine images. This section describes the features of commonly used AWSTOE action modules, and how to configure them, including examples.

Components are authored with plaintext YAML documents. For more information about document syntax, see Use the AWSTOE component document framework for custom components.

> **Note**
>
> All action modules use the same account as the Systems Manager agent when they run, which is `root` on Linux, and `NT Authority\SYSTEM` on Windows.

The following cross-reference categorizes action modules by the type of actions that they perform.

General execution

- Assert (Linux, Windows, macOS)
- ExecuteBash (Linux, macOS)
- ExecuteBinary (Linux, Windows, macOS)
- ExecuteDocument (Linux, Windows, macOS)
- ExecutePowerShell (Windows)

File download and upload

- S3Download (Linux, Windows, macOS)

- S3Upload (Linux, Windows, macOS)
- WebDownload (Linux, Windows, macOS)

File system operations

- AppendFile (Linux, Windows, macOS)
- CopyFile (Linux, Windows, macOS)
- CopyFolder (Linux, Windows, macOS)
- CreateFile (Linux, Windows, macOS)
- CreateFolder (Linux, Windows, macOS)
- CreateSymlink (Linux, Windows, macOS)
- DeleteFile (Linux, Windows, macOS)
- DeleteFolder (Linux, Windows, macOS)
- ListFiles (Linux, Windows, macOS)
- MoveFile (Linux, Windows, macOS)
- MoveFolder (Linux, Windows, macOS)
- ReadFile (Linux, Windows, macOS)
- SetFileEncoding (Linux, Windows, macOS)
- SetFileOwner (Linux, Windows, macOS)
- SetFolderOwner (Linux, Windows, macOS)
- SetFilePermissions (Linux, Windows, macOS)
- SetFolderPermissions (Linux, Windows, macOS)

Software installation actions

- InstallMSI (Windows)
- UninstallMSI (Windows)

System actions

- Reboot (Linux, Windows)
- SetRegistry (Windows)
- UpdateOS (Linux, Windows)

General execution modules

The following section contains details for action modules that run commands and control execution workflow.

General execution action modules

- Assert (Linux, Windows, macOS)
- ExecuteBash (Linux, macOS)
- ExecuteBinary (Linux, Windows, macOS)
- ExecuteDocument (Linux, Windows, macOS)
- ExecutePowerShell (Windows)

Assert (Linux, Windows, macOS)

The **Assert** action module performs value comparisons using Comparison operators or Logical operators as input. The result of the operator expression (true or false) indicates the overall success or failure status for the step.

If the comparison or logical operator expression evaluates to `true`, the step is marked as `Success`. Otherwise, the step is marked as `Failed`. If the step fails, the `onFailure` parameter decides the outcome of the step.

Input

Key name	Description	Type	Required
`input`	Contains a single comparison or logical operator. Note, logical operators can contain more	This is variable, depending on the operator	Yes

Key name	Description	Type	Required
	than one comparison operator.		

Input example: A simple comparison using the `stringEquals` comparison operator

This example evaluates to `true`.

```
- name: StringComparison
  action: Assert
  inputs:
    stringEquals: '2.1.1'
    value: '{{ validate.ApplicationVersion.outputs.stdout }}'
```

Input example: Regex comparisons using the `patternMatches` comparison operator

These examples all evaluate to `true`.

```
- name: Letters only
  action: Assert
  inputs:
    patternMatches: '^[a-zA-Z]+$'
    value: 'ThisIsOnlyLetters'

- name: Letters and spaces only
  action: Assert
  inputs:
    patternMatches: '^[a-zA-Z\s]+$'
    value: 'This text contains spaces'

- name: Numbers only
  action: Assert
  inputs:
    patternMatches: '^[0-9]+$'
    value: '1234567890'
```

Input example: Nested comparisons with logical operators and chained variables

The following example demonstrates nested comparisons with logical operators that use comparisons with chained variables. The `Assert` evaluates to `true` if either of the following are true:

- The `ApplicationVersion` is greater than `2.0` and the `CPUArchitecture` equals `arm64`.
- The `CPUArchitecture` equals `x86_64`.

```
- name: NestedComparisons
  action: Assert
  inputs:
    or: # <- first level deep
      - and: # <- second level deep
          - numberGreaterThan: 2.0 # <- third level deep
            value: '{{ validate.ApplicationVersion.outputs.stdout }}'
          - stringEquals: 'arm64'
            value: '{{ validate.CPUArchitecture.outputs.stdout }}'
      - stringEquals: 'x86_64'
        value: '{{ validate.CPUArchitecture.outputs.stdout }}'
```

Output:

The output of an `Assert` is success or failure of the step.

ExecuteBash (Linux, macOS)

The **ExecuteBash** action module allows you to run bash scripts with inline shell code/commands. This module supports Linux.

All of the commands and instructions that you specify in the commands block are converted into a file (for example, `input.sh`) and run with the bash shell. The result of running the shell file is the exit code of the step.

The **ExecuteBash** module handles system restarts if the script exits with an exit code of 194. When initiated, the application performs one of the following actions:

- The application hands the exit code to the caller if it is run by the Systems Manager Agent. The Systems Manager Agent handles the system reboot and runs the same step that initiated the restart, as described in Rebooting Managed Instance from Scripts.
- The application saves the current `executionstate`, configures a restart trigger to rerun the application, and restarts the system.

After system restart, the application runs the same step that initiated the restart. If you require this functionality, you must write idempotent scripts that can handle multiple invocations of the same shell command.

Input

Key name	Description	Type	Required
commands	Contains a list of instructions or commands to run as per bash syntax. Multi-line YAML is allowed.	List	Yes

Input example: Before and after a reboot

```
name: ExitCode194Example
description: This shows how the exit code can be used to restart a system with
 ExecuteBash
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: RestartTrigger
        action: ExecuteBash
        inputs:
          commands:
            - |
              REBOOT_INDICATOR=/var/tmp/reboot-indicator
              if [ -f "${REBOOT_INDICATOR}" ]; then
                echo 'The reboot file exists. Deleting it and exiting with success.'
                rm "${REBOOT_INDICATOR}"
                exit 0
              fi
              echo 'The reboot file does not exist. Creating it and triggering a
 restart.'
              touch "${REBOOT_INDICATOR}"
              exit 194
```

Output

Field	Description	Type
`stdout`	Standard output of command execution.	string

If you start a reboot and return exit code 194 as part of the action module, the build will resume at the same action module step that initiated the reboot. If you start a reboot without the exit code, the build process may fail.

Output example: Before reboot (first time through document)

```
{
 “stdout”: “The reboot file does not exist. Creating it and triggering a restart."
}
```

Output example: After reboot, (second time through document)

```
{
 “stdout”: “The reboot file exists. Deleting it and exiting with success."
}
```

ExecuteBinary (Linux, Windows, macOS)

The **ExecuteBinary** action module allows you to run binary files with a list of command-line arguments.

The **ExecuteBinary** module handles system restarts if the binary file exits with an exit code of 194 (Linux) or `3010` (Windows). When this happens, the application performs one of the following actions:

- The application hands the exit code to the caller if it is run by the Systems Manager Agent. The Systems Manager Agent handles restarting the system and runs the same step that initiated the restart, as described in Rebooting Managed Instance from Scripts.
- The application saves the current `executionstate`, configures a restart trigger to rerun the application, and restarts the system.

After the system restarts, the application runs the same step that initiated the restart. If you require this functionality, you must write idempotent scripts that can handle multiple invocations of the same shell command.

Input

Key name	Description	Type	Required
`path`	The path to the binary file for execution.	String	Yes
`arguments`	Contains a list of command-line arguments to use when running the binary.	String List	No

Input example: install .NET

```
- name: "InstallDotnet"
  action: ExecuteBinary
  inputs:
    path: C:\PathTo\dotnet_installer.exe
    arguments:
      - /qb
      - /norestart
```

Output

Field	Description	Type
`stdout`	Standard output of command execution.	string

Output example

```
{
 "stdout": "success"
```

```
}
```

ExecuteDocument (Linux, Windows, macOS)

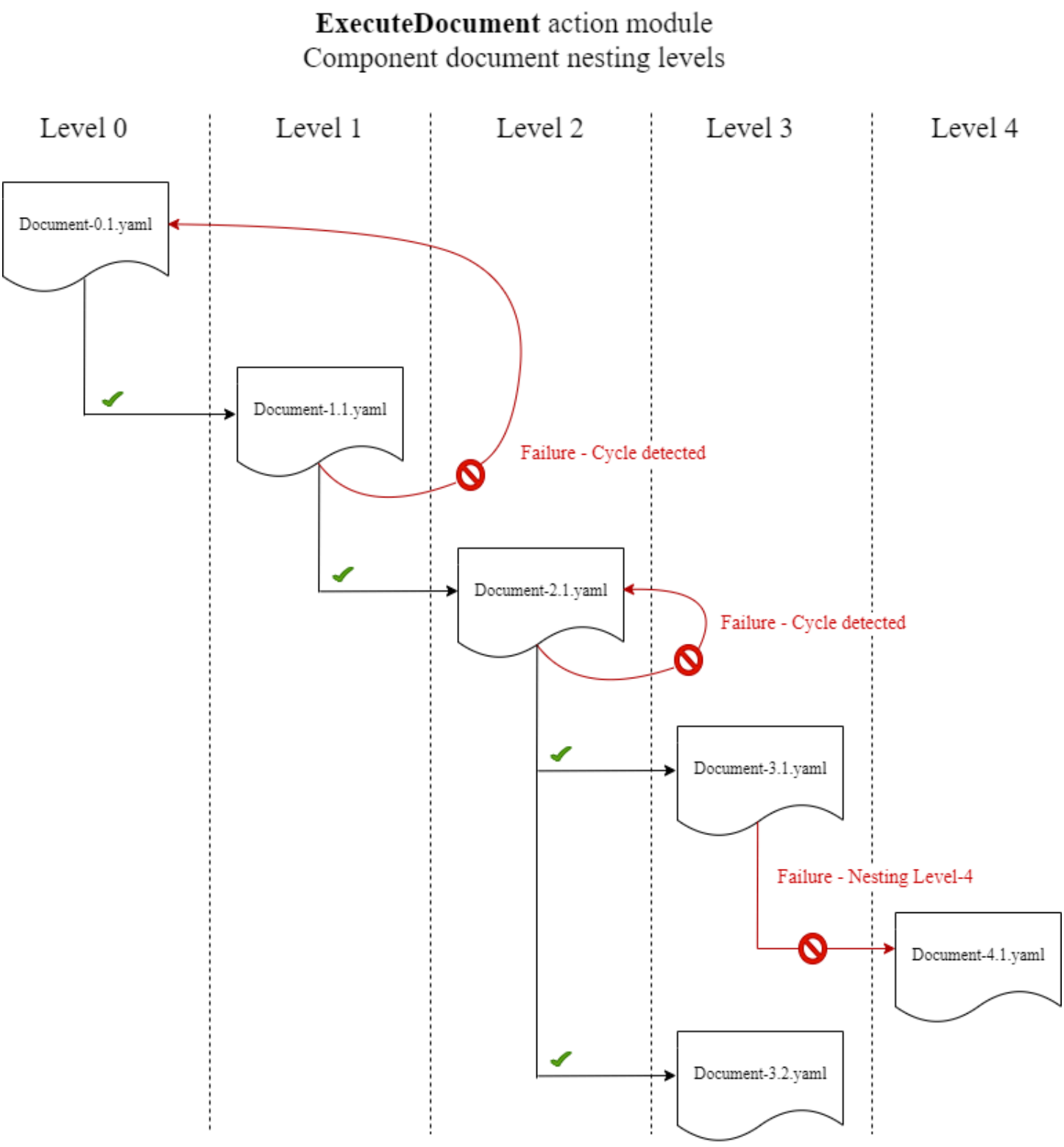
The **ExecuteDocument** action module adds support for nested component documents, running multiple component documents from one document. AWSTOE validates the document that is passed in the input parameter at run time.

Restrictions

- This action module runs one time, with no retries allowed, and no option to set timeout limits. **ExecuteDocument** sets the following default values, and returns an error if you try to change them.
  - `timeoutSeconds`: -1
  - `maxAttempts`: 1

  > **Note**
  >
  > You can leave these values blank, and AWSTOE uses the default values.

- Document nesting is allowed, up to three levels deep, but no more than that. Three levels of nesting translates to four document levels, as the top level isn't nested. In this scenario, the lowest level document must not call any other documents.
- Cyclic execution of component documents is not allowed. Any document that calls itself outside of a looping construct, or that calls another document higher up in the current chain of execution, initiates a cycle that can result in an endless loop. When AWSTOE detects a cyclic execution, it stops the execution and records the failure.



If a component document tries to run itself, or to run any of the component documents that are higher up in the current chain of execution, the execution fails.

Input

Key name	Description	Type	Required
`document`	Path of component document. Valid options include: • Local file paths • S3 URIs • EC2 Image Builder component build version ARNs	String	Yes
`document-s3-bucket-owner`	The account ID of the S3 bucket owner for the S3 bucket where component documents are stored. *(Recommended if you are using S3 URIs in your component document.)*	String	No
`phases`	Phases to run in the component document, expressed as a comma-separated list. If no phases are specified, then all phases run.	String	No
`parameters`		Parameter Map List	No

Key name	Description	Type	Required
	Input parameters that are passed in to the component document at runtime as key value pairs.		

Parameter map input

Key name	Description	Type	Required
`name`	The name of the input parameter to pass to the component document that the **ExecuteDocument** action module is running.	String	Yes
`value`	The value of the input parameter.	String	Yes

Input examples

The following examples show variations of the inputs for your component document, depending on your installation path.

Input example: Local document path

```
# main.yaml
schemaVersion: 1.0

phases:
  - name: build
    steps:
```

```
      - name: ExecuteNestedDocument
        action: ExecuteDocument
        inputs:
          document: Sample-1.yaml
          phases: build
          parameters:
            - name: parameter-1
              value: value-1
            - name: parameter-2
              value: value-2
```

Input example: S3 URI as a document path

```
# main.yaml
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: ExecuteNestedDocument
        action: ExecuteDocument
        inputs:
          document: s3://my-bucket/Sample-1.yaml
          document-s3-bucket-owner: 123456789012
          phases: build,validate
          parameters:
            - name: parameter-1
              value: value-1
            - name: parameter-2
              value: value-2
```

Input example: EC2 Image Builder component ARN as a document path

```
# main.yaml
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: ExecuteNestedDocument
        action: ExecuteDocument
        inputs:
          document: arn:aws:imagebuilder:us-west-2:aws:component/Sample-Test/1.0.0
```

```
          phases: test
          parameters:
            - name: parameter-1
              value: value-1
            - name: parameter-2
              value: value-2
```

Using a ForEach loop to run documents

```
# main.yaml
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: ExecuteNestedDocument
        action: ExecuteDocument
        loop:
          name: 'myForEachLoop'
          forEach:
            - Sample-1.yaml
            - Sample-2.yaml
        inputs:
          document: "{{myForEachLoop.value}}"
          phases: test
          parameters:
            - name: parameter-1
              value: value-1
            - name: parameter-2
              value: value-2
```

Using a For loop to run documents

```
# main.yaml
schemaVersion: 1.0

phases:
  - name: build
    steps:
      - name: ExecuteNestedDocument
        action: ExecuteDocument
        loop:
          name: 'myForLoop'
```

```
          for:
            start: 1
            end: 2
            updateBy: 1
        inputs:
          document: "Sample-{{myForLoop.value}}.yaml"
          phases: test
          parameters:
            - name: parameter-1
              value: value-1
            - name: parameter-2
              value: value-2
```

Output

AWSTOE creates an output file called `detailedoutput.json` every time it runs. The file contains details about every phase and step of every component document that is invoked while it's running. For the **ExecuteDocument** action module, you can find a brief runtime summary in the `outputs` field, and details about the phases, steps, and documents that it runs in the `detailedOutput`.

```
{
 \"executedStepCount\":1,\"executionId\":\"97054e22-06cc-11ec-9b14-acde48001122\",
\"failedStepCount\":0,\"failureMessage\":\"\",\"ignoredFailedStepCount\":0,\"logUrl\":
\"\",\"status\":\"success\"
}",
```

Each component document's output summary object contains the following details, as shown here, with sample values:

- executedStepCount":1
- "executionId":"12345a67-89bc-01de-2f34-abcd56789012"
- "failedStepCount":0
- "failureMessage":""
- "ignoredFailedStepCount":0
- "logUrl":""
- "status":"success"

Output example

The following example shows output from the **ExecuteDocument** action module when a nested execution occurs. In this example, the `main.yaml` component document successfully runs the `Sample-1.yaml` component document.


```
{
    "executionId": "12345a67-89bc-01de-2f34-abcd56789012",
    "status": "success",
    "startTime": "2021-08-26T17:20:31-07:00",
    "endTime": "2021-08-26T17:20:31-07:00",
    "failureMessage": "",
    "documents": [
        {
            "name": "",
            "filePath": "main.yaml",
            "status": "success",
            "description": "",
            "startTime": "2021-08-26T17:20:31-07:00",
            "endTime": "2021-08-26T17:20:31-07:00",
            "failureMessage": "",
            "phases": [
                {
                    "name": "build",
                    "status": "success",
                    "startTime": "2021-08-26T17:20:31-07:00",
                    "endTime": "2021-08-26T17:20:31-07:00",
                    "failureMessage": "",
                    "steps": [
                        {
                            "name": "ExecuteNestedDocument",
                            "status": "success",
                            "failureMessage": "",
                            "timeoutSeconds": -1,
                            "onFailure": "Abort",
                            "maxAttempts": 1,
                            "action": "ExecuteDocument",
                            "startTime": "2021-08-26T17:20:31-07:00",
                            "endTime": "2021-08-26T17:20:31-07:00",
                            "inputs": "[{\"document\":\"Sample-1.yaml\",\"document-s3-
bucket-owner\":\"\",\"phases\":\"\",\"parameters\":null}]",
                            "outputs": "[{\"executedStepCount\":1,\"executionId\":
\"98765f43-21ed-09cb-8a76-fedc54321098\",\"failedStepCount\":0,\"failureMessage\":\"\",
\"ignoredFailedStepCount\":0,\"logUrl\":\"\",\"status\":\"success\"}]",
                            "loop": null,
```

```
                            "detailedOutput": [
                                {
                                    "executionId": "98765f43-21ed-09cb-8a76-
fedc54321098",
                                    "status": "success",
                                    "startTime": "2021-08-26T17:20:31-07:00",
                                    "endTime": "2021-08-26T17:20:31-07:00",
                                    "failureMessage": "",
                                    "documents": [
                                        {
                                            "name": "",
                                            "filePath": "Sample-1.yaml",
                                            "status": "success",
                                            "description": "",
                                            "startTime": "2021-08-26T17:20:31-07:00",
                                            "endTime": "2021-08-26T17:20:31-07:00",
                                            "failureMessage": "",
                                            "phases": [
                                                {
                                                    "name": "build",
                                                    "status": "success",
                                                    "startTime":
 "2021-08-26T17:20:31-07:00",
                                                    "endTime":
 "2021-08-26T17:20:31-07:00",
                                                    "failureMessage": "",
                                                    "steps": [
                                                        {
                                                            "name": "ExecuteBashStep",
                                                            "status": "success",
                                                            "failureMessage": "",
                                                            "timeoutSeconds": 7200,
                                                            "onFailure": "Abort",
                                                            "maxAttempts": 1,
                                                            "action": "ExecuteBash",
                                                            "startTime":
 "2021-08-26T17:20:31-07:00",
                                                            "endTime":
 "2021-08-26T17:20:31-07:00",
                                                            "inputs": "[{\"commands\":
[\"echo \\\"Hello World!\\\"\"]}]",
                                                            "outputs": "[{\"stdout\":
\"Hello World!\"}]",
                                                            "loop": null,
```

```
                                                    "detailedOutput": null
                                                }]
                                            }]
                                        }]
                                    }]
                                }]

                            }]
                        }]
}
```

ExecutePowerShell (Windows)

The **ExecutePowerShell** action module allows you to run PowerShell scripts with inline shell code/commands. This module supports the Windows platform and Windows PowerShell.

All of the commands/instructions specified in the commands block are converted into a script file (for example, `input.ps1`) and run using Windows PowerShell. The result of running the shell file is the exit code.

The **ExecutePowerShell** module handles system restarts if the shell command exits with an exit code of `3010`. When initiated, the application performs one of the following actions:

- Hands the exit code to the caller if run by the Systems Manager Agent. The Systems Manager Agent handles the system reboot and runs the same step that initiated the restart, as described in Rebooting Managed Instance from Scripts.
- Saves the current `executionstate`, configures a restart trigger to rerun the application, and reboots the system.

After system restart, the application runs the same step that initiated the restart. If you require this functionality, you must write idempotent scripts that can handle multiple invocations of the same shell command.

Input

Key name	Description	Type	Required
`commands`	Contains a list of instructions or commands to run	String List	Yes. Must specify `commands` or `file`, not both.

Key name	Description	Type	Required
	as per PowerShell syntax. Multi-line YAML is allowed.		
`file`	Contains the path to a PowerShell script file. PowerShell will run against this file using the `-file` command line argument. The path must point to a `.ps1` file.	String	Yes. Must specify `commands` or `file`, not both.

Input example: Before and after a reboot

```
name: ExitCode3010Example
description: This shows how the exit code can be used to restart a system with
 ExecutePowerShell
schemaVersion: 1.0
phases:
  - name: build
    steps:
      - name: RestartTrigger
        action: ExecutePowerShell
        inputs:
          commands:
            - |
              $rebootIndicator = Join-Path -Path $env:SystemDrive -ChildPath 'reboot-
indicator'
              if (Test-Path -Path $rebootIndicator) {
                Write-Host 'The reboot file exists. Deleting it and exiting with
 success.'
                Remove-Item -Path $rebootIndicator -Force | Out-Null
                [System.Environment]::Exit(0)
              }
              Write-Host 'The reboot file does not exist. Creating it and triggering a
 restart.'
              New-Item -Path $rebootIndicator -ItemType File | Out-Null
```

```
            [System.Environment]::Exit(3010)
```

Output

Field	Description	Type
stdout	Standard output of command execution.	string

If you run a reboot and return exit code 3010 as part of the action module, the build will resume at the same action module step that initiated the reboot. If you run a reboot without the exit code, the build process may fail.

Output example: Before reboot (first time through document)

```
{
 “stdout”: “The reboot file does not exist. Creating it and triggering a restart."
}
```

Output example: After reboot, (second time through document)

```
{
 “stdout”: “The reboot file exists. Deleting it and exiting with success."
}
```

File download and upload modules

The following section contains details for action modules that upload or download files.

Download and upload action modules

- S3Download (Linux, Windows, macOS)
- S3Upload (Linux, Windows, macOS)
- WebDownload (Linux, Windows, macOS)

S3Download (Linux, Windows, macOS)

With the `S3Download` action module, you can download an Amazon S3 object, or a set of objects, to a local file or folder that you specify with the `destination` path. If any file already exists in the specified location, and the `overwrite` flag is set to true, `S3Download` overwrites the file.

Your `source` location can point to a specific object in Amazon S3, or you can use a key prefix with an asterisk wildcard (`*`) to download a set of objects that match the key prefix path. When you specify a key prefix in your `source` location, the `S3Download` action module downloads everything that matches the prefix (files and folders included). Make sure that the key prefix ends with a forward-slash, followed by an asterisk (`/*`), so that you download everything that matches the prefix. For example: *`s3://my-bucket/my-folder/*`*.

If the `S3Download` action for a specified key prefix fails during a download, the folder content is not rolled back to its state prior to the failure. The destination folder remains as it was at the time of the failure.

Supported use cases

The `S3Download` action module supports the following use cases:

- The Amazon S3 object is downloaded to a local folder, as specified in the download path.
- Amazon S3 objects (with a key prefix in the Amazon S3 file path) are downloaded to the specified local folder, which recursively copies all Amazon S3 objects that match the key prefix to the local folder.

IAM requirements

The IAM role that you associate with your instance profile must have permissions to run the `S3Download` action module. The following IAM policies must be attached to the IAM role that is associated with the instance profile:

- **Single file**: `s3:GetObject` against the bucket/object (for example, `arn:aws:s3:::`**`BucketName`**`/*`).
- **Multiple files**: `s3:ListBucket` against the bucket/object (for example, `arn:aws:s3:::`**`BucketName`**) and `s3:GetObject` against the bucket/object (for example, `arn:aws:s3:::`**`BucketName`**`/*`).

Input

Key	Description	Type	Required	Default
`source`	The Amazon S3 bucket that is the source for your download. You can specify a path to a specific object, or use a key prefix, that ends with a forward-slash, followed by an asterisk wildcard (`/*`), to download a set of objects that match the key prefix.	String	Yes	N/A
`destination`	The local path where the Amazon S3 objects are downloaded. To download a single file, you must specify the file name as part of the path. For example,	String	Yes	N/A

Key	Description	Type	Required	Default
	`/myfolder/package.zip` .			
`expectedBucketOwner`	Expected owner account ID of the bucket provided in the `source` path. We recommend that you verify the ownership of the Amazon S3 bucket specified in the source.	String	No	N/A

Key	Description	Type	Required	Default
`overwrite`	When set to true, if a file of the same name already exists in the destination folder for the specified local path, the download file overwrites the local file. When set to false, the existing file on the local system is protected from being overwritten, and the action module fails with a download error. For example, `Error: S3Download: File already exists and "overwrite" property for "destination" file is set to`	Boolean	No	true

Key	Description	Type	Required	Default
	false. Cannot download.			

Note

For the following examples, the Windows folder path can be replaced with a Linux path. For example, *C:\myfolder\package.zip* can be replaced with */myfolder/package.zip*.

Input example: copy an Amazon S3 object to a local file

The following example shows how to copy an Amazon S3 object to a local file.

```
- name: DownloadMyFile
  action: S3Download
  inputs:
    - source: s3://amzn-s3-demo-source-bucket/path/to/package.zip
      destination: C:\myfolder\package.zip
      expectedBucketOwner: 123456789022
      overwrite: false
    - source: s3://amzn-s3-demo-source-bucket/path/to/package.zip
      destination: C:\myfolder\package.zip
      expectedBucketOwner: 123456789022
      overwrite: true
    - source: s3://amzn-s3-demo-source-bucket/path/to/package.zip
      destination: C:\myfolder\package.zip
      expectedBucketOwner: 123456789022
```

Input example: copy all Amazon S3 objects in an Amazon S3 bucket with key prefix to a local folder

The following example shows how to copy all Amazon S3 objects in an Amazon S3 bucket with the key prefix to a local folder. Amazon S3 has no concept of a folder, therefore all objects that match the key prefix are copied. The maximum number of objects that can be downloaded is 1000.

```
- name: MyS3DownloadKeyprefix
```

```
    action: S3Download
    maxAttempts: 3
    inputs:
      - source: s3://amzn-s3-demo-source-bucket/path/to/*
        destination: C:\myfolder\
        expectedBucketOwner: 123456789022
        overwrite: false
      - source: s3://amzn-s3-demo-source-bucket/path/to/*
        destination: C:\myfolder\
        expectedBucketOwner: 123456789022
        overwrite: true
      - source: s3://amzn-s3-demo-source-bucket/path/to/*
        destination: C:\myfolder\
        expectedBucketOwner: 123456789022
```

Output

None.

S3Upload (Linux, Windows, macOS)

With the **S3Upload** action module, you can upload a file from a source file or folder to an Amazon S3 location. You can use a wildcard (*) in the path specified for your source location to upload all of the files whose path matches the wildcard pattern.

If the recursive **S3Upload** action fails, any files that have already been uploaded will remain in the destination Amazon S3 bucket.

Supported use cases

- Local file to Amazon S3 object.
- Local files in folder (with wildcard) to Amazon S3 key prefix.
- Copy local folder (must have `recurse` set to `true`) to Amazon S3 key prefix.

IAM requirements

The IAM role that you associate with your instance profile must have permissions to run the `S3Upload` action module. The following IAM policy must be attached to the IAM role that is associated with the instance profile. The policy must grant `s3:PutObject` permissions to the target Amazon S3 bucket. For example, `arn:aws:s3:::BucketName/*`).

Input

Key	Description	Type	Required	Default
`source`	The local path where source files/folders originate. The `source` supports an asterisk wildcard (*).	String	Yes	N/A
`destination`	The path for the destination Amazon S3 bucket where source files/folders are uploaded.	String	Yes	N/A
`recurse`	When set to `true`, performs **S3Upload** recursively.	String	No	`false`
`expectedBucketOwner`	The expected owner account ID for the Amazon S3 bucket specified in the destination path. We recommend that you verify the	String	No	N/A

Key	Description	Type	Required	Default
	ownership of the Amazon S3 bucket specified in the destination.			

Input example: copy a local file to an Amazon S3 object

The following example shows how to copy a local file to an Amazon S3 object.

```
- name: MyS3UploadFile
  action: S3Upload
  onFailure: Abort
  maxAttempts: 3
  inputs:
    - source: C:\myfolder\package.zip
      destination: s3://amzn-s3-demo-destination-bucket/path/to/package.zip
      expectedBucketOwner: 123456789022
```

Input example: copy all files in a local folder to an Amazon S3 bucket with key prefix

The following example shows how to copy all files in the local folder to an Amazon S3 bucket with key prefix. This example does not copy sub-folders or their contents because `recurse` is not specified, and it defaults to `false`.

```
- name: MyS3UploadMultipleFiles
  action: S3Upload
  onFailure: Abort
  maxAttempts: 3
  inputs:
    - source: C:\myfolder\*
      destination: s3://amzn-s3-demo-destination-bucket/path/to/
      expectedBucketOwner: 123456789022
```

Input example: copy all files and folders recursively from a local folder to an Amazon S3 bucket

The following example shows how to copy all files and folders recursively from a local folder to an Amazon S3 bucket with key prefix.

```
- name: MyS3UploadFolder
  action: S3Upload
  onFailure: Abort
  maxAttempts: 3
  inputs:
    - source: C:\myfolder\*
      destination: s3://amzn-s3-demo-destination-bucket/path/to/
      recurse: true
      expectedBucketOwner: 123456789022
```

Output

None.

WebDownload (Linux, Windows, macOS)

The **WebDownload** action module allows you to download files and resources from a remote location over the HTTP/HTTPS protocol (*HTTPS is recommended*). There are no limits on the number or size of downloads. This module handles retry and exponential backoff logic.

Each download operation is allocated a maximum of 5 attempts to succeed according to user inputs. These attempts differ from those specified in the `maxAttempts` field of document `steps`, which are related to action module failures.

This action module implicitly handles redirects. All HTTP status codes, except for `200`, result in an error.

Input

Key name	Description	Type	Required	Default
`source`	The valid HTTP/HTTPS URL (*HTTPS is recommended*), which follows the RFC 3986 standard. Chaining expressions are permitted.	String	Yes	N/A

Key name	Description	Type	Required	Default
`destination`	An absolute or relative file or folder path on the local system. Folder paths must end with /. If they do not end with /, they will be treated as file paths. The module creates any required file or folder for successful downloads. Chaining expressions are permitted.	String	Yes	N/A

Key name	Description	Type	Required	Default
`overwrite`	When enabled, overwrites any existing files on the local system with the downloaded file or resource. When not enabled, any existing files on the local system are not overwritten, and the action module fails with an error. When overwrite is enabled and checksum and algorithm are specified, then the action module downloads the file only if the checksum and the hash of any pre-existing files do not match.	Boolean	No	`true`

Key name	Description	Type	Required	Default
checksum	When you specify the checksum, it is checked against the hash of the downloaded file that is generated with the supplied algorithm. For file verification to be enabled, both the checksum and the algorithm must be provided. Chaining expressions are permitted.	String	No	N/A

Key name	Description	Type	Required	Default
`algorithm`	The algorithm used to calculate the checksum. The options are MD5, SHA1, SHA256, and SHA512. For file verification to be enabled, both the checksum and the algorithm must be provided. Chaining e xpressions are permitted.	String	No	N/A
`ignoreCertificateErrors`	SSL certificate validation is ignored when enabled.	Boolean	No	`false`

Output

Key name	Description	Type
`destination`	Newline character-delimited string that specifies the destinati	String

Key name	Descripti on	Type				
	on path where the downloade d files or resources are stored.					

Input example: download remote file to local destination

```
  - name: DownloadRemoteFile
    action: WebDownload
    maxAttempts: 3
    inputs:
      - source: https://testdomain/path/to/java14.zip
        destination: C:\testfolder\package.zip
```

Output:

```
{
 "destination": "C:\\testfolder\\package.zip"
}
```

Input example: download more than one remote file to more than one local destination

```
  - name: DownloadRemoteFiles
    action: WebDownload
    maxAttempts: 3
    inputs:
      - source: https://testdomain/path/to/java14.zip
        destination: /tmp/java14_renamed.zip
      - source: https://testdomain/path/to/java14.zip
        destination: /tmp/create_new_folder_and_add_java14_as_zip/
```

Output:

```
{
```

```
 "destination": "/tmp/create_new_folder/java14_renamed.zip\n/tmp/
create_new_folder_and_add_java14_as_zip/java14.zip"
}
```

Input example: download one remote file without overwriting local destination, and download another remote file with file verification

```
  - name: DownloadRemoteMultipleProperties
    action: WebDownload
    maxAttempts: 3
    inputs:
      - source: https://testdomain/path/to/java14.zip
        destination: C:\create_new_folder\java14_renamed.zip
        overwrite: false
      - source: https://testdomain/path/to/java14.zip
        destination: C:\create_new_folder_and_add_java14_as_zip\
        checksum: ac68bbf921d953d1cfab916cb6120864
        algorithm: MD5
        overwrite: true
```

Output:

```
{
 "destination": "C:\\create_new_folder\\java14_renamed.zip\nC:\
\create_new_folder_and_add_java14_as_zip\\java14.zip"
}
```

Input example: download remote file and ignore SSL certification validation

```
  - name: DownloadRemoteIgnoreValidation
    action: WebDownload
    maxAttempts: 3
    inputs:
      - source: https://www.bad-ssl.com/resource
        destination: /tmp/downloads/
        ignoreCertificateErrors: true
```

Output:

```
{
 "destination": "/tmp/downloads/resource"
```

```
}
```

File system operations modules

The following section contains details for action modules that perform file system operations.

File system operation action modules

- AppendFile (Linux, Windows, macOS)
- CopyFile (Linux, Windows, macOS)
- CopyFolder (Linux, Windows, macOS)
- CreateFile (Linux, Windows, macOS)
- CreateFolder (Linux, Windows, macOS)
- CreateSymlink (Linux, Windows, macOS)
- DeleteFile (Linux, Windows, macOS)
- DeleteFolder (Linux, Windows, macOS)
- ListFiles (Linux, Windows, macOS)
- MoveFile (Linux, Windows, macOS)
- MoveFolder (Linux, Windows, macOS)
- ReadFile (Linux, Windows, macOS)
- SetFileEncoding (Linux, Windows, macOS)
- SetFileOwner (Linux, Windows, macOS)
- SetFolderOwner (Linux, Windows, macOS)
- SetFilePermissions (Linux, Windows, macOS)
- SetFolderPermissions (Linux, Windows, macOS)

AppendFile (Linux, Windows, macOS)

The **AppendFile** action module adds specified content to the preexisting content of a file.

If the file encoding value is different from the default encoding (`utf-8`) value, then you can specify the file encoding value by using the `encoding` option. By default, `utf-16` and `utf-32` are assumed to use little-endian encoding.

The action module returns an error when the following occurs:

- The specified file does not exist at runtime.
- You don't have write permissions to modify the file content.
- The module encounters an error during the file operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Yes
`content`	The content to be appended to the file.	String	No	Empty string	N/A	Yes
`encoding`	The encoding standard.	String	No	`utf8`	`utf8`, `utf-8`, `utf16`,`utf-16-LE`, `utf-16-LE` `utf16-BE`, `utf-16-BE` , `utf32`, `utf-32`, `utf32-LE`,`utf-32-LE` , `utf32-BE`, and `utf-32-`	Yes

Key name	Descripti on	Type	Required	Default value	Acceptabl e values	Supported on all platforms
					BE . The value of the encoding option is case insensitive.	

Input example: append file without encoding (Linux)

```
- name: AppendingFileWithOutEncodingLinux
  action: AppendFile
  inputs:
    - path: ./Sample.txt
      content: "The string to be appended to the file"
```

Input example: append file without encoding (Windows)

```
- name: AppendingFileWithOutEncodingWindows
  action: AppendFile
  inputs:
    - path: C:\MyFolder\MyFile.txt
      content: "The string to be appended to the file"
```

Input example: append file with encoding (Linux)

```
- name: AppendingFileWithEncodingLinux
  action: AppendFile
  inputs:
    - path: /FolderName/SampleFile.txt
      content: "The string to be appended to the file"
      encoding: UTF-32
```

Input example: append file with encoding (Windows)

```
- name: AppendingFileWithEncodingWindows
  action: AppendFile
  inputs:
    - path: C:\MyFolderName\SampleFile.txt
      content: "The string to be appended to the file"
      encoding: UTF-32
```

Input example: append file with empty string (Linux)

```
- name: AppendingEmptyStringLinux
  action: AppendFile
  inputs:
    - path: /FolderName/SampleFile.txt
```

Input example: append file with empty string (Windows)

```
- name: AppendingEmptyStringWindows
  action: AppendFile
  inputs:
    - path: C:\MyFolderName\SampleFile.txt
```

Output

None.

CopyFile (Linux, Windows, macOS)

The **CopyFile** action module copies files from the specified source to the specified destination. By default, the module recursively creates the destination folder if it does not exist at runtime.

If a file with the specified name already exists in the specified folder, the action module, by default, overwrites the existing file. You can override this default behavior by setting the overwrite option to `false`. When the overwrite option is set to `false`, and there is already a file in the specified location with the specified name, the action module will return an error. This option works the same as the `cp` command in Linux, which overwrites by default.

The source file name can include a wildcard (*). Wildcard characters are accepted only after the last file path separator (/ or \). If wildcard characters are included in the source file name, all of the files that match the wildcard are copied to the destination folder. If you want to move more than one file by using a wildcard character, the input to the `destination` option must end with a file path separator (/ or \), which indicates that the destination input is a folder.

If the destination file name is different from the source file name, you can specify the destination file name using the `destination` option. If you do not specify a destination file name, the name of the source file is used to create the destination file. Any text that follows the last file path separator (/ or \) is treated as the file name. If you want to use the same file name as the source file, then the input of the `destination` option must end with a file path separator (/ or \).

The action module returns an error when the following occurs:

- You do not have permission to create a file in the specified folder.
- The source files do not exist at runtime.
- There is already a folder with the specified file name and the `overwrite` option is set to `false`.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`source`	The source file path.	String	Yes	N/A	N/A	Yes
`destination`	The destination file path.	String	Yes	N/A	N/A	Yes
`overwrite`	When set to false, the destination files will not be replaced when there is already a file in the specified location	Boolean	No	`true`	N/A	Yes

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
	with the specified name.					

Input example: copy a file (Linux)

```
- name: CopyingAFileLinux
  action: CopyFile
  inputs:
    - source: /Sample/MyFolder/Sample.txt
      destination: /MyFolder/destinationFile.txt
```

Input example: copy a file (Windows)

```
- name: CopyingAFileWindows
  action: CopyFile
  inputs:
    - source: C:\MyFolder\Sample.txt
      destination: C:\MyFolder\destinationFile.txt
```

Input example: copy a file using the source file name (Linux)

```
- name: CopyingFileWithSourceFileNameLinux
  action: CopyFile
  inputs:
    - source: /Sample/MyFolder/Sample.txt
      destination: /MyFolder/
```

Input example: copy a file using the source file name (Windows)

```
- name: CopyingFileWithSourceFileNameWindows
  action: CopyFile
  inputs:
    - source: C:\Sample\MyFolder\Sample.txt
      destination: C:\MyFolder\
```

Input example: copy a file using the wildcard character (Linux)

```
- name: CopyingFilesWithWildCardLinux
  action: CopyFile
  inputs:
    - source: /Sample/MyFolder/Sample*
      destination: /MyFolder/
```

Input example: copy a file using the wildcard character (Windows)

```
- name: CopyingFilesWithWildCardWindows
  action: CopyFile
  inputs:
    - source: C:\Sample\MyFolder\Sample*
      destination: C:\MyFolder\
```

Input example: copy a file without overwriting (Linux)

```
- name: CopyingFilesWithoutOverwriteLinux
  action: CopyFile
  inputs:
    - source: /Sample/MyFolder/Sample.txt
      destination: /MyFolder/destinationFile.txt
      overwrite: false
```

Input example: copy a file without overwriting (Windows)

```
- name: CopyingFilesWithoutOverwriteWindows
  action: CopyFile
  inputs:
    - source: C:\Sample\MyFolder\Sample.txt
      destination: C:\MyFolder\destinationFile.txt
      overwrite: false
```

Output

None.

CopyFolder (Linux, Windows, macOS)

The **CopyFolder** action module copies a folder from the specified source to the specified destination. The input for the `source` option is the folder to copy, and the input for the

`destination` option is the folder where the contents of the source folder are copied. By default, the module recursively creates the destination folder if it does not exist at runtime.

If a folder with the specified name already exists in the specified folder, the action module, by default, overwrites the existing folder. You can override this default behavior by setting the overwrite option to `false`. When the overwrite option is set to `false`, and there is already a folder in the specified location with the specified name, the action module will return an error.

The source folder name can include a wildcard (*). Wildcard characters are accepted only after the last file path separator (/ or \). If wildcard characters are included in the source folder name, all of the folders that match the wildcard are copied to the destination folder. If you want to copy more than one folder by using a wildcard character, the input to the `destination` option must end with a file path separator (/ or \), which indicates that the destination input is a folder.

If the destination folder name is different from the source folder name, you can specify the destination folder name using the `destination` option. If you do not specify a destination folder name, the name of the source folder is used to create the destination folder. Any text that follows the last file path separator (/ or \) is treated as the folder name. If you want to use the same folder name as the source folder, then the input of the `destination` option must end with a file path separator (/ or \).

The action module returns an error when the following occurs:

- You do not have permission to create a folder in the specified folder.
- The source folders do not exist at runtime.
- There is already a folder with the specified folder name and the `overwrite` option is set to `false`.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`source`	The source folder path.	String	Yes	N/A	N/A	Yes

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
destination	The destination folder path.	String	Yes	N/A	N/A	Yes
overwrite	When set to false, the destination folders will not be replaced when there is already a folder in the specified location with the specified name.	Boolean	No	true	N/A	Yes

Input example: copy a folder (Linux)

```
- name: CopyingAFolderLinux
  action: CopyFolder
  inputs:
    - source: /Sample/MyFolder/SampleFolder
      destination: /MyFolder/destinationFolder
```

Input example: copy a folder (Windows)

```
- name: CopyingAFolderWindows
```

```
  action: CopyFolder
  inputs:
    - source: C:\Sample\MyFolder\SampleFolder
      destination: C:\MyFolder\destinationFolder
```

Input example: copy a folder using the source folder name (Linux)

```
- name: CopyingFolderSourceFolderNameLinux
  action: CopyFolder
  inputs:
    - source: /Sample/MyFolder/SourceFolder
      destination: /MyFolder/
```

Input example: copy a folder using the source folder name (Windows)

```
- name: CopyingFolderSourceFolderNameWindows
  action: CopyFolder
  inputs:
    - source: C:\Sample\MyFolder\SampleFolder
      destination: C:\MyFolder\
```

Input example: copy a folder using the wildcard character (Linux)

```
- name: CopyingFoldersWithWildCardLinux
  action: CopyFolder
  inputs:
    - source: /Sample/MyFolder/Sample*
      destination: /MyFolder/
```

Input example: copy a folder using the wildcard character (Windows)

```
- name: CopyingFoldersWithWildCardWindows
  action: CopyFolder
  inputs:
    - source: C:\Sample\MyFolder\Sample*
      destination: C:\MyFolder\
```

Input example: copy a folder without overwriting (Linux)

```
- name: CopyingFoldersWithoutOverwriteLinux
  action: CopyFolder
```

```
    inputs:
      - source: /Sample/MyFolder/SourceFolder
        destination: /MyFolder/destinationFolder
        overwrite: false
```

Input example: copy a folder without overwriting (Windows)

```
- name: CopyingFoldersWithoutOverwrite
  action: CopyFolder
  inputs:
    - source: C:\Sample\MyFolder\SourceFolder
      destination: C:\MyFolder\destinationFolder
      overwrite: false
```

Output

None.

CreateFile (Linux, Windows, macOS)

The **CreateFile** action module creates a file in a specified location. By default, if required, the module also recursively creates the parent folders.

If the file already exists in the specified folder, the action module, by default, truncates or overwrites the existing file. You can override this default behavior by setting the overwrite option to `false`. When the overwrite option is set to `false`, and there is already a file in the specified location with the specified name, the action module will return an error.

If the file encoding value is different from the default encoding (`utf-8`) value, then you can specify the file encoding value by using the `encoding` option. By default, `utf-16` and `utf-32` are assumed to use little-endian encoding.

`owner`, `group`, and `permissions` are optional inputs. The input for `permissions` must be a string value. Files are created with default values when not provided. These options are not supported on Windows platforms. This action module validates and returns an error if the `owner`, `group`, and `permissions` options are used on Windows platforms.

This action module can create a file the with permissions defined by the default `umask` value of the operating system. You must set the `umask` value if you want to override the default value.

The action module returns an error when the following occurs:

- You do not have permission to create a file or a folder in the specified parent folder.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Yes
`content`	The text content of the file.	String	No	N/A	N/A	Yes
`encoding`	The encoding standard.	String	No	`utf8`	`utf8`, `utf-8`, `utf16`,`utf-16-LE`, `utf-16-LE` `utf16-BE`, `utf-16-BE` , `utf32`, `utf-32`, `utf32-LE`,`utf-32-LE` , `utf32-BE`, and `utf-32-BE` . The value of the	Yes

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
					encoding option is case insensitive.	
owner	The user name or ID.	String	No	N/A	N/A	Not supported on Windows.
group	The group name or ID.	String	No	The current user.	N/A	Not supported on Windows.
permissions	The file permissions.	String	No	0666	N/A	Not supported on Windows.

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`overwrite`	If the name of the specified file already exists, setting this value to `false` prevents the file from being truncated or overwritten by default.	Boolean	No	`true`	N/A	Yes

Input example: create a file without overwriting (Linux)

```
- name: CreatingFileWithoutOverwriteLinux
  action: CreateFile
  inputs:
    - path: /home/UserName/Sample.txt
      content: The text content of the sample file.
      overwrite: false
```

Input example: create a file without overwriting (Windows)

```
- name: CreatingFileWithoutOverwriteWindows
  action: CreateFile
  inputs:
    - path: C:\Temp\Sample.txt
      content: The text content of the sample file.
```

```
        overwrite: false
```

Input example: create a file with file properties

```
- name: CreatingFileWithFileProperties
  action: CreateFile
  inputs:
    - path: SampleFolder/Sample.txt
      content: The text content of the sample file.
      encoding: UTF-16
      owner: Ubuntu
      group: UbuntuGroup
      permissions: 0777
   - path: SampleFolder/SampleFile.txt
      permissions: 755
    - path: SampleFolder/TextFile.txt
      encoding: UTF-16
      owner: root
      group: rootUserGroup
```

Input example: create a file without file properties

```
- name: CreatingFileWithoutFileProperties
  action: CreateFile
  inputs:
    - path: ./Sample.txt
    - path: Sample1.txt
```

Input example: create an empty file to skip a section in the Linux clean up script

```
- name: CreateSkipCleanupfile
  action: CreateFile
  inputs:
    - path: <skip section file name>
```

For more information, see Override the Linux clean up script

Output

None.

CreateFolder (Linux, Windows, macOS)

The **CreateFolder** action module creates a folder in a specified location. By default, if required, the module also recursively creates the parent folders.

If the folder already exists in the specified folder, the action module, by default, truncates or overwrites the existing folder. You can override this default behavior by setting the overwrite option to `false`. When the overwrite option is set to `false`, and there is already a folder in the specified location with the specified name, the action module will return an error.

`owner`, `group`, and `permissions` are optional inputs. The input for `permissions` must be a string value. These options are not supported on Windows platforms. This action module validates and returns an error if the `owner`, `group`, and `permissions` options are used on Windows platforms.

This action module can create a folder the with permissions defined by the default `umask` value of the operating system. You must set the `umask` value if you want to override the default value.

The action module returns an error when the following occurs:

- You do not have permission to create a folder in the specified location.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The folder path.	String	Yes	N/A	N/A	Yes
`owner`	The user name or ID.	String	No	The current user.	N/A	Not supported on Windows.
`group`	The group name or ID.	String	No	The group of the	N/A	Not supported

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
				current user.		on Windows.
`permissions`	The folder permissions.	String	No	`0777`	N/A	Not supported on Windows.
`overwrite`	If the name of the specified file already exists, setting this value to `false` prevents the file from being truncated or overwritten by default.	Boolean	No	`true`	N/A	Yes

Input example: create a folder (Linux)

```
- name: CreatingFolderLinux
  action: CreateFolder
  inputs:
    - path: /Sample/MyFolder/
```

Input example: create a folder (Windows)

```
- name: CreatingFolderWindows
  action: CreateFolder
  inputs:
    - path: C:\MyFolder
```

Input example: create a folder specifying folder properties

```
- name: CreatingFolderWithFolderProperties
  action: CreateFolder
  inputs:
    - path: /Sample/MyFolder/Sample/
      owner: SampleOwnerName
      group: SampleGroupName
      permissions: 0777
    - path: /Sample/MyFolder/SampleFoler/
      permissions: 777
```

Input example: create a folder that overwrites the existing folder, if there is one.

```
- name: CreatingFolderWithOverwrite
  action: CreateFolder
  inputs:
    - path: /Sample/MyFolder/Sample/
      overwrite: true
```

Output

None.

CreateSymlink (Linux, Windows, macOS)

The **CreateSymlink** action module creates symbolic links, or files that contain a reference to another file. This module is not supported on Windows platforms.

The input for the `path` and `target` options can be either an absolute or relative path. If the input for the `path` option is a relative path, it is replaced with the absolute path when the link is created.

By default, when a link with the specified name already exists in the specified folder, the action module returns an error. You can override this default behavior by setting the `force` option to `true`. When the `force` option is set to `true`, the module will overwrite the existing link.

If a parent folder does not exist, the action module creates the folder recursively, by default.

The action module returns an error when the following occurs:

- The target file does not exist at runtime.
- A nonsymbolic link file with the specified name already exists.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Not supported on Windows.
`target`	The target file path to which the symbolic link points.	String	Yes	N/A	N/A	Not supported on Windows.
`force`	Forces the creation of a link when a link with the same name already exists.	Boolean	No	`false`	N/A	Not supported on Windows.

Input example: create symbolic link that forces the creation of a link

```
- name: CreatingSymbolicLinkWithForce
  action: CreateSymlink
```

```
    inputs:
      - path: /Folder2/Symboliclink.txt
        target: /Folder/Sample.txt
        force: true
```

Input example: create a symbolic link that does not force the creation of a link

```
- name: CreatingSymbolicLinkWithOutForce
  action: CreateSymlink
  inputs:
    - path: Symboliclink.txt
      target: /Folder/Sample.txt
```

Output

None.

DeleteFile (Linux, Windows, macOS)

The **DeleteFile** action module deletes a file or files in a specified location.

The input of `path` should be a valid file path or a file path with a wild card character (*) in the file name. When wildcard characters are specified in the file name, all of the files within the same folder that match the wildcard will be deleted.

The action module returns an error when the following occurs:

- You do not have permission to perform delete operations.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Yes

Input example: delete a single file (Linux)

```
- name: DeletingSingleFileLinux
  action: DeleteFile
  inputs:
    - path: /SampleFolder/MyFolder/Sample.txt
```

Input example: delete a single file (Windows)

```
- name: DeletingSingleFileWindows
  action: DeleteFile
  inputs:
    - path: C:\SampleFolder\MyFolder\Sample.txt
```

Input example: delete a file that ends with "log" (Linux)

```
- name: DeletingFileEndingWithLogLinux
  action: DeleteFile
  inputs:
    - path: /SampleFolder/MyFolder/*log
```

Input example: delete a file that ends with "log" (Windows)

```
- name: DeletingFileEndingWithLogWindows
  action: DeleteFile
  inputs:
    - path: C:\SampleFolder\MyFolder\*log
```

Input example: delete all files in a specified folder (Linux)

```
- name: DeletingAllFilesInAFolderLinux
  action: DeleteFile
  inputs:
    - path: /SampleFolder/MyFolder/*
```

Input example: delete all files in a specified folder (Windows)

```
- name: DeletingAllFilesInAFolderWindows
  action: DeleteFile
  inputs:
    - path: C:\SampleFolder\MyFolder\*
```

Output

None.

DeleteFolder (Linux, Windows, macOS)

The **DeleteFolder** action module deletes folders.

If the folder is not empty, you must set the `force` option to `true` to remove the folder and its contents. If you do not set the `force` option to `true`, and the folder you are trying to delete is not empty, the action module returns an error. The default value of the `force` option is `false`.

The action module returns an error when the following occurs:

- You do not have permission to perform delete operations.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The folder path.	String	Yes	N/A	N/A	Yes
`force`	Removes the folder whether or not the folder is empty.	Boolean	No	`false`	N/A	Yes

Input example: delete a folder that is not empty using the `force` option (Linux)

```
- name: DeletingFolderWithForceOptionLinux
  action: DeleteFolder
  inputs:
    - path: /Sample/MyFolder/Sample/
```

```
        force: true
```

Input example: delete a folder that is not empty using the `force` option (Windows)

```
- name: DeletingFolderWithForceOptionWindows
  action: DeleteFolder
  inputs:
    - path: C:\Sample\MyFolder\Sample\
      force: true
```

Input example: delete a folder (Linux)

```
- name: DeletingFolderWithOutForceLinux
  action: DeleteFolder
  inputs:
    - path: /Sample/MyFolder/Sample/
```

Input example: delete a folder (Windows)

```
- name: DeletingFolderWithOutForce
  action: DeleteFolder
  inputs:
    - path: C:\Sample\MyFolder\Sample\
```

Output

None.

ListFiles (Linux, Windows, macOS)

The **ListFiles** action module lists the files in a specified folder. When the recursive option is set to `true`, it lists the files in subfolders. This module does not list files in subfolders by default.

To list all of the files with names that match a specified pattern, use the `fileNamePattern` option to provide the pattern. The `fileNamePattern` option accepts the wildcard (*) value. When the `fileNamePattern` is provided, all of the files that match the specified file name format are returned.

The action module returns an error when the following occurs:

- The specified folder does not exist at runtime.

- You do not have permission to create a file or a folder in the specified parent folder.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The folder path.	String	Yes	N/A	N/A	Yes
`fileNamePattern`	The pattern to match to list all files with names that match the pattern.	String	No	N/A	N/A	Yes
`recursive`	Lists files in the folder recursively.	Boolean	No	`false`	N/A	Yes

Input example: list files in specified folder (Linux)

```
- name: ListingFilesInSampleFolderLinux
  action: ListFiles
  inputs:
    - path: /Sample/MyFolder/Sample
```

Input example: list files in specified folder (Windows)

```
- name: ListingFilesInSampleFolderWindows
  action: ListFiles
  inputs:
```

```
      - path: C:\Sample\MyFolder\Sample
```

Input example: list files that end with "log" (Linux)

```
- name: ListingFilesWithEndingWithLogLinux
  action: ListFiles
  inputs:
    - path: /Sample/MyFolder/
      fileNamePattern: '*log'
```

Input example: list files that end with "log" (Windows)

```
- name: ListingFilesWithEndingWithLogWindows
  action: ListFiles
  inputs:
    - path: C:\Sample\MyFolder\
      fileNamePattern: '*log'
```

Input example: list files recursively

```
- name: ListingFilesRecursively
  action: ListFiles
  inputs:
    - path: /Sample/MyFolder/
      recursive: true
```

Output

Key name	Description	Type
`files`	The list of files.	String

Output example

```
{
 "files": "/sample1.txt,/sample2.txt,/sample3.txt"
}
```

MoveFile (Linux, Windows, macOS)

The **MoveFile** action module moves files from the specified source to the specified destination.

If the file already exists in the specified folder, the action module, by default, overwrites the existing file. You can override this default behavior by setting the overwrite option to `false`. When the overwrite option is set to `false`, and there is already a file in the specified location with the specified name, the action module will return an error. This option works the same as the `mv` command in Linux, which overwrites by default.

The source file name can include a wildcard (*). Wildcard characters are accepted only after the last file path separator (/ or \). If wildcard characters are included in the source file name, all of the files that match the wildcard are copied to the destination folder. If you want to move more than one file by using a wildcard character, the input to the `destination` option must end with a file path separator (/ or \), which indicates that the destination input is a folder.

If the destination file name is different from the source file name, you can specify the destination file name using the `destination` option. If you do not specify a destination file name, the name of the source file is used to create the destination file. Any text that follows the last file path separator (/ or \) is treated as the file name. If you want to use the same file name as the source file, then the input of the `destination` option must end with a file path separator (/ or \).

The action module returns an error when the following occurs:

- You do not have permission to create a file in the specified folder.
- The source files do not exist at runtime.
- There is already a folder with the specified file name and the `overwrite` option is set to `false`.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`source`	The source file path.	String	Yes	N/A	N/A	Yes

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`destination`	The destination file path.	String	Yes	N/A	N/A	Yes
`overwrite`	When set to false, the destination files will not be replaced when there is already a file in the specified location with the specified name.	Boolean	No	`true`	N/A	Yes

Input example: move a file (Linux)

```
- name: MovingAFileLinux
  action: MoveFile
  inputs:
    - source: /Sample/MyFolder/Sample.txt
      destination: /MyFolder/destinationFile.txt
```

Input example: move a file (Windows)

```
- name: MovingAFileWindows
  action: MoveFile
  inputs:
    - source: C:\Sample\MyFolder\Sample.txt
```

```
      destination: C:\MyFolder\destinationFile.txt
```

Input example: move a file using the source file name (Linux)

```
- name: MovingFileWithSourceFileNameLinux
  action: MoveFile
  inputs:
    - source: /Sample/MyFolder/Sample.txt
      destination: /MyFolder/
```

Input example: move a file using the source file name (Windows)

```
- name: MovingFileWithSourceFileNameWindows
  action: MoveFile
  inputs:
    - source: C:\Sample\MyFolder\Sample.txt
      destination: C:\MyFolder
```

Input example: move a file using a wildcard character (Linux)

```
- name: MovingFilesWithWildCardLinux
  action: MoveFile
  inputs:
    - source: /Sample/MyFolder/Sample*
      destination: /MyFolder/
```

Input example: move a file using a wildcard character (Windows)

```
- name: MovingFilesWithWildCardWindows
  action: MoveFile
  inputs:
    - source: C:\Sample\MyFolder\Sample*
      destination: C:\MyFolder
```

Input example: move a file without overwriting (Linux)

```
- name: MovingFilesWithoutOverwriteLinux
  action: MoveFile
  inputs:
    - source: /Sample/MyFolder/Sample.txt
```

```
        destination: /MyFolder/destinationFile.txt
        overwrite: false
```

Input example: move a file without overwriting (Windows)

```
- name: MovingFilesWithoutOverwrite
  action: MoveFile
  inputs:
    - source: C:\Sample\MyFolder\Sample.txt
      destination: C:\MyFolder\destinationFile.txt
      overwrite: false
```

Output

None.

MoveFolder (Linux, Windows, macOS)

The **MoveFolder** action module moves folders from the specified source to the specified destination. The input for the `source` option is the folder to move, and the input to the `destination` option is the folder where the contents of the source folders are moved.

If the destination parent folder or the input to the `destination` option does not exist at runtime, the default behavior of the module is to recursively create the folder at the specified destination.

If a folder with the same as the source folder already exists in the destination folder, the action module, by default, overwrites the existing folder. You can override this default behavior by setting the overwrite option to `false`. When the overwrite option is set to `false`, and there is already a folder in the specified location with the specified name, the action module will return an error.

The source folder name can include a wildcard (*). Wildcard characters are accepted only after the last file path separator (/ or \). If wildcard characters are included in the source folder name, all of the folders that match the wildcard are copied to the destination folder. If you want to move more than one folder by using a wildcard character, the input to the `destination` option must end with a file path separator (/ or \), which indicates that the destination input is a folder.

If the destination folder name is different from the source folder name, you can specify the destination folder name using the `destination` option. If you do not specify a destination folder name, the name of the source folder is used to create the destination folder. Any text that follows the last file path separator (/ or \) is treated as the folder name. If you want to use the same folder

name as the source folder, then the input of the `destination` option must end with a file path separator (/ or \).

The action module returns an error when the following occurs:

- You do not have permission to create a folder in the destination folder.
- The source folders do not exist at runtime.
- There is already a folder with the specified name and the `overwrite` option is set to `false`.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`source`	The source folder path.	String	Yes	N/A	N/A	Yes
`destination`	The destination folder path.	String	Yes	N/A	N/A	Yes
`overwrite`	When set to false, the destination folders will not be replaced when there is already a folder in the specified location	Boolean	No	`true`	N/A	Yes

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
	with the specified name.					

Input example: move a folder (Linux)

```
- name: MovingAFolderLinux
  action: MoveFolder
  inputs:
    - source: /Sample/MyFolder/SourceFolder
      destination: /MyFolder/destinationFolder
```

Input example: move a folder (Windows)

```
- name: MovingAFolderWindows
  action: MoveFolder
  inputs:
    - source: C:\Sample\MyFolder\SourceFolder
      destination: C:\MyFolder\destinationFolder
```

Input example: move a folder using the source folder name (Linux)

```
- name: MovingFolderWithSourceFolderNameLinux
  action: MoveFolder
  inputs:
    - source: /Sample/MyFolder/SampleFolder
      destination: /MyFolder/
```

Input example: move a folder using the source folder name (Windows)

```
- name: MovingFolderWithSourceFolderNameWindows
  action: MoveFolder
  inputs:
    - source: C:\Sample\MyFolder\SampleFolder
      destination: C:\MyFolder\
```

Input example: move a folder using a wildcard character (Linux)

```
- name: MovingFoldersWithWildCardLinux
  action: MoveFolder
  inputs:
    - source: /Sample/MyFolder/Sample*
      destination: /MyFolder/
```

Input example: move a folder using a wildcard character (Windows)

```
- name: MovingFoldersWithWildCardWindows
  action: MoveFolder
  inputs:
    - source: C:\Sample\MyFolder\Sample*
      destination: C:\MyFolder\
```

Input example: move a folder without overwriting (Linux)

```
- name: MovingFoldersWithoutOverwriteLinux
  action: MoveFolder
  inputs:
    - source: /Sample/MyFolder/SampleFolder
  destination: /MyFolder/destinationFolder
  overwrite: false
```

Input example: move a folder without overwriting (Windows)

```
- name: MovingFoldersWithoutOverwriteWindows
  action: MoveFolder
  inputs:
    - source: C:\Sample\MyFolder\SampleFolder
      destination: C:\MyFolder\destinationFolder
      overwrite: false
```

Output

None.

ReadFile (Linux, Windows, macOS)

The **ReadFile** action module reads the content of a text file of type string. This module can be used to read the content of a file for use in subsequent steps through chaining or for reading data to the

`console.log` file. If the specified path is a symbolic link, this module returns the content of the target file. This module only supports text files.

If the file encoding value is different from the default encoding (`utf-8`) value, then you can specify the file encoding value by using the `encoding` option. By default, `utf-16` and `utf-32` are assumed to use little-endian encoding.

By default, this module cannot print the file content to the `console.log` file. You can override this setting by setting the `printFileContent` property to `true`.

This module can return only the content of a file. It cannot parse files, such as Excel or JSON files.

The action module returns an error when the following occurs:

- The file does not exist at runtime.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Yes
`encoding`	The encoding standard.	String	No	`utf8`	`utf8`, `utf-8`, `utf16`,`utf-` `utf16-LE`, `utf-16-LE` `utf16-BE`, `utf-16-BE` , `utf32`, `utf-32`, `utf32-`	Yes

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
					LE,utf-32-LE , utf32-BE, and utf-32-BE . The value of the encoding option is case insensitive.	
printFileContent	Prints the file content to the console.log file.	Boolean	No	false	N/A	Yes.

Input example: read a file (Linux)

```
- name: ReadingFileLinux
  action: ReadFile
  inputs:
    - path: /home/UserName/SampleFile.txt
```

Input example: read a file (Windows)

```
- name: ReadingFileWindows
  action: ReadFile
  inputs:
    - path: C:\Windows\WindowsUpdate.log
```

Input example: read a file and specify encoding standard

```
- name: ReadingFileWithFileEncoding
  action: ReadFile
  inputs:
    - path: /FolderName/SampleFile.txt
      encoding: UTF-32
```

Input example: read a file and print to the `console.log` file

```
- name: ReadingFileToConsole
  action: ReadFile
  inputs:
    - path: /home/UserName/SampleFile.txt
      printFileContent: true
```

Output

Field	Description	Type
`content`	The file content.	string

Output example

```
{
 "content" : "The file content"
}
```

SetFileEncoding (Linux, Windows, macOS)

The **SetFileEncoding** action module modifies the encoding property of an existing file. This module can convert file encoding from `utf-8` to a specified encoding standard. By default, `utf-16` and `utf-32` are assumed to be little-endian encoding.

The action module returns an error when the following occurs:

- You do not have permission to perform the specified modification.
- The file does not exist at runtime.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Yes
`encoding`	The encoding standard.	String	No	`utf8`	`utf8`, `utf-8`, `utf16`,`utf-16-LE`, `utf-16-LE` `utf16-BE`, `utf-16-BE` , `utf32`, `utf-32`, `utf32-LE`,`utf-32-LE` , `utf32-BE`, and `utf-32-BE` . The value of the encoding option is case insensitive.	Yes

Input example: set file encoding property

```
- name: SettingFileEncodingProperty
  action: SetFileEncoding
  inputs:
    - path: /home/UserName/SampleFile.txt
      encoding: UTF-16
```

Output

None.

SetFileOwner (Linux, Windows, macOS)

The **SetFileOwner** action module modifies the `owner` and`group` owner properties of an existing file. If the specified file is a symbolic link, the module modifies the `owner` property of the source file. This module is not supported on Windows platforms.

This module accepts user and group names as inputs. If the group name is not provided, the module assigns the group owner of the file to the group that the user belongs to.

The action module returns an error when the following occurs:

- You do not have permission to perform the specified modification.
- The specified user or group name does not exist at runtime.
- The file does not exist at runtime.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Not supported on Windows.
`owner`	The user name.	string	Yes	N/A	N/A	Not supported

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
						on Windows.
group	The name of the user group.	String	No	The name of the group that the user belongs to.	N/A	Not supported on Windows.

Input example: set file owner property without specifying the name of the user group

```
- name: SettingFileOwnerPropertyNoGroup
  action: SetFileOwner
  inputs:
    - path: /home/UserName/SampleText.txt
      owner: LinuxUser
```

Input example: set file owner property by specifying the owner and the user group

```
- name: SettingFileOwnerProperty
  action: SetFileOwner
  inputs:
    - path: /home/UserName/SampleText.txt
      owner: LinuxUser
      group: LinuxUserGroup
```

Output

None.

SetFolderOwner (Linux, Windows, macOS)

The **SetFolderOwner** action module recursively modifies the `owner` and`group` owner properties of an existing folder. By default, the module can modify ownership for all of the contents in a folder. You can set the `recursive` option to `false` to override this behavior. This module is not supported on Windows platforms.

This module accepts user and group names as inputs. If the group name is not provided, the module assigns the group owner of the file to the group that the user belongs to.

The action module returns an error when the following occurs:

- You do not have permission to perform the specified modification.
- The specified user or group name does not exist at runtime.
- The folder does not exist at runtime.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The folder path.	String	Yes	N/A	N/A	Not supported on Windows.
`owner`	The user name.	string	Yes	N/A	N/A	Not supported on Windows.
`group`	The name of the user group.	String	No	The name of the group that the user belongs to.	N/A	Not supported on Windows.
`recursive`	Overrides the default behavior of modifying ownership	Boolean	No	`true`	N/A	Not supported on Windows.

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
	for all of the contents of a folder when set to `false`.					

Input example: set folder owner property without specifying the name of the user group

```
- name: SettingFolderPropertyWithOutGroup
  action: SetFolderOwner
  inputs:
    - path: /SampleFolder/
      owner: LinuxUser
```

Input example: set folder owner property without overriding the ownership of all of the contents in a folder

```
- name: SettingFolderPropertyWithOutRecursively
  action: SetFolderOwner
  inputs:
    - path: /SampleFolder/
      owner: LinuxUser
      recursive: false
```

Input example: set file ownership property by specifying the name of the user group

```
- name: SettingFolderPropertyWithGroup
  action: SetFolderOwner
  inputs:
    - path: /SampleFolder/
      owner: LinuxUser
      group: LinuxUserGroup
```

Output

None.

SetFilePermissions (Linux, Windows, macOS)

The **SetFilePermissions** action module modifies the `permissions` of an existing file. This module is not supported on Windows platforms.

The input for `permissions` must be a string value.

This action module can create a file the with permissions defined by the default umask value of the operating system. You must set the `umask` value if you want to override the default value.

The action module returns an error when the following occurs:

- You do not have permission to perform the specified modification.
- The file does not exist at runtime.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The file path.	String	Yes	N/A	N/A	Not supported on Windows.
`permissions`	The file permissions.	String	Yes	N/A	N/A	Not supported on Windows.

Input example: modify file permissions

```
- name: ModifyingFilePermissions
  action: SetFilePermissions
  inputs:
```

```
      - path: /home/UserName/SampleFile.txt
        permissions: 766
```

Output

None.

SetFolderPermissions (Linux, Windows, macOS)

The **SetFolderPermissions** action module recursively modifies the `permissions` of an existing folder and all of its subfiles and subfolders. By default, this module can modify permissions for all of the contents of the specified folder. You can set the `recursive` option to `false` to override this behavior. This module is not supported on Windows platforms.

The input for `permissions` must be a string value.

This action module can modify permissions according to the default umask value of the operating system. You must set the `umask` value if you want to override the default value.

The action module returns an error when the following occurs:

- You do not have permission to perform the specified modification.
- The folder does not exist at runtime.
- The action module encounters an error while performing the operation.

Input

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`path`	The folder path.	String	Yes	N/A	N/A	Not supported on Windows.
`permissions`	The folder permissions.	String	Yes	N/A	N/A	Not supported on Windows.

Key name	Description	Type	Required	Default value	Acceptable values	Supported on all platforms
`recursive`	Overrides the default behavior of modifying permissions for all of the contents of a folder when set to `false`.	Boolean	No	`true`	N/A	Not supported on Windows.

Input example: set folder permissions

```
- name: SettingFolderPermissions
  action: SetFolderPermissions
  inputs:
    - path: SampleFolder/
      permissions: 0777
```

Input example: set folder permissions without modifying permissions for all of the contents of a folder

```
- name: SettingFolderPermissionsNoRecursive
  action: SetFolderPermissions
  inputs:
    - path: /home/UserName/SampleFolder/
      permissions: 777
      recursive: false
```

Output

None.

Software installation actions

The following section describes action modules that install or uninstall software.

IAM requirements

If your installation download path is an S3 URI, then the IAM role that you associate with your instance profile must have permission to run the `S3Download` action module. To grant the required permission, attach the `S3:GetObject` IAM policy to the IAM role that is associated with your instance profile, and specify the path for your bucket. For example, *`arn:aws:s3:::BucketName/*`*).

Complex MSI Inputs

If your input strings contain double quote characters ("), you must use one of the following methods to ensure that they are interpreted correctly:

- You can use single quotes (') on the outside of your string, to contain it, and double quotes (") inside of your string, as shown in the following example.

  ```
  properties:
    COMPANYNAME: '"Acme ""Widgets"" and ""Gizmos."""'
  ```

  In this case, if you need to use an apostrophe inside of your string, you must escape it. This means using another single quote (') before the apostrophe.
- You can use double quotes (") on the outside of your string, to contain it. And you can escape any double quotes inside of your string, using the backslash character (\), as shown in the following example.

  ```
  properties:
    COMPANYNAME: "\"Acme \"\"Widgets\"\" and \"\"Gizmos.\"\"\""
  ```

Both of these methods pass the value `COMPANYNAME="Acme ""Widgets"" and ""Gizmos."""` to the **msiexec** command.

Software installation action modules

- InstallMSI (Windows)
- UninstallMSI (Windows)

InstallMSI (Windows)

The `InstallMSI` action module installs a Windows application using an MSI file. You can specify the MSI file using a local path, an S3 object URI, or a web URL. The reboot option configures the reboot behavior of the system.

AWSTOE generates the **msiexec** command based on the input parameters for the action module. Values for the `path` (MSI file location) and `logFile` (log file location) input parameters must be enclosed in quotation marks (").

The following MSI exit codes are considered successful:

- 0 (Success)
- 1614 (ERROR_PRODUCT_UNINSTALLED)
- 1641 (Reboot Initiated)
- 3010 (Reboot Required)

Input

Key name	Description	Type	Required	Default value	Acceptable values
`path`	Specify the MSI file location using one of the following: • The local file path. The path can be absolute or relative •	String	Yes	N/A	N/A

Key name	Description	Type	Required	Default value	Acceptable values
	A valid S3 object URI. • A valid web HTTP/HTTPS URL (HTTPS is recommended) that follows the RFC 3986 standard. Chaining expressions are allowed.				

Key name	Description	Type	Required	Default value	Acceptable values
`reboot`	Configure the system reboot behavior that follows a successful run of the action mo dule. **Settings:** • `Force` – Initiates a system reboot after the **msiexec** command runs successfu lly. • `Allow` – Initiates a system reboot if the **msiexec** command returns an exit code that	String	No	`Allow`	`Allow`, `Force`, `Skip`

Key name	Description	Type	Required	Default value	Acceptable values
	indicates a reboot is required. • `Skip` – Logs an informational message to the `console.log` file indicating that a reboot was skipped. This option prevents a reboot, even if the **msiexec** command returns an exit code that indicates a reboot is required.				

Key name	Description	Type	Required	Default value	Acceptable values
`logOptions`	Specify the options to use for MSI installation logging. Specified flags are passed to the MSI installer, along with the /L command line parameter to enable logging. If no flags are specified, AWSTOE uses the default value. For more information about log options for MSI, see Command Line Options in the Microsoft *Windows Installer*	String	No	`*VX`	`i,w,e,a,r,u,c,m,o,p,v,x,+,!,*`

Key name	Description	Type	Required	Default value	Acceptable values
	product documentation.				
`logFile`	An absolute or relative path to the log file location. If the log file path does not exist, it is created. If the log file path is not provided, AWSTOE does not store the MSI installation log.	String	No	N/A	N/A

Key name	Description	Type	Required	Default value	Acceptable values
`properties`	MSI logging property key-value pairs , for example: `TARGETDIR: "C:\target\location"` Note: Modification of the following properties is not allowed: • `REBOOT="ReallySuppress"` • `REINSTALLMODE="ecmus"` • `REINSTALL="ALL"`	Map[String]String	No	N/A	N/A

Key name	Description	Type	Required	Default value	Acceptable values
`ignoreAuthenticodeSignatureErrors`	Flag to ignore authenticode signature validation errors for the installer specified in path. The **Get-AuthenticodeSignature** command is used to validate installers. **Settings:** • `true` – Validation errors are ignored and the installer runs. • `false` – Validation errors are not ignored. The instal	Boolean	No	`false`	`true`, `false`

Key name	Description	Type	Required	Default value	Acceptable values
	ler runs only when validation is successful. This is the default behavior.				

Key name	Description	Type	Required	Default value	Acceptable values
`allowUnsignedInstaller`	Flag to allow running the unsigned installer specified in the path. The **Get-AuthenticodeSignature** command is used to validate installers. **Settings:** • `true` – Ignores the `NotSigned` status returned by the **Get-AuthenticodeSignature** command and runs the installer. • `false` – Requires	Boolean	No	`false`	`true`, `false`

Key name	Description	Type	Required	Default value	Acceptable values
	the instal ler to be signed. Unsigned installers will not run. This is the default behavior.				

Examples

The following examples show variations of the input section for your component document, depending on your installation path.

Input example: local document path installation

```
- name: local-path-install
  steps:
    - name: LocalPathInstaller
      action: InstallMSI
      inputs:
        path: C:\sample.msi
        logFile: C:\msilogs\local-path-install.log
        logOptions: '*VX'
        reboot: Allow
        properties:
          COMPANYNAME: '"Amazon Web Services"'
        ignoreAuthenticodeSignatureErrors: true
        allowUnsignedInstaller: true
```

Input example: Amazon S3 path installation

```
- name: s3-path-install
  steps:
    - name: S3PathInstaller
      action: InstallMSI
```

```
      inputs:
        path: s3://<bucket-name>/sample.msi
        logFile: s3-path-install.log
        reboot: Force
        ignoreAuthenticodeSignatureErrors: false
        allowUnsignedInstaller: true
```

Input example: web path installation

```
- name: web-path-install
  steps:
    - name: WebPathInstaller
      action: InstallMSI
      inputs:
        path: https://<some-path>/sample.msi
        logFile: web-path-install.log
        reboot: Skip
        ignoreAuthenticodeSignatureErrors: true
        allowUnsignedInstaller: false
```

Output

The following is an example of the output from the `InstallMSI` action module.

```
{
 "logFile": "web-path-install.log",
 "msiExitCode": 0,
 "stdout": ""
}
```

UninstallMSI (Windows)

The `UninstallMSI` action module allows you to remove a Windows application using an MSI file. You can specify the MSI file location using a local file path, an S3 object URI, or a web URL. The reboot option configures the reboot behavior of the system.

AWSTOE generates the **msiexec** command based on the input parameters for the action module. The MSI file location (`path`) and log file location (`logFile`) are explicitly enclosed in double quotes (") while generating the **msiexec** command.

The following MSI exit codes are considered successful:

- 0 (Success)
- 1605 (ERROR_UNKNOWN_PRODUCT)
- 1614 (ERROR_PRODUCT_UNINSTALLED)
- 1641 (Reboot Initiated)
- 3010 (Reboot Required)

Input

Key name	Description	Type	Required	Default value	Acceptable values
`path`	Specify the MSI file location using one of the following: • The local file path. The path can be absolute or relative. • A valid S3 object URI. • A valid web HTTP/HTTPS URL (HTTPS is recommended) that follows the	String	Yes	N/A	N/A

Key name	Description	Type	Required	Default value	Acceptable values
	RFC 3986 standard. Chaining expressions are allowed.				

Key name	Description	Type	Required	Default value	Acceptable values
`reboot`	Configures the system reboot behavior that follows a successful run of the action module. **Settings:** • `Force` – Initiates a system reboot after the **msiexec** command runs successfully. • `Allow` – Initiates a system reboot if the **msiexec** command returns an exit code that	String	No	`Allow`	`Allow`, `Force`, `Skip`

Key name	Description	Type	Required	Default value	Acceptable values
	indicates a reboot is required. • `Skip` – Logs an informational message to the `console.log` file indicating that a reboot was skipped. This option prevents a reboot, even if the **msiexec** command returns an exit code that indicates a reboot is required.				

Key name	Description	Type	Required	Default value	Acceptable values
`logOptions`	Specify the options to use for MSI installation logging. Specified flags are passed to the MSI installer, along with the /L command line parameter to enable logging. If no flags are specified, AWSTOE uses the default value. For more information about log options for MSI, see Command Line Options in the Microsoft *Windows Installer*	String	No	`*VX`	`i,w,e,a,r,u,c,m,o,p,v,x,+,!,*`

Key name	Description	Type	Required	Default value	Acceptable values
	product documentation.				
`logFile`	An absolute or relative path to the log file location. If the log file path does not exist, it is created. If the log file path is not provided, AWSTOE does not store the MSI installation log.	String	No	N/A	N/A

Key name	Description	Type	Required	Default value	Acceptable values
`properties`	MSI logging property key-value pairs , for example: `TARGETDIR: "C:\target\location"` Note: Modification of the following properties is not allowed: • `REBOOT="ReallySuppress"` • `REINSTALLMODE="ecmus"` • `REINSTALL="ALL"`	Map[String]String	No	N/A	N/A

Key name	Description	Type	Required	Default value	Acceptable values
`ignoreAuthenticodeSignatureErrors`	Flag to ignore authenticode signature validation errors for the installer specified in path. The **Get-AuthenticodeSignature** command is used to validate installers. **Settings:** • `true` – Validation errors are ignored and the installer runs. • `false` – Validation errors are not ignored. The instal	Boolean	No	`false`	`true`, `false`

Key name	Description	Type	Required	Default value	Acceptable values
	ler runs only when validation is successful. This is the default behavior.				

Key name	Description	Type	Required	Default value	Acceptable values
`allowUnsignedInstaller`	Flag to allow running the unsigned installer specified in the path. The **Get-AuthenticodeSignature** command is used to validate installers. **Settings:** • `true` – Ignores the `NotSigned` status returned by the **Get-AuthenticodeSignature** command and runs the installer. • `false` – Requires	Boolean	No	`false`	`true`, `false`

Key name	Description	Type	Required	Default value	Acceptable values
	the instal ler to be signed. Unsigned installers will not run. This is the default behavior.				

Examples

The following examples show variations of the input section for your component document, depending on your installation path.

Input example: remove local document path installation

```
- name: local-path-uninstall
  steps:
    - name: LocalPathUninstaller
      action: UninstallMSI
      inputs:
        path: C:\sample.msi
        logFile: C:\msilogs\local-path-uninstall.log
        logOptions: '*VX'
        reboot: Allow
        properties:
          COMPANYNAME: '"Amazon Web Services"'
        ignoreAuthenticodeSignatureErrors: true
        allowUnsignedInstaller: true
```

Input example: remove Amazon S3 path installation

```
- name: s3-path-uninstall
  steps:
    - name: S3PathUninstaller
      action: UninstallMSI
```

```
      inputs:
        path: s3://<bucket-name>/sample.msi
        logFile: s3-path-uninstall.log
        reboot: Force
        ignoreAuthenticodeSignatureErrors: false
        allowUnsignedInstaller: true
```

Input example: remove web path installation

```
- name: web-path-uninstall
  steps:
    - name: WebPathUninstaller
      action: UninstallMSI
      inputs:
        path: https://<some-path>/sample.msi
        logFile: web-path-uninstall.log
        reboot: Skip
        ignoreAuthenticodeSignatureErrors: true
        allowUnsignedInstaller: false
```

Output

The following is an example of the output from the `UninstallMSI` action module.

```
{
 "logFile": "web-path-uninstall.log",
 "msiExitCode": 0,
 "stdout": ""
}
```

System action modules

The following section describes action modules that perform system actions or update system settings.

System action modules

- Reboot (Linux, Windows)
- SetRegistry (Windows)
- UpdateOS (Linux, Windows)

Reboot (Linux, Windows)

The **Reboot** action module reboots the instance. It has a configurable option to delay the start of the reboot. By default, `delaySeconds` is set to `0`, which means that there is no delay. Step timeout is not supported for the Reboot action module, as it does not apply when the instance is rebooted.

If the application is invoked by the Systems Manager Agent, it hands the exit code (`3010` for Windows, 194 for Linux) to the Systems Manager Agent. The Systems Manager Agent handles the system reboot as described in Rebooting Managed Instance from Scripts.

If the application is invoked on the host as a standalone process, it saves the current execution state, configures a post-reboot auto-run trigger to rerun the application after the reboot, and then reboots the system.

Post-reboot auto-run trigger:

- **Windows**. AWSTOE creates a Windows Task Scheduler entry with a trigger that runs automatically at `SystemStartup`
- **Linux**. AWSTOE adds a job in crontab that runs automatically after the system reboots.

```
@reboot /download/path/awstoe run --document s3://bucket/key/doc.yaml
```

This trigger is cleaned up when the application starts.

> **Retries**
>
> By default, the maximum number of retries is set to the Systems Manager `CommandRetryLimit`. If the number of reboots exceeds the retry limit, the automation fails. You can change the limit by editing the Systems Manager agent config file (`Mds.CommandRetryLimit`). See Runtime Configuration in the Systems Manager agent open source.

To use the **Reboot** action module, for steps that contain reboot `exitcode` (for example, `3010`), you must run the application binary as `sudo user`.

Input

Key name	Description	Type	Required	Default
delaySeconds	Delays a specific amount of time before initiating a reboot.	Integer	No	0

Input example: reboot step

```
- name: RebootStep
  action: Reboot
  onFailure: Abort
  maxAttempts: 2
  inputs:
    delaySeconds: 60
```

Output

None.

When the **Reboot** module completes, Image Builder continues to the next step in the build.

SetRegistry (Windows)

The **SetRegistry** action module accepts a list of inputs and allows you to set the value for the specified registry key. If a registry key does not exist, it is created in the defined path. This feature applies only to Windows.

Input

Key name	Description	Type	Required
path	Path of registry key.	String	Yes
name	Name of registry key.	String	Yes
value	Value of registry key.	String/Number/Array	Yes

Key name	Description	Type	Required
type	Value type of registry key.	String	Yes

Supported path prefixes

- HKEY_CLASSES_ROOT / HKCR:
- HKEY_USERS / HKU:
- HKEY_LOCAL_MACHINE / HKLM:
- HKEY_CURRENT_CONFIG / HKCC:
- HKEY_CURRENT_USER / HKCU:

Supported types

- BINARY
- DWORD
- QWORD
- SZ
- EXPAND_SZ
- MULTI_SZ

Input example: set registry key values

```
- name: SetRegistryKeyValues
  action: SetRegistry
  maxAttempts: 3
  inputs:
    - path: HKLM:\SOFTWARE\MySoftWare
      name: MyName
      value: FirstVersionSoftware
      type: SZ
    - path: HKEY_CURRENT_USER\Software\Test
      name: Version
      value: 1.1
```

```
        type: DWORD
```

Output

None.

UpdateOS (Linux, Windows)

The **UpdateOS** action module adds support for installing Windows and Linux updates. It installs all available updates by default. Alternatively, you can configure a list of one or more specific updates for the action module to install. You can also specify updates to exclude from the installation.

If both "include" and "exclude" lists are provided, the resulting list of updates can include only those listed in the "include" list that are not listed in the "exclude" list.

> **Note**
>
> **UpdateOS** doesn't support Amazon Linux 2023 (AL2023). We recommend that you update your base AMI to the new version that comes with every release. For other alternatives, see Control the updates received from major and minor releases in the *Amazon Linux 2023 User Guide*.

- **Windows**. Updates are installed from the update source configured on the target machine.
- **Linux**. The application checks for the supported package manager in the Linux platform and uses either `yum` or `apt-get` package manager. If neither are supported, an error is returned. You should have `sudo` permissions to run the **UpdateOS** action module. If you do not have `sudo` permissions an `error.Input` is returned.

Input

Key name	Description	Type	Required
`include`	For Windows, you can specify the following: • One or more Microsoft	String List	No

Key name	Description	Type	Required
	Knowledge Base (KB) article IDs to include in the list of updates that may be installed. Valid formats are `KB1234567` or `1234567`. • An update name using a wildcard value (*). Valid formats are `Security*` or `*Security*`. For Linux, you can specify one or more packages to be included in the list of updates for installation.		

Key name	Description	Type	Required
`exclude`	For Windows, you can specify the following: • One or more Microsoft Knowledge Base (KB) article IDs to include in the list of updates to be excluded from the installation. Valid formats are `KB1234567` or `1234567`. • An update name using a wildcard (`*`) value. Valid formats are: `Security*` or `*Security*` . For Linux, you can specify one or more packages to be excluded from the list of updates for installation.	String List	No

Input example: add support for installing Linux updates

```
- name: UpdateMyLinux
```

```
    action: UpdateOS
    onFailure: Abort
    maxAttempts: 3
    inputs:
      exclude:
        - ec2-hibinit-agent
```

Input example: add support for installing Windows updates

```
- name: UpdateWindowsOperatingSystem
  action: UpdateOS
  onFailure: Abort
  maxAttempts: 3
  inputs:
    include:
      - KB1234567
      - '*Security*'
```

Expand the set of Windows updates that UpdateOS installs

On Windows, **UpdateOS** searches for and installs every update that applies to the instance. The search includes only updates that are not hidden and not already installed. The search draws from the update services that are registered on the instance with the Windows Update Agent, the Windows component that manages update sources. By default, the only registered service is the Windows Update service. This service provides operating system updates only.

The `include` and `exclude` inputs filter the results of that search. These inputs select updates from, or remove updates from, the set that the search already returned. They cannot add an update that the search did not return. To install a broader set of updates than the default, you broaden what the search covers instead of changing the filters.

To have **UpdateOS** also install updates for other Microsoft products, opt in to the Microsoft Update service on the instance before the **UpdateOS** step runs. These products include drivers, Microsoft Office, and SQL Server. To opt in, add an earlier ExecutePowerShell (Windows) step in the same component that registers the Microsoft Update service with the Windows Update Agent. After you opt in, the **UpdateOS** search returns the additional updates. Your `include` and `exclude` filters then apply to that broader set.

The following component document step uses PowerShell to register the Microsoft Update service:

```
- name: OptInToMicrosoftUpdate
```

```
    action: ExecutePowerShell
    onFailure: Abort
    maxAttempts: 3
    inputs:
      commands:
        - |
          $serviceManager = New-Object -ComObject Microsoft.Update.ServiceManager
          # Register the Microsoft Update service by using its public service ID
          $serviceManager.AddService2('7971f918-a847-4430-9279-4a52d1efe18d', 7, '') |
Out-Null
```

> **Note**
>
> The Microsoft Update service ID `7971f918-a847-4430-9279-4a52d1efe18d` is a well-known public identifier that Microsoft defines. This **ExecutePowerShell** step must appear before the **UpdateOS** step in the component so that you opt in before the update search runs.

Output

None.

Configure input for the AWSTOE run command

To streamline command line input for your AWSTOE **run** command, you can include settings for command parameters and options in a JSON format input configuration file with a `.json` file extension. AWSTOE can read your file from one of the following locations:

- A local file path (*`./config.json`*).
- An S3 bucket (*`s3://<bucket-name>/<key-path>/config.json`*).

When you enter the **run** command, you can specify the input configuration file using the **--config** parameter. For example:

```
awstoe run --config <file-path>/config.json
```

Input configuration file

The input configuration JSON file includes key-value pairs for all of the settings that you can provide directly through **run** command parameters and options. If you specify a setting in both the input configuration file and the **run** command, as a parameter or option, the following rules of precedence apply:

Rules of precedence

1. A setting that is supplied directly to the **run** command in the AWS CLI, via a parameter or option, overrides any value that is defined in the input configuration file for the same setting.
2. A setting in the input configuration file overrides a component default value.
3. If no other settings are passed into the component document, it can apply a default value, if one exists.

There are two exceptions to this rule – documents and parameters. These settings work differently in the input configuration and as command parameters. If you use the input configuration file, you must not specify these parameters directly to the **run** command. Doing so will generate an error.

Component settings

The input configuration file contains the following settings. To streamline your file, you can leave out any optional settings that aren't needed. All settings are optional unless otherwise noted.

- **cwIgnoreFailures** (Boolean) – Ignore logging failures from the CloudWatch Logs.
- **cwLogGroup** (String) – The `LogGroup` name for the CloudWatch Logs.
- **cwLogRegion** (String) – The AWS Region that applies to the CloudWatch Logs.
- **cwLogStream** (String) – The `LogStream` name for the CloudWatch Logs, that directs AWSTOE where to stream the `console.log` file.
- **documentS3BucketOwner** (String) – The account ID of the bucket owner for S3 URI-based documents.
- **documents** (array of objects, required) – An array of JSON objects representing the YAML component documents that the AWSTOE **run** command is running. At least one component document must be specified.

  Each object consists of the following fields:

  - **path** (String, required) – The file location of the YAML component document. This must be one of the following:
    - A local file path (*`./component-doc-example.yaml`*).

- An S3 URI (`s3://bucket/key`).
- An Image Builder component build version ARN (arn:aws:imagebuilder:us-west-2:123456789012:component/my-example-component/2021.12.02/1).

- **parameters** (array of objects) – An array of key-value pair objects, each representing a component-specific parameter that the **run** command passes in when it runs the component document. Parameters are optional for components. The component document may or may not have parameters defined.

  Each object consists of the following fields:

  - **name** (String, required) – The name of the component parameter.
  - **value** (String, required) – The value to pass in to the component document for the named parameter.

  To learn more about component parameters, see the **Parameters** section in the Use variables in your custom component document page.

- **executionId** (String) – This is the unique ID that applies to the execution of the current **run** command. This ID is included in output and log file names, to uniquely identify those files, and link them to the current command execution. If this setting is left out, AWSTOE generates a GUID.
- **logDirectory** (String) – The destination directory where AWSTOE stores all of the log files from this command execution. By default, this directory is located inside of the following parent directory: `TOE_<DATETIME>_<EXECUTIONID>`. If you do not specify the log directory, AWSTOE uses the current working directory (`.`).
- **logS3BucketName** (String) – If component logs are stored in Amazon S3 (recommended), AWSTOE uploads the component application logs to the S3 bucket named in this parameter.
- **logS3BucketOwner** (String) – If component logs are stored in Amazon S3 (recommended), this is the owner account ID for the bucket where AWSTOE writes the log files.
- **logS3KeyPrefix** (String) – If component logs are stored in Amazon S3 (recommended), this is the S3 object key prefix for the log location in the bucket.
- **parameters** (array of objects) – An array of key-value pair objects that represent parameters that apply globally to all of the components that are included in the current **run** command execution.
  - **name** (String, required) – The name of the global parameter.
  - **value** (String, required) – The value to pass in to all of the component documents for the named parameter.

- **phases** (String) – A comma-separated list that specifies which phases to run from the YAML component documents. If a component document includes additional phases, those will not run.
- **stateDirectory** (String) – The file path where state tracking files are stored.
- **trace** (Boolean) – Enables verbose logging to the console.

Examples

The following example shows an input configuration file that runs the `build` and `test` phases for two component documents: `sampledoc.yaml`, and `conversation-intro.yaml`. Each component document has a parameter that applies only to itself, and both use one shared parameter. The `project` parameter applies to both component documents.

```
{
   "documents": [
     {
       "path": "<file path>/awstoe/sampledoc.yaml",
       "parameters": [
         {
           "name": "dayofweek",
           "value": "Monday"
         }
       ]
     },
     {
       "path": "<file path>/awstoe/conversation-intro.yaml",
       "parameters": [
         {
           "name": "greeting",
           "value": "Hello, HAL."
         }
       ]
     }
   ],
   "phases": "build,test",
   "parameters": [
     {
       "name": "project",
       "value": "examples"
     }
   ],
   "cwLogGroup": "<log_group_name>",
```

```
    "cwLogStream": "<log_stream_name>",
    "documentS3BucketOwner": "<owner_aws_account_number>",
    "executionId": "<id_number>",
    "logDirectory": "<local_directory_path>",
    "logS3BucketName": "<bucket_name_for_log_files>",
    "logS3KeyPrefix": "<key_prefix_for_log_files>",
    "logS3BucketOwner": "<owner_aws_account_number>"
}
```

Image Builder output image resources

After you have created image resources for AMI or container images with Image Builder, you can manage them using the Image Builder console, through the Image Builder API, or with **imagebuilder** commands in the AWS CLI.

> **Tip**
>
> When you have multiple resources of the same type, tagging helps you to identify a specific resource based on the tags you've assigned to it. For more information about tagging your resources using Image Builder commands in the AWS CLI, see the Tag resources section of this guide.

This section covers how to list, view, and create images. For information about image workflows and how to manage them, see Manage build, test, and distribution workflows for Image Builder images.

Contents

- List images and build versions
- View image resource details
- Create custom images with Image Builder
- Import and export virtual machine images with Image Builder
- Import verified Windows ISO disk images with Image Builder
- Manage security findings for Image Builder images
- Clean up Image Builder resources

List images and build versions

On the **Images** page in the Image Builder console, you can see lists of all of the Image Builder image resources that you own, that are shared with you, and that you have access to. The list results include some key details about those resources.

You can also see all of the images in your account that have pending workflow actions.

Contents

- List images
- List images waiting for action
- List image build versions

List images

This section describes the different ways that you can list information about your images.

You can use one of the following methods to list Image Builder image resources that you have access to. For the API action, see ListImages in the *EC2 Image Builder API Reference*. For the associated SDK request, refer to the See Also link on the same page.

Contents

- List images in the console
- List images with AWS CLI commands

List images in the console

To open the **Images** list page in the console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Images** from the navigation pane.

The **Images** page in the console is divided into tabs, based on image ownership or workflow actions that are pending. This section covers the first three tabs that show images that you own or have access to.

Console tab: Owned by me

In the **Owned by me** tab, you can use the following filters to streamline the image list results.

- You can search for all or part of the name in the search bar.
- You can filter images based on their operating system platform (Windows, Linux, or macOS).
- You can filter images based on the type of output they produce (AMI or container image).
- You can use **Filter source** to find images that were imported from a virtual machine (VMIE), or from an ISO disk image.

Following the filter controls, the **Owned by me** tab shows a list of Image Builder images that you created, with the following details for the listed resources:

Name / Version

Image Builder image resource names start with the recipe name and version that they're built from. Select the link to see all of the related image build versions.

Type

The type of output image that Image Builder creates for this image resource (an AMI or a container image).

Platform

The operating system platform of the image resource, for example, "Linux", "Windows", or "macOS".

Image source

The origin of the base image that Image Builder used to build this image resource. This is primarily used to filter results for images that were imported from a virtual machine (**VMIE**).

Creation time

The date and time when Image Builder created the current version of the image resource.

ARN

The Amazon Resource Name (ARN) of the current version of the image resource.

Console tab: Shared with me

In the **Shared with me** tab, you can use the following filters to streamline the image list results.

- You can search for all or part of the name in the search bar.
- You can filter images based on their operating system platform (Windows, Linux, or macOS).
- You can filter images based on the type of output they produce (AMI or container image).
- You can use **Filter source** to find images that were imported from a virtual machine (VMIE), or from an ISO disk image.

Following the filter controls, the **Shared with me** tab shows a list of Image Builder images that were shared with you, with the following details for the listed resources:

Image name

The name of the image resource that was shared with you. To use a shared image in a recipe, you select the **Select managed images** option, and change the **Image origin** to **Images shared with me**.

Type

The type of output image that Image Builder creates for this image resource (an AMI or a container image).

Version

The version of the operating system platform for the image resource, usually a numeric field in the following format: <major>.<minor>.<patch>.

Image source

The origin of the base image that Image Builder used to build this image resource, if applicable. This is primarily used to filter results for images that were imported from a virtual machine (**VMIE**).

Platform

The operating system platform of the image resource, for example, "Linux", "Windows", or "macOS".

Creation time

The date and time when Image Builder created the version of the image resource that was shared with you.

Owner

The owner of the shared image resource.

ARN

The Amazon Resource Name (ARN) of the image resource version that was shared with you.

Console tab: Managed by Amazon

In the **Managed by Amazon** tab, you can use the following filters to streamline the image list results.

- You can search for all or part of the name in the search bar.

- You can filter images based on their operating system platform (Windows, Linux, or macOS).
- You can filter images based on the type of output they produce (AMI or container image).
- You can use **Filter source** to find images that were imported from a virtual machine (VMIE), or from an ISO disk image.

Following the filter controls, the **Managed by Amazon** tab shows a list of Amazon managed Image Builder images that you can use as base images for your recipes. Image Builder displays the following details for listed resources:

Image name

The name of the managed image. When you create a recipe, the default for your base image is **Quick start (Amazon managed)**. The images that are listed in this tab populate the **Image name** list associated with the operating system platform you choose for your base image when you create a recipe.

Type

The type of output image that Image Builder creates for this image resource (an AMI or a container image).

Version

The version of the operating system platform for the image resource, usually a numeric field in the following format: <major>.<minor>.<patch>.

Platform

The operating system platform of the image resource, for example, "Linux", "Windows", or "macOS".

Creation time

The date and time when Image Builder created the version of the image resource that was shared with you.

Owner

Amazon owns the managed images.

ARN

The Amazon Resource Name (ARN) of the image resource version that was shared with you.

List images with AWS CLI commands

When you run the **list-images** command in the AWS CLI, you can get a list of images that you own or have access to.

The following command example shows how to use the **list-images** command without filters to list all of the Image Builder image resources that you own.

Example: list all images

```
aws imagebuilder list-images
```

Output:

```
{
 "requestId": "1abcd234-e567-8fa9-0123-4567b890cd12",
 "imageVersionList": [
  {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-name/1.0.0",
    "name": "image-recipe-name",
    "type": "AMI",
    "version": "1.0.0",
    "platform": "Linux",
    "owner": "123456789012",
    "dateCreated": "2022-04-28T01:38:23.286Z"
  },
  {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-win/1.0.1",
    "name": "image-recipe-win",
    "type": "AMI",
    "version": "1.0.1",
    "platform": "Windows",
    "owner": "123456789012",
    "dateCreated": "2022-04-28T01:38:23.286Z"
  },
  {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-
macos/1.1.1",
    "name": "image-recipe-macos",
    "type": "AMI",
    "version": "1.1.1",
    "platform": "macOS",
    "owner": "123456789012",
```

```
    "dateCreated": "2022-04-28T01:38:23.286Z"
  }
 ]
}
```

When you run the **list-images** command, you can apply filters to streamline the results, as the following example shows. For more information about how to filter your results, see the list-images command in the *AWS CLI Command Reference*.

Example: filter for Linux images

```
aws imagebuilder list-images --filters name="platform",values="Linux"
```

Output:

```
{
 "requestId": "1abcd234-e567-8fa9-0123-4567b890cd12",
 "imageVersionList": [
  {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-name/1.0.0",
    "name": "image-recipe-name",
    "type": "AMI",
    "version": "1.0.0",
    "platform": "Linux",
    "owner": "123456789012",
    "dateCreated": "2022-04-28T01:38:23.286Z"
  }
 ]
}
```

List images waiting for action

When you use the `WaitForAction` step action in your image workflow, it pauses the workflow until you send it a signal to resume processing or fail the workflow. You can use this step action if you have an external process that needs to run before you continue. You can then use the `SendWorkflowStepAction` to send a signal to the paused step to `RESUME` or `STOP`. You can also stop or resume your workflow from the console.

The following tabs show how to get a list of all of the image resources in your account with workflow steps that are currently paused to wait for a signal to resume or stop. The tabs cover console steps and the AWS CLI command.

You can also use the API or an SDK to get a list of workflow steps that are waiting for action. For the API action, see ListWaitingWorkflowSteps in the *EC2 Image Builder API Reference*. For the associated SDK request, refer to the See Also link on the same page.

Console

To get to the **Waiting for action** tab in the console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Images** from the navigation pane. This opens the **Images** list page.
3. Select the **Waiting for action** tab from the list page.
4. (optional) To stop or resume a step, select the check box next to the name, and then choose **Stop step** or **Resume step**. You can select more than one check box to perform the same action for all selected steps.

Pending workflow step details

Workflow details for the pending step include the following:

- **Image name** – The name of the image resource that has the pending step. You can select the name link to display the detail page for that image.
- **Pending step name** – The name of the workflow step that's waiting for action.
- **Step execution Id** – Uniquely identifies the runtime instance of the workflow step. You can select the linked ID to display runtime details for the step.
- **Step start** – The timestamp when the runtime instance of the workflow step started.
- **Workflow ARN** – The Amazon Resource Name (ARN) of the workflow with the pending step.
- **Actions** – The step action that's in a wait state.

AWS CLI

When you run the **list-waiting-workflow-steps** command in the AWS CLI, you'll get a list of all of the images in your account that have workflow steps that are waiting for action before completing the image creation process.

The following command example shows how to use the **list-waiting-workflow-steps** command to list all of the images in your account with workflow steps that are waiting for action.

Example: list images in your account with waiting workflow steps

```
aws imagebuilder list-waiting-workflow-steps
```

Output:

The output for this example shows one image in the account with a step that's waiting for action.

```
{
    "steps": [
        {
            "imageBuildVersionArn": "arn:aws:imagebuilder:us-
west-2:111122223333:image/example-image/1.0.0/8",
            "name": "WaitForAction",
            "workflowExecutionId": "wf-a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
            "stepExecutionId": "step-a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
            "workflowBuildVersionArn": "arn:aws:imagebuilder:us-
west-2:111122223333:workflow/test/wait-for-action/1.0.0/1",
            "startTime": "2023-11-21T23:21:23.609Z",
            "action": "WaitForAction"
        }
    ]
}
```

List image build versions

On the **Image build versions** page of the Image Builder console, you can see a list of build versions and additional details for an image resource that you own. You can also use commands or actions with the Image Builder API, SDKs, or AWS CLI to list image build versions.

You can use one of the following methods to list image build versions for image resources that you own. For the API action, see ListImageBuildVersions in the *EC2 Image Builder API Reference*. For the associated SDK request, refer to the See Also link on the same page.

Console

Version details

Details on the **Image build versions** page in the Image Builder console include the following:

- **Version** – The image resource build version. In the Image Builder console, the version links to an image detail page.

- **Type** – The type of output that Image Builder distributed when it created this image resource (an AMI or a container image).
- **Date created** – The date and time when Image Builder created the image build version.
- **Image status** – The current status of the image build version. Status can relate to the image build or disposition. For example, during the build process, you might see a status of `Building` or `Distributing`. For disposition of the image, you might see a status of `Deprecated` or `Deleted`.
- **Reason for failure** – The reason for the image status. The Image Builder console only displays the reason when the build fails (**Image status** equals `Failed`).
- **Failure details** – Structured details about where the build failed, displayed when you choose a `Failed` image status. Details can include the stage that failed, the workflow step, the component step that raised the error, and the destination Regions that failed. The failed workflow step links to its runtime detail. For more information, see Find the cause of a failed image build with failure context.
- **Security findings** – The aggregated image scan findings for the referenced image build version.
- **ARN** – The Amazon Resource Name (ARN) for the referenced version of the image resource.
- **Log stream** – A link to the log stream detail for the referenced image build version.

List versions

To list image build versions in the Image Builder console, perform the following steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Images** from the navigation pane. By default, the image list shows the current version of each of the images that you own.
3. To see a list of all the versions for an image, choose the current version link. The link opens the **Image build versions** page that lists all of the build versions for a specific image.

AWS CLI

When you run the **list-image-build-versions** command in the AWS CLI, you'll get a full list of build versions for the specified image resource. You must own the image to run this command.

The following command example shows how to use the **list-image-build-versions** command to list all of the build versions for the specified image.

Example: list build versions for a specific image

```
aws imagebuilder list-image-build-versions --image-version-arn
 arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-name/1.0.0
```

Output:

The output for this example includes two build versions for the specified image recipe.

```
{
  "requestId": "12f3e45d-67cb-8901-af23-45ed678c9b01",
  "imageSummaryList": [
    {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-
name/1.0.0/2",
    "name": "image-recipe-name",
    "type": "AMI",
    "version": "1.0.0/2",
    "platform": "Linux",
    "osVersion": "Amazon Linux 2",
    "state": {
      "status": "AVAILABLE"
    },
    "owner": "123456789012",
    "dateCreated": "2023-03-10T01:04:40.609Z",
    "outputResources": {
      "amis": [
        {
        "region": "us-west-2",
        "image": "ami-012b3456789012c3d",
        "name": "image-recipe-name 2023-03-10T01-05-12.541Z",
        "description": "First verison of image-recipe-name",
        "accountId": "123456789012"
        }
      ]
    },
    "tags": {}
    },
    {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/image-recipe-
name/1.0.0/1",
    "name": "image-recipe-name",
    "type": "AMI",
```

```
    "version": "1.0.0/1",
    "platform": "Linux",
    "osVersion": "Amazon Linux 2",
    "state": {
      "status": "AVAILABLE"
    },
    "owner": "123456789012",
    "dateCreated": "2023-03-10T00:07:16.384Z",
    "outputResources": {
      "amis": [
        {
        "region": "us-west-2",
        "image": "ami-0d1e23456789f0a12",
        "name": "image-recipe-name 2023-03-10T00-07-18.146132Z",
        "description": "First verison of image-recipe-name",
        "accountId": "123456789012"
        }
      ]
    },
    "tags": {}
    }
  ]
}
```


> **Note**
>
> Output from the **list-image-build-versions** command doesn't include security findings or log streams at this time.

View image resource details

On the image details page in the Image Builder console, you can view details for a specific image resource that you own. You can also use commands or actions with the Image Builder API, SDKs, or AWS CLI to get image details.

For more information about resources that another AWS account shared with you through a AWS Resource Access Manager (AWS RAM) resource share, see Access AWS resources shared with you in the *AWS RAM User Guide*.

Contents

- View image details in the Image Builder console
- Get image policy details from the AWS CLI

View image details in the Image Builder console

The image detail page in the Image Builder console includes a summary section, with additional information grouped into tabs. The page heading is the name and build version of the recipe that created the image. If a tab doesn't apply to your image, the tab is inactive and doesn't display data.

Console detail sections and tabs

- Summary section
- Output resources tab
- Infrastructure configuration tab
- Distribution settings tab
- Workflow tab
- Security findings tab
- Tags tab

Summary section

The summary section spans the width of the page and includes the following details. These details are always displayed.

Recipe

The recipe name and version that doesn't include the build version. For example, if the build version is `sample-linux-recipe | 1.0.1/2`, the recipe is `sample-linux-recipe | 1.0.1`, and the build version is 2.

Date created

The date and time when Image Builder created the image build version.

Image status

The current status of the image build version. Status can relate to the image build or disposition. For example, during the build process, you might see a status of `Building` or

`Distributing`. For disposition of the image, you might see a status of `Deprecated` or `Deleted`.

Reason for failure

The reason for the image status. The Image Builder console only displays the reason when the build fails (**Image status** equals `Failed`).

Failure details

Structured details about where the build failed, displayed when you choose a `Failed` image status. Details can include the stage that failed, the workflow step, the component step that raised the error, and the destination Regions that failed. The failed workflow step links to its runtime detail. For more information, see Find the cause of a failed image build with failure context.

Output resources tab

The **Output resources** tab lists output and distribution details for the image resource that is currently displayed. The information that Image Builder displays depends on the type of recipe that the pipeline used to create the image, as follows.

Image recipe

- **Region** – The distribution Region for the output Amazon Machine Image (AMI) that is specified in the **Image** column.
- **Image** – The ID of the AMI that Image Builder distributed to the destination. This ID is linked to the **Amazon Machine Images (AMIs)** page in the Amazon EC2 console.

> **Note**
>
> Image Builder creates the AMI after it creates the output image resource, and before it distributes the AMI to the destination.

- **Name** – The name of the AMI that Image Builder distributed to the destination.
- **Description** – The optional description from the image recipe that the pipeline used to create the output image resource.
- **Account** – The AWS account that owns the currently displayed Image Builder image resource.

Container recipe

Image Builder displays the following details for output created from a container recipe.

- **Region** – The distribution Region for the container image that is specified in the **Image URI** column.
- **Image URI** – The URI of the output container image that Image Builder distributed to the ECR repository in the destination Region.

> **Note**
>
> Image Builder displays one row per destination. The output image always has at least one entry for distribution to the account that created the image. Additional destinations can include distributions across Regions, AWS accounts, or AWS Organizations. For more information, see Manage Image Builder distribution settings.

Infrastructure configuration tab

The **Infrastructure configuration** tab displays the Amazon EC2 infrastructure settings that Image Builder used to build and test the image that is currently displayed. Image Builder always displays the name of the infrastructure configuration resource (**Configuration name**) and its Amazon Resource Name (**ARN**). If your infrastructure configuration sets the values, additional infrastructure details can include the following

- Instance types
- An instance profile
- Network infrastructure
- Security group settings
- An Amazon S3 location where Image Builder stores application logs
- An Amazon EC2 key pair for troubleshooting
- An Amazon SNS topic for event notifications

For more information, see Manage Image Builder infrastructure configuration.

Distribution settings tab

The **Distribution settings** tab displays settings that Image Builder used to distribute your output images. Image Builder always displays the name of the distribution configuration resource (**Configuration name**) and its Amazon Resource Name (**ARN**). Additional distribution details depend on the type of recipe that the Image Builder pipeline used to create the image, as follows:

Image recipe

If your distribution configuration resource sets the values, additional distribution details can include the following,:

- **Region** – The distribution Region for the output Amazon Machine Image (AMI).
- **Output AMI name** – The name of the AMI that Image Builder distributed to the destination.
- **Encryption (KMS key)** – If configured, the AWS KMS key that Image Builder uses to encrypt the image for distribution to the target Region.
- **Target accounts for distribution** – If you configured cross-account distribution, this column displays a comma-separated list of AWS accounts to share the output image with in the target Region.
- **Principals with shared permission** – A comma-separated list of the AWS principals that have permission to launch your image, for example, AWS accounts or groups, AWS Organizations or organizational units (OUs).

  > **Note**
  >
  > When you grant permission for other principals to launch your image, you still own the image. AWS bills your account for all of the instances that Amazon EC2 launches from your image.

- **Target accounts for faster launch configuration** – The AWS accounts where EC2 Fast Launch distributes pre-provisioned snapshots for launch.
- **Associated license configurations** – The License Manager license configuration ARNs that are associated with the AMI in the specified Region.
- **Launch template configuration** – Identifies an Amazon EC2 launch template to use for a specific account.
- **Set launch template default version** – Sets the specified Amazon EC2 launch template as the default launch template for the specified AWS account.

Container recipe

Container distributions always include the following details:

- **Region** – The distribution Region for the container image specified in the **Image URI** column.
- **Image URI** – The URI of the output container image that Image Builder distributed to the Amazon ECR repository in the destination Region.

> **Note**
>
> Image Builder displays one row per destination. The output image always has at least one entry for distribution to the account that created the image. Additional destinations can include distributions across Regions, AWS accounts, or AWS Organizations. For more information, see Manage Image Builder distribution settings.

Workflow tab

Workflows define the sequence of steps that Image Builder performs when it creates a new image. All images have build, test, and distribution workflows. The **Workflow** tab displays the applicable workflows that Image Builder ran for your image.

Filter workflow types

Image Builder initially displays the build or import workflow summary and workflow steps by default. However, the **Workflow** filter shows all of the workflows that are in progress or completed for your image. To view a different workflow, select from the list.

Image workflows that produce AMI output can have build, import, or test workflows. Container workflows that produce container output can have build, test, or distribution workflows.

> **Note**
>
> If the workflow hasn't started yet, it doesn't appear in the list. For example, if your image build that has both build and test workflows configured has just started, the build workflow is the only workflow type that appears in the list. When the test workflow begins, Image Builder adds it to the list.

Following the **Workflow** filter, the selected workflow shows a runtime summary that includes the following details for every workflow type:

Workflow status

The current runtime status for this workflow. Values can include the following:

- Pending
- Skipped
- Running
- Completed
- Failed
- Rollback-in-progress
- Rollback-completed

Execution ID

A unique identifier that Image Builder assigns to keep track of runtime resources each time it runs a workflow.

Start

The timestamp when the runtime instance of this workflow started.

End

The timestamp when this runtime instance of the workflow finished.

Total steps

The total number of steps in the workflow. This should equal the sum of the step counts for steps that succeeded, were skipped, and failed.

Steps succeeded

A runtime count for the number of steps in the workflow that ran successfully.

Steps failed

A runtime count for the number of steps in the workflow that failed.

Steps skipped

A runtime count for the number of steps in the workflow that were skipped.

The details in the following list report the current status for all of the steps in this runtime instance of the workflow. Image Builder displays the same details for all image types.

Step #

A number that represents the order in which Image Builder runs the workflow steps.

Step ID

A unique identifier for the workflow step, assigned at runtime.

Step status

The current runtime status of the specified workflow step.

Rollback status

The current rollback status if this runtime instance of the workflow failed.

Step name

The name of the specified workflow step.

Start

The timestamp when the specified step for this runtime instance of the workflow started.

End

The timestamp when the specified step for this runtime instance of the workflow finished.

Security findings tab

If you've activated scanning, the **Security findings** tab displays Common Vulnerabilities and Exposures (CVE) findings. Amazon Inspector identified these findings on the test instance that Image Builder launched to create your new image. To ensure that Image Builder captures findings for your image, you must configure scanning as follows:

1. Activate Amazon Inspector scans for your account. For more information, see Getting started with Amazon Inspector in the *Amazon Inspector User Guide*.
2. Activate security findings for the pipeline that creates this image. When you activate security findings for your pipeline, Image Builder saves a snapshot of the findings before it terminates the test instance. For more information, see Configure security scans for Image Builder images in the AWS Management Console

The **Security findings** tab includes the following details for each vulnerability that Amazon Inspector identified for your image.

Severity

The severity level of the CVE finding. Values are as follows:

- Untriaged
- Informational
- Low
- Medium
- High
- Critical

Finding ID

The unique identifier for the CVE finding that Amazon Inspector detected for your image when it scanned the test instance. The ID is linked to the **Security findings > By vulnerability** page. For more information, see Manage security findings for Image Builder images in the AWS Management Console.

Source

The source of the vulnerability information for the CVE finding.

Age

The number of days since the finding was first observed for your image.

Inspector score

The score that Amazon Inspector assigned for the CVE finding.

Tags tab

The **Tags** tab displays any tags that you have defined for your image.

Get image policy details from the AWS CLI

The following example shows how to get the details of an image policy with its Amazon Resource Name (ARN).

```
aws imagebuilder get-image-policy --image-arn arn:aws:imagebuilder:us-
west-2:123456789012:image/example-image/2019.12.02
```

Create custom images with Image Builder

There are several different ways that you can create a new Image Builder image. For example, you can use one of the following methods to create an image with the AWS Management Console or AWS CLI. You can also use the CreateImage API action or run a build pipeline to create the image. For the SDK request associated with the API action, you can refer to the See Also link for that command in the *EC2 Image Builder API Reference*.

AWS Management Console

To create a new image from an existing pipeline, you can manually run the pipeline, as follows. You can also use the pipeline wizard to create a new image from scratch. See Pipeline wizard: Create AMI or Pipeline wizard: Create container image, depending on the type of image you want to create.

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Image pipelines** from the navigation pane.
3. Select the check box next to the **Pipeline name** that you want to run.
4. To create the image, select **Run pipeline** from the **Actions** menu. This starts the pipeline.

You can also specify a schedule to run your pipeline, or use Amazon EventBridge to run your pipeline based on rules that you configure.

AWS CLI

Before you run the **create-image** command in the AWS CLI, you must create the following resources if they don't already exist:

Required resources

- **Recipe** – You must specify exactly one recipe for your image, as follows:

  Image recipe

  Specify the Amazon Resource Name (ARN) for your image recipe resource with the `--image-recipe-arn` parameter.

Container recipe

Specify the ARN for your container recipe resource with the `--container-recipe-arn` parameter.

- **Infrastructure configuration** – Specify the ARN for your infrastructure configuration resource with the `--infrastructure-configuration-arn` parameter.

You can also specify any of the following resources that your image requires:

Optional resources and configuration

- **Distribution configuration** – By default, Image Builder distributes the output image resource to your account in the Region where you run the **create-image** command. To provide additional destinations or configuration for your distribution, specify the ARN for your distribution configuration resource with the `--distribution-configuration-arn` parameter.
- **Image scanning** – To configure snapshots for Amazon Inspector findings on your image or container test instance, use the `--image-scanning-configuration` parameter. For container images you also specify the ECR repository that Amazon Inspector uses for its scans.
- **Image tests** – To suppress the Image Builder test stage, use the `--image-tests-configuration` parameter. Alternatively, you can set a timeout for how long it can run.
- **Image tags** – Use the `--tags` parameter to add tags to your output image resource.
- **Image workflows** – If you don't specify any build or test workflows, Image Builder creates your image with its default image workflow. To specify workflows that you've created, use the `--workflows` parameter.

> **Note**
>
> If you specify image workflows, you must also provide the name or ARN of the IAM role that Image Builder uses to run your workflow actions in the `--execution-role` parameter.

The following example shows how to create an image with the create-image AWS CLI command. For more information, see the *AWS CLI Command Reference*.

Example: Create a basic image with default distribution

```
aws imagebuilder create-image --image-recipe-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-recipe/simple-recipe-linux/1.0.0 --infrastructure-
configuration-arn arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-
configuration/simple-infra-config-linux
```

Output:

```
{
"requestId": "1abcd234-e567-8fa9-0123-4567b890cd12",
"imageVersionList": [
    {
        "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/simple-recipe-
linux/1.0.0",
        "name": "simple-recipe-linux",
        ...
    }
]
}
```

Cancel image creation from the AWS CLI

To cancel an in-progress image build, use the **cancel-image-creation** command, as follows:

```
aws imagebuilder cancel-image-creation --image-build-version-arn
 arn:aws:imagebuilder:us-west-2:123456789012:image/my-example-recipe/2019.12.03/1
```

Import and export virtual machine images with Image Builder

When you export a VM from its virtualization environment, that process creates a set of one or more disk container files that act as snapshots of your VM's environment, settings, and data. You can use these files to import your VM, and use it as the base image for your image recipes. To export, you can create VM disk files as output from your custom image build, and distribute the files.

Image Builder supports the following file formats for your VM disk containers:

- Open Virtualization Archive (OVA)

- Virtual Machine Disk (VMDK)
- Virtual Hard Disk (VHD/VHDX)
- Raw

The import uses the disks to create an Amazon Machine Image (AMI) and an Image Builder image resource, either of which can serve as the base image for your custom image recipe. The VM disks must be stored in S3 buckets for the import. Alternatively, you can import from an existing EBS snapshot.

In the Image Builder console, you can import the image directly, and then use the output image or AMI in your recipes, or you can specify import parameters when you are creating your recipe or recipe version. For more information about importing as part of your image recipe, see VM import configuration.

Import a VM into Image Builder

Image Builder integrates with the Amazon EC2 VM Import/Export API to enable the import process to run asynchronously in the background. Image Builder references the task ID from the VM import to track its progress, and creates an Image Builder image resource as output. This allows you to reference the Image Builder image resource in your recipes before the VM import finishes.

Console

To import a VM with the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Images** from the navigation pane.
3. To open the import dialog, choose **Import image**.
4. Enter the following **General** information:
   - Specify a unique **Name** for your image.
   - Specify a **Version** for the base image. Use the following format: *major*.*minor*.*patch*.
5. Choose the import type: **VM import**.
6. Provide details for each of the following sections on the **Import image** page. Then choose **Import image** when you're done.

Base image operating system

1. Select the **Image Operating System (OS)** option that matches your VM OS platform.
2. Select the **OS version** that matches the version for your VM from the list.

VM import configuration

1. When you export your VM from its virtualization environment, that process creates a set of one or more disk container files. These act as snapshots of your VM's environment, settings, and data. You can use these files to import your VM as the base image for your image recipe. For more information about importing VMs in Image Builder, see Import and export VM images.

   To specify the location of your import source, follow these steps:

   Import source

   Specify the source for the first VM image disk container or snapshot to import in the **Disk container 1** section.

   a. **Source** – This can be either an S3 bucket, or an EBS snapshot.
   b. **Select S3 location of disk** – Enter the location in Amazon S3 where your disk images are stored. To browse for the location, choose **Browse S3**.
   c. To add a disk container, choose **Add disk container**.

2. **IAM role**

   To associate an IAM role with your VM import configuration, select the role from the **IAM role** dropdown list, or choose **Create new role** to create a new one. If you create a new role, the IAM Roles console page opens in a separate tab.

3. **Advanced settings – *optional***

   The following settings are optional. With these settings, you can configure encryption, licensing, tags, and more for the base image that the import creates.

   Base image architecture

   To specify the architecture of your VM import source, select a value from the **Architecture** list.

   Encryption

   If your VM disk images are encrypted, you must provide a key to use for the import process. To specify a KMS key for the import, select a value from the **Encryption (KMS key)** list. The list contains KMS keys that your account has access to in the current Region.

   License management

   When you import a VM, the import process automatically detects the VM OS and applies the appropriate license to the base image. Depending on your OS platform, the license types are as follows:

   - **License included** – An appropriate AWS license for your platform is applied to your base image.
   - **Bring your own license (BYOL)** – Retains the license from your VM, if applicable.

   To attach license configurations created with AWS License Manager to your base image, select from the **License configuration name** list. For more information about License Manager, see Working with AWS License Manager

   > **Note**
   >
   > - License configurations contain licensing rules based on the terms of your enterprise agreements.
   > - Linux only supports BYOL licenses.

   Tags (base image)

Tags use key-value pairs to assign searchable text to your Image Builder resource. To specify tags for the imported base image, enter key-value pairs using the **Key** and **Value** boxes.

To add a tag, choose **Add tag**. To remove a tag, choose **Remove tag**.

AWS CLI

To import a VM from disks into an AMI and create an Image Builder image resource that you can reference right away, follow these steps from the AWS CLI:

1. Initiate a VM import, with the Amazon EC2 VM Import/Export **import-image** command in the AWS CLI. Make note of the task ID that is returned in the command response. You'll need it for the next step. For more information, see Importing a VM as an image using VM Import/Export in the *VM Import/Export User Guide*.

2. **Create a CLI input JSON file**

   To streamline the Image Builder **import-vm-image** command that is used in the AWS CLI, we create a JSON file that contains all of the import configuration that we want to pass into the command.

   > **Note**
   >
   > The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API operation request parameters, see the ImportVmImage operation in the *EC2 Image Builder API Reference*.
   > To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*. to the Image Builder **import-vm-image** command as options.

   Here is a summary of the parameters that we specify in this example:

   - **name** (string, required) – The name for the Image Builder image resource to create as output from the import.

- **semanticVersion** (string, required) – The semantic version for the output image that specifies the version in the following format, with numeric values in each position to indicate a specific version: <major>.<minor>.<patch>. For example, `1.0.0`. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.
- **description** (string) – The description of the image recipe.
- **platform** (string, required) – The operating system platform for the imported VM.
- **vmImportTaskId** (string, required) – The `ImportTaskId` (AWS CLI) from the Amazon EC2 VM import process. Image Builder monitors the import process to pull in the AMI that it creates and build an Image Builder image resource that can be used in recipes right away.
- **tags** (string map) – Tags are key-value pairs that are attached to the import resources. Up to 50 key-value pairs are allowed.

Save the file as `import-vm-image.json`, to use in the Image Builder **import-vm-image** command.

```
{
    "name": "example-request",
    "semanticVersion": "1.0.0",
    "description": "vm-import-test",
    "platform": "Linux",
    "vmImportTaskId": "import-ami-01ab234567890cd1e",
    "tags": {
     "Usage": "VMIE"
    }
}
```

3. **Import the image**

   Run the **import-vm-image** command, with the file that you created as input:

```
aws imagebuilder import-vm-image --cli-input-json file://import-vm-image.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.

- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

Distribute VM disks from your image build from the AWS CLI

You can set up distribution of supported VM disk format files to S3 buckets in target Regions as part of your regular image build process, using Image Builder distribution configurations in the AWS CLI. For more information, see Example: Create distribution settings for output VM disks from the AWS CLI.

Import verified Windows ISO disk images with Image Builder

A Windows operating system ISO file is a disk image file that contains the complete installation package for a specific version of the Windows operating system. Microsoft provides official Windows operating system ISO files for download, either directly from their website or through authorized resellers. To avoid potential malware or unauthorized versions, obtain the ISO files from a trusted and legitimate source.

EC2 Image Builder uses the `build-image-from-iso` import workflow to import the ISO disk file and create a secondary volume from it. After configuration is complete, Image Builder takes a snapshot of the volume it created from the import and uses it to create an Amazon Machine Image (AMI).

Security considerations for ISO disk image import

The ISO disk image that you supply provides the operating system for the output AMI. During the import, Image Builder mounts the ISO and applies the Windows image that it contains.

The import process runs executables that it resolves from the ISO and from the applied Windows image. These executables run with SYSTEM privileges on the build instance, under the instance profile role from the infrastructure configuration that you specify for the import.

Because the ISO provides the operating system, obtaining authentic media is your responsibility. An ISO from an untrusted source can affect the output AMI and any instances that you launch from it. Obtain ISO files from Microsoft or an authorized reseller.

Permission to start an import against an infrastructure configuration includes the ability to run under that configuration's instance profile role. Image Builder evaluates `iam:PassRole` when you create the infrastructure configuration, not when you start the import. We recommend that you grant permission to start imports only to principals that you trust with the instance profile role.

For more information, see Data protection and the AWS shared responsibility model in Image Builder.

Supported operating systems for ISO disk image import

Image Builder supports the following Windows operating system ISO disk images:

- Windows 11 Enterprise version 25H2 (x64)
- Windows 11 Enterprise version 24H2 (x64)
- Windows 11 Enterprise version 23H2 (x64)

Image Builder does not support the following Windows operating system ISO disk images:

- Long-Term Servicing Channel (LTSC) images
- ISO disk images created from the Windows Media Creation Tool
- Evaluation images

Prerequisites to import an ISO disk image

Note

During the import process, the build instance downloads AWS drivers, EC2Launch v2, and the Systems Manager Agent from Amazon S3, and Microsoft Defender from the public internet. These components are pre-staged onto the output AMI. The build instance also communicates with Amazon EC2, Amazon CloudWatch Logs, and SSM APIs.
The build instance downloads AWS drivers from a Regional Amazon S3 bucket in the same AWS Region where the import runs. Because this traffic stays within the Region, the Amazon S3 Gateway endpoint is sufficient to download the drivers in any Region.
However, Microsoft Defender requires public internet access to download regardless of Region. If the build instance does not have internet access, the import still succeeds but does not install Microsoft Defender on the output AMI.

For the list of the minimal required VPC endpoints and S3 URLs, see Minimal network requirements for private VPC.

To import an ISO disk image, you must meet the following prerequisites:

- The operating system of the disk image must be one that Image Builder supports. For a list of supported operating systems, see Supported operating systems for ISO disk image import.
- To ensure that you can import your ISO image, download it from the Microsoft 365 admin center.
- You must upload your ISO disk file to Amazon S3 in the same AWS account and AWS Region where the import runs before you can run the import process.
- The file extension is case-sensitive for the import process and must be `.ISO`. If your file extension is lowercase, run one of the following commands to rename it:

  Command

  ```
  aws s3 cp s3://amzn-s3-demo-bucket/Win11_24H2_English.iso s3://amzn-s3-demo-bucket/Win11_24H2_English.ISO
  ```

  PowerShell

  ```
  Copy-S3Object -BucketName amzn-s3-demo-bucket -Key Win11_24H2_English.iso -DestinationKey Win11_24H2_English.ISO
  ```

- Microsoft licensing is not automatically included with the import. You must bring your own license (BYOL). For more information about licensing for Microsoft software, see Licensing on the *Amazon Web Services and Microsoft Frequently Asked Questions* page.
- The import process uses two separate IAM roles:

  Execution role

  This role grants permission for Image Builder to call AWS services on your behalf during the import process.

  Important

  We recommend that you don't pass the AWSServiceRoleForImageBuilder service-linked role as your execution role. Instead, create a custom IAM role and attach the EC2ImageBuilderExecutionPolicy AWS managed policy. This policy grants the same

permissions that Image Builder needs to call AWS services on your behalf. Using a custom role gives you full control over the permissions that Image Builder uses. It also keeps your service control policies (SCPs) and resource control policies (RCPs) in effect for operations that Image Builder performs on your behalf.

Instance profile role

This role grants permission for the actions that the service performs on the EC2 instance. You can specify an instance profile role in your infrastructure configuration resource. Attach the following managed policies to your instance profile role to ensure that you have all of the permissions needed for the import process:

- EC2InstanceProfileForImageBuilder
- AmazonSSMManagedInstanceCore

The EC2InstanceProfileForImageBuilder policy includes the `s3:GetObject` permission that the build instance uses to download your ISO file. This access applies to objects that have an ISO file extension in your own account. As a result, you do not need to grant additional Amazon S3 permissions for the ISO.

> **Note**
>
> We recommend that you grant the instance profile role only the permissions that the import requires. The import process runs executables from the ISO and the applied Windows image with SYSTEM privileges under this role. Any additional permissions that you grant also apply to those executables.

For more information, see Manage Image Builder infrastructure configuration, EC2InstanceProfileForImageBuilder policy, and Security considerations for ISO disk image import.

Optional import settings

You can optionally configure the following settings when you import an ISO disk image. These settings control Secure Boot, UEFI data, and image index selection for the imported image.

Secure Boot

Secure Boot is a UEFI security feature that ensures only trusted software runs during the boot process. By default, Secure Boot is enabled for ISO disk image imports. You can disable Secure Boot if you need to use custom unsigned drivers for testing or legacy application compatibility.

Custom UEFI data

You can provide a custom UEFI data blob as a Base64-encoded string to use during the boot process instead of the default UEFI data that Image Builder generates. You can specify custom UEFI data only when Secure Boot is enabled (the default). The data can be at most 64 KB.

You can inspect and modify UEFI data by using the python-uefivars tool on the GitHub website. For more information, see UEFI variables for Amazon EC2 instances.

Image index

A Windows ISO file can contain a `.wim` file with multiple image indexes, where each index represents a different Windows edition (for example, Home or Pro). By default, Image Builder uses the first valid image index from the ISO file. You can specify a one-based image index to select a specific edition from a multi-edition ISO file.

Import an ISO disk image into Image Builder

Before you start the import process, make sure that you have met all of the Prerequisites.

The import process installs the following software and drivers on your image:

- EC2Launch v2
- AWS Systems Manager agent
- AWS NVMe driver
- AWS ENA network driver
- AWS PCI Serial Driver
- EC2 Windows Utility Driver
- Microsoft Defender Update Kit

The import process makes the following configuration updates on your image:

- Configures the system to use the Amazon Time server.

Choose a tab to view the import steps for your preferred method:

Console

To import an ISO disk image with the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Images** from the navigation pane.
3. To open the import dialog, choose **Import image**.
4. Enter the following **General** information:
   - Specify a unique **Name** for your image.
   - Specify a **Version** for the base image. Use the following format: *major.minor.patch*.
5. Choose the import type: **ISO import**.
6. Enter the following **ISO import configuration** details. Then choose **Import image** when you are done.
   - **S3 URI** – Enter the location where your ISO disk file is stored. To browse for the file, choose **Browse S3**.
   - **IAM role** – To associate an IAM role with your import configuration, select the role from the **IAM role** dropdown list, or choose **Create new role** to create a new one. If you create a new role, the IAM Roles console page opens in a separate tab.

     You can specify the AWSServiceRoleForImageBuilder service-linked role, or you can specify your own custom role for service access.
7. You can optionally configure the following advanced settings for the import. For more information about these settings, see Optional import settings.
   - **Secure Boot** – Secure Boot is enabled by default. To disable Secure Boot for the imported image, clear the **Secure Boot** check box.
   - **Custom UEFI data** – To provide a custom UEFI data blob, enter the Base64-encoded string. This option is available only when Secure Boot is enabled.
   - **Image index** – To select a specific Windows edition from a multi-edition ISO file, enter the one-based image index.
8. You can optionally add tags to your Image Builder image resource. Adding tags here does not add the tags to your AMI.

9. The **ISO infrastructure configuration** defines settings for the instance that Image Builder launches to host the import process. You can use an infrastructure configuration that Image Builder creates based on service defaults, or you can use an existing infrastructure configuration. For more information, see Manage Image Builder infrastructure configuration.

   To create a new infrastructure configuration, choose **Create infrastructure configuration**. This opens in a separate tab. After you finish creating the new resource, you can return to the import configuration and choose **Use existing infrastructure configuration**.

10. To start the import process, choose **Import image**.

After the import is complete, your image appears in the list of images that you own. For more details, see List images.

AWS CLI

The following example shows how to import an image from an ISO disk file and create an AMI from it with the AWS CLI.

Here is a summary of the parameters that we specify in this example:

- **name** (string, required) – The name for the Image Builder image resource to create as output from the import.
- **semanticVersion** (string, required) – The semantic version for the output image that specifies the version in the following format, with numeric values in each position to indicate a specific version: <major>.<minor>.<patch>. For example, `1.0.0`. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.
- **description** (string) – The description of the image recipe.
- **executionRole** (string) – The name or Amazon Resource Name (ARN) for the IAM role that grants Image Builder access to perform workflow actions to import an image from a Microsoft ISO file. We recommend that you specify a custom role that has the EC2ImageBuilderExecutionPolicy AWS managed policy attached.
- **platform** (string, required) – The operating system platform for the ISO disk image. Valid values include `Windows`.
- **osVersion** (string, required) – The operating system version for the ISO disk image. Valid values include `Microsoft Windows 11`.

- **infrastructureConfigurationArn** (string, required) – The Amazon Resource Name (ARN) of the infrastructure configuration resource that's used for launching the EC2 instance on which the ISO image is built.
- **uri** (string, required) – The URI of the ISO disk file that's stored in Amazon S3.
- **registerImageOptions** (object) – Configures Secure Boot and UEFI settings for the imported image. Contains the following fields:
  - **secureBootEnabled** (boolean) – Specifies whether Secure Boot is enabled for the output AMI. The default value is `true`. To disable Secure Boot for custom unsigned drivers, set this value to `false`.
  - **uefiData** (string) – A Base64-encoded representation of the non-volatile UEFI variable store. You can specify this parameter only when `secureBootEnabled` is `true` or unspecified.
- **windowsConfiguration** (object) – Windows-specific configuration settings for the ISO import. Contains the following fields:
  - **imageIndex** (integer) – The 1-based index that specifies which Windows edition to install from a multi-edition Windows ISO file. A Windows ISO can contain a `.wim` file with multiple image indexes, each representing a different edition.

```
aws imagebuilder import-disk-image \
    --name "example-iso-disk-import" \
    --semantic-version "1.0.0" \
    --description "Import an ISO disk image" \
    --execution-role "ImageBuilderExecutionRole" \
    --platform "Windows" \
    --os-version "Microsoft Windows 11" \
    --infrastructure-configuration-arn "arn:aws:imagebuilder:us-
east-1:111122223333:infrastructure-configuration/example-infrastructure-
configuration-123456789abc" \
    --uri "s3://amzn-s3-demo-source-bucket/examplefile.ISO" \
    --register-image-options '{"secureBootEnabled": true, "uefiData": "custom-
base64-encoded-uefi-data"}' \
    --windows-configuration '{"imageIndex": 1}'
```

After the import is complete, your image appears in the list of images that you own. For more details, see List images.

PowerShell

The following example shows how to import an image from an ISO disk file and create an AMI from it with PowerShell.

Here is a summary of the parameters that we specify in this example:

- **name** (string, required) – The name for the Image Builder image resource to create as output from the import.
- **semanticVersion** (string, required) – The semantic version for the output image that specifies the version in the following format, with numeric values in each position to indicate a specific version: <major>.<minor>.<patch>. For example, `1.0.0`. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.
- **description** (string) – The description of the image recipe.
- **executionRole** (string) – The name or Amazon Resource Name (ARN) for the IAM role that grants Image Builder access to perform workflow actions to import an image from a Microsoft ISO file. We recommend that you specify a custom role that has the EC2ImageBuilderExecutionPolicy AWS managed policy attached.
- **platform** (string, required) – The operating system platform for the ISO disk image. Valid values include `Windows`.
- **osVersion** (string, required) – The operating system version for the ISO disk image. Valid values include `Microsoft Windows 11`.
- **infrastructureConfigurationArn** (string, required) – The Amazon Resource Name (ARN) of the infrastructure configuration resource that's used for launching the EC2 instance on which the ISO image is built.
- **uri** (string, required) – The URI of the ISO disk file that's stored in Amazon S3.
- **registerImageOptions** (object) – Configures Secure Boot and UEFI settings for the imported image. Contains the following fields:
  - **secureBootEnabled** (boolean) – Specifies whether Secure Boot is enabled for the output AMI. The default value is `true`. To disable Secure Boot for custom unsigned drivers, set this value to `false`.
  - **uefiData** (string) – A Base64-encoded representation of the non-volatile UEFI variable store. You can specify this parameter only when `secureBootEnabled` is `true` or unspecified.

- **windowsConfiguration** (object) – Windows-specific configuration settings for the ISO import. Contains the following fields:
  - **imageIndex** (integer) – The 1-based index that specifies which Windows edition to install from a multi-edition Windows ISO file. A Windows ISO can contain a `.wim` file with multiple image indexes, each representing a different edition.

```
Import-EC2IBDiskImage `
    -Name "example-iso-disk-import" `
    -SemanticVersion "1.0.0" `
    -Description "Import an ISO disk image" `
    -ExecutionRole "ImageBuilderExecutionRole" `
    -Platform "Windows" `
    -OsVersion "Microsoft Windows 11" `
    -InfrastructureConfigurationArn "arn:aws:imagebuilder:us-
east-1:111122223333:infrastructure-configuration/example-infrastructure-
configuration-123456789abc" `
    -Uri "s3://amzn-s3-demo-source-bucket/examplefile.ISO" `
    -RegisterImageOptions_SecureBootEnabled $true `
    -RegisterImageOptions_UefiData "custom-base64-encoded-uefi-data" `
    -WindowsConfiguration_ImageIndex 1
```

After the import is complete, your image appears in the list of images that you own. For more details, see List images.

Launch an instance from the output AMI

You can now use the output AMI as a regular AMI and launch instances from it. When you launch an instance from the output AMI, the Windows operating system runs Sysprep Specialize to finalize the instance configuration.

> **Note**
>
> The network requirements described on this page apply to the import build process only. After the import completes successfully, launching instances from the output AMI follows standard Amazon EC2 networking requirements. A successful import does not guarantee a successful instance launch — your launch might still fail depending on your network configuration.

Minimal network requirements for private VPC

Required VPC endpoints:

Endpoint	Type	Purpose
com.amazonaws.*{region}*.s3	Gateway	Access Amazon S3 buckets (EC2Launch v2, SSM Agent, AWS drivers, and your ISO)
com.amazonaws.*{region}*.ec2	Interface	Create snapshots and describe volumes
com.amazonaws.*{region}*.logs	Interface	Write build logs to CloudWatch Logs
com.amazonaws.*{region}*.ssm	Interface	SSM API calls (SendCommand, DescribeInstanceInformation)
com.amazonaws.*{region}*.ssmmessages	Interface	SSM Agent data channel (receive commands, send output)
com.amazonaws.*{region}*.ec2messages	Interface	SSM Agent message polling

Amazon S3 endpoints accessed during import:

- https://ec2-windows-drivers-downloads-*{region}*.s3.dualstack.*{region}*.amazonaws.com/NVMe/Latest/AWSNVMe.zip
- https://ec2-windows-drivers-downloads-*{region}*.s3.dualstack.*{region}*.amazonaws.com/ENA/Latest/AwsEnaNetworkDriver.zip
- https://ec2-windows-drivers-downloads-*{region}*.s3.dualstack.*{region}*.amazonaws.com/AWSPCISerialDriver/Latest/AWSPCISerialDriver.zip

- `https://ec2-windows-drivers-downloads-{region}.s3.dualstack.{region}.amazonaws.com/EC2WinUtil/Latest/EC2WinUtil.zip`
- `https://amazon-ec2launch-v2-{region}.s3.dualstack.{region}.amazonaws.com/windows/amd64/latest/AmazonEC2Launch.msi`
- `https://amazon-ssm-{region}.s3.{region}.amazonaws.com/latest/windows_amd64/AmazonSSMAgentSetup.exe`

> **Note**
>
> In `us-east-1`, the driver bucket name has no Region suffix. The build instance downloads the drivers from `ec2-windows-drivers-downloads.s3.dualstack.us-east-1.amazonaws.com` instead. In both cases, the bucket is in the same Region as the import, so the Amazon S3 Gateway endpoint is sufficient.

This represents the minimum configuration required for the import to operate in a private subnet. Depending on your VPC settings and desired outcome, you may need additional network configuration to allow traffic between the build instance and the VPC endpoints.

Next steps

You can use the output AMI like any other AMI – launch instances from it directly, or use it as a base image in Image Builder to build and customize further. For more information, see Create custom images with Image Builder.

Troubleshoot ISO disk image imports

If your ISO disk image import fails, you can use Amazon CloudWatch Logs to identify where the import went wrong. Image Builder streams build logs to CloudWatch Logs after the build completes. To find the logs for your import, use the following log group and stream, replacing *ImageName* with the name you gave your image:

LogGroup: `/aws/imagebuilder/`*ImageName*

LogStream: *ImageVersion*/*ImageBuildVersion*

For more information about Image Builder logs in CloudWatch Logs, see Monitor Image Builder logs with Amazon CloudWatch Logs. For additional troubleshooting guidance, see Troubleshoot Image Builder issues.

Manage security findings for Image Builder images

When you activate security scanning with Amazon Inspector, it continuously scans machine images and running instances in your account for operating system and programming language vulnerabilities. If activated, security scanning is automatic, and Image Builder can save a snapshot of the findings from your test instance when you create a new image. Amazon Inspector is a paid service.

When Amazon Inspector discovers vulnerabilities in your software or network settings, it takes the following actions:

- Notifies you that there was a finding.
- Rates the severity of the finding. The severity rating categorizes vulnerabilities to help you prioritize your findings, and includes the following values:
  - Untriaged
  - Informational
  - Low
  - Medium
  - High
  - Critical
- Provides information about the finding, and links to additional resources for more detail.
- Offers remediation guidance to help you resolve the issues that generated the finding.

Configure security scans for Image Builder images in the AWS Management Console

If you've activated Amazon Inspector for your account, Amazon Inspector automatically scans the EC2 instances that Image Builder launches to build and test a new image. Those instances have a short lifespan during the build and test process, and their findings would normally expire as soon as those instances shut down. To help you investigate and remediate findings for your new

image, Image Builder can optionally save any findings that Amazon Inspector identified on your test instance during the build process as a snapshot.

Step 1: Activate Amazon Inspector security scans for your account

To activate Amazon Inspector security scans for your account from the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Security scanning settings** from the navigation pane. This opens the **Security scanning** dialog box.

   The dialog box displays the scanning status for your account. If Amazon Inspector is already activated for your account, the status shows **Enabled**.
3. Follow steps 1 and 2 of the instructions to activate Amazon Inspector scanning.

> **Note**
>
> Amazon Inspector incurs charges. For more information, see Amazon Inspector pricing.

If you've activated scanning for your pipeline, Image Builder takes a snapshot of the findings for your test instance when you create a new image. This way, you can access the findings after Image Builder terminates the test instance.

Step 2: Configure your pipeline to save snapshots for vulnerability findings

To configure vulnerability finding snapshots for your pipeline, perform the following steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Image pipelines** from the navigation pane.
3. Pick one of the following methods to specify pipeline details:

   Create a new pipeline

   1. From the **Image pipelines** page, choose **Create image pipeline**. This opens the **Specify pipeline details** page in the pipeline wizard.

Update an existing pipeline

1. From the **Image pipelines** page, choose the **Pipeline name** link for the pipeline that you want to update. This opens the pipeline detail page.

   > **Note**
   >
   > Alternatively, you can select the check box next to the name of the pipeline that you want to update, and then choose **View details**.

2. From the pipeline details page, select **Edit pipeline** from the **Action** menu. This takes you to the **Edit pipeline** page.

4. In the **General** section from the pipeline wizard or the **Edit pipeline** page, select the **Enable security scan** check box.

   > **Note**
   >
   > If you want to turn off the snapshots later, you can edit your pipeline to clear the check box. This doesn't deactivate Amazon Inspector scanning for your account. To deactivate Amazon Inspector scanning, see Deactivating Amazon Inspector in the *Amazon Inspector User Guide*.

Manage security findings for Image Builder images in the AWS Management Console

The **Security findings** list pages display high-level information about the findings for your resources, with views based on several different filters that you can apply. Each view includes the following options at the top to change your view:

- **All security findings** – This is the default view if you choose **Security findings** page from the navigation pane in the Image Builder console.
- **By vulnerability** – This view shows a high-level list of all of the image resources in your account that have findings. The **Finding ID** is linked to more detailed information about the finding. This information appears on a panel that opens on the right side of the page. The panel includes the following information:

- A detailed description of the finding.
- A **Finding details** tab. This tab includes a finding overview, affected packages, summary remediation advice, vulnerability details, and related vulnerabilities. The **Vulnerability ID** links to detailed vulnerability information in the National Vulnerability Database.
- A **Score breakdown** tab. This tab includes a side-by-side comparison of the CVSS and Amazon Inspector scores so that you can see where Amazon Inspector has modified a score, if applicable.

- **By image pipeline** – This view shows the number of findings for each image pipeline in your account. Image Builder displays counts for medium severity and higher findings, plus a total for all findings. All data in the list is linked, as follows:
  - The **Image pipeline name** column links to the detail page for the specified image pipeline.
  - The severity level column links open the **All security findings** view, filtered by the associated image pipeline name and severity level.

  You can also use search criteria to refine your results.
- **By image** – This view shows the number of findings for each image build in your account. Image Builder displays counts for medium severity and higher findings, plus a total for all findings. All data in the list is linked, as follows:
  - The **Image name** column links to the image detail page for the specified image build. For more information, see View image resource details.
  - The severity level column links open the **All security findings** view, filtered by the associated image build name and severity level.

  You can also use search criteria to refine your results.

Image Builder shows the following details in the **Findings** list section of the default **All security findings** view.

Severity

The severity level of the CVE finding. Values are as follows:

- Untriaged
- Informational
- Low
- Medium

- High
- Critical

Finding ID

The unique identifier for the CVE finding that Amazon Inspector detected for your image when it scanned the test instance. The ID is linked to the **Security findings > By vulnerability** page.

Image ARN

The Amazon Resource Name (ARN) for the image with the finding specified in the **Finding ID** column.

Pipeline

The pipeline that built the image specified in the **Image ARN** column.

Description

A short description of the finding.

Inspector score

The score that Amazon Inspector assigned for the CVE finding.

Remediation

Links to details about the recommended course of action to remediate the finding.

Published date

The date and time when this vulnerability was first added to the vendor's database.

Clean up Image Builder resources

To avoid unexpected charges, make sure to clean up resources and pipelines that you created from the examples in this guide. For more information about deleting resources in Image Builder, see Delete outdated or unused Image Builder resources.

Manage lifecycle policies for Image Builder images

EC2 Image Builder lifecycle policies automate deprecation, disabling, and deletion of outdated images and their associated resources. Each pipeline build creates a new image version and distributes associated resources. Without lifecycle policies, earlier versions remain in your account until you delete them manually.

Lifecycle policies define rules that control when and how Image Builder retires outdated images. Associated resources include output images distributed to other AWS accounts, organizations, and organizational units (OUs). These resources can span multiple AWS Regions. You specify which lifecycle steps to include and when each step runs.

Enabled lifecycle policies run automatically once per day. Image Builder manages the execution schedule. For execution details, see How lifecycle policy execution works.

Tip

For information about a deployable lifecycle policy example with ready-to-use policy documents, see the lifecycle sample on GitHub. For more information, see Explore Image Builder sample projects on GitHub.

Benefits of automated lifecycle management

Automated lifecycle management:

- Automates retirement of images and their associated resources across accounts and Regions.
- Eliminates compliance risks from launching new instances with outdated images.
- Maintains fresh image inventories by removing obsolete versions.
- Reduces infrastructure costs by removing associated resources when you delete images.

Cost savings

There is no cost to use EC2 Image Builder to create custom AMI or container images. However, standard pricing applies for other services that are used in the process. Removing outdated images and associated resources reduces costs:

- Reduces the number of images you need to patch by removing outdated versions.
- Removes distributed AMIs and their associated snapshots when you delete AMI image resources, eliminating snapshot storage costs.
- Deletes underlying resources when you delete container image resources, eliminating Amazon ECR storage costs and data transfer charges.

> **Note**
>
> Before you configure policy actions, verify that no downstream dependencies reference images the policy removes. Image Builder does not evaluate the impact on downstream dependencies such as Auto Scaling groups or launch templates.

Contents

- Lifecycle management prerequisites for Image Builder images
- List lifecycle management policies for Image Builder image resources
- View lifecycle policy details
- Create lifecycle policies
- How lifecycle policy execution works
- How lifecycle management rules work for Image Builder image resources

Lifecycle management prerequisites for Image Builder images

Complete these steps before you create lifecycle policies.

- Create an IAM role that grants Image Builder permission to run lifecycle policies. You have three options:
  - Choose **Create lifecycle execution role using service defaults** in the Image Builder console when you create a lifecycle policy. This attaches the `EC2ImageBuilderLifecycleExecutionPolicy` managed policy automatically.
  - Choose **Create a new lifecycle execution role** in the Image Builder console. This opens IAM with pre-filled settings for one-click role creation.
  - Create the role manually. For instructions, see Create an IAM role for Image Builder lifecycle management.

- Create an IAM role in each destination account where you distributed associated resources across accounts. This role grants Image Builder permission to perform lifecycle actions in that account. For instructions, see Create an IAM role for Image Builder cross-account lifecycle management.

  > **Note**
  >
  > This prerequisite does not apply if you only granted launch permissions for an output AMI. With launch permissions, all AMI resources remain in your account.

- For container images, add the tag `LifecycleExecutionAccess: EC2 Image Builder` to your ECR repositories. This tag grants Image Builder access to run lifecycle actions on container images in the repository.

Create an IAM role for Image Builder lifecycle management

Create a service role that grants Image Builder permission to perform lifecycle actions on your image resources.

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. Choose **Roles** from the navigation pane.
3. Choose **Create role**.
4. Select **Custom trust policy** for the **Trusted entity type**.
5. Paste the following JSON trust policy into the **Custom trust policy** text area, replacing the sample text. This policy allows Image Builder to assume the role for lifecycle actions.

   JSON

```
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Action": [
                "sts:AssumeRole"
            ],
            "Effect": "Allow",
            "Principal": {
                "Service": [
                    "imagebuilder.amazonaws.com"
```

```
                ]
            }
        }
    ]
}
```

6. Select **EC2ImageBuilderLifecycleExecutionPolicy** from the managed policy list, then choose **Next**.

> **Tip**
>
> Filter on `image` to streamline results.

7. Enter a **Role name**.
8. Review your settings, then choose **Create role**.

Create an IAM role for Image Builder cross-account lifecycle management

Create this role in each destination account where Image Builder distributed associated resources. The role grants Image Builder permission to perform lifecycle actions in that account.

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. Choose **Roles** from the navigation pane.
3. Choose **Create role**.
4. Select **Custom trust policy** for the **Trusted entity type**.
5. Paste the following JSON trust policy into the **Custom trust policy** text area, replacing the sample text. This policy allows Image Builder to assume the role for lifecycle actions.

> **Note**
>
> Image Builder uses this role on behalf of the destination account owner. Set the `aws:SourceAccount` to the account where Image Builder distributed the resources.

```
{
    "Version": "2012-10-17",
```

```
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "Service": [
                    "imagebuilder.amazonaws.com"
                ]
            },
            "Action": "sts:AssumeRole",
            "Condition": {
                "StringEquals": {
                    "aws:SourceAccount": "444455556666"
                },
                "ArnLike": {
                    "aws:SourceArn": "arn:*:imagebuilder:*:*:image/*/*/*"
                }
            }
        }
    ]
}
```

6. Select **EC2ImageBuilderLifecycleExecutionPolicy** from the managed policy list, then choose **Next**.

> **Tip**
>
> Filter on `image` to streamline results.

7. Enter `Ec2ImageBuilderCrossAccountLifecycleAccess` as the **Role name**. You must use this exact name.
8. Review your settings, then choose **Create role**.

List lifecycle management policies for Image Builder image resources

You can get a list of your image lifecycle management policies that includes key detail columns on the **Lifecycle policies** list page in the AWS Management Console, or with commands or actions in the Image Builder API, SDKs, or AWS CLI.

You can use one of the following methods to list Image Builder image lifecycle policy resources in your AWS account. For the API action, see ListLifecyclePolicies in the *EC2 Image Builder API Reference*. For the associated SDK request, refer to the See Also link on the same page.

AWS Management Console

The following details are shown in the console for your existing policies. You can select any column to change the sort order for your results. The policy list is initially sorted by **Policy name**. The column name for the current sort order is bold.

If you have more than one page of results, the paging arrows in the top right corner of the panel become active. You can filter results by policy name, policy status, output image type and image resource ARN with the search bar.

- **Policy name** – The name of the policy.
- **Policy status** – Whether the policy is active or inactive.
- **Type** – The type of output image that Image Builder distributes when you create a new image version (AMI or container image).
- **Last execution date** – The last time the lifecycle policy ran.
- **Date created** – The timestamp from the creation of the lifecycle policy.
- **ARN** – The Amazon Resource Name (ARN) of the lifecycle policy resource.

To list lifecycle policies in the AWS Management Console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Select **Lifecycle policies** from the navigation pane. This shows a list of image lifecycle policies in your account.

Available actions

You can also perform the following actions for your lifecycle policy from the **Lifecycle policies** list page.

To create a new image lifecycle policy, choose **Create lifecycle policy**. For more information about how to create a policy, see Create lifecycle policies.

For all of the following actions, you must select the policy first. To select a policy, you can select the check box next to the **Policy name**.

- To turn the policy off or on, select **Disable policy** or **Enable policy** from the **Actions** menu.
- To change the policy, select **Edit policy** from the **Actions** menu.
- To delete a policy, select **Delete policy** from the **Actions** menu.
- To create a new policy that uses your selected policy for baseline settings, select **Clone policy** from the **Actions** menu.

AWS CLI

The following command example shows how to use the AWS CLI to list image lifecycle policies for a specific AWS Region. For more information about the parameters and options that you can use with this command, see the list-lifecycle-policies command in the AWS CLI Command Reference.

Example:

```
aws imagebuilder list-lifecycle-policies \
--region us-west-1
```

Output:

```
{
    "lifecyclePolicySummaryList": [
        {
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:lifecycle-policy/
sample-lifecycle-policy1",
            "name": "sample-lifecycle-policy1",
            "status": "DISABLED",
            "executionRole": "arn:aws:iam::111122223333:role/sample-lifecycle-role",
            "resourceType": "AMI_IMAGE",
            "dateCreated": "2023-11-07T14:57:01.603000-08:00",
            "tags": {}
        },
        {
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:lifecycle-policy/
sample-lifecycle-policy2",
            "name": "sample-lifecycle-policy2",
            "status": "ENABLED",
            "executionRole": "arn:aws:iam::111122223333:role/sample-lifecycle-role",
            "resourceType": "AMI_IMAGE",
            "dateCreated": "2023-09-06T10:43:21.436000-07:00",
```

```
            "dateLastRun": "2023-11-13T04:43:46.106000-08:00",
            "tags": {}
        },
        {
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:lifecycle-policy/
sample-lifecycle-policy3",
            "name": "sample-lifecycle-policy3",
            "status": "ENABLED",
            "executionRole": "arn:aws:iam::111122223333:role/sample-lifecycle-role",
            "resourceType": "AMI_IMAGE",
            "dateCreated": "2023-10-19T15:16:40.046000-07:00",
            "dateUpdated": "2023-10-21T20:07:15.958000-07:00",
            "dateLastRun": "2023-11-12T09:27:45.830000-08:00"
}]}
```

Note

To use your default AWS Region, run this command without the `--region` parameter.

View lifecycle policy details

Use the EC2 Image Builder console, the AWS CLI, or the API to view lifecycle policy configuration, execution history, and rule definitions.

Contents

- View lifecycle policy details in the Image Builder console

View lifecycle policy details in the Image Builder console

The lifecycle policy detail page displays a summary section and tabs with additional information.

Console detail sections and tabs

- Summary section
- Rules tab
- Scope tab
- RunLog tab

Summary section

The summary section shows these details:

Policy status

Active (policy runs on schedule) or Inactive (policy is paused).

Type

Output image type: AMI or container image.

Date created

Timestamp when you created the policy.

Date modified

Timestamp of the most recent policy update.

Last run date

Timestamp of the most recent policy execution.

IAM role

IAM role that Image Builder assumes to perform lifecycle actions.

ARN

Amazon Resource Name (ARN) of the lifecycle policy.

Description

Policy description, if provided.

Rules tab

The **Rules** tab displays the lifecycle rules configured for this policy:

- **Name** – A fixed name that matches the policy action type:
  - `Deprecation rule`
  - `Disable rule`
  - `Deletion rule`

- **Rule** – Short description of the configured action.
- **Rule conditions** – Resource handling configuration, rule exceptions, and retention settings.

For more information about rule configuration, see How lifecycle rules work.

Scope tab

The **Scope** tab displays the resource selection criteria for this policy:

- **Filter:** *`type of filter`* – The filter type that defines the scope:
  - `recipes` – Recipes used to create the images this policy applies to.
  - `tags` – Tags that Image Builder uses to select images this policy applies to.
- **Search** bar – Filters the list by **Name**.
- **Name** – Name or tag configured as filter criteria.
- **Version** – Recipe version (recipe filter only).

RunLog tab

Image Builder saves runtime details for each policy execution. Each table row represents one execution:

- **Execution ID** – Unique identifier for the execution instance.
- **Execution status** – Current execution state.
- **Resource impacted** – Indicates whether the execution identified image resources for lifecycle actions.
- **Start date** – Timestamp when the execution started.
- **End date** – Timestamp when the execution ended. This field is empty if the execution is in progress or pending.

For execution status descriptions, see Execution statuses.

Viewing per-resource details

Run the list-lifecycle-execution-resources AWS CLI command with the execution ID to view individual resource outcomes. Each entry shows the action taken, its result (succeeded, failed, or skipped), and the reason.

Create lifecycle policies

When you create a new EC2 Image Builder lifecycle policy, the configuration depends on what kind of image the policy is for. The API action to create a lifecycle policy for AMI image resources and container image resources is the same (CreateLifecyclePolicy). However, the configuration for the image resources and associated resources is different. This section shows you how to create lifecycle management policies for both.

> **Note**
>
> Before you create a lifecycle policy, make sure that you've met all Prerequisites.

Create lifecycle management policies for Image Builder AMI image resources

You can use one of the following methods to create an AMI image lifecycle policy with the AWS Management Console or AWS CLI. You can also use the CreateLifecyclePolicy API action. For the associated SDK request, you can refer to the See Also link for that command in the *EC2 Image Builder API Reference*.

AWS Management Console

To create a lifecycle policy for AMI image resources in the AWS Management Console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Lifecycle policies** from the navigation pane.
3. Choose **Create lifecycle policy**.
4. Configure policy settings described in the following procedures.
5. To create the lifecycle policy after you've configured settings, choose **Create policy**.

Configure **General** settings for your policy.

1. Select the **AMI** option from **Policy type**.
2. Enter the **Policy name**.
3. Optionally enter a **Description** for your lifecycle policy.

4. By default, **Activate** is turned on. The default setting activates the lifecycle policy and adds it to the schedule right away. To create a policy that's initially deactivated, you can turn **Activate** off.
5. For the **IAM role**, select one of the following options:

   - **Create lifecycle execution role using service defaults** – Generates a pre-configured role with the `EC2ImageBuilderLifecycleExecutionPolicy` managed policy attached. This is the recommended option if you don't have specific custom permission requirements.
   - **Choose an existing role** – Select an existing IAM role from the dropdown list. The list filters out Service-Linked Roles (SLRs) that are not compatible with lifecycle policy execution.
   - **Create a new lifecycle execution role** – Opens the IAM console with pre-filled trust policy and lifecycle execution policy settings for one-click role creation. For step-by-step instructions, see Create an IAM role for Image Builder lifecycle management.

   > **Note**
   >
   > Service-Linked Roles are not compatible with lifecycle policy execution and are automatically filtered from the role selection. If you previously created a lifecycle policy with a Service-Linked Role, you can update the policy to use a compatible execution role.

Configure the **Rule scope** for your policy.

This section configures the resource selection for your lifecycle policy, based on the type of filter that you use.

1. **Filter type: Recipes** – To apply lifecycle rules to image resources based on the recipe that created them, select up to 50 recipe versions for the policy. You can use the split panel browser to search for recipes and select specific versions.

   You can also use wildcard patterns for the semantic version to target multiple versions of a recipe with a single policy. The following wildcard patterns are supported:

   - `x.x.x` – Matches all versions of the recipe.

- `1.x.x` – Matches all minor and patch versions within major version 1.
- `1.0.x` – Matches all patch versions within version 1.0.

Wildcard patterns are resolved to all matching recipe versions at execution time. This means that new recipe versions created after you set up the policy are automatically included in the next scheduled execution.

> **Note**
>
> Recipe versions created or deleted after a policy execution begins are not included until the next scheduled execution.

2. **Filter type: Tags** – To apply lifecycle rules to image resources based on resource tags, enter a list of up to 50 key value pairs for the policy to match on. Image Builder discovers resources through tag scanning and applies lifecycle rules to matching resources.

> **Note**
>
> Resources tagged or untagged after a policy execution begins are not included until the next scheduled execution.

Configure **Exclusion rules** for your policy (optional).

Exclusion rules define exceptions to the lifecycle rules. Resources that meet the criteria specified by the exclusion rules are excluded from lifecycle actions.

1. For AMI image policies, you can configure the following AMI exclusion rules:

   - **Exclude public AMIs** – Select this option to exclude public AMIs from lifecycle actions.
   - **Exclude AMIs by Region** – Specify AWS Regions to exclude from lifecycle actions.
   - **Exclude AMIs shared with accounts** – Specify AWS accounts whose shared AMIs should be excluded from lifecycle actions.
   - **Exclude recently launched AMIs** – Specify a time period to exclude AMIs that were recently used to launch instances.
   - **Exclude AMIs by tags** – Specify tags for AMIs that should be excluded from lifecycle actions.

2. For tag-based Image Builder image policies, you can specify tags for Image Builder image resources that should be excluded from lifecycle actions.

Turn on one or more of the following **Lifecycle rules** to apply to the resources that the lifecycle policy selects. If a resource matches on more than one lifecycle rule when the policy runs, Image Builder performs rule actions in the following order: 1) Deprecate, 2) Disable, 3) Delete.

Deprecate rule

Sets the Image Builder image resource status to `Deprecated`. Image Builder pipelines still run for deprecated images. You can optionally set the deprecation time for associated AMIs without affecting your ability to launch new instances.

- **Unit count** – Specify the integer value for the period of time that must pass after an image resource is created before it's marked as `Deprecated`.
- **Unit** – Select the time range to use. The range can be `Days`, `Weeks`, `Months`, or `Years`.
- **Deprecate AMIs** – Select the checkbox to mark associated Amazon EC2 AMIs with a deprecation date. The AMIs remain available, and you can still launch new instances from them.

Disable rule

Sets the Image Builder image resource status to `Disabled`. This prevents Image Builder pipelines from running for this image. You can optionally disable the associated AMI to prevent new instance launches.

- **Unit count** – Specify the integer value for the period of time that must pass after an image resource is created before it's marked as `Disabled`.
- **Unit** – Select the time range to use. The range can be `Days`, `Weeks`, `Months`, or `Years`.
- **Disable AMIs** – Select the checkbox to disable associated Amazon EC2 AMIs. You can no longer use the AMIs or launch new instances from them.

Delete rule

Deletes the image resources by age or by count. You define the threshold that meets your needs. When an Image Builder image resource passes the threshold, it's removed. You can

optionally deregister associated AMIs or delete the snapshots for those AMIs. You can also specify tags for resources that you want to retain past the threshold.

When you configure the **Delete rule** by age, Image Builder deletes the image resource after a period of time that you configure. For example, delete image resources after 6 months. When you configure by count, Image Builder retains the most recent number of images that you specify, or as close to that number as possible, and deletes earlier versions.

- **By age**
  - **Unit count** – Specify the integer value for the period of time that must pass after an image resource is created before it's deleted.
  - **Unit** – Select the time range to use. The range can be `Days`, `Weeks`, `Months`, or `Years`.
  - **Retain at least one image per recipe** – Select the check box to keep the latest available image resource for each recipe version that this rule affects.

  By count

  - **Image count** – Specify the integer value for the number of recent image resources to keep for each recipe version.
- **Deregister AMIs** – Select the check box to deregister associated Amazon EC2 AMIs. You can no longer use the AMIs or launch new instances from them.
- **Retain images, AMIs, and snapshots with associated tags** – Select the checkbox to enter a list of tags for image resources that you want to keep. Tags apply to image resources and Amazon EC2 AMIs. You can enter up to 50 key value pairs.

Tags (optional)

Add tags to your lifecycle policy.

AWS CLI

To create a new Image Builder lifecle policy, you can use the **create-lifecycle-policy** command in the AWS CLI.

Create lifecycle management policies for Image Builder container image resources

You can use one of the following methods to create a container image lifecycle policy with the AWS Management Console or AWS CLI. You can also use the CreateLifecyclePolicy API action. For the associated SDK request, you can refer to the See Also link for that command in the *EC2 Image Builder API Reference*.

AWS Management Console

To create a lifecycle policy for container image resources in the AWS Management Console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Lifecycle policies** from the navigation pane.
3. Choose **Create lifecycle policy**.
4. Configure policy settings described in the following procedures.
5. To create the lifecycle policy after you've configured settings, choose **Create policy**.

Policy configuration: General settings

Configure **General** settings for your policy.

1. Select the **Container image** option from **Policy type**.
2. Enter the **Policy name**.
3. Optionally enter a **Description** for your lifecycle policy.
4. By default, **Activate** is turned on. The default setting activates the lifecycle policy and adds it to the schedule right away. To create a policy that's initially deactivated, you can turn **Activate** off.
5. For the **IAM role**, select one of the following options:

   - **Create lifecycle execution role using service defaults** – Generates a pre-configured role with the `EC2ImageBuilderLifecycleExecutionPolicy` managed policy attached. This is the recommended option if you don't have specific custom permission requirements.

- **Choose an existing role** – Select an existing IAM role from the dropdown list. The list filters out Service-Linked Roles (SLRs) that are not compatible with lifecycle policy execution.
- **Create a new lifecycle execution role** – Opens the IAM console with pre-filled trust policy and lifecycle execution policy settings for one-click role creation. For step-by-step instructions, see Create an IAM role for Image Builder lifecycle management.

> **Note**
>
> Service-Linked Roles are not compatible with lifecycle policy execution and are automatically filtered from the role selection. If you previously created a lifecycle policy with a Service-Linked Role, you can update the policy to use a compatible execution role.

Configure the **Rule scope** for your policy.

This section configures the resource selection for your lifecycle policy, based on the type of filter that you use.

1. **Filter type: Recipes** – To apply lifecycle rules to image resources based on the recipe that created them, select up to 50 recipe versions for the policy. You can use the split panel browser to search for recipes and select specific versions.

   You can also use wildcard patterns for the semantic version to target multiple versions of a recipe with a single policy. The following wildcard patterns are supported:

   - `x.x.x` – Matches all versions of the recipe.
   - `1.x.x` – Matches all minor and patch versions within major version 1.
   - `1.0.x` – Matches all patch versions within version 1.0.

   Wildcard patterns are resolved to all matching recipe versions at execution time. This means that new recipe versions created after you set up the policy are automatically included in the next scheduled execution.

> **Note**
>
> Recipe versions created or deleted after a policy execution begins are not included until the next scheduled execution.

2. **Filter type: Tags** – To apply lifecycle rules to image resources based on resource tags, enter a list of up to 50 key value pairs for the policy to match on. Image Builder discovers resources through tag scanning and applies lifecycle rules to matching resources.

> **Note**
>
> Resources tagged or untagged after a policy execution begins are not included until the next scheduled execution.

Configure **Exclusion rules** for your policy (optional).

Exclusion rules define exceptions to the lifecycle rules. Resources that meet the criteria specified by the exclusion rules are excluded from lifecycle actions.

1. For AMI image policies, you can configure the following AMI exclusion rules:
   - **Exclude public AMIs** – Select this option to exclude public AMIs from lifecycle actions.
   - **Exclude AMIs by Region** – Specify AWS Regions to exclude from lifecycle actions.
   - **Exclude AMIs shared with accounts** – Specify AWS accounts whose shared AMIs should be excluded from lifecycle actions.
   - **Exclude recently launched AMIs** – Specify a time period to exclude AMIs that were recently used to launch instances.
   - **Exclude AMIs by tags** – Specify tags for AMIs that should be excluded from lifecycle actions.
2. For tag-based Image Builder image policies, you can specify tags for Image Builder image resources that should be excluded from lifecycle actions.

Delete rule

For container images, this rule deletes the Image Builder container image resource. You can optionally remove Docker images that were distributed to ECR repositories to prevent them from being used to run new containers.

When you configure the **Delete rule** by age, Image Builder deletes the image resource after a period of time that you configure. For example, delete image resources after 6 months. When you configure by count, Image Builder retains the most recent number of images that you specify, or as close to that number as possible, and deletes earlier versions.

- **By age**
  - **Unit count** – Specify the integer value for the period of time that must pass after an image resource is created before it's deleted.
  - **Unit** – Select the time range to use. The range can be `Days`, `Weeks`, `Months`, or `Years`.
  - **Retain at least one image** – Select the checkbox to keep only the latest available image resource for each recipe version that this rule affects.

  By count

  - **Image count** – Specify the integer value for the number of recent image resources to keep for each recipe version.
- **Delete ECR container images** – Select the check box to delete associated container images stored in an ECR repository. You can no longer use the container image as a base to create new images, or to run new containers.
- **Retain images with associated tags** – Select the checkbox to enter a list of tags for image resources that you want to keep.

Tags (optional)

Add tags to your lifecycle policy.

AWS CLI

To create a new Image Builder lifecle policy, you can use the **create-lifecycle-policy** command in the AWS CLI.

How lifecycle policy execution works

Image Builder runs enabled lifecycle policies on a recurring schedule. Each run is an *execution*. During an execution, Image Builder evaluates your image resources against the policy rules and performs the specified lifecycle actions.

Contents

- Execution schedule
- Execution statuses
- How resources are evaluated
- How retention works for delete rules
- Manually managing resource state
- Canceling an execution
- How lifecycle policies handle externally modified resources
- Monitoring execution results

Execution schedule

Image Builder runs enabled lifecycle policies once per day.

- Image Builder manages the exact execution time. You cannot configure it.
- Only one execution runs per policy at a time. An in-progress or pending execution continues rather than starting a new one.
- Disabled policies do not run, and disabling a policy stops any pending execution from processing new resources.

Execution statuses

Monitor lifecycle execution progress using the RunLog tab in the console or the list-lifecycle-executions AWS CLI command. Each execution reports one of these statuses:

`IN_PROGRESS`

Image Builder is actively evaluating resources and performing lifecycle actions.

`PENDING`

Processing is paused. It resumes during the next scheduled run.

`SUCCESS`

Image Builder processed all applicable resources successfully.

`FAILED`

One or more resource actions encountered an error. Use the list-lifecycle-execution-resources command to identify which resources failed and why.

`CANCELLING`

Image Builder received a cancellation request and is finishing the current processing step.

`CANCELLED`

The execution was canceled. Image Builder does not roll back resources processed before cancellation.

How resources are evaluated

Image Builder evaluates image resources from newest to oldest (by creation date) using these steps:

1. **Resource selection** – Image Builder identifies all image resources matching the policy scope, defined by either a recipe filter (including version patterns) or a tag filter.
2. **Active build check** – Image Builder skips images with a build in progress (building, testing, or distributing state) and evaluates them in the next run.
3. **Rule evaluation** – Image Builder evaluates rules in priority order: deprecate, then disable, then delete. Only one action applies to each image per execution. If an image matches a deprecate rule, Image Builder skips the disable and delete rules for that image during the same run.

   Evaluation differs by rule type:

   For deprecate and disable rules

   a. AGE filter check (if configured) – Image Builder checks whether the image is older than the specified threshold.

   b. Image-level tag exclusion check (`exclusionRules.tagMap`) – Image Builder skips images that have an exclusion tag.

For delete rules

a. AGE or COUNT filter check – For AGE, Image Builder checks whether the image is older than the threshold. For COUNT, Image Builder checks whether the retention count has been reached.

b. Failed or canceled check – Images in a failed or canceled state qualify for deletion and do not consume a retention slot.

c. Retention check – If you configured a `retainAtLeast` value (AGE filter) or a count value (COUNT filter), the newest images fill retention slots first. An image filling a retention slot stays without further evaluation.

d. Image-level tag exclusion check (`exclusionRules.tagMap`) – For images that pass the retention check (images that would otherwise be deleted), Image Builder checks for an exclusion tag. If present, Image Builder skips the image.

> **Important**
>
> Image Builder evaluates retention before tag exclusion. An image within the retention window remains protected regardless of exclusion tags. Tag exclusion applies only to images beyond the retention limit.

A tag-excluded image does not consume a retention slot and does not affect the retention count for other images.

4. **AMI-level exclusion checks** – After determining eligible images, Image Builder evaluates their output AMIs against AMI-level exclusion rules (`exclusionRules.amis`). These rules include Region exclusion, public AMI exclusion, AMI tag exclusion, shared account exclusion, and last-launched exclusion. Image Builder reports an output AMI that meets any exclusion criteria as `SKIPPED` with a reason that indicates the matched condition.

> **Note**
>
> Subsequent executions apply disable or delete rules to previously deprecated resources if they meet the criteria.

How retention works for delete rules

Retention filters (AGE and COUNT) evaluate against Image Builder image resources, not output AMIs or containers directly. Image Builder retains the newest images per recipe version and marks older images for deletion.

For detailed retention calculation logic, including age-based and count-based filter behavior, see How retention is calculated.

Manually managing resource state

You can trigger immediate lifecycle state changes for a specific image build version using the start-resource-state-update command, without waiting for the next scheduled run.

Supported transitions:

- **Deprecate** – Mark an image as deprecated.
- **Disable** – Prevent an image from launching new instances.
- **Delete** – Delete an image and its associated resources (you must specify at least one associated resource type).
- **Available** – Return a deprecated or disabled image to available state.

Each manual state change creates a separate lifecycle execution. Track it using the list-lifecycle-executions command.

Canceling an execution

Cancel an in-progress or pending execution using the cancel-lifecycle-execution command or the Image Builder console.

When you cancel an execution:

- The execution transitions to `CANCELLING` while finishing the current resource action.
- After the current action completes, the execution transitions to `CANCELLED`.
- Image Builder does not roll back already-processed resources. For example, an image deprecated before cancellation remains deprecated.
- Image Builder skips unprocessed resources.

How lifecycle policies handle externally modified resources

You or other AWS services can modify resources in your account outside of Image Builder lifecycle policies. Examples of external modifications:

- AMI deregistration through the Amazon EC2 console
- AMI deprecation using the Amazon EC2 API
- Container image deletion from an Amazon ECR repository
- Image Builder image resource deletion using the Image Builder API

If a resource is already deleted or already in the desired state, Image Builder reports the action as SUCCESS. The policy does not fail when resources have been cleaned up through other means.

> **Note**
>
> A SKIPPED status is different. Image Builder reports SKIPPED only when a resource exists but an exclusion rule prevents the action.

Monitoring execution results

Monitor lifecycle execution results at two levels:

Execution level

View all executions for a policy, including status, start time, and end time.

- **Console** – Open the lifecycle policy details page and choose the **RunLog** tab. For more information, see RunLog tab.
- **AWS CLI** – Run list-lifecycle-executions with the lifecycle policy ARN.

Resource level

View per-resource outcomes within an execution.

- **Console** – In the **RunLog** tab, choose an execution ID to view processed resources.
- **AWS CLI** – Run list-lifecycle-execution-resources with the execution ID.

Each resource entry includes:

- Resource ARN
- Action taken (or attempted)
- Resource status (`SUCCESS`, `FAILED`, or `SKIPPED`)
- Reason for the outcome (particularly useful for skipped or failed resources)

How lifecycle management rules work for Image Builder image resources

Lifecycle rules keep your images fresh and reduce infrastructure costs, such as snapshot storage for output AMIs and Amazon ECR repository storage for containers.

Lifecycle policies support these rule types:

Deprecate rule

Sets the Image Builder image resource status to `Deprecated`. Image Builder pipelines still run for deprecated images. You can optionally set the deprecation time for associated AMIs without affecting your ability to launch new instances.

Deprecated AMIs do not appear in general searches. For example, the Amazon EC2 **describe-images** command excludes deprecated AMIs from results. To find a deprecated AMI, specify its AMI ID directly.

> **Note**
>
> This rule does not apply to container-based images.

Disable rule

Sets the Image Builder image resource status to `Disabled`. This prevents Image Builder pipelines from running for this image. You can optionally disable the associated AMI to prevent new instance launches.

A disabled AMI becomes private and no longer launches new instances. Accounts, organizations, or organizational units that previously had shared access lose that access.

> **Note**
>
> This rule does not apply to container-based images.

Delete rule

Deletes the image resources by age or by count. You define the threshold that meets your needs. When an Image Builder image resource passes the threshold, it's removed. You can optionally deregister associated AMIs or delete the snapshots for those AMIs. You can also specify tags for resources that you want to retain past the threshold.

For container images, this rule deletes the Image Builder container image resource. You can also remove container images from ECR repositories to prevent new container launches.

Rule priority and evaluation order

When a policy has multiple rule types, Image Builder evaluates each resource in this order:

1. Deprecate rule
2. Disable rule
3. Delete rule

> **Important**
>
> Only one action applies to each resource per execution. If a resource matches a deprecate rule, Image Builder deprecates it and skips the disable and delete rules for that resource during the same run. In subsequent executions, Image Builder evaluates the resource against other rules if it meets their criteria.

This priority order supports a progressive lifecycle strategy. For example, you can configure a policy to deprecate images after 90 days, disable them after 120 days, and delete them after 180 days. Each execution applies only the highest-priority matching action.

Image states that skip rule evaluation

Image Builder skips images in certain states to prevent duplicate actions:

- **Deprecate rule** – Image Builder skips images that are already deprecated, disabled, failed, or canceled.
- **Disable rule** – Image Builder skips images that are already disabled, failed, or canceled.
- **Delete rule** – Image Builder evaluates images in any state for deletion, subject to retention rules and exclusions.

Contents

- AMI lifecycle exclusion rules
- Tags as resource selectors vs. exclusion rules
- How retention is calculated
- How lifecycle actions affect associated resources
- Allowed resource state transitions
- View rule details for a lifecycle policy

AMI lifecycle exclusion rules

Exclusion rules protect specific AMIs from lifecycle actions. Configure exclusion rules in the AWS Management Console, the API, or the AWS CLI.

Lifecycle policies support these exclusion rule types:

- **Tag-based exclusion** – Excludes Image Builder image resources with specific tags (up to 50 tags). For more information about how tags work at different resource levels, see Tags as resource selectors vs. exclusion rules.
- **Public AMI exclusion** – Excludes publicly shared AMIs.
- **Last launched exclusion** – Excludes AMIs that launched an instance within a specified time period.

> **Note**
>
> Amazon EC2 reports the last launched time with a 24-hour delay. Launches within the last 24 hours might not be reflected when the exclusion check runs.

- **Region exclusion** – Excludes AMIs in specific AWS Regions.
- **Shared account exclusion** – Excludes AMIs shared with specific AWS accounts.

> **Note**
>
> Image Builder skips images with a build in progress (pending, creating, building, importing, testing, distributing, or integrating state). Image Builder evaluates these images in the next scheduled run.

AMI exclusion rule evaluation order

EC2 Image Builder evaluates AMI-level exclusion rules (`exclusionRules.amis`) on the output AMI after determining eligibility for a lifecycle action. These rules apply to the Amazon EC2 AMI resource, not the Image Builder image resource. Retention counting runs separately. An excluded AMI does not consume a retention slot. Image Builder checks conditions in order and skips the AMI at the first match:

1. **Region exclusion** – Checks whether the AMI is in an excluded Region.
2. **Public AMI exclusion** – Checks whether the AMI is public and `isPublic` exclusion is enabled.
3. **Tag exclusion** – Checks whether the AMI has tags matching the exclusion tag map.
4. **Shared account exclusion** – Checks whether the AMI is shared with accounts listed in the exclusion.
5. **Last launched exclusion** – Checks whether the AMI launched within the excluded time window.

In execution resource details, skipped AMIs display a `SKIPPED` status with a reason that indicates which exclusion condition matched.

Tags as resource selectors vs. exclusion rules

Tags serve two distinct purposes in lifecycle policies. Each tag mechanism operates on a specific resource level:

- **Image Builder image** – The Image Builder resource that tracks a build (ARN format: `arn:aws:imagebuilder:`*`region`*`:`*`account`*`:image/`*`name`*`/`*`version`*). Manage tags on this resource through Image Builder.
- **Output AMI or container image** – The underlying Amazon EC2 AMI or Amazon ECR container image that Image Builder produces. Manage tags on these resources through Amazon EC2 or Amazon ECR respectively.

Tags as resource selectors (policy scope)

Tag-based resource selection evaluates tags on the *Image Builder image resource only*, not on output AMIs or containers. Image Builder uses these tags to *find* resources the policy applies to.

Configure tag-based resource selection in the `resourceSelection.tagMap` field. Each entry is a key-value pair. The policy selects Image Builder images matching *any* specified tag key-value pair (OR logic). Image Builder does not evaluate images without matching tags.

Tags as exclusion rules (rule-level exceptions)

Exclusion tags work in the opposite direction. After Image Builder selects resources based on the policy scope, it checks each resource against exclusion rules *before* taking any action. Configure exclusion tags at two levels, each operating on a different resource type:

`exclusionRules.tagMap`

Evaluates tags on the *Image Builder image resource only*. Does *not* check tags on underlying AMIs or containers. If an Image Builder image tag matches an entry (exact key and value match), Image Builder skips the image and all associated output resources.

`exclusionRules.amis.tagMap`

Evaluates tags on the *output AMI* (the Amazon EC2-level resource) during associated resource processing. Use this to exclude specific output AMIs based on their Amazon EC2 tags (for example, tags applied through distribution settings or directly through Amazon EC2).

Important

Resource selection and `exclusionRules.tagMap` do not evaluate tags on output AMIs (Amazon EC2 tags) or containers (Amazon ECR tags). To exclude output AMIs based on Amazon EC2 tags, use `exclusionRules.amis.tagMap`.

Example Tag selector and exclusion working together

A policy with these settings:

- Resource selection tag: `Environment: Production` (evaluated on Image Builder image resources)

- Image-level exclusion tag (`exclusionRules.tagMap`): `Retain: True` (evaluated on Image Builder image resources)
- AMI-level exclusion tag (`exclusionRules.amis.tagMap`): `SharedWith: Partner` (evaluated on output AMIs)

Image Builder performs these steps:

1. **Resource selection** – Image Builder finds all Image Builder image resources tagged `Environment: Production`.
2. **Image-level exclusion** – Image Builder checks each selected Image Builder image for the tag `Retain: True`. Image Builder skips images with this tag, including their output resources.
3. **AMI-level exclusion** – Image Builder checks output AMIs (Amazon EC2 resources) of remaining images for the tag `SharedWith: Partner`. AMIs with this tag are skipped.

How retention is calculated

When you configure retention settings for delete rules, the AGE and COUNT filters evaluate against your *Image Builder image resources*, not directly against output AMIs or containers.

> **Important**
>
> The AGE filter uses the Image Builder image resource creation date (set once the build completes), not the output AMI or container creation date. The COUNT filter counts Image Builder image resources per recipe version, not output AMIs or containers.

Retention calculation depends on how you specify recipe versions in your policy scope:

Specific version (for example, `1.0.0`)

Retention count applies to Image Builder images built with that exact recipe version. Image Builder retains the newest images (by creation date) first.

Wildcard version pattern (for example, `1.x.x`)

Retention count applies independently per matching recipe version. For example, `1.x.x` with a retention count of 5 retains the 5 newest images for `1.0.0`, the 5 newest for `1.1.0`, and so on.

Tag-based resource selection

With tag-based resource selection (see Tags as resource selectors vs. exclusion rules), retention is also calculated per recipe version. Image Builder sorts images newest-first within each version and applies retention counts independently per version group.

Age-based vs. count-based delete filters

Delete rules use one of two filter types to determine deletion eligibility:

AGE filter

Retains Image Builder images newer than the specified age threshold (in days, weeks, months, or years from the Image Builder image creation date). You can set `retainAtLeast` to keep a minimum number of the newest images per recipe version, regardless of age.

COUNT filter

Retains the newest N Image Builder images per recipe version. All images beyond the specified count qualify for deletion.

Additional retention behaviors apply:

- Failed or canceled Image Builder images do not count toward retention limits and always qualify for deletion.
- Image Builder processes images newest-first and applies retention counts before evaluating deletion eligibility.

How lifecycle actions affect associated resources

Lifecycle actions on an Image Builder image affect associated output AMIs or containers, depending on rule type and configuration:

Deprecate

Sets the Image Builder image resource status to `Deprecated`. You can also deprecate associated output AMIs. Deprecated AMIs do not appear in general searches but remain usable by AMI ID. Image Builder adds a `DeprecatedBy: EC2 Image Builder` tag to each deprecated AMI.

Applies to AMI-based images only, not containers.

Disable

Sets the Image Builder image resource status to `Disabled`. You can also disable associated output AMIs. Disabled AMIs become private and no longer launch new instances.

Applies to AMI-based images only, not containers.

Delete

Deletes the Image Builder image resource. You can also remove:

- Output AMIs distributed to other AWS Regions and accounts
- Snapshots associated with those AMIs
- Containers distributed to Amazon ECR repositories

Applies to both AMI-based and container-based images.

> **Note**
>
> Image Builder makes lifecycle action decisions at the image level. Associated output resources (AMIs, snapshots, containers) change only if you configured the rule to include them.

Allowed resource state transitions

Lifecycle policies and the `StartResourceStateUpdate` API transition image resources between these states:

Available → Deprecated

Marks an available image as deprecated. The image remains usable by AMI ID but does not appear in general searches. Image Builder adds a `DeprecatedBy: EC2 Image Builder` tag for tracking.

Available or Deprecated → Disabled

Makes the AMI private and prevents new instance launches. If the AMI was previously deprecated, Image Builder removes the deprecated tag because the image moved to a more restrictive state.

Any non-building state → Deleted

Deregisters the AMI or deletes the container image from ECR. You can include associated snapshots or underlying containers for deletion.

Deprecated or Disabled → Available

The `StartResourceStateUpdate` API returns a deprecated or disabled image to available state. This reverses deprecation, re-enables the AMI, and removes the deprecation date and DeprecatedBy tag. This transition works only through the manual API, not automated policy execution.

Note

Images currently being built (in pending, creating, building, importing, testing, distributing, or integrating state) do not change state. A manual state update on an image with an active build fails with an error.

View rule details for a lifecycle policy

In the console, the lifecycle policy details page has a Rules tab that shows rule details for the policy.

In the AWS CLI, run the get-lifecycle-policy command. The response includes all configured actions (rules) with their settings.

Configure custom images with Image Builder

Configuration resources are the building blocks that make up image pipelines, as well as the images those pipelines produce. This chapter covers creating, maintaining, and sharing Image Builder resources, including components, recipes, and images, along with infrastructure configuration and distribution settings.

> **Note**
>
> To help you manage your Image Builder resources, you can assign your own metadata to each resource in the form of tags. You use tags to categorize your AWS resources in different ways; for example, by purpose, owner, or environment. This is useful when you have many resources of the same type. You can more readily identify a specific resource based on the tags you've assigned to it.
> For more information about tagging your resources using Image Builder commands in the AWS CLI, see the Tag resources section of this guide.

Contents

- Manage recipes in Image Builder
- Manage Image Builder infrastructure configuration
- Manage Image Builder distribution settings

Manage recipes in Image Builder

An EC2 Image Builder recipe is the blueprint for creating a customized machine image. A recipe specifies three key elements:

1. **Base image** – The starting point for your image (an AMI, a container image, or an imported VM).
2. **Components** – The build and test steps that customize your image. Components are optional. This design supports testing and distribution-only workflows.
3. **Configuration** – Storage volumes, instance settings, the working directory, and other build-time parameters.

Image Builder supports two types of recipes:

- **Image recipes** produce Amazon Machine Images (AMIs) that you can use to launch Amazon EC2 instances.
- **Container recipes** produce Docker container images stored in Amazon ECR repositories.

Recipes are immutable. After you create a recipe, you can't modify or replace it. To update components or any other configuration, you must create a new recipe or recipe version. Image Builder retains all previous versions. This lets you trace image lineage back to the exact recipe that produced each output. You can always apply tags to your existing recipes. For more information about tagging your resources using Image Builder commands in the AWS CLI, see the Tag resources section of this guide.

> **Tip**
>
> You can use Amazon managed components in your recipes, or you can develop your own custom components. For more information, see Develop custom components for your Image Builder image. For image recipes that create output AMIs, you can also use AWS Marketplace image products and components. For more information about integration with AWS Marketplace products, see AWS Marketplace integration in Image Builder.

Use the topics in this section to manage your EC2 Image Builder recipes, including listing existing recipes, viewing their details, and creating new recipe versions.

Contents

- Image recipes compared to container recipes
- Recipe versioning
- Recipe constraints and limits
- List and view image recipe details
- List and view container recipe details
- Create a new version of an image recipe
- Create a new version of a container recipe
- Track AMI lineage with watermarks
- Clean up resources

Image recipes compared to container recipes

The following table compares the features of image recipes and container recipes.

Feature	Image recipe	Container recipe
Output	AMI	Docker container image in Amazon ECR
Base image sources	AMI ID, Image Builder image ARN, SSM parameter, AWS Marketplace product	Docker Hub image, Amazon ECR image, Amazon-managed image, Image Builder image ARN
Dockerfile	Not applicable	Required (template with contextual variables)
Target repository	Not applicable	Amazon ECR (required)
Storage configuration	Block device mappings for the output AMI	Block device mappings for the build instance
User data	Supported (overrides default cloud-init)	Not supported at recipe level
Systems Manager agent control	Configurable (uninstall after build)	Not configurable
AWS Marketplace components	Supported	Not supported
Platform override	Not applicable (detected from AMI)	Available for Amazon ECR and Docker Hub images

Recipe versioning

Every recipe uses semantic versioning in the format *<major>.<minor>.<patch>*. Each version node accepts values from 0 to 1,073,741,823 (2^30 - 1).

You can use a wildcard (x) in one position to enable automatic version incrementing. When you create a recipe with a wildcard version, Image Builder replaces the x with the next available number for that position.

Pattern	Behavior	Example sequence
1.0.x	Increments the patch number	1.0.1, 1.0.2, 1.0.3, ...
1.x.0	Increments the minor number	1.1.0, 1.2.0, 1.3.0, ...
x.0.0	Increments the major number	1.0.0, 2.0.0, 3.0.0, ...

The following rules apply to wildcard versions:

- Only one x wildcard is allowed per version string.
- The wildcard can appear in any single position (major, minor, or patch).
- The numeric values in the remaining positions must be explicit integers.

Tip

Use wildcard versions in your CI/CD automation so that you don't have to track and increment recipe versions by hand. Each time you create a recipe with the same wildcard, Image Builder resolves the next available version. For example, a recipe that always uses 1.0.x resolves to 1.0.1, then 1.0.2, and so on. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

Recipe constraints and limits

Before you create a recipe, review the following constraints.

Constraint	Limit	Notes
Components per recipe	20 (default)	Includes both build and test components. You can request an increase through AWS Support.

Constraint	Limit	Notes
Maximum recipe size	25 KB	The cumulative size of all component configurations, including parameter values.
Product codes per output image	9	Combined from the base image and AWS Marketplace components.
Component uniqueness	One per recipe	The same component (regardless of version) can appear only once.
Version node maximum	1,073,741,823	Per node (major, minor, or patch).
Recipe name	Cannot be changed	The name is fixed after creation. Create a new recipe for a different name.

Components must also meet the following compatibility requirements:

- Components must match the recipe's platform (Linux, Windows, or macOS).
- Components must support the parent image's OS version, when OS version metadata is available.
- Components with a `DEPRECATED` or `DISABLED` status can't be added to new recipes.
- CIS hardening components require a CIS-published parent image.

List and view image recipe details

This section describes the various ways that you can find information and view details for your EC2 Image Builder image recipes.

Image recipe details

- List image recipes from the console
- List image recipes from the AWS CLI
- View image recipe details from the console
- Get image recipe details from the AWS CLI
- Get image recipe policy details from the AWS CLI

List image recipes from the console

To see a list of the image recipes created under your account in the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Image recipes** from the navigation pane. This shows a list of the image recipes that are created under your account.
3. To view details or create a new recipe version, choose the **Recipe name** link. This opens the detail view for the recipe.

> **Note**
>
> You can also select the check box next to the **Recipe name**, then choose **View details**.

List image recipes from the AWS CLI

The following example shows how to list all of your image recipes, using the AWS CLI.

```
aws imagebuilder list-image-recipes
```

The command returns a summary for each image recipe, shown in the following example output.

```
{
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "imageRecipeSummaryList": [
        {
            "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-
recipe/1.0.0",
            "name": "my-recipe",
            "platform": "Linux",
            "owner": "123456789012",
            "parentImage": "arn:aws:imagebuilder:us-west-2:aws:image/amazon-linux-2023-
x86/x.x.x",
            "dateCreated": "2024-01-15T10:30:00.000Z",
            "tags": {
                "Environment": "Production"
            }
        }
```

```
    ]
}
```

You can filter the results by owner to control which recipes the command returns.

```
aws imagebuilder list-image-recipes --owner Self
```

Use `Self` to list the recipes that you own, or `Shared` to list recipes that other accounts have shared with you.

```
aws imagebuilder list-image-recipes --owner Shared
```

To limit the number of results that the command returns on each page, use the `--max-results` parameter. If more results are available, the response includes a `nextToken` value that you pass to the next command to retrieve the following page.

```
aws imagebuilder list-image-recipes --max-results 10 --next-token "eyJuZXh0VG9rZW4..."
```

View image recipe details from the console

To view details for a specific image recipe using the Image Builder console, select the image recipe to review, using the steps described in List image recipes from the console.

On the recipe detail page, you can:

- Delete the recipe. For more information about deleting resources in Image Builder, see Delete outdated or unused Image Builder resources.
- Create a new version.
- Create a pipeline from the recipe. After choosing **Create pipeline from this recipe**, you are taken to the pipeline wizard. For more information about creating an Image Builder pipeline using the pipeline wizard, see Tutorial: Create an image pipeline with output AMI from the Image Builder console wizard

> **Note**
>
> When you create a pipeline from an existing recipe, the option to create a new recipe is not available.

Get image recipe details from the AWS CLI

The following example shows how to use an **imagebuilder** CLI command to get the details of an image recipe by specifying its Amazon Resource Name (ARN).

```
aws imagebuilder get-image-recipe --image-recipe-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-recipe/my-recipe/1.0.0
```

The command returns the full image recipe, shown in the following example output.

```
{
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "imageRecipe": {
        "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-
recipe/1.0.0",
        "name": "my-recipe",
        "description": "My Linux image recipe",
        "platform": "Linux",
        "version": "1.0.0",
        "components": [
            {
                "componentArn": "arn:aws:imagebuilder:us-
west-2:123456789012:component/my-component/1.0.0/1"
            }
        ],
        "parentImage": "arn:aws:imagebuilder:us-west-2:aws:image/amazon-linux-2023-x86/
x.x.x",
        "dateCreated": "2024-01-15T10:30:00.000Z",
        "tags": {},
        "owner": "123456789012"
    }
}
```

Get image recipe policy details from the AWS CLI

A recipe policy is a resource-based policy. It controls cross-account access to your recipe. When you share a recipe through AWS Resource Access Manager (AWS RAM), Image Builder creates the policy automatically. You can also set a custom policy with the `put-image-recipe-policy` command.

> **Note**
>
> If you set the resource policy directly with `put-image-recipe-policy`, you must then promote the resource to a AWS RAM resource share so that it's visible to the principals you share it with. For more information, see Option 2: Apply a resource policy and promote to an existing resource share.

The following example shows how to use an **imagebuilder** CLI command to get the details of an image recipe policy by specifying its ARN. If no policy is attached to the recipe, the response is empty.

```
aws imagebuilder get-image-recipe-policy --image-recipe-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-recipe/my-recipe/1.0.0
```

List and view container recipe details

This section describes the ways that you can find information and view details for your EC2 Image Builder container recipes.

Container recipe details

- List container recipes in the console
- List container recipes with the AWS CLI
- View container recipe details in the console
- Get container recipe details with the AWS CLI
- Get container recipe policy details with the AWS CLI

List container recipes in the console

To see a list of the container recipes that have been created under your account in the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Container recipes** from the navigation pane. This shows a list of the container recipes that are created under your account.

3. To view details or create a new recipe version, choose the **Recipe name** link. This opens the detail view for the recipe.

> **Note**
>
> You can also select the check box next to the **Recipe name**, and then choose **View details**.

List container recipes with the AWS CLI

The following example shows how to list all of your container recipes, using the AWS CLI.

```
aws imagebuilder list-container-recipes
```

The command returns a summary for each container recipe, shown in the following example output.

```
{
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "containerRecipeSummaryList": [
        {
            "arn": "arn:aws:imagebuilder:us-west-2:123456789012:container-recipe/my-container-recipe/1.0.0",
            "name": "my-container-recipe",
            "containerType": "DOCKER",
            "platform": "Linux",
            "owner": "123456789012",
            "dateCreated": "2024-01-15T10:30:00.000Z",
            "tags": {}
        }
    ]
}
```

You can filter the results by owner to control which recipes the command returns. Use `Self` to list the recipes that you own, or `Shared` to list recipes that other accounts have shared with you.

```
aws imagebuilder list-container-recipes --owner Self
```

To limit the number of results that the command returns on each page, use the `--max-results` parameter. If more results are available, the response includes a `nextToken` value that you pass to the next command to retrieve the following page.

```
aws imagebuilder list-container-recipes --max-results 10 --next-token
 "eyJuZXh0VG9rZW4..."
```

View container recipe details in the console

To view details for a specific container recipe with the Image Builder console, select the container recipe to review, and use the steps described in List container recipes in the console.

On the recipe detail page, you can do the following:

- Delete the recipe. For more information on how to delete resources in Image Builder, see Delete outdated or unused Image Builder resources.
- Create a new version.
- Create a pipeline from the recipe. After you choose **Create pipeline from this recipe**, the console opens the pipeline wizard. For more information about creating an Image Builder pipeline using the pipeline wizard, see Tutorial: Create an image pipeline with output AMI from the Image Builder console wizard

> **Note**
>
> When you create a pipeline from an existing recipe, the option to create a new recipe isn't available.

Get container recipe details with the AWS CLI

The following example shows how to use an **imagebuilder** CLI command to get the details of a container recipe by specifying its ARN.

```
aws imagebuilder get-container-recipe --container-recipe-arn arn:aws:imagebuilder:us-
west-2:123456789012:container-recipe/my-container-recipe/1.0.2
```

The command returns the full container recipe, shown in the following example output.

```
{
```

```
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "containerRecipe": {
        "arn": "arn:aws:imagebuilder:us-west-2:123456789012:container-recipe/my-
container-recipe/1.0.2",
        "containerType": "DOCKER",
        "name": "my-container-recipe",
        "description": "My Linux Docker container image",
        "platform": "Linux",
        "components": [
            {
                "componentArn": "arn:aws:imagebuilder:us-
west-2:123456789012:component/my-component/1.0.0/1"
            }
        ],
        "parentImage": "amazonlinux:latest",
        "dockerfileTemplateData": "FROM
 {{{ imagebuilder:parentImage }}}\n{{{ imagebuilder:environments }}}\n{{{ imagebuilder:componen
        "targetRepository": {
            "service": "ECR",
            "repositoryName": "my-repo"
        },
        "dateCreated": "2024-01-15T10:30:00.000Z",
        "owner": "123456789012"
    }
}
```

Get container recipe policy details with the AWS CLI

A recipe policy is a resource-based policy. It controls cross-account access to your recipe. When you share a recipe through AWS Resource Access Manager (AWS RAM), Image Builder creates the policy automatically. You can also set a custom policy with the `put-container-recipe-policy` command.

The following example shows how to use an **imagebuilder** CLI command to get the details of a container recipe policy by specifying its ARN. If no policy is attached to the recipe, the response is empty.

```
aws imagebuilder get-container-recipe-policy --container-recipe-arn
 arn:aws:imagebuilder:us-west-2:123456789012:container-recipe/my-container-recipe/1.0.2
```

Create a new version of an image recipe

This section shows you how to create an image recipe or a new version of an existing recipe. An image recipe defines the base AMI, the build components, and the configuration. Use this recipe to create Amazon Machine Images (AMIs) with Image Builder. You can create image recipes from the Image Builder console or with the AWS CLI.

Contents

- Create a new image recipe version from the console
- Create an image recipe with the AWS CLI
- Import a VM as your base image in the console

Create a new image recipe version from the console

When you create a new recipe version, it's virtually the same as creating a new recipe. The difference is that certain details are pre-selected to match the base recipe, in most cases. The following list describes the differences between creating a new recipe and creating a new version of an existing recipe.

Base recipe details in the new version

- **Name** – *Not editable*.
- **Version** – Required. Enter the version number that you want to create in the format *<major>.<minor>.<patch>*. Image Builder supports automatic version incrementing for recipes, allowing you to use wildcard patterns in your recipe versions. When you create a recipe with a wildcard version such as `1.0.x`, Image Builder automatically increments the version (for example, `1.0.1`, `1.0.2`, `1.0.3`, and so on). This eliminates the need to manually track and increment recipe versions.
- The **Select image** option – Pre-selected, but you can edit it. If you change your choice for the source of your base image, you might lose other details that depend on the original option that you chose.

  To see details that are associated with your base image selection, choose the tab that matches your selection.

  Managed image

  - **Image Operating System (OS)** – *Not editable*.

- **Image name** – Pre-selected, based on the combination of base image choices that you made for the existing recipe. However, if you change the **Select image** option, you lose the pre-selected **Image name**.
- **Auto-versioning options** – Does *not* match your base recipe. This image option defaults to the **Use selected OS version** option.

> **Important**
>
> If you're using semantic versioning to kick off pipeline builds, make sure that you change this value to **Use latest available OS version**. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

AWS Marketplace image

- **Subscriptions** – This tab should be open, and the subscribed image from AWS Marketplace should be pre-selected to match your base recipe. If you change the image that your recipe uses as its base image, you might lose other details that depend on the original image that you chose.

For more information about AWS Marketplace products, see Buying products in the *AWS Marketplace Buyer Guide*.

Custom AMI

AMI source (Required) - Enter the AMI ID or an AWS Systems Manager (SSM) Parameter Store parameter that contains an AMI ID to use as the base image. The SSM Agent must be pre-installed in the selected AMI.

- **AMI ID** – This setting is not pre-filled with your original entry. Enter the AMI ID for your base image. Example: *ami-1234567890abcdef1*.
- **SSM parameter** – Enter the name or ARN of the SSM Parameter Store parameter that contains the AMI ID for your base image. Example: */ib/test/param* or `arn:aws:ssm:`*us-east-1*`:`*111122223333*`:parameter`*/ib/test/param*.

- **Instance configuration** – Settings are pre-selected, but you can edit them.
  - **Systems Manager agent** – You can select or clear this check box to control installation of the Systems Manager agent on the new image. By default, this check box stays clear, and Image Builder keeps the Systems Manager agent in your final AMI. To remove the Systems Manager agent from the final image, select the check box.

- **User data** – You can use this area to provide commands, or a command script to run, when you launch your build instance. However, this value replaces any commands that Image Builder might have added to ensure that Systems Manager is installed. These commands include the clean-up script that Image Builder normally runs for Linux images prior to creating the new image.

  When Image Builder launches an instance, user data scripts run during the cloud-init phase, before component execution begins. This step is logged to the following file on the instance: `var/log/cloud-init.log`.

  > **Note**
  >
  > - If you enter user data, make sure that the Systems Manager agent is pre-installed on your base image, or that you include the install in your user data.
  > - For Linux images, ensure that clean-up steps run by including a command to create an empty file named `perform_cleanup` in your user data script. Image Builder detects this file, and runs the clean-up script prior to creating the new image. For more information and a sample script, see Security best practices for Image Builder.

- **Working directory** – Pre-selected, but you can edit it.
- **Components** – Components that are already included in the recipe are displayed in the **Selected components** section at the end of each of the component lists (build and test). You can remove or reorder the selected components to suit your needs.

  CIS hardening components don't follow the standard component ordering rules in Image Builder recipes. The CIS hardening components always run last to ensure that the benchmark tests run against your output image.

  > **Note**
  >
  > Build and test component lists display available components based on the component owner type. To add a component, choose **Add build components**, and select the ownership filter that applies. For example, to add a build component that's associated with an AWS Marketplace product, select `AWS Marketplace`. This opens a selection panel on the right side of the console interface that lists AWS Marketplace components. For the CIS component, select `Third party managed`.

You can configure the following settings for your selected component:

- **Versioning options** – Pre-selected, but you can change them. We recommend that you choose the **Use latest available component version** option to ensure that your image builds always pick up the latest version of the component. If you need to use a specific component version in your recipe, you can choose **Specify component version**, and enter the version in the **Component version** box that appears.
- **Input parameters** – Displays input parameters that the component accepts. The **Value** is pre-filled with the value from the prior version of the recipe. If you are using this component for the first time in this recipe, and a default value was defined for the input parameter, the default value appears in the **Value** box with greyed-out text. If no other value is entered, Image Builder uses the default value.

  If an input parameter is required, but doesn't have a default value defined in the component, you must provide a value. Image Builder won't create the recipe version if there are any required parameters that are missing and don't have a default value defined.

  > **Important**
  >
  > Component parameters are plain text values, and are logged in AWS CloudTrail. We recommend that you use AWS Secrets Manager or the AWS Systems Manager Parameter Store to store your secrets. For more information about Secrets Manager, see What is Secrets Manager? in the *AWS Secrets Manager User Guide*. For more information about AWS Systems Manager Parameter Store, see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

To expand settings for **Versioning options** or **Input parameters**, you can choose the arrow next to the name of the setting. To expand all of the settings for all selected components, you can toggle the **Expand all** switch off and on.

- **Storage (volumes)** – are pre-filled. The root volume **Device name**, **Snapshot**, and **IOPS** selections, are not editable. However, you can change all of the remaining settings, such as the **Size**. You can also add new volumes, and encrypt new or existing volumes.

  To encrypt volumes for the images that Image Builder creates under your account in the source Region (where the build runs), you must use the storage volume encryption in the image recipe.

Encryption that runs during the distribution phase of the build is only for images that are distributed to other accounts or Regions.

> **Note**
>
> If you use encryption for your volumes, you must select the key for each volume separately, even if the key is the same one that's used for the root volume.

> **Note**
>
> If you don't have an existing recipe, use the Image Builder pipeline wizard, or choose **Image recipes** from the navigation pane and then choose **Create image recipe**. The fields described in this section apply to both new recipes and new versions.

To create a new image recipe version:

1. At the top of the recipe details page, choose **Create new version**. This opens the **Create image recipe** page.
2. To create the new version, make your changes, and then choose **Create recipe**.

   Your final image can contain up to nine product codes from AWS Marketplace image products and components. Image Builder returns an error during recipe creation if your base image and components exceed this limit.

Review the following constraints before you create an image recipe:

- Your final image can contain at most nine AWS Marketplace product codes, combined from the base image and components. A product code is an identifier that AWS Marketplace attaches to a paid or supported AMI for billing and licensing.

> **Tip**
>
> Components published through AWS Marketplace can also carry product codes. Image Builder reads the product codes from each component's metadata. It counts the distinct product code IDs, along with the product codes on the base AMI, toward the limit.

To check the product codes on a base AMI, run the Amazon EC2 describe-images command and query the `ProductCodes` field, as shown in the following example:

```
aws ec2 describe-images --image-ids ami-example12345 --query
 "Images[].ProductCodes"
```

- You can include up to 20 components (build and test combined). This is the default limit, which you can request to increase through AWS Support.
- The same component can't appear more than once in a recipe.
- All components must match the platform (Linux, Windows, or macOS) of your base image. Components must also support the OS version when that metadata is available.

For more information about creating an image recipe when you create an image pipeline, see Step 2: Choose recipe in the **Get started** section of this guide.

Create an image recipe with the AWS CLI

To create an image recipe with the Image Builder `create-image-recipe` command in the AWS CLI, follow these steps:

Prerequisites

Before you run the Image Builder commands in this section to create an image recipe from the AWS CLI, you can optionally create components that the recipe uses. The image recipe example in the following step refers to example components that are created in the Create a custom component from the AWS CLI section of this guide.

If you want to include components in your recipe, note the ARNs that you want to include. You can also create recipes without any components for testing existing AMIs or distribution-only workflows.

1. **Create a CLI input JSON file**

   You can provide all of the input for the **create-image-recipe** command with inline command parameters. However, the resulting command can be quite long. To streamline the command, you can instead provide a JSON file that contains all of the recipe settings.

> **Note**
>
> The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API operation request parameters, see the CreateImageRecipe command in the *EC2 Image Builder API Reference*.
> To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*.

Here is a summary of the parameters that these examples specify:

- **name** (string, required) – The name of the image recipe.
- **description** (string) – The description of the image recipe.
- **parentImage** (string, required) – The image that the image recipe uses as a base for your customized image. You can specify the parent image using one of the following options:
  - **AMI ID** – Use when you have a specific AMI (for example, `ami-1234567890abcdef1`) that you want to customize. Because an AMI ID is static, we recommend an Image Builder image ARN or an SSM parameter instead when you want your recipe to pick up newer base images automatically.
  - **Image Builder image resource ARN** – Use when you want to build on top of an Image Builder image. This includes Amazon-managed images that Image Builder provides for the most popular operating systems, as well as images that you previously created. Specify the image ARN with a semantic version, or use a version wildcard to always get the latest version.
  - **AWS Systems Manager (SSM) Parameter Store parameter** – Use when you want your recipe to automatically pick up new AMI IDs without creating a new recipe version. Prefix the parameter with `ssm:`, followed by the parameter name or ARN. This is ideal for pipelines that should always use the latest Amazon Linux or Windows base image.
  - **AWS Marketplace product ID** – Use when you subscribe to an AMI product in AWS Marketplace and want to customize it further. You can specify the product ID in either of the following formats:
    - A universally unique identifier (UUID), for example `722e1255-be34-4bbe-9ce6-80634c9d01f7`.

- A product ID with the `prod-` prefix, for example `prod-example12345`.

  Subscribe to the product before you use it as a parent image. For more information, see AWS Marketplace integration in Image Builder.

  Note

  - When you use an AMI ID or an SSM parameter that resolves to an AMI, you must have access to that AMI in your account. The AMI must also exist in the same Region where Image Builder runs the build.
  - The Linux and macOS examples specify an AMI ID, and the Windows example uses an Image Builder image ARN.
  - The `parentImage` parameter accepts an AMI ID, an Image Builder image ARN, an `ssm:` parameter reference, or an AWS Marketplace product ID. If the value doesn't match one of these formats, Image Builder returns an `InvalidParameterValueException` for the `parentImage` parameter.

- **semanticVersion** (string, required) – Enter the version number that you want to create in the format *<major>.<minor>.<patch>*. Image Builder supports automatic version incrementing for recipes, allowing you to use wildcard patterns in your recipe versions. When you create a recipe with a wildcard version such as `1.0.x`, Image Builder automatically increments the version (for example, `1.0.1`, `1.0.2`, `1.0.3`, and so on). This eliminates the need to manually track and increment recipe versions. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.
- **components** (array, optional) – Contains an array of `ComponentConfiguration` objects. Components are optional - you can create recipes without any components for testing or distribution workflows:

  Note

  Image Builder installs components in the order that you specified them in the recipe. However, CIS hardening components always run last to ensure that the benchmark tests run against your output image.

  - **componentARN** (string, required) – The component ARN.

> **Tip**
>
> To use one of the examples to create your own image recipe, you must replace the example ARNs with the ARNs for the components that you are using for your recipe.

- **parameters** (array of objects) – Contains an array of `ComponentParameter` objects. If an input parameter is required, but doesn't have a default value defined in the component, you must provide a value. Image Builder won't create the recipe version if there are any required parameters that are missing and don't have a default value defined.

  > **Important**
  >
  > Component parameters are plain text values, and are logged in AWS CloudTrail. We recommend that you use AWS Secrets Manager or the AWS Systems Manager Parameter Store to store your secrets. For more information about Secrets Manager, see What is Secrets Manager? in the *AWS Secrets Manager User Guide*. For more information about AWS Systems Manager Parameter Store, see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

  - **name** (string, required) – The name of the component parameter to set.
  - **value** (array of strings, required) – Contains an array of strings to set the value for the named component parameter. If there is a default value defined for the component, and no other value is provided, AWSTOE uses the default value.

- **amiWatermarks** (array of strings, optional) – A list of watermark names to attach to output AMIs built from this recipe. Watermarks are lineage markers that help you trace the history of your images. Specify 1 to 5 names. Each name must be 3 to 128 characters, and can include letters, numbers, spaces, and the following special characters: `( ) [ ] . / - ' @ _`. For more information, see Track AMI lineage with watermarks.
- **additionalInstanceConfiguration** (object) – Specify additional settings and launch scripts for your build instances.
  - **systemsManagerAgent** (object) – Contains settings for the Systems Manager agent on your build instance.

> **Note**
>
> Windows recipes don't support the `systemsManagerAgent` configuration. If you include it with a Windows parent image, the request fails.

- **uninstallAfterBuild** (Boolean) – Controls whether the Systems Manager agent is removed from your final build image prior to creating the new AMI. If this option is set to `true`, then the agent is removed from the final image. If the option is set to `false`, then the agent is left in so that it is included in the new AMI. The default value is `false`.

  > **Note**
  >
  > If the `uninstallAfterBuild` attribute isn't included in the JSON file, and the following conditions are true, then Image Builder removes the Systems Manager agent from the final image so that it isn't available in the AMI:
  >
  > - The `userDataOverride` is empty or has been omitted from the JSON file.
  > - Image Builder automatically installed the Systems Manager agent on the build instance for an operating system that didn't have the agent pre-installed on the base image.

- **userDataOverride** (string) – Provide commands or a command script to run when you launch your build instance.

  > **Note**
  >
  > The user data is always base 64 encoded. For example, the following commands are encoded as `IyEvYmluL2Jhc2gKbWtkaXIgLXAgL3Zhci9iYi8KdG91Y2ggL3Zhcg==`:
  >
  > ```
  > #!/bin/bash
  > mkdir -p /var/bb/
  > touch /var
  > ```
  >
  > The Linux example uses this encoded value.

Linux

The base image (`parentImage` property) in the following example is an AMI. When you use an AMI, you must have access to the AMI, and the AMI must be in the source Region (the same Region where Image Builder runs the command). Save the file as `create-image-recipe.json`, and use it in the **create-image-recipe** command.

```
{
"name": "BB Ubuntu Image recipe",
"description": "Hello World image recipe for Linux.",
"parentImage": "ami-1234567890abcdef1",
"semanticVersion": "1.0.0",
"components": [
 {
  "componentArn": "arn:aws:imagebuilder:us-west-2:111122223333:component/bb$"
 }
],
"additionalInstanceConfiguration": {
 "systemsManagerAgent": {
   "uninstallAfterBuild": true
 },
 "userDataOverride": "IyEvYmluL2Jhc2gKbWtkaXIgLXAgL3Zhci9iYi8KdG91Y2ggL3Zhcg=="
}
}
```

Windows

The following example refers to the latest version of the Windows Server 2016 English Full Base image. The ARN in this example references the latest image based on the semantic version filters that you've specified: `arn:aws:imagebuilder:us-west-2:aws:image/windows-server-2016-english-full-base-x86/x.x.x`.

```
{
"name": "MyBasicRecipe",
"description": "This example image recipe creates a Windows 2016 image.",
"parentImage": "arn:aws:imagebuilder:us-west-2:aws:image/windows-server-2016-english-full-base-x86/x.x.x",
"semanticVersion": "1.0.0",
"components": [
 {
```

```
  "componentArn": "arn:aws:imagebuilder:us-west-2:111122223333:component/my-example-component/2019.12.02/1"
 },
 {
  "componentArn": "arn:aws:imagebuilder:us-west-2:111122223333:component/my-imported-component/1.0.0/1"
 }
]
}
```

> **Note**
>
> To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

macOS

The base image (`parentImage` property) in the following example is an AMI. When you use an AMI, you must have access to the AMI, and the AMI must be in the source Region (the same Region where Image Builder runs the command). Save the file as `create-image-recipe.json`, and use it in the **create-image-recipe** command.

```
{
"name": "macOS Catalina Image recipe",
"description": "Hello World image recipe for macOS.",
"parentImage": "ami-1234567890abcdef1",
"semanticVersion": "1.0.0",
"components": [
 {
  "componentArn": "arn:aws:imagebuilder:us-west-2:111122223333:component/catalina$"
 }
],
"additionalInstanceConfiguration": {
 "systemsManagerAgent": {
   "uninstallAfterBuild": true
 },
 "userDataOverride": "IyEvYmluL2Jhc2gKbWtkaXIgLXAgL3Zhci9iYi8KdG91Y2ggL3Zhcg=="
}
}
```

Example: Recipe without components

You can create recipes without any components for testing existing AMIs or distribution-only workflows. The following example shows a recipe that uses an existing AMI without applying any additional components:

```
{
 "name": "Test Distribution Recipe",
 "description": "Recipe for testing and distributing existing AMI without
 modifications.",
 "parentImage": "ami-1234567890abcdef1",
 "semanticVersion": "1.0.0",
 "additionalInstanceConfiguration": {
  "systemsManagerAgent": {
    "uninstallAfterBuild": true
  }
 }
}
```

2. **Create the recipe**

Use the following command to create the recipe. Provide the name of the JSON file that you created in the prior step in the `--cli-input-json` parameter:

```
aws imagebuilder create-image-recipe --cli-input-json file://create-image-
recipe.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

Your final image can contain up to nine product codes from AWS Marketplace image products and components. Image Builder returns an error during recipe creation if your base image and components exceed this limit when you run the `create-image-recipe` command.

The command returns the ARN of the new image recipe, as shown in the following example output.

```
{
 "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
 "clientToken": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
 "imageRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-recipe/1.0.1"
}
```

3. **Verify your recipe**

   To confirm that Image Builder created your recipe as expected, run the **get-image-recipe** command with the ARN that the previous step returned.

```
aws imagebuilder get-image-recipe --image-recipe-arn arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-recipe/1.0.1
```

Working directory

The working directory specifies the filesystem path on the build instance where Image Builder runs build and test operations. Image Builder passes this path to AWS Systems Manager as the working directory for command execution.

If you don't specify a working directory, Image Builder uses the following defaults:

- Linux: `/tmp`
- macOS: `/tmp`
- Windows: `C:/`

For Windows, the path can't contain the double-quote (") character.

> **Tip**
>
> Set the working directory to a path on a larger attached volume when your components need more temporary disk space during installation than the default directory provides.

AMI tags

You can apply tags to the AMI that Image Builder creates during the build phase, before image distribution. Image Builder applies these tags to the AMI, separate from the resource tags on the recipe itself. Specify AMI tags with the `amiTags` parameter in your JSON input file.

> **Note**
>
> You can't use the reserved tag keys `CreatedBy` or `Ec2ImageBuilderArn`. Image Builder manages these keys automatically.

```
{
 "name": "tagged-recipe",
 "semanticVersion": "1.0.0",
 "parentImage": "arn:aws:imagebuilder:us-west-2:aws:image/amazon-linux-2023-x86/x.x.x",
 "components": [
  {
   "componentArn": "arn:aws:imagebuilder:us-west-2:aws:component/update-linux/x.x.x"
  }
 ],
 "amiTags": {
  "Environment": "Production",
  "Team": "Platform",
  "CostCenter": "12345"
 }
}
```

Common errors and troubleshooting

The following table lists common errors that you might encounter when you create an image recipe, along with how to resolve them.

Error	Cause	Resolution
"A component may be specified in an image recipe at most once"	A duplicate component (even with a different version).	Remove the duplicate. Use only one version of each component.
"Component ARN does not match the Parent Image Platform"	A platform mismatch.	Verify your base image platform. Use Linux components with Linux AMIs, and so on.
"Component ARN does not support the Parent Image OS Version"	An OS version incompatibility.	Check the component's supported OS versions. Use a compatible component version.
"Image Builder does not support configuring the SSM Agent on Windows"	You specified `systemsManagerAgent` with a Windows parent image.	Remove the `additionalInstanceConfiguration.systemsManagerAgent` block.
"You've exceeded the maximum cumulative component size of 25 KB"	Too many or too-large parameters.	Reduce the parameter count or shorten parameter values.
"Recipe can contain at most 9 marketplace products"	Too many AWS Marketplace product codes.	Reduce the number of AWS Marketplace components, or use a base image with fewer product codes.
"Recipes with marketplace components must contain at least 1 build component"	The recipe references AWS Marketplace components but has no build component.	Add at least one build component to the recipe.
"The supplied semantic version does not follow the required format"	An invalid version string.	Use the *major.minor.patch* format with one optional `x` wildcard.

Error	Cause	Resolution
"Component ARN ... is deprecated and cannot be included in new recipes" (or "is disabled")	A referenced component has a `DEPRECATED` or `DISABLED` status.	Update to a current component version.

Import a VM as your base image in the console

This section shows you how to import a virtual machine (VM) as the base image for your image recipe. It doesn't cover other steps involved with creating a recipe or recipe version here. For additional steps to create a new image recipe with the pipeline creation wizard in the Image Builder console, see Pipeline wizard: Create AMI. For additional steps to create a new image recipe or recipe version, see Create a new version of an image recipe.

To import a VM as the base image for your image recipe in the Image Builder console, follow these steps, along with any other required steps, to create your recipe or recipe version.

1. In the **Select image** section for the base image, select the **Import base image** option.
2. Choose the **Image Operating System (OS)** and **OS version** as you normally would.

VM import configuration

When you export your VM from its virtualization environment, that process creates a set of one or more disk container files that act as snapshots of your VM environment, settings, and data. You can use these files to import your VM as the base image for your image recipe. For more information about importing VMs in Image Builder, see Import and export VM images

To specify the location of your import source, follow these steps:

Import source

Specify the source for the first VM image disk container or snapshot to import in the **Disk container 1** section.

1. **Source** – This can be either an S3 bucket or an EBS snapshot.
2. **Select S3 location of disk** – Enter the location in Amazon S3 where your disk images are stored. To browse for the location, choose **Browse S3**.

3. To add a disk container, choose **Add disk container**.

IAM role

To associate an IAM role with your VM import configuration, select the role from the **IAM role** dropdown list, or choose **Create new role** to create a new one. If you create a new role, the IAM Roles console page opens in a separate tab.

Advanced settings – *optional*

The following settings are optional. With these settings, you can configure encryption, licensing, tags, and more for the base image that the import creates.

General

1. Specify a unique **Name** for the base image. If you do not enter a value, the base image inherits the recipe name.
2. Specify a **Version** for the base image. Use the following format: *<major>.<minor>.<patch>*. If you do not enter a value, the base image inherits the recipe version.
3. You can also enter a **Description** for the base image.

Base image architecture

To specify the architecture of your VM import source, select a value from the **Architecture** list.

Encryption

If your VM disk images are encrypted, you must provide a key to use for the import process. To specify an AWS KMS key for the import, select a value from the **Encryption (KMS key)** list. The list contains KMS keys that your account has access to in the current Region.

License management

When you import a VM, the import process automatically detects the VM OS and applies the appropriate license to the base image. Depending on your OS platform, the license types are as follows:

- **License included** – An appropriate AWS license for your platform is applied to your base image.

- **Bring your own license (BYOL)** – Retains the license from your VM, if applicable.

To attach license configurations created with AWS License Manager to your base image, select from the **License configuration name** list. For more information about License Manager, see Working with license configurations in the *License Manager User Guide*.

> **Note**
>
> - License configurations contain licensing rules based on the terms of your enterprise agreements.
> - Linux only supports BYOL licenses.

Tags (base image)

Tags use key-value pairs to assign searchable text to your Image Builder resource. To specify tags for the imported base image, enter key-value pairs with the **Key** and **Value** boxes.

To add a tag, choose **Add tag**. To remove a tag, choose **Remove tag**.

Create a new version of a container recipe

This section shows you how to create a container recipe or a new version of an existing recipe. A container recipe defines three key elements: the base image, the build components, and the target repository. Use this recipe to produce Docker container images that Image Builder stores in Amazon ECR.

Contents

- Create a new container recipe version with the console
- Create a container recipe with the AWS CLI

Create a new container recipe version with the console

Creating a new version of a container recipe is virtually the same as creating a new recipe. The difference is that certain details are pre-selected to match the base recipe, in most cases. The following list describes the differences between creating a new recipe and creating a new version of an existing recipe.

Recipe details

- **Name** – *not editable*.
- **Version** – Required. This detail isn't pre-filled with the current version or any kind of a sequence. Enter the version number that you want to create in the format *major.minor.patch*. If the version already exists, Image Builder returns an error.

Base image

- **Select image** option – Pre-selected, but editable. If you change your choice for the source of your base image, you might lose other details that depend on the original option that you chose.

  For Docker container images, you can choose from public images hosted on DockerHub, existing container images in Amazon ECR, or Amazon-managed container images. To see details that are associated with your base image selection, choose the tab that matches your selection.

  Managed images

  - **Image Operating System (OS)** – *Not editable*.
  - **Image name** – Pre-selected, based on the combination of base image choices that you made for the existing recipe. However, if you change the **Select image** option, you lose the pre-selected **Image name**.
  - **Auto-versioning options** – Does *not* match your base recipe. Auto-versioning options defaults to the **Use selected OS version** option.

    > **Important**
    >
    > If you're using semantic versioning to kick off pipeline builds, make sure that you change this value to **Use latest available OS version**. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.

  ECR image

  - **Image Operating System (OS)** – Pre-selected, but editable.
  - **OS version** – Pre-selected, but editable.
  - **ECR image ID** – Pre-filled, but editable.

  Docker Hub image

  - **Image Operating System (OS)** – *Not editable*.

- **OS version** – Pre-selected, but editable.
- **Docker image ID** – Pre-filled, but editable.

Instance configuration

- **AMI source** (Required) – Identify a custom AMI to use as the base image for your container build and test instance. This can be an AMI ID or an AWS Systems Manager (SSM) Parameter Store parameter that contains an AMI ID.
  - **AMI ID** – This setting is not pre-filled with your original entry. Enter the AMI ID for your base image. Example: *ami-1234567890abcdef1*.
  - **SSM parameter** – Enter the name or ARN of the SSM Parameter Store parameter that contains the AMI ID for your base image. Example: */ib/test/param* or `arn:aws:ssm:`*us-east-1*`:`*111122223333*`:parameter`*/ib/test/param*.
- **Storage (volumes)**

  EBS volume 1 (AMI root) – Pre-filled. You can't edit the root volume **Device name**, **Snapshot**, or **IOPS** selections. However, you can change all of the remaining settings, such as the **Size**. You can also add new volumes.

  > **Note**
  >
  > If you specified a base AMI that was shared with you from another account, the snapshots for any secondary volumes that are specified must also be shared with your account.

Working directory

- **Working directory path** – Pre-filled, but editable.

Components

- **Components** – Components that are already included in the recipe are displayed in the **Selected components** section at the end of each of the component lists (build and test). You can remove or reorder the selected components to suit your needs.

CIS hardening components don't follow the standard component ordering rules in Image Builder recipes. The CIS hardening components always run last to ensure that the benchmark tests run against your output image.

> **Note**
>
> Build and test component lists display available components based on the component owner type. To add a component, choose **Add build components**, and select the ownership filter that applies. For example, to add a build component that's associated with an AWS Marketplace product, select `AWS Marketplace`. This opens a selection panel on the right side of the console interface that lists AWS Marketplace components. For the CIS component, select `Third party managed`.

You can configure the following settings for your selected component:

- **Versioning options** – Pre-selected, but you can change them. We recommend that you choose the **Use latest available component version** option to ensure that your image builds always pick up the latest version of the component. If you need to use a specific component version in your recipe, you can choose **Specify component version**, and enter the version in the **Component version** box that appears.
- **Input parameters** – Displays input parameters that the component accepts. The **Value** is pre-filled with the value from the prior version of the recipe. If you are using this component for the first time in this recipe, and a default value was defined for the input parameter, the default value appears in the **Value** box with greyed-out text. If no other value is entered, Image Builder uses the default value.

  If an input parameter is required, but doesn't have a default value defined in the component, you must provide a value. Image Builder won't create the recipe version if there are any required parameters that are missing and don't have a default value defined.

  > **Important**
  >
  > Component parameters are plain text values, and are logged in AWS CloudTrail. We recommend that you use AWS Secrets Manager or the AWS Systems Manager Parameter Store to store your secrets. For more information about Secrets Manager, see What is Secrets Manager? in the *AWS Secrets Manager User Guide*. For more

information about AWS Systems Manager Parameter Store, see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

To expand settings for **Versioning options** or **Input parameters**, you can choose the arrow next to the name of the setting. To expand all of the settings for all selected components, you can toggle the **Expand all** switch off and on.

Dockerfile template

- **Dockerfile template** – Pre-filled, but editable. You can specify any of the following contextual variables that Image Builder replaces with build information at runtime.

parentImage (required)

At build time, this variable resolves to the base image for your recipe.

Example:

```
FROM
{{{ imagebuilder:parentImage }}}
```

environments (required if components are specified)

At build time, this variable resolves to the Dockerfile directives that stage your components in the build context. These directives copy the component scripts into the image and set the environment variables that those scripts use. It prepares the environment but doesn't run the components that you specify. Place this variable before the `components` variable.

Example:

```
{{{ imagebuilder:environments }}}
```

components (optional)

At build time, this variable resolves to the command that runs the build and test component scripts for the components that the container recipe includes, and then removes those

scripts from the image. This is the variable that runs your components. Place it after the `environments` variable.

Example:

```
{{{ imagebuilder:components }}}
```

Target repository

- **Target repository name** – The Amazon ECR repository where your output image is stored if there is no other repository specified in your pipeline's distribution configuration for the Region where the pipeline runs (Region 1).

To create a new container recipe version:

1. On the container recipe details page, choose **Create new version** at the top of the page. The console opens the **Create recipe** page for container recipes.
2. To create the new version, make your changes, and then choose **Create recipe**.

For more information about creating a container recipe when you create an image pipeline, see Step 2: Choose recipe in the **Get started** section of this guide.

Create a container recipe with the AWS CLI

To create an Image Builder container recipe with the `imagebuilder create-container-recipe` command in the AWS CLI, follow these steps:

Prerequisites

Before you run the Image Builder commands in this section to create a container recipe with the AWS CLI, you must create the components that the recipe will use. The container recipe example in the following step refers to example components that are created in the Create a custom component from the AWS CLI section of this guide.

After you create your components, or if you are using existing components, note the ARNs that you want to include in the recipe.

1. **Create a CLI input JSON file**

   You can provide all of the input for the **create-container-recipe** command with inline command parameters. However, the resulting command can be quite long. To streamline the command, you can instead provide a JSON file that contains all of the container recipe settings

   > **Note**
   >
   > The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API operation request parameters, see the CreateContainerRecipe command in the *EC2 Image Builder API Reference*.
   > To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*.

   Here is a summary of the parameters in this example:

   - **components** (array of objects, optional) – Contains an array of `ComponentConfiguration` objects. Components are optional for container recipes. You can customize the output image with BUILD components, with instructions in your Dockerfile template (for example, `RUN` or `COPY` statements), or both. TEST components validate the image but don't modify it.

     > **Note**
     >
     > Image Builder installs components in the order that you specified them in the recipe. However, CIS hardening components always run last to ensure that the benchmark tests run against your output image.

     - **componentArn** (string, required) – The component ARN.

       > **Tip**
       >
       > To use the example to create your own container recipe, replace the example ARNs with the ARNs for the components that you are using for your recipe,. These include the AWS Region, name, and the version number for each.

- **parameters** (array of objects) – Contains an array of `ComponentParameter` objects. If an input parameter is required, but doesn't have a default value defined in the component, you must provide a value. Image Builder won't create the recipe version if there are any required parameters that are missing and don't have a default value defined.

  > **Important**
  >
  > Component parameters are plain text values, and are logged in AWS CloudTrail. We recommend that you use AWS Secrets Manager or the AWS Systems Manager Parameter Store to store your secrets. For more information about Secrets Manager, see What is Secrets Manager? in the *AWS Secrets Manager User Guide*. For more information about AWS Systems Manager Parameter Store, see AWS Systems Manager Parameter Store in the *AWS Systems Manager User Guide*.

  - **name** (string, required) – The name of the component parameter to set.
  - **value** (array of strings, required) – Contains an array of strings to set the value for the named component parameter. If there is a default value defined for the component, and no other value is provided, AWSTOE uses the default value.
- **containerType** (string, required) – The type of container to create. Valid values include `DOCKER`.
- **dockerfileTemplateData** (string) – The inline Dockerfile template for building your image. Inline data is limited to 16,000 characters. You must specify either `dockerfileTemplateData` or `dockerfileTemplateUri`, but not both.

  Your Dockerfile template can include contextual variables (placeholders that Image Builder replaces with build information at runtime). Include at least the `parentImage` variable. If your recipe includes components, also include the `environments` variable and the `components` variable.

  parentImage (required)

  At build time, this variable resolves to the base image for your recipe.

  Example:

  ```
  FROM
  {{{ imagebuilder:parentImage }}}
  ```

environments (required if components are specified)

At build time, this variable resolves to the Dockerfile directives that stage your components in the build context. These directives copy the component scripts into the image and set the environment variables that those scripts use. It prepares the environment but doesn't run the components that you specify. Place this variable before the `components` variable.

Example:

```
{{{ imagebuilder:environments }}}
```

components (optional)

At build time, this variable resolves to the command that runs the build and test component scripts for the components that the container recipe includes, and then removes those scripts from the image. This is the variable that runs your components. Place it after the `environments` variable.

Example:

```
{{{ imagebuilder:components }}}
```

To store the template in Amazon S3 instead, use the **dockerfileTemplateUri** parameter with a valid Amazon S3 URI (for example, `s3://my-bucket/templates/Dockerfile`).

- **name** (string, required) – The name of the container recipe.
- **description** (string) – The description of the container recipe.
- **parentImage** (string, required) – The Docker container image to use in the container recipe as a baseline for your customized image.
  - Public images hosted on DockerHub
  - Existing container images in Amazon ECR
  - Amazon-managed container images
- **platformOverride** (string) – Specifies the operating system platform when you use a custom base image. We recommend that you set this value when you use a Docker Hub or Amazon ECR image. If you omit it, Image Builder attempts to detect the platform from the container manifest, which might not always be available. You can't specify `platformOverride` when

your parent image is an Image Builder image ARN. Valid values are `Linux` and `Windows`. Container recipes don't support the macOS platform.

- **semanticVersion** (string, required) – The semantic version of the container recipe specified in the following format, with numeric values in each position to indicate a specific version: *<major>.<minor>.<patch>*. An example would be `1.0.0`. To learn more about semantic versioning for Image Builder resources, see Semantic versioning in Image Builder.
- **tags** (string map) – Tags that are attached to the container recipe.
- **instanceConfiguration** (object) – A group of options that can be used to configure an instance for building and testing container images.
  - **image** (string) – The base image for a container build and test instance. This can contain an AMI ID or it can specify an AWS Systems Manager (SSM) Parameter Store parameter, prefixed by `ssm:`, followed by the parameter name or ARN. If you use an SSM parameter, the parameter value must contain an AMI ID. If you don't specify a base image, Image Builder uses the appropriate Amazon ECS optimized AMI as a base image.
  - **blockDeviceMappings** (array of objects) – Defines the block devices to attach for building an instance from the Image Builder AMI specified in the **image** parameter.
    - **deviceName** (string) – The device that these mappings apply to.
    - **ebs** (object) – Used to manage Amazon EBS specific configuration for this mapping.
      - **deleteOnTermination** (Boolean) – Used to configure delete on termination of the associated device.
      - **encrypted** (Boolean) – Used to configure device encryption.
      - **volumeSize** (integer) – Used to override the device's volume size.
      - **volumeType** (string) – Used to override the device's volume type.
- **targetRepository** (object, required) – The destination repository for the container image if there is no other repository specified in your pipeline's distribution configuration for the Region where the pipeline runs (Region 1).
  - **repositoryName** (string, required) – The name of the container repository where the output container image is stored. This name is prefixed by the repository location.
  - **service** (string, required) – Specifies the repository service that stores the output image. The valid value is ECR. The target repository must already exist.
- **workingDirectory** (string) – The working directory for use during build and test workflows.

The following example shows a complete container recipe input file that defines a Linux Docker container with build components. Save it as `create-container-recipe.json`, and use it in the **create-container-recipe** command.

```
{
 "components": [
   {
   "componentArn": "arn:aws:imagebuilder:us-west-2:111122223333:component/
helloworldal2/x.x.x"
   }
 ],
 "containerType": "DOCKER",
 "description": "My Linux Docker container image",
 "dockerfileTemplateData": "FROM
 {{{ imagebuilder:parentImage }}}\n{{{ imagebuilder:environments }}}\n{{{ imagebuilder:comp
 "name": "amazonlinux-container-recipe",
 "parentImage": "amazonlinux:latest",
 "platformOverride": "Linux",
 "semanticVersion": "1.0.2",
 "tags": {
   "sometag" : "Tag detail"
 },
 "instanceConfiguration": {
   "image": "ami-1234567890abcdef1",
   "blockDeviceMappings": [
   {
   "deviceName": "/dev/xvda",
   "ebs": {
    "deleteOnTermination": true,
    "encrypted": false,
    "volumeSize": 8,
    "volumeType": "gp2"
    }
    }
   ]
 },
 "targetRepository": {
   "repositoryName": "myrepo",
   "service": "ECR"
 },
 "workingDirectory": "/tmp"
```

```
}
```

2. **Create the recipe**

   Use the following command to create the recipe. Provide the name of the JSON file that you created in the prior step in the `--cli-input-json` parameter:

   ```
   aws imagebuilder create-container-recipe --cli-input-json file://create-container-recipe.json
   ```

   > **Note**
   >
   > - You must include the `file://` notation at the beginning of the JSON file path.
   > - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

   The following example output shows the ARN of the newly created container recipe, along with the request ID and client token for the request.

   ```
   {
    "requestId": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "clientToken": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
    "containerRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:container-recipe/my-container-recipe/1.0.2"
   }
   ```

Container recipe constraints

Review the following constraints before you create a container recipe:

- You must specify a target Amazon ECR repository that already exists.
- AWS Marketplace components aren't supported in container recipes.

- Components are optional. You can customize the output image with BUILD components, with instructions in your Dockerfile template (for example, `RUN` or `COPY` statements), or both. TEST components validate the image but don't modify it.
- Container recipes don't support the macOS platform.
- For the Dockerfile template, provide either inline data (up to 16,000 characters) or an Amazon S3 URI. You can't specify both.
- The cumulative recipe size can't exceed 25 KB. If you receive a size error, reduce the number of component parameters or shorten parameter values. This limit is separate from the Dockerfile template size limits.
- When you set `platformOverride` to `Windows`, you must also specify `imageOsVersionOverride`. This applies to any non-Image Builder parent image, such as an Amazon ECR image or a Docker Hub image.

Common errors and troubleshooting

The following table lists common errors that you might encounter when you create a container recipe, along with how to resolve them.

Error	Cause	Resolution
"Container Recipes must not contain marketplace components"	A AWS Marketplace component in a container recipe.	Use only non-AWS Marketplace components.
"Container recipes don't currently support the macOS platform"	`platformOverride` is set to macOS.	Use `Linux` or `Windows`.
"You must specify either dockerfileTemplateData or a dockerfileTemplateUri"	You specified both or neither.	Provide exactly one.
"Invalid S3 URI"	A malformed Amazon S3 path in `dockerfileTemplateUri`.	Use the format `s3://bucket/key`.

Error	Cause	Resolution
"You cannot specify a platform override when using an Image Builder Image as your parent"	`platform0 verride` with an Image Builder image ARN.	Remove `platform0verride` . Image Builder detects the platform from the parent image metadata.
"You must specify an image OsVersion override when using ECR Repositories as your parent image for Windows Platform"	A Windows `platform0 verride` without an OS version.	Add the `image0sVersion0ver ride` field.

Track AMI lineage with watermarks

AMI watermarks are simple text labels that track the history of your machine images. You add watermark names to your image recipe, and Image Builder attaches them to the output AMI during the build process.

When you copy or distribute an AMI to other Regions or accounts, the watermarks copy automatically. All copies of your AMI carry the same watermarks. This helps you trace the history of your images.

You cannot make watermarked AMIs public. If your recipe includes watermarks or your source AMI has watermarks, Image Builder rejects distribution configurations that set launch permissions to public.

Key characteristics of AMI watermarks:

- **Purpose** – Track AMI lineage across copies and distributions.
- **Scope** – Metadata only. Watermarks do not affect instance performance or runtime behavior.
- **Visibility restriction** – Watermarked AMIs cannot be made public.

Contents

- Watermark constraints
- Prerequisites
- Add watermarks to an image recipe

- View watermarks on an existing recipe
- Considerations

Watermark constraints

The following constraints apply to AMI watermarks in Image Builder image recipes.

Constraint	Value
Watermarks per recipe	1 to 5
Name length	3 to 128 characters
Allowed characters	Letters, numbers, spaces, and the following special characters: `( ) [ ] . / - ' @ _`
Edge characters	Names cannot begin or end with a space
Case sensitivity	Watermark names are case-sensitive
Duplicates	Duplicate names within the same recipe are not permitted
Total per output AMI	Source AMI watermarks plus recipe watermarks cannot exceed 5

Prerequisites

Before you use AMI watermarks, verify the following requirements.

- AMI watermarks are supported only for image recipes, not container recipes.
- Your Image Builder execution role must include the `ec2:AttachImageWatermark` permission on `arn:aws:ec2:*::image/*`. If you use the Image Builder service-linked role, this permission is included automatically.

Add watermarks to an image recipe

You can add watermarks when you create an image recipe or a new version of an existing recipe. Choose one of the following tabs for instructions.

Console

To add watermarks to an image recipe

1. When you create or version an image recipe, in the recipe configuration section, expand **AMI watermarks**.
2. Enter a watermark name (3 to 128 characters). Choose **Add watermark** to add more names (up to 5 total).
3. Complete the remaining recipe creation steps, and then choose **Create recipe**.

AWS CLI

To add watermarks with the AWS CLI, include the `amiWatermarks` parameter in your JSON input file for the **create-image-recipe** command.

The following example shows a recipe JSON file with watermarks configured.

```
{
    "name": "MyWatermarkedRecipe",
    "description": "Recipe with AMI watermarks for lineage tracking.",
    "parentImage": "ami-1234567890abcdef1",
    "semanticVersion": "1.0.0",
    "components": [
        {
            "componentArn": "arn:aws:imagebuilder:us-
west-2:111122223333:component/my-component/1.0.0/1"
        }
    ],
    "amiWatermarks": [
        "ProductionV1",
        "team-alpha"
    ]
}
```

Run the following command to create the recipe.

```
aws imagebuilder create-image-recipe --cli-input-json file://create-watermarked-
recipe.json
```

The following list describes the `amiWatermarks` parameter.

- **amiWatermarks** (array of strings, optional) – A list of watermark names to attach to output AMIs built from this recipe. Specify 1 to 5 names. Each name must be 3 to 128 characters, and can include letters, numbers, spaces, and the following special characters: `( ) [ ] . / - ' @ _`

CloudFormation

You can specify AMI watermarks in an `AWS::ImageBuilder::ImageRecipe` resource by using the `AmiWatermarks` property.

The following example shows a minimal image recipe template with watermarks configured.

```
Resources:
  WatermarkedRecipe:
    Type: AWS::ImageBuilder::ImageRecipe
    Properties:
      Name: MyWatermarkedRecipe
      Version: 1.0.0
      ParentImage: arn:aws:imagebuilder:us-west-2:aws:image/amazon-linux-2023-x86/
x.x.x
      Components:
        - ComponentArn: arn:aws:imagebuilder:us-west-2:111122223333:component/my-
component/1.0.0/1
      AmiWatermarks:
        - ProductionV1
        - team-alpha
```

You can set the `AmiWatermarks` property only at creation time. Because image recipes are immutable, changing watermarks requires a new recipe version.

For more information about the `AmiWatermarks` property, see AWS::ImageBuilder::ImageRecipe in the *AWS CloudFormation Template Reference*.

View watermarks on an existing recipe

You can view the watermarks configured for a recipe by calling the **get-image-recipe** command in the AWS CLI.

```
aws imagebuilder get-image-recipe --image-recipe-arn arn:aws:imagebuilder:us-
west-2:111122223333:image-recipe/my-watermarked-recipe/1.0.0
```

The response includes the `amiWatermarks` array if watermarks were configured for that recipe version.

Considerations

Keep the following points in mind when you use AMI watermarks.

- Watermarks from a source AMI plus watermarks defined in the recipe combine on the output AMI. The total cannot exceed 5. If the combined count exceeds 5, the build fails.
- If you distribute a watermarked AMI to other Regions or accounts, the watermarks propagate automatically.
- Image Builder validates that watermarked AMIs are not set to public at image creation time. If your recipe has watermarks (or the source AMI has watermarks) and the distribution configuration sets launch permissions to public, Image Builder returns an `InvalidParameterCombinationException` error.

Clean up resources

To avoid unexpected charges, make sure to clean up resources and pipelines that you created from the examples in this guide. For more information about deleting resources in Image Builder, see Delete outdated or unused Image Builder resources.

Manage Image Builder infrastructure configuration

An infrastructure configuration is a reusable Image Builder resource that defines the Amazon EC2 environment where Image Builder builds and tests your image. When you create an image pipeline, you attach one infrastructure configuration to it. Image Builder then uses those settings every time the pipeline runs a build.

Because the infrastructure configuration is a separate resource, you can reuse the same build environment across many pipelines. You can also update the environment in one place without modifying individual pipelines. When you update an infrastructure configuration, your changes take effect on the *next* build. Your changes don't affect builds that are already in progress or images that Image Builder already created.

> **Note**
>
> An infrastructure configuration is independent from the images it helps create. Deleting or editing an infrastructure configuration doesn't change images that Image Builder already built. If a pipeline references an infrastructure configuration, you can't delete that configuration until you remove the reference.

Use an infrastructure configuration to specify the following settings for your build and test environment. For API field names, required settings, and constraints, see CreateInfrastructureConfiguration in the *EC2 Image Builder API Reference*.

- **Instance types** for your build and test instances. We recommend that you specify more than one instance type because this allows Image Builder to launch an instance from a pool with sufficient capacity. This can reduce your transient build failures. If you specify more than one type, Image Builder launches an instance from the first type that has available capacity. If none of your instance types are available in the , the build fails.

  For Mac images, choose instance types that natively support macOS. For more information, see Amazon EC2 Mac instances in the *Amazon EC2 User Guide*.
- **An instance profile** that gives your build and test instances the permissions to run your components. For example, if you have a component that retrieves resources from Amazon S3, the instance profile requires permissions to access those files. The instance profile also requires a minimal set of permissions for EC2 Image Builder to successfully communicate with the instance. For more information, see Get set up to build custom images with Image Builder.
- **Instance placement settings** that control the Availability Zone, tenancy, and Dedicated Host where Image Builder launches your instances.
- **Networking** – the VPC subnet and security groups for your build and test instances. If you specify a subnet, you must also specify at least one security group.
- **Logging** – the Amazon S3 location where Image Builder stores AWSTOE application logs from your build and test phases. To use Amazon S3 logging, the instance profile must have `s3:PutObject` permissions for the target bucket (`arn:aws:s3:::BucketName/*`). If you don't configure Amazon S3 logging, Image Builder keeps the AWSTOE application logs on the build and test instances only.

- **Troubleshooting settings** – an Amazon EC2 key pair and the `terminateInstanceOnFailure` setting. With these settings, you can keep a failed build instance running and connect to it to investigate.
- **Instance metadata options** that control whether instances require IMDSv2 tokens, and the metadata response hop limit.
- **An SNS topic** where Image Builder publishes messages about your image build status, such as when an image becomes available or a build fails. For more information, see Amazon SNS integration in Image Builder.

> **Note**
>
> If your SNS topic is encrypted, the key that encrypts this topic must reside in the account where the Image Builder service runs. Image Builder can't send notifications to SNS topics that are encrypted with keys from other accounts.

Contents

- Instance placement and tenancy
- List and view infrastructure configuration details
- Create an infrastructure configuration
- Update an infrastructure configuration
- Delete an infrastructure configuration
- Image Builder and AWS PrivateLink interface VPC endpoints

> **Tip**
>
> When you have multiple resources of the same type, tagging helps you to identify a specific resource based on the tags you've assigned to it. For more information about tagging your resources using Image Builder commands in the AWS CLI, see the Tag resources section of this guide.

Instance placement and tenancy

Use placement settings to control where Image Builder launches your build and test instances. By default, Amazon EC2 instances run on shared tenancy hardware, which means multiple AWS accounts might share the same physical server. You can change the tenancy to run on single-tenant hardware or a Dedicated Host. You can also pin instances to a specific Availability Zone.

For the placement field names, their valid values, and constraints, see Placement in the *EC2 Image Builder API Reference*.

> **Note**
>
> Mac instances require a Dedicated Host. Set `tenancy` to `host` for macOS images. If your Dedicated Host has auto-placement enabled and you don't specify a `hostId` or `hostResourceGroupArn`, Amazon EC2 finds an available host for you. For more information, see Auto-placement in the *Amazon EC2 User Guide*.

List and view infrastructure configuration details

This section describes the various ways that you can find information and view details for your EC2 Image Builder infrastructure configurations.

Infrastructure configuration details

- List infrastructure configurations
- Get infrastructure configuration details

List infrastructure configurations

Console

To see a list of the infrastructure configurations created under your account in the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Infrastructure configuration** from the navigation pane. This shows a list of the infrastructure configurations that are created under your account.

AWS CLI

The following example shows how to list all of your infrastructure configurations, using the **list-infrastructure-configurations** command in the AWS CLI.

```
aws imagebuilder list-infrastructure-configurations
```

To narrow the results, use the `--filters` option. You can filter by `name`. The following example returns infrastructure configurations whose name matches the value that you specify.

```
aws imagebuilder list-infrastructure-configurations --filters name=name,values=my-example-infrastructure-configuration
```

If you have many infrastructure configurations, Image Builder returns results one page at a time. Use `--max-results` to control the page size. If the response includes a `nextToken` value, pass it with `--next-token` to retrieve the next page.

```
aws imagebuilder list-infrastructure-configurations --max-results 10
```

Get infrastructure configuration details

Console

To view the details for a specific infrastructure configuration in the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Infrastructure configuration** from the navigation pane.
3. Choose the **Configuration name** link for the infrastructure configuration that you want to view. This opens the detail page, where you can review its settings.

AWS CLI

The following example shows how to use the **get-infrastructure-configuration** command in the AWS CLI to get the details of an infrastructure configuration by specifying its Amazon Resource Name (ARN).

```
aws imagebuilder get-infrastructure-configuration --infrastructure-configuration-
arn arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/my-
example-infrastructure-configuration
```

Create an infrastructure configuration

This section describes how you can use the Image Builder console or **imagebuilder** commands in the AWS CLI to create an infrastructure configuration.

Console

To create an infrastructure configuration resource from the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. From the navigation pane, choose **Infrastructure configuration**.
3. Choose **Create infrastructure configuration**.
4. In the **General** section, enter the following required information:
   - Enter the **Name** of your infrastructure configuration resource.
   - Select an **IAM role** that you want to associate with the instance profile for component permissions on your build and test instances. Image Builder uses these permissions to download and run your components, upload logs to CloudWatch, and perform any additional actions that the components in your recipe specify.
5. In the **AWS infrastructure** panel, configure the remaining infrastructure settings. Enter the following required information:
   - **Instance type** – You can specify one or more instance types to use for this build. Image Builder selects one of these instance types based on availability.

     Note

     Mac instances run on `.metal` instance types on a Dedicated Host. Your instance type must match one of the types that are defined for the host that it runs on. For more information about Mac instances and a list of instance types that

natively support the macOS operating system, see Amazon EC2 Mac instances in the *Amazon EC2 User Guide*.

- **SNS topic (optional)** – Select an SNS topic to receive notifications and alerts from EC2 Image Builder.

If you do not supply values for the following settings, they use service-specific defaults, where applicable.

- **VPC, subnet, and security groups** – Image Builder uses your default VPC and subnet. For more information about configuring VPC interface endpoints, see Image Builder and AWS PrivateLink interface VPC endpoints.
- In the **Troubleshooting settings** section, configure the following values:
  - By default, the **Terminate instance on failure** check box is selected. However, when a build fails, you can connect to the Amazon EC2 instance to troubleshoot. If you want your instance to continue to run after a build failure, clear the check box.
  - **Key pair** – If your Amazon EC2 instance continues to run after a build failure, you can create a key pair or use an existing key pair to connect to the instance and troubleshoot.
  - **Logs** – You can specify an Amazon S3 bucket where Image Builder can write application logs to help troubleshoot your build and tests. If you don't specify an Amazon S3 bucket, Image Builder writes the application logs to the instance.
- In the **Instance metadata settings** section, configure the following values to apply to the Amazon EC2 instances that Image Builder uses to build and test your image:
  - Select the **Metadata version** to determine if Amazon EC2 requires a signed token header for instance metadata retrieval requests.
    - **V1 and V2 (token optional)** – Default value if you don't select anything.
    - **V2 (token required)**

> **Note**
>
> We recommend that you configure all EC2 instances that Image Builder launches from a pipeline build to use IMDSv2 so that instance metadata retrieval requests require a signed token header.

- **Metadata token response hop limit** – The number of network hops that the metadata token can travel. Valid range: 1–64. If you don't set a value, Image Builder applies a hop limit of 2.

- In the **Instance placement settings** section, configure the following values to apply to the Amazon EC2 instances that Image Builder uses to build and test your image:
  - You can select the **Availability Zone** where Image Builder launches instances during image creation.
  - Optionally select **Tenancy** for the servers that run the instances that you launch. By default, Amazon EC2 instances run on shared tenancy hardware. This means that multiple AWS accounts might share the same physical hardware. An instance with `dedicated` tenancy runs on single-tenant hardware. An instance with `host` tenancy runs on a Dedicated Host.

    Mac instances require a Dedicated Host that's created as a prerequisite before you build a custom image. Select `host` for your macOS image. You can then select a target host or host resource group to launch instances, but it's not required if your Dedicated Host has auto-placement enabled. For more information, see Auto-placement in the *Amazon EC2 User Guide*.
    - **Tenancy host ID** – The ID of the Dedicated Host on which the instances run.
    - **Tenancy host resource group** – The Amazon Resource Name (ARN) of the host resource group in which to launch the instances.

6. In the **Infrastructure tags** section (optional), you can assign metadata tags to the Amazon EC2 instance that Image Builder launches during the build process. Enter tags as key-value pairs.
7. In the **Tags** section (optional), you can assign metadata tags to the infrastructure configuration resource that Image Builder creates as output. Enter tags as key-value pairs.

AWS CLI

The following procedure shows how to configure the infrastructure for your image with the Image Builder **create-infrastructure-configuration** command in the AWS CLI. The command in step 2 takes in the file that you create in step 1. For these examples, the file from step 1 is called `create-infrastructure-configuration.json`.

The following example sets common infrastructure fields. To require IMDSv2 tokens on the build and test instances, add an `instanceMetadataOptions` block with `httpTokens` set to `required`.

> **Note**
>
> We recommend that you configure all EC2 instances that Image Builder launches from a pipeline build to use IMDSv2 so that instance metadata retrieval requests require a signed token header.

1. **Create a CLI input JSON file**

   The following examples show variations of the JSON file that you might create for infrastructure configuration. Use a file editing tool to create a JSON file of your own.

   Example 1: Configuration to retain an instance from a failed build

   This example specifies two instance types, `m7i.large` and `m7i.xlarge`. We recommend that you specify more than one instance type because this allows Image Builder to launch an instance from a pool with sufficient capacity. This can reduce your transient build failures.

   The `instanceProfileName` specifies the instance profile that provides the instance with the permissions that the profile requires to perform customization activities. For example, if you have a component that retrieves resources from Amazon S3, the instance profile requires permissions to access those files. The instance profile also requires a minimal set of permissions for EC2 Image Builder to successfully communicate with the instance. For more information, see Get set up to build custom images with Image Builder.

```
{
    "name": "ExampleInfraConfigDontTerminate",
    "description": "An example that will retain instances of failed builds",
    "instanceTypes": [
        "m7i.large", "m7i.xlarge"
    ],
    "instanceProfileName": "myIAMInstanceProfileName",
    "securityGroupIds": [
        "sg-12345678"
    ],
```

```
    "subnetId": "subnet-12345678",
    "logging": {
        "s3Logs": {
            "s3BucketName": "my-logging-bucket",
            "s3KeyPrefix": "my-path"
        }
    },
    "keyPair": "myKeyPairName",
    "terminateInstanceOnFailure": false,
    "snsTopicArn": "arn:aws:sns:us-west-2:123456789012:MyTopic"
}
```

Example 2: macOS configuration with auto-placement

This example specifies instance types and placement for a Mac instance where the Dedicated Host has auto-placement enabled.

```
{
   "name": "macOSInfraConfigAutoPlacement",
   "description": "An example infrastructure configuration for macOS.",
   "instanceProfileName": "EC2InstanceProfileForImageBuilder",
   "instanceTypes": ["mac1.metal", "mac2.metal"],
   "terminateInstanceOnFailure": false,
   "placement": {
      "tenancy": "host"
   }
}
```

Example 3: macOS configuration with Host ID specified

This example specifies instance type and placement for a Mac instance that targets a specific Dedicated Host.

```
{
   "name": "macOSInfraConfigHostPlacement",
   "description": "An example infrastructure configuration for macOS.",
   "instanceProfileName": "EC2InstanceProfileForImageBuilder",
   "instanceTypes": ["mac2-m1ultra.metal"],
   "terminateInstanceOnFailure": false,
   "placement": {
      "tenancy": "host",
      "hostId" : "h-1234567890abcdef0"
```

```
    }
}
```

Example 4: Custom VPC with IMDSv2 and Amazon S3 logging

This example launches instances in a specific subnet and security group, requires IMDSv2 tokens, and writes application logs to Amazon S3. Because the example sets `subnetId`, it must also set `securityGroupIds`.

```
{
    "name": "VpcInfraConfigWithLogging",
    "description": "Build in a custom VPC with IMDSv2 and S3 logging",
    "instanceTypes": ["m7i.large", "m8i.large"],
    "instanceProfileName": "EC2InstanceProfileForImageBuilder",
    "subnetId": "subnet-12345678",
    "securityGroupIds": ["sg-12345678"],
    "instanceMetadataOptions": {
        "httpTokens": "required",
        "httpPutResponseHopLimit": 2
    },
    "logging": {
        "s3Logs": {
            "s3BucketName": "my-logging-bucket",
            "s3KeyPrefix": "image-builder-logs"
        }
    },
    "resourceTags": {
        "Project": "golden-ami"
    },
    "terminateInstanceOnFailure": true
}
```

Example 5: Dedicated Host placement with a host resource group

This example targets a host resource group instead of a specific host ID. Because `tenancy` is `host`, you can specify a host resource group ARN. Don't also specify a `hostId`.

```
{
    "name": "HostResourceGroupInfraConfig",
    "instanceProfileName": "EC2InstanceProfileForImageBuilder",
    "instanceTypes": ["mac2.metal"],
    "terminateInstanceOnFailure": false,
```

```
    "placement": {
        "tenancy": "host",
        "hostResourceGroupArn": "arn:aws:resource-groups:us-
west-2:123456789012:group/my-host-group"
    }
}
```

2. **Use the file you created as input when you run the following command.**

```
aws imagebuilder create-infrastructure-configuration --cli-input-json
 file://create-infrastructure-configuration.json
```

Update an infrastructure configuration

This section covers how you can use the Image Builder console or **imagebuilder** commands in the AWS CLI to update an infrastructure configuration resource. To track your resources, you can apply tags as follows. Enter tags as key-value pairs.

- *Resource tags* assign metadata tags to the Amazon EC2 instance that Image Builder launches during the build process.
- *Tags* assign metadata tags to the infrastructure configuration resource that Image Builder creates as output.

Console

You can edit the following infrastructure configuration details from the Image Builder console:

- The **Description** for your infrastructure configuration.
- The **IAM role** to associate with the instance profile.
- **AWS infrastructure**, including the **Instance type** and an **SNS topic** for notifications.
- **VPC, subnet, and security groups**.
- **Troubleshooting settings**, including **Terminate instance on failure**, the **Key pair** for connecting, and an optional S3 bucket location for instance logs.

To update an infrastructure configuration resource from the Image Builder console, follow these steps:

Choose an existing Image Builder infrastructure configuration

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. To see a list of the infrastructure configuration resources under your account, choose **Infrastructure configuration** from the navigation pane.
3. To view details or edit an infrastructure configuration, choose the **Configuration name** link. This opens the detail view for the infrastructure configuration.

   > **Note**
   >
   > You can also select the check box next to the **Configuration name**, then choose **View detail**.

4. From the upper right corner of the **Infrastructure details** panel, choose **Edit** .
5. When you're ready to save updates you've made to your infrastructure configuration, choose **Save changes**.

AWS CLI

The following example shows how to update the infrastructure configuration for your image with the Image Builder **update-infrastructure-configuration** command in the AWS CLI.

1. **Create a CLI input JSON file**

   In this example, the settings match the create example, except that `terminateInstanceOnFailure` is set to `true`. After you run the **update-infrastructure-configuration** command, pipelines that use this infrastructure configuration terminate the build and test instances when a build fails.

   The following example sets common infrastructure fields. To require IMDSv2 tokens on the build and test instances, add an `instanceMetadataOptions` block with `httpTokens` set to `required`.

> **Note**
>
> We recommend that you configure all EC2 instances that Image Builder launches from a pipeline build to use IMDSv2 so that instance metadata retrieval requests require a signed token header.

Use a file editing tool to create a JSON file with keys shown in the following example, plus values that are valid for your environment. This example uses a file named `update-infrastructure-configuration.json`:

```
{
"infrastructureConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:infrastructure-configuration/my-example-infrastructure-
configuration",
"description": "An example that will terminate instances of failed builds",
"instanceTypes": [
    "m7i.large", "m7i.2xlarge"
],
"instanceProfileName": "myIAMInstanceProfileName",
"securityGroupIds": [
    "sg-12345678"
],
"subnetId": "subnet-12345678",
"logging": {
    "s3Logs": {
        "s3BucketName": "my-logging-bucket",
        "s3KeyPrefix": "my-path"
    }
},
"terminateInstanceOnFailure": true,
"snsTopicArn": "arn:aws:sns:us-west-2:123456789012:MyTopic"
}
```

2. **Use the file you created as input when you run the following command.**

```
aws imagebuilder update-infrastructure-configuration --cli-input-json
 file://update-infrastructure-configuration.json
```

Delete an infrastructure configuration

You can delete an infrastructure configuration that you no longer need. You can't delete an infrastructure configuration while an image pipeline references it. First update or delete the pipeline, and then delete the infrastructure configuration.

Console

To delete an infrastructure configuration from the Image Builder console, follow these steps:

Delete infrastructure configuration

1. To see a list of the infrastructure configurations created under your account, choose **Infrastructure configuration** from the navigation pane.
2. Select the check box next to **Configuration name** to select the infrastructure configuration that you want to delete.
3. At the top of the **Infrastructure configurations** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

AWS CLI

The following example shows how to delete an infrastructure configuration with the **delete-infrastructure-configuration** command in the AWS CLI.

```
aws imagebuilder delete-infrastructure-configuration --infrastructure-configuration-
arn arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/my-
example-infrastructure-configuration
```

Image Builder and AWS PrivateLink interface VPC endpoints

You can establish a private connection between your VPC and EC2 Image Builder by creating an *interface VPC endpoint*. Interface endpoints are powered by AWS PrivateLink, a technology that enables you to privately access Image Builder APIs without an internet gateway, NAT device, VPN connection, or Direct Connect connection. Instances in your VPC don't need public IP addresses to communicate with Image Builder APIs. Traffic between your VPC and Image Builder does not leave the Amazon network.

Each interface endpoint is represented by one or more Elastic Network Interfaces in your subnets. When you create a new image, you can specify the VPC subnet-id in your infrastructure configuration.

> **Note**
>
> Each service that you access from within a VPC has its own interface endpoint, with its own endpoint policy. Image Builder downloads the AWSTOE component manager application and accesses managed resources from S3 buckets to create custom images. To grant access to those buckets, you must update the S3 endpoint policy to allow it. For more information, see Custom policies for S3 bucket access.

> **Tip**
>
> For information about a deployable private VPC build example, including the required endpoints and endpoint policies, see the private VPC builds sample on GitHub. For more information, see Explore Image Builder sample projects on GitHub.

For more information about VPC endpoints, see Interface VPC endpoints (AWS PrivateLink) in the *Amazon VPC User Guide*.

Considerations for Image Builder VPC endpoints

Before you set up an interface VPC endpoint for Image Builder, ensure that you review Interface endpoint properties and limitations in the *Amazon VPC User Guide*.

Image Builder supports making calls to all of its API actions from your VPC.

Create an interface VPC endpoint for Image Builder

To create a VPC endpoint for the Image Builder service, you can use either the Amazon VPC console or the AWS Command Line Interface (AWS CLI). For more information, see Creating an interface endpoint in the *Amazon VPC User Guide*.

Create a VPC endpoint for Image Builder using the following service name:

- com.amazonaws.*region*.imagebuilder

If you enable private DNS for the endpoint, you can make API requests to Image Builder using its default DNS name for the Region, for example: `imagebuilder.us-east-1.amazonaws.com`. To look up the endpoint that applies to your target Region, see EC2 Image Builder endpoints and quotas in the *Amazon Web Services General Reference*.

For more information, see Accessing a service through an interface endpoint in the *Amazon VPC User Guide*.

Create a VPC endpoint policy for Image Builder

You can attach an endpoint policy to your VPC endpoint that controls access to Image Builder. The policy specifies the following information:

- The principal that can perform actions.
- The actions that can be performed.
- The resources on which actions can be performed.

If you are using Amazon-managed components in your recipe, the VPC endpoint for Image Builder must allow access to the following serviced-owned component library:

`arn:aws:imagebuilder:region:aws:component/*`

> **Important**
>
> When a non-default policy is applied to an interface VPC endpoint for EC2 Image Builder, certain failed API requests, such as those failing from `RequestLimitExceeded`, might not be logged to AWS CloudTrail or Amazon CloudWatch.

For more information, see Controlling access to services with VPC endpoints in the *Amazon VPC User Guide*.

Custom policies for S3 bucket access

Image Builder uses a publicly available S3 bucket to store and access managed resources, such as components. It also downloads the AWSTOE component management application from a separate S3 bucket. If you use a VPC endpoint for Amazon S3 in your environment, you'll need to ensure that your S3 VPC endpoint policy allows Image Builder to access the following S3 buckets. The bucket names are unique per AWS Region (*region*) and the application environment

(*environment*). Image Builder and AWSTOE support the following application environments: `prod`, `preprod`, and `beta`.

- The AWSTOE component manager bucket:

  ```
  s3://ec2imagebuilder-toe-region-environment
  ```

  Example: s3://ec2imagebuilder-toe-us-west-2-prod/*
- The Image Builder managed resources bucket:

  ```
  s3://ec2imagebuilder-managed-resources-region-environment/components
  ```

  Example: s3://ec2imagebuilder-managed-resources-us-west-2-prod/components/*

VPC endpoint policy examples

This section includes examples of custom VPC endpoint policies.

General VPC endpoint policy for Image Builder actions

The following example endpoint policy for Image Builder denies permission to delete Image Builder images and components. The example policy also grants permission to perform all other EC2 Image Builder actions.

JSON

```
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Action": "imagebuilder:*",
            "Effect": "Allow",
            "Resource": "*"
        },
        {
            "Action": "imagebuilder:DeleteImage",
            "Effect": "Deny",
            "Resource": "*"
        },
        {
```

```
            "Action": "imagebuilder:DeleteComponent",
            "Effect": "Deny",
            "Resource": "*"
        }
    ]
}
```

Restrict access by organization, allow managed component access

The following example endpoint policy shows how to restrict access to identities and resources that belong to your organization and provide access to the Amazon-managed Image Builder components. Replace *region*, *principal-org-id*, and *resource-org-id* with your organization's values.

JSON

```
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Sid": "AllowRequestsByOrgsIdentitiesToOrgsResources",
            "Effect": "Allow",
            "Principal": {
                "AWS": "*"
            },
            "Action": "*",
            "Resource": "*",
            "Condition": {
                "StringEquals": {
                    "aws:PrincipalOrgID": "principal-org-id",
                    "aws:ResourceOrgID": "resource-org-id"
                }
            }
        },
        {
            "Sid": "AllowAccessToEC2ImageBuilderComponents",
            "Effect": "Allow",
            "Principal": {
                "AWS": "*"
            },
            "Action": [
```

```
                "imagebuilder:GetComponent"
            ],
            "Resource": [
                "arn:aws:imagebuilder:us-east-1:aws:component/*"
            ]
        }
    ]
}
```

VPC endpoint policy for Amazon S3 bucket access

The following S3 endpoint policy example shows how to provide access to the S3 buckets that Image Builder uses to build custom images. Replace *region* and *environment* with your organization's values. Add any other required permissions to the policy based on your application requirements.

> **Note**
>
> For Linux images, if you don't specify user data in your image recipe, Image Builder adds a script to download and install the Systems Manager agent on the build and test instances for your image. To download the agent, Image Builder accesses the S3 bucket for your build Region.
>
> To ensure that Image Builder can bootstrap the build and test instances, add the following additional resource to your S3 endpoint policy:
>
> `"arn:aws:s3:::amazon-ssm-region/*"`

JSON

```
{
  "Version":"2012-10-17",
  "Statement": [
    {
      "Sid": "AllowImageBuilderAccessToAppAndComponentBuckets",
      "Effect": "Allow",
      "Principal": {
        "AWS": "*"
      },
      "Action": [
```

```
        "s3:GetObject"
      ],
      "Resource": [
        "arn:aws:s3:::ec2imagebuilder-toe-region-environment/*",
        "arn:aws:s3:::ec2imagebuilder-managed-resources-region-environment/
components/*"
      ]
    }
  ]
}
```

Manage Image Builder distribution settings

Before you configure distribution settings for your output images, we recommend that you verify availability for any underlying infrastructure or other requirements for instances that are launched from your output image in the distribution target Regions. For example, not all Regions support EC2 Mac Dedicated Hosts, which are required to launch instances from a macOS image. For more information about instance types and pricing for Dedicated Hosts, see Amazon EC2 Dedicated Hosts Pricing.

After you create distribution settings with Image Builder, you can manage them using the Image Builder console, the Image Builder API, or **imagebuilder** commands in the AWS CLI. With distribution settings, you can perform the following actions:

AMI distribution

- Specify the name and description of your output AMI.
- Authorize other AWS accounts, organizations, and OUs to launch the AMI from the owner's account. The owner account is billed for charges that are associated with the AMI.

> **Note**
>
> To make an AMI public, set the launch permission authorized accounts to `all`. For information and examples, see **ModifyImageAttribute** in the *Amazon EC2 API Reference*.

> **Important**
>
> You cannot make AMIs with watermarks public. If your image recipe includes watermarks, or if the source AMI has watermarks attached, you cannot set launch permissions to public. Image Builder rejects the distribution configuration. Watermarks propagate automatically when you copy or distribute an AMI across Regions or accounts. For more information, see Track AMI lineage with watermarks.

- Create a copy of the output AMI for each of the specified target accounts, organizations, and OUs in the destination Region. The target accounts, organizations, and OUs own their AMI copies, and are billed for any associated charges. For more information about distributing your AMI to AWS Organizations and OUs, see Share an AMI with organizations or OUs.
- Copy the AMI to the owner's account in other AWS Regions.
- Export VM image disks to Amazon Simple Storage Service (Amazon S3). For more information, see Example: Create distribution settings for output VM disks from the AWS CLI.

Container image distribution

- Specify the ECR repository where Image Builder stores the output image in the distribution Region.

You can use your distribution settings in the following ways to deliver images to target Regions, accounts, AWS Organizations and organizational units (OUs) one time, or with every pipeline build:

- To automatically deliver updated images to specified Regions, accounts, Organizations, and OUs, use distribution settings with an Image Builder pipeline that runs on a schedule.
- To create a new image and deliver it to the specified Regions, accounts, Organizations, and OUs, use distribution settings with an Image Builder pipeline that you run one time from the Image Builder console, using **Run pipeline** from the **Actions** menu.
- To create a new image and deliver it to the specified Regions, accounts, Organizations, and OUs, use distribution settings with the following API action or Image Builder command in the AWS CLI:
  - The **CreateImage** action in the Image Builder API.
  - The **create-image** command in the AWS CLI.

- To export virtual machine (VM) image disks to S3 buckets in target Regions as part of your regular image build process.

> **Tip**
>
> When you have multiple resources of the same type, tagging helps you to identify a specific resource based on the tags you've assigned to it. For more information about tagging your resources using Image Builder commands in the AWS CLI, see the Tag resources section of this guide.

Contents

- List and view distribution configuration detail
- Create and update AMI distribution configurations
- Create and update distribution settings for container images
- Set up cross-account AMI distribution with Image Builder
- Configure AMI distribution with an EC2 launch template
- Use enhanced AMI distribution capabilities

List and view distribution configuration detail

This section describes the various ways that you can find information and view details for your EC2 Image Builder distribution configuration.

Distribution configuration detail

- List distribution configurations from the console
- View distribution configuration details from the console
- List distributions from the AWS CLI
- Get distribution configuration detail from the AWS CLI

List distribution configurations from the console

To see a list of the distribution configurations created under your account in the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Distribution settings** from the navigation pane. This shows a list of the distribution configurations that are created under your account.
3. To view details or create new distribution configuration, choose the **Configuration name** link. This opens the detail view for the distribution settings.

> **Note**
>
> You can also select the check box next to the **Configuration name**, then choose **View details**.

View distribution configuration details from the console

To view details for a specific distribution configuration using the Image Builder console, select the configuration to review, using the steps described in List distribution configurations from the console.

On the distribution detail page, you can:

- **Delete** the distribution configuration. For more information about deleting resources in Image Builder, see Delete outdated or unused Image Builder resources.
- **Edit** distribution details.

List distributions from the AWS CLI

The following example shows how to use the **list-distribution-configurations** command in the AWS CLI to list all of your distributions.

```
aws imagebuilder list-distribution-configurations
```

Get distribution configuration detail from the AWS CLI

The following example shows how to use the **get-distribution-configuration** command in the AWS CLI to get the details of a distribution configuration by specifying its Amazon Resource Name (ARN).

```
aws imagebuilder get-distribution-configuration --distribution-configuration-arn
 arn:aws:imagebuilder:us-west-2:123456789012:distribution-configuration/my-example-
distribution-configuration
```

Create and update AMI distribution configurations

This section covers creating and updating distribution configurations for an Image Builder AMI.

Contents

- AMI distribution prerequisites
- Create an AMI distribution configuration
- Update an AMI distribution configuration
- Example: Enable EC2 Fast Launch with a launch template for output AMIs
- Example: Create distribution settings for output VM disks from the AWS CLI

AMI distribution prerequisites

Some distribution settings have prerequisites, as follows:

Topics

- Prerequisites for SSM output parameters
- Prerequisites for EC2 Fast Launch

Prerequisites for SSM output parameters

Before you create a new AMI distribution configuration that sets an AWS Systems Manager Parameter Store parameter (SSM parameter), ensure that you've met the following prerequisites.

Execution role

> When you create a pipeline or use the create-image command in the AWS CLI, you can only specify one Image Builder execution role. If you have defined an Image Builder workflow execution role, you would add any additional feature permissions to that role. Otherwise, you would create a new custom role that includes the required permissions.

> **Important**
>
> We recommend that you don't pass the AWSServiceRoleForImageBuilder service-linked role as your execution role. Instead, create a custom IAM role and attach the EC2ImageBuilderExecutionPolicy AWS managed policy. This policy grants the same permissions that Image Builder needs to call AWS services on your behalf. Using a custom role gives you full control over the permissions that Image Builder uses. It also keeps your service control policies (SCPs) and resource control policies (RCPs) in effect for operations that Image Builder performs on your behalf.

- To store the output AMI ID in an SSM parameter during distribution, you must specify the `ssm:PutParameter` action in your Image Builder execution role, with the parameter listed as a resource.
- When you set the parameter data type to `AWS EC2 Image` to signal Systems Manager to validate the parameter value as an AMI ID, you must also add the `ec2:DescribeImages` action.

Opt-in Region

You must enable an opt-in Region (Region that is disabled by default) in the source account. This requirement applies when your distribution configuration targets that Region in `ssmParameterConfigurations`, whether you use the Image Builder service-linked role or a custom execution role.

> **Note**
>
> The AMI copy to an opt-in Region can succeed even when the source account hasn't enabled the Region. Only the SSM output parameter write fails.

Without this prerequisite, the build fails with an error similar to the following:

```
In region 'af-south-1' - 'STS Client Error: The provided execution role does not
 exist or does not have sufficient permissions.'
```

To resolve this issue, do one of the following:

- Enable the opt-in Regions in the source account. For instructions on enabling a Region, see Enable or disable AWS Regions in your account in the *AWS Account Management Reference Guide*.
- Omit `ssmParameterConfigurations` for the opt-in Regions. Instead, use an Amazon EventBridge rule to react to the EC2 Image Builder Image State Change event and write the parameters yourself.

Prerequisites for EC2 Fast Launch

Before you create a new distribution configuration for EC2 Fast Launch for Windows AMIs, ensure that you've met the following prerequisites.

- If you provide a custom launch template when you configure EC2 Fast Launch, the service uses the VPC and other configuration settings that you've defined in the launch template. For more information, see Use a launch template when you set up EC2 Fast Launch.
- If you don't use a custom launch template to configure your settings, you must attach the EC2FastLaunchFullAccess policy to the IAM role that Image Builder uses to create your image. When you create a pipeline or use the create-image command in the AWS CLI, you can only specify one Image Builder execution role. If you have defined an Image Builder workflow execution role, you would add any additional feature permissions to that role. Otherwise, you would create a new custom role that includes the required permissions.

  This feature requires additional permissions beyond those in the base execution policy, so you must use a custom role. We recommend that you create a custom role with the EC2ImageBuilderExecutionPolicy AWS managed policy attached, and then add the EC2FastLaunchFullAccess policy to that role.

  Then, when Image Builder copies your image, EC2 Fast Launch automatically creates an CloudFormation stack with the following resources in your AWS account.

  - A virtual private cloud (VPC)
  - Private subnets across multiple Availability Zones
  - A launch template configured with Instance Metadata Service Version 2 (IMDSv2)
  - A security group with no inbound or outbound rules

> **Note**
>
> Image Builder doesn't support cross-account distribution for AMIs with EC2 Fast Launch pre-enabled. EC2 Fast Launch must be enabled from the destination account.

Create an AMI distribution configuration

Distribution configurations include the output AMI name, specific Region settings for encryption, launch permissions, and AWS accounts, organizations, and organizational units (OUs) that can launch the output AMI, and license configurations.

A distribution configuration allows you to specify the name and description of your output AMI, authorize other AWS accounts to launch the AMI, copy the AMI to other accounts, and replicate the AMI to other AWS Regions. It also allows you to export the AMI to Amazon Simple Storage Service (Amazon S3), or configure EC2 Fast Launch for output Windows AMIs. To make an AMI public, set the launch permission authorized accounts to `all`. See the examples for making an AMI public at EC2 **ModifyImageAttribute**.

Console

Follow these steps to create a new AMI distribution configuration in the AWS Management Console:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Distribution settings** from the navigation pane. This shows a list of the distribution configurations that are created under your account.
3. Choose **Create distribution settings** near the top of the **Distribution settings** panel.
4. In the **Image type** section, choose the **Amazon Machine Image (AMI)** output type.
5. In the **General** section, enter a **Name** for your distribution configuration, and optional description.
6. In the **Region settings** section, enter the following details for each Region where you are distributing your AMI:

    a. The AMI is distributed to the current Region (**Region 1**), by default. **Region 1** is the source for the distribution. Some settings for **Region 1** are not open for editing. For any Regions that you add, you can choose a Region from the **Region** dropdown list.

The **Kms key** identifies the AWS KMS key that's used to encrypt the EBS volumes for your image in the target Region. It's important to note that this doesn't apply for the original AMI that the build creates under your account in the source Region (**Region 1**). Encryption that runs during the distribution phase of the build is only for images that are distributed to other accounts or Regions.

To encrypt the EBS volumes for the AMI that's created in the source Region for your account, you must set the KMS key in the image recipe block device mapping (**Storage (volumes)** in the console).

Image Builder copies the AMI to the **Target accounts** that you specify for the Region.

> **Prerequisite**
>
> To copy an image across accounts, you must create the `EC2ImageBuilderDistributionCrossAccountRole` role in all of the distribution target accounts, and attach the Ec2ImageBuilderCrossAccountDistributionAccess policy managed policy to the role.

The **Output AMI name** is optional. If you provide a name, the final output AMI name includes an appended timestamp of when the AMI is built. If you do not specify a name, Image Builder appends the build timestamp to the recipe name. This ensures unique AMI names for each build.

i. With AMI sharing, you can grant access for specified AWS Principals to launch instances from your AMI. If you expand the **AMI sharing** section, you can enter the following details:

   - **Launch permissions** – Select **Private** if you want to keep your AMI private, and allow access for specific AWS Principals to launch an instance from your private AMI. Select **Public** if you want to make your AMI public. Any AWS Principal can launch an instance from your public AMI.
   - **Principals** – You can grant access for the following types of AWS Principals to launch instances:
     - **AWS account** – Grant access to a specific AWS account

- **Organizational unit (OU)** – Grant access to an OU, and all of its child entities. Child entities include OUs and AWS accounts.
- **Organization** – Grant access to your AWS Organizations, and all of its child entities. Child entities include OUs and AWS accounts.

  First, select the Principal type. Then enter the ID for the AWS Principal to which you want to grant access in the box to the right of the drop-down list. You can enter multiple IDs of different types.

ii. You can expand the **License configuration** section to attach license configurations created with AWS License Manager to your Image Builder images. License configurations contain licensing rules based on the terms of your enterprise agreements. Image Builder automatically includes license configurations that were associated with your base AMI.

iii. You can expand the **Launch template configuration** section to specify an EC2 launch template to use for launching instances from the AMI you create.

  If you are using an EC2 launch template, you can instruct Image Builder to create a new version of your launch template that includes the latest AMI ID after the build completes. To update the launch template, configure the settings as follows:

  - **Launch template name** – Select the name of the launch template that you want Image Builder to update.
  - **Set the default version** – Select this check box to update the launch template default version to the new version.

  To add another launch template configuration, choose **Add launch template configuration**. You can have up to five launch template configurations per Region.

iv. You can expand the **SSM parameter configurations** section to configure an SSM parameter that will store the output AMI ID for the image that's distributed to the destination Region. You can optionally specify a distribution account in the Region.

  Parameter name – Enter the name for your parameter. For example `/output/image/param`.

  Data type – Keep the default value (`AWS EC2 Image`). This tells Systems Manager to validate the parameter value to ensure that it's a valid AMI ID.

b. To add distribution settings for another Region, choose **Add Region**.

7. Choose **Create settings** when you are done.

AWS CLI

The following example shows how to use the **create-distribution-configuration** command to create a new distribution configuration for your AMI, using the AWS CLI.

1. **Create a CLI input JSON file**

   Use a file-editing tool to create a JSON file with keys shown in one of the following examples, and values that are valid for your environment. These examples define which AWS accounts, AWS Organizations or organizational units (OUs) have permission to launch the AMI you distribute to the specified Regions. Name the file `create-ami-distribution-configuration.json`, for use in the next step:

   Example 1: Distribute to AWS accounts

   This example distributes an AMI to two Regions, and specifies AWS accounts that have launch permissions in each Region.

```
{
 "name": "MyExampleAccountDistribution",
 "description": "Copies AMI to eu-west-1, and specifies accounts that can launch
 instances in each Region.",
 "distributions": [
  {
   "region": "us-west-2",
   "amiDistributionConfiguration": {
    "name": "Name {{imagebuilder:buildDate}}",
    "description": "An example image name with parameter references",
    "amiTags": {
     "KeyName": "Some Value"
    },
    "launchPermission": {
     "userIds": [
      "987654321012"
     ]
    }
   }
  },
```

```
  {
   "region": "eu-west-1",
   "amiDistributionConfiguration": {
    "name": "My {{imagebuilder:buildVersion}} image {{imagebuilder:buildDate}}",
    "amiTags": {
     "KeyName": "Some value"
    },
    "launchPermission": {
     "userIds": [
      "100000000001"
     ]
    }
   }
  }
 ]
}
```

Example 2: Distribute to Organizations and OUs

This example distributes an AMI to the source Region, and specifies organization and OU launch permissions.

```
{
 "name": "MyExampleAWSOrganizationDistribution",
 "description": "Shares AMI with the Organization and OU",
 "distributions": [
  {
   "region": "us-west-2",
   "amiDistributionConfiguration": {
    "name": "Name {{ imagebuilder:buildDate }}",
    "launchPermission": {
     "organizationArns": [
      "arn:aws:organizations::123456789012:organization/o-myorganization123"
     ],
     "organizationalUnitArns": [
      "arn:aws:organizations::123456789012:ou/o-123example/ou-1234-
myorganizationalunit"
     ]
    }
   }
  }
 ]
```

```
}
```

Example 3: Store the output AMI ID in an SSM parameter

This example stores the output AMI ID in an AWS Systems Manager Parameter Store parameter in the distribution Region.

```
{
 "name": "SSMParameterOutputAMI",
 "description": "Updates an SSM parameter with the output AMI ID for the
 distribution.",
 "distributions": [
  {
   "region": "us-west-2",
   "amiDistributionConfiguration": {
    "name": "Name {{ imagebuilder:buildDate }}"
   },
   "ssmParameterConfigurations": [
    {
     "amiAccountId": "111122223333",
     "parameterName": "/output/image/param",
     "dataType": "aws:ec2:image"
    }
   ]
  }
 ]
}
```

2. **Run the following command, using the file you created as input.**

```
aws imagebuilder create-distribution-configuration --cli-input-json
 file://create-ami-distribution-configuration.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows

uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

For more detailed information, see **create-distribution-configuration** in the *AWS CLI Command Reference*.

Update an AMI distribution configuration

You can change your AMI distribution configuration. However, the changes you make do not apply to any resources that Image Builder has already distributed. For example, if you have distributed an AMI to a Region that you later remove from your distribution, the AMI that was already distributed remains in that Region until you remove it manually.

AWS Management Console

Follow these steps to an AMI distribution configuration in the AWS Management Console:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Distribution settings** from the navigation pane. This shows a list of the distribution configurations that are created under your account.
3. To view details or update a distribution configuration, choose the **Configuration name** link. This opens the detail view for the distribution settings.

> **Note**
>
> You can also select the check box next to the **Configuration name**, then choose **View details**.

4. To edit distribution configuration, choose **Edit** from the upper right corner of the **Distribution details** section. Some fields are locked, such as the **Name** of the distribution configuration, and the default **Region** that is displayed as **Region 1**. For more information about the distribution configuration settings, see Create an AMI distribution configuration.
5. Choose **Save changes** when you are done.

AWS CLI

The following example shows how to use the **update-distribution-configuration** command to update distribution settings for your AMI, using the AWS CLI.

1. **Create a CLI input JSON file**

   Use a file-editing tool to create a JSON file with the keys shown in the following example, and values that are valid for your environment. This example uses a file named `update-ami-distribution-configuration.json`.

```
{
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:distribution-configuration/update-ami-distribution-
configuration.json",
 "description": "Copies AMI to eu-west-2, and specifies accounts that can launch
 instances in each Region.",
 "distributions": [
   {
   "region": "us-west-2",
   "amiDistributionConfiguration": {
    "name": "Name {{imagebuilder:buildDate}}",
    "description": "An example image name with parameter references",
    "launchPermission": {
     "userIds": [
      "987654321012"
     ]
    }
   }
  },
  {
   "region": "eu-west-2",
   "amiDistributionConfiguration": {
    "name": "My {{imagebuilder:buildVersion}} image {{imagebuilder:buildDate}}",
    "amiTags": {
     "KeyName": "Some value"
    },
    "launchPermission": {
     "userIds": [
      "100000000001"
     ]
    }
   }
```

```
  }
 ]
}
```

2. **Run the following command, using the file you created as input.**

```
aws imagebuilder update-distribution-configuration --cli-input-json
 file://update-ami-distribution-configuration.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

For more detailed information, see **update-distribution-configuration** in the *AWS CLI Command Reference*. To update tags for your distribution configuration resource, see the Tag resources section.

Example: Enable EC2 Fast Launch with a launch template for output AMIs

The following example shows how to use the **create-distribution-configuration** command with a launch template to create distribution settings that have EC2 Fast Launch configured for your AMI, from the AWS CLI.

To configure EC2 Fast Launch settings without a launch template, ensure that you've met all of the EC2 Fast Launch prerequisites before you create your distribution configuration.

1. **Create a CLI input JSON file**

   Use a file editing tool to create a JSON file with keys as shown in the following example, plus values that are valid for your environment.

   This example launches instances for all of its target resources simultaneously, because the maximum number of parallel launches is greater than the target resource count. This file is

named `ami-dist-config-win-fast-launch.json` in the command example shown in the next step.

```
{
"name": "WinFastLaunchDistribution",
"description": "An example of Windows AMI EC2 Fast Launch settings in the
 distribution configuration.",
"distributions": [
 {
  "region": "us-west-2",
  "amiDistributionConfiguration": {
   "name": "Name {{imagebuilder:buildDate}}",
   "description": "Includes Windows AMI EC2 Fast Launch settings.",
   "amiTags": {
    "KeyName": "Some Value"
   }
  },
  "fastLaunchConfigurations": [{
   "enabled": true,
   "snapshotConfiguration": {
    "targetResourceCount": 5
   },
   "maxParallelLaunches": 6,
   "launchTemplate": {
    "launchTemplateId": "lt-0ab1234c56d789012",
    "launchTemplateVersion": "1"
    }
  }],
  "launchTemplateConfigurations": [{
       "launchTemplateId": "lt-0ab1234c56d789012",
       "setDefaultVersion": true
    }]
 }]
}
```

Note

You can specify the `launchTemplateName` instead of the `launchTemplateId` in the `launchTemplate` section, but you can't specify both the name and Id.

2. **Run the following command, using the file you created as input.**

```
aws imagebuilder create-distribution-configuration --cli-input-json file://ami-dist-config-win-fast-launch.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

For more detailed information, see **create-distribution-configuration** in the *AWS CLI Command Reference*.

Example: Create distribution settings for output VM disks from the AWS CLI

The following example shows how to use the **create-distribution-configuration** command to create distribution settings that will export VM image disks to Amazon S3 with every image build.

1. **Create a CLI input JSON file**

   You can streamline the **create-distribution-configuration** command that you use in the AWS CLI. To do this, create a JSON file that contains all of the export configuration that you want to pass into the command.

   > **Note**
   >
   > The naming convention for the data values in the JSON file follows the pattern that is specified for the Image Builder API operation request parameters. To review the API operation request parameters, see the **CreateDistributionConfiguration** command in the *EC2 Image Builder API Reference*.

To provide the data values as command line parameters, refer to the parameter names specified in the *AWS CLI Command Reference*. to the **create-distribution-configuration** command as options.

Here is a summary of the parameters that we specify in the `s3ExportConfiguration` JSON object for this example:

- **roleName** (string, required) – The name of the role that grants VM Import/Export permission to export images to your S3 bucket.
- **diskImageFormat** (string, required) – Export the updated disk image to one of the following supported formats:
  - **Virtual Hard Disk (VHD)** – Compatible with Citrix Xen and Microsoft Hyper-V virtualization products.
  - **Stream-optimized ESX Virtual Machine Disk (VMDK)** – Compatible with VMware ESX and VMware vSphere versions 4, 5, and 6.
  - **Raw** – Raw format.
- **s3Bucket** (string, required) – The S3 bucket in which to store the output disk images for your VM.

Save the file as `export-vm-disks.json`. Use the file name in the **create-distribution-configuration** command.

```
{
 "name": "example-distribution-configuration-with-vm-export",
 "description": "example",
 "distributions": [
  {
   "region": "us-west-2",
   "amiDistributionConfiguration": {
    "description": "example-with-vm-export"

   },
   "s3ExportConfiguration": {
    "roleName": "vmimport",
    "diskImageFormat": "RAW",
    "s3Bucket": "vm-bucket-export"
   }
```

```
  }],
 "clientToken": "abc123def4567ab"
}
```

2. **Run the following command, using the file you created as input.**

```
aws imagebuilder create-distribution-configuration --cli-input-json file://export-vm-disks.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

For more detailed information, see **create-distribution-configuration** in the *AWS CLI Command Reference*.

Create and update distribution settings for container images

This section covers creating and updating distribution settings for Image Builder container images.

Contents

- Create distribution settings for Image Builder container images from the AWS CLI
- Update distribution settings for your container image from the AWS CLI

Create distribution settings for Image Builder container images from the AWS CLI

A distribution configuration enables you to specify the name and description of your output container image and replicate the container image to other AWS Regions. You can also apply separate tags to the distribution configuration resource and to the container images within each Region.

1. **Create a CLI input JSON file**

   Use your favorite file-editing tool to create a JSON file with the keys shown in the following example, plus values that are valid for your environment. This example uses a file named `create-container-distribution-configuration.json`:

```
{
 "name": "distribution-configuration-name",
 "description": "Distributes container image to Amazon ECR repository in two
 regions.",
 "distributions": [
  {
   "region": "us-west-2",
   "containerDistributionConfiguration": {
    "description": "My test image.",
    "targetRepository": {
     "service": "ECR",
     "repositoryName": "testrepo"
    },
    "containerTags": ["west2", "image1"]
   }
  },
  {
   "region": "us-east-1",
   "containerDistributionConfiguration": {
    "description": "My test image.",
    "targetRepository": {
     "service": "ECR",
     "repositoryName": "testrepo"
    },
      "containerTags": ["east1", "imagedist"]
   }
  }
 ],
 "tags": {
    "DistributionConfigurationTestTagKey1":
 "DistributionConfigurationTestTagValue1",
    "DistributionConfigurationTestTagKey2":
 "DistributionConfigurationTestTagValue2"
 }
}
```

2. **Run the following command, using the file you created as input.**

```
aws imagebuilder create-distribution-configuration --cli-input-json file://create-container-distribution-configuration.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

For more detailed information, see **create-distribution-configuration** in the *AWS CLI Command Reference*.

Update distribution settings for your container image from the AWS CLI

The following example shows how to use the **update-distribution-configuration** command to update distribution settings for your container image, using the AWS CLI. You can also update tags for the container images within each Region.

1. **Create a CLI input JSON file**

   Use your favorite file-editing tool to create a JSON file with keys shown in the following example, plus values that are valid for your environment. This example uses a file named `update-container-distribution-configuration.json`:

```
{
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:distribution-configuration/update-container-distribution-
configuration.json",
 "description": "Distributes container image to Amazon ECR repository in two
 regions.",
 "distributions": [
  {
   "region": "us-west-2",
```

```
   "containerDistributionConfiguration": {
    "description": "My test image.",
    "targetRepository": {
     "service": "ECR",
     "repositoryName": "testrepo"
    },
    "containerTags": ["west2", "image1"]
   }
  },
  {
   "region": "us-east-2",
   "containerDistributionConfiguration": {
    "description": "My test image.",
    "targetRepository": {
     "service": "ECR",
     "repositoryName": "testrepo"
    },
      "containerTags": ["east2", "imagedist"]
   }
  }
 ]
}
```

2. **Run the following command, using the file you created as input:**

```
aws imagebuilder update-distribution-configuration --cli-input-json file://update-container-distribution-configuration.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

For more detailed information, see **update-distribution-configuration** in the *AWS CLI Command Reference*. To update tags for your distribution configuration resource, see the Tag resources section.

Set up cross-account AMI distribution with Image Builder

This section describes how you can configure distribution settings to deliver an Image Builder AMI to other accounts that you specify.

The destination account can then launch or modify the AMI, as needed.

> **Tip**
>
> For information about a deployable example that includes the AWS KMS key policy and the target account role, see the cross-account AMIs sample on GitHub. The same repository includes a Terraform variant. For more information, see Explore Image Builder sample projects on GitHub.

> **Note**
>
> AWS CLI command examples in this section assume that you have previously created image recipe and infrastructure configuration JSON files. To create the JSON file for an image recipe, see Create an image recipe with the AWS CLI. To create the JSON file for an infrastructure configuration, see Create an infrastructure configuration.

Prerequisites for cross-account AMI distribution

To ensure that target accounts can successfully launch instances from your Image Builder image, you must configure the appropriate permissions for all destination accounts in all Regions.

If you encrypt your AMI using AWS Key Management Service (AWS KMS), you must configure an AWS KMS key for your account that is used to encrypt the new image.

When Image Builder performs cross-account distribution for encrypted AMIs, the image in the source account is decrypted and pushed to the target Region, where it is re-encrypted using the designated key for that Region. Because Image Builder acts on behalf of the target account, and uses an IAM role that you create in the destination Region, that account must have access to keys in both the source and destination Regions.

Encryption keys

The following prerequisites are required if your image is encrypted using AWS KMS. IAM prerequisites are covered in the next section.

Source account requirements

- Create a KMS key in your account in all Regions where you build and distribute your AMI. You can also use an existing key.
- Update the key policy for all of those keys to allow destination accounts to use your key.

Destination account requirements

- Add an inline policy to `EC2ImageBuilderDistributionCrossAccountRole` that allows the role to perform the required actions to distribute an encrypted AMI. For IAM configuration steps, see the IAM policies prerequisites section.

For more information about cross-account access using AWS KMS, see Allowing users in other accounts to use a KMS key in the *AWS Key Management Service Developer Guide*.

Specify your encryption key in the image recipe, as follows:

- If you are using the Image Builder console, choose your encryption key from the **Encryption (KMS alias)** dropdown list in the **Storage (volumes)** section of your recipe.
- If you are using the **CreateImageRecipe** API action, or the **create-image-recipe** command in the AWS CLI, configure your key in the `ebs` section under `blockDeviceMappings` in your JSON input.

  The following JSON snippet shows encryption settings for an image recipe. In addition to providing your encryption key, you must also set the `encrypted` flag to `true`.

```
{
 ...
 "blockDeviceMappings": [
 {
  "deviceName": "Example root volume",
  "ebs": {
   "deleteOnTermination": true,
   "encrypted": true,
   "iops": 100,
```

```
    "kmsKeyId": "image-owner-key-id",
    ...
   },
   ...
 }],
 ...
}
```

IAM policies

To configure cross-account distribution permissions in AWS Identity and Access Management (IAM), follow these steps:

1. To use Image Builder AMIs that are distributed across accounts, the destination account owner must create a new IAM role in their account called `EC2ImageBuilderDistributionCrossAccountRole`.
2. They must attach the Ec2ImageBuilderCrossAccountDistributionAccess policy to the role to enable cross-account distribution. For more information about managed policies, see Managed Policies and Inline Policies in the *AWS Identity and Access Management User Guide*.
3. Verify that the source account ID is added to the trust policy attached to the IAM role of the destination account. The following example shows a trust policy in the destination account that specifies the account ID from the source account.

   JSON

   ```
   {
       "Version":"2012-10-17",
       "Statement": [{
           "Effect": "Allow",
           "Principal": {
               "AWS": "arn:aws:iam::444455556666:root"
           },
           "Action": "sts:AssumeRole"
       }]
   }
   ```

   For more information about trust policies, see Resource-Based Policies in the *AWS Identity and Access Management User Guide*.

4. If the AMI you distribute is encrypted, the destination account owner must add the following inline policy to the `EC2ImageBuilderDistributionCrossAccountRole` in their account so that they can use your KMS keys. The `Principal` section contains their account number. This enables Image Builder to act on their behalf when it uses AWS KMS to encrypt and decrypt the AMI with the appropriate keys for each Region.

   JSON

   ```
   {
    "Version":"2012-10-17",
    "Statement": [
     {
      "Sid": "AllowRoleToPerformKMSOperationsOnBehalfOfTheDestinationAccount",
      "Effect": "Allow",
      "Action": [
       "kms:Encrypt",
       "kms:Decrypt",
       "kms:ReEncrypt*",
       "kms:GenerateDataKey*",
       "kms:DescribeKey",
       "kms:CreateGrant",
       "kms:ListGrants",
       "kms:RevokeGrant"
      ],
      "Resource": "*"
     }
    ]
   }
   ```

   For more information about inline policies, see Inline Policies in the *AWS Identity and Access Management User Guide*.

5. If you are using `launchTemplateConfigurations` to specify an Amazon EC2 launch template, you must also add the following policy to your `EC2ImageBuilderDistributionCrossAccountRole` in each destination account.

   JSON

   ```
   {
   ```

```
    "Version":"2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ec2:CreateLaunchTemplateVersion",
                "ec2:ModifyLaunchTemplate"
            ],
            "Resource": "*",
            "Condition": {
                "StringEquals": {
                    "aws:ResourceTag/CreatedBy": "EC2 Image Builder"
                }
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:DescribeLaunchTemplates"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:CreateTags"
            ],
            "Resource": "arn:aws:ec2:*:*:launch-template/*",
            "Condition": {
                "StringEquals": {
                    "aws:RequestTag/CreatedBy": "EC2 Image Builder"
                }
            }
        }
    ]
}
```

6. If you use an AWS Systems Manager Parameter Store parameter to store the AMI ID of the output AMI for the distribution account and Region, you must add the following policy to your `EC2ImageBuilderDistributionCrossAccountRole` in each destination account.

JSON

```
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:PutParameter"
            ],
            "Resource": "arn:aws:ssm:*:111122223333:parameter/ImageBuilder-*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:DescribeImages"
            ],
            "Resource": "*"
        }
    ]
}
```

Limits for cross-account distribution

There are some limitations when distributing Image Builder images across accounts:

- The destination account is limited to 50 concurrent AMI copies for each destination Region.
- If you want to copy a paravirtual (PV) virtualization AMI to another Region, the destination Region must support PV virtualization AMIs. For more information, see Linux AMI virtualization types.
- You cannot create an unencrypted copy of an encrypted snapshot. If you don't specify an AWS Key Management Service (AWS KMS) customer managed key for the `KmsKeyId` parameter, Image Builder uses the default key for Amazon Elastic Block Store (Amazon EBS). For more information, see Amazon EBS Encryption in the *Amazon Elastic Compute Cloud User Guide*.

For more information, see CreateDistributionConfiguration in the *EC2 Image Builder API Reference*.

Configure cross-account distribution for an Image Builder AMI from the console

This section describes how to create and configure distribution settings for cross-account distribution of your Image Builder AMIs using the AWS Management Console. Configuring cross-account distribution requires specific IAM permissions. You must complete the Prerequisites for cross-account AMI distribution for this section before you continue.

To create distribution settings in the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Distribution settings** from the navigation pane. This shows a list of the distribution settings that are created under your account.
3. At the top of the **Distribution settings** page, choose **Create distribution settings**. This takes you to the **Create distribution settings** page.
4. In the **Image type** section, choose **Amazon Machine Image (AMI)** as the **Output type**. This is the default setting.
5. In the **General** section, enter the **Name** of the distribution settings resource that you want to create (*required*).
6. In the **Region settings** section, enter a 12-digit account ID that you want to distribute your AMI to in **Target accounts** for the selected Region, and press **Enter**. This checks for the correct formatting, and then displays the account ID that you entered below the box. Repeat the process to add more accounts.

   To remove an account that you entered, choose the **X** displayed to the right of the account ID.

   Enter the **Output AMI name** for each Region.
7. Continue specifying any additional settings that you require, and choose **Create settings** to create your new distribution settings resource.

Configure cross-account distribution for an Image Builder AMI from the AWS CLI

This section describes how to configure a distribution settings file and use the **create-image** command in the AWS CLI to build and distribute an Image Builder AMI across accounts.

Configuring cross-account distribution requires specific IAM permissions. You must complete the Prerequisites for cross-account AMI distribution for this section before you run the **create-image** command.

1. **Configure a distribution settings file**

   Before you use the **create-image** command in the AWS CLI to create an Image Builder AMI that is distributed to another account, you must create a `DistributionConfiguration` JSON structure that specifies the target account IDs in the `AmiDistributionConfiguration` settings. You must specify at least one `AmiDistributionConfiguration` in the source Region.

   The following sample file, named `create-distribution-configuration.json`, shows configuration for cross-account image distribution in the source Region.

```
{
 "name": "cross-account-distribution-example",
 "description": "Cross Account Distribution Configuration Example",
 "distributions": [
  {
   "amiDistributionConfiguration": {
    "targetAccountIds": ["123456789012", "987654321098"],
    "name": "Name {{ imagebuilder:buildDate }}",
    "description": "ImageCopy Ami Copy Configuration"
   },
   "region": "us-west-2"
  }
 ]
}
```

2. **Create the distribution settings**

   To create an Image Builder distribution settings resource using the create-distribution-configuration command in the AWS CLI, provide the following parameters in the command:

   - Enter the name of the distribution in the `--name` parameter.
   - Attach the distribution configuration JSON file you created in the `--cli-input-json` parameter.

```
aws imagebuilder create-distribution-configuration --name my distribution name --
cli-input-json file://create-distribution-configuration.json
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

You can also provide JSON directly in the command, using the `--distributions` parameter.

Configure AMI distribution with an EC2 launch template

To help ensure a consistent launch experience for your Image Builder AMI in target accounts and Regions, you can specify an Amazon EC2 launch template in your distribution settings, using `launchTemplateConfigurations`. When `launchTemplateConfigurations` are present during the distribution process, Image Builder creates a new version of the launch template that includes all of the original settings from the template, and the new AMI ID from the build. For more information about launching an EC2 instance using a launch template, see one of the following links, depending on your target operating system.

- Launch a Linux instance from a launch template
- Launch a Windows instance from a launch template

Note

When you include a launch template to enable Windows Fast Launch in your image, the launch template must include the following tag so that Image Builder can enable Windows Fast Launch on your behalf.

```
CreatedBy: EC2 Image Builder
```

Add an EC2 launch template to AMI distribution settings from the console

To provide a launch template with your output AMI, follow these steps in the console:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Distribution settings** from the navigation pane. This shows a list of the distribution settings that are created under your account.
3. At the top of the **Distribution settings** page, choose **Create distribution settings**. This opens the **Create distribution settings** page.
4. In the **Image type** section, choose the **Amazon Machine Image (AMI) Output type**. This is the default setting.
5. In the **General** section, enter the **Name** of the distribution settings resource that you want to create (*required*).
6. In the **Region settings** section, select the name of an EC2 launch template from the list. If there are no launch templates in your account, choose **Create new launch template**, which opens the **Launch Templates** in the **EC2 Dashboard**.

   Select the **Set the default version** check box to update the launch template default version to the new version that Image Builder creates with your output AMI.

   To add another launch template to the selected Region, choose **Add launch template configuration**.

   To remove a launch template, choose **Remove**.
7. Continue specifying any additional settings that you require, and choose **Create settings** to create your new distribution settings resource.

Add an EC2 launch template to AMI distribution settings from the AWS CLI

This section describes how to configure a distribution settings file with a launch template, and use the **create-image** command in the AWS CLI to build and distribute an Image Builder AMI and a new version of the launch template that uses it.

1. **Configure a distribution settings file**

   Before you can create an Image Builder AMI with a launch template, using the AWS CLI, you must create a distribution configuration JSON structure that specifies the `launchTemplateConfigurations` settings. You must specify at least one `launchTemplateConfigurations` entry in the source Region.

The following sample file, named `create-distribution-config-launch-template.json`, shows a few possible scenarios for launch template configuration in the source Region.

```
{
    "name": "NewDistributionConfiguration",
    "description": "This is just a test",
    "distributions": [
        {
            "region": "us-west-2",
            "amiDistributionConfiguration": {
                "name": "test-{{imagebuilder:buildDate}}-
{{imagebuilder:buildVersion}}",
                "description": "description"
            },
            "launchTemplateConfigurations": [
                {
                    "launchTemplateId": "lt-0a1bcde2fgh34567",
                    "accountId": "935302948087",
                    "setDefaultVersion": true
                },
                {
                    "launchTemplateId": "lt-0aaa1bcde2ff3456"
                },
                {
                    "launchTemplateId": "lt-12345678901234567",
                    "accountId": "123456789012"
                }
            ]
        }
    ],
    "clientToken": "clientToken1"
}
```

2. **Create the distribution settings**

   To create an Image Builder distribution settings resource using the create-distribution-configuration command in the AWS CLI, provide the following parameters in the command:

   - Enter the name of the distribution in the `--name` parameter.

- Attach the distribution configuration JSON file you created in the `--cli-input-json` parameter.

```
aws imagebuilder create-distribution-configuration --name my distribution name--
cli-input-json file://create-distribution-config-launch-template.json
```

> **Note**
>
> - You must include the `file://` notation at the beginning of the JSON file path.
> - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

You can also provide JSON directly in the command, using the `--distributions` parameter.

Use enhanced AMI distribution capabilities

Image Builder offers advanced distribution capabilities that give you flexibility and control over how your AMIs are distributed across regions and accounts. These capabilities separate distribution from the build process, allowing you to distribute existing images on demand, recover from distribution failures efficiently, and implement controlled, multi-stage distribution strategies through customizable workflows.

You can use enhanced AMI distribution capabilities in Image Builder to directly perform distribution activities without the need to re-run a complete image build.

Decoupled Distribution

The DistributeImage API accepts three types of source image references:

- **AMI ID** – A standard AMI identifier (for example, `ami-0abcdef1234567890`)
- **SSM Parameter** – An SSM parameter that stores an AMI ID (for example, `ssm:/my/ami/parameter`)
- **Image Builder version ARN** – An Image Builder image version ARN

Distribution Retry

If an image distribution fails, use the `RetryImage` API to retry distribution. This reduces time to troubleshoot the cause of the failure by avoiding a complete image rebuild. Use `RetryImage` after resolving the underlying cause of the distribution failure.

The RetryImage API accepts an image build version ARN (for example, `arn:aws:imagebuilder:us-west-2:123456789012:image/my-image/1.0.0/1`). When you invoke the API, Image Builder automatically resumes the distribution process from the point of failure using the original distribution configuration and settings. The `RetryImage` API can retry distributions that failed during the distribution phase, test phase, or integration phase. It works with AMIs in the following states: pending, failed, deleted, or available.

Prerequisites

Before retrying a distribution, ensure the following:

- You have identified and resolved the root cause of the failure. Review distribution logs in CloudWatch Logs for error details.
- You have the necessary IAM permissions to retry the image build.
- For cross-account distribution failures, verify that the `EC2ImageBuilderDistributionCrossAccountRole` in the destination account has the `Ec2ImageBuilderCrossAccountDistributionAccess` policy attached.

Important: Retrying without fixing the underlying issue will result in repeated failures.

Distribution Workflows

Distribution workflows are a new workflow type that complement build and test workflows, enabling you to define and control the distribution process with sequential steps. With distribution workflows, you can create custom distribution processes that include AMI copy operations, wait-for-action checkpoints, image attribute modifications, and other distribution-related steps. This provides structured control over how your AMIs are distributed, with step-level visibility, parallel distribution capabilities, and granular error reporting.

To learn more about creating and customizing workflows, see Manage Image Workflows.

Share Image Builder resources with AWS RAM

EC2 Image Builder integrates with AWS Resource Access Manager (AWS RAM) so that you can share the following types of Image Builder resources with any AWS account or through AWS Organizations.

- Components
- Images
- Recipes

To share resources through AWS RAM, you must create a resource share. A resource share specifies the resources to share and the consumers with whom to share them. Consumers can be individual AWS accounts, organizational units, or an entire organization in AWS Organizations. The following list includes the types of accounts and organizations that you can share with.

- Specific AWS accounts inside or outside of its organization in AWS Organizations.
- An organizational unit (OU) inside of its organization in AWS Organizations.
- Its entire organization in AWS Organizations.
- AWS Organizations or OUs outside of its organization.

In this model, the AWS account that owns the resource (owner) shares it with other AWS accounts or through AWS Organizations (consumers) within the same Region. When a shared resource is updated, consumers get those updates automatically.

> **Note**
>
> Shared components, images, and image recipes count toward the corresponding resource limits of the owner only. The resource limits of the consumers are not affected by the resources that are shared with them.

Topics

- Resource owners
- Resource consumers
- Create an AWS RAM resource share for your Image Builder resources

- Unshare an Image Builder resource from AWS RAM

Resource owners

Image Builder resources can only be shared in the AWS Region where they are created. When you share these resources, they will not replicate across Regions.

To get a list of the Image Builder resources that you own and can share, specify the ownership filter in the console or when you run the command in the AWS CLI.

- List Image Builder components
- List images
- List and view image recipe details
- List and view container recipe details

For more information about AWS RAM, see the *AWS RAM User Guide*.

Prerequisites for sharing Image Builder resources

To share an Image Builder resource, such as a component, image, or recipe:

- Your AWS account must own the Image Builder resource that you want to share. You cannot share resources that have been shared with you.
- The AWS Key Management Service (AWS KMS) key associated with encrypted resources must be explicitly shared with the target accounts, organizations, or OUs.
- In order to share your Image Builder resources with AWS Organizations and OUs using AWS RAM, you must enable sharing. For more information, see Enable Sharing with AWS Organizations in the *AWS RAM User Guide*.
- If you distribute an image encrypted with AWS KMS across accounts in different Regions, you must create a KMS key and alias in each target Region. Additionally, the people who will be launching instances in those Regions will need access to the KMS key specified via the Key Policy.

The following resources that Image Builder creates from your pipeline build are not considered Image Builder resources – rather, they are external resources that Image Builder distributes in your account, and to the AWS Regions, accounts, and organizations or organizational units (OUs) that you specify in your distribution configuration.

- Amazon Machine Images (AMIs)
- Container images that reside in Amazon ECR

For more information about distribution settings for your AMI, see Create and update AMI distribution configurations. For more information about distribution settings for your container image in Amazon ECR, see Create and update distribution settings for container images.

For more information about sharing your AMI with AWS Organizations and OUs, see Share an AMI with organizations or OUs.

Resource consumers

Consumers can use a shared resource, but cannot modify it in any way. When they create Image Builder recipes, they can specify a shared image as the base image, and they can add shared components. They can also specify a shared recipe when they create an Image Builder image pipeline, or when they use the **create-image** command in the AWS CLI.

If you belong to an organization in AWS Organizations, and sharing within your organization is enabled, consumers in your organization are automatically granted access to the shared resource. Otherwise, consumers receive an invitation to join the resource share and are granted access to the shared resource after accepting the invitation.

Create an AWS RAM resource share for your Image Builder resources

To share an Image Builder component, image, or recipe, you must add it to an AWS Resource Access Manager resource share. The resource share specifies the resources to share and the consumers with whom they are shared.

The following options are available for sharing your resources.

Option 1: Create a RAM resource share

When you create a RAM resource share, you can share a component, image, or recipe that you own in a single step. Use one of the following methods to create your resource share:

- **Console**

To create your resource share using the AWS RAM console, see Share AWS resources owned by you in the *AWS RAM User Guide*.

- **AWS CLI**

  To create your resource share using the AWS RAM command line interface, run the **create-resource-share** command in the AWS CLI.

Option 2: Apply a resource policy and promote to an existing resource share

The second option for sharing your resources involves two steps, running commands in the AWS CLI for both. The first step uses Image Builder commands in the AWS CLI to apply resource-based policies to the shared resource. The second step promotes the resource to a RAM resource share using the **promote-resource-share-created-from-policy** AWS RAM command in the AWS CLI to ensure that the resource is visible to all principals with whom you've shared it.

1. **Apply the resource policy**

   To successfully apply the resource policy, you must ensure that the account with which you are sharing has permission to access any underlying resources.

   Choose the tab that matches your resource type for the applicable command.

   Image

   You can apply a resource policy to an image, to allow others to use it as the base image in their recipes.

   Run the **put-image-policy** Image Builder command in the AWS CLI, to identify the AWS principals to share the image with.

```
aws imagebuilder put-image-policy --image-arn arn:aws:imagebuilder:us-
west-2:123456789012:image/my-example-image/2019.12.03/1 --policy '{ "Version":
 "2012-10-17",        "Statement": [ { "Effect": "Allow", "Principal":
 { "AWS": [ "123456789012" ] }, "Action": ["imagebuilder:GetImage",
 "imagebuilder:ListImages"], "Resource": [ "arn:aws:imagebuilder:us-
west-2:123456789012:image/my-example-image/2019.12.03/1" ] } ] }'
```

Component

You can apply a resource policy to a build or test component to enable cross-account sharing. This command gives other accounts permission to use your component in their recipes. To successfully apply the resource policy, you must ensure that the account with which you are sharing has permission to access any resources referenced by the shared component, such as files hosted on private repositories.

Run the **put-component-policy** Image Builder command in the AWS CLI, to identify the AWS principals to share the component with.

```
aws imagebuilder put-component-policy --component-arn arn:aws:imagebuilder:us-
west-2:123456789012:component/my-example-component/2019.12.03/1 --
policy '{ "Version": "2012-10-17",        "Statement": [ { "Effect":
 "Allow", "Principal": { "AWS": [ "123456789012" ] }, "Action":
 [ "imagebuilder:GetComponent", "imagebuilder:ListComponents" ], "Resource":
 [ "arn:aws:imagebuilder:us-west-2:123456789012:component/my-example-
component/2019.12.03/1" ] } ] }'
```

Image recipe

You can apply a resource policy to an image recipe to enable cross-account sharing. This command gives other accounts permission to use your recipe to create images in their accounts. To successfully apply the resource policy, you must ensure that the account with which you are sharing has permission to access any resources that the recipe references, such as the base image, or selected components.

Run the **put-image-recipe-policy** Image Builder command in the AWS CLI, to identify the AWS principals to share the image with.

```
aws imagebuilder put-image-recipe-policy --image-recipe-arn
 arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-example-image-
recipe/2019.12.03 --policy '{ "Version": "2012-10-17",        "Statement":
 [ { "Effect": "Allow", "Principal": { "AWS": [ "123456789012" ] }, "Action":
 [ "imagebuilder:GetImageRecipe", "imagebuilder:ListImageRecipes" ], "Resource":
 [ "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-example-image-
recipe/2019.12.03" ] } ] }'
```

Container recipe

You can apply a resource policy to a container recipe to enable cross-account sharing. This command gives other accounts permission to use your recipe to create images in their accounts. To successfully apply the resource policy, you must ensure that the account with which you are sharing has permission to access any resources that the recipe references, such as the base image, or selected components.

Run the **put-container-recipe-policy** Image Builder command in the AWS CLI, to identify the AWS principals to share the image with.

```
aws imagebuilder put-container-recipe-policy --container-recipe-arn
 arn:aws:imagebuilder:us-west-2:123456789012:container-recipe/my-
example-container-recipe/2021.12.03 --policy '{ "Version": "2012-10-17",
        "Statement": [ { "Effect": "Allow", "Principal": { "AWS":
 [ "123456789012" ] }, "Action": [ "imagebuilder:GetContainerRecipe",
 "imagebuilder:ListContainerRecipes" ], "Resource": [ "arn:aws:imagebuilder:us-
west-2:123456789012:container-recipe/my-example-container-
recipe/2021.12.03" ] } ] }'
```

Note

To set the correct policies for sharing and unsharing a resource, the resource owner must have `imagebuilder:put*` permissions.

2. **Promote as a RAM resource share**

To ensure that the resource is visible to all principals with whom you've shared it, run the **promote-resource-share-created-from-policy** AWS RAM command in the AWS CLI.

Unshare an Image Builder resource from AWS RAM

To unshare an Image Builder resource that you own, such as a shared component, image, or recipe, you must remove it from the AWS Resource Access Manager resource share. You can do this using the AWS RAM console or the AWS CLI.

> **Note**
>
> Owners cannot delete a shared resource until it is no longer shared. An owner cannot unshare these resources until none of the consumers depend on them.

To unshare a shared component, image, or recipe that you own using the AWS Resource Access Manager console

See Updating a Resource Share in the *AWS RAM User Guide*.

To unshare a shared component, image, or recipe that you own using the AWS CLI

Use the **disassociate-resource-share** command to stop sharing the resource.

Tag Image Builder output resources

Tagging your resources can be useful for filtering and tracking resource costs, or other categories. You can also control access based on tags. For more information about tag-based authorization, see Authorization based on Image Builder tags

Image Builder supports the following dynamic tags:

- `- {{imagebuilder:buildDate}}`

  Resolves to the build date/time at build time.
- `- {{imagebuilder:buildVersion}}`

  Resolves to a build version, which is a number that is located at the end of an Image Builder Amazon Resource Name (ARN.) For example, `"arn:aws:imagebuilder:us-west-2:123456789012:component/myexample-component/2019.12.02/1"` shows the build version as 1.

To help you keep track of Amazon Machine Images (AMIs) that you've distributed, Image Builder automatically adds the following tags to your output AMIs.

- `"CreatedBy":"EC2 Image Builder"`
- `"Ec2ImageBuilderArn":"arn:aws:imagebuilder:`*`us-west-2`*`:`*`123456789012`*`:image/`*`simple-recipe-linux`*`/`*`1.0.0/10`*`"`. This tag contains the ARN of the Image Builder image resource that was used to create the AMI.

Contents

- Tag a resource from the AWS CLI
- Untag a resource from the AWS CLI
- List all of the tags for a specific resource from the AWS CLI

Tag a resource from the AWS CLI

The following example shows how to use an **imagebuilder** CLI command to to add and tag a resource in EC2 Image Builder. You must provide the `resourceArn` and the tags to apply to it.

The example `tag-resource.json` contents are as follows:

```
{
    "resourceArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-pipeline/my-example-pipeline",
    "tags": {
        "KeyName": "KeyValue"
    }
}
```

Run the following command, which references the preceding `tag-resource.json` file.

```
aws imagebuilder tag-resource --cli-input-json file://tag-resource.json
```

Untag a resource from the AWS CLI

The following example shows how to use an **imagebuilder** CLI command to remove a tag from a resource. You must provide the `resourceArn` and the keys to remove the tag.

The example `untag-resource.json` contents are as follows:

```
{
    "resourceArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-pipeline/my-example-pipeline",
    "tagKeys": [
        "KeyName"
    ]
}
```

Run the following command, which references the preceding `untag-resource.json` file.

```
aws imagebuilder untag-resource --cli-input-json file://untag-resource.json
```

List all of the tags for a specific resource from the AWS CLI

The following example shows how to use an **imagebuilder** CLI command to list all the tags for a specific resource.

```
aws imagebuilder list-tags-for-resource --resource-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-pipeline/my-example-pipeline
```

Delete outdated or unused Image Builder resources

Your Image Builder environment, just like your home, needs regular maintenance to help you find what you need, and complete your tasks without wading through clutter. Make sure to regularly clean up temporary resources that you created for testing. Otherwise, you might forget about those resources, and then later, not remember what they were used for. By then, it might not be clear if you can safely get rid of them.

Deleting resources does not delete any Amazon EC2 AMIs or Amazon ECR container images that are created during the image build process. You must clean those up separately, using the appropriate Amazon EC2 or Amazon ECR console actions, or API or AWS CLI commands.

Tip

To prevent dependency errors when you delete resources, make sure to delete your resources in the following order:

1. Image pipeline
2. Image recipe
3. All remaining resources

Delete resources from the AWS Management Console

To delete an image pipeline and its resources, follow these steps:

Delete the pipeline

1. To see a list of the build pipelines created under your account, choose **Image pipelines** from the navigation pane.
2. Select the check box next to **Pipeline name** to select the pipeline that you want to delete.
3. At the top of the **Image pipelines** panel, on the **Actions** menu, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete the recipe

1. To see a list of the recipes created under your account, choose **Image recipes** from the navigation pane.
2. Select the check box next to **Recipe name** to select the recipe that you want to delete.
3. At the top of the **Image recipes** panel, on the **Actions** menu, choose **Delete recipe**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete infrastructure configuration

1. To see a list of the infrastructure configurations created under your account, choose **Infrastructure configuration** from the navigation pane.
2. Select the check box next to **Configuration name** to select the infrastructure configuration that you want to delete.
3. At the top of the **Infrastructure configurations** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete distribution settings

1. To see a list of the distribution settings created under your account, choose **Distribution settings** from the navigation pane.
2. Select the check box next to **Configuration name** to select the distribution settings that you created for this tutorial.
3. At the top of the **Distribution settings** panel, choose **Delete**.
4. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete an image

1. To see a list of the images created under your account, choose **Images** from the navigation pane.
2. Choose the image **Version** for the image that you want to remove. This opens the **Image build versions** page.
3. Select the check box next to the **Version** for any image that you want to delete. You can select more than one image version at a time.

4. At the top of the **Image build versions** panel, choose **Delete version**.
5. To confirm the deletion, enter `Delete` in the box, and choose **Delete**.

Delete an image pipeline from the AWS CLI

The following examples show how to delete Image Builder resources using the AWS CLI. As mentioned previously, resources must be deleted in the following order to avoid dependency errors:

1. Image pipeline
2. Image recipe
3. All remaining resources

Delete image pipeline from the AWS CLI

The following example shows how to delete an image pipeline by specifying its ARN.

```
aws imagebuilder delete-image-pipeline --image-pipeline-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-pipeline/my-example-pipeline
```

Delete image recipe from the AWS CLI

The following example shows how to delete an image recipe by specifying its ARN.

```
aws imagebuilder delete-image-recipe --image-recipe-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-recipe/my-example-recipe/2019.12.03
```

Delete an infrastructure configuration

The following example shows how to delete an infrastructure configuration resource by specifying its ARN.

```
aws imagebuilder delete-infrastructure-configuration --infrastructure-configuration-arn
 arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/my-example-
infrastructure-configuration
```

Delete distribution settings

The following example shows how to delete a distribution settings resource by specifying its ARN.

```
aws imagebuilder delete-distribution-configuration --distribution-configuration-arn
 arn:aws:imagebuilder:us-west-2:123456789012:distribution-configuration/my-example-
distribution-configuration
```

Delete an image

The following example shows how to delete an image build version by specifying its ARN.

```
aws imagebuilder delete-image --image-build-version-arn arn:aws:imagebuilder:us-
west-2:123456789012:image/my-example-image/2019.12.02/1
```

Delete a component

The following example shows how to use an **imagebuilder** CLI command to delete a component build version by specifying its ARN.

```
aws imagebuilder delete-component --component-build-version-arn
 arn:aws:imagebuilder:us-west-2:123456789012:component/my-example-
component/2019.12.02/1
```

> **Important**
>
> Make sure there are no recipes that reference the component build version in any way before you delete it. Failing to do so could cause pipeline failures.

Validate Image Builder resource creation with a dry run

With a dry run, you can check whether a request to create an Image Builder resource would succeed, without creating the resource. When you set the `dryRun` parameter to `true` in your request, Image Builder validates the required permissions and request parameters, and then stops before it creates anything. The outcome is one of the following:

- If validation succeeds, the request fails with a `DryRunOperationException` error. This error indicates that the request is valid, and that the resource creation would have succeeded without the `dryRun` parameter.
- If validation fails, the request returns the same error that it would return without the `dryRun` parameter, for example `InvalidParameterValueException` or `ResourceAlreadyExistsException`.

In both cases, Image Builder doesn't create the resource. Dry runs give you immediate feedback on your resource configurations. This is especially useful for automation and AI agents that create Image Builder resources. Such tools can validate each configuration and correct errors before they create anything.

The following create actions support the `dryRun` parameter:

- `CreateComponent`
- `CreateContainerRecipe`
- `CreateDistributionConfiguration`
- `CreateImagePipeline`
- `CreateImageRecipe`
- `CreateInfrastructureConfiguration`
- `CreateLifecyclePolicy`
- `CreateWorkflow`

> **Note**
>
> The `CreateImage` action doesn't support the `dryRun` parameter, because it starts an image build rather than creating a configuration resource.

Perform a dry run from the AWS CLI

The following example shows how to validate an infrastructure configuration with the `create-infrastructure-configuration` command. The `--dry-run` option turns the request into a dry run.

```
aws imagebuilder create-infrastructure-configuration \
    --name my-example-infrastructure-configuration \
    --instance-profile-name EC2InstanceProfileForImageBuilder \
    --dry-run
```

If the configuration is valid, the command returns the following error to show that the request would have succeeded.

```
An error occurred (DryRunOperationException) when calling the
 CreateInfrastructureConfiguration operation: Request would have succeeded, but dryRun
 flag is set.
```

Manage build, test, and distribution workflows for Image Builder images

An image workflow defines the sequence of steps that EC2 Image Builder runs during one stage of the image creation process. You author a workflow as a YAML document and create it as a versioned, reusable resource. Image Builder then runs your workflows when it builds, tests, and distributes your images.

Workflows give you direct control over the image creation process. You decide which steps run, in what order, what each step does when it fails, and whether Image Builder rolls back a failed step. You can start from an Amazon managed workflow, clone and customize it, or write your own from scratch.

Image workflow benefits

- With image workflows, you have more flexibility, visibility, and control over the image creation process.
- You can add customized workflow steps when you define your workflow document, or you can choose to use the Image Builder default workflow.
- You can exclude workflow steps that Image Builder includes in default image workflows.
- You can create test-only workflows that skip the build process entirely. You can do the same to create build-only or distribution-only workflows.

> **Note**
>
> You can't modify an existing workflow, but you can clone it or create a new version.

> **Tip**
>
> For information about deployable workflow examples, including approval gates and AWS Step Functions integration, see the workflow samples on GitHub. For more information, see Explore Image Builder sample projects on GitHub.

Workflow topics

- Workflow framework: Stages
- How a workflow runs
- Monitor workflow runs with Amazon EventBridge
- Workflow resource constraints
- Service access
- Use managed workflows for your images
- List image workflows
- Create an image workflow
- Create a YAML workflow document

Workflow framework: Stages

Image Builder organizes the image creation process into three stages. Each stage runs a workflow of the matching *type*. Stages run in a fixed order, and a stage starts only after the previous stage finishes successfully.

The following table lists the default behavior of each stage. Because you define the steps in each workflow, you can customize what a stage does.

Image Builder workflow stages

Order	Stage	Workflow type	What it does (default)
1	**Build**	`BUILD`	Launches a build instance, runs your build components, and creates an image (AMI or container image) from the instance.
2	**Test**	`TEST`	Launches a test instance from the new image, runs your test components, and optionally collects image scan findings.
3	**Distribution**	`DISTRIBUTION`	Copies the image to target Regions and accounts, modifies image attributes, and applies post-distribution configurations such

Order	Stage	Workflow type	What it does (default)
			as launch templates and license configurations.

You can run a workflow for only some stages. For example, you can skip the build stage to test or distribute an image that already exists, or skip the test stage to build and distribute without testing. To skip the build or test stage, omit a workflow of that type from your pipeline or image request.

> **Note**
>
> The distribution workflow is optional. If you omit it, Image Builder does not skip distribution – it still distributes your AMI by running the distribution configuration that you attach to the pipeline or image. Add a distribution workflow when you want to override that distribution configuration with different distribution settings, or to gain more visibility into the distribution process. To skip distribution entirely, provide a null or empty distribution configuration.

> **Note**
>
> An image pipeline or image request can include at most one build workflow and one distribution workflow. It can also include one or more test workflows. The total number of workflows cannot exceed ten. For example, you can pair one build workflow and one distribution workflow with up to eight test workflows.

How a workflow runs

A workflow runs its steps in the order you define them in the YAML document. Each step performs one action, such as launching an instance or running components.

Step outcomes

Each step ends in one of the following states.

Workflow step outcomes

State	Meaning
COMPLETED	The step finished successfully.
SKIPPED	A conditional if statement on the step evaluated to false, so Image Builder skipped the step.
FAILED	The step did not finish successfully.
WAITING	A WaitForAction step is paused, waiting for an external action.
TIMED_OUT	The step ran longer than its timeoutSeconds value.

Failure handling

The onFailure attribute on each step controls what happens when a step fails.

- Abort (default) – Image Builder fails the step, fails the workflow, and runs no further steps. If rollback is enabled, the rollback begins at the failed step and works backward through prior steps.
- Continue – Image Builder fails the step but runs the remaining steps. No rollback occurs.

Rollback

When a step fails with onFailure: Abort and rollbackEnabled: true (the default), Image Builder rolls back completed steps in reverse order, starting with the step that failed. Not every action can be rolled back. An action that has no rollback records a status of NO_ROLLBACK.

Monitor workflow runs with Amazon EventBridge

Image Builder emits Amazon EventBridge events as your workflows run, so you can react to progress and to steps that need attention. For example, a WaitForAction step publishes an event with the detail type EC2 Image Builder Workflow Step Waiting to your default event bus. You can route this event to a target such as a Lambda function or an Amazon SNS topic to drive an approval process. For more information about how Image Builder works with EventBridge, see Amazon EventBridge integration in Image Builder.

To track step-level progress programmatically, use the `ListWorkflowExecutions`, `GetWorkflowExecution`, `ListWorkflowStepExecutions`, and `GetWorkflowStepExecution` API operations.

Workflow resource constraints

Your workflow documents and configurations must stay within the following default limits.

Workflow resource constraints

Constraint	Default limit	Notes
Steps per workflow document	15	Steps run in document order.
Outputs per workflow document	25	Outputs pass values to later workflows.
Parameters per workflow document	25	Inputs the caller can set.
Parameter value length	1,024 characters	Per parameter value.
Inline document size (`data`)	16,000 bytes	Use the `uri` (Amazon S3) option for larger documents.
Workflows per image or pipeline	10	At most 1 build and 1 distribution, plus test workflows, for a combined total of 10.

Workflow resources are immutable. To change a workflow, create a new version or clone it. Image Builder keeps every version, so you can trace which workflow produced each image.

Service access

To run image workflows, Image Builder needs permission to perform workflow actions. You grant this permission with an execution role that Image Builder assumes on your behalf. You assign the execution role as follows.

Important

We recommend that you don't pass the AWSServiceRoleForImageBuilder service-linked role as your execution role. Instead, create a custom IAM role and attach the EC2ImageBuilderExecutionPolicy AWS managed policy. This policy grants the same permissions that Image Builder needs to call AWS services on your behalf. Using a custom role gives you full control over the permissions that Image Builder uses. It also keeps your service control policies (SCPs) and resource control policies (RCPs) in effect for operations that Image Builder performs on your behalf.

- **Console** – In the pipeline wizard **Step 3 Define image creation process**, select your custom role from the **IAM role** list in the **Service access** panel.
- **Image Builder API** – In the CreateImage action request, specify your custom role as the value for the `executionRole` parameter.

To create a custom execution role, see Creating a role to delegate permissions to an AWS service in the *AWS Identity and Access Management User Guide*.

Use managed workflows for your images

AWS creates and maintains managed workflows. When you use managed workflows in your image pipelines or for one-off image creation, you can select the Amazon Resource Name (ARN) of the managed workflow that you want to use. Amazon provides the latest versions that have patches and other updates applied. To get a list of managed workflows, see List image workflows, and filter on **Owner = Amazon** (console).

You can choose a managed workflow based on your build speed and validation requirements. The following are examples of managed workflow types:

Standard managed workflows (default)

Standard managed workflows include comprehensive steps for building, testing, and validating your images with full EC2 status checks.

The following are standard managed workflows:

- **build-image** – Default Amazon-managed AMI build workflow.

- **test-image** – Default Amazon-managed AMI test workflow.
- **build-container** – Default Amazon-managed container build workflow.
- **test-container** – Default Amazon-managed container test workflow.

Express managed workflows

Express managed workflows include only essential steps and reduce image creation time.

The following are express managed workflows:

- **express-build-image** – Express Amazon-managed AMI build workflow that reduces build time. Waits only for the instance running state instead of full EC2 status checks, and skips image metadata collection.
- **express-build-container** – Express Amazon-managed container build workflow that reduces build time. Waits only for the instance running state instead of full EC2 status checks.
- **express-test-image** – Express Amazon-managed AMI test workflow that reduces test time. Waits only for the instance running state instead of full EC2 status checks, and skips security scan findings collection.

List image workflows

On the **Image workflows** list page in the Image Builder console, you can get a list of the image workflow resources that you own or have access to, along with some key details about these resources. You can also use commands or actions with the Image Builder API, SDKs, or AWS CLI to list image workflows in your account.

You can use one of the following methods to list image workflow resources that you own or have access to. For the API action, see ListWorkflows in the *EC2 Image Builder API Reference*. For the associated SDK request, refer to the See Also link on the same page.

You can filter on the following details to streamline the list of results. For example, if you filter on **Owner = Amazon** in the console, the list displays only AWS managed workflows.

- Workflow
- Version
- Type
- Owner

Console

Workflow details

Details on the **Image workflows** list page in the Image Builder console include the following:

- **Workflow** – The name of the most recent version of the image workflow resource. In the Image Builder console, the **Workflow** column links to the workflow detail page.
- **Version** – The most recent version of the image workflow resource.
- **Type** – The workflow type: `BUILD`, `TEST`, or `DISTRIBUTION`.
- **Owner** – The owner of the workflow resource.
- **Creation time** – The date and time when Image Builder created the most recent version of the image workflow resource.
- **ARN** – The Amazon Resource Name (ARN) of the current version of the image workflow resource.

List image workflows

To list image workflow resources in the Image Builder console, perform the following steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Image workflows** from the navigation pane.

Filter results

On the **Image workflows** list page, you can search for specific image workflows to filter your results. The following filters are available for image workflows:

`Workflow`

You can enter all or part of a workflow name to streamline results. The default is to show all workflows in the list.

`Version`

You can enter all or part of a version number to streamline results. The default is to show all versions in the list.

`Type`

You can filter by the workflow type or view all types. The default is to show all workflow types in the list.

- *BUILD*
- *TEST*
- *DISTRIBUTION*

`Owner`

When you select the owner filter from the search bar, Image Builder shows a list of the owners for the image workflows in your account. You can select an owner from the list to streamline results. The default is to show all owners in the list.

- *AWS account* – The account that owns the workflow resource.
- *Amazon* – The AWS managed build, test, and distribution workflow resources that Amazon owns and manages.

AWS CLI

When you run the **list-workflows** command in the AWS CLI, you can get a list of image workflows that you own or have access to.

The following command example shows how to use the **list-workflows** command without filters to list all of the Image Builder image workflow resources that you own or have access to.

Example: list all image workflows

```
aws imagebuilder list-workflows
```

Output:

```
{
    "workflowVersionList": [
        {
            "name": "example-test-workflow",
            "dateCreated": "2023-11-21T22:53:14.347Z",
            "version": "1.0.0",
            "owner": "111122223333",
            "type": "TEST",
```

```
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
test/example-test-workflow/1.0.0"
        },
        {
            "name": "example-build-workflow",
            "dateCreated": "2023-11-20T12:26:10.425Z",
            "version": "1.0.0",
            "owner": "111122223333",
            "type": "BUILD",
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
build/example-build-workflow/1.0.0"
        },
        {
            "name": "example-distribution-workflow",
            "dateCreated": "2025-11-19T10:25:10.425Z",
            "version": "1.0.0",
            "owner": "111122223333",
            "type": "DISTRIBUTION",
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
distribution/example-distribution-workflow/1.0.0"
        }
    ]
}
```

When you run the **list-workflows** command, you can apply filters to streamline the results, as the following example shows. For more information about how to filter your results, see the list-workflows command in the *AWS CLI Command Reference*.

Example: filter for build workflows

```
aws imagebuilder list-workflows --filters name="type",values="BUILD"
```

Output:

```
{
    "workflowVersionList": [
        {
            "name": "example-build-workflow",
            "dateCreated": "2023-11-20T12:26:10.425Z",
            "version": "1.0.0",
            "owner": "111122223333",
            "type": "BUILD",
```

```
            "arn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
build/example-build-workflow/1.0.0"
        }
    ]
}
```

Get workflow details

To get the details for a specific image workflow version, run the get-workflow command in the AWS CLI. For the API action, see GetWorkflow in the *EC2 Image Builder API Reference*.

Example: get workflow details

```
aws imagebuilder get-workflow \
    --workflow-build-version-arn arn:aws:imagebuilder:us-
west-2:111122223333:workflow/build/example-build-workflow/1.0.0/1
```

The response includes the workflow `type`, `state`, `data` (the YAML workflow document), `parameters`, `owner`, and `kmsKeyId`.

Create an image workflow

When you create an image workflow, you have more control over your image creation process. You can specify the workflow that runs when Image Builder builds your image, the workflows that run when it tests the image, and the workflow that runs when it distributes the image. You can also specify a customer managed key to encrypt your workflow resources. To learn more about encryption for your workflow resources, see Encryption and key management in Image Builder.

For image creation, you can specify one build stage workflow, one or more test stage workflows, and one distribution stage workflow. You can even skip a stage entirely, depending on your needs. You configure the actions that your workflow takes in the YAML definition document that your workflow uses. For more information about syntax for your YAML document, see Create a YAML workflow document.

To create a new build, test, or distribution workflow, select the tab that matches your environment.

AWS Management Console

You can use the following process to create a new workflow in the Image Builder console.

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Image workflows** from the navigation pane. This displays a list of image workflows that your account owns or has access to.

   > **Note**
   >
   > The list always includes the Amazon managed workflow resources that Image Builder uses for its default workflows. To view details for those workflows, select the **Workflow** link.

3. To create a new workflow, choose **Create image workflow**. This displays the **Create image workflow** page.
4. Configure the details for your new workflow. Select the workflow type near the top of the form: choose **Build** to create a build workflow, **Test** to create a test workflow, or **Distribution** to create a distribution workflow. The workflow type maps to the `Type` value in the API (`BUILD`, `TEST`, or `DISTRIBUTION`). Image Builder populates the **Templates** list based on this option. All other steps are the same for build, test, and distribution workflows.

   General

   The general section includes settings that apply to your workflow resource, such as name and description. The general settings include the following:

   - **Image workflow name** (required) – The name for your image workflow. The name must be unique in your account. The name can be up to 128 characters in length. Valid characters include letters, numbers, spaces, `-`, and `_`.
   - **Version** (required) – The semantic version for the workflow resource to create (*major.minor.patch*).
   - **Description** (optional) – Optionally add a description for your workflow.
   - **KMS key** (optional) – You can encrypt your workflow resources with an customer managed key. For more information, see Encrypt image workflows with a customer managed key.

   Definition document

   The YAML workflow document contains all of the configuration for your workflow.

Get started

- To start with an Image Builder default template as a baseline for your workflow, select the **Start from templates** option. This option is selected by default. After you choose what template to use from the **Templates** list, this copies the default configuration from the template you selected into the **Content** for your new workflow document, where you can make changes.
- To define your workflow document from scratch, select the **Start from scratch** option. This populates the **Content** with a short outline of some important parts of the document format to help you get started.

The **Content** panel includes a status bar at the bottom that shows warnings or errors for your YAML document. For more information about how to create a YAML workflow document, see Create a YAML workflow document.

5. When you've completed your workflow, or if you want to save progress and come back to it later, choose **Create workflow**.

AWS CLI

Before you run the **create-workflow** command in the AWS CLI, you must create the YAML document that contains all of the configuration for your workflow. For more information, see Create a YAML workflow document.

The following example shows how to create a build workflow with the create-workflow AWS CLI command. The `--data` parameter refers to a YAML document that contains the build configuration for the workflow you create.

Example: Create workflow

```
aws imagebuilder create-workflow --name example-build-workflow --semantic-
version 1.0.0 --type BUILD --data file://example-build-workflow.yml
```

Output:

```
{
 "workflowBuildVersionArn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
build/example-build-workflow/1.0.0/1",
```

```
 "clientToken": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222"
}
```

The following example shows how to create a test workflow with the create-workflow AWS CLI command. The `--data` parameter refers to a YAML document that contains the test configuration for the workflow you create.

Example: Create test workflow

```
aws imagebuilder create-workflow --name example-test-workflow --semantic-
version 1.0.0 --type TEST --data file://example-test-workflow.yml
```

Output:

```
{
 "workflowBuildVersionArn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
test/example-test-workflow/1.0.0/1",
 "clientToken": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222"
}
```

The following example shows how to create a distribution workflow with the create-workflow AWS CLI command. The `--data` parameter refers to a YAML document that contains the distribution configuration for the workflow you create.

Example: Create distribution workflow

```
aws imagebuilder create-workflow --name example-distribution-workflow --semantic-
version 1.0.0 --type DISTRIBUTION --data file://example-distribution-workflow.yml
```

Output:

```
{
 "workflowBuildVersionArn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/
distribution/example-distribution-workflow/1.0.0/1",
 "clientToken": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222"
}
```

Create a YAML workflow document

The YAML format definition document configures input, output, and workflow steps for the build, test, and distribution stages of the image creation process. The same document format applies to all three workflow types. You can start from templates that include standardized steps, or you can start from scratch to define your own workflow. Whether you use a template or start from scratch, you can customize the workflow to fit your needs.

Structure of a YAML workflow document

The following sections describe the structure of the YAML workflow document that Image Builder uses to perform image build, test, and distribution actions.

- Workflow document identification
- Workflow document input parameters
- Workflow document steps
- Workflow document outputs

Workflow document identification

Uniquely identifies the workflow. This section can include the following attributes.

Field	Description	Type	Required
name	The name of the workflow document.	String	No
description	The document description.	String	No
schemaVersion	The document schema version, currently 1.0.	String	Yes

Example

```
---
name: sample-test-image
description: Workflow for a sample image, with extra configuration options exposed
 through workflow parameters.
schemaVersion: 1.0
```

Workflow document input parameters

This part of the workflow document defines input parameters that the caller can specify. If you do not have any parameters, you can leave this section out. If you do specify parameters, each parameter can include the following attributes.

You can define up to 25 parameters in a workflow document. Each parameter value can contain up to 1,024 characters. A parameter must use one of four supported data types: `string`, `integer`, `boolean`, or `stringList`. If you do not specify a `default` value for a parameter, you must provide the parameter value at runtime.

Field	Description	Type	Required	Constraints
name	The name of the parameter.	String	Yes	
description	The parameter description.	String	No	
default	The default value of the parameter, if no value is provided. If you don't include a default value in the parameter definition, the	Matches the parameter data type.	No	

Field	Description	Type	Required	Constraints
	parameter value is required at runtime.			
type	The data type of the parameter . If you don't include the data type in the parameter definition, the parameter type defaults to a string value required at runtime.	String	Yes	The data type of the parameter must be one of the following: • `string` • `integer` • `boolean` • `stringList`

Example

Specify the parameter in the workflow document.

```
parameters:
  - name: waitForActionAtEnd
    type: boolean
    default: true
    description: "Wait for an external action at the end of the workflow"
```

Use the parameter value in the workflow document.

```
$.parameters.waitForActionAtEnd
```

Workflow document steps

Specifies up to 15 step actions for the workflow. Steps run in the order that they're defined within the workflow document. In case of failure, a rollback runs in reverse order, starting with the step that failed, and working backward through prior steps.

Each step can refer to the output of any prior step actions. This is known as *chaining, or referencing*. To refer to output from a prior step action, you can use a JSONPath selector. For example:

```
$.stepOutputs.step-name.output-name
```

For more information, see Use dynamic variables in your workflow document.

Note

Even though the step itself doesn't have an output attribute, any output from a step action is included in `stepOutput` for the step.

Note

If you set `waitSeconds` for a step, the value must be less than `timeoutSeconds`. Each step action also defines a maximum `timeoutSeconds` value. If you set `timeoutSeconds` higher than the maximum for the action, validation fails. For the per-action maximums, see Supported step actions for your workflow document.

Each step can include the following attributes.

Field	Description	Type	Required	Default value	Constraints
action	The workflow action that this step performs.	String	Yes		Must be a supported step action for Image Builder

Field	Description	Type	Required	Default value	Constraints
					workflow documents.

Field	Description	Type	Required	Default value	Constraints
`if`, followed by a set of conditional statements that modify the `if` operator.	Conditional statements add flow of control decision points to the body of your workflow steps.	Dict	No		Image Builder supports the following conditional statements as modifiers to the `if` operator: • Branching conditions and modifiers: `if`, and, `or`, `not`. Branching conditions are specified on a line by themselves. • Comparison operators: `booleanEquals`, `numberEquals`,

Field	Description	Type	Required	Default value	Constraints
					`numberGreaterThan`, `numberGreaterThanEquals`, `numberLessThan`, `numberLessThanEquals`, `stringEquals`.
description	The step description.	String	No		Empty strings are not allowed. If included, length must be 1-1024 characters.

Field	Description	Type	Required	Default value	Constraints
inputs	Contains parameters that the step action needs to run. You can specify key values as static values, or with a JSONPath variable that resolves to the correct data type.	Dict	Yes		
name	The name of the step. This name must be unique within the workflow document.	String	Yes		Length must be between 3-128 characters. Can include alphanumeric characters and _. No spaces.

Field	Description	Type	Required	Default value	Constraints
onFailure	Configures the action to take if the step fails, as follows. **Behavior** • `Abort` – Fails the step, fails the workflow, and doesn't run any remaining steps after the step that failed. If rollback is enabled, the rollback begins with the step that failed, and continues until all steps that allow it	String	No	`Abort`	`Abort` | `Continue`

Field	Description	Type	Required	Default value	Constraints
	are rolled back. • `Continue` – Fails the step, but continues to run remaining steps after the step that failed. In this case, there is no rollback.				

Field	Description	Type	Required	Default value	Constraints
retry	Configures Image Builder to automatically run the step again if it fails. For more information, see Retry failed workflow steps.	Dict	No	No retries	The `retry` attribute contains the following fields: • `maxAttempts` (required) – The total number of times that the step can run, including the first attempt. Valid values: 1–10. • `backoffSeconds` (optional) – The number of seconds that Image Builder waits before it starts

Field	Description	Type	Required	Default value	Constraints
					each retry attempt. If you don't set a value, Image Builder waits 30 seconds. Valid values: 0–600.
rollbackEnabled	Configures whether the step will be rolled back if a failure occurs. You can use a static Boolean value or a dynamic JSONPath variable that resolves to a Boolean value.	Boolean	No	`true`	`true` | `false` | or a JSONPath variable that resolves to true or false.

Field	Description	Type	Required	Default value	Constraints
timeoutSeconds	The maximum time, in seconds, that the step runs before failing and retrying, if retries apply.	Integer	No	Depends on the default defined for the step action, if applicable.	Cannot be more than the max timeout of the step action
waitSeconds	The time, in seconds, for which the step execution will pause.	Integer	No	0	Cannot be more than timeoutSeconds of the step action

Example

```
steps:
  - name: LaunchTestInstance
    action: LaunchInstance
    onFailure: Abort
    inputs:
      waitFor: "ssmAgent"

  - name: ApplyTestComponents
    action: ExecuteComponents
    onFailure: Abort
    inputs:
      instanceId.$: "$.stepOutputs.LaunchTestInstance.instanceId"

  - name: TerminateTestInstance
    action: TerminateInstance
```

```
    onFailure: Continue
    inputs:
      instanceId.$: "$.stepOutputs.LaunchTestInstance.instanceId"

  - name: WaitForActionAtEnd
    action: WaitForAction
    if:
      booleanEquals: true
      value: "$.parameters.waitForActionAtEnd"
```

Retry failed workflow steps

By default, each step in a workflow runs one time. To have Image Builder automatically run a step again when it fails, add the `retry` attribute to the step. The `retry` attribute contains the following fields.

- `maxAttempts` (required) – The total number of times that the step can run, including the first attempt. For example, if you set `maxAttempts` to 3 and every attempt fails, the step runs three times before Image Builder marks it as failed. Valid values: 1–10.
- `backoffSeconds` (optional) – The number of seconds that Image Builder waits before it starts each retry attempt. If you don't set a value, Image Builder waits 30 seconds. To retry immediately, set the value to `0`. Valid values: 0–600.

Retries work as follows:

- The `timeoutSeconds` value for the step applies to each attempt separately. The timeout clock restarts when a retry attempt starts.
- If the step still fails after the final attempt, the `onFailure` behavior for the step applies.

Some step actions have additional retry behavior:

- Before it retries a `LaunchInstance` step, Image Builder terminates the instance that the failed attempt launched. The retry attempt launches a new instance.
- When it retries an `ExecuteComponents` step, Image Builder runs your components again from the beginning. It doesn't undo changes that a failed attempt already made on the instance. Before you configure retries for a step that runs components, make sure that your components can safely run more than once.

To see how many times a step ran, use the `GetWorkflowStepExecution` or `ListWorkflowStepExecutions` API operations. The response includes the `attemptNumber` and `maxAttempts` fields for the step.

> **Note**
>
> The `retry` attribute for a workflow step is separate from the `maxAttempts` field, which retries an individual step within a AWSTOE component document. For more information, see Use the AWSTOE component document framework for custom components.

Example

```
steps:
  - name: LaunchBuildInstance
    action: LaunchInstance
    onFailure: Abort
    retry:
      maxAttempts: 3
      backoffSeconds: 60
    inputs:
      waitFor: "ssmAgent"
```

Workflow document outputs

Defines outputs for the workflow. Each output is a key value pair that specifies the name of the output and the value. You can use outputs to export data at runtime that subsequent workflows can use. This section is optional.

You can define up to 25 outputs in a workflow document. Each output name must be unique across all of the workflows that you include in your pipeline. A later workflow can then reference an output by name with `$.workflowOutputs.`*`name`*.

> **Note**
>
> You reference the output of a step in the *same* workflow with `$.stepOutputs.`*`stepName`*`.`*`field`*, but you reference the output of an *earlier* workflow with only the output name (`$.workflowOutputs.`*`name`*) and no step name.

Each output that you define includes the following attributes.

Field	Description	Type	Required
name	The name of the output. The name must be unique across the workflows that you include in your pipeline.	String	Yes
value	The value for the output. The value of the string can be a dyanmic variable, such as an output file from a step action. For more information, see Use dynamic variables in your workflow document.	String	Yes

Example

Create an output image ID for the workflow document with step output from the `createProdImage` step.

```
outputs:
  - name: 'outputImageId'
    value: '$.stepOutputs.createProdImage.imageId'
```

Refer to the workflow output in the next workflow.

```
$.workflowOutputs.outputImageId
```

Supported step actions for your workflow document

This section includes details for the step actions that Image Builder supports.

Terms used in this section

AMI

Amazon Machine Image

ARN

Amazon Resource Name

The following table shows which workflow stages support each step action. A check mark (X) indicates that you can use the step action in that stage. Image Builder restricts a few actions to specific stages: `ExecuteComponents` to the build and test stages, `CollectImageScanFindings` to the test stage, and `DistributeImage`, `ModifyImageAttributes`, `ApplyImageConfigurations`, and `DistributeContainerImage` to the distribution stage. You can use every other action in any stage.

Step action	Build	Test	Distribution	Notes
LaunchInstance	X	X	X	Launches an Amazon EC2 instance.
BootstrapInstanceForContainer	X	X	X	Installs Docker and the AWS CLI for container builds.
ExecuteComponents	X	X		Runs components on the instance. Restricted to the build and test stages.
CollectImageMetadata	X	X	X	AMI builds only.
RunSysPrep	X	X	X	Windows builds.

Step action	Build	Test	Distribution	Notes
SanitizeInstance	X	X	X	Linux AMI builds; not for containers.
CreateImage	X	X	X	Creates an AMI from the build instance.
CreateImageFromIso	X	X	X	Creates an AMI from an ISO disk image.
RegisterImage	X	X	X	Registers an AMI from snapshots.
DistributeContainerImage			X	Distributes a container image. Restricted to the distribution stage.
CollectImageScanFindings		X		Collects image scan findings. Restricted to the test stage. Requires Amazon Inspector and image scanning.
RunCommand	X	X	X	Runs an AWS Systems Manager (Systems Manager) command document.
WaitForSSMAgent	X	X	X	Waits for Systems Manager connectivity after a reboot.
WaitForAction	X	X	X	Pauses for an external action.
ExecuteStateMachine	X	X	X	Runs a Step Functions state machine.
TerminateInstance	X	X	X	Terminates an instance. For example, a container-distribution workflow terminates the build instance after it pushes the image.

Step action	Build	Test	Distribution	Notes
DistributeImage			X	Copies an AMI to Regions and accounts. Restricted to the distribution stage.
ModifyImageAttributes			X	Modifies AMI launch permissions. Restricted to the distribution stage.
ApplyImageConfigurations			X	Applies launch templates, licenses, exports, fast launch, and Systems Manager parameters. Restricted to the distribution stage.

Important

A single workflow distributes either AMIs or container images, not both. If a workflow includes `DistributeContainerImage`, it cannot also include `DistributeImage`, `ModifyImageAttributes`, or `ApplyImageConfigurations`. These AMI distribution actions operate on Amazon EC2 AMIs, while `DistributeContainerImage` operates on container images in Amazon Elastic Container Registry (Amazon ECR).

Supported actions

- ApplyImageConfigurations
- BootstrapInstanceForContainer
- CollectImageMetadata
- CollectImageScanFindings
- CreateImage
- CreateImageFromIso
- DistributeContainerImage
- DistributeImage

- ExecuteComponents
- ExecuteStateMachine
- LaunchInstance
- ModifyImageAttributes
- RegisterImage
- RunCommand
- RunSysPrep
- SanitizeInstance
- TerminateInstance
- WaitForAction
- WaitForSSMAgent

ApplyImageConfigurations

Use this step action to apply various configurations and integrations to distributed AMIs, such as license configurations, launch template configurations, S3 export configurations, EC2 Fast Launch configurations, and Systems Manager parameter configurations. Configurations apply to distributed images only in the source account, except for SSM parameter configs which can be applied cross-account.

> **Note**
>
> The `configurations` input is optional. If you provide it, Image Builder uses your workflow inputs and ignores the attached distribution configuration. If you omit it, Image Builder falls back to the distribution configuration attached to the pipeline or image.

Default Timeout: 360 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action. The `distributedImages.$` input is required. The remaining rows describe the fields within each item of the `configurations` array.

Input name	Description	Type	Required	Default	Constraints
distributedImages.$	The list of distributed images to configure. Reference the `distributedImages` output from a `DistributeImage` step in the same workflow.	String	Yes		A JSONPath reference that starts with `$.stepOutputs.`
configurations	The configurations to apply to the distributed AMIs, as a list. Each item targets one AWS Region.	Array	No		
configurations:region	The AWS Region of the distributed AMI to configure.	String	Yes		Required for each item in `configurations`.

Input name	Description	Type	Required	Default	Constraints
configurations:licenseConfigurationArns	The license configuration ARN for the image.	Array	No		
configurations:launchTemplateConfigurations	The launch template configurations to apply to the distributed AMIs.	Array	No		
configurations:launchTemplateConfigurations:launchTemplateId	The launch template ID to apply to the image.	String	Yes if `launchTemplateConfigurations` is specified		
configurations:launchTemplateConfigurations:accountId	The launch template account IDs to apply to the image.	String	No		
configurations:launchTemplateConfigurations:setDefaultVersion	The launch template default version setting for the image.	Boolean	No		

Input name	Description	Type	Required	Default	Constraints
configurations:s3ExportConfiguration	The Amazon S3 export configuration for the distributed AMIs.	Array	No		
configurations:s3ExportConfiguration:roleName	The Amazon S3 export configuration role name for the image.	String	Yes if `s3ExportConfiguration` is specified		
configurations:s3ExportConfiguration:diskImageFormat	The Amazon S3 export configuration disk image format for the image.	String	Yes if `s3ExportConfiguration` is specified		Allowed values - VMDK|RAW|VHD
configurations:s3ExportConfiguration:s3Bucket	The Amazon S3 export configuration bucket name for the image.	String	Yes if `s3ExportConfiguration` is specified		
configurations:s3ExportConfiguration:s3Prefix	The Amazon S3 export configuration bucket prefix for the image.	String	No		

Input name	Description	Type	Required	Default	Constraints
configurations:fastLaunchConfigurations	The Amazon EC2 Fast Launch configuration for the image.	Array	No		
configurations:fastLaunchConfigurations:enabled	Whether Amazon EC2 Fast Launch is enabled for the image.	Boolean	Yes if `fastLaunchConfigurations` is specified		
configurations:fastLaunchConfigurations:snapshotConfiguration	The snapshot configuration for pre-provisioning Amazon EC2 Fast Launch snapshots.	Map	No		
configurations:fastLaunchConfigurations:snapshotConfiguration:targetResourceCount	The Amazon EC2 Fast Launch target resource count for the image.	Integer	No		

Input name	Description	Type	Required	Default	Constraints
configurations:fastLaunchConfigurations:maxParallelLaunches	The Amazon EC2 Fast Launch maximum parallel launches for the image.	Integer	No		
configurations:fastLaunchConfigurations:launchTemplate	The launch template that Amazon EC2 Fast Launch uses to prepare pre-provisioned snapshots.	Map	No		
configurations:fastLaunchConfigurations:launchTemplate:launchTemplateId	The Amazon EC2 Fast Launch launch template ID for the image.	String	No		
configurations:fastLaunchConfigurations:launchTemplate:launchTemplateName	The Amazon EC2 Fast Launch launch template name for the image.	String	No		

Input name	Description	Type	Required	Default	Constraints
configurations:fastLaunchConfigurations:launchTemplate:launchTemplateVersion	The Amazon EC2 Fast Launch launch template version for the image.	String	No		
configurations:ssmParameterConfigurations	The Systems Manager parameter configuration for the image.	Map	No		
configurations:ssmParameterConfigurations:amiAccountId	The Systems Manager parameter AMI account ID for the image.	String	No		
configurations:ssmParameterConfigurations:parameterName	The Systems Manager parameter name for the image.	String	Yes if `ssmParameterConfigurations` is specified		

Input name	Description	Type	Required	Default	Constraints
configurations:ssmParameterConfigurations:dataType	The Systems Manager parameter data type for the image.	String	No		Allowed values - text|aws:ec2:image)

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
configuredImages	A list of configured images.	Array
configuredImages:accountId	The destination account ID of the distributed image.	String
configuredImages:name	The name of the AMI.	String
configuredImages:amiId	The AMI ID of the distributed image.	String
configuredImages:dateStarted	UTC time when distribution started.	String
configuredImages:dateStopped	UTC time when distribution completed.	String
configuredImages:step	The step at which distribution stopped.	Completed|AssociateLicensesRunning|UpdateLaunchTemplateRunning|PutSsmParametersRunning|UpdateFastLaunchConfiguration|ExportAmiQueued|ExportAmiRunning

Output name	Description	Type
configuredImages:region	The AWS Region of the distributed image.	String
configuredImages:status	Distribution status.	Completed|Failed|Cancelled|TimedOut
configuredImages:errorMessage	Error message, if any.	String

Example

Specify the step action in the workflow document.

```
- name: ApplyImageConfigurations
  action: ApplyImageConfigurations
  onFailure: Abort
  inputs:
    distributedImages.$: $.stepOutputs.DistributeImageStep.distributedImages
    configurations:
      - region: us-west-2
        licenseConfigurationArns:
          - arn:aws:license-manager:us-west-2:111122223333:license-configuration:lic-example
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.ApplyImageConfigurationsStep.configuredImages
```

BootstrapInstanceForContainer

This step action runs a service script to bootstrap the instance with minimum requirements to run container workflows. Image Builder uses the **sendCommand** in the Systems Manager API to run this script. For more information, see AWS Systems Manager Run Command.

> **Note**
>
> The bootstrap script installs the AWS CLI and Docker packages that are prerequisites for Image Builder to successfully build Docker containers. If you don't include this step action, the image build could fail.

Default Timeout: 60 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the instance to bootstrap.	String	Yes		This must be the output instance ID from the workflow step that launched the instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
runCommandId	The ID of the Systems Manager **sendCommand** that	String

Output name	Description	Type
	ran the bootstrap script on the instance.	
status	The status returned from the Systems Manager **sendCommand**.	String
output	Output returned from the Systems Manager **sendCommand**.	String

Example

Specify the step action in the workflow document.

```
- name: ContainerBootstrapStep
  action: BootstrapInstanceForContainer
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.ContainerBootstrapStep.status
```

CollectImageMetadata

This step action is only valid for build workflows.

EC2 Image Builder runs AWS Systems Manager (Systems Manager) Agent on the EC2 instances it launches to build and test your image. Image Builder collects additional information about the instance used during the build phase with Systems Manager Inventory. This information includes the operating system (OS) name and version, as well as the list of packages and their respective versions as reported by your operating system.

> **Note**
>
> This step action only works for images that create AMIs.

Default Timeout: 30 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: Image Builder rolls back any Systems Manager resources that were created during this step.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The build instance to apply the metadata settings to.	String	Yes		This must be the output instance ID from the workflow step that launched the build instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
osVersion	The operating system name and version collected from the build instance.	String

Output name	Description	Type
associationId	The Systems Manager association ID used for inventory collection.	String

Example

Specify the step action in the workflow document.

```
- name: CollectMetadataStep
  action: CollectImageMetadata
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use output from the step action in the workflow document.

```
$.stepOutputs.CollectMetadataStep.osVersion
```

CollectImageScanFindings

If Amazon Inspector is enabled for your account and image scanning is enabled for your pipeline, this step action collects image scan findings reported by Amazon Inspector for your test instance. This step action is not available for build workflows.

Default Timeout: 120 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID for the instance that scanning ran on.	String	Yes		This must be the output instance ID from the workflow step that launched the instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
runCommandId	The ID of the Systems Manager **sendCommand** that ran the script to collect findings.	String
status	The status returned from the Systems Manager **sendCommand**.	String
output	Output returned from the Systems Manager **sendCommand**.	String

Example

Specify the step action in the workflow document.

```
- name: CollectFindingsStep
  action: CollectImageScanFindings
```

```
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.CollectFindingsStep.status
```

CreateImage

This step action creates an image from a running instance with the Amazon EC2 `CreateImage` API. During the creation process, the step action waits as necessary to verify that the resources have reached the correct state before it continues.

Default Timeout: 720 minutes

Max Timeout: 3 days (259,200 seconds)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The instance to create the new image from.	String	Yes		The instance for the provided instance ID must be in a `running` state when this step starts.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
imageId	The AMI ID of the image that's created.	String

Example

Specify the step action in the workflow document.

```
- name: CreateImageFromInstance
  action: CreateImage
  onFailure: Abort
  inputs:
      instanceId.$: "i-1234567890abcdef0"
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.CreateImageFromInstance.imageId
```

CreateImageFromIso

Use this step action to create an Amazon Machine Image (AMI) from an ISO disk image on the build instance. Use it in a build workflow when your source is an ISO file rather than a base AMI. Image Builder converts the ISO to an AMI and waits for the resources to reach the required state before it continues.

> **Note**
>
> This action has the same requirements as importing an ISO disk image. For more information, see Import verified Windows ISO disk images with Image Builder.

Default Timeout: 720 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the build instance that holds the ISO disk image.	String	Yes		This must be the output instance ID from the workflow step that launched the build instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
amiName	The name of the AMI that the step created.	String
snapshotId	The ID of the snapshot that backs the AMI.	String
architecture	The architecture of the AMI (x86_64 or arm64).	String

Example

Specify the step action in the workflow document.

```
- name: CreateImageFromIsoStep
  action: CreateImageFromIso
  onFailure: Abort
```

```
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.CreateImageFromIsoStep.amiName
```

DistributeContainerImage

Use this step action to distribute a container image that the build stage created to Amazon ECR repositories in the target Regions defined for the image. Use this action in a distribution workflow for container (DOCKER) images. It works as the container-image counterpart to `DistributeImage`.

This step action runs a Systems Manager command on the build instance to push the container image. The instance must have Docker and the AWS CLI installed. For more information, see BootstrapInstanceForContainer.

> **Important**
>
> A workflow that includes `DistributeContainerImage` cannot also include `DistributeImage`, `ModifyImageAttributes`, or `ApplyImageConfigurations`. A single workflow distributes either container images or AMIs, not both.

Default Timeout: 120 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the build	String	Yes		This must be the output

Input name	Description	Type	Required	Default	Constraints
	instance that holds the container image.				instance ID from the workflow step that launched the build instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
status	The status returned from the Systems Manager **sendCommand**.	String
succeededRegions	The Regions where distribut ion succeeded.	Array
failedRegions	The Regions where distribut ion failed.	Array

Example

Specify the step action in the workflow document.

```
- name: DistributeContainer
  action: DistributeContainerImage
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.DistributeContainer.status
```

DistributeImage

This step action distributes an AMI to the target Regions and accounts that you specify. It uses the distribution configuration from your `CreateImage` or `CreateImagePipeline` request, or custom distribution settings in the workflow that override the default configuration.

> **Note**
>
> The `distributions` input is optional. If you provide it, Image Builder uses your workflow inputs and ignores the attached distribution configuration. If you omit it, Image Builder falls back to the distribution configuration attached to the pipeline or image.

Default Timeout: 360 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
distributions	The distribution settings for the AMI, as a list. Each item targets one AWS Region. If you omit this input, Image Builder uses the	Array	No		

Input name	Description	Type	Required	Default	Constraints
	distribution configuration attached to the pipeline or image.				
distributions:region	The AWS Region to distribute the AMI to.	String	Yes		Minimum length of 1. Maximum length of 1024.
distributions:name	The name to apply to the distributed AMI.	String	No		
distributions:description	The description to apply to the distributed AMI.	String	No		
distributions:targetAccountIds	The account IDs to distribute the AMI to.	Array	No		
distributions:amiTags	The tags to apply to the distributed AMI.	Map	No		Maximum of 50 tags.

Input name	Description	Type	Required	Default	Constraints
distributions:kmsKeyId	The KMS key to use to encrypt the distributed AMI.	String	No		

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
distributedImages	A list of distributed images	Array
distributedImages:region	The AWS Region of the distributed image.	String
distributedImages:name	The name of the AMI.	String
distributedImages:amiId	The AMI ID of the distributed image.	String
distributedImages:accountId	The destination account ID of the distributed image.	String
distributedImages:dateStarted	UTC time when distribution started.	String
distributedImages:dateStopped	UTC time when distribution completed.	String
distributedImages:status	Distribution status.	Completed|Failed|Cancelled|TimedOut
distributedImages:step	The step at which distribution stopped.	Completed|CopyAmiRunning

Output name	Description	Type
distributedImages:errorMessage	Error message, if any.	String

Example

Specify the step action in the workflow document.

```
- name: DistributeImage
  action: DistributeImage
  onFailure: Abort
  inputs:
    distributions:
      - region.$: "$.parameters.SourceRegion"
        description: "AMI distribution to source region"
        amiTags:
          DistributionTest: "SourceRegion"
          WorkflowStep: "DistributeToSourceRegion"
          BuildDate: "{{imagebuilder:buildDate:yyyyMMHHss}}"
          BuildVersion: "{{imagebuilder:buildVersion}}"
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.DistributeImageStep.distributedImages
```

ExecuteComponents

This step action runs components that are specified in the recipe for the current image being built. Build workflows run build components on the build instance. Test workflows only run test components on the test instance.

Image Builder uses the **sendCommand** in the Systems Manager API to run components. For more information, see AWS Systems Manager Run Command.

Default Timeout: 720 minutes

Max Timeout: 1 day (24 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID for the instance that the components should run on.	String	Yes		This must be the output instance ID from the workflow step that launched the instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
runCommandId	The ID of the Systems Manager **sendCommand** that ran the components on the instance.	String
status	The status returned from the Systems Manager **sendCommand**.	String
output	Output returned from the Systems Manager **sendCommand**.	String

Example

Specify the step action in the workflow document.

```
- name: ExecComponentsStep
  action: ExecuteComponents
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use output from the step action in the workflow document.

```
$.stepOutputs.ExecComponentsStep.status
```

ExecuteStateMachine

This step action starts execution of an AWS Step Functions state machine from an Image Builder workflow. Image Builder uses the Step Functions `StartExecution` API to initiate the state machine and waits for it to complete. This is useful for integrating complex workflows, compliance validation, or certification processes into your image building pipeline.

For more information, see Learn about state machines in Step Functions in the *AWS Step Functions Developer Guide*.

Default Timeout: 6 hours

Max Timeout: 24 hours

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
stateMachineArn	The ARN of the Step Functions	String	Yes		Must be a valid state

Input name	Description	Type	Required	Default	Constraints
	state machine to execute.				machine ARN.
input	JSON input data to provide to the state machine.	String	No	{}	Must be valid JSON string, maximum length: 16 KiB.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
executionArn	The ARN of the state machine execution.	String
output	The output of the state machine execution.	String

IAM permissions required

Your custom execution role must have the following permissions to use this step action:

Allow actions

- `states:StartExecution`
- `states:DescribeExecution`

Specify resources

- `arn:aws:states:`*`us-west-2`*`:`*`111122223333`*`:stateMachine:`*`state-machine-name`*
- `arn:aws:states:`*`us-west-2`*`:`*`111122223333`*`:execution:`*`state-machine-name`*`:*`

Example

Specify the step action in the workflow document.

```
- name: ValidateImageCompliance
  action: ExecuteStateMachine
  timeoutSeconds: 3600
  onFailure: Abort
  inputs:
    stateMachineArn: arn:aws:states:us-
west-2:111122223333:stateMachine:ImageComplianceValidation
    input: |
      {
        "imageId": "{{ $.stepOutputs.CreateImageFromInstance.imageId }}",
        "region": "us-west-2",
        "complianceLevel": "high",
        "requiredScans": ["cve", "benchmark", "configuration"]
      }
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.ValidateImageCompliance.executionArn
```

LaunchInstance

Use this step action to launch an instance in your AWS account. The action waits until the instance meets the specified health check condition and the Systems Manager agent is running before proceeding to the next step. The launch action uses settings from your recipe and infrastructure configuration resources. For example, the instance type to launch comes from the infrastructure configuration. The output is the instance ID of the instance that launched.

The `waitFor` input configures the condition that satisfies the step completion requirement. The `healthCheck` input specifies the level of EC2 instance health validation that must pass before the step proceeds.

Default Timeout: 75 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: For build instances, rollback performs the action that you have configured in your infrastructure configuration resource. By default, build instances are terminated if image creation

fails. However, there is a setting in the infrastructure configuration to keep the build instance for troubleshooting.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
imageIdOverride	The image to use for launching the instance	String	No	Build stage: Image recipe base image Test stage: Output AMI from the build stage	Must be a valid AMI ID
instanceTypesOverride	Image Builder tries each instance type in the list until it finds one that launches successfully	List of String	No	Instance types specified in your Infrastructure Configuration	Must be valid instance types
waitFor	The condition to wait for before completing the workflow step and moving on to the next step	String	Yes	None	Image Builder supports `ssmAgent`.
healthCheck	The level of EC2 health validation	String	No	`STATUS_CHECK_PASSED`	Valid values: `RUNNING` | `STATUS_CH`

Input name	Description	Type	Required	Default	Constraints
	required before the workflow step proceeds. Specify RUNNING for faster builds with minimal validation, or STATUS_CHECK_PASSED to wait for EC2 status checks to pass.				ECK_PASSED .

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
instanceId	The instance ID of the instance that launched.	String

Example

Specify the step action in the workflow document.

```
- name: LaunchStep
  action: LaunchInstance
  onFailure: Abort
  inputs:
    healthCheck: "RUNNING"
    waitFor: ssmAgent
```

Use output from the step action in the workflow document.

```
$.stepOutputs.LaunchStep.instanceId
```

ModifyImageAttributes

Use this step action to modify attributes of distributed AMIs, such as launch permissions and other AMI attributes. It operates on AMIs that have been distributed to target Regions and accounts.

> **Note**
>
> The `attributes` input is optional. If you provide it, Image Builder uses your workflow inputs and ignores the attached distribution configuration. If you omit it, Image Builder falls back to the distribution configuration attached to the pipeline or image.

Default Timeout: 120 minutes

Max Timeout: 180 minutes (3 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
distributedImages.$	The list of distributed images to modify. Reference the `distributedImages` output from a `Distribut`	String	Yes		A JSONPath reference that starts with `$.stepOutputs.`

Input name	Description	Type	Required	Default	Constraints
	`eImage` step in the same workflow.				
attributes	The image attributes to modify, as a list. Each item targets one AWS Region.	Array	No		
attributes:region	The AWS Region of the distributed AMI to modify.	String	Yes		Required for each item in `attributes`.
attributes:launchPermission	The launch permission settings to apply to the distributed AMI.	Map	No		
attributes:launchPermission:userIds	The account IDs to add to or remove from the launch permissions for the AMI.	Array	No		

Input name	Description	Type	Required	Default	Constraints
attributes:launchPermission:userGroups	The user groups to add to or remove from the launch permissions for the AMI.	Array	No		
attributes:launchPermission:organizationArns	The AWS Organizations ARNs to add to or remove from the launch permissions for the AMI.	Array	No		
attributes:launchPermission:organizationalUnitArns	The organizational unit (OU) ARNs to add to or remove from the launch permissions for the AMI.	Array	No		

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
modifiedImages	A list of modified images	Array

Output name	Description	Type
modifiedImages:accountId	The destination account ID of the distributed image.	String
modifiedImages:name	The name of the AMI.	String
modifiedImages:amiId	The AMI ID of the distributed image.	String
modifiedImages:dateStarted	UTC time when distribution started.	String
modifiedImages:dateStopped	UTC time when distribution completed.	String
modifiedImages:step	The step at which distribution stopped.	Completed|ModifyAmiRunning
modifiedImages:region	The AWS Region of the image.	String
modifiedImages:status	Distribution status.	Completed|Failed|Cancelled|TimedOut
modifiedImages:errorMessage	Error message, if any.	String

Example

Specify the step action in the workflow document.

```
- name: ModifyImageAttributes
  action: ModifyImageAttributes
  onFailure: Abort
  inputs:
    distributedImages.$: $.stepOutputs.DistributeImageStep.distributedImages
    attributes:
      - region: us-west-2
        launchPermission:
          userIds:
```

```
        - "111122223333"
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.ModifyImageAttributesStep.modifiedImages
```

RegisterImage

This step action registers a new Amazon Machine Image (AMI) using the Amazon EC2 RegisterImage API. It allows you to create an AMI from an existing snapshot or set of snapshots, specifying various image attributes.

Default Timeout: 540 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
architecture	The architecture of the AMI.	String	No		Valid values: i386, x86_64, arm64, x86_64_mac, arm64_mac
blockDeviceMapping	The block device mapping entries for the AMI.	Array	No		
bootMode	The boot mode of the AMI.	String	No		Valid values: legacy-bios, uefi, uefi-preferred

Input name	Description	Type	Required	Default	Constraints
description	A description for the AMI.	String	No		
enaSupport	Whether enhanced networking with ENA is enabled.	Boolean	No		
imageLocation	The location of the AMI manifest.	String	No		Required for S3-backed AMIs
imdsSupport	The IMDSv2 support level.	String	No		Valid values: v2.0

Input name	Description	Type	Required	Default	Constraints
includeSnapshotTags	Whether to include tags from the first snapshot defined in the block device mapping.	Boolean	No	FALSE	When set to true, tags are included as follows: • Tags from the `SnapshotId` of the first EBS volume in the `blockDeviceMapping` list that contains a `SnapshotId` is merged with the output AMI tags. • Output AMI tags take precedence over snapshot tags with the same key. • AWS reserved tags (those with keys starting with `aws:`) are automatically excluded. • If multiple EBS volumes with `SnapshotId` are defined, only tags from the first EBS volume in the list that contains a

Input name	Description	Type	Required	Default	Constraints
					`SnapshotId` is included.
kernelId	The ID of the kernel to use.	String	No		
ramdiskId	The ID of the RAM disk to use.	String	No		
rootDeviceName	The device name of the root device.	String	No		Example: /dev/sda1
sriovNetSupport	Enhanced networking with the Intel 82599 VF interface.	String	No		
tpmSupport	TPM version support.	String	No		Valid values: v2.0
uefiData	Base64-encoded UEFI data.	String	No		
virtualizationType	The virtualization type.	String	No		Valid values: hvm, paravirtual

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
imageId	The AMI ID of the registered image.	String

IAM permissions required

Your custom execution role must have the following permissions to use this step action:

Allow actions

- ec2:DescribeSnapshots
- ec2:CreateTags

Example

Specify the step action in the workflow document.

```
- name: RegisterNewImage
  action: RegisterImage
  onFailure: Abort
  inputs:
    architecture: "x86_64"
    bootMode: "uefi"
    blockDeviceMapping:
      - DeviceName: "/dev/sda1"
        Ebs:
          SnapshotId: "snap-1234567890abcdef0"
          VolumeSize: 100
          VolumeType: "gp3"
    rootDeviceName: "/dev/sda1"
    virtualizationType: "hvm"
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.RegisterNewImage.imageId
```

Example with a SnapshotId from another step and snapshot tags included in the generated AMI

```
- name: CreateSnapshot
  action: RunCommand
  onFailure: Abort
  inputs:
    instanceId: "i-1234567890abcdef0"
    documentName: "AWS-RunShellScript"
    parameters:
      commands:
        - "aws ec2 create-snapshot --volume-id vol-1234567890abcdef0 --description
 'Snapshot for AMI' --query 'SnapshotId' --output text"
```

```
- name: RegisterImageFromSnapshot
  action: RegisterImage
  onFailure: Abort
  inputs:
    architecture: "x86_64"
    bootMode: "uefi"
    blockDeviceMapping:
      - DeviceName: "/dev/sda1"
        Ebs:
          SnapshotId.$: "$.stepOutputs.CreateSnapshot.output[0]"
          VolumeSize: 100
          VolumeType: "gp3"
    includeSnapshotTags: true
    rootDeviceName: "/dev/sda1"
    virtualizationType: "hvm"
```

RunCommand

This step action runs a command document for your workflow. Image Builder uses the **sendCommand** in the Systems Manager API to run it for you. For more information, see AWS Systems Manager Run Command.

Default Timeout: 720 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the instance to run the command document on.	String	Yes		This must be the output instance ID from the workflow step that

Input name	Description	Type	Required	Default	Constraints
					launched the instance for this workflow.
documentName	The name of the Systems Manager command document to run.	String	Yes		
parameters	A list of key value pairs for any parameters that the command document requires.	dictionary<string, list<string>>	Conditional		
documentVersion	The command document version to run.	String	No	$DEFAULT	

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
runCommandId	The ID of the Systems Manager **sendCommand** that ran the command document on the instance.	String

Output name	Description	Type
status	The status returned from the Systems Manager **sendCommand**.	String
output	Output returned from the Systems Manager **sendCommand**.	List of strings

Example

Specify the step action in the workflow document.

```
- name: RunCommandDoc
  action: RunCommand
  onFailure: Abort
  inputs:
    documentName: SampleDocument
    parameters:
        osPlatform:
          - "linux"
    instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.RunCommandDoc.status
```

RunSysPrep

This step action uses the **sendCommand** in the Systems Manager API to run the `AWSEC2-RunSysprep` document for Windows instances before the build instance shuts down for the snapshot. These actions follow AWS best practices for hardening and cleaning the image.

Default Timeout: 60 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the instance to run the `AWSEC2-RunSysprep` document on.	String	Yes		This must be the output instance ID from the workflow step that launched the instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
runCommandId	The ID of the Systems Manager **sendCommand** that ran the `AWSEC2-RunSysprep` document on the instance.	String
status	The status returned from the Systems Manager **sendCommand**.	String
output	Output returned from the Systems Manager **sendCommand**.	String

Example

Specify the step action in the workflow document.

```
- name: RunSysprep
  action: RunSysPrep
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.RunSysprep.status
```

SanitizeInstance

This step action runs the recommended sanitize script for Linux instances before the build instance shuts down for the snapshot. The sanitize script helps ensure that the final image follows security best practices, and that build artifacts or settings that should not carry over to your snapshot are removed. For more information about the script, see Required post-build clean up. This step action does not apply to container images.

Image Builder uses the **sendCommand** in the Systems Manager API to run this script. For more information, see AWS Systems Manager Run Command.

Default Timeout: 60 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the instance to sanitize.	String	Yes		This must be the output instance ID from the

Input name	Description	Type	Required	Default	Constraints
					workflow step that launched the instance for this workflow.

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
runCommandId	The ID of the Systems Manager **sendCommand** that ran the sanitize script on the instance.	String
status	The status returned from the Systems Manager **sendCommand**.	String
output	Output returned from the Systems Manager **sendCommand**.	String

Example

Specify the step action in the workflow document.

```
- name: SanitizeStep
  action: SanitizeInstance
  onFailure: Abort
  inputs:
      instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.SanitizeStep.status
```

TerminateInstance

This step action terminates the instance that you specify with the `instanceId` input. By default, it initiates termination and moves to the next step without waiting. A background process handles cleanup if termination encounters EC2 service errors. To wait for full termination before proceeding, set the `waitForTermination` input to `true`.

Default Timeout: 30 minutes

Max Timeout: 720 minutes (12 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the instance to terminate.	String	Yes	None	None
waitForTermination	Specifies whether the step waits for the instance to reach the terminated state before proceeding. When set to `true`, the step waits for full	Boolean	No	`false`	`true` | `false`

Input name	Description	Type	Required	Default	Constraints
	termination (10 seconds to several minutes).				

Outputs: There are no outputs for this step action.

Example

Specify the step action in the workflow document.

```
- name: TerminateInstance
  action: TerminateInstance
  onFailure: Continue
  inputs:
      instanceId.$: i-1234567890abcdef0
      waitForTermination: false
```

WaitForAction

This step action pauses the running workflow and waits to receive an external action from the Image Builder **SendWorkflowStepAction** API action. This step publishes an EventBridge event to your default EventBridge event bus with detail type `EC2 Image Builder Workflow Step Waiting`. The step can also send an SNS notification if you provide an SNS Topic ARN, or invoke a Lambda function asynchronously if you provide a Lambda function name.

How the pause and resume works

When a `WaitForAction` step runs, Image Builder sets the step status to `WAITING` and publishes an EventBridge event (detail type `EC2 Image Builder Workflow Step Waiting`). If you provide `snsTopicArn`, it also sends an Amazon SNS notification. If you provide `lambdaFunctionName`, it invokes that function asynchronously. The workflow stays paused until one of the following happens:

- You call **SendWorkflowStepAction** with `RESUME` to continue, or `STOP` to end the workflow.
- The step reaches its timeout (default 3 days, maximum 7 days), and the workflow fails.

The `reason` that you pass to **SendWorkflowStepAction** is stored with the step and is available to later steps as the step's `reason` output.

Default Timeout: 3 days

Max Timeout: 7 days (604,800 seconds)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
snsTopicArn	An optional SNS topic ARN to send a notification to when the workflow step is pending.	String	No		
lambdaFunctionName	An optional name or ARN of the Lambda function to invoke asynchronously when the workflow step is pending.	String	No		
payload	JSON string used as message	String	No		Must be valid JSON string, max 16 KiB

Input name	Description	Type	Required	Default	Constraints
	for SNS and payload for Lambda. If provided, a custom payload is wrapped in default message/ payload, used for SNS and Lambda respectiv ely. If not provided, generates default message/p ayload.				

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
action	The action that the **SendWorkflowStepAction** A PI action returns.	String (`RESUME` or `STOP`)
reason	The reason for the returned action.	String

IAM permissions required

Your custom execution role must have the following permissions to use this step action:

Allow actions

- `lambda:InvokeFunction`

Specify resources

- `arn:aws:lambda:us-west-2:111122223333:function:function-name`
- `arn:aws:lambda:us-west-2:111122223333:function:*`

Example

Specify the step action in the workflow document with SNS notification.

```
- name: SendEventAndWait
  action: WaitForAction
  onFailure: Abort
  inputs:
    snsTopicArn: arn:aws:sns:us-west-2:111122223333:ExampleTopic
```

Specify the step action in the workflow document with Lambda function invocation.

```
- name: SendEventAndWaitWithLambda
  action: WaitForAction
  onFailure: Abort
  inputs:
    lambdaFunctionName: ExampleFunction
    payload: |
      {
        "imageId": "{{ $.stepOutputs.CreateImageFromInstance.imageId }}",
        "region": "us-west-2"
      }
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.SendEventAndWait.reason
```

WaitForSSMAgent

This step action waits for an EC2 instance to become manageable by AWS Systems Manager after expected periods of unresponsiveness. It's particularly valuable for workflows with known

instance interruptions, such as system reboots, OS upgrades, or platform-specific operations that temporarily disconnect the instance from SSM. Image Builder monitors the instance until it regains SSM connectivity or times out.

Default Timeout: 60 minutes

Max Timeout: 180 minutes (3 hours)

You can override the default with `timeoutSeconds`, up to the maximum shown. A value above the maximum fails validation.

Rollback: There is no rollback for this step action.

Inputs: The following table includes supported inputs for this step action.

Input name	Description	Type	Required	Default	Constraints
instanceId	The ID of the instance to monitor for SSM connectivity.	String	Yes		Must be a valid EC2 instance ID

Outputs: The following table includes outputs for this step action.

Output name	Description	Type
status	Connection status of SSM Agent.	String

Example

Specify the step action in the workflow document.

```
- name: WaitForInstanceAfterReboot
  action: WaitForSSMAgent
  onFailure: Abort
  timeoutSeconds: 900
  inputs:
```

```
    instanceId.$: $.stepOutputs.LaunchStep.instanceId
```

Use the output of the step action value in the workflow document.

```
$.stepOutputs.WaitForInstanceAfterReboot.status
```

Use dynamic variables in your workflow document

You can use dynamic variables in your workflow documents to represent values that vary at runtime for your image creation process. String interpolation for dynamic variables allows you to embed JSONPath expressions within structured content such as JSON strings.This is particularly useful when you need to pass runtime values within complex payloads to step actions like `ExecuteStateMachine` or `WaitForAction`.

To use string interpolation for dynamic variables, wrap JSONPath expressions in double curly braces `"{{...}}"` within your string content. Only JSONPath expressions wrapped in double curly braces are processed as variables. Any JSONPath expressions not wrapped in double curly braces are treated as literal string content.

JSONPath dynamic workflow variable syntax

```
$.<document structure>.[<step name>.]<variable name>
```

Dynamic variable values are represented as JSONPath selectors with structural nodes that uniquely identify the target variable. The first node after the root ($) refers to the workflow document structure, such as `stepOutputs`, or in the case of Image Builder system variables, `imageBuilder`. The following list contains supported JSONPath workflow document structure nodes.

Document structure nodes

- parameters - The workflow parameters
- stepOutputs - Outputs from a step in the same workflow doc
- workflowOutputs - Outputs from a workflow doc that already ran
- imagebuilder - Image Builder system variables

The `parameters` and `stepOutputs` document structure nodes include an optional node for the step name. This helps ensure unique variable names across all of the steps.

The final node in the JSONPath is the name of the target variable, such as `instanceId`.

Each step can refer to the output of any prior step actions with these JSONPath dynamic variables. This is also known as *chaining, or referencing*. To refer to output from a prior step action, you might use the following dynamic variable.

```
$.stepOutputs.step-name.output-name
```

> **Important**
>
> When an input parameter refers to a dynamic variable, the chaining indicator (`.$`) must be attached to the end of the parameter name.

Example 1: Input parameter chaining indicator

The following example shows an input parameter that uses string interpolation to resolve a dynamic variable in the parameter value at runtime.

```
  - name: ApplyTestComponents
    action: ExecuteComponents
    onFailure: Abort
    inputs:
      instanceId.$: "$.stepOutputs.LaunchTestInstance.instanceId"
```

Example 2: String interpolation in dynamic variables

The following example demonstrates how dynamic variables use string interpolation to determine values at runtime.

```
- name: ValidateImageConfiguration
  action: ExecuteStateMachine
  inputs:
    stateMachineArn: arn:aws:states:us-east-1:111122223333:stateMachine:ImageValidation
    input: |
      {
        "imageId": "{{ $.stepOutputs.CreateImageFromInstance.imageId }}",
        "region": "us-east-1",
        "buildDate": "{{ $.imagebuilder.dateTime }}",
        "instanceType": "{{ $.stepOutputs.LaunchStep.instanceType }}"
      }
```

In this example, the JSONPath expressions wrapped in double curly braces are resolved at runtime:

- `{{ $.stepOutputs.CreateImageFromInstance.imageId }}` - Resolves to the actual image ID from the CreateImageFromInstance step
- `{{ $.imagebuilder.dateTime }}` - Resolves to the current build timestamp. See Use Image Builder system variables for a list of Image Builder system variables that you can use.
- `{{ $.stepOutputs.LaunchStep.instanceType }}` - Resolves to the instance type used in the LaunchStep

The literal strings like `"region": "us-east-1"` remain unchanged.

> **Note**
>
> String interpolation works with any string content in your workflow document, including multiline strings using the YAML pipe (|) operator. The curly brace requirement acts as an escape mechanism to clearly distinguish between JSONPath variables and literal text content.

Use Image Builder system variables

Image Builder provides the following system variables that you can use in your workflow document. These are read-only values that Image Builder populates at runtime. You reference a system variable with the `imagebuilder` document structure node, for example `$.imagebuilder.platform`.

Variable name	Description	Type	Example value
cloudWatchLogGroup	The name of the CloudWatch Logs group for output logs. Format: `/aws/imagebuilder/`*`<recipe-name>`*	String	`/aws/imagebuilder/`*`sampleImageRecipe`*

Variable name	Description	Type	Example value
cloudWatchLogStream	The name of the CloudWatch Logs stream for output logs.	String	*1.0.0/1*
collectImageMetadata	The setting that directs Image Builder whether to collect instance metadata.	Boolean	`true` | `false`
collectImageScanFindings	The current value of the setting that enables Image Builder to collect image scan findings.	Boolean	`true` | `false`
imageBuildNumber	The build version number of the image.	Integer	*1*
imageId	The AMI id of the base image.	String	*ami-12345 67890abcdef1*
imageName	The name of the image.	String	*sampleImage*
imageType	The image output type.	String	`AMI` | `Docker`
imageVersionNumber	The version number of the image.	String	*1.0.0*

Variable name	Description	Type	Example value
instanceProfileName	The name of the instance profile role that Image Builder uses to launch build and test instances.	String	*SampleImageBuilderInstanceProfileRole*
platform	The operating system platform of the image that's built.	String	`Linux` | `Windows` | `MacOS`
s3Logs	A JSON object that contains configuration for the S3 logs that Image Builder writes.	JSON object	{'s3Logs': {'s3BucketName': '*sample-bucket* ', 's3KeyPrefix': '*ib-logs*'}}
securityGroups	The security group IDs that apply to build and test instances.	List [String]	*[sg-1234567890abcdef1, sg-11112222333344445]*
sourceImageARN	The Amazon Resource Name (ARN) of the Image Builder image resource that the workflow uses for build and test stages.	String	arn:aws:imagebuilder:*us-east-1* :*111122223333* :image/*sampleImage* /*1.0.0/1*

Variable name	Description	Type	Example value
subnetId	The ID of the subnet to launch the build and test instances into.	String	*subnet-1234567890abcdef1*
terminateInstanceOnFailure	The current value of the setting that directs Image Builder to terminate the instance on failure or keep it for troubleshooting.	Boolean	`true` | `false`
workflowPhase	The current stage that's running for the workflow execution.	String	`Build` | `Test`
workingDirectory	The path to the working directory.	String	`/tmp`

Use conditional statements in your workflow steps

Conditional statements begin with the `if` statement document attribute. The ultimate purpose of the `if` statement is to determine whether to run the step action or to skip it. If the `if` statement resolves to `true`, then the step action runs. If it resolves to `false`, Image Builder skips the step action and records a step status of `SKIPPED` in the log.

The `if` statement supports branching statements (`and`, `or`) and conditional modifiers (`not`). It also supports the following comparison operators that perform value comparisons (equal, less than, greater than) based on the data types it compares (string or number).

Supported comparison operators

- `booleanEquals`
- `numberEquals`
- `numberGreaterThan`
- `numberGreaterThanEquals`
- `numberLessThan`
- `numberLessThanEquals`
- `stringEquals`

Rules for branching statements and conditional modifiers

The following rules apply for branching statements (`and`, `or`) and conditional modifiers (`not`).

- Branching statements and conditional modifiers must appear on a line by themselves.
- Branching statements and conditional modifiers must follow level rules.
  - There can only be one statement at the parent level.
  - Each child branch or modifier starts a new level.

  For more information about levels, see Nested levels in conditional statements.
- Each branching statement must have at least one child conditional statement, but no more than ten.
- Conditional modifiers operate on only one child conditional statement.

Nested levels in conditional statements

Conditional statements operate at several levels in a section of their own. For example, the `if` statement attribute appears at the same level in your workflow document as the step name and action. This is the base of the conditional statement.

You can specify up to four levels of conditional statements, but only one statement can appear at the parent level. All other branching statements, conditional modifiers, or conditional operators are indented from there, one indent per level.

The following outline shows the maximum number of nested levels for a conditional statement.

```
base:
  parent:
    - child (level 2)
        - child (level 3)
            child (level 4)
```

`if` attribute

The `if` attribute specifies the conditional statement as a document attribute. This is level zero.

Parent level

This is the first level of nesting for conditional statements. There can be only one statement at this level. If you don't need branching or modifiers, this can be a conditional operator with no child statements. This level doesn't use dash notation, except for conditional operators.

Child levels

Levels two through four are considered child levels. Child statements can include branching statements, conditional modifiers, or conditional operators.

Example: Nested levels

The following example shows the maximum number of levels in a conditional statement.

```
if:
  and:                            #first level
    - stringEquals: 'my_string'    #second level
      value: 'my_string'
    - and:                        #also second level
        - numberEquals: '1'        #third level
          value: 1
        - not:                     #also third level
            stringEquals: 'second_string'      #fourth level
            value: "diff_string"
```

Nesting rules

- Each branch or modifier at the child level starts a new level.
- Each level is indented.
- There can be a maximum of four levels, including one statement, modifier, or operator at the parent level, and up to three additional levels.

Conditional statement examples

This group of examples show various aspects of conditional statements.

Branching: and

The `and` branching statement operates on a list of expressions that are children of the branch, all of which must evaluate to `true`. Image Builder evaluates the expressions in the order that they appear in the list. If any expression evaluates to `false`, then processing stops and the branch is considered `false`.

The following example evaluates to `true`, because both expressions evaluate to `true`.

```
if:
  and:
    - stringEquals: 'test_string'
      value: 'test_string'
    - numberEquals: 1
      value: 1
```

Branching: or

The `or` branching statement operates on a list of expressions that are children of the branch, at least one of which must evaluate to `true`. Image Builder evaluates the expressions in the order that they appear in the list. If any expression evaluates to `true`, then processing stops and the branch is considered `true`.

The following example evaluates to `true`, even though the first expression is `false`.

```
if:
  or:
    - stringEquals: 'test_string'
      value: 'test_string_not_equal'
    - numberEquals: 1
      value: 1
```

Conditional modifier: not

The `not` conditional modifier negates the conditional statements that are children of the branch.

The following example evaluates to `true` when the `not` modifier negates the `stringEquals` conditional statement.

```
if:
  not:
    - stringEquals: 'test_string'
      value: 'test_string_not_equal'
```

Conditional statement: booleanEquals

The `booleanEquals` comparison operator compares Boolean values and returns true if the Boolean values exact match.

The following example determines if `collectImageScanFindings` is enabled.

```
if:
  - booleanEquals: true
    value: '$.imagebuilder.collectImageScanFindings'
```

Conditional statement: stringEquals

The `stringEquals` comparison operator compares two strings and returns true if the strings are an exact match. If either value isn't a string, Image Builder converts it to a string before it compares.

The following example compares the platform system variable to determine if the workflow is running on a Linux platform.

```
if:
  - stringEquals: 'Linux'
    value: '$.imagebuilder.platform'
```

Conditional statement: numberEquals

The `numberEquals` comparison operator compares two numbers and returns true if the numbers are equal. The numbers to compare must be one of the following formats.

- Integer
- Float
- A string that matches the following regex pattern: `^-?[0-9]+(\.)?[0-9]+$`.

The following example comparisons all evaluate to `true`.

```
if:
  # Value provider as a number
  numberEquals: 1
  value: '1'

  # Comparison value provided as a string
  numberEquals: '1'
  value: 1

  # Value provided as a string
  numberEquals: 1
  value: '1'

  # Floats are supported
  numberEquals: 5.0
  value: 5.0

  # Negative values are supported
  numberEquals: -1
  value: -1
```

Manage custom image creation in Image Builder through a repeatable pipeline process

Image Builder image pipelines provide an automation framework for creating and maintaining custom AMIs and container images. Pipelines deliver the following functionality:

- Assemble the base image, build and test components for image customization, infrastructure configuration, and distribution settings.
- Facilitate scheduling for automated maintenance processes using the `Schedule builder` in the console wizard, or entering cron expressions for recurring updates to your images.
- Enable change detection for the base image and components, to automatically skip scheduled builds when there are no changes.
- Enable rule-based automation through Amazon EventBridge.

> **Note**
>
> For more information about using the EventBridge API to view or change rules, see the Amazon EventBridge API Reference. For more information about using EventBridge **events** commands in the AWS CLI to view or change rules, see events in the *AWS CLI Command Reference*.

Topics

- Configure pipeline execution settings for image pipelines
- List and view pipeline details
- Create and update AMI image pipelines
- Create and update container image pipelines
- Configure image pipeline workflows in Image Builder
- Use EventBridge with Image Builder pipelines

Configure pipeline execution settings for image pipelines

You can choose from the following options to schedule pipeline execution:

Schedule Builder

Use the Schedule Builder to configure automatic, recurring pipeline execution. You define when and how often your pipeline should run (day, time, and frequency). The default schedule is every week based on the day and time that the schedule is created (UTC).

Cron expression

Automatically run the pipeline with a cron expression that specifies the schedule. For more information about the cron syntax that Image Builder uses, see Use cron expressions in Image Builder.

Manual

The pipeline does not run on a schedule. In the console, choose **Run pipeline** from the **Actions** menu to run the pipeline. From the AWS CLI, you can run `start-image-pipeline-execution`.

Dependency settings

For scheduled builds, you can choose whether to always run on the schedule or to skip pipeline execution unless there are dependency updates, such as a change to the base image or to a component that's used in the recipe.

Automatically disable a failing pipeline

For image pipelines that run on a schedule, you can configure the maximum number of consecutive failures to allow (up to `10`) before Image Builder automatically disables the pipeline. If you don't set an `AutoDisablePolicy`, Image Builder uses a default value of `5` consecutive failures.

Auto-disable settings

Image Builder tracks the number of consecutive failures for scheduled pipeline executions and takes one of the following actions each time it runs on a schedule:

- If the pipeline execution is successful, the number of consecutive failures resets to zero.
- If the pipeline execution fails, Image Builder increments the number of consecutive failures. If the failure count exceeds the limit defined in the `AutoDisablePolicy`, Image Builder disables the pipeline.

The consecutive failure count is also reset to zero under the following conditions:

- The pipeline runs manually and succeeds.
- The pipeline configuration is updated.

If the pipeline runs manually and fails, the count remains the same. The next scheduled run continues to increment where it left off before.

Configure pipeline logging

When you create or update an image pipeline, you can configure custom CloudWatch Logs groups for image build and pipeline logs. Make sure that your custom pipeline execution role has the following permissions to create and access the log group resources.

- logs:CreateLogGroup
- logs:CreateLogStream
- logs:PutLogEvents

Custom log groups

To use custom log groups for image build or pipeline execution, first create the log group in CloudWatch Logs. For more information, see Create a log group in the *Amazon CloudWatch Logs User Guide*. For additional guidance on log group naming requirements, see CreateLogGroup in the *Amazon CloudWatch Logs API Reference*.

Console

Specify the **Image log group** or **Pipeline log group** for your pipeline in the **Logging configuration** section under **Advanced settings**.

CLI

Specify the following fields within the `logging-configuration` object if you use a JSON object for configuration:

- `imageLogGroupName`
- `pipelineLogGroupName`

To specify all parameters directly in the command line, see create-image-pipeline in the *AWS CLI Command Reference*.

Image Builder uses the following default log groups if you don't specify a custom log group:

Image build logs

Image Builder writes build logs to the following Image Builder CloudWatch Logs group and stream:

LogGroup: `/aws/imagebuilder/`*`ImageName`*

LogStream (x.x.x/x): *`ImageVersion/ImageBuildVersion`*

Pipeline execution logs

Image Builder writes pipeline execution logs to the following Image Builder CloudWatch Logs group and stream:

LogGroup: `/aws/imagebuilder/pipeline/`*`pipeline-name`*

LogStream: *`2025/09/01`* (the pipeline execution date in YYYY/MM/DD format)

Each pipeline log is appended to the stream for that day.

Run an image pipeline manually

If you chose the manual schedule option for your pipeline, it will only run when you manually kick off the build. If you chose one of the automatic scheduling options, you can also run it manually, in between regularly scheduled runs. For example, if you have a pipeline that normally runs once a month, but you need to incorporate an update to one of your components two weeks after the prior run, you can choose to run your pipeline manually.

Console

To run your pipeline from the pipeline details page in the Image Builder console, choose **Run pipeline** from the **Actions** menu at the top of the page. A status message appears at the top of the page to notify you that your pipeline has started, or if there is an error.

1. In the upper left corner of the pipeline details page, choose **Run pipeline**, from the **Actions** menu.
2. You can see the current status of your pipeline on the **Output images** tab, in the **Status** column.

AWS CLI

The following example shows how to use the **start-image-pipeline-execution** command in the AWS CLI to start an image pipeline manually. When you run this command, the pipeline builds and distributes a new image.

```
aws imagebuilder start-image-pipeline-execution --image-pipeline-arn
 arn:aws:imagebuilder:us-west-2:111122223333:image-pipeline/my-example-pipeline
```

To see what resources are created when the build pipeline runs, see Resources created.

Use cron expressions in Image Builder

Use cron expressions for EC2 Image Builder to set up a time window to refresh your image with updates that apply to your pipeline's base image and components. The time window for your pipeline refresh starts with the time you set in the cron expression. You can set the time in your cron expression down to the minute. Your pipeline build can run on or after the start time.

It can sometimes take a few seconds, or up to a minute for your build to start running.

> **Note**
>
> Cron expressions use the Universal Coordinated Time (UTC) time zone by default, or you can specify the time zone. For more information about UTC time, and to find the offset for your time zone, see Time Zone Abbreviations – Worldwide List.

Supported values for cron expressions in Image Builder

EC2 Image Builder uses a cron format that consists of six required fields. Each one is separated from the others by a space in between, with no leading or trailing spaces:

<Minute> <Hour> <Day> <Month> <Day of the week> <Year>

The following table shows supported values for required cron entries.

Supported values for cron expressions

Field	Values	Wildcards
Minute	`0-59`	`,-*/`
Hour	`0-23`	`,-*/`
Day	`1-31`	`, - * ? / L W`
Month	`1-12` or `jan-dec`	`, - * /`
Day of the week	`1-7` or `sun-sat`	`, - * ? L #`
Year	`1970-2199`	`, - * /`

Wildcards

The following table describes how Image Builder uses wildcards for cron expressions. Keep in mind that it can take up to a minute after the time you specify for the build to start.

Supported wildcards for cron expressions

Wildcard	Description
,	The **,** (comma) wildcard includes additional values. In the Month field, `jan,feb,mar` includes January, February, and March.
-	The **-** (dash) wildcard specifies ranges. In the day of the month field, `1-15` includes days 1 through 15 of the specified month.
*****	The * (asterisk) wildcard includes all valid values for the field.
?	The `?` (question mark) wildcard specifies that the field value depends on another setting. In the case of the Day and Day-of-week fields, when one is specified or includes all possible

Wildcard	Description
	values (*), the other must be a ?. You cannot specify both. For example, if you enter a 7 in the Day field (run the build on the seventh day of the month), the Day-of-week position must contain a ?.
/	The **/** (forward slash) wildcard specifies increments. For example, if you want your build to run every other day, enter `*/2` in the day field.
L	The **L** wildcard in either of the day fields, specifies the *last* day: 28-31 for the day of the month, depending on what the month is, or Sunday, for the day of the week.
W	The **W** wildcard in the Day-of-month field specifies a weekday. In the Day-of-month field, if you enter a number prior to the `W`, that means you want to target the weekday that is closest to that day. For instance, if you specify `3W`, you want your build to run on the weekday closest to the third day of the month.
#	The **#** (hash) is allowed only for the day of the week field, and must be followed by a number between 1 and 5. The number specifies which weeks in a given month apply for the build to run. For example, if you want your build to run on the second Friday of each month, use `fri#2` for the day of the week field.

Restrictions

- You can't specify the Day-of-month and Day-of-week fields in the same cron expression. If you specify a value or * in one of these fields, you must use a ? in the other.

- Cron expressions that lead to rates faster than one minute are not supported.

Examples of cron expressions in Image Builder

Cron expressions are entered differently for the Image Builder console, than they are for the API or CLI. To see examples, choose the tab that applies to you.

Image Builder console

The following examples show cron expressions that you can enter into the console for your build schedule. UTC time is specified using a 24-hour clock.

Run daily at 10:00 AM (UTC)

```
0 10 * * ? *
```

Run daily at 12:15 PM (UTC)

```
15 12 * * ? *
```

Run daily at midnight (UTC)

```
0 0 * * ? *
```

Run at 10:00 AM (UTC) every weekday morning

```
0 10 ? * 2-6 *
```

Run at 6 PM (UTC) every weekday evening

```
0 18 ? * mon-fri *
```

Run at 8:00 AM (UTC) on the first day of every month

```
0 8 1 * ? *
```

Run on the second Tuesday of every month at 10:30 PM (UTC)

```
30 22 ? * tue#2 *
```

> **Tip**
>
> If you don't want your pipeline job to extend into the next day while it's running, make sure that you factor in time for your build when you specify the start time.

API/CLI

The following examples show cron expressions that you can enter for your build schedule using CLI commands or API requests. Only the cron expression is shown.

Run daily at 10:00 AM (UTC)

```
cron(0 10 * * ? *)
```

Run daily at 12:15 PM (UTC)

```
cron(15 12 * * ? *)
```

Run daily at midnight (UTC)

```
cron(0 0 * * ? *)
```

Run at 10:00 AM (UTC) every weekday morning

```
cron(0 10 ? * 2-6 *)
```

Run at 6:00 PM (UTC) every weekday evening

```
cron(0 18 ? * mon-fri *)
```

Run at 8:00 AM (UTC) on the first day of every month

```
cron(0 8 1 * ? *)
```

Run on the second Tuesday of every month at 10:30 PM (UTC)

```
cron(30 22 ? * tue#2 *)
```

> **Tip**
>
> If you don't want your pipeline job to extend into the next day while it's running, make sure that you factor in time for your build when you specify the start time.

Rate expressions in Image Builder

A rate expression starts when you create the scheduled event rule, and then runs on its defined schedule.

Rate expressions have two required fields. Fields are separated by white space.

Syntax

```
rate(value unit)
```

value

A positive number.

unit

The unit of time. Different units are required for values of 1, such as `minute`, and values over 1, such as `minutes`.

Valid values: minute | minutes | hour | hours | day | days

Restrictions

If the value is equal to 1, then the unit must be singular. Similarly, for values greater than 1, the unit must be plural. For example, `rate(1 hours)` and `rate(5 hour)` are not valid, but `rate(1 hour)` and `rate(5 hours)` are valid.

List and view pipeline details

This section describes the various ways that you can find information and view details for your EC2 Image Builder image pipelines.

Pipeline details

- List image pipelines from the AWS CLI
- Get image pipeline details from the AWS CLI

List image pipelines from the AWS CLI

The following example shows how to use the **list-image-pipelines** command in the AWS CLI to list all of your image pipelines.

```
aws imagebuilder list-image-pipelines
```

Get image pipeline details from the AWS CLI

The following example shows how to use the **get-image-pipeline** command in the AWS CLI to get the details about an image pipeline through its ARN.

```
aws imagebuilder get-image-pipeline --image-pipeline-arn arn:aws:imagebuilder:us-
west-2:123456789012:image-pipeline/my-example-pipeline
```

Create and update AMI image pipelines

You can set up, configure, and manage AMI image pipelines from the Image Builder console, through the Image Builder API, SDKs or the AWS CLI. In the console, you can use the **Create image pipeline** console wizard to guide you through the following steps.

- Specify pipeline details such as name, description, and resource tags.
- Configure pipeline schedule and logging defaults. For scheduled pipeline execution, you can set the number of consecutive failures that are allowed before Image Builder disables the pipeline.
- Select an AMI image recipe that includes a base image from quick-start Amazon managed images, images that you created or that were shared with you, or images that you subscribe to through the AWS Marketplace. The recipe also includes components that perform the following tasks on the EC2 instances that Image Builder uses to build your image:
  - Add and remove software
  - Customize settings and scripts
  - Run selected tests
- Specify workflows to configure image build and test steps that your pipeline runs.
- Define infrastructure configuration for your pipeline with default settings or settings that you configure yourself. Configuration includes the instance type and key pair to use for your image, security and network settings, log storage and troubleshooting settings, and SNS notifications.

This is an *optional* step. Image Builder uses default settings for your infrastructure configuration if you don't define the configuration yourself.

- Define distribution settings to deliver your images to destination AWS Regions and accounts. You can specify a KMS key for encryption, configure AMI sharing or license configuration, or configure a launch template for the AMIs you distribute.

  This is an *optional* step. If you don't define the configuration yourself, Image Builder uses default naming for your output AMI, and distributes the AMI to the source Region. The source Region is the Region where you run the pipeline.

For more information and a step-by-step tutorial about using the **Create image pipeline** console wizard with default values where provided, see Tutorial: Create an image pipeline with output AMI from the Image Builder console wizard.

Contents

- Create an AMI image pipeline from the AWS CLI
- Update AMI image pipelines from the console
- Update AMI image pipelines from the AWS CLI

Create an AMI image pipeline from the AWS CLI

To create an image pipeline from the AWS CLI, run the **create-image-pipeline** command with the configuration options that apply for your pipeline. You have the option to create a JSON file that contains all of your pipeline configuration, or to specify configuration at runtime. This section uses the JSON configuration file method to simplify the command.

How often your pipeline builds a new image to incorporate any pending updates from your base image and components depends on the `schedule` that you have configured. A `schedule` has the following attributes:

- `scheduleExpression` – Sets the schedule for when your pipeline runs to evaluate the `pipelineExecutionStartCondition` and determine if it should start a build. The schedule is configured with cron expressions. For more information on how to format a cron expression in Image Builder, see Use cron expressions in Image Builder.
- `pipelineExecutionStartCondition` – Determines if your pipeline should start the build. Valid values include:

- EXPRESSION_MATCH_ONLY – your pipeline will build a new image every time the cron expression matches the current time.
- EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE – your pipeline builds a new image only when the schedule expression matches and there are pending updates to your base image or components. If no updates are pending, the build is skipped. To build immediately without waiting for updates, run the pipeline manually.

When you run the **create-image-pipeline** command in the AWS CLI, many of the configuration resources are optional. However, some of the resources have conditional requirements, depending on what type of image the pipeline creates. The following resource identifiers are required for AMI image pipelines:

- Image recipe ARN
- Infrastructure configuration ARN

Example: Create a Windows 2019 image

This example configures a pipeline that is scheduled to run once a week on Sunday. The configuration file shown in the first step uses existing resources for the image recipe, infrastructure, and distribution configuration, along with other settings to create a Windows 2019 image.

1. **Create a configuration file (optional)**

   This example uses a configuration file named `create-image-pipeline.json` to configure the settings in one place. Alternatively, you can use command line options when you run the command to specify all of the details that are shown here in the configuration file.

```
{
 "name": "ExampleWindows2019Pipeline",
 "description": "Builds Windows 2019 Images",
 "enhancedImageMetadataEnabled": true,
 "imageRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-example-recipe/2020.12.03",
 "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/my-example-infrastructure-configuration",
```

```
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:distribution-configuration/my-example-distribution-
configuration",
 "imageTestsConfiguration": {
  "imageTestsEnabled": true,
  "timeoutMinutes": 60
 },
 "schedule": {
  "scheduleExpression": "cron(0 0 * * SUN *)",
  "pipelineExecutionStartCondition":
 "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
 },
 "status": "ENABLED"
}
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. **Run the command to create an image**

   This example uses the configuration file created in the first step as input to the `create-image-pipeline` command. Alternatively, you can specify the settings and resources for your pipeline directly when you run the command. For more information, see create-image-pipeline in the *AWS CLI Reference*.

```
aws imagebuilder create-image-pipeline --cli-input-json file://create-image-
pipeline.json
```

Example: Create a pipeline with image scanning and custom workflows

This example configures a pipeline that checks every seven days and runs only when dependency updates are available. The configuration file uses existing resources for the image recipe and infrastructure. It enables vulnerability scanning with Amazon Inspector. The configuration also

specifies custom workflows with an execution role. Parallel groups run security and functional tests at the same time. Pipeline logs are sent to custom CloudWatch log groups.

1. **Create a configuration file**

   Create a JSON file named `create-pipeline-with-workflows.json`. This file defines the pipeline configuration with image scanning enabled and custom test workflows. Replace the placeholder values with your own resource ARNs.

```
{
 "name": "MyPipelineWithScanning",
 "description": "Pipeline with vulnerability scanning and custom workflows",
 "imageRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-recipe/1.0.0",
 "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/my-infra-config",
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-west-2:123456789012:distribution-configuration/my-dist-config",
 "imageScanningConfiguration": {
  "imageScanningEnabled": true
 },
 "workflows": [
  {
   "workflowArn": "arn:aws:imagebuilder:us-west-2:123456789012:workflow/build/my-build-workflow/1.0.0"
  },
  {
   "workflowArn": "arn:aws:imagebuilder:us-west-2:123456789012:workflow/test/my-security-scan/1.0.0",
   "onFailure": "ABORT",
   "parallelGroup": "security"
  },
  {
   "workflowArn": "arn:aws:imagebuilder:us-west-2:123456789012:workflow/test/my-compliance-check/1.0.0",
   "onFailure": "ABORT",
   "parallelGroup": "security"
  },
  {
   "workflowArn": "arn:aws:imagebuilder:us-west-2:123456789012:workflow/test/my-functional-test/1.0.0",
   "onFailure": "CONTINUE",
   "parallelGroup": "functional"
```

```
  },
  {
   "workflowArn": "arn:aws:imagebuilder:us-west-2:123456789012:workflow/test/my-
performance-test/1.0.0",
   "onFailure": "CONTINUE",
   "parallelGroup": "functional"
  }
 ],
 "executionRole": "arn:aws:iam::123456789012:role/ImageBuilderExecutionRole",
 "loggingConfiguration": {
  "imageLogGroupName": "/aws/imagebuilder/my-pipeline-image-logs",
  "pipelineLogGroupName": "/aws/imagebuilder/my-pipeline-execution-logs"
 },
 "imageTestsConfiguration": {
  "imageTestsEnabled": true,
  "timeoutMinutes": 60
 },
 "schedule": {
  "scheduleExpression": "rate(7 days)",
  "pipelineExecutionStartCondition":
 "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
 },
 "status": "ENABLED"
}
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. **Run the command**

```
aws imagebuilder create-image-pipeline --cli-input-json file://create-pipeline-
with-workflows.json
```

Update AMI image pipelines from the console

After you have created an Image Builder image pipeline for your AMI image, you can make changes to the infrastructure configuration and distribution settings from the Image Builder console.

To update an image pipeline with a new image recipe, you must use the AWS CLI. For more information, see Update AMI image pipelines from the AWS CLI in this guide.

Choose an existing Image Builder pipeline

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. To see a list of the image pipelines created under your account, choose **Image pipelines** from the navigation pane.

   > **Note**
   >
   > The list of image pipelines includes an indicator for the type of output image that is created by the pipeline – AMI or Docker.

3. To view details or edit a pipeline, choose the **Pipeline name** link. This opens the detail view for the pipeline.

   > **Note**
   >
   > You can also select the check box next to the **Pipeline name**, then choose **View detail**.

Pipeline details

The pipeline details page includes the following sections:

Summary

The section at the top of the page summarizes key details for the pipeline that are visible with any of the detail tabs open. The details displayed in this section are editable only on their respective detail tabs.

Detail tabs

- **Output images** – Shows output images that the pipeline has produced.

- **Image recipe** – Shows recipe details. After you create a recipe, you cannot edit it. You must create a new version of the recipe from the **Image recipes** page in the Image Builder console, or by using Image Builder commands in the AWS CLI. For more information, see Manage recipes in Image Builder.
- **Infrastructure configuration** – Shows editable information for configuring your build pipeline infrastructure.
- **Distribution settings** – Shows editable information for AMI distribution.
- **EventBridge rules** – For the selected **Event Bus**, shows EventBridge rules that target the current pipeline. Includes **Create event bus** and **Create rule** actions that link to the EventBridge console. For more information about this tab, see Use EventBridge.

Edit infrastructure configuration for your pipeline

Infrastructure configuration includes the following details that you can edit after creating the pipeline:

- The **Description** for your infrastructure configuration.
- The **IAM role** to associate with the instance profile.
- **AWS infrastructure**, including the **Instance type** and an **SNS topic** for notifications.
- **VPC, subnet, and security groups**.
- **Troubleshooting settings**, including **Terminate instance on failure**, the **Key pair** for connecting, and an optional S3 bucket location for instance logs.

To edit infrastructure configuration from the pipeline details page, follow these steps:

1. Choose the **Infrastructure configuration** tab.
2. Choose **Edit** from the upper right corner of the **Configuration details** panel.
3. When you are ready to save updates you've made to your infrastructure configuration, choose **Save changes**.

Edit distribution settings for your pipeline

Distribution settings include the following details that you can edit after creating the pipeline:

- The **Description** for your distribution configuration.

- **Region settings** for the Regions where you distribute your image. Region 1 defaults to the Region where you created the pipeline. You can add Regions for distribution with the **Add Region** button, and you can remove all Regions except Region 1.

  Region settings include:

  - Target **Region**
  - The **Output AMI name**
  - **Launch permissions**, and accounts to share them with
  - Associated licenses (**Associate license configurations**)

  > **Note**
  >
  > License Manager settings will not replicate across AWS Regions that must be enabled in your account, for example, between the `ap-east-1` (Hong Kong) and the `me-south-1` (Bahrain) Regions.

To edit your distribution settings from the pipeline details page, follow these steps:

1. Choose the **Distribution settings** tab.
2. Choose **Edit** from the upper right corner of the **Distribution details** panel.
3. When you are ready to save your updates, choose **Save changes**.

Edit the build schedule for your pipeline

The **Edit pipeline** page includes the following details that you can edit after creating the pipeline:

- The **Description** for your pipeline.
- **Enhanced metadata collection**. This is turned on by default. To turn it off, clear the **Enable enhanced metadata collection** check box.
- The **Build schedule** for your pipeline. You can change your **Schedule options** and all of the settings here.

To edit your pipeline from the pipeline details page, follow these steps:

1. In the upper right corner of the pipeline details page, choose **Actions**, and then **Edit pipeline**.

2. When you are ready to save your updates, choose **Save changes**.

> **Note**
>
> For more information about scheduling your build using cron expressions, see Use cron expressions in Image Builder.

Update AMI image pipelines from the AWS CLI

You can update an AMI image pipeline using a JSON file as input to the **update-image-pipeline** command in the AWS CLI. To configure the JSON file, you must have Amazon Resource Names (ARNs) to reference the following existing resources:

- Image pipeline to update
- Image recipe
- Infrastructure configuration
- Distribution settings

You can update an AMI image pipeline with the **update-image-pipeline** command in the AWS CLI as follows:

> **Note**
>
> The **update-image-pipeline** command replaces the entire pipeline configuration. You must specify all required properties in the update request. Include all properties—both properties you want to change and properties that should stay the same. Properties that you omit are reset to default values or are removed.
> To prevent unintended removal of existing settings, use the **get-image-pipeline** command to retrieve the current configuration. Then modify only the fields you want to change:
>
> ```
> aws imagebuilder get-image-pipeline --image-pipeline-arn
>  arn:aws:imagebuilder:us-west-2:123456789012:image-pipeline/my-pipeline
> ```
>
> Use the output as the basis for your update request JSON file.

1. **Create a CLI input JSON file**

   Use your favorite file editing tool to create a JSON file with the following keys, plus values that are valid for your environment. This example uses a file named `update-image-pipeline.json`:

```
 {
 "imagePipelineArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-
pipeline/my-example-pipeline",
 "imageRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-
example-recipe/2019.12.08",
 "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:infrastructure-configuration/my-example-infrastructure-
configuration",
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:distribution-configuration/my-example-distribution-
configuration",
 "imageTestsConfiguration": {
  "imageTestsEnabled": true,
  "timeoutMinutes": 120
 },
 "schedule": {
  "scheduleExpression": "cron(0 0 * * MON *)",
  "pipelineExecutionStartCondition":
 "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
 },
 "status": "DISABLED"
}
```

   Note

   - You must include the `file://` notation at the beginning of the JSON file path.
   - The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. Run the following command, using the file you created as input.

```
aws imagebuilder update-image-pipeline --cli-input-json file://update-image-
pipeline.json
```

Create and update container image pipelines

You can set up, configure, and manage container image pipelines using the Image Builder console, through the Image Builder API, or with **imagebuilder** commands in the AWS CLI. The **Create image pipeline** console wizard provides starting artifacts, and guides you through steps to:

- Select a base image from quick-start managed images, Amazon ECR, or Docker Hub repositories
- Add and remove software
- Customize settings and scripts
- Run selected tests
- Create a Dockerfile using pre-configured build-time variables.
- Distribute images to AWS Regions

For more information and a step-by-step tutorial about using the **Create image pipeline** console wizard, see Tutorial: Create an image pipeline with output Docker container image from the Image Builder console wizard.

Contents

- Create a container image pipeline from the AWS CLI
- Update a container image pipeline from the console
- Update container image pipelines from the AWS CLI

Create a container image pipeline from the AWS CLI

To create an image pipeline from the AWS CLI, run the **create-image-pipeline** command with the configuration options that apply for your pipeline. You have the option to create a JSON file that contains all of your pipeline configuration, or to specify configuration at runtime. This section uses the JSON configuration file method to simplify the command.

How often your pipeline builds a new image to incorporate any pending updates from your base image and components depends on the `schedule` that you have configured. A `schedule` has the following attributes:

- `scheduleExpression` – Sets the schedule for when your pipeline runs to evaluate the `pipelineExecutionStartCondition` and determine if it should start a build. The schedule is configured with cron expressions. For more information on how to format a cron expression in Image Builder, see Use cron expressions in Image Builder.
- `pipelineExecutionStartCondition` – Determines if your pipeline should start the build. Valid values include:
  - `EXPRESSION_MATCH_ONLY` – your pipeline will build a new image every time the cron expression matches the current time.
  - `EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE` – your pipeline builds a new image only when the schedule expression matches and there are pending updates to your base image or components. If no updates are pending, the build is skipped. To build immediately without waiting for updates, run the pipeline manually.

When you run the **create-image-pipeline** command in the AWS CLI, many of the configuration resources are optional. However, some of the resources have conditional requirements, depending on what type of image the pipeline creates. The following resources are required for container image pipelines:

- Container recipe ARN
- Infrastructure configuration ARN

If you do not include a distribution configuration resource when you run the **create-image-pipeline** command, the output image is stored in the ECR repository that you specify as the target repository in your container recipe in the Region where you run the command. If you include a distribution configuration resource for your pipeline, the target repository that you have specified for the first Region in the distribution is used.

1. **Create a CLI input JSON file**

   Use your favorite file editing tool to create a JSON file with the following keys, plus values that are valid for your environment. This example uses a file named `create-image-pipeline.json`:

```
{
 "name": "MyWindows2019Pipeline",
 "description": "Builds Windows 2019 Images",
 "enhancedImageMetadataEnabled": true,
 "containerRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:container-
recipe/my-example-recipe/2020.12.03",
 "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:infrastructure-configuration/my-example-infrastructure-
configuration",
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:distribution-configuration/my-example-distribution-
configuration",
 "imageTestsConfiguration": {
  "imageTestsEnabled": true,
  "timeoutMinutes": 60
 },
 "schedule": {
  "scheduleExpression": "cron(0 0 * * SUN *)",
  "pipelineExecutionStartCondition":
 "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
 },
 "status": "ENABLED"
}
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. Run the following command, using the file you created as input.

```
aws imagebuilder create-image-pipeline --cli-input-json file://create-image-
pipeline.json
```

Example: Create a container pipeline with image scanning and custom workflows

This example configures a container pipeline that checks every Monday at 10:00 AM UTC and runs only when dependency updates are available. The configuration file uses existing resources for the container recipe and infrastructure. It enables vulnerability scanning with Amazon Inspector and ECR integration. The configuration also specifies custom workflows with an execution role. Parallel groups run security and functional tests at the same time. Pipeline logs are sent to custom CloudWatch log groups.

1. **Create a configuration file**

   Create a JSON file named `create-container-pipeline-with-workflows.json`. This file defines the container pipeline configuration with image scanning enabled and custom test workflows. Replace the placeholder values with your own resource ARNs.

```
{
 "name": "MyContainerPipelineWithScanning",
 "description": "Container pipeline with vulnerability scanning and custom
 workflows",
 "containerRecipeArn": "arn:aws:imagebuilder:us-east-1:123456789012:container-
recipe/my-container-recipe/1.0.0",
 "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-
east-1:123456789012:infrastructure-configuration/my-infra-config",
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
east-1:123456789012:distribution-configuration/my-dist-config",
 "imageScanningConfiguration": {
  "imageScanningEnabled": true,
  "ecrConfiguration": {
   "repositoryName": "my-scanning-repo",
   "containerTags": ["scan-latest"]
  }
 },
 "workflows": [
  {
   "workflowArn": "arn:aws:imagebuilder:us-east-1:123456789012:workflow/build/my-
build-workflow/1.0.0"
  },
  {
   "workflowArn": "arn:aws:imagebuilder:us-east-1:123456789012:workflow/test/my-
security-scan/1.0.0",
   "onFailure": "ABORT",
   "parallelGroup": "security"
  },
  {
```

```
    "workflowArn": "arn:aws:imagebuilder:us-east-1:123456789012:workflow/test/my-compliance-check/1.0.0",
    "onFailure": "ABORT",
    "parallelGroup": "security"
   },
   {
    "workflowArn": "arn:aws:imagebuilder:us-east-1:123456789012:workflow/test/my-functional-test/1.0.0",
    "onFailure": "CONTINUE",
    "parallelGroup": "functional"
   },
   {
    "workflowArn": "arn:aws:imagebuilder:us-east-1:123456789012:workflow/test/my-performance-test/1.0.0",
    "onFailure": "CONTINUE",
    "parallelGroup": "functional"
   }
  ],
  "executionRole": "arn:aws:iam::123456789012:role/ImageBuilderExecutionRole",
  "loggingConfiguration": {
   "imageLogGroupName": "/aws/imagebuilder/my-container-pipeline-image-logs",
   "pipelineLogGroupName": "/aws/imagebuilder/my-container-pipeline-execution-logs"
  },
  "imageTestsConfiguration": {
   "imageTestsEnabled": true,
   "timeoutMinutes": 120
  },
  "schedule": {
   "scheduleExpression": "cron(0 10 ? * MON *)",
   "pipelineExecutionStartCondition":
  "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
  },
  "status": "ENABLED"
}
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows

uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. **Run the command**

```
aws imagebuilder create-image-pipeline --cli-input-json file://create-container-pipeline-with-workflows.json
```

Update a container image pipeline from the console

After you have created an Image Builder container image pipeline for your Docker image, you can make changes to the infrastructure configuration and distribution settings from the Image Builder console.

To update a container image pipeline with a new container recipe, you must use the AWS CLI. For more information, see Update container image pipelines from the AWS CLI in this guide.

Choose an existing Image Builder Docker image pipeline

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. To see a list of the image pipelines created under your account, choose **Image pipelines** from the navigation pane.

> **Note**
>
> The list of image pipelines includes an indicator for the type of output image that is created by the pipeline – AMI or Docker.

3. To view details or edit a pipeline, choose the **Pipeline name** link. This opens the detail view for the pipeline.

> **Note**
>
> You can also select the check box next to the **Pipeline name**, then choose **View detail**.

Pipeline details

The EC2 Image Builder pipeline details page includes the following sections:

Summary

The section at the top of the page summarizes key details for the pipeline that are visible with any of the detail tabs open. The details displayed in this section are editable only on their respective detail tabs.

Detail tabs

- **Output images** – Shows output images that the pipeline has produced.
- **Container recipe** – Shows recipe details. After you create a recipe, you cannot edit it. You must create a new version of the recipe from the **Container recipes** page. For more information, see Create a new version of a container recipe.
- **Infrastructure configuration** – Shows editable information for configuring your build pipeline infrastructure.
- **Distribution settings** – Shows editable information for Docker image distribution.
- **EventBridge rules** – For the selected **Event Bus**, shows EventBridge rules that target the current pipeline. Includes **Create event bus** and **Create rule** actions that link to the EventBridge console. For more information about this tab, see Use EventBridge.

Edit infrastructure configuration for your pipeline

Infrastructure configuration includes the following details that you can edit after creating the pipeline:

- The **Description** for your infrastruction configuration.
- The **IAM role** to associate with the instance profile.
- **AWS infrastructure**, including the **Instance type** and an **SNS topic** for notifications.
- **VPC, subnet, and security groups**.
- **Troubleshooting settings**, including **Terminate instance on failure**, the **Key pair** for connecting, and an optional S3 bucket location for instance logs.

To edit infrastructure configuration from the pipeline details page, follow these steps:

1. Choose the **Infrastructure configuration** tab.
2. Choose **Edit** from the upper right corner of the **Configuration details** panel.
3. When you are ready to save updates you've made to your infrastructure configuration, choose **Save changes**.

Edit distribution settings for your pipeline

Distribution settings include the following details that you can edit after creating the pipeline:

- The **Description** for your distribution settings.
- **Region settings** for the Regions where you distribute your image. Region 1 defaults to the Region where you created the pipeline. You can add Regions for distribution with the **Add Region** button, and you can remove all Regions except Region 1.

  Region settings include:

  - Target **Region**
  - The **Service** defaults to "ECR", and is not editable.
  - **Repository name** – the name of your target repository (*not including the Amazon ECR location*). For example, the repository name with the location would look like the following pattern:

    `<account-id>.dkr.ecr.<region>.amazonaws.com/<repository-name>`

    > **Note**
    >
    > If you change the **Repository name**, only the images created after the name change will be added under the new name. Any prior images that your pipeline created remain in their original repository.

To edit your distribution settings from the pipeline details page, follow these steps:

1. Choose the **Distribution settings** tab.
2. Choose **Edit** from the upper right corner of the **Distribution details** panel.
3. When you are ready to save updates you've made to your distribution settings, choose **Save changes**.

Edit the build schedule for your pipeline

The **Edit pipeline** page includes the following details that you can edit after creating the pipeline:

- The **Description** for your pipeline.
- **Enhanced metadata collection**. This is turned on by default. To turn it off, clear the **Enable enhanced metadata collection** check box.
- The **Build schedule** for your pipeline. You can change your **Schedule options** and all of the settings in this section.

To edit your pipeline from the pipeline details page, follow these steps:

1. In the upper right corner of the pipeline details page, choose **Actions**, and then **Edit pipeline**.
2. When you are ready to save your updates, choose **Save changes**.

> **Note**
>
> For more information about scheduling your build using cron expressions, see Use cron expressions in Image Builder.

Update container image pipelines from the AWS CLI

You can update a container image pipeline using a JSON file as input to the **update-image-pipeline** command in the AWS CLI. To configure the JSON file, you must have Amazon Resource Names (ARNs) to reference the following existing resources:

- Image pipeline to update
- Container recipe
- Infrastructure configuration
- Distribution settings (if included in the current pipeline)

> **Note**
>
> If the distribution settings resource is included, then the ECR repository that's specified as the target repository in the distribution settings for the Region where the command runs

(Region 1) takes precedence over the target repository that's specified in the container recipe.

Follow these steps to update a container image pipeline using the **update-image-pipeline** command in the AWS CLI:

Note

The **update-image-pipeline** command replaces the entire pipeline configuration. You must specify all required properties in the update request. Include all properties—both properties you want to change and properties that should stay the same. Properties that you omit are reset to default values or are removed.
To prevent unintended removal of existing settings, use the **get-image-pipeline** command to retrieve the current configuration. Then modify only the fields you want to change:

```
aws imagebuilder get-image-pipeline --image-pipeline-arn
 arn:aws:imagebuilder:us-west-2:123456789012:image-pipeline/my-container-
pipeline
```

Use the output as the basis for your update request JSON file.

1. **Create a CLI input JSON file**

   Use your favorite file editing tool to create a JSON file with the following keys, plus values that are valid for your environment. This example uses a file named `update-image-pipeline.json`:

```
{
 "imagePipelineArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-
pipeline/my-example-pipeline",
 "containerRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:container-
recipe/my-example-recipe/2020.12.08",
 "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:infrastructure-configuration/my-example-infrastructure-
configuration",
 "distributionConfigurationArn": "arn:aws:imagebuilder:us-
west-2:123456789012:distribution-configuration/my-example-distribution-
configuration",
```

```
 "imageTestsConfiguration": {
  "imageTestsEnabled": true,
  "timeoutMinutes": 120
 },
 "schedule": {
  "scheduleExpression": "cron(0 0 * * MON *)",
  "pipelineExecutionStartCondition":
 "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
 },
 "status": "DISABLED"
}
```

Note

- You must include the `file://` notation at the beginning of the JSON file path.
- The path for the JSON file should follow the appropriate convention for the base operating system where you are running the command. For example, Windows uses the backslash (\) to refer to the directory path, while Linux and macOS use the forward slash (/).

2. Run the following command, using the file you created as input.

```
aws imagebuilder update-image-pipeline --cli-input-json file://update-image-pipeline.json
```

Configure image pipeline workflows in Image Builder

With image workflows, you can customize the workflows that your pipeline runs to build, test, and distribute images according to your needs. The workflows that you define run within the context of the Image Builder workflow framework. For more information about the stages that make up the workflow framework, see Manage build, test, and distribution workflows for Image Builder images.

Build workflow

Build workflows run during the `Build` stage of the workflow framework. You can specify only one build workflow for your pipeline. Or you can skip the build entirely to configure a test-only pipeline.

Test workflow

Test workflows run during the `Test` stage of the workflow framework. You can add one or more test workflows to your pipeline, up to the limit of ten workflows total, which also counts your build and distribution workflows. Test workflows can run in parallel or one at a time, depending on how you define your test groups. You can also skip tests entirely if you only want your pipeline to build.

Distribution workflow

Distribution workflows run during the `Distribution` stage of the workflow framework. A distribution workflow is optional. If you do not specify one, Image Builder still distributes your AMI by running the distribution configuration that you attach to the pipeline or image. Specify a distribution workflow when you want to override that distribution configuration with different distribution settings, or to gain more visibility into the distribution process. You can specify one distribution workflow for your pipeline. If you build container images and do not specify a distribution workflow, Image Builder adds the Amazon managed container-distribution workflow for you.

Define test groups for test workflows

You define test workflows within test groups. You can run multiple test workflows for your pipeline. The combined limit is ten workflows total, which includes your build and distribution workflows. You decide whether to run the test workflows in a specific order or to run as many as possible at the same time. How they run depends on how you define your test groups. The following scenarios demonstrate several ways that you can define your test workflows.

Note

The `parallelGroup` and `onFailure` settings apply only to test workflows. Image Builder rejects them on a build or distribution workflow with an `InvalidParameterCombinationException`.

How test groups run

Image Builder runs your test workflows in test groups. It runs the groups one at a time. The test workflows within a single group run at the same time (in parallel). Image Builder runs up to five

test workflows at the same time; if a group has more than five, Image Builder starts the next test workflow as each one finishes. A test workflow that isn't part of a group runs on its own.

How you define test groups depends on whether you use the console or the AWS CLI and API. Select the tab that matches the method you use.

AWS Management Console

When you create or edit a pipeline in the console, you define your test workflows in the **Test workflow** section of the image creation process. To run tests, choose the option to select test workflows. To build images without testing, choose the option to skip test workflows.

The console organizes test workflows into test groups. A new pipeline starts with one test group. To build your test configuration, do the following:

- **Add a test workflow to a group** – Add a test workflow to a group and select the workflow from your own workflows (**Owned by me**) or the AWS managed workflows (**Managed by Amazon**). If the workflow defines parameters, the console shows them so that you can enter values. A group can hold up to five test workflows, which run at the same time.
- **Add a test group** – Add another test group to run a different set of tests. You can add up to ten test groups. To rename a group, choose **Edit name**. A group name can have up to 128 characters, and can include letters, numbers, hyphens (-), and underscores (_).

Image Builder runs the test groups one at a time, in the order that they appear in the wizard. The test workflows within a group run at the same time. A group can contain up to five test workflows. To run your tests one at a time, put each test workflow in its own group.

> **Note**
>
> You can add or remove test workflows and groups, but you cannot reorder them. Plan the order of your test groups before you create them.

AWS CLI

When you use the AWS CLI or the Image Builder API, you don't define test groups directly. Instead, you set the `parallelGroup` attribute on each test workflow in the `workflows` list. Test workflows that have the same `parallelGroup` value form one group and run at the same

time. A test workflow that has no `parallelGroup` value runs on its own. If you don't set a `parallelGroup` value on any of your test workflows, Image Builder runs them one at a time.

The AWS CLI and API don't limit the number of test workflows in a group. The only limit is the total number of workflows, which can't exceed ten (including your build and distribution workflows). The console limits a group to five test workflows.

Image Builder always runs build workflows first, then test workflows, then the distribution workflow. This order applies regardless of how you list them.

Within the test stage, Image Builder orders your test workflows as follows:

- It orders the groups by the position where each group first appears in your `workflows` list. It does not order them by the `parallelGroup` value.
- It keeps each workflow that has no group in its listed position.
- It runs the workflows in a group together, at the position where that group first appears.

Example

Suppose you list five test workflows in this order, and set the `parallelGroup` value on some of them:

- Test workflow A – no group
- Test workflow B – `parallelGroup`: `tests-1`
- Test workflow C – no group
- Test workflow D – `parallelGroup`: `tests-1`
- Test workflow E – `parallelGroup`: `tests-2`

Image Builder runs them in the following order:

1. Test workflow A, on its own.
2. Test workflow B and test workflow D, at the same time. They share the `tests-1` group, which first appears at test workflow B.
3. Test workflow C, on its own.
4. Test workflow E, on its own, in the `tests-2` group.

Test workflow D runs together with test workflow B because they share a group, even though you listed test workflow C between them. The group named `tests-1` runs before `tests-2` because `tests-1` appears first in the list – the group order follows the order in the list, not the `parallelGroup` value.

Scenario 1: Run one test workflow at a time

To run all of your test workflows one at a time, configure a separate test group for each test workflow, up to the combined limit of ten workflows total (which includes your build and distribution workflows). Image Builder runs the test groups one at a time. This is one way to ensure that your test workflows run one at a time in a specific order.

Scenario 2: Run multiple test workflows at the same time

If the order doesn't matter, and you want to run as many test workflows as possible at the same time, you can configure a single test group and put the maximum number of test workflows in it. Image Builder starts up to five test workflows at the same time, and starts additional test workflows as others complete. If your goal is to run your test workflows as fast as possible, this is one way to do it.

Scenario 3: Mix and match

If you have a mixed scenario, with some test workflows that can run at the same time and some that should run one at a time, you can configure your test groups to accomplish this goal. The only limit to how you configure your test groups is the maximum number of test workflows that can run for your pipeline

Set workflow parameters in an Image Builder pipeline from the console

Workflow parameters function the same way for build, test, and distribution workflows. When you create or update a pipeline, you select the build, test, and distribution workflows that you want to include. If you defined parameters in the workflow document for a workflow that you selected, Image Builder displays them in the **Parameters** panel. The panel is hidden for workflows that do not have parameters defined.

Each parameter displays the following attributes that your workflow document defined:

- **Name** (*not editable*) – The name of the parameter.
- **Type** (*not editable*) – The data type for the parameter value.

- **Value** – The value for the parameter. You can edit the parameter value to set it for your pipeline.

Specify the IAM service role that Image Builder uses to run workflow actions

When you attach custom image workflows to your pipeline, or when you set a logging configuration, you must also specify an execution role. This is the IAM role that Image Builder assumes to run your workflow actions. The role must trust the Image Builder service principal. For the required permissions, see the workflow service access information that follows.

To run image workflows, Image Builder needs permission to perform workflow actions. You grant this permission with an execution role that Image Builder assumes on your behalf. You assign the execution role as follows.

> **Important**
>
> We recommend that you don't pass the AWSServiceRoleForImageBuilder service-linked role as your execution role. Instead, create a custom IAM role and attach the EC2ImageBuilderExecutionPolicy AWS managed policy. This policy grants the same permissions that Image Builder needs to call AWS services on your behalf. Using a custom role gives you full control over the permissions that Image Builder uses. It also keeps your service control policies (SCPs) and resource control policies (RCPs) in effect for operations that Image Builder performs on your behalf.

- **Console** – In the pipeline wizard **Step 3 Define image creation process**, select your custom role from the **IAM role** list in the **Service access** panel.
- **Image Builder API** – In the CreateImage action request, specify your custom role as the value for the `executionRole` parameter.

To create a custom execution role, see Creating a role to delegate permissions to an AWS service in the *AWS Identity and Access Management User Guide*.

Associate workflows with a pipeline

To associate custom build, test, and distribution image workflows with your pipeline, select the tab that matches the method you want to use.

AWS Management Console

When you create or update a pipeline in the AWS Management Console, the **Create image pipeline** wizard includes a **Workflows** step where you select the workflows that your pipeline runs. To associate custom image workflows, do the following in that step:

1. For **Build workflow**, select the build workflow that you want your pipeline to run.
2. For **Test workflows**, add one or more test workflows and organize them into test groups to control the order in which they run. For more information, see Define test groups for test workflows.
3. For **Distribution workflow**, select a distribution workflow if you want to override the attached distribution configuration or gain more visibility into the distribution process. This is optional.
4. For **Execution role**, select the IAM role that Image Builder assumes to run your workflow actions. An execution role is required when you associate custom image workflows. For more information, see Specify the IAM service role that Image Builder uses to run workflow actions.
5. If a workflow that you selected defines parameters, set their values in the **Parameters** panel. For more information, see Set workflow parameters in an Image Builder pipeline from the console.

For a step-by-step walkthrough of the full **Create image pipeline** wizard, see Create and update AMI image pipelines.

AWS CLI

To associate custom image workflows when you create a pipeline, use the **create-image-pipeline** command. Specify your execution role with the `--execution-role` parameter, and list your build, test, and distribution workflows with the `--workflows` parameter. The following example creates a pipeline with one build workflow, one test workflow, and one distribution workflow.

```
aws imagebuilder create-image-pipeline \
    --name example-pipeline \
    --image-recipe-arn arn:aws:imagebuilder:us-west-2:111122223333:image-
recipe/example/1.0.0 \
    --infrastructure-configuration-arn arn:aws:imagebuilder:us-
west-2:111122223333:infrastructure-configuration/example \
```

```
    --execution-role
 arn:aws:iam::111122223333:role/ImageBuilderWorkflowExecutionRole \
    --workflows '[
        {"workflowArn":"arn:aws:imagebuilder:us-west-2:111122223333:workflow/
build/example-build/1.0.0"},
        {"workflowArn":"arn:aws:imagebuilder:us-west-2:111122223333:workflow/
test/example-test/1.0.0","parallelGroup":"group-1","onFailure":"CONTINUE"},
        {"workflowArn":"arn:aws:imagebuilder:us-west-2:111122223333:workflow/
distribution/example-distribute/1.0.0"}
    ]'
```

Use EventBridge with Image Builder pipelines

AWS and partner services stream events to Amazon EventBridge event buses in near real time. You can also send your own custom events. Event buses use rules to route each event to one or more targets.

Image Builder works with EventBridge in two independent directions:

- **Start a pipeline build from a rule.** You can set an Image Builder pipeline as a rule target, so EventBridge runs the pipeline when an event matches the rule or when a schedule fires. See Trigger a pipeline build on a schedule and Trigger a pipeline build from an event pattern.
- **React to events that Image Builder sends.** Image Builder publishes events to the default event bus when significant changes occur—for example, when an image becomes `AVAILABLE` or a scan detects CVEs. You can match these events with a rule and route them to targets such as a Lambda function or an Amazon SNS topic to start your own automations. See React to events that Image Builder sends.

For more information about the events that Image Builder sends and the fields in each event, see Event messages that Image Builder sends.

> **Note**
>
> Event buses are Region-specific. A rule and the resources it invokes are typically in the same Region; to route across Regions, target an event bus in the destination Region. Image Builder publishes its events to the default event bus in the Region where the build runs.

Contents

- EventBridge terms
- View EventBridge rules for your Image Builder pipeline
- Trigger a pipeline build on a schedule
- Trigger a pipeline build from an event pattern
- React to events that Image Builder sends

EventBridge terms

The following terms help you understand how EventBridge integrates with your Image Builder pipelines.

Event

Describes a change in an environment that might affect one or more application resources. The environment can be an AWS environment, a SaaS partner service or application, or one of your applications or services. You can also set up scheduled events on a timeline.

Event bus

A pipeline that receives event data from applications and services.

Source

The service or application that sent the event to the event bus.

Target

A resource or endpoint that EventBridge invokes when it matches a rule, delivering data from the event to the target.

Rule

A rule matches incoming events and sends them to targets for processing. A single rule can send an event to multiple targets, which can then run in parallel. Rules are based either on an event pattern or a schedule.

Pattern

An event pattern defines the event structure and the fields that a rule matches in order to initiate the target action.

Schedule

Schedule rules perform an action on a schedule, such as running an Image Builder pipeline to refresh an image on a quarterly basis. There are two types of schedule expressions:

- **Cron expressions** – Match specific scheduling criteria using the cron syntax that can outline simple criteria; for example, running weekly on a specific day. You can also establish more complex criteria, such as running quarterly on the fifth day of the month, between 2 AM and 4 AM.
- **Rate expressions** – Specify a regular interval when the target is invoked, such as every 12 hours.

View EventBridge rules for your Image Builder pipeline

The **EventBridge rules** tab in the Image Builder **Image pipelines** detail page displays EventBridge event buses that your account has access to, and the rules for the selected event bus that apply to the current pipeline. This tab also links directly to the EventBridge console for creating new resources.

Actions that link to the EventBridge console

- **Create event bus**
- **Create rule**

To learn more about EventBridge, see the following topics in the *Amazon EventBridge User Guide*.

- What is Amazon EventBridge
- Amazon EventBridge event buses
- Amazon EventBridge events
- Amazon EventBridge rules

Trigger a pipeline build on a schedule

Set an Image Builder pipeline as the target of an EventBridge schedule rule to refresh an image on a regular cadence. The following example creates a rule that starts a pipeline build every 90 days.

Note

A pipeline can also carry its own built-in **schedule** (a cron or rate expression stored on the pipeline). That schedule is managed by Image Builder and is separate from any EventBridge rule:

- Use the **pipeline schedule** for a simple recurring rebuild. It can also gate builds on dependency updates and auto-disable a failing pipeline. See `Schedule` in the *EC2 Image Builder API Reference*.
- Use an **EventBridge rule** to start a build from an event pattern, or to fan one trigger out to multiple targets.

AWS Management Console

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. To see a list of the image pipelines created under your account, choose **Image pipelines** from the navigation pane.

   Note

   The list of image pipelines includes an indicator for the type of output image that is created by the pipeline – AMI or Docker.

3. To view details or edit a pipeline, choose the **Pipeline name** link. This opens the detail view for the pipeline.

   Note

   You can also select the check box next to the **Pipeline name**, then choose **View detail**.

4. Open the **EventBridge rules** tab.
5. Keep the default event bus that is pre-selected in the **Event Bus** panel.
6. Choose **Create rule**. This takes you to the **Create rule** page in the Amazon EventBridge console.

7. Enter a name and description for the rule. The rule name must be unique within the event bus for the selected Region.
8. In the **Define pattern** panel, choose the **Schedule** option. This expands the panel, with the **Fixed rate every** option selected.
9. Enter `90` in the first box, and select **Days** from the drop-down list.
10. Perform the following actions in the **Select targets** panel:
    a. Select `EC2 Image Builder` from the **Target** drop-down list.
    b. To apply the rule to an Image Builder pipeline, select the target pipeline from the **Image Pipeline** drop-down list.
    c. EventBridge needs permission to initiate a build for the selected pipeline. For this example, keep the default option to **Create a new role for this specific resource**.
    d. Choose **Add target**.
11. Choose **Create**

> **Note**
>
> The current EventBridge console may create schedules through EventBridge Scheduler, and the exact labels and steps can change over time. The linked *Amazon EventBridge User Guide* is authoritative for the current console experience.

AWS CLI

These steps create a schedule rule that starts a pipeline build every 90 days. EventBridge needs an IAM role that it can assume to call `imagebuilder:StartImagePipelineExecution` on your pipeline.

1. Create a rule with a rate expression:

```
aws events put-rule \
  --name refresh-image-every-90-days \
  --schedule-expression "rate(90 days)"
```

2. Create an IAM role that EventBridge can assume, with this trust policy:

```
{
```

```
    "Version": "2012-10-17",
    "Statement": [{
        "Effect": "Allow",
        "Principal": { "Service": "events.amazonaws.com" },
        "Action": "sts:AssumeRole"
    }]
}
```

Attach a permissions policy that allows the pipeline to start:

```
{
    "Version": "2012-10-17",
    "Statement": [{
        "Effect": "Allow",
        "Action": "imagebuilder:StartImagePipelineExecution",
        "Resource": "arn:aws:imagebuilder:us-west-2:111122223333:image-
pipeline/my-pipeline"
    }]
}
```

3. Add the pipeline as the rule's target, referencing the role from the previous step:

```
aws events put-targets \
  --rule refresh-image-every-90-days \
  --targets '[{
    "Id": "1",
    "Arn": "arn:aws:imagebuilder:us-west-2:111122223333:image-pipeline/my-
pipeline",
    "RoleArn": "arn:aws:iam::111122223333:role/EventBridgeImageBuilderRole"
  }]'
```

4. Confirm the target is attached:

```
aws events list-targets-by-rule --rule refresh-image-every-90-days
```

Note

To learn more about settings for rate expression rules that are not covered in this example, see Rate expressions in the *Amazon EventBridge User Guide*.

Trigger a pipeline build from an event pattern

Instead of a schedule, you can start a pipeline build when an event matches a pattern. Create a rule with an event pattern, then add your pipeline as the target (with the same IAM role described in Trigger a pipeline build on a schedule).

The following example starts a build whenever a specific base image becomes `AVAILABLE`—for example, to chain a dependent image build after its base image finishes. The `resources` prefix scopes the rule to the base image so that it matches only that image, and not the dependent pipeline's own output:

```
{
    "source": ["aws.imagebuilder"],
    "detail-type": ["EC2 Image Builder Image State Change"],
    "detail": {
        "state": { "status": ["AVAILABLE"] }
    },
    "resources": [{
        "prefix": "arn:aws:imagebuilder:us-west-2:111122223333:image/my-base-image/"
    }]
}
```

Important

Scope the event pattern to the base image, as shown by the `resources` prefix in this example. A pattern that matches every `AVAILABLE` image in the account also matches the dependent pipeline's own output image, which starts the pipeline again and can create an endless build loop. Filter on the specific base image name or ARN prefix so the rule matches only the image you intend.

AWS Management Console

1. Open the Amazon EventBridge console at https://console.aws.amazon.com/events/.
2. Choose **Rules**, then **Create rule**. Keep the **default** event bus.
3. Enter a name and description. Under **Rule type**, choose **Rule with an event pattern**.
4. For the event source, choose **Other**, and paste the event pattern above into the **Event pattern** box.

5. In the **Select targets** panel, choose `EC2 Image Builder` from the **Target** drop-down list, then choose the pipeline to build from the **Image Pipeline** drop-down list.
6. EventBridge needs permission to start the pipeline. Keep the default option to **Create a new role for this specific resource**.
7. Choose **Create rule**.

AWS CLI

Create the rule and add the pipeline as the target:

```
aws events put-rule \
  --name rebuild-on-base-available \
  --event-pattern '{"source":["aws.imagebuilder"],"detail-type":["EC2 Image Builder
 Image State Change"],"detail":{"state":{"status":["AVAILABLE"]}},"resources":
[{"prefix":"arn:aws:imagebuilder:us-west-2:111122223333:image/my-base-image/"}]}'

aws events put-targets \
  --rule rebuild-on-base-available \
  --targets '[{"Id":"1","Arn":"arn:aws:imagebuilder:us-west-2:111122223333:image-
pipeline/dependent-
pipeline","RoleArn":"arn:aws:iam::111122223333:role/EventBridgeImageBuilderRole"}]'
```

For the events you can match and their fields, see Event messages that Image Builder sends.

React to events that Image Builder sends

Image Builder publishes events to the default event bus when your resources reach significant points—for example, when an image changes state, a scan completes, a workflow step pauses for input, or a pipeline is automatically disabled. You can match these events with a rule and route them to a target to start your own automation. Common patterns include:

- Notify a team through an Amazon SNS topic when an image becomes `AVAILABLE` or `FAILED`.
- Invoke a Lambda function to register a new AMI in a parameter store, start external compliance tests, or update a deployment pipeline.
- Alert on security findings when a scan reports critical CVEs.
- Drive an approval workflow when a `WaitForAction` workflow step pauses a build.

To act on an event that Image Builder sends, create a rule whose event pattern matches the event `source` (`aws.imagebuilder`) and `detail-type`, and optionally narrows on fields inside `detail`. Then add the target that runs your automation.

Example: Notify on image completion (`AVAILABLE` or `FAILED`)

```
{
    "source": ["aws.imagebuilder"],
    "detail-type": ["EC2 Image Builder Image State Change"],
    "detail": {
        "state": { "status": ["AVAILABLE", "FAILED"] }
    }
}
```

Example: Alert only when a scan finds critical CVEs

Use a numeric matcher so that clean scans don't trigger the rule:

```
{
    "source": ["aws.imagebuilder"],
    "detail-type": ["EC2 Image Builder CVE Detected"],
    "detail": {
        "finding-severity-counts": {
            "critical": [{ "numeric": [">", 0] }]
        }
    }
}
```

AWS Management Console

1. Open the Amazon EventBridge console at https://console.aws.amazon.com/events/.
2. Choose **Rules**, then **Create rule**. Keep the **default** event bus.
3. Enter a name and description. Under **Rule type**, choose **Rule with an event pattern**.
4. For the event source, choose **Other**, and paste one of the event patterns above into the **Event pattern** box.
5. Choose your target—for example, an Amazon SNS topic or a Lambda function—and complete the target settings.
6. Choose **Create rule**.

AWS CLI

Create the rule and send matching events to an Amazon SNS topic:

```
aws events put-rule \
  --name image-available-or-failed \
  --event-pattern '{"source":["aws.imagebuilder"],"detail-type":["EC2 Image Builder
 Image State Change"],"detail":{"state":{"status":["AVAILABLE","FAILED"]}}}'

aws events put-targets \
  --rule image-available-or-failed \
  --targets '[{"Id":"1","Arn":"arn:aws:sns:us-west-2:111122223333:image-status"}]'
```

EventBridge also needs permission to send events to your target. For more information about the permissions that each target type requires, see Permissions for sending events to targets and Using resource-based policies for Amazon EventBridge in the *Amazon EventBridge User Guide*.

Note

When you match the `EC2 Image Builder Workflow Step Waiting` event, your target can call `SendWorkflowStepAction` with the `workflow-step-execution-id` from the event and an `action` of `RESUME` or `STOP`. See WaitForAction.

Integrate products and services in Image Builder

EC2 Image Builder integrates with AWS Marketplace and other AWS services and applications to help you create robust, secure custom machine images.

Products

Image Builder recipes can incorporate image products from AWS Marketplace and Image Builder managed components to provide specialized build and test functionality, as follows.

- **AWS Marketplace image products** – Use an image product from AWS Marketplace as the base image in your recipe to meet organizational standards, such as CIS Hardening. When you create a recipe from the Image Builder console, you can choose from your existing subscriptions, or search for a specific product from AWS Marketplace. When you create a recipe from the Image Builder API, CLI, or SDK, you can specify an image product Amazon Resource Name (ARN) to use as your base image.
- **Image Builder components** – Components that you specify in your recipes can perform build and test actions, for example, to install software or perform compliance validation. Some image products that you subscribe to from AWS Marketplace might include a companion component that you can use in your recipes. The CIS Hardened images include a matching AWSTOE component that you can use in your recipe to enforce CIS Benchmarks Level 1 guidelines for your configuration.

> **Note**
>
> For more information about compliance-related products, see Compliance products for your Image Builder images.

Services

Image Builder integrates with the following AWS services to provide detailed event metrics, logging, and monitoring. This information helps you track your activity, troubleshoot image build issues, and create automations based on event notifications.

- **AWS Organizations** – AWS Organizations allows you to apply Service Control Policies (SCP) on accounts in your organization. You can create, manage, enable, and disable individual policies.

Similar to all other AWS artifacts and services, Image Builder honors the policies defined in AWS Organizations. AWS provides template SCPs for common scenarios, such as enforcing constraints on member accounts to launch instances with only approved AMIs.

- **AWS CloudTrail** – Monitor Image Builder events that are sent to CloudTrail. For more information about CloudTrail integration with Image Builder, see Log Image Builder API calls using CloudTrail.

  To learn more about CloudTrail, including how to turn it on and find your log files, see the AWS CloudTrail User Guide.

- **Amazon CloudWatch Logs** – Monitor, store, and access your Image Builder log files with CloudWatch. Optionally, you can save your logs to an S3 bucket. To learn more about CloudWatch integration with Image Builder, see Monitor Image Builder logs with Amazon CloudWatch Logs.

  For more information about CloudWatch Logs, see What is Amazon CloudWatch Logs? in the *Amazon CloudWatch Logs User Guide*.

- **Amazon Elastic Container Registry (Amazon ECR)** – Amazon ECR is a managed AWS container image registry service that is secure, scalable, and reliable. Container images that you create with Image Builder are stored in Amazon ECR in your source Region (where your build runs), and in any Regions where you distribute the container image. For more information about Amazon ECR, see the Amazon Elastic Container Registry User Guide.

- **Amazon EventBridge** – Connect to a stream of real-time event data from Image Builder activities in your account. For more information about EventBridge, see What Is Amazon EventBridge? in the *Amazon EventBridge User Guide*.

- **Amazon Inspector** – Discover vulnerabilities in your software and network settings with automatic scans for the EC2 test instance that Image Builder launches create a new image. Image Builder saves findings for your output image resource so that you can investigate and remediate after your test instance terminates. For more information about scans and pricing, see What is Amazon Inspector? in the *Amazon Inspector User Guide*.

  Amazon Inspector can also scan your ECR repositories if you configure enhanced scanning. For more information, see Scanning Amazon ECR container images in the *Amazon Inspector User Guide*.

> **Note**
>
> Amazon Inspector is a paid feature.

- **AWS License Manager** – You can attach a License Manager self-managed license to an output AMI during the distribution process. The license that you specify for the destination Region must already exist in that Region. For more information about self-managed licenses, see Self-managed licenses in License Manager.
- **AWS Marketplace** – See a list of your current AWS Marketplace product subscriptions, and search for image products directly from Image Builder. You can also use an image product that you've subscribed to as the base image for an Image Builder recipe. For more information about managing AWS Marketplace subscriptions, see Buying products in the *AWS Marketplace Buyer Guide*.
- **AWS Resource Access Manager (AWS RAM)** – With AWS RAM, you can share resources with any AWS account or through AWS Organizations. If you have multiple AWS accounts, you can create resources centrally and use AWS RAM to share those resources with other accounts. EC2 Image Builder allows sharing for the following resources: components, images, and image recipes. For more information about AWS RAM, see the AWS Resource Access Manager User Guide. For information about sharing Image Builder resources, see Share Image Builder resources with AWS RAM.
- **Amazon Simple Notification Service (Amazon SNS)** – If configured, publish detailed messages about your image status to an SNS topic that you subscribe to. For more information about Amazon SNS, see What is Amazon SNS? in the *Amazon Simple Notification Service Developer Guide*.

Product and service integration topics

- Amazon EventBridge integration in Image Builder
- Amazon Inspector integration in Image Builder
- AWS Marketplace integration in Image Builder
- Amazon SNS integration in Image Builder
- Compliance products for your Image Builder images

Amazon EventBridge integration in Image Builder

Amazon EventBridge is a serverless event bus service that you can use to connect your Image Builder application with related data from other AWS services. In EventBridge, a rule matches incoming events and sends them to targets for processing. A single rule can send an event to multiple targets, and these events then run in parallel.

With EventBridge, you can automate your AWS services and respond automatically to system events such as application availability issues or resource changes. AWS services deliver events to EventBridge in near real time. You can set up rules that react to incoming events to initiate actions. For example, sending an event to a Lambda function when the status of an EC2 instance changes from pending to running. EventBridge calls these matching definitions *event patterns*. To create a rule based on an event pattern, see Creating Amazon EventBridge rules that react to events in the *Amazon EventBridge User Guide*.

Image Builder works with EventBridge in two independent directions. Choose the one that matches your goal:

- **Run a pipeline in response to an event (Image Builder as a target).** EventBridge starts a pipeline build when an event matches a rule, or when a schedule fires.
- **React to what Image Builder reports (Image Builder as a source).** Image Builder publishes events to the default event bus that you can match and route to your own targets.

For step-by-step procedures for both directions, see Use EventBridge with Image Builder pipelines. For the event catalog, see Event messages that Image Builder sends.

Actions that can be automatically initiated include the following:

- Invoke an AWS Lambda function
- Invoke Amazon EC2 Run Command
- Relay the event to Amazon Kinesis Data Streams
- Activate an AWS Step Functions state machine
- Notify an Amazon SNS topic or an Amazon SQS queue

You can also set up scheduling rules for the default event bus to perform an action at regular intervals, such as running an Image Builder pipeline to refresh an image on a quarterly basis. There are two types of schedule expressions:

- **cron expressions** – The following example of a cron expression schedules a task to run every day at noon UTC+0:

  ```
  cron(0 12 * * ? *)
  ```

  For more information about using cron expressions with EventBridge, see Cron expressions in the *Amazon EventBridge User Guide*.
- **rate expressions** – The following example of a rate expression schedules a task to run every 12 hours:

  ```
  rate(12 hours)
  ```

  For more information about using rate expressions with EventBridge, see Rate expressions in the *Amazon EventBridge User Guide*.

For more information about how EventBridge rules integrate with Image Builder image pipelines, see Use EventBridge with Image Builder pipelines.

> **Note**
>
> A pipeline's built-in schedule and an EventBridge schedule rule are different mechanisms:
>
> - A **pipeline schedule** (`schedule.scheduleExpression`) is part of the pipeline resource. Image Builder evaluates it, can gate a build on dependency updates with `pipelineExecutionStartCondition`, and can auto-disable a failing pipeline with `autoDisablePolicy`.
> - An **EventBridge schedule rule** lives in EventBridge in your account and always starts a build when the schedule fires; it has no dependency gating and no auto-disable behavior.

Event messages that Image Builder sends

Image Builder sends events to the default EventBridge event bus when an Image Builder resource reaches a significant point in its lifecycle—for example, when an image changes state, a scan completes, a workflow step pauses for input, or a pipeline is automatically disabled. Every event uses the source `aws.imagebuilder`.

The following sections describe each event: when Image Builder sends it, the fields in the event `detail`, and the resource ARNs in the `resources` array. To act on these events, see React to

events that Image Builder sends. The account IDs, Regions, ARNs, and timestamps in the examples are placeholders—replace them with your own.

Topics

- EC2 Image Builder Image State Change
- EC2 Image Builder CVE Detected
- EC2 Image Builder Workflow Step Waiting
- EC2 Image Builder Image Pipeline Automatically Disabled

EC2 Image Builder Image State Change

Image Builder sends this event when the state changes for an image resource during image creation. For example, when the image status changes from one state to another, as follows:

- From `building` to `testing`
- From `testing` to `distribution`
- From `testing` to `failed`
- From `integrating` to `available`

```
{
    "version": "0",
    "id": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "detail-type": "EC2 Image Builder Image State Change",
    "source": "aws.imagebuilder",
    "account": "111122223333",
    "time": "2024-01-18T17:50:56Z",
    "region": "us-west-2",
    "resources": ["arn:aws:imagebuilder:us-west-2:111122223333:image/
cmkencryptedworkflowtest-a1b2c3d4-5678-90ab-cdef-EXAMPLE22222/1.0.0/1"],
    "detail": {
        "previous-state": {
            "status": "TESTING"
        },
        "state": {
            "status": "AVAILABLE"
        }
    }
}
```

Image Builder sends this event each time an image resource changes state during image creation, across the build transitions shown above.

The event `detail` contains the following fields:

Field	Description
`previous-state.status`	The image status before the change (for example, `TESTING`).
`state.status`	The new image status (for example, `AVAILABLE`).

The build-transition status values are `BUILDING`, `TESTING`, `DISTRIBUTING`, `INTEGRATING`, `AVAILABLE`, `CANCELLED`, and `FAILED`.

The `resources` array contains the ARN of the image resource that changed state.

EC2 Image Builder CVE Detected

If you have CVE detection enabled for your image, Image Builder sends a message with the results whenever an image scan completes.

```
{
    "version": "0",
    "id": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "detail-type": "EC2 Image Builder CVE Detected",
    "source": "aws.imagebuilder",
    "account": "111122223333",
    "time": "2023-03-01T16:59:09Z",
    "region": "us-east-1",
    "resources": [
        "arn:aws:imagebuilder:us-east-1:111122223333:image/test-image/1.0.0/1",
        "arn:aws:imagebuilder:us-east-1:111122223333:image-pipeline/test-pipeline"
    ],
    "detail": {
        "resource-id": "i-1234567890abcdef0",
        "finding-severity-counts": {
            "all": 0,
            "critical": 0,
            "high": 0,
            "medium": 0
```

```
        }
    }
}
```

Image Builder sends this event when an image scan completes, and only when you enable image scanning (Amazon Inspector) for the image. If scanning is off, Image Builder doesn't send this event. To turn on scanning, see Configure security scans for Image Builder images in the AWS Management Console.

The event `detail` contains the following fields:

Field	Description
`resource-id`	The ID of the Amazon EC2 test instance that Image Builder scanned.
`finding-severity-counts.all`	Total number of findings across the reported severities.
`finding-severity-counts.critical`	Number of critical-severity findings.
`finding-severity-counts.high`	Number of high-severity findings.
`finding-severity-counts.medium`	Number of medium-severity findings.

Important

`finding-severity-counts` reports `critical`, `high`, and `medium` counts plus the `all` total. It does not report `low`, `informational`, or `untriaged` findings. To review the full set of findings, see the security findings in the Image Builder console or in Amazon Inspector.

The `resources` array contains the ARN of the image resource, and the ARN of the image pipeline when the scan ran from a pipeline.

EC2 Image Builder Workflow Step Waiting

Image Builder sends a message when a `WaitForAction` workflow step pauses to wait for an asynchronous action to complete.

```
{
    "version": "0",
    "id": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "detail-type": "EC2 Image Builder Workflow Step Waiting",
    "source": "aws.imagebuilder",
    "account": "111122223333",
    "time": "2024-01-18T16:54:44Z",
    "region": "us-west-2",
    "resources": ["arn:aws:imagebuilder:us-west-2:111122223333:image/
workflowstepwaitforactionwithvalidsnstopictest-a1b2c3d4-5678-90ab-cdef-
EXAMPLE22222/1.0.0/1", "arn:aws:imagebuilder:us-west-2:111122223333:workflow/build/
build-workflow-a1b2c3d4-5678-90ab-cdef-EXAMPLE33333/1.0.0/1"],
    "detail": {
        "workflow-execution-id": "wf-a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
        "workflow-step-execution-id": "step-a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
        "workflow-step-name": "TestAutoSNSStop"
    }
}
```

Image Builder sends this event when a `WaitForAction` workflow step pauses to wait for your response. The workflow stays paused until you respond or the step times out.

The event `detail` contains the following fields:

Field	Description
`workflow-execution-id`	The ID of the running workflow that contains the paused step.
`workflow-step-execution-id`	The ID of the specific step execution that is waiting.
`workflow-step-name`	The name of the `WaitForAction` step, as defined in the workflow document.

The `resources` array contains the ARN of the image resource and the ARN of the workflow.

To respond, call `SendWorkflowStepAction` with the `workflow-step-execution-id` from the event and an `action` of `RESUME` to continue, or `STOP` to end the build. See WaitForAction. To drive this from an event automatically, see React to events that Image Builder sends.

EC2 Image Builder Image Pipeline Automatically Disabled

If you've configured the `autoDisablePolicy` for your pipeline, then Image Builder disables the pipeline and sends an event message to EventBridge when the number of consecutive scheduled pipeline execution failures exceeds the maximum number that's allowed per the policy.

```
{
    "version": "0",
    "id": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
    "detail-type": "EC2 Image Builder Image Pipeline Automatically Disabled",
    "source": "aws.imagebuilder",
    "account": "111122223333",
    "time": "2025-09-18T16:54:44Z",
    "region": "us-west-2",
    "resources": ["arn:aws:imagebuilder:us-west-2:111122223333:image-pipeline/disabled-image-pipeline-name"],
    "detail": {
        "consecutive-failures": "5"
    }
}
```

If you configure an `autoDisablePolicy` on a pipeline's schedule, Image Builder counts consecutive failures of **scheduled** builds. When the count reaches the policy's `failureCount`, Image Builder disables the pipeline and sends this event.

The event `detail` contains the following fields:

Field	Description
`consecutive-failures`	The number of consecutive scheduled-build failures that trig gered the auto-disable.

The `resources` array contains the ARN of the pipeline that was disabled.

> **Note**
>
> Only scheduled builds count toward the total. A manual build that fails does not increase it; a manual or scheduled build that succeeds—and creating or updating the pipeline—resets it to zero. See `autoDisablePolicy` in the *EC2 Image Builder API Reference*.

Amazon Inspector integration in Image Builder

When you activate security scanning with Amazon Inspector, it continuously scans machine images and running instances in your account for operating system and programming language vulnerabilities. If activated, security scanning is automatic, and Image Builder can save a snapshot of the findings from your test instance when you create a new image. Amazon Inspector is a paid service.

When Amazon Inspector discovers vulnerabilities in your software or network settings, it takes the following actions:

- Notifies you that there was a finding.
- Rates the severity of the finding. The severity rating categorizes vulnerabilities to help you prioritize your findings, and includes the following values:
  - Untriaged
  - Informational
  - Low
  - Medium
  - High
  - Critical
- Provides information about the finding, and links to additional resources for more detail.
- Offers remediation guidance to help you resolve the issues that generated the finding.

Configure security scans

If you've activated Amazon Inspector for your account, Amazon Inspector automatically scans the EC2 instances that Image Builder launches to build and test a new image. Those instances have a short lifespan during the build and test process, and their findings would normally expire as soon as those instances shut down. To help you investigate and remediate findings for your new

image, Image Builder can optionally save any findings that Amazon Inspector identified on your test instance during the build process as a snapshot.

To configure security scans for your pipeline, see Configure security scans for Image Builder images in the AWS Management Console.

Review security findings

In the Image Builder console, you can view security findings for all of your Image Builder resources in one place. You can see all findings on the **Security findings** page in the **Security Overview** section, or you can group your findings by vulnerability, by image pipeline, or by image. The console defaults to display all security findings. The summary panel for the **All security findings** option shows the number of findings that you have for each severity level. For more information, see Manage security findings for Image Builder images in the AWS Management Console.

To learn more about Amazon Inspector vulnerability findings, see Understanding findings in Amazon Inspector in the *Amazon Inspector User Guide*.

AWS Marketplace integration in Image Builder

AWS Marketplace is a curated digital catalog where you can find and subscribe to third-party software, data, and services that help you build solutions to fit your business needs. AWS Marketplace brings authenticated buyers and registered sellers together with software listings from popular categories such as security, networking, storage, machine learning, and more.

An AWS Marketplace seller can be an independent software vendor (ISV), a reseller, or an individual who has something to offer that works with AWS products and services. When the seller submits a product in AWS Marketplace, they define the price of the product, and the terms and conditions of use. Buyers agree to the pricing, terms, and conditions set for the offer. To learn more about AWS Marketplace, see What is AWS Marketplace?

AWS Marketplace integration features

Image Builder integrates with AWS Marketplace to provide the following capabilities directly from the Image Builder console:

- Search for image products that are available in AWS Marketplace.
- Search for AWS Marketplace image products that deliver components.
- See a list of your current AWS Marketplace product subscriptions.

- Use an AWS Marketplace image product that you've subscribed to as the base image for an Image Builder recipe.
- Use AWS Marketplace components that you've subscribed to in an Image Builder recipe.

Image Builder integrates with AWS Marketplace to show image products and components that you've subscribed to. You can also search for AWS Marketplace image products and components from the **Discover products** page without leaving the Image Builder console.

The output AMI that Image Builder creates includes the product codes from AWS Marketplace image products and components. You can have up to nine product codes for your final customized image.

AWS Marketplace subscriptions in Image Builder

The **Subscriptions** page in the AWS Marketplace section of the Image Builder console shows you a list of the AWS Marketplace products that you're currently subscribed to. Each subscribed product shows the following details:

- The product name. This is linked to the product detail page in AWS Marketplace. The product detail page for your subscribed product opens in a new tab in your browser.
- The **Publisher**. This is linked to the publisher detail page in AWS Marketplace. The publisher detail page opens in a new tab in your browser.
- The **Version** that you subscribed to.

> **Note**
>
> Image Builder derives the version for an AWS Marketplace image from the product listing's recommended version when that version is available. If the listing doesn't provide a parseable version, Image Builder derives a date-based version from the AMI creation date. For example, the derived version might look like `2026.8.11/1`. As a result, the Image Builder version for the product can reflect a date instead of the vendor's version string.

- If there are any **Associated components** included with your subscribed product, Image Builder displays a link to the component detail.

At the top of the page, you can search for a specific product by name, or you can page through your results with the pagination controls. To use a subscribed image product in a new recipe, select a subscribed product and choose **Create new recipe**. Image Builder pre-selects the first product in your list by default.

> **Note**
>
> If you're looking for a product that you just subscribed to, and you don't see it in the list, use the refresh button at the top of the tab to refresh your results. It might take a few minutes for a new subscription to appear in the list.

Discover AWS Marketplace image products from the Image Builder console

This section focuses on AWS Marketplace image products to use as a base image in your recipe. For products that include associated software components, you can filter on the product owner in the console and in the API, SDK, and CLI. For more information, see List Image Builder components. For more information about finding, subscribing to, and using AWS Marketplace components, see Use AWS Marketplace components to customize your image.

Discover products

To find an AWS Marketplace image product from the Image Builder console, follow these steps:

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. From the navigation pane, choose **Discover products** in the **AWS Marketplace** section.
3. You can search for image products in the **Image products** tab on the **Discover products** page.

   Image Builder pre-filters products from AWS Marketplace to focus on machine images that you can use in your Image Builder recipes. For more information about AWS Marketplace integration with Image Builder, choose the tab that matches what you want to see.

   This tab contains two panels. On the left, the **Refine results** panel helps you filter your results to find the products that you want to subscribe to. On the right, the **Search products** panel shows the products that meet your filter criteria, and also gives you the option to search by product name.

   Refine results

The following list shows just a few of the filters that you can apply to your product search:

- Select one or more product categories, such as infrastructure software or machine learning.
- Choose the operating systems for your image product or choose all products for a specific operating system platform, for example **All Linux/Unix**.
- Choose one or more publishers to display their available products. Select the **Show All** link to display all of the publishers that have products that fit the filters that you've applied.

> **Note**
>
> Publisher names are not in alphabetical order. If you're looking for a specific publisher, like `Center for Internet Security`, you can enter part of the name in the search box at the top of the **All publishers** dialog. You should spell out the name, as an abbreviation, such as `CIS` might not produce the results that you're looking for.
> You can also browse the publisher names page by page.

Filter choices are dynamic. Each choice that you make affects your options for all of the other categories. There are thousands of products available in AWS Marketplace, so the more you can filter, the more likely you are to find what you want.

Search products

To find a specific product by name, you can enter part of the name in the search bar at the top of this panel. Each product result includes the following details:

- The product name and logo. Both of these are linked to the product detail page in AWS Marketplace. The detail page opens in a new tab in your browser. From there, you can subscribe to the image product if you want to use it in an Image Builder recipe. For more information, see Buying products in the *AWS Marketplace Buyer Guide*.

  If you subscribe to the image product in AWS Marketplace, switch back to the Image Builder tab in your browser, and refresh your list of subscribed image products to see it.

> **Note**
>
> It might take a few minutes before your new subscription is available.

- The publisher name. This is linked to the publisher detail page in AWS Marketplace. The publisher detail page opens in a new tab in your browser.
- The product version.
- The product star rating, and direct links to the review section of the product detail page in AWS Marketplace. The detail page opens in a new tab in your browser.
- The first few lines of the product description.

Directly below the search bar, you can see how many results your search produced and what subset of those results is currently displayed. You can use additional controls on the right side of the panel to adjust your settings for the number of products to display at one time, and the sort order to apply to your results. You can also use the pagination control to page through your results.

Use an AWS Marketplace image product in Image Builder recipes

Open the **Create recipe** page and select an AWS Marketplace image product to use as your base image, as follows.

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. From the navigation pane, choose **Image recipes** in the **AWS Marketplace** section. This shows you a list of image recipes that you've created.
3. Choose **Create image recipe**. This opens the **Create recipe** page.
4. Enter your recipe **Name** and **Version** in the **Recipe details** section as usual.
5. In the **Base image** section, choose the **AWS Marketplace images** option. This shows you a list of the AWS Marketplace image products that you've subscribed to in the **Subscriptions** tab. You can choose your base image from the list.

   You can also search for other image products that are available in AWS Marketplace directly from the **AWS Marketplace** tab. Choose **Add products**, or open the **AWS Marketplace** tab directly. For more information about how to set filters and search in the AWS Marketplace, see Discover AWS Marketplace image products from the Image Builder console.

6. Enter remaining details as usual. If any or your product subscriptions include build components, you can select them from the **Build components** list. Select `AWS Marketplace` from the component owner type list to see them, or select `Third party managed` for the CIS component.

   > **Note**
   >
   > If your base image is a CIS-published AWS Marketplace image product, Image Builder verifies CIS hardening component compatibility. Choose the CIS component that matches the benchmark and operating system of your base image to avoid a recipe validation error.

7. Choose **Create recipe**.

   Your final image can contain up to nine product codes from AWS Marketplace image products and components. If your selected base image and components contain more than nine product codes, Image Builder returns an error when you try to create the recipe.

Amazon SNS integration in Image Builder

Amazon Simple Notification Service (Amazon SNS) is a managed service that provides asynchronous message delivery from publishers to subscribers (also known as producers and consumers).

You can specify an SNS topic in your infrastructure configuration. When you create an image or run a pipeline, Image Builder can publish detailed messages about your image status to this topic. When the image status reaches one of the following states, Image Builder publishes a message:

- `AVAILABLE`
- `FAILED`

For an example SNS message from Image Builder, see SNS message format. If you want to create a new SNS topic, see Getting started with Amazon SNS in the *Amazon Simple Notification Service Developer Guide*.

Encrypted SNS Topics

If your SNS topic is encrypted, you must grant permission in the AWS KMS key policy for the Image Builder service role to perform the following actions:

- `kms:Decrypt`
- `kms:GenerateDataKey`

> **Note**
>
> If your SNS topic is encrypted, the key that encrypts this topic must reside in the account where the Image Builder service runs. Image Builder can't send notifications to SNS topics that are encrypted with keys from other accounts.

Example KMS key policy addition

The following example shows the additional section that you add to the KMS key policy. Use the Amazon Resource Name (ARN) for the IAM service-linked role that Image Builder created under your account when you first created an Image Builder image. To learn more about the Image Builder service-linked role, see Use IAM service-linked roles for Image Builder.

```
{
  "Statement": [{
    "Effect": "Allow",
    "Principal": {
      "AWS": "arn:aws:iam::123456789012:role/aws-service-role/
imagebuilder.amazonaws.com/AWSServiceRoleForImageBuilder"
    },
    "Action": [
      "kms:GenerateDataKey*",
      "kms:Decrypt"
    ],
    "Resource": "*"
  }]
}
```

You can use one of the following methods to get the ARN.

AWS Management Console

To get the ARN for the service-linked role that Image Builder created under your account from the AWS Management Console, follow these steps:

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the left navigation pane, choose **Roles**.
3. Search for `ImageBuilder`, and choose the following **Role name** from the results: `AWSServiceRoleForImageBuilder`. This displays the role detail page.
4. To copy the ARN to your clipboard, choose the icon next to the ARN name.

AWS CLI

To get the ARN for the service-linked role that Image Builder created under your account from the AWS CLI, use the IAM get-role command, as follows.

```
aws iam get-role --role-name AWSServiceRoleForImageBuilder
```

Partial sample output:

```
{
    "Role": {
        "Path": "/aws-service-role/imagebuilder.amazonaws.com/",
        "RoleName": "AWSServiceRoleForImageBuilder",
        ...
        "Arn": "arn:aws:iam::123456789012:role/aws-service-role/
imagebuilder.amazonaws.com/AWSServiceRoleForImageBuilder",
        ...
}
```

SNS message format

After Image Builder publishes a message to your Amazon SNS topic, other services that subscribe to the topic can filter on the message format and determine if it meets criteria for further action. For example, a success message might initiate a task to update an AWS Systems Manager parameter store, or to launch an external compliance testing workflow for the output AMI.

The following example shows the JSON payload for a typical message that Image Builder publishes when a pipeline build runs to completion, and creates a Linux image.


```
{
  "versionlessArn": "arn:aws:imagebuilder:us-west-1:123456789012:image/example-linux-
image",
  "semver": 12379400392853802748991242 27,
  "arn": "arn:aws:imagebuilder:us-west-1:123456789012:image/example-linux-
image/1.0.0/3",
  "name": "example-linux-image",
  "version": "1.0.0",
  "type": "AMI",
  "buildVersion": 3,
  "state": {
    "status": "AVAILABLE"
  },
  "platform": "Linux",
  "imageRecipe": {
    "arn": "arn:aws:imagebuilder:us-west-1:123456789012:image-recipe/example-linux-
image/1.0.0",
    "name": "amjule-barebones-linux",
    "version": "1.0.0",
    "components": [
      {
        "componentArn": "arn:aws:imagebuilder:us-west-1:123456789012:component/update-
linux/1.0.2/1"
      }
    ],
    "platform": "Linux",
    "parentImage": "arn:aws:imagebuilder:us-west-1:987654321098:image/amazon-linux-2-
x86/2022.6.14/1",
    "blockDeviceMappings": [
      {
        "deviceName": "/dev/xvda",
        "ebs": {
          "encrypted": false,
          "deleteOnTermination": true,
          "volumeSize": 8,
          "volumeType": "gp2"
        }
      }
    ],
    "dateCreated": "Feb 24, 2021 12:31:54 AM",
```

```
    "tags": {
      "internalId": "1a234567-8901-2345-bcd6-ef7890123456",
      "resourceArn": "arn:aws:imagebuilder:us-west-1:123456789012:image-recipe/example-
linux-image/1.0.0"
    },
    "workingDirectory": "/tmp",
    "accountId": "462045008730"
  },
  "sourcePipelineArn": "arn:aws:imagebuilder:us-west-1:123456789012:image-pipeline/
example-linux-pipeline",
  "infrastructureConfiguration": {
    "arn": "arn:aws:imagebuilder:us-west-1:123456789012:infrastructure-configuration/
example-linux-infra-config-uswest1",
    "name": "example-linux-infra-config-uswest1",
    "instanceProfileName": "example-linux-ib-baseline-admin",
    "tags": {
      "internalId": "234abc56-d789-0123-a4e5-6b789d012c34",
      "resourceArn": "arn:aws:imagebuilder:us-west-1:123456789012:infrastructure-
configuration/example-linux-infra-config-uswest1"
    },
    "logging": {
      "s3Logs": {
        "s3BucketName": "amzn-s3-demo-bucket"
      }
    },
    "keyPair": "example-linux-key-pair-uswest1",
    "terminateInstanceOnFailure": true,
    "snsTopicArn": "arn:aws:sns:us-west-1:123456789012:example-linux-ibnotices-
uswest1",
    "dateCreated": "Feb 24, 2021 12:31:55 AM",
    "accountId": "123456789012"
  },
  "imageTestsConfigurationDocument": {
    "imageTestsEnabled": true,
    "timeoutMinutes": 720
  },
  "distributionConfiguration": {
    "arn": "arn:aws:imagebuilder:us-west-1:123456789012:distribution-configuration/
example-linux-distribution",
    "name": "example-linux-distribution",
    "dateCreated": "Feb 24, 2021 12:31:56 AM",
    "distributions": [
      {
        "region": "us-west-1",
```

```
        "amiDistributionConfiguration": {}
      }
    ],
    "tags": {
      "internalId": "345abc67-8910-12d3-4ef5-67a8b90c12de",
      "resourceArn": "arn:aws:imagebuilder:us-west-1:123456789012:distribution-
configuration/example-linux-distribution"
    },
    "accountId": "123456789012"
  },
  "dateCreated": "Jul 28, 2022 1:13:45 AM",
  "outputResources": {
    "amis": [
      {
        "region": "us-west-1",
        "image": "ami-01a23bc4def5a6789",
        "name": "example-linux-image 2022-07-28T01-14-17.416Z",
        "accountId": "123456789012"
      }
    ]
  },
  "buildExecutionId": "ab0cd12e-34fa-5678-b901-2c3456d789e0",
  "testExecutionId": "6a7b8901-cdef-234a-56b7-8cd89ef01234",
  "distributionJobId": "1f234567-8abc-9d0e-1234-fa56b7c890de",
  "integrationJobId": "432109b8-afe7-6dc5-4321-0ba98f7654e3",
  "accountId": "123456789012",
  "osVersion": "Amazon Linux 2",
  "enhancedImageMetadataEnabled": true,
  "buildType": "USER_INITIATED",
  "tags": {
    "internalId": "901e234f-a567-89bc-0123-d4e567f89a01",
    "resourceArn": "arn:aws:imagebuilder:us-west-1:123456789012:image/example-linux-
image/1.0.0/3"
  }
}
```

The following example shows the JSON payload for a typical message that Image Builder publishes for a pipeline build failure for a Linux image.

```
{
  "versionlessArn": "arn:aws:imagebuilder:us-west-2:123456789012:image/my-example-
image",
  "semver": 123794003928538027489912423 1,
```

```
  "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image/my-example-image/1.0.0/7",
  "name": "My Example Image",
  "version": "1.0.0",
  "type": "AMI",
  "buildVersion": 7,
  "state": {
    "status": "FAILED",
    "reason": "Image Failure reason."
  },
  "platform": "Linux",
  "imageRecipe": {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-example-
image/1.0.0",
    "name": "My Example Image",
    "version": "1.0.0",
    "description": "Testing Image recipe",
    "components": [
      {
        "componentArn": "arn:aws:imagebuilder:us-west-2:123456789012:component/my-
example-image-component/1.0.0/1"
      }
    ],
    "platform": "Linux",
    "parentImage": "ami-0cd12345db678d90f",
    "dateCreated": "Jun 21, 2022 11:36:14 PM",
    "tags": {
      "internalId": "1a234567-8901-2345-bcd6-ef7890123456",
      "resourceArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-
example-image/1.0.0"
    },
    "accountId": "123456789012"
  },
  "sourcePipelineArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-pipeline/my-
example-image-pipeline",
  "infrastructureConfiguration": {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/
my-example-infra-config",
    "name": "SNS topic Infra config",
    "description": "An example that will retain instances of failed builds",
    "instanceTypes": [
      "t2.micro"
    ],
    "instanceProfileName": "EC2InstanceProfileForImageBuilder",
    "tags": {
```

```
      "internalId": "234abc56-d789-0123-a4e5-6b789d012c34",
      "resourceArn": "arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-
configuration/my-example-infra-config"
    },
    "terminateInstanceOnFailure": true,
    "snsTopicArn": "arn:aws:sns:us-west-2:123456789012:example-pipeline-notification-
topic",
    "dateCreated": "Jul 5, 2022 7:31:53 PM",
    "accountId": "123456789012"
  },
  "imageTestsConfigurationDocument": {
    "imageTestsEnabled": true,
    "timeoutMinutes": 720
  },
  "distributionConfiguration": {
    "arn": "arn:aws:imagebuilder:us-west-2:123456789012:distribution-configuration/my-
example-distribution-config",
    "name": "New distribution config",
    "dateCreated": "Dec 3, 2021 9:24:22 PM",
    "distributions": [
      {
        "region": "us-west-2",
        "amiDistributionConfiguration": {},
        "fastLaunchConfigurations": [
          {
            "enabled": true,
            "snapshotConfiguration": {
              "targetResourceCount": 2
            },
            "maxParallelLaunches": 2,
            "launchTemplate": {
              "launchTemplateId": "lt-01234567890"
            },
            "accountId": "123456789012"
          }
        ]
      }
    ],
    "tags": {
      "internalId": "1fecd23a-4f56-7f89-01e2-345678abbe90",
      "resourceArn": "arn:aws:imagebuilder:us-west-2:123456789012:distribution-
configuration/my-example-distribution-config"
    },
    "accountId": "123456789012"
```

```
  },
  "dateCreated": "Jul 5, 2022 7:40:15 PM",
  "outputResources": {
    "amis": []
  },
  "accountId": "123456789012",
  "enhancedImageMetadataEnabled": true,
  "buildType": "SCHEDULED",
  "tags": {
    "internalId": "456c78b9-0e12-3f45-afb6-7e89b0f1a23b",
    "resourceArn": "arn:aws:imagebuilder:us-west-2:123456789012:image/my-example-
image/1.0.0/7"
  }
}
```


Compliance products for your Image Builder images

With constantly evolving security standards, it can be a challenge to maintain compliance and safeguard your organization from cyber threats. To help ensure that your custom images are compliant, and stay that way through automatic updates when publishers release new versions, Image Builder integrates with AWS Marketplace compliance products and Image Builder components.

Image Builder integrates with the following compliance products:

- **Center for Internet Security (CIS) Benchmarks hardening**

  You can use CIS Hardened Images and the related CIS hardening components to build custom images that comply with the latest CIS Benchmarks Level 1 guidelines. CIS Hardened Images are available in AWS Marketplace. To learn more about how to set up and use CIS Hardened Images and hardening components, see the Quick Start Guide: CIS Hardening Components for EC2 Image Builder in the CIS security wiki.

  > **Note**
  >
  > When you subscribe to a CIS Hardened Image, you also get access to the associated build component that runs a script to enforce CIS Benchmark Level 1 guidelines for your configuration. For more information, see CIS hardening components.

- **Security Technical Implementation Guides (STIG)**

For STIG compliance, use can use Amazon-managed AWS Task Orchestrator and Executor (AWSTOE) STIG components in your Image Builder recipes. STIG components scan your build instance for misconfigurations and run a remediation script to correct issues that they find. We can't guarantee STIG compliance for the images that you build with Image Builder. You must work with your organization's compliance team to verify that your final image is compliant. For a complete list of AWSTOE STIG components that you can use in your Image Builder recipes, see Amazon managed STIG hardening components for Image Builder.

Monitor events and logs in Image Builder

To maintain the reliability, availability, and performance of your EC2 Image Builder pipelines, it's important to monitor events and logs. Events and logs help you see the big picture and dive down into the details when an API call fails. Image Builder integrate with services that can send alerts and kick off automated responses when events match the criteria that you've configured.

The following topics describe monitoring techniques you can use through services that integrate with Image Builder.

Monitor events and logs

- Log Image Builder API calls using CloudTrail
- Monitor Image Builder logs with Amazon CloudWatch Logs

Log Image Builder API calls using CloudTrail

EC2 Image Builder is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in Image Builder. CloudTrail captures all API calls for Image Builder as events. The calls captured include calls from the Image Builder console and code calls to the Image Builder API operations. If you create a trail, you can enable continuous delivery of CloudTrail events to an Amazon S3 bucket, including events for Image Builder. If you don't configure a trail, you can still view the most recent events in the CloudTrail console in **Event history**. Using the information collected by CloudTrail, you can determine the request that was made to Image Builder, the IP address from which the request was made, who made the request, when it was made, and additional details.

To learn more about CloudTrail, see the AWS CloudTrail User Guide.

Image Builder information in CloudTrail

CloudTrail is enabled on your AWS account when you create the account. When activity occurs in Image Builder, that activity is recorded in a CloudTrail event along with other AWS service events in **Event history**. You can view, search, and download recent events in your AWS account. For more information, see Viewing events with CloudTrail Event history.

For an ongoing record of events in your AWS account, including events for Image Builder, create a trail. A *trail* enables CloudTrail to deliver log files to an Amazon S3 bucket. By default, when

you create a trail in the console, the trail applies to all AWS Regions. The trail logs events from all Regions in the AWS partition and delivers the log files to the Amazon S3 bucket that you specify. Additionally, you can configure other AWS services to further analyze and act upon the event data collected in CloudTrail logs. For more information, see the following:

- Overview for creating a trail
- CloudTrail supported services and integrations
- Configuring Amazon SNS notifications for CloudTrail
- Receiving CloudTrail log files from multiple regions and Receiving CloudTrail log files from multiple accounts

All Image Builder actions are logged by CloudTrail and are documented in the EC2 Image Builder API Reference. For example, calls to the `CreateImagePipeline`, `UpdateInfrastructureConfiguration`, and `StartImagePipelineExecution` actions generate entries in the CloudTrail log files.

Every event or log entry contains information about who generated the request. The identity information helps you determine the following:

- Whether the request was made with root or AWS Identity and Access Management (IAM) user credentials.
- Whether the request was made with temporary security credentials for a role or federated user.
- Whether the request was made by another AWS service.

For more information, see the CloudTrail userIdentity element.

Monitor Image Builder logs with Amazon CloudWatch Logs

CloudWatch Logs support is turned on by default. Image Builder retains build logs on the instance during the build process, then streams the logs to CloudWatch Logs when the build is complete. Before it creates the final build image, Image Builder removes local logs from the instance.

Image build logs

Image build logs contain the detailed logs for an individual image build. Image Builder writes image build logs to the following Image Builder CloudWatch Logs group and stream:

LogGroup: `/aws/imagebuilder/`*`ImageName`*

LogStream (x.x.x/x): *`ImageVersion/ImageBuildVersion`*

Pipeline execution logs

Image Builder writes pipeline execution logs when an image pipeline runs or when a pipeline skips a regularly scheduled run, along with details about why that happened. For example, when dependency updates are configured for a scheduled pipeline, the following scenarios will have associated messaging:

- Image Builder writes a log entry when it skips pipeline execution because there were no dependency updates.
- When there is a dependency update, Image Builder logs the ARN of the resource that changed.

Image Builder writes pipeline execution logs to the following Image Builder CloudWatch Logs group and stream:

LogGroup: `/aws/imagebuilder/pipeline/`*`pipeline-name`*

LogStream: *`2025/09/01`* (the pipeline execution date in YYYY/MM/DD format)

Each pipeline log is appended to the stream for that day.

Custom log groups

If you've specified custom log groups for image or pipeline logging, Image Builder writes the logs to the LogGroup that you've specified in your pipeline, or in one of the create image commands if you ran the build manually. For more information about how this works in Image Builder, see Configure pipeline logging.

Opt out

You can opt out of CloudWatch Logs streaming by removing the following permissions associated with the custom role that applies for your use case.

- logs:CreateLogGroup
- logs:CreateLogStream
- logs:PutLogEvents

Log type	Custom role
Image build	Execution role
Pipeline execution	Execution role
Component logs	Instance profile role

For advanced troubleshooting, you can run predefined commands and scripts using AWS Systems Manager Run Command. For more information, see Troubleshoot Image Builder issues.

Security in Image Builder

Cloud security at AWS is the highest priority. As an AWS customer, you benefit from a data center and network architecture that is built to meet the requirements of the most security-sensitive organizations.

Security is a shared responsibility between AWS and you. The shared responsibility model describes this as security *of* the cloud and security *in* the cloud:

- **Security of the cloud** – AWS is responsible for protecting the infrastructure that runs AWS services in the AWS Cloud. AWS also provides you with services that you can use securely. Third-party auditors regularly test and verify the effectiveness of our security as part of the AWS Compliance Programs. To learn about the compliance programs that apply to EC2 Image Builder, see AWS services in Scope by Compliance Program.
- **Security in the cloud** – Your responsibility is determined by the AWS service that you use. You are also responsible for other factors including the sensitivity of your data, your company's requirements, and applicable laws and regulations.

This documentation helps you understand how to apply the shared responsibility model when using Image Builder. The following topics show you how to configure Image Builder to meet your security and compliance objectives. You also learn how to use other AWS services that help you to monitor and secure your Image Builder resources.

Topics

- Data protection and the AWS shared responsibility model in Image Builder
- Identity and Access Management integration for Image Builder
- Compliance validation for Image Builder
- Data redundancy and resilience in Image Builder
- Infrastructure security in Image Builder
- Patch Management for Image Builder images
- Security best practices for Image Builder

Data protection and the AWS shared responsibility model in Image Builder

The AWS shared responsibility model applies to data protection in EC2 Image Builder. As described in this model, AWS is responsible for protecting the global infrastructure that runs all of the AWS Cloud. You are responsible for maintaining control over your content that is hosted on this infrastructure. You are also responsible for the security configuration and management tasks for the AWS services that you use. For more information about data privacy, see Data Privacy FAQ. For information about data protection in Europe, see the General Data Protection Regulation (GDPR) Center.

For data protection purposes, we recommend that you protect AWS account credentials and set up individual users with AWS IAM Identity Center or AWS Identity and Access Management (IAM). That way, each user is given only the permissions necessary to fulfill their job duties. We also recommend that you secure your data in the following ways:

- Use multi-factor authentication (MFA) with each account.
- Use SSL/TLS to communicate with AWS resources. We require TLS 1.2 and recommend TLS 1.3.
- Set up API and user activity logging with AWS CloudTrail. For information about using CloudTrail trails to capture AWS activities, see Working with CloudTrail trails in the *AWS CloudTrail User Guide*.
- Use AWS encryption solutions, along with all default security controls within AWS services.
- Use advanced managed security services such as Amazon Macie, which assists in discovering and securing sensitive data that is stored in Amazon S3.
- If you require FIPS 140-3 validated cryptographic modules when accessing AWS through a command line interface or an API, use a FIPS endpoint. For more information about the available FIPS endpoints, see Federal Information Processing Standard (FIPS) 140-3.

We strongly recommend that you never put confidential or sensitive information, such as your customers' email addresses, into tags or free-form text fields such as a **Name** field. This includes when you work with Image Builder or other AWS services using the console, API, AWS CLI, or AWS SDKs. Any data that you enter into tags or free-form text fields used for names may be used for billing or diagnostic logs. If you provide a URL to an external server, we strongly recommend that you do not include credentials information in the URL to validate your request to that server.

Your responsibility for imported ISO disk images

When you import a Windows ISO disk image, the ISO that you supply provides the operating system for the output AMI. Under the shared responsibility model, verifying that the media is authentic is your responsibility.

The import runs in your own AWS account, on a build instance that uses the instance profile role from your infrastructure configuration. During the import, Image Builder runs executables from the ISO and the applied Windows image with SYSTEM privileges under that role.

An ISO from an untrusted source can affect the output AMI and any instances that you launch from it. Obtain ISO files from Microsoft or an authorized reseller. For more information, see Import verified Windows ISO disk images with Image Builder.

Encryption and key management in Image Builder

Image Builder encrypts data in transit and at rest by default with a service-owned KMS key, except for the following:

- **Custom components** – Image Builder encrypts custom components with your default KMS key, or a service-owned KMS key.
- **Image workflows** – Image Builder can encrypt your image workflows with a customer managed key if you specify the key during workflow creation. Image Builder handles encryption and decryption with your key to run the workflows that you've configured for your images.

You can manage your own keys through AWS KMS. However, you don't have permission to manage the Image Builder KMS key owned by Image Builder. For more information about managing your KMS keys with AWS Key Management Service, see Getting Started in the AWS Key Management Service Developer Guide.

Encryption context

To provide an additional integrity and authenticity check on your encrypted data, you have the option of including an encryption context when you encrypt the data. When a resource is encrypted with an encryption context, AWS KMS cryptographically binds the context to the ciphertext. The resource can only be decrypted if the requester provides an exact, case-sensitive match for the context.

The policy examples in this section use an encryption context that resembles the Amazon Resource Name (ARN) of an Image Builder workflow resource.

Encrypt image workflows with a customer managed key

To add a layer of protection, you can encrypt your Image Builder workflow resources with your own customer managed key. If you use your customer managed key to encrypt the Image Builder workflows that you create, you must grant access in the key policy for Image Builder to use your key when it encrypts and decrypts workflow resources. You can revoke access at any time. However, Image Builder will not have access to any workflows that are already encrypted if you revoke access to the key.

The process to grant Image Builder access to use your customer managed key has two steps, as follows:

Step 1: Add key policy permissions for Image Builder workflows

To enable Image Builder to encrypt and decrypt workflow resources when it creates or uses those workflows, you must specify permissions in the KMS key policy.

This example key policy grants access for Image Builder pipelines to encrypt workflow resources during the creation process, and decrypt workflow resources to use them. The policy also grants access for key administrators. The encryption context and resource specification use a wildcard to cover all Regions where you have workflow resources.

As a prerequisite for using image workflows, you created an IAM workflow execution role that grants permission for Image Builder to run workflow actions. The principal for the first statement shown in the key policy example here must specify your IAM workflow execution role.

For more information about customer managed keys, see Managing access to customer managed keys in the *AWS Key Management Service Developer Guide*.

JSON

```
{
 "Version":"2012-10-17",
 "Statement": [
  {
   "Sid": "Allow access to build images with encrypted workflow",
   "Effect": "Allow",
   "Principal": {
```

```
    "AWS": "arn:aws:iam::111122223333:role/YourImageBuilderExecutionRole"
   },
   "Action": [
    "kms:Decrypt",
    "kms:GenerateDataKey"
   ],
   "Resource": "*",
   "Condition": {
    "StringLike": {
     "kms:EncryptionContext:aws:imagebuilder:arn":
 "arn:aws:imagebuilder:*:111122223333:workflow/*"
    }
   }
  },
  {
   "Sid": "Allow access for key administrators",
   "Effect": "Allow",
   "Principal": {
    "AWS": "arn:aws:iam::111122223333:root"
   },
   "Action": [
    "kms:*"
   ],
   "Resource": "arn:aws:kms:*:111122223333:key/*"
  }
 ]
}
```

Step 2: Grant key access to your workflow execution role

The IAM role that Image Builder assumes to run your workflows needs permission to use your customer managed key. Without access to your key, Image Builder won't be able to encrypt or decrypt your workflow resources with it.

Edit the policy for your workflow execution role to add the following policy statement.

JSON

```
{
 "Version":"2012-10-17",
 "Statement": [
  {
```

```
    "Sid": "AllowAccessToWorkflowKey",
    "Effect": "Allow",
    "Action": [
     "kms:Decrypt",
     "kms:GenerateDataKey"
    ],
    "Resource": "arn:aws:kms:us-west-2:111122223333:key/key_ID",
    "Condition": {
     "StringLike": {
      "kms:EncryptionContext:aws:imagebuilder:arn":
  "arn:aws:imagebuilder:*:111122223333:workflow/*"
     }
    }
   }
  ]
}
```

AWS CloudTrail events for image workflows

The following examples show typical AWS CloudTrail entries for encrypting and decrypting image workflows that are stored with a customer managed key.

Example: GenerateDataKey

This example shows what a CloudTrail event might look like when Image Builder invokes the AWS KMS **GenerateDataKey** API action from the Image Builder **CreateWorkflow** API action. Image Builder must encrypt a new workflow before it creates the workflow resource.

```
{
 "eventVersion": "1.08",
 "userIdentity": {
  "type": "AssumedRole",
  "principalId": "PRINCIPALID1234567890:workflow-role-name",
  "arn": "arn:aws:sts::111122223333:assumed-role/Admin/workflow-role-name",
  "accountId": "111122223333",
  "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
  "sessionContext": {
   "sessionIssuer": {
    "type": "Role",
    "principalId": "PRINCIPALID1234567890",
    "arn": "arn:aws:iam::111122223333:role/Admin",
    "accountId": "111122223333",
```

```
    "userName": "Admin"
   },
   "webIdFederationData": {},
   "attributes": {
    "creationDate": "2023-11-21T20:29:31Z",
    "mfaAuthenticated": "false"
   }
  },
  "invokedBy": "imagebuilder.amazonaws.com"
 },
 "eventTime": "2023-11-21T20:31:03Z",
 "eventSource": "kms.amazonaws.com",
 "eventName": "GenerateDataKey",
 "awsRegion": "us-west-2",
 "sourceIPAddress": "imagebuilder.amazonaws.com",
 "userAgent": "imagebuilder.amazonaws.com",
 "requestParameters": {
  "encryptionContext": {
   "aws:imagebuilder:arn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/build/
sample-encrypted-workflow/1.0.0/*",
   "aws-crypto-public-key": "key value"
  },
  "keyId": "arn:aws:kms:us-west-2:111122223333:alias/ExampleKMSKey",
  "numberOfBytes": 32
 },
 "responseElements": null,
 "requestID": "a1b2c3d4-5678-90ab-cdef-EXAMPLEaaaaa",
 "eventID": "a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
 "readOnly": true,
 "resources": [
  {
   "accountId": "111122223333",
   "type": "AWS::KMS::Key",
   "ARN": "arn:aws:kms:us-west-2:111122223333:key/a1b2c3d4-5678-90ab-cdef-EXAMPLEzzzzz"
  }
 ],
 "eventType": "AwsApiCall",
 "managementEvent": true,
 "recipientAccountId": "111122223333",
 "eventCategory": "Management"
}
```


Example: Decrypt

This example shows what a CloudTrail event might look like when Image Builder invokes the AWS KMS **Decrypt** API action from the Image Builder **GetWorkflow** API action. Image Builder pipelines need to decrypt a workflow resource before they can use it.


```
{
 "eventVersion": "1.08",
 "userIdentity": {
  "type": "AssumedRole",
  "principalId": "PRINCIPALID1234567890:workflow-role-name",
  "arn": "arn:aws:sts::111122223333:assumed-role/Admin/workflow-role-name",
  "accountId": "111122223333",
  "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
  "sessionContext": {
   "sessionIssuer": {
    "type": "Role",
    "principalId": "PRINCIPALID1234567890",
    "arn": "arn:aws:iam::111122223333:role/Admin",
    "accountId": "111122223333",
    "userName": "Admin"
   },
   "webIdFederationData": {},
   "attributes": {
    "creationDate": "2023-11-21T20:29:31Z",
    "mfaAuthenticated": "false"
   }
  },
  "invokedBy": "imagebuilder.amazonaws.com"
 },
 "eventTime": "2023-11-21T20:34:25Z",
 "eventSource": "kms.amazonaws.com",
 "eventName": "Decrypt",
 "awsRegion": "us-west-2",
 "sourceIPAddress": "imagebuilder.amazonaws.com",
 "userAgent": "imagebuilder.amazonaws.com",
 "requestParameters": {
  "keyId": "arn:aws:kms:us-west-2:111122223333:key/a1b2c3d4-5678-90ab-cdef-
EXAMPLEzzzzz",
  "encryptionAlgorithm": "SYMMETRIC_DEFAULT",
  "encryptionContext": {
   "aws:imagebuilder:arn": "arn:aws:imagebuilder:us-west-2:111122223333:workflow/build/
sample-encrypted-workflow/1.0.0/*",
   "aws-crypto-public-key": "ABC123def4567890abc12345678/90dE/F123abcDEF+4567890abc123D
+ef1=="
```

```
  }
 },
 "responseElements": null,
 "requestID": "a1b2c3d4-5678-90ab-cdef-EXAMPLEbbbbb",
 "eventID": "a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
 "readOnly": true,
 "resources": [
  {
   "accountId": "111122223333",
   "type": "AWS::KMS::Key",
   "ARN": "arn:aws:kms:us-west-2:111122223333:key/a1b2c3d4-5678-90ab-cdef-EXAMPLEzzzzz"
  }
 ],
 "eventType": "AwsApiCall",
 "managementEvent": true,
 "recipientAccountId": "111122223333",
 "eventCategory": "Management"
}
```

Data storage in Image Builder

Image Builder doesn't store any of your logs in the service. All logs are saved on your Amazon EC2 instance that is used to build the image, or in your Systems Manager automation logs.

Inter-network Traffic Privacy in Image Builder

Connections are secured between Image Builder and on-premises locations, between AZs within an AWS Region, and between AWS Regions through HTTPS. There are no direct connections between accounts.

Identity and Access Management integration for Image Builder

Topics

- Audience
- Authenticating with identities
- How Image Builder works with IAM policies and roles
- Manage data perimeters for S3 bucket download access in Image Builder
- Image Builder identity-based policies
- IAM permissions for custom workflows

- Image Builder resource-based policies
- Use AWS managed policies for EC2 Image Builder
- Use IAM service-linked roles for Image Builder
- Troubleshoot IAM issues in Image Builder

Audience

How you use AWS Identity and Access Management (IAM) differs based on your role:

- **Service user** - request permissions from your administrator if you cannot access features (see Troubleshoot IAM issues in Image Builder)
- **Service administrator** - determine user access and submit permission requests (see How Image Builder works with IAM policies and roles)
- **IAM administrator** - write policies to manage access (see Image Builder identity-based policies)

Authenticating with identities

For detailed information about how to provide authentication for people and processes in your AWS account, see Identities in the *IAM User Guide*.

How Image Builder works with IAM policies and roles

Before you use IAM to manage access to Image Builder, learn what IAM features are available to use with Image Builder.

To get a high-level view of how Image Builder and other AWS services work with most IAM features, see AWS services that work with IAM in the *IAM User Guide*.

Identity-based policies for Image Builder

Supports identity-based policies: Yes

Identity-based policies are JSON permissions policy documents that you can attach to an identity, such as an IAM user, group of users, or role. These policies control what actions users and roles can perform, on which resources, and under what conditions. To learn how to create an identity-based policy, see Define custom IAM permissions with customer managed policies in the *IAM User Guide*.

With IAM identity-based policies, you can specify allowed or denied actions and resources as well as the conditions under which actions are allowed or denied. To learn about all of the elements that you can use in a JSON policy, see IAM JSON policy elements reference in the *IAM User Guide*.

Identity-based policy examples for Image Builder

To view examples of Image Builder identity-based policies, see Image Builder identity-based policies.

Resource-based policies within Image Builder

Supports resource-based policies: Yes

Resource-based policies are JSON policy documents that you attach to a resource. Examples of resource-based policies are IAM *role trust policies* and Amazon S3 *bucket policies*. In services that support resource-based policies, service administrators can use them to control access to a specific resource. For the resource where the policy is attached, the policy defines what actions a specified principal can perform on that resource and under what conditions. You must specify a principal in a resource-based policy. Principals can include accounts, users, roles, federated users, or AWS services.

To enable cross-account access, you can specify an entire account or IAM entities in another account as the principal in a resource-based policy. For more information, see Cross account resource access in IAM in the *IAM User Guide*.

Policy actions for Image Builder

Supports policy actions: Yes

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Action` element of a JSON policy describes the actions that you can use to allow or deny access in a policy. Include actions in a policy to grant permissions to perform the associated operation.

To see a list of Image Builder actions, see Actions defined by EC2 Image Builder in the *Service Authorization Reference*.

Policy actions in Image Builder use the following prefix before the action:

```
imagebuilder
```

To specify multiple actions in a single statement, separate them with commas.

```
"Action": [
 "imagebuilder:action1",
 "imagebuilder:action2"
 ]
```

To view examples of Image Builder identity-based policies, see Image Builder identity-based policies.

Policy resources for Image Builder

Supports policy resources: Yes

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Resource` JSON policy element specifies the object or objects to which the action applies. As a best practice, specify a resource using its Amazon Resource Name (ARN). For actions that don't support resource-level permissions, use a wildcard (*) to indicate that the statement applies to all resources.

```
"Resource": "*"
```

To see a list of Image Builder resource types and their ARNs, see Resources defined by EC2 Image Builder in the *Service Authorization Reference*. To learn with which actions you can specify the ARN of each resource, see Actions defined by EC2 Image Builder.

To view examples of Image Builder identity-based policies, see Image Builder identity-based policies.

Policy condition keys for Image Builder

Supports service-specific policy condition keys: Yes

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Condition` element specifies when statements execute based on defined criteria. You can create conditional expressions that use condition operators, such as equals or less than, to match the condition in the policy with values in the request. To see all AWS global condition keys, see AWS global condition context keys in the *IAM User Guide*.

To see a list of Image Builder condition keys, see Condition keys for EC2 Image Builder in the *Service Authorization Reference*. To learn with which actions and resources you can use a condition key, see Actions defined by EC2 Image Builder.

To view examples of Image Builder identity-based policies, see Image Builder identity-based policies.

ACLs in Image Builder

Supports ACLs: No

Access control lists (ACLs) control which principals (account members, users, or roles) have permissions to access a resource. ACLs are similar to resource-based policies, although they do not use the JSON policy document format.

ABAC with Image Builder

Supports ABAC (tags in policies): Partial

Attribute-based access control (ABAC) is an authorization strategy that defines permissions based on attributes called tags. You can attach tags to IAM entities and AWS resources, then design ABAC policies to allow operations when the principal's tag matches the tag on the resource.

To control access based on tags, you provide tag information in the condition element of a policy using the `aws:ResourceTag/key-name`, `aws:RequestTag/key-name`, or `aws:TagKeys` condition keys.

If a service supports all three condition keys for every resource type, then the value is **Yes** for the service. If a service supports all three condition keys for only some resource types, then the value is **Partial**.

For more information about ABAC, see Define permissions with ABAC authorization in the *IAM User Guide*. To view a tutorial with steps for setting up ABAC, see Use attribute-based access control (ABAC) in the *IAM User Guide*.

Using temporary credentials with Image Builder

Supports temporary credentials: Yes

Temporary credentials provide short-term access to AWS resources and are automatically created when you use federation or switch roles. AWS recommends that you dynamically generate temporary credentials instead of using long-term access keys. For more information, see Temporary security credentials in IAM and AWS services that work with IAM in the *IAM User Guide*.

Cross-service principal permissions for Image Builder

Supports forward access sessions (FAS): Yes

Forward access sessions (FAS) use the permissions of the principal calling an AWS service, combined with the requesting AWS service to make requests to downstream services. For policy details when making FAS requests, see Forward access sessions.

Service roles for Image Builder

Supports service roles: Yes

A service role is an IAM role that a service assumes to perform actions on your behalf. An IAM administrator can create, modify, and delete a service role from within IAM. For more information, see Create a role to delegate permissions to an AWS service in the *IAM User Guide*.

> **Warning**
>
> Changing the permissions for a service role might break Image Builder functionality. Edit service roles only when Image Builder provides guidance to do so.

Service-linked roles for Image Builder

Supports service-linked roles: Yes

A service-linked role is a type of service role that is linked to an AWS service. The service can assume the role to perform an action on your behalf. Service-linked roles appear in your AWS account and are owned by the service. An IAM administrator can view, but not edit the permissions for service-linked roles.

For details about the Image Builder service-linked role, see Use IAM service-linked roles for Image Builder.

Image Builder identity-based policies

With IAM identity-based policies, you can specify allowed or denied actions and resources, and also the conditions under which actions are allowed or denied. Image Builder supports specific actions, resources, and condition keys. For information about all of the elements that you use in a JSON policy, see Actions, Resources, and Condition Keys for Amazon EC2 Image Builder in the *IAM User Guide*.

Actions

Policy actions in Image Builder use the following prefix before the action: `imagebuilder:`. Policy statements must include either an `Action` or `NotAction` element. Image Builder defines its own set of actions that describe tasks that you can perform with this service.

To specify multiple actions in a single statement, separate them with commas as follows:

```
"Action": [
 "imagebuilder:action1",
 "imagebuilder:action2"
]
```

You can specify multiple actions using wildcards (*). For example, to specify all actions that begin with the word `List`, include the following action:

```
"Action": "imagebuilder:List*"
```

To see a list of Image Builder actions, see Actions, Resources, and Condition Keys for AWS services in the *IAM User Guide*.

Managing access using policies

For detailed information about how to manage access in AWS by creating policies and attaching them to IAM identities or AWS resources, see Policies and Permissions in the *IAM User Guide*.

The IAM role that you associate with your instance profile must have permissions to run the build and test components included in your image. The following IAM role policies must be attached to the IAM role that is associated with the instance profile:

- EC2InstanceProfileForImageBuilder
- EC2InstanceProfileForImageBuilderECRContainerBuilds
- AmazonSSMManagedInstanceCore

Resources

Administrators can use AWS JSON policies to specify who has access to what. That is, which **principal** can perform **actions** on what **resources**, and under what **conditions**.

The `Resource` JSON policy element specifies the object or objects to which the action applies. As a best practice, specify a resource using its Amazon Resource Name (ARN). For actions that don't support resource-level permissions, use a wildcard (*) to indicate that the statement applies to all resources.

```
"Resource": "*"
```

The ARN is made up of multiple nodes that help identify the resource and ensure that the name is unique. The last nodes in the name include several variations in formatting for the resource type, name, and ID. When Image Builder creates a resource it uses the following format:

`arn:aws:imagebuilder:`*`region`*`:`*`owner`*`:`*`resource-type/resource-name/version/build-version`*

> **Note**
>
> The build version is not always included in the resource ARN. However, some API operations, such as GetComponent, need the build version to uniquely identify a resource to retrieve.

For the resources that Image Builder uses in its recipes, such as the base image or components, the owner node can be one of the following:

- The account number of the resource owner
- For Amazon managed resources: `aws`
- For AWS Marketplace resources: `aws-marketplace`

The following example shows the ARN for a managed component to install the Amazon CloudWatch agent on Linux:

```
arn:aws:imagebuilder:us-east-1:aws:component/amazon-cloudwatch-agent-linux/1.0.1/1
```

This example shows the ARN for a fictitious managed component from the AWS Marketplace:

```
arn:aws:imagebuilder:us-east-1:aws-marketplace:component/example-linux-software-component/1.0.1
```

For more information about getting a list of components, including the use of an ownership filter, see List Image Builder components.

Example ARNs

The following are some examples of resource ARNs that you might specify in an IAM policy:

- Instance ARN

```
"Resource": "arn:aws:imagebuilder:us-east-1:111122223333:instance/i-1234567890abcdef0"
```

- Wildcard (*) example to specify all instances for a given account

```
"Resource": "arn:aws:imagebuilder:us-east-1:111122223333:instance/*"
```

- Wildcard (*) example to specify all versions of a managed image workflow

```
"Resource": "arn:aws:imagebuilder:us-east-1:aws:workflow/build/build-image/*"
```

- Managed image ARN

```
"Resource": "arn:aws:imagebuilder:us-east-1:aws:image/amazon-linux-2-arm64/2024.12.17/1"
```

- Wildcard (*) example to specify all versions of a managed image

```
"Resource": "arn:aws:imagebuilder:us-east-1:aws:image/amazon-linux-2-arm64/x.x.x"
```

Many EC2 Image Builder API actions involve multiple resources. To specify multiple resources in a single statement, separate the ARNs with commas.

```
"Resource": [
   "resource1",
   "resource2"
]
```

Condition keys

Image Builder provides service-specific condition keys and supports using some global condition keys. To see all AWS global condition keys, see AWS Global Condition Context Keys in the *IAM User Guide*. The following service-specific condition keys are provided.

imagebuilder:CreatedResourceTagKeys

Works with string operators.

Use this key to filter access by the presence of tag keys in the request. This allows you to manage the resources that Image Builder creates.

Availability – This key is available to only the `CreateInfrastrucutreConfiguration` and `UpdateInfrastructureConfiguration` APIs.

imagebuilder:CreatedResourceTag/<key>

Works with string operators.

Use this key to filter access by the tag key-value pairs that are attached to the resource that Image Builder created. This allows you to manage Image Builder resources through defined tags.

Availability – This key is available to only the `CreateInfrastrucutreConfiguration` and `UpdateInfrastructureConfiguration` APIs.

imagebuilder:LifecyclePolicyResourceType

Works with string operators.

Use this key to filter access by the Lifecycle resource type specified in the request.

The value for this key can be either `AMI_IMAGE` or `CONTAINER_IMAGE`.

Availability – This key is available to only the `CreateLifecyclePolicy` and `UpdateLifecyclePolicy` APIs.

imagebuilder:Ec2MetadataHttpTokens

Works with string operators.

Use this key to filter access by the EC2 Instance Metadata HTTP Token Requirement specified in the request.

This value for this key can be either `optional` or `required`.

Availability – This key is available to only the `CreateInfrastrucutreConfiguration` and `UpdateInfrastructureConfiguration` APIs.

imagebuilder:StatusTopicArn

Works with string operators.

Use this key to filter access by the SNS Topic ARN in the request to which terminal state notifications will be published.

Availability – This key is available to only the `CreateInfrastrucutreConfiguration` and `UpdateInfrastructureConfiguration` APIs.

Examples

To view examples of Image Builder identity-based policies, see Image Builder identity-based policies.

Image Builder resource-based policies

Resource-based policies specify what actions a specified principal can perform on the Image Builder resource and under what conditions. Image Builder supports resource-based permissions policies for components, images, and image recipes. Resource-based policies let you grant usage permission to other accounts on a per-resource basis. You can also use a resource-based policy to allow an AWS service to access your components, images, and image recipes.

For information about how to attach a resource-based policy to a component, image, or image recipe, see Share Image Builder resources with AWS RAM.

> **Note**
>
> When you update a resource policy using Image Builder, the update will appear in the RAM console.

Authorization based on Image Builder tags

You can attach tags to Image Builder resources or pass tags in a request to Image Builder. To control access based on tags, you provide tag information in the condition element of a

policy using the `imagebuilder:ResourceTag/key-name`, `aws:RequestTag/key-name`, or `aws:TagKeys` condition keys. For more information about tagging Image Builder resources, see Tag a resource from the AWS CLI.

Image Builder IAM roles

An IAM role is an entity within your AWS account that has specific permissions.

Using temporary credentials with Image Builder

You can use temporary credentials to sign in with federation, assume an IAM role, or to assume a cross-account role. You obtain temporary security credentials by calling AWS STS API operations such as AssumeRole or GetFederationToken.

Service-linked roles

Service-linked roles allow AWS services to access resources in other services to complete an action on your behalf. Service-linked roles appear in your IAM account and are owned by the service. A user with administrative access can view but not edit the permissions for service-linked roles.

Image Builder supports service-linked roles. For information about creating or managing Image Builder service-linked roles, see Use IAM service-linked roles for Image Builder.

Service roles

This feature allows a service to assume a service role on your behalf. This role allows the service to access resources in other services to complete an action on your behalf. Service roles appear in your IAM account and are owned by the account. This means that an user with administrative access can change the permissions for this role. However, doing so might break the functionality of the service.

Manage data perimeters for S3 bucket download access in Image Builder

EC2 Image Builder maintains two classes of AWS service-owned S3 buckets that contain downloadable resources needed to run Image Builder workloads in your account. If you use data perimeters to control access to Amazon S3 in your environment, you might need to explicitly allow access to these buckets. You can use the bucket ARN or bucket URL to allowlist these buckets, depending on how you control access to Amazon S3.

Component management bootstrapping scripts (Required)

This S3 bucket contains bootstrapping scripts to set up the AWSTOE application on the EC2 instances that are used to create images. Image Builder requires access to download the scripts to support build and testing for new images.

- **S3 bucket ARN:** `arn:<AWS partition>:s3:::ec2imagebuilder-managed-resources-<AWS Region>-prod`
- **S3 bucket URL:** `https://ec2imagebuilder-managed-resources-<AWS Region>.s3.<AWS Region>.<AWS partition-specific domain name>`

Managed components

This S3 bucket contains package payloads for Amazon managed components. Image Builder requires access to download any managed components that are configured in your recipes.

- **S3 bucket ARN:** `arn:<AWS partition>:s3:::ec2imagebuilder-toe-<AWS Region>-prod`
- **S3 bucket URL:** `https://ec2imagebuilder-toe-<AWS Region>.s3.<AWS Region>.<AWS partition-specific domain name>`

Image Builder identity-based policies

Topics

- Identity-based policy best practices
- Using the Image Builder console

Identity-based policy best practices

Identity-based policies determine whether someone can create, access, or delete Image Builder resources in your account. These actions can incur costs for your AWS account. When you create or edit identity-based policies, follow these guidelines and recommendations:

- **Get started with AWS managed policies and move toward least-privilege permissions** – To get started granting permissions to your users and workloads, use the *AWS managed policies* that grant permissions for many common use cases. They are available in your AWS account. We recommend that you reduce permissions further by defining AWS customer managed policies that are specific to your use cases. For more information, see AWS managed policies or AWS managed policies for job functions in the *IAM User Guide*.

- **Apply least-privilege permissions** – When you set permissions with IAM policies, grant only the permissions required to perform a task. You do this by defining the actions that can be taken on specific resources under specific conditions, also known as *least-privilege permissions*. For more information about using IAM to apply permissions, see Policies and permissions in IAM in the *IAM User Guide*.
- **Use conditions in IAM policies to further restrict access** – You can add a condition to your policies to limit access to actions and resources. For example, you can write a policy condition to specify that all requests must be sent using SSL. You can also use conditions to grant access to service actions if they are used through a specific AWS service, such as CloudFormation. For more information, see IAM JSON policy elements: Condition in the *IAM User Guide*.
- **Use IAM Access Analyzer to validate your IAM policies to ensure secure and functional permissions** – IAM Access Analyzer validates new and existing policies so that the policies adhere to the IAM policy language (JSON) and IAM best practices. IAM Access Analyzer provides more than 100 policy checks and actionable recommendations to help you author secure and functional policies. For more information, see Validate policies with IAM Access Analyzer in the *IAM User Guide*.
- **Require multi-factor authentication (MFA)** – If you have a scenario that requires IAM users or a root user in your AWS account, turn on MFA for additional security. To require MFA when API operations are called, add MFA conditions to your policies. For more information, see Secure API access with MFA in the *IAM User Guide*.

For more information about best practices in IAM, see Security best practices in IAM in the *IAM User Guide*.

Using the Image Builder console

To access the EC2 Image Builder console, you must have a minimum set of permissions. These permissions allow you to list and view details about the Image Builder resources in your AWS account. If you create an identity-based policy that is more restrictive than the minimum required permissions, the console won't function as intended for entities (IAM users or roles) with that policy.

To ensure that your IAM entities can use the Image Builder console, you must attach one of the following AWS managed policies to them:

- AWSImageBuilderReadOnlyAccess policy
- AWSImageBuilderFullAccess policy

For more information about Image Builder managed policies, see Use AWS managed policies for EC2 Image Builder.

Important

The **AWSImageBuilderFullAccess** policy is required to create the Image Builder service-linked role. When you attach this policy to an IAM entity, you must also attach the following custom policy and include the resources you want to use that do not have `imagebuilder` in the resource name:

JSON

```
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "sns:Publish"
            ],
            "Resource": "arn:aws:sns:*:*:*imagebuilder*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "iam:GetInstanceProfile"
            ],
            "Resource": "arn:aws:iam::*:instance-profile/*imagebuilder*"
        },
        {
            "Effect": "Allow",
            "Action": "iam:PassRole",
            "Resource": [
                "arn:aws:iam::*:instance-profile/*imagebuilder*",
                "arn:aws:iam::*:role/*imagebuilder*"
            ],
            "Condition": {
                "StringEquals": {
                    "iam:PassedToService": "ec2.amazonaws.com"
                }
```

```
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:ListBucket"
            ],
            "Resource": "arn:aws:s3::*:*imagebuilder*"
        }
    ]
}
```

You don't need to allow minimum console permissions for users that are making calls to only the AWS CLI or the AWS API. Instead, allow access to only the actions that match the API operation that you're trying to perform.

IAM permissions for custom workflows

When using custom workflows with specific step actions like RegisterImage, additional IAM permissions may be required beyond the standard Image Builder managed policies. This section describes the additional permissions needed for custom workflow step actions.

RegisterImage step action permissions

The `RegisterImage` step action requires specific Amazon EC2 permissions to register AMIs and optionally retrieve snapshot tags. When using the `includeSnapshotTags` parameter, additional permissions are needed to describe snapshots.

Required permissions for RegisterImage step action:

For all resources, allow the following actions:

- `ec2:RegisterImage`
- `ec2:DescribeSnapshots`

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
```

```
            "Action": [
                "ec2:RegisterImage",
                "ec2:DescribeSnapshots"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:CreateTags"
            ],
            "Resource": "arn:aws:ec2:*::image/*",
            "Condition": {
                "StringEquals": {
                    "ec2:CreateAction": "RegisterImage"
                }
            }
        }
    ]
}
```

Permission details:

- `ec2:RegisterImage` - Required to register new AMIs from snapshots
- `ec2:DescribeSnapshots` - Required when using `includeSnapshotTags: true` to retrieve snapshot tags for merging with AMI tags
- `ec2:CreateTags` - Required to apply tags to the registered AMI, including both Image Builder default tags and merged snapshot tags

> **Note**
>
> The `ec2:DescribeSnapshots` permission is only used when the `includeSnapshotTags` parameter is set to `true`. If you don't use this feature, you can omit this permission.

Tag merging behavior:

When `includeSnapshotTags` is enabled, the RegisterImage step action will:

- Retrieve tags from the first snapshot specified in the block device mapping

- Exclude any AWS reserved tags (those with keys starting with "aws:")
- Merge snapshot tags with Image Builder's default AMI registration tags
- Give precedence to Image Builder tags when tag keys conflict

Image Builder resource-based policies

For information about how to create a component, see Use components to customize your Image Builder image.

Restricting Image Builder component access to specific IP addresses

The following example grants permissions to any user to perform any Image Builder operations on components. However, the request must originate from the range of IP addresses specified in the condition.

The condition in this statement identifies the 54.240.143.* range of allowed Internet Protocol version 4 (IPv4) IP addresses, with one exception: 54.240.143.188.

The `Condition` block uses the `IpAddress` and `NotIpAddress` conditions and the `aws:SourceIp` condition key, which is an AWS-wide condition key. For more information about these condition keys, see Specifying Conditions in a Policy. The`aws:sourceIp` IPv4 values use the standard CIDR notation. For more information, see IP Address Condition Operators in the *IAM User Guide*.

JSON

```
{
  "Version":"2012-10-17",
  "Id": "IBPolicyId1",
  "Statement": [
    {
      "Sid": "IPAllow",
      "Effect": "Allow",
      "Action": "imagebuilder:GetComponent",
      "Resource": "arn:aws:imagebuilder:*::examplecomponent/*",
      "Condition": {
         "IpAddress": {"aws:SourceIp": "54.240.143.0/24"},
         "NotIpAddress": {"aws:SourceIp": "54.240.143.188/32"}
      }
```

```
    }
  ]
}
```

Use AWS managed policies for EC2 Image Builder

An AWS managed policy is a standalone policy that is created and administered by AWS. AWS managed policies are designed to provide permissions for many common use cases so that you can start assigning permissions to users, groups, and roles.

Keep in mind that AWS managed policies might not grant least-privilege permissions for your specific use cases because they're available for all AWS customers to use. We recommend that you reduce permissions further by defining customer managed policies that are specific to your use cases.

You cannot change the permissions defined in AWS managed policies. If AWS updates the permissions defined in an AWS managed policy, the update affects all principal identities (users, groups, and roles) that the policy is attached to. AWS is most likely to update an AWS managed policy when a new AWS service is launched or new API operations become available for existing services.

For more information, see AWS managed policies in the *IAM User Guide*.

AWSImageBuilderFullAccess policy

The **AWSImageBuilderFullAccess** policy grants full access to Image Builder resources for the role it's attached to, allowing the role to list, describe, create, update, and delete Image Builder resources. The policy also grants targeted permissions to related AWS services that are needed, for example, to verify resources, or to display current resources for the account in the AWS Management Console.

Permissions details

This policy includes the following permissions:

- **Image Builder** – Administrative access is granted, so that the role can list, describe, create, update, and delete Image Builder resources.
- **Amazon EC2** – Access is granted for Amazon EC2 Describe actions that are needed to verify resource existence or get lists of resources belonging to the account.

- **IAM** – Access is granted to get and use instance profiles whose name contains "imagebuilder", to verify the existence of the Image Builder service-linked role via the `iam:GetRole` API action, and to create the Image Builder service-linked role.
- **License Manager** – Access is granted to list license configurations or licenses for a resource.
- **Amazon S3** – Access is granted to list buckets belonging to the account, and also Image Builder buckets with "imagebuilder" in their names.
- **Amazon SNS** – Write permissions are granted to Amazon SNS to verify topic ownership for topics containing "imagebuilder".

To view the permissions for this policy, see AWSImageBuilderFullAccess in the *AWS Managed Policy Reference*.

AWSImageBuilderReadOnlyAccess policy

The **AWSImageBuilderReadOnlyAccess** policy provides read-only access to all Image Builder resources. Permissions are granted to verify that the Image Builder service-linked role exists via the `iam:GetRole` API action.

Permissions details

This policy includes the following permissions:

- **Image Builder** – Access is granted for read-only access to Image Builder resources.
- **IAM** – Access is granted to verify the existence of the Image Builder service-linked role via the `iam:GetRole` API action.

To view the permissions for this policy, see AWSImageBuilderReadOnlyAccess in the *AWS Managed Policy Reference*.

AWSServiceRoleForImageBuilder policy

The **AWSServiceRoleForImageBuilder** policy allows Image Builder to call AWS services on your behalf.

Permissions details

This policy is attached to the Image Builder service-linked role when the role is created through Systems Manager. For more information about the Image Builder service-linked role, see Use IAM service-linked roles for Image Builder.

The policy includes the following permissions:

- **CloudWatch Logs** – Access is granted to create and upload CloudWatch Logs to any log group whose name starts with `/aws/imagebuilder/`.
- **Amazon EC2** – Access is granted for Image Builder to create, take snapshots of and register images (AMIs) that it creates and launch EC2 instances in your account. Image Builder uses related snapshots, volumes, network interfaces, subnets, security groups, license configuration and key pairs as required, as long as the image, instance, and volumes that are being created or used are tagged with `CreatedBy: EC2 Image Builder` or `CreatedBy: EC2 Fast Launch`.

  Image Builder can get information about Amazon EC2 images, instance attributes, instance status, the instance types that are available to your account, launch templates, subnets, hosts, and tags on your Amazon EC2 resources.

  Image Builder can update image settings to enable or disable faster launching of Windows instances in your account, where the image is tagged with `CreatedBy: EC2 Image Builder`.

  Additionally, Image Builder can start, stop, and terminate instances that are running in your account, share Amazon EBS snapshots, create and update images and launch templates, de-register existing images, add tags, and replicate images across accounts that you have granted permissions to via the **Ec2ImageBuilderCrossAccountDistributionAccess** policy. Image Builder tagging is required for all of these actions, as described previously.

  Image Builder can also attach AMI watermarks to images tagged `CreatedBy: EC2 Image Builder`, so that watermarks propagate to derivative AMIs.
- **Amazon ECR** – Access is granted for Image Builder to create a repository if needed for container image vulnerability scans, and tag the resources it creates to limit the scope of its operations. Access is also granted for Image Builder to delete the container images that it created for the scans after it takes snapshots of the vulnerabilities.
- **EventBridge** – Access is granted for Image Builder to create and manage EventBridge rules.
- **IAM** – Access is granted for Image Builder to pass any role in your account to Amazon EC2, and to VM Import/Export.
- **Image Builder** – Access is granted for Image Builder to automatically trigger pipelines on the user's behalf on a user-provided schedule and apply tags to the resulting images. Only used when the `imageTags` property is set on a pipeline and that pipeline is configured to run on a schedule.

- **Amazon Inspector** – Access is granted for Image Builder to determine when Amazon Inspector completes build instance scans, and to collect findings for images that are configured to allow it.
- **AWS KMS** – Access is granted for Amazon EBS to encrypt, decrypt, or re-encrypt Amazon EBS volumes. This is crucial to ensure that encrypted volumes work when Image Builder builds an image.
- **License Manager** – Access is granted for Image Builder to update License Manager specifications via `license-manager:UpdateLicenseSpecificationsForResource`.
- **Amazon SNS** – Write permissions are granted for any Amazon SNS topic in your account.
- **Systems Manager** – Access is granted for Image Builder to list Systems Manager commands and their invocations, inventory entries , describe instance information and automation execution statuses, describe hosts for instance placement support, and get command invocation details. Image Builder can also send automation signals, and stop automation executions for any resource in your account.

  Image Builder is able to issue run command invocations to any instance that is tagged `"CreatedBy": "EC2 Image Builder"` for the following script files: `AWS-RunPowerShellScript`, `AWS-RunShellScript`, or `AWSEC2-RunSysprep`. Image Builder is able to start an Systems Manager automation execution in your account for automation documents where the name starts with `ImageBuilder`.

  Image Builder is also able to create or delete State Manager associations for any instance in your account, as long as the association document is `AWS-GatherSoftwareInventory`, and to create the Systems Manager service-linked role in your account.

  Image Builder is able to read public Parameter Store Parameters, and read and update private Parameters prefixed with `/imagebuilder/` so that it can update the Parameter value with the output AMI IDs that Image Builder creates from a new build.
- **AWS STS** – Access is granted for Image Builder to assume roles named **EC2ImageBuilderDistributionCrossAccountRole** from your account to any account where the Trust policy on the role permits it. This is used for cross-account image distribution.

To view the permissions for this policy, see AWSServiceRoleForImageBuilder in the *AWS Managed Policy Reference*.

EC2ImageBuilderExecutionPolicy policy

The **EC2ImageBuilderExecutionPolicy** policy grants permissions that allow Image Builder to call AWS services on your behalf. You can attach this policy to IAM roles that you pass to Image Builder as an execution role instead of using the service-linked role.

Permissions details

The policy includes the following permissions:

- **CloudWatch Logs** – Access is granted to create and upload CloudWatch Logs to any log group whose name starts with `/aws/imagebuilder/`.
- **Amazon EC2** – Access is granted for Image Builder to create, take snapshots of, and register images (AMIs) that it creates, and launch EC2 instances in your account. Image Builder uses related snapshots, volumes, network interfaces, subnets, security groups, license configurations, and key pairs as required, as long as the image, instance, and volumes that are being created or used are tagged with `CreatedBy: EC2 Image Builder` or `CreatedBy: EC2 Fast Launch`.

  Image Builder can get information about Amazon EC2 images, instance attributes, instance status, the instance types that are available to your account, launch templates, subnets, hosts, and tags on your Amazon EC2 resources.

  Image Builder can update image settings to enable or disable faster launching of Windows instances in your account, where the image is tagged with `CreatedBy: EC2 Image Builder`.

  Additionally, Image Builder can start, stop, and terminate instances that are running in your account, share Amazon EBS snapshots, create and update images, update launch templates, de-register existing images, add tags, and replicate images across accounts that you have granted permissions to via the **Ec2ImageBuilderCrossAccountDistributionAccess** policy. Image Builder tagging is required for all of these actions, as described previously.

  Image Builder can also attach AMI watermarks to images tagged `CreatedBy: EC2 Image Builder`, so that watermarks propagate to derivative AMIs.
- **Amazon ECR** – Access is granted for Image Builder to create a repository if needed for container image vulnerability scans, and tag the resources it creates to limit the scope of its operations. Access is also granted for Image Builder to delete the container images that it created for the scans after it takes snapshots of the vulnerabilities.
- **EventBridge** – Access is granted for Image Builder to create and manage EventBridge rules.

- **IAM** – Access is granted for Image Builder to pass any role in your account to Amazon EC2, and to VM Import/Export.
- **Image Builder** – Access is granted for Image Builder to automatically trigger pipelines on the user's behalf on a user-provided schedule and apply tags to the resulting images. Only used when the `imageTags` property is set on a pipeline and that pipeline is configured to run on a schedule.
- **Amazon Inspector** – Access is granted for Image Builder to determine when Amazon Inspector completes build instance scans, and to collect findings for images that are configured to allow it.
- **AWS KMS** – Access is granted for Amazon EBS to encrypt, decrypt, or re-encrypt Amazon EBS volumes. This is crucial to ensure that encrypted volumes work when Image Builder builds an image.
- **License Manager** – Access is granted for Image Builder to update License Manager specifications via `license-manager:UpdateLicenseSpecificationsForResource`.
- **Amazon SNS** – Write permissions are granted for any Amazon SNS topic in your account.
- **Systems Manager** – Access is granted for Image Builder to list Systems Manager command invocations, inventory entries, describe instance information and association execution statuses, describe hosts for instance placement support, and get command invocation details.

  Image Builder can issue run command invocations to any instance that is tagged `"CreatedBy": "EC2 Image Builder"` for the following script files: `AWS-RunPowerShellScript`, `AWS-RunShellScript`, or `AWSEC2-RunSysprep`.

  Image Builder can also create or delete State Manager associations for any instance in your account that is tagged `"CreatedBy": "EC2 Image Builder"`, as long as the association document is `AWS-GatherSoftwareInventory`, and to create the Systems Manager service-linked role in your account.

  Image Builder can read public Parameter Store Parameters, and read and update private Parameters prefixed with `/imagebuilder/` so that it can update the Parameter value with the output AMI IDs that Image Builder creates from a new build.
- **AWS STS** – Access is granted for Image Builder to assume roles named **EC2ImageBuilderDistributionCrossAccountRole** from your account to any account where the Trust policy on the role permits it. This is used for cross-account image distribution.

To view the permissions for this policy, see EC2ImageBuilderExecutionPolicy in the *AWS Managed Policy Reference*.

Ec2ImageBuilderCrossAccountDistributionAccess policy

The **Ec2ImageBuilderCrossAccountDistributionAccess** policy grants permissions for Image Builder to distribute images across accounts in target Regions. Additionally, Image Builder can describe, copy, and apply tags to any Amazon EC2 image in the account. The policy also grants the ability to modify AMI permissions via the `ec2:ModifyImageAttribute` API action.

Permissions details

This policy includes the following permissions:

- **Amazon EC2** – Access is granted for Amazon EC2 to describe, copy, and modify attributes for an image, and to create tags for any Amazon EC2 images in the account.

To view the permissions for this policy, see Ec2ImageBuilderCrossAccountDistributionAccess in the *AWS Managed Policy Reference*.

EC2ImageBuilderLifecycleExecutionPolicy policy

The **EC2ImageBuilderLifecycleExecutionPolicy** policy grants permissions for Image Builder to perform actions such as deprecate, disable, or delete Image Builder image resources and their underlying resources (AMIs, snapshots) to support automated rules for image lifecycle management tasks.

Permissions details

This policy includes the following permissions:

- **Amazon EC2** – Access is granted for Amazon EC2 to perform the following actions for Amazon Machine Images (AMIs) in the account that are tagged with `CreatedBy: EC2 Image Builder`.
  - Enable and disable an AMI.
  - Enable and disable image deprecation.
  - Describe and deregister an AMI.
  - Describe and modify AMI image attributes.
  - Delete volume snapshots that are associated with the AMI.
  - Retrieve tags for a resource.
  - Add or remove tags from an AMI for deprecation.

- **Amazon ECR** – Access is granted for Amazon ECR to perform the following batch actions on ECR repositories with the `LifecycleExecutionAccess: EC2 Image Builder` tag. Batch actions support automated container image lifecycle rules.
  - `ecr:BatchGetImage`
  - `ecr:BatchDeleteImage`

  Access is granted at the repository level for ECR repositories that are tagged with `LifecycleExecutionAccess: EC2 Image Builder`.
- **AWS Resource groups** – Access is granted for Image Builder to get resources based on tags.
- **EC2 Image Builder** – Access is granted for Image Builder to delete Image Builder image resources.

To view the permissions for this policy, see EC2ImageBuilderLifecycleExecutionPolicy in the *AWS Managed Policy Reference*.

EC2InstanceProfileForImageBuilder policy

The **EC2InstanceProfileForImageBuilder** policy grants the minimum permissions required for an EC2 instance to work with Image Builder. This does not include permissions required to use the Systems Manager Agent.

Permissions details

This policy includes the following permissions:

- **CloudWatch Logs** – Access is granted to create and upload CloudWatch Logs to any log group whose name starts with `/aws/imagebuilder/`.
- **Amazon EC2** – Access is granted to describe volumes and snapshots, to create snapshots of volume or snapshot resources that Image Builder created, and to create tags for Image Builder resources.
- **Image Builder** – Access is granted to get any Image Builder or AWS Marketplace component.
- **AWS KMS** – Access is granted to decrypt an Image Builder component, if it was encrypted via AWS KMS.
- **Amazon S3** – Access is granted to get objects stored in an Amazon S3 bucket whose name starts with `ec2imagebuilder-`, or resources that have an ISO file extension.

To view the permissions for this policy, see EC2InstanceProfileForImageBuilder in the *AWS Managed Policy Reference*.

EC2InstanceProfileForImageBuilderECRContainerBuilds policy

The **EC2InstanceProfileForImageBuilderECRContainerBuilds** policy grants the minimum permissions required for an EC2 instance when working with Image Builder to build Docker images and then register and store the images in an Amazon ECR container repository. This does not include permissions required to use the Systems Manager Agent.

Permissions details

This policy includes the following permissions:

- **CloudWatch Logs** – Access is granted to create and upload CloudWatch Logs to any log group whose name starts with `/aws/imagebuilder/`.
- **Amazon ECR** – Access is granted for Amazon ECR to get, register, and store a container image, and to get an authorization token.
- **Image Builder** – Access is granted to get an Image Builder component or container recipe.
- **AWS KMS** – Access is granted to decrypt an Image Builder component or container recipe, if it was encrypted via AWS KMS.
- **Amazon S3** – Access is granted to get objects stored in an Amazon S3 bucket whose name starts with `ec2imagebuilder-`.

To view the permissions for this policy, see EC2InstanceProfileForImageBuilderECRContainerBuilds in the *AWS Managed Policy Reference*.

Image Builder updates to AWS managed policies

This section provides information about updates to AWS managed policies for Image Builder since this service began tracking these changes. For automatic alerts about changes to this page, subscribe to the RSS feed on the Image Builder document history page.

Change	Description	Date
EC2ImageBuilderExecutionPolicy – Update to an existing policy	Image Builder added `ec2:AttachImageWatermark` to allow Imag	June 22, 2026

Change	Description	Date
	e Builder to attach AMI watermarks to output images tagged `CreatedBy: EC2 Image Builder`.	
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder added `ec2:AttachImageWatermark` to allow Image Builder to attach AMI watermarks to output images tagged `CreatedBy: EC2 Image Builder`.	June 22, 2026
EC2ImageBuilderExecutionPolicy – New policy	Image Builder added the new `EC2ImageBuilderExecutionPolicy` policy that contains permissions for Image Builder to call AWS services on your behalf. You can attach this policy to IAM roles that you pass to Image Builder as an execution role instead of using the service-linked role.	June 4, 2026

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role to support the automated tagging of output images when the `imageTags` property is set on a pipeline. • Added `imagebuilder:StartImagePipelineExecution` to allow Image Builder to trigger pipelines on the user's behalf on a user-provided schedule with the tags to be applied. • Added `imagebuilder:TagResource` to allow Image Builder to tag output images from pipelines on the user's behalf.	March 18, 2026

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role: • Removed `ssm:StartAutomationExecution`, as the service completed its migration away from SSM Automation in 2023 and no longer requires this permission.	February 26, 2026

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role to support the use of AWS Systems Manager (SSM) Parameter Store Parameters in recipes and during image distribution. • Added ssm:GetParameter to allow Image Builder to read public SSM Parameters and private SSM Parameters prefixed with `/imagebuilder/` so that they can be used in recipes. • Added ssm:PutParameter to allow Image Builder to update private SSM Parameters prefixed with `/imagebuilder/` with the output AMI IDs that Image Builder creates from a new build.	July 23, 2025

Change	Description	Date
EC2InstanceProfileForImageBuilder – Update to an existing policy	Image Builder made the following changes to the instance profile policy to support more file extensions for ISO file downloads. • Added two file extensions to the `s3:GetObject` action resource list: `"arn:aws:s3:::*/*.iso"` and `"arn:aws:s3:::*/*.Iso"` .	May 19, 2025
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role to support the import of Microsoft client OS ISO files as the base image. • Added ec2:RegisterImage to allow Image Builder to create a snapshot and create and register an AMI whose baseline operating system was imported from verified ISO disk files.	December 30, 2024

Change	Description	Date
EC2InstanceProfileForImageBuilder – Update to an existing policy	Image Builder made the following changes to the instance profile policy to support image creation from disk image files. • Added the following ec2 actions: DescribeVolumes and DescribeSnapshots on all resources to retrieve details. Also added the following actions for resources that were created by Image Builder: CreateSnapshot for volume and snapshot resources, and CreateTags. Added s3:GetObject for resources with an "ISO" file extension.	December 30, 2024
EC2InstanceProfileForImageBuilder – Updated policy	Image Builder updated the `EC2InstanceProfileForImageBuilder` policy to allow Image Builder to get AWS Marketplace components.	December 2, 2024
EC2ImageBuilderLifecycleExecutionPolicy – New policy	Image Builder added the new `EC2ImageBuilderLifecycleExecutionPolicy` policy that contains permissions for image lifecycle management.	November 17, 2023

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role to provide instance placement support. • Added ec2:DescribeHosts enables Image Builder to poll the hostId to determine when it's in a valid state to launch an instance. • Added ssm:GetCommandInvocation, API action to improve the method that Image Builder uses to get details of the command invocation.	October 19, 2023

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role to provide instance placement support. • Added ec2:DescribeHosts enable Image Builder to poll the hostId to determine when it's in a valid state to launch an instance. • Added ssm:GetCommandInvocation, API action to improve the method that Image Builder uses to get details of the command invocation.	September 28, 2023

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role to allow Image Builder workflows to collect vulnerability findings for both AMI and ECR container image builds. The new permissions support the CVE detection and reporting feature. • Added inspector2:ListCoverage and inspector2:ListFindings to allow Image Builder to determine when Amazon Inspector completes test instance scans, and to collect findings for images that are configured to allow it. • Added ecr:CreateRepository, with a requirement for Image Builder to tag the repository with `CreatedBy: EC2 Image Builder` (tag-on-create). Also added ecr:TagResource (required for tag-on-create) with the same CreatedBy tag constraint, and an additional constraint that requires the repository name to start with `image-builder-`	March 30, 2023

Change	Description	Date
	`*`. The name constraint prevents the escalation of privileges and prevents changes to repositories that Image Builder didn't create. • Added ecr:BatchDeleteImage for ECR repositories tagged with `CreatedBy : EC2 Image Builder`. This permission requires the repository name to start with `image-builder-*` . • Added event permissions for Image Builder to create and manage Amazon EventBridge managed rules that include `ImageBuilder-*` in the name.	
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role: • Added License Manager licenses as a resource for the ec2:RunInstance call to allow customers to use base image AMIs that are associated with a license configuration.	March 22, 2022

Change	Description	Date
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role: • Added permissions for EC2 EnableFastLaunch API action, to enable and disable faster launching for Windows instances. • Tightened scope more for ec2:CreateTags action and resource tag conditions.	February 21, 2022
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder made the following changes to the service role: • Added permissions to call the VMIE service to import a VM and create a base AMI from it. • Tightened scope for ec2:CreateTags action and resource tag conditions.	November 20, 2021
AWSServiceRoleForImageBuilder – Update to an existing policy	Image Builder added new permissions to fix issues where more than one inventory association causes the image build to get stuck.	August 11, 2021

Change	Description	Date
AWSImageBuilderFullAccess – Update to an existing policy	Image Builder made the following changes to the full access role: • Added permissions to allow `ec2:DescribeInstanceTypeOffereings` . • Added permissions to call `ec2:DescribeInstanceTypeOffereings` to enable the Image Builder console to accurately reflect the instance types that are available in the account.	April 13, 2021
Image Builder started tracking changes	Image Builder started tracking changes for its AWS managed policies.	April 02, 2021

Use IAM service-linked roles for Image Builder

EC2 Image Builder uses AWS Identity and Access Management (IAM) service-linked roles. A service-linked role is a unique type of IAM role that is linked directly to Image Builder. Service-linked roles are predefined by Image Builder and include all of the permissions that the service requires to call other AWS services on your behalf.

A service-linked role makes setting up Image Builder more efficient, because you don't have to add the necessary permissions manually. Image Builder defines the permissions of its service-linked roles, and unless defined otherwise, only Image Builder can assume its roles. The defined permissions include the trust policy and the permissions policy. The permissions policy cannot be attached to any other IAM entity.

For information about other services that support service-linked roles, see AWS services That Work with IAM and look for the services that have **Yes** in the **Service-Linked Role** column. Choose a **Yes** with a link to view the service-linked role documentation for that service.

Service-linked role permissions for Image Builder

Image Builder uses the **AWSServiceRoleForImageBuilder** service-linked role to allow EC2 Image Builder to access AWS resources on your behalf. The service-linked role trusts the *imagebuilder.amazonaws.com* service to assume the role.

You don't need to manually create this service-linked role. When you create your first Image Builder image in the AWS Management Console, the AWS CLI, or the AWS API, Image Builder creates the service-linked role for you.

The following actions create a new image:

- Run the pipeline wizard in the Image Builder console to create a custom image.
- Use one of the following API actions, or its corresponding AWS CLI command:
  - The **CreateImage** API action (**create-image** in the AWS CLI).
  - The **ImportVmImage** API action (**import-vm-image** in the AWS CLI).
  - The **StartImagePipelineExecution** API action (**start-image-pipeline-execution** in the AWS CLI).

> **Important**
>
> If the service-linked role is deleted from your account, you can use the same process to create it again. When you create your first EC2 Image Builder resource, Image Builder creates the service-linked role for you again.

To see permissions for the **AWSServiceRoleForImageBuilder**, see the AWSServiceRoleForImageBuilder policy page. To learn more about configuring permissions for a service-linked role, see Service-Linked Role Permissions in the *IAM User Guide*.

Removing an Image Builder service-linked role from your account

You can use the IAM console, the AWS CLI, or the AWS API to manually remove the service-linked role for Image Builder from your account. However, before you do this, you must ensure that there are no Image Builder resources enabled that refer to it.

> **Note**
>
> If the Image Builder service is using the role when you try to delete the resources, the deletion might fail. If that happens, wait for a few minutes and try the operation again.

Clean up Image Builder resources used by the `AWSServiceRoleForImageBuilder` role

1. Verify that no pipeline builds are running before you start. To cancel a running build, use the `cancel-image-creation` command from the AWS CLI.

   ```
   aws imagebuilder cancel-image-creation --image-build-version-
   arn arn:aws:imagebuilder:us-east-1:123456789012:image/sample-image/1.0.0/1
   ```

2. Change all pipeline schedules to use a manual build process, or delete them if you won't be using them again. For more information about deleting resources, see Delete outdated or unused Image Builder resources.

Delete the service-linked role using IAM

You can use the IAM console, the AWS CLI, or the AWS API to delete the `AWSServiceRoleForImageBuilder` role from your account. For more information, see Deleting a Service-Linked Role in the *IAM User Guide*.

Supported Regions for Image Builder service-linked roles

Image Builder supports using service-linked roles in all of the AWS Regions where the service is available. For the list of supported AWS Regions, see AWS Regions and Endpoints.

Troubleshoot IAM issues in Image Builder

Topics

- I am not authorized to perform an action in Image Builder

- I am not authorized to perform iam:PassRole
- I want to allow people outside of my AWS account to access my Image Builder resources

I am not authorized to perform an action in Image Builder

If you receive an error that you're not authorized to perform an action, your policies must be updated to allow you to perform the action.

The following example error occurs when the `mateojackson` IAM user tries to use the console to view details about a fictional *`my-example-widget`* resource but doesn't have the fictional `imagebuilder:`*`GetWidget`* permissions.

```
User: arn:aws:iam::123456789012:user/mateojackson is not authorized to perform:
 imagebuilder:GetWidget on resource: my-example-widget
```

In this case, the policy for the `mateojackson` user must be updated to allow access to the *`my-example-widget`* resource by using the `imagebuilder:`*`GetWidget`* action.

If you need help, contact your AWS administrator. Your administrator is the person who provided you with your sign-in credentials.

I am not authorized to perform iam:PassRole

If you receive an error that you're not authorized to perform the `iam:PassRole` action, your policies must be updated to allow you to pass a role to Image Builder.

Some AWS services allow you to pass an existing role to that service instead of creating a new service role or service-linked role. To do this, you must have permissions to pass the role to the service.

The following example error occurs when an IAM user named `marymajor` tries to use the console to perform an action in Image Builder. However, the action requires the service to have permissions that are granted by a service role. Mary does not have permissions to pass the role to the service.

```
User: arn:aws:iam::123456789012:user/marymajor is not authorized to perform:
 iam:PassRole
```

In this case, Mary's policies must be updated to allow her to perform the `iam:PassRole` action.

If you need help, contact your AWS administrator. Your administrator is the person who provided you with your sign-in credentials.

I want to allow people outside of my AWS account to access my Image Builder resources

You can create a role that users in other accounts or people outside of your organization can use to access your resources. You can specify who is trusted to assume the role. For services that support resource-based policies or access control lists (ACLs), you can use those policies to grant people access to your resources.

To learn more, consult the following:

- To learn whether Image Builder supports these features, see How Image Builder works with IAM policies and roles.
- To learn how to provide access to your resources across AWS accounts that you own, see Providing access to an IAM user in another AWS account that you own in the *IAM User Guide*.
- To learn how to provide access to your resources to third-party AWS accounts, see Providing access to AWS accounts owned by third parties in the *IAM User Guide*.
- To learn how to provide access through identity federation, see Providing access to externally authenticated users (identity federation) in the *IAM User Guide*.
- To learn the difference between using roles and resource-based policies for cross-account access, see Cross account resource access in IAM in the *IAM User Guide*.

Compliance validation for Image Builder

EC2 Image Builder is not in scope of any AWS compliance programs.

Our new AWS sign-up experience is not designed for regulated workloads. If you're using our new AWS sign-up experience, but you want to use AWS for regulated workloads, you can sign up for AWS (advanced) or activate advanced features for your AWS environment.

To learn whether an AWS service is within the scope of specific compliance programs, see AWS services in Scope by Compliance Program and choose the compliance program that you are interested in. For general information, see AWS Compliance Programs.

You can download third-party audit reports using AWS Artifact. For more information, see Downloading Reports in AWS Artifact.

Your compliance responsibility when using AWS services is determined by the sensitivity of your data, your company's compliance objectives, and applicable laws and regulations. For more information about your compliance responsibility when using AWS services, see AWS Security Documentation.

You can incorporate compliance products from AWS Marketplace or components from AWS Task Orchestrator and Executor (AWSTOE) into your Image Builder images to help ensure that your images are compliant. For more information, see Compliance products for your Image Builder images.

Data redundancy and resilience in Image Builder

The AWS global infrastructure is built around AWS Regions and Availability Zones. AWS Regions provide multiple physically separated and isolated Availability Zones, which are connected with low-latency, high-throughput, and highly redundant networking. With Availability Zones, you can design and operate applications and databases that automatically fail over between zones without interruption. Availability Zones are more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

The EC2 Image Builder service allows you to distribute images built in one Region with other Regions, giving them multi-Region resiliency for AMIs. There is no mechanism to "back up" image pipelines, recipes, or components. You can store the recipe and component documents outside of the Image Builder service, such as in an Amazon S3 bucket.

The EC2 Image Builder cannot be configured for High Availability (HA). You can distribute images to multiple Regions to make the images more highly available.

For more information about AWS Regions and Availability Zones, see AWS Global Infrastructure.

Infrastructure security in Image Builder

The AWS global network provides security capabilities and controls network access for services like EC2 Image Builder. For more information about the infrastructure security that AWS provides for its services, see the Infrastructure Security section in the *Introduction to AWS Security* whitepaper.

To send requests through the AWS global network for Image Builder API actions, your client software must comply with the following security guidelines:

- To send requests for Image Builder API actions, client software must use a supported version of Transport Layer Security (TLS).

> **Note**
>
> AWS is phasing out support for TLS versions 1.0 and 1.1. We strongly recommend that you update your client software to use TLS version 1.2 or later so that you can still connect. For more information, see this AWS Security Blog post.

- Client software must support cipher suites with perfect forward secrecy (PFS), such as Ephemeral Diffie-Hellman (DHE) or Elliptic Curve Ephemeral Diffie-Hellman (ECDHE). Most current systems, such as Java 7 and later, support these modes.
- You must sign your API requests with an access key ID and a secret access key that is associated with an AWS Identity and Access Management (IAM) principal. Or you can use the AWS Security Token Service (AWS STS) to generate temporary security credentials for your requests.

Additionally, the EC2 instances that Image Builder uses to build and test images must have access to AWS Systems Manager.

Patch Management for Image Builder images

AWS provides updated managed AMIs each month that have the latest updates and security patches applied for the following operating systems. You can use these AMIs as the base image for your customizations. For more information, see Supported operating systems.

- Linux distributions including Amazon Linux 2, AL2023, Red Hat Enterprise Linux (RHEL), CentOS, Ubuntu, SUSE Linux Enterprise Server
- Windows Server 2016 and later
- macOS 10.14.x and later

After you create a custom image, you are responsible for Amazon EC2 system patching, per the shared responsibility model. If the EC2 instances in your application workload can be easily replaced, then it might be most efficient to update the base AMI and redeploy all compute nodes based on this image.

> **Note**
>
> For macOS patching, we recommend that you create a new version of your recipe that uses the latest managed AMI for the base image, and then build an updated custom image from the recipe and your other image build resources. If your Mac instances are not easily replaced, see the Update the operating system and software on Mac instances page in the *Amazon EC2 User Guide* for more information.

The following are two ways you can keep your Image Builder AMIs up to date.

- **AWS-provided patching components** – EC2 Image Builder provides the following build components that install all pending operating system updates:
  - `update-linux`
  - `update-windows`

  These components use the `UpdateOS` action module. For more information, see UpdateOS. The components can be added to your image build pipelines by selecting them from the list of AWS-provided components.
- **Custom build components with patching operations** – To selectively install or update patches on operating systems of supported AMIs, you can author an Image Builder component to install the required patches. A custom component can install patches using shell scripts (Bash or PowerShell), or it can use the `UpdateOS` action module to specify patches for installation or exclusion. For more information, see Action modules supported by AWSTOE component manager.

  Component that uses the `UpdateOS` action module (Linux and Windows only. The `UpdateOS` action module is not supported for macOS.)

```
schemaVersion: 1.0
phases:
  - name: build
 steps:
   - name: UpdateOS
  action: UpdateOS
```

  Component that uses Bash to install yum updates

```
schemaVersion: 1.0
phases:
  - name: build
 steps:
   - name: InstallYumUpdates
  action: ExecuteBash
  inputs:
    commands:
   - sudo yum update -y
```

Security best practices for Image Builder

EC2 Image Builder provides a number of security features to consider as you develop and implement your own security policies. The following best practices are general guidelines and don't represent a complete security solution. Because these best practices might not be appropriate or sufficient for your environment, treat them as helpful considerations rather than prescriptions.

- Do not use overly-permissive security groups in Image Builder recipes.
- Do not share images with accounts that you do not trust.
- Do not make images public that have private or sensitive data.
- Apply all available Windows or Linux security patches during image builds.
- Periodically apply managed AMI updates to your macOS recipes and create new images to launch instances that have the latest security patches.
- When you import a Windows ISO disk image, obtain the ISO from Microsoft or an authorized reseller. Also, grant the instance profile role only the permissions that the import requires. For more information, see Security considerations for ISO disk image import.

We strongly recommend that you test your images to validate the security posture and applicable security compliance levels. Solutions such as Amazon Inspector can help validate the security and compliance posture of images.

IMDSv2 for Image Builder pipelines

When your Image Builder pipeline runs, it sends HTTP requests to launch EC2 instances that Image Builder uses to build and test your image. To configure the version of IMDS that your pipeline

uses for the launch requests, set the `httpTokens` parameter in your Image Builder infrastructure configuration instance metadata settings.

> **Note**
>
> We recommend that you configure all EC2 instances that Image Builder launches from a pipeline build to use IMDSv2 so that instance metadata retrieval requests require a signed token header.

For more information about Image Builder infrastructure configuration, see Manage Image Builder infrastructure configuration. For more information about EC2 instance metadata options for Linux images, see Configure the instance metadata options in the Amazon EC2 User Guide. For Windows images, see Configure the instance metadata options in the Amazon EC2 User Guide.

Required post-build clean up

After Image Builder completes all of the build steps for your custom image, Image Builder prepares the build instance for testing and image creation. Before shutting down the build instance to create the snapshot, Image Builder performs the following clean up to ensure the security of your image:

Linux

The Image Builder pipeline runs a clean up script to help ensure that the final image follows security best practices, and to remove any build artifacts or settings that should not carry over to your snapshot. However, you can skip sections of the script, or override the user data entirely. Therefore, the images produced by Image Builder pipelines are not necessarily compliant with any specific regulatory criteria.

When the pipeline completes its build and test stages, Image Builder automatically runs the following clean-up script just before it creates the output image.

> **Important**
>
> If you override **User data** in your recipe, the script doesn't run. In that case, make sure that you include a command in your user data that creates an empty file named `perform_cleanup`. Image Builder detects this file and runs the clean-up script prior to creating the new image.

After the file clean up completes, Image Builder appends steps to the script that uninstall the Systems Manager agent and remove the `cronie` package. Image Builder tracks what it installed during the build in the `/tmp/imagebuilder_service` service working directory. Image Builder uses those markers to decide what to remove:

- **Systems Manager agent** – Whether Image Builder uninstalls the agent depends on the `systemsManagerAgent.uninstallAfterBuild` setting in your image recipe and whether Image Builder installed the agent. For more information, see the `uninstallAfterBuild` setting in Create an image recipe with the AWS CLI.
- **`cronie` package** – This step applies to Amazon Linux 1, Amazon Linux 2, and Amazon Linux 2023. If Image Builder installed a crontab during the build, it records a `crontab_installed` marker in the service working directory. Image Builder then removes the `cronie` package as part of clean up. To keep `cronie` in your final image, delete the marker file before clean up runs by adding the following command to a component or to your user data:

```
rm -f /tmp/imagebuilder_service/crontab_installed
```

```
#!/bin/bash
if [[ ! -f {{workingDirectory}}/perform_cleanup ]]; then
    echo "Skipping cleanup"
    exit 0
else
    sudo rm -f {{workingDirectory}}/perform_cleanup
fi

function cleanup() {
    FILES=("$@")
    for FILE in "${FILES[@]}"; do
        if [[ -f "$FILE" ]]; then
            echo "Deleting $FILE";
            sudo shred -zuf $FILE;
        fi;
        if [[ -f $FILE ]]; then
            echo "Failed to delete '$FILE'. Failing."
            exit 1
        fi;
    done
};
```

```
# Clean up for cloud-init files
CLOUD_INIT_FILES=(
    "/etc/sudoers.d/90-cloud-init-users"
    "/etc/locale.conf"
    "/var/log/cloud-init.log"
    "/var/log/cloud-init-output.log"
)
if [[ -f {{workingDirectory}}/skip_cleanup_cloudinit_files ]]; then
    echo "Skipping cleanup of cloud init files"
else
    echo "Cleaning up cloud init files"
    cleanup "${CLOUD_INIT_FILES[@]}"
    if [[ -d "/var/lib/cloud" ]]; then
        if [[ $( sudo find /var/lib/cloud -type f | sudo wc -l ) -gt 0 ]]; then
            echo "Deleting files within /var/lib/cloud/*"
            sudo find /var/lib/cloud -type f -exec shred -zuf {} \;
        fi;

        if [[ $( sudo ls /var/lib/cloud | sudo wc -l ) -gt 0 ]]; then
            echo "Deleting /var/lib/cloud/*"
            sudo rm -rf /var/lib/cloud/* || true
        fi;
    fi;
fi;


# Clean up for temporary instance files
INSTANCE_FILES=(
    "/etc/.updated"
    "/etc/aliases.db"
    "/etc/hostname"
    "/var/lib/misc/postfix.aliasesdb-stamp"
    "/var/lib/postfix/master.lock"
    "/var/spool/postfix/pid/master.pid"
    "/var/.updated"
    "/var/cache/yum/x86_64/2/.gpgkeyschecked.yum"
)
if [[ -f {{workingDirectory}}/skip_cleanup_instance_files ]]; then
    echo "Skipping cleanup of instance files"
else
    echo "Cleaning up instance files"
    cleanup "${INSTANCE_FILES[@]}"
fi;
```

```
# Clean up for ssh files
SSH_FILES=(
    "/etc/ssh/ssh_host_rsa_key"
    "/etc/ssh/ssh_host_rsa_key.pub"
    "/etc/ssh/ssh_host_ecdsa_key"
    "/etc/ssh/ssh_host_ecdsa_key.pub"
    "/etc/ssh/ssh_host_ed25519_key"
    "/etc/ssh/ssh_host_ed25519_key.pub"
    "/root/.ssh/authorized_keys"
)
if [[ -f {{workingDirectory}}/skip_cleanup_ssh_files ]]; then
    echo "Skipping cleanup of ssh files"
else
    echo "Cleaning up ssh files"
    cleanup "${SSH_FILES[@]}"
    USERS=$(ls /home/)
    for user in $USERS; do
        echo Deleting /home/"$user"/.ssh/authorized_keys;
        sudo find /home/"$user"/.ssh/authorized_keys -type f -exec shred -zuf {} \;
    done
    for user in $USERS; do
        if [[ -f /home/"$user"/.ssh/authorized_keys ]]; then
            echo Failed to delete /home/"$user"/.ssh/authorized_keys;
            exit 1
        fi;
    done;
fi;


# Clean up for instance log files
INSTANCE_LOG_FILES=(
    "/var/log/audit/audit.log"
    "/var/log/boot.log"
    "/var/log/dmesg"
    "/var/log/cron"
)
if [[ -f {{workingDirectory}}/skip_cleanup_instance_log_files ]]; then
    echo "Skipping cleanup of instance log files"
else
    echo "Cleaning up instance log files"
    cleanup "${INSTANCE_LOG_FILES[@]}"
fi;
```

```
# Clean up for TOE files
if [[ -f {{workingDirectory}}/skip_cleanup_toe_files ]]; then
    echo "Skipping cleanup of TOE files"
else
    echo "Cleaning TOE files"
    shopt -s nullglob
    TOE_MATCHES=({{workingDirectory}}/TOE_*)
    shopt -u nullglob
    if [[ ${#TOE_MATCHES[@]} -gt 0 ]]; then
        if [[ $( sudo find "${TOE_MATCHES[@]}" -type f | sudo wc -l) -gt 0 ]]; then
            echo "Deleting files within {{workingDirectory}}/TOE_*"
            sudo find "${TOE_MATCHES[@]}" -type f -exec shred -zuf {} \;
        fi
        shopt -s nullglob
        TOE_REMAINING=({{workingDirectory}}/TOE_*)
        shopt -u nullglob
        if [[ ${#TOE_REMAINING[@]} -gt 0 ]]; then
            if [[ $( sudo find "${TOE_REMAINING[@]}" -type f | sudo wc -l) -gt 0 ]];
 then
                echo "Failed to delete {{workingDirectory}}/TOE_*"
                exit 1
            fi
            echo "Deleting {{workingDirectory}}/TOE_*"
            sudo rm -rf "${TOE_REMAINING[@]}"
        fi
        shopt -s nullglob
        TOE_FINAL=({{workingDirectory}}/TOE_*)
        shopt -u nullglob
        if [[ ${#TOE_FINAL[@]} -gt 0 ]]; then
            echo "Failed to delete {{workingDirectory}}/TOE_*"
            exit 1
        fi
    fi
fi

# Clean up for ssm log files
if [[ -f {{workingDirectory}}/skip_cleanup_ssm_log_files ]]; then
    echo "Skipping cleanup of ssm log files"
else
    echo "Cleaning up ssm log files"
    if [[ -d "/var/log/amazon/ssm" ]]; then
        if [[ $( sudo find /var/log/amazon/ssm -type f | sudo wc -l) -gt 0 ]]; then
            echo "Deleting files within /var/log/amazon/ssm/*"
```

```
            sudo find /var/log/amazon/ssm -type f -exec shred -zuf {} \;
        fi
        if [[ $( sudo find /var/log/amazon/ssm -type f | sudo wc -l) -gt 0 ]]; then
            echo "Failed to delete /var/log/amazon/ssm"
            exit 1
        fi
        echo "Deleting /var/log/amazon/ssm/*"
        sudo rm -rf /var/log/amazon/ssm
        if [[ -d "/var/log/amazon/ssm" ]]; then
            echo "Failed to delete /var/log/amazon/ssm"
            exit 1
        fi
    fi
fi


shopt -s nullglob
SA_MATCHES=(/var/log/sa/sa*)
shopt -u nullglob
if [[ ${#SA_MATCHES[@]} -gt 0 ]]; then
    echo "Deleting /var/log/sa/sa*"
    sudo shred -zuf "${SA_MATCHES[@]}"
    shopt -s nullglob
    SA_REMAINING=(/var/log/sa/sa*)
    shopt -u nullglob
    if [[ ${#SA_REMAINING[@]} -gt 0 ]]; then
        echo "Failed to delete /var/log/sa/sa*"
        exit 1
    fi
fi

shopt -s nullglob
DHCLIENT_MATCHES=(/var/lib/dhclient/dhclient*.lease)
shopt -u nullglob
if [[ ${#DHCLIENT_MATCHES[@]} -gt 0 ]]; then
    echo "Deleting /var/lib/dhclient/dhclient*.lease"
    sudo shred -zuf "${DHCLIENT_MATCHES[@]}"
    shopt -s nullglob
    DHCLIENT_REMAINING=(/var/lib/dhclient/dhclient*.lease)
    shopt -u nullglob
    if [[ ${#DHCLIENT_REMAINING[@]} -gt 0 ]]; then
        echo "Failed to delete /var/lib/dhclient/dhclient*.lease"
        exit 1
    fi
```

```
fi

if [[ $( sudo find /var/tmp -type f | sudo wc -l) -gt 0 ]]; then
    echo "Deleting files within /var/tmp/*"
    sudo find /var/tmp -type f -exec shred -zuf {} \;
fi
if [[ $( sudo find /var/tmp -type f | sudo wc -l) -gt 0 ]]; then
    echo "Failed to delete /var/tmp"
    exit 1
fi
if [[ $( sudo ls /var/tmp | sudo wc -l ) -gt 0 ]]; then
    echo "Deleting /var/tmp/*"
    sudo rm -rf /var/tmp/*
fi

if [[ -f "/var/lib/systemd/random-seed" ]]; then
    echo "Deleting /var/lib/systemd/random-seed"
    sudo shred -zuf /var/lib/systemd/random-seed
    sudo rm -f /var/lib/systemd/random-seed
fi

# Shredding is not guaranteed to work well on rolling logs

if [[ -f "/var/lib/rsyslog/imjournal.state" ]]; then
    echo "Deleting /var/lib/rsyslog/imjournal.state"
    sudo shred -zuf /var/lib/rsyslog/imjournal.state
    sudo rm -f /var/lib/rsyslog/imjournal.state
fi

if [[ -d "/var/log/journal" ]] && [[ $( sudo ls /var/log/journal/ | sudo wc -l ) -gt
 0 ]]; then
    echo "Deleting /var/log/journal/*"
    sudo find /var/log/journal/ -type f -exec shred -zuf {} \;
    sudo rm -rf /var/log/journal/*
fi

if [[ -f "/etc/machine-id" ]]; then
    echo "Truncating /etc/machine-id"
    sudo truncate -s 0 /etc/machine-id
fi

if [[ -f "/var/lib/dbus/machine-id" ]]; then
    echo "Truncating /var/lib/dbus/machine-id"
    sudo truncate -s 0 /var/lib/dbus/machine-id
```

```
fi

sudo touch /etc/machine-id

# Flush all pending writes to disk before instance shutdown and snapshot
sync

echo "Sanitize OK"


################################################################################
# Image Builder appends the following steps to the clean up script to uninstall
# the Systems Manager (SSM) agent and, on Amazon Linux 1, Amazon Linux 2, and
# Amazon Linux 2023, to remove the cronie package when Image Builder installed a
# crontab during the build. Image Builder uses the /tmp/imagebuilder_service
# working directory to track what it installed.
################################################################################

SERVICE_ROOT_WORKING_DIR="/tmp/imagebuilder_service"

# SSM_UNINSTALL_CONDITION reflects the systemsManagerAgent.uninstallAfterBuild
# recipe setting and how the SSM agent was installed:
#   SSM_INSTALLED_BY_CUSTOMER      - always uninstall the SSM agent
#   SSM_INSTALLED_BY_IMAGE_BUILDER - uninstall only if Image Builder installed it
#   (any other value)              - leave the SSM agent in the final image
SSM_UNINSTALL_CONDITION="<uninstallAfterBuild condition>"

function error_exit {
  echo "$1" 1>&2
  exit 1
}

function ssm_exists() {
  eval "$1"  > /dev/null 2>&1
  echo $?
}

function cleanup_image() {
  rm -rf "${SERVICE_ROOT_WORKING_DIR}"
}

function uninstall_ssm_agent() {

  uninstall_package="$1"
```

```
 uninstall_all=""
 uninstall_success="false"

 if [ "${uninstall_package}" == "" ]; then
   uninstall_all="true"
 fi

 yum="sudo yum search amazon-ssm-agent | grep amazon-ssm-agent"
 snap="sudo snap list amazon-ssm-agent"
 rpm="sudo rpm -qa amazon-ssm-agent | grep amazon-ssm-agent"
 dpkg="sudo dpkg --get-selections | grep amazon-ssm-agent"
 pkg="su -m root -c \"pkg info -l amazon-ssm-agent | grep amazon-ssm-agent\""


 if [[ ("${uninstall_all}" == "true" || "${uninstall_package}" == "snap") &&
$(ssm_exists "${snap}") -eq 0 ]]; then
   echo "Package found in Snap.... Uninstalling"
   (sleep 30 ; sudo snap remove amazon-ssm-agent) &>/dev/null &
   uninstall_success="true"
 fi

 if [[ ("${uninstall_all}" == "true" || "${uninstall_package}" == "yum") &&
$(ssm_exists "${yum}") -eq 0 ]]; then
   echo "Package found in Yum.... Uninstalling"
   (sleep 30 ; sudo yum remove -y amazon-ssm-agent) &>/dev/null &
   uninstall_success="true"
 fi

 if [[ ("${uninstall_all}" == "true" || "${uninstall_package}" == "rpm") &&
$(ssm_exists "${rpm}") -eq 0 ]]; then
   echo "Package found in Rpm.... Uninstalling"
   (sleep 30 ; sudo rpm -e amazon-ssm-agent) &>/dev/null &
   uninstall_success="true"
 fi

 if [[ ("${uninstall_all}" == "true" || "${uninstall_package}" == "dpkg") &&
$(ssm_exists "${dpkg}") -eq 0 ]]; then
   echo "Package found in Dpkg.... Uninstalling"
   (sleep 30 ; sudo dpkg -r --force-all amazon-ssm-agent) &>/dev/null &
   uninstall_success="true"
 fi

 if [[ ("${uninstall_all}" == "true" || "${uninstall_package}" == "pkg") &&
$(ssm_exists "${pkg}") -eq 0 ]]; then
```

```
    echo "Package found in FreeBSD.... Uninstalling"
    (sleep 30 ; su -m root -c "pkg remove -y amazon-ssm-agent") &> /dev/null &
    uninstall_success="true"
  fi

  if [ "${uninstall_success}" == "false" ] ; then
    error_exit "Unable to uninstall an SSM agent"
  fi
}

# Amazon Linux releases where Image Builder installs cronie to provide a crontab:
# Amazon Linux AMI (AL1), AL2, and AL2023.
function is_cronie_supported_amazon_linux() {
    if [ "$(get_os_type)" != "amzn" ]; then
        return 1
    fi
    case "$(get_os_version)" in
        2|2023) return 0 ;;
        # AL1 releases use date-based versions from 2010 through 2018.
        201[0-8].[0-9][0-9]) return 0 ;;
        *) return 1 ;;
    esac
}

function uninstall_crontab() {
    if is_cronie_supported_amazon_linux ; then
        echo "Uninstalling cronie package"
        sudo yum remove -y cronie
    fi
}

function get_os_type() {
    FILE=/etc/os-release
    if [ -e $FILE ]; then
        . $FILE
        echo $ID
    else
        echo ""
    fi
}

function get_os_version() {
    FILE=/etc/os-release
    if [ -e $FILE ]; then
```

```
        . $FILE
        echo $VERSION_ID
    else
        echo ""
    fi
}

if [ "${SSM_UNINSTALL_CONDITION}" == "SSM_INSTALLED_BY_CUSTOMER" ] ; then
  echo "Uninstall after build set to true. Uninstalling SSM agent."
  uninstall_ssm_agent

elif [ "${SSM_UNINSTALL_CONDITION}" == "SSM_INSTALLED_BY_IMAGE_BUILDER" ] ; then
  echo "Checking if the SSM agent was installed by Image Builder"
  if [[ -f ${SERVICE_ROOT_WORKING_DIR}/ssm_installed ]] ; then
    package_manager="$(cat ${SERVICE_ROOT_WORKING_DIR}/ssm_installed)"
    echo "Uninstalling the SSM agent installed by Image Builder using
 ${package_manager}"
    uninstall_ssm_agent "${package_manager}"
  fi
else
  echo "Uninstall after build set to false. Skipping SSM agent uninstall."
fi

# When Image Builder installs a crontab during the build (on Amazon Linux 1,
# Amazon Linux 2, or Amazon Linux 2023), it records a crontab_installed marker
# and removes the cronie package here. To keep cronie in your final image,
# delete the marker before clean up runs:
#   rm -f /tmp/imagebuilder_service/crontab_installed
if [[ -f ${SERVICE_ROOT_WORKING_DIR}/crontab_installed ]] ; then
  echo "Uninstalling crontab installed by Image Builder"
  uninstall_crontab
fi

cleanup_image
```

Windows

After the Image Builder pipeline customizes Windows images, it runs the Microsoft Sysprep utility. These actions follow AWS best practices for hardening and cleaning the image.

macOS

The Image Builder pipeline runs a clean up script to help ensure that the final image follows security best practices, and to remove any build artifacts or settings that should not carry over

to your snapshot. However, you can skip sections of the script, or override the user data entirely. Therefore, the images produced by Image Builder pipelines are not necessarily compliant with any specific regulatory criteria.

When the pipeline completes its build and test stages, Image Builder automatically runs the following clean-up script just before it creates the output image.

> **Important**
>
> If you override **User data** in your recipe, the script doesn't run. In that case, make sure that you include a command in your user data that creates an empty file named `perform_cleanup`. Image Builder detects this file and runs the clean-up script prior to creating the new image.

```
#!/bin/bash
if [[ ! -f {{workingDirectory}}/perform_cleanup ]]; then
  echo "Skipping cleanup"
  exit 0
else
  sudo rm -f {{workingDirectory}}/perform_cleanup
fi

function cleanup() {
  FILES=("$@")
  for FILE in "${FILES[@]}"; do
      if [[ -f "$FILE" ]]; then
          echo "Deleting $FILE";
          sudo rm -f $FILE;
      fi;
      if [[ -f $FILE ]]; then
          echo "Failed to delete '$FILE'. Failing."
          exit 1
      fi;
  done
};

# Reset EC2 macOS Init instance history so the image behaves as a first boot
if [[ -f {{workingDirectory}}/skip_cleanup_ec2_macos_init_files ]]; then
  echo "Skipping cleanup of ec2-macos-init instance history"
else
  echo "Cleaning up ec2-macos-init instance history"
```

```
  if [[ -x /usr/local/bin/ec2-macos-init ]]; then
      sudo /usr/local/bin/ec2-macos-init clean -all
  fi
fi

# Clean up for temporary instance files
INSTANCE_FILES=(
  "/Library/Preferences/SystemConfiguration/NetworkInterfaces.plist"
)
if [[ -f {{workingDirectory}}/skip_cleanup_instance_files ]]; then
  echo "Skipping cleanup of instance files"
else
  echo "Cleaning up instance files"
  cleanup "${INSTANCE_FILES[@]}"
fi;


# Clean up for ssh files
SSH_FILES=(
  "/etc/ssh/ssh_host_rsa_key"
  "/etc/ssh/ssh_host_rsa_key.pub"
  "/etc/ssh/ssh_host_ecdsa_key"
  "/etc/ssh/ssh_host_ecdsa_key.pub"
  "/etc/ssh/ssh_host_ed25519_key"
  "/etc/ssh/ssh_host_ed25519_key.pub"
  "/var/root/.ssh/authorized_keys"
)
if [[ -f {{workingDirectory}}/skip_cleanup_ssh_files ]]; then
  echo "Skipping cleanup of ssh files"
else
  echo "Cleaning up ssh files"
  cleanup "${SSH_FILES[@]}"
  USERS=$(ls /Users/)
  for user in $USERS; do
      if [[ -f /Users/"$user"/.ssh/authorized_keys ]]; then
          echo Deleting /Users/"$user"/.ssh/authorized_keys;
          sudo rm -f /Users/"$user"/.ssh/authorized_keys;
      fi;
  done
  for user in $USERS; do
      if [[ -f /Users/"$user"/.ssh/authorized_keys ]]; then
          echo Failed to delete /Users/"$user"/.ssh/authorized_keys;
          exit 1
      fi;
```

```
  done;
fi;


# Clean up for instance log files
INSTANCE_LOG_FILES=(
  "/var/log/amazon/ec2/ec2-macos-init.log"
  "/var/log/amazon/ec2/ena-ethernet.log"
  "/var/log/amazon/ec2/system-monitoring.log"
)
if [[ -f {{workingDirectory}}/skip_cleanup_instance_log_files ]]; then
  echo "Skipping cleanup of instance log files"
else
  echo "Cleaning up instance log files"
  cleanup "${INSTANCE_LOG_FILES[@]}"
fi;

# Clean up for TOE files
if [[ -f {{workingDirectory}}/skip_cleanup_toe_files ]]; then
  echo "Skipping cleanup of TOE files"
else
  echo "Cleaning TOE files"
  shopt -s nullglob
  TOE_MATCHES=({{workingDirectory}}/TOE_*)
  shopt -u nullglob
  if [[ ${#TOE_MATCHES[@]} -gt 0 ]]; then
      if [[ $( sudo find "${TOE_MATCHES[@]}" -type f | sudo wc -l) -gt 0 ]]; then
          echo "Deleting files within {{workingDirectory}}/TOE_*"
          sudo find "${TOE_MATCHES[@]}" -type f -exec rm -f {} \;
      fi
      shopt -s nullglob
      TOE_REMAINING=({{workingDirectory}}/TOE_*)
      shopt -u nullglob
      if [[ ${#TOE_REMAINING[@]} -gt 0 ]]; then
          if [[ $( sudo find "${TOE_REMAINING[@]}" -type f | sudo wc -l) -gt 0 ]];
 then
              echo "Failed to delete {{workingDirectory}}/TOE_*"
              exit 1
          fi
          echo "Deleting {{workingDirectory}}/TOE_*"
          sudo rm -rf "${TOE_REMAINING[@]}"
      fi
      shopt -s nullglob
      TOE_FINAL=({{workingDirectory}}/TOE_*)
```

```
      shopt -u nullglob
      if [[ ${#TOE_FINAL[@]} -gt 0 ]]; then
          echo "Failed to delete {{workingDirectory}}/TOE_*"
          exit 1
      fi
  fi
fi

# Clean up for ssm log files
if [[ -f {{workingDirectory}}/skip_cleanup_ssm_log_files ]]; then
  echo "Skipping cleanup of ssm log files"
else
  echo "Cleaning up ssm log files"
  if [[ -d "/var/log/amazon/ssm" ]]; then
      if [[ $( sudo find /var/log/amazon/ssm -type f | sudo wc -l) -gt 0 ]]; then
          echo "Deleting files within /var/log/amazon/ssm/*"
          sudo find /var/log/amazon/ssm -type f -exec rm -f {} \;
      fi
      if [[ $( sudo find /var/log/amazon/ssm -type f | sudo wc -l) -gt 0 ]]; then
          echo "Failed to delete /var/log/amazon/ssm"
          exit 1
      fi
      echo "Deleting /var/log/amazon/ssm/*"
      sudo rm -rf /var/log/amazon/ssm
      if [[ -d "/var/log/amazon/ssm" ]]; then
          echo "Failed to delete /var/log/amazon/ssm"
          exit 1
      fi
  fi
fi


# Clean up for DHCP lease files
shopt -s nullglob
DHCP_LEASE_MATCHES=(/var/db/dhcpclient/leases/*)
shopt -u nullglob
if [[ ${#DHCP_LEASE_MATCHES[@]} -gt 0 ]]; then
  echo "Deleting /var/db/dhcpclient/leases/*"
  sudo rm -f "${DHCP_LEASE_MATCHES[@]}"
  shopt -s nullglob
  DHCP_LEASE_REMAINING=(/var/db/dhcpclient/leases/*)
  shopt -u nullglob
  if [[ ${#DHCP_LEASE_REMAINING[@]} -gt 0 ]]; then
      echo "Failed to delete /var/db/dhcpclient/leases/*"
```

```
      exit 1
  fi
fi

if [[ $( sudo find /var/tmp -type f | sudo wc -l) -gt 0 ]]; then
      echo "Deleting files within /var/tmp/*"
      sudo find /var/tmp -type f -exec rm -f {} \;
fi
if [[ $( sudo find /var/tmp -type f | sudo wc -l) -gt 0 ]]; then
      echo "Failed to delete /var/tmp"
      exit 1
fi
if [[ $( sudo ls /var/tmp | sudo wc -l ) -gt 0 ]]; then
      echo "Deleting /var/tmp/*"
      sudo rm -rf /var/tmp/*
fi

# Flush all pending writes to disk before instance shutdown and snapshot
sync
```

Override the Linux clean up script

Image Builder creates images that are secure by default and follow our security best practices. However, some more advanced use-cases might require you to skip one or more sections of the built-in clean up script. If you do need to skip some of the clean up, we strongly recommend that you test your output AMI to ensure the security of your image.

> **Important**
>
> Skipping sections in the clean up script can result in sensitive information, such as owner account details or SSH keys being included in the final image, and in any instance launched from that image. You might also experience problems with launching in different Availability Zones, Regions, or accounts.

The following table outlines the sections of the clean up script, the files that are deleted in that section, and the file names that you can use to flag a section that Image Builder should skip. To skip a specific section of the clean up script, you can use the CreateFile component action module or a command in your user data (if overriding) to create an empty file with the name specified in the **Skip section file name** column.

Note

The files that you create to skip a section of the clean up script should not include a file extension. For example, if you want to skip the `CLOUD_INIT_FILES` section of the script, but you create a file named `skip_cleanup_cloudinit_files.txt`, Image Builder will not recognize the skip file.

Input

Clean up section	Files removed	Skip section file name

`CLOUD_INIT_FILES`	`/etc/sudoers.d/90-cloud-init-users`
	`/etc/locale.conf`
	`/var/log/cloud-init.log`
	`/var/log/cloud-init-output.log`
	All files under `/var/lib/cloud/`
		`skip_cleanup_cloudinit_files`

`INSTANCE_FILES`	`/etc/.updated`
	`/etc/aliases.db`
	`/etc/hostname`
	`/var/lib/misc/postfix.aliasesdb-stamp`
	`/var/lib/postfix/master.lock`
	`/var/spool/postfix/pid/master.pid`
		`skip_cleanup_instance_files`

Clean up section	Files removed	Skip section file name
	/var/.updated /var/cache/yum/x86_64/2/.gpgkeyschecked.yum	
SSH_FILES	/etc/ssh/ssh_host_rsa_key /etc/ssh/ssh_host_rsa_key.pub /etc/ssh/ssh_host_ecdsa_key /etc/ssh/ssh_host_ecdsa_key.pub /etc/ssh/ssh_host_ed25519_key /etc/ssh/ssh_host_ed25519_key.pub /root/.ssh/authorized_keys /home/<all users>/.ssh/authorized_keys	skip_cleanup_ssh_files
INSTANCE_LOG_FILES	/var/log/audit/audit.log /var/log/boot.log /var/log/dmesg /var/log/cron	skip_cleanup_instance_log_files

Clean up section	Files removed	Skip section file name
TOE_FILES	{{workingDirectory}}/TOE_*	skip_cleanup_toe_files
SSM_LOG_FILES	/var/log/amazon/ssm/*	skip_cleanup_ssm_log_files

Clean up steps that always run

The sections in the preceding table are the only parts of the clean up script that you can skip. After the script processes those sections, it also removes the following items, and you can't skip these steps:

- /var/log/sa/sa*
- /var/lib/dhclient/dhclient*.lease
- All files under /var/tmp/
- /var/lib/systemd/random-seed
- /var/lib/rsyslog/imjournal.state
- All files under /var/log/journal/

The script also truncates the machine ID files /etc/machine-id and /var/lib/dbus/machine-id. This ensures that each instance launched from the image generates a unique machine ID.

Override the macOS clean up script

Image Builder creates images that are secure by default and follow our security best practices. However, some more advanced use-cases might require you to skip one or more sections of the built-in clean up script. If you do need to skip some of the clean up, we strongly recommend that you test your output AMI to ensure the security of your image.

Important

Skipping sections in the clean up script can result in sensitive information, such as owner account details or SSH keys being included in the final image, and in any instance launched from that image. You might also experience problems with launching in different Availability Zones, Regions, or accounts.

The following table outlines the sections of the clean up script, the files that are deleted in that section, and the file names that you can use to flag a section that Image Builder should skip. To skip a specific section of the clean up script, you can use the CreateFile component action module or a command in your user data (if overriding) to create an empty file with the name specified in the **Skip section file name** column.

Note

The files that you create to skip a section of the clean up script should not include a file extension. For example, if you want to skip the `INSTANCE_FILES` section of the script, but you create a file named `skip_cleanup_instance_files.txt`, Image Builder will not recognize the skip file.

Input

Clean up section	Files removed	Skip section file name
`EC2_MACOS_INIT_FILES`	Runs `ec2-macos-init clean -all` to reset the EC2 macOS Init instance history so the image behaves as a first boot.	`skip_cleanup_ec2_macos_init_files`
`INSTANCE_FILES`	`/Library/Preferences/SystemConfiguration/NetworkInterfaces.plist`	`skip_cleanup_instance_files`

Clean up section	Files removed	Skip section file name
SSH_FILES	/etc/ssh/ssh_host_rsa_key /etc/ssh/ssh_host_rsa_key.pub /etc/ssh/ssh_host_ecdsa_key /etc/ssh/ssh_host_ecdsa_key.pub /etc/ssh/ssh_host_ed25519_key /etc/ssh/ssh_host_ed25519_key.pub /var/root/.ssh/authorized_keys /Users/<all users>/.ssh/authorized_keys	skip_cleanup_ssh_files
INSTANCE_LOG_FILES	/var/log/amazon/ec2/ec2-macos-init.log /var/log/amazon/ec2/ena-ethernet.log /var/log/amazon/ec2/system-monitoring.log	skip_cleanup_instance_log_files
TOE_FILES	{{workingDirectory}}/TOE_*	skip_cleanup_toe_files

Clean up section	Files removed	Skip section file name
SSM_LOG_FILES	/var/log/amazon/ssm/*	skip_cleanup_ssm_log_files

Troubleshoot Image Builder issues

EC2 Image Builder integrates with AWS services for monitoring and troubleshooting to help you troubleshoot image build issues. Image Builder tracks and displays the progress for each step in the image building process. Additionally, Image Builder can export logs to an Amazon S3 location that you provide.

For advanced troubleshooting, you can run predefined commands and scripts using AWS Systems Manager Run Command.

> **Tip**
>
> You can use the Troubleshoot feature, powered by AWS DevOps Agent, to diagnose failed builds and get AI-powered root cause analysis with remediation steps. For more information, see Troubleshoot failed builds with AI - Preview.

Contents

- Troubleshoot pipeline builds
- Find the cause of a failed image build with failure context
- Troubleshooting scenarios
- Troubleshoot failed builds with AI - Preview
- Troubleshoot builds with an AI coding agent

Troubleshoot pipeline builds

If an Image Builder pipeline build fails, Image Builder returns an error message that describes the failure. Image Builder also returns a `workflow execution ID` in the failure message, such as the one in the following example output:

```
Workflow Execution ID: wf-12345abc-6789-0123-abc4-567890123abc failed with reason: …
```

A failed image also carries structured failure context that names the workflow step, component step, or distribution that caused the failure. For more information, see Find the cause of a failed image build with failure context.

Image Builder arranges and directs image build actions through a series of steps that are defined for the runtime stages in its standard image creation process. The build and test stages of the process each have an associated workflow. When Image Builder runs a workflow to build or test a new image, it generates a workflow metadata resource that keeps track of runtime details.

Container images have an additional workflow that runs during distribution.

Research details for runtime instance failures for your workflow

To troubleshoot a runtime failure for your workflow, you can call the GetWorkflowExecution and ListWorkflowStepExecutions API actions with your `workflow execution ID`.

Review workflow runtime logs

- **Amazon CloudWatch Logs**

  Image Builder publishes detailed workflow execution logs to the following Image Builder CloudWatch Logs group and stream:

  With CloudWatch Logs, you can search log data with filter patterns. For more information, see Search log data using filter patterns in the *Amazon CloudWatch Logs User Guide*.
- **AWS CloudTrail**

  All build activity is also logged in CloudTrail if it's activated in your account. You can filter CloudTrail events by the source `imagebuilder.amazonaws.com`. Alternatively, you can search for the Amazon EC2 instance ID that is returned in the execution log to see more details about the pipeline execution.
- **Amazon Simple Storage Service (S3)**

  If you've specified an S3 bucket name and key prefix in your infrastructure configuration, the workflow step runtime log path follows this pattern:

  ```
  S3://S3BucketName/KeyPrefix/ImageName/ImageVersion/ImageBuildVersion/
  WorkflowExecutionId/StepName
  ```

  The logs that you send to your S3 bucket show the steps and error messages for activity on the EC2 instance during the image build process. The logs include log outputs from the component manager, the definitions of the components that were run, and the detailed output (in JSON) of all of the steps taken on the instance. If you encounter an issue, you should review these files, starting with `application.log`, to diagnose the cause of the problem on the instance.

By default, Image Builder shuts down the Amazon EC2 build or test instance that is running when the pipeline fails. You can change the instance settings for the infrastructure configuration resource that your pipeline uses, to retain your build or test instance for troubleshooting.

To change the instance settings in the console, you must clear the **Terminate instance on failure** check box located in the **Troubleshooting settings** section of your infrastructure configuration resource.

You can also change the instance settings with the **update-infrastructure-configuration** command in the AWS CLI. Set the `terminateInstanceOnFailure` value to `false` in the JSON file that the command references with the `--cli-input-json` parameter. For details, see Update an infrastructure configuration.

> **Tip**
>
> For information about a sample that deploys a build that fails on purpose, with a walkthrough that shows where each failure class leaves evidence, see the debugging sample on GitHub. For more information, see Explore Image Builder sample projects on GitHub.

Find the cause of a failed image build with failure context

When an image build fails, Image Builder reports the failure in the image `state`. The state carries a message that describes the failure in `reason`, and structured **failure context** in `failureContext`.

Failure context is a set of fields that name the workflow, the workflow step, the component step, and the destination Regions involved in the failure. Because the fields are structured, your automation can branch on them directly, and you can pass their values to other Image Builder API operations to get more detail.

Image Builder returns failure context from the GetImage, ListImageBuildVersions, and ListImagePipelineImages API operations, and displays it in the Image Builder AWS Management Console.

Contents

- What failure context contains
- View failure context for a failed image

- Trace a failure to its root cause
- Use failure context with AI agents
- Considerations

What failure context contains

Failure context describes a failure at three levels. Every member is optional, and Image Builder returns only the members that apply to the failure. For the members, their types, and their constraints, see ImageState in the *EC2 Image Builder API Reference*.

The image

Which stage the image was in when it failed, and which workflow and workflow step were running. The workflow and step execution identifiers are the same values that ListWorkflowStepExecutions and GetWorkflowStepExecution take, so you can pass them straight to those operations.

The component step

For a build or test failure that a component caused, the component that ran, the phase and step within its document, the AWSTOE action module that the step ran, and the error the step reported. Image Builder identifies the component by build version, so it names the exact revision that ran even when your recipe references a wildcard version. For the action modules, see Action modules supported by AWSTOE component manager.

The destination Regions

For a distribution or integration failure, a summary error for the distribution as a whole, and one entry for each destination that failed. Each entry carries its , how the distribution ended there, the error from the service that Image Builder called, and, for a cross-account distribution, the target AWS account that Image Builder distributed to. When the AMI copy succeeded but a step that follows it didn't, the entry also names that step – associating license configurations, updating launch templates, putting SSM parameters, updating Amazon EC2 Fast Launch configurations, or exporting the AMI. Destinations that succeeded are omitted.

Note

Which members Image Builder returns depends on how far the build progressed. A failure that happens before Image Builder starts a workflow has no workflow to name. For

example, if the parent image in your recipe no longer exists, failure context identifies the stage and nothing more.

The examples in View failure context for a failed image show the members that Image Builder returns for a component failure and for a distribution failure.

View failure context for a failed image

View failure context in the Image Builder console

Image Builder displays the failure details for an image wherever it displays a `Failed` image status.

1. Open the EC2 Image Builder console at https://console.aws.amazon.com/imagebuilder/.
2. Choose **Images** from the navigation pane, and then choose the failed image build version. You can also open the **Output images** list for a pipeline.
3. Choose the `Failed` image status. Image Builder displays the failure details for the image, and links the failed workflow step to its runtime detail.

Get failure context with the AWS CLI

Run the **get-image** command with the build version ARN of the failed image.

```
aws imagebuilder get-image \
    --image-build-version-arn arn:aws:imagebuilder:us-west-2:123456789012:image/my-example-recipe/1.0.0/1 \
    --query "image.state"
```

The following example output shows a build that failed because a component step ran a script that exited with a non-zero status.

```
{
    "status": "FAILED",
    "reason": "Workflow Execution ID: 'wf-a1b2c3d4-5678-90ab-cdef-EXAMPLE11111' failed with reason: Document arn:aws:imagebuilder:us-west-2:123456789012:component/my-example-component/1.0.0/1 failed!",
    "failureContext": {
        "imageStatus": "BUILDING",
        "workflowExecutionId": "wf-a1b2c3d4-5678-90ab-cdef-EXAMPLE11111",
```

```
        "workflowArn": "arn:aws:imagebuilder:us-west-2:aws:workflow/build/build-
image/x.x.x/x",
        "stepExecutionId": "step-a1b2c3d4-5678-90ab-cdef-EXAMPLE22222",
        "failedStep": "ApplyBuildComponents",
        "componentFailure": {
            "componentArn": "arn:aws:imagebuilder:us-west-2:123456789012:component/my-
example-component/1.0.0/1",
            "phaseName": "build",
            "stepName": "InstallPackages",
            "action": "ExecuteBash",
            "errorMessage": "exit status 1"
        }
    }
}
```

The next example output shows an image that built and tested successfully, then failed while Image Builder updated launch templates in three destination Regions. The build succeeded in every other destination, so only the three failed Regions appear.

```
{
    "status": "FAILED",
    "reason": "Integration failed with JobId 'a1b2c3d4-5678-90ab-cdef-EXAMPLE33333',
 status = 'Failed' for ARN 'arn:aws:imagebuilder:us-west-2:123456789012:image/my-
example-recipe/1.0.0/1'. …",
    "failureContext": {
        "imageStatus": "INTEGRATING",
        "distributionFailure": {
            "errorMessage": "In region 'eu-west-1' - 'EC2 Client Error: 'The launch-
template ID 'lt-0a1b2c3d4EXAMPLE' does not exist'' …",
            "regionFailures": [
                {
                    "region": "eu-west-1",
                    "status": "FAILED",
                    "imageConfigurationStep": "UPDATE_LAUNCH_TEMPLATES",
                    "errorMessage": "EC2 Client Error: 'The launch-template ID
 'lt-0a1b2c3d4EXAMPLE' does not exist'"
                },
                {
                    "region": "us-east-1",
                    "status": "FAILED",
                    "imageConfigurationStep": "UPDATE_LAUNCH_TEMPLATES",
                    "errorMessage": "EC2 Client Error: 'The launch-template ID
 'lt-1a2b3c4d5EXAMPLE' does not exist'"
```

```
                },
                {
                    "region": "us-east-2",
                    "status": "FAILED",
                    "imageConfigurationStep": "UPDATE_LAUNCH_TEMPLATES",
                    "errorMessage": "EC2 Client Error: 'The launch-template ID
 'lt-2a3b4c5d6EXAMPLE' does not exist'"
                }
            ]
        }
    }
}
```

To find the failed builds in an account without inspecting each one, list image build versions and filter on the image status. The following example returns the failed builds for an image, with the failure context for each.

```
aws imagebuilder list-image-build-versions \
    --image-version-arn arn:aws:imagebuilder:us-west-2:123456789012:image/my-example-recipe/1.0.0 \
    --query "imageSummaryList[?state.status=='FAILED'].[arn, state.failureContext]"
```

Trace a failure to its root cause

Failure context narrows a failure down to a single step. Use the following steps to go from that step to the evidence that explains it.

1. **Read `imageStatus` to find the stage that failed.** A value of `BUILDING` or `TESTING` means the failure happened on the Amazon EC2 instance that Image Builder launched, so the component logs are the next place to look. A value of `DISTRIBUTING` or `INTEGRATING` means the image was built and the failure is in your distribution settings or in a destination account or .
2. **Read the member that describes the specific failure.** If `componentFailure` is present, it identifies the failing step in your component document, along with the action the step ran and the error it reported. If `distributionFailure` is present, each entry in `regionFailures` gives you a destination and its own error.
3. **Inspect the workflow runtime detail.** Call ListWorkflowStepExecutions with `workflowExecutionId` to see every step in the workflow and where the failed step falls

in the sequence. Call GetWorkflowStepExecution with `stepExecutionId` for the inputs, outputs, and rollback status of the failed step itself.

The following example lists the steps for a failed workflow execution.

```
aws imagebuilder list-workflow-step-executions \
    --workflow-execution-id wf-a1b2c3d4-5678-90ab-cdef-EXAMPLE11111
```

4. **Read the logs for the failed step.** Use `workflowExecutionId` and `failedStep` to go directly to the log path for that step. For more information, see Get the full component output from the logs.
5. **Reproduce the failure if you need to.** To keep the build instance running so that you can connect to it, clear the **Terminate instance on failure** setting in the infrastructure configuration that your pipeline uses. For more information, see Troubleshoot pipeline builds.

Get the full component output from the logs

Failure context reports the error that a component step raised, but not the standard output and standard error of the script that the step ran. Image Builder keeps that output in the component logs.

When a component fails, AWSTOE writes the details of the first failed step to the console log, followed by the complete standard error output for that step.

```
  Document: MyExampleDocument
  ComponentArn: arn:aws:imagebuilder:us-west-2:123456789012:component/my-example-
component/1.0.0/1
  Phase: build
  Step: InstallPackages
  Action: ExecuteBash
  ErrorMessage: exit status 1
  Stderr: the full standard error output of the step
```

`ComponentArn` is the same value that `componentFailure.componentArn` reports, so use it to match the log block to the failure context for an image. `Document` is the `name` that the component document declares, which the author chooses independently of the component resource, so the two can differ and `Document` alone doesn't identify which component failed.

AWSTOE writes `ErrorMessage` and `Stderr` only when the failed step produced them.

Image Builder streams the component logs to Amazon CloudWatch Logs when the build completes. If you specified an Amazon S3 bucket in your infrastructure configuration, Image Builder also writes them there. For the log group and stream names, see Monitor Image Builder logs with Amazon CloudWatch Logs. For the files that AWSTOE produces and what each one contains, see Component logging.

Use failure context with AI agents

Failure context is designed to be read by automation as well as by people. An AI agent that troubleshoots a failed build reads the named fields and uses their values as arguments to the next API call it makes. That makes a diagnosis repeatable, and it keeps the agent from guessing which component or to investigate.

You can use failure context in either of the following ways:

- **Troubleshoot in the Image Builder AWS Management Console** – The Troubleshoot feature, powered by AWS DevOps Agent, uses failure context to scope its investigation to the workflow step and component that failed before it examines logs and related resources. For more information, see Troubleshoot failed builds with AI - Preview.
- **Your own AI coding agent** – An agent that calls `GetImage` receives failure context in the response and can follow it the same way. To give your agent the broader Image Builder knowledge it needs to act on what it finds, see Troubleshoot builds with an AI coding agent.

If you build your own automation on failure context, treat every member as optional and check for the members you use rather than for the presence of `failureContext` itself. Which members Image Builder returns depends on the failure, and Image Builder can add members over time.

Considerations

Note the following when you use failure context:

- Image Builder returns failure context only for images that failed. A successful image and an image that you cancelled don't have it.
- A failed image carries both `reason` and `failureContext`. Use `reason` for a readable summary of the failure, and `failureContext` to locate it.
- If a component uses the `ExecuteDocument` action to run a nested document, failure context identifies the component that Image Builder ran from your recipe, not the nested document.

- Error messages in failure context are bounded in length and can be truncated. The component logs hold the complete output.
- Failure context reports the first step that failed. If more than one step failed, review the workflow step executions and the component logs for the rest.
- Error messages can contain text that a component or another AWS service produced. Treat them as untrusted input if you render them or pass them to another system.

Troubleshooting scenarios

This section lists the following detailed troubleshooting scenarios:

- Access denied – status code 403
- Build times out while verifying the Systems Manager Agent availability on the build instance
- Windows secondary disk is offline at launch
- Build fails with CIS hardened base image
- AssertInventoryCollection fails (Systems Manager Automation)

To see the details of a scenario, choose the scenario title to expand it. You can have multiple titles expanded at the same time.

Access denied – status code 403

Description

The pipeline build fails with "AccessDenied: Access Denied status code: 403".

Cause

Possible causes include:

- The instance profile does not have the required permissions to access APIs or component resources.
- The instance profile role is missing permissions that are required for logging to Amazon S3. Most commonly, this occurs when the instance profile role does not have **PutObject** permissions for your S3 buckets.

Solution

Depending on the cause, this issue can be resolved as follows:

- **Instance profile is missing managed policies** – Add the missing policies to your instance profile role. Then run the pipeline again.
- **Instance profile is missing write permissions for S3 bucket** – Add a policy to your instance profile role that grants **PutObject** permissions to write to your S3 bucket. Then run the pipeline again.

Build times out while verifying the Systems Manager Agent availability on the build instance

Description

The pipeline build fails with "status = 'TimedOut'" and "failure message = 'Step timed out while step is verifying the Systems Manager Agent availability on the target instance(s)'".

Cause

Possible causes include:

- The instance that was launched to perform the build operations and to run components was not able to access the Systems Manager endpoint.
- The instance profile does not have the required permissions.

Solution

Depending on the possible cause, this issue can be resolved as follows:

- **Access issue, private subnet** – If you are building in a private subnet, make sure that you have set up PrivateLink endpoints for Systems Manager, Image Builder, and, if you want logging, Amazon S3/CloudWatch. For more information about setting up PrivateLink endpoints, see Access AWS services through AWS PrivateLink.
- **Missing permissions** – Add the following managed policies to your IAM service-linked role for Image Builder:
  - EC2InstanceProfileForImageBuilder
  - EC2InstanceProfileForImageBuilderECRContainerBuilds

- AmazonSSMManagedInstanceCore

For more information about the Image Builder service-linked role, see Use IAM service-linked roles for Image Builder.

Windows secondary disk is offline at launch

Description

When the instance type used to build an Image Builder Windows AMI does not match the instance type that is used to launch from the AMI, an issue can occur where non-root volumes are offline at launch. This primarily happens when the build instance is using a newer architecture than the launch instance.

The following example demonstrates what happens when an Image Builder AMI is built on an EC2 Nitro instance type and launched on an EC2 Xen instance:

Build instance type: m5.large (Nitro)

Launch instance type: t2.medium (Xen)

```
PS C:\Users\Administrator> get-disk
Number  Friendly Name  Serial Number         Health Status  Operational Status  Total
 Size  Partition Style
------  -------------  -------------         -------------  ------------------
 ----------  ---------------
0       AWS PVDISK     vol0abc12d34e567f8a9  Healthy        Online                  30
 GB  MBR
1       AWS PVDISK     vol1bcd23e45f678a9b0  Healthy        Offline                  8
 GB  MBR
```

Cause

Because of Windows default settings, newly discovered disks are not automatically brought online and formatted. When the instance type is changed on EC2, Windows treats this as new disks being discovered. This is because of the underlying driver change.

Solution

We recommend that you use the same system of instance types when building your Windows AMI that you intend to launch from. Do not include instance types that are built on different systems

in your infrastructure configuration. If any of the instance types you specify use the Nitro system, then they should all use the Nitro system.

For more information about instances that are built on the Nitro system, see Instances built on the Nitro System in the *Amazon EC2 User Guide*.

Build fails with CIS hardened base image

Description

You are using a CIS hardened base image and the build fails.

Cause

When the `/tmp` directory is classified as `noexec`, it can cause Image Builder to fail.

Solution

Choose a different location for your working directory in the `workingDirectory` field of the image recipe. For more information, see the ImageRecipe data type description.

AssertInventoryCollection fails (Systems Manager Automation)

Description

Systems Manager Automation shows a failure in the `AssertInventoryCollection` automation step.

Cause

You or your organization might have created a Systems Manager State Manager association that collects inventory information for EC2 instances. If enhanced image metadata collection is enabled for your Image Builder pipeline (this is the default), Image Builder attempts to create a new inventory association for the build instance. However, Systems Manager does not allow multiple inventory associations for managed instances, and prevents a new association if one already exists. This causes the operation to fail, and results in a failed pipeline build.

Solution

To resolve this issue, turn off enhanced image metadata collection, using one of the following methods:

- Update your image pipeline in the console, to clear the **Enable enhanced metadata collection** check box. Save your changes and run a pipeline build.

  For more information about updating your AMI image pipeline using the EC2 Image Builder console, see Update AMI image pipelines from the console. For more information about updating your container image pipeline using the EC2 Image Builder console, see Update a container image pipeline from the console.

- You can also update your image pipeline with the **update-image-pipeline** command in the AWS CLI. To do this, include the `EnhancedImageMetadataEnabled` property in your JSON file, set to `false`. The following example shows the property set to `false`.

```
{
    "name": "MyWindows2019Pipeline",
    "description": "Builds Windows 2019 Images",
    "enhancedImageMetadataEnabled": false,
    "imageRecipeArn": "arn:aws:imagebuilder:us-west-2:123456789012:image-recipe/my-example-recipe/2020.12.03",
    "infrastructureConfigurationArn": "arn:aws:imagebuilder:us-west-2:123456789012:infrastructure-configuration/my-example-infrastructure-configuration",
    "distributionConfigurationArn": "arn:aws:imagebuilder:us-west-2:123456789012:distribution-configuration/my-example-distribution-configuration",
    "imageTestsConfiguration": {
        "imageTestsEnabled": true,
        "timeoutMinutes": 60
    },
    "schedule": {
        "scheduleExpression": "cron(0 0 * * SUN *)",
        "pipelineExecutionStartCondition":
 "EXPRESSION_MATCH_AND_DEPENDENCY_UPDATES_AVAILABLE"
    },
    "status": "ENABLED"
}
```

To prevent this from happening for new pipelines, clear the **Enable enhanced metadata collection** check box when you create a new pipeline using the EC2 Image Builder console, or set the value of the `EnhancedImageMetadataEnabled` property in your JSON file to `false` when you create your pipeline using the AWS CLI.

Troubleshoot failed builds with AI - Preview

Preview feature

This feature is in preview and is subject to change.

When EC2 Image Builder builds fail, the root cause can be time-consuming and complex to identify. The Troubleshoot feature in Image Builder, powered by AWS DevOps Agent, automates this process with AI-powered analysis. You can quickly identify the cause of complex build failures or detect patterns across multiple failed pipelines.

When a build fails, you can use Troubleshoot to analyze build logs, Amazon CloudWatch logs, workflow step executions, and related AWS resources. You receive a root cause analysis and remediation steps to resolve the issue.

You can troubleshoot a single failed pipeline build or analyze multiple failed pipelines to identify common patterns and shared root causes.

Contents

- Prerequisites
- Set up troubleshooting
- Troubleshoot a failed build
- Troubleshoot multiple failed pipelines
- What Troubleshoot investigates
- Considerations

Prerequisites

Before you use the Troubleshoot feature, make sure that the IAM user or role that you use has the following permissions:

- `aidevops:ListAgentSpaces` – Required to discover available agent spaces.
- `aidevops:CreateChat` – Required to start troubleshooting sessions.
- `aidevops:SendChatMessage` – Required to send messages during troubleshooting.

- `aidevops:CreateAgentSpace` – Required only if you want Image Builder to create an agent space for you. You can omit this permission if you bring your own agent space.

For more information about IAM policies, see Policies and permissions in IAM.

Set up troubleshooting

The Troubleshoot feature requires an AWS DevOps Agent agent space. You can use an existing agent space or have Image Builder create one for you:

- **Bring your own agent space** – If you already have an agent space, Image Builder uses it for troubleshooting.
- **Have Image Builder create one** – If you don't have an agent space, Image Builder creates and configures one when you start your first investigation. This option requires the `aidevops:CreateAgentSpace` permission.

To start troubleshooting, choose the **Troubleshooting** icon in the AWS Management Console header.

> **Note**
>
> For more information about AWS DevOps Agent, see the AWS DevOps Agent User Guide.

Troubleshoot a failed build

When an image build fails, you can start an AI-powered investigation from several entry points in the Image Builder AWS Management Console.

Start a troubleshooting investigation

Use one of the following methods to start troubleshooting a failed build:

- **Pipelines table** – Choose the **Troubleshooting** icon next to a failed pipeline status in the **Image pipelines** list.
- **Output images table** – Choose the **Troubleshooting** icon next to a failed image build in the output images list.

- **Troubleshooting drawer** – In the AWS Management Console header, choose the **Troubleshooting** icon, then select the pipeline you want to investigate.

During the investigation

After you start troubleshooting, Troubleshoot investigates the failure. You can track real-time progress in the drawer as logs and resources are analyzed. The investigation typically completes in a few minutes. You can continue working in other AWS Management Console areas while the analysis runs. When the investigation completes, you receive:

- Root cause analysis that identifies why the build failed
- Remediation steps to resolve the issue
- Commands or configuration changes to fix the problem

After you review the results, you can provide feedback on the response quality. To re-run the analysis against the same failed build, choose **Troubleshoot again**.

Troubleshoot multiple failed pipelines

If you have multiple failed pipelines, you can analyze them together to identify common patterns and shared root causes.

Start an aggregate investigation

Use one of the following methods to troubleshoot multiple pipelines:

- In the **Image pipelines** table, select multiple failed pipelines and choose **Troubleshoot selected**.
- Open the troubleshooting drawer and choose **Troubleshoot all** to analyze all failed pipelines.

Aggregate analysis results

You receive a grouped analysis organized by root cause. For each group, you get:

- Description of the shared root cause
- Pipelines affected by that root cause
- Remediation steps for the group

After the aggregate analysis, you can choose a drill-down prompt to investigate a specific pipeline in more detail.

What Troubleshoot investigates

When you troubleshoot a failed build, the analysis covers the following areas:

- **Failure context** – Reads the structured failure details on the failed image to scope the investigation to the stage, workflow step, component step, or destination that failed. For more information, see Find the cause of a failed image build with failure context.
- **Build logs and Amazon CloudWatch logs** – Checks for errors, non-zero exit codes, timeouts, and stack traces.
- **Workflow step executions** – Identifies the failed step and examines its details.
- **Networking and permissions** – Reviews IAM instance profile permissions, security groups, subnet routing, NAT gateways, internet gateways, and VPC endpoints.
- **Components and recipe configuration** – Checks for script errors, missing dependencies, broken URLs, and base AMI validity.
- **Network connectivity** – Checks AWS Systems Manager (Systems Manager) Agent reachability, DNS resolution, and proxy configuration.
- **Build history** – Reviews recent builds to distinguish persistent failures from intermittent issues.

Considerations

Note the following when using the Troubleshoot feature:

- Troubleshoot performs read-only analysis. Your resources are not modified.
- Troubleshooting is scoped to Image Builder build failures and related infrastructure such as IAM, VPC, and Systems Manager Agent.

> **Note**
>
> AI generates these responses. Verify the analysis and recommendations before you modify your resources.

For more information about troubleshooting Image Builder pipeline builds, see Troubleshoot pipeline builds.

Troubleshoot builds with an AI coding agent

The Agent Toolkit for AWS gives AI coding agents the tools, knowledge, and guardrails they need to work with AWS services. It works with agents such as Kiro, Claude Code, Cursor, and Codex. The toolkit includes the `amazon-ec2-image-builder` skill, a curated package of instructions and reference material that guides your agent through Image Builder tasks.

With the skill loaded, your agent can diagnose a failed build from your terminal or IDE. The skill directs the agent to the workflow step that failed and to the component logs in Amazon CloudWatch Logs. It provides remediation steps for common failure scenarios such as instance connectivity timeouts, missing instance profile permissions, and component errors.

The skill covers the rest of the Image Builder workflow: the build IAM role, Amazon managed and custom components, image recipes, and infrastructure and distribution configuration. It handles one-off builds and recurring pipelines for golden AMI automation and OS patching. It supports Linux, Windows, and macOS AMIs, and container images.

> **Note**
>
> The skill runs in your own AI coding agent. For AI-powered root cause analysis built into the Image Builder console, see Troubleshoot failed builds with AI - Preview.

Contents

- Get the skill
- Considerations

Get the skill

Your agent can get the skill in the following ways:

- **Discover at runtime through the AWS MCP Server** – Agents connected to the AWS MCP Server can search for and load the skill on demand, without local installation. For more information, see Skills in the *Agent Toolkit for AWS User Guide*.

- **Install with the AWS CLI** – The following command installs the skill for the AI coding agents that are detected on your system. The command specifies the `us-east-1` Region because the skills catalog is available only in that Region. This doesn't limit where you can use the skill. For setup and version requirements, see AWS CLI in the *Agent Toolkit for AWS User Guide*.

```
aws agent-toolkit add-skill \
    --skill-name amazon-ec2-image-builder \
    --region us-east-1
```

- **Download from GitHub** – The skill source is available in the Agent Toolkit for AWS repository on GitHub. Add it to your agent's skills directory.

Considerations

Note the following when you use the skill:

- Your agent uses your AWS credentials to call Image Builder and related services. We recommend that you scope the agent's IAM permissions to the minimum that the task needs.
- AI generates the responses. Verify the analysis and recommendations before you modify your resources.

Documentation history of changes to the Image Builder user guide

The following table describes important changes to the documentation by date. For notification about updates to this documentation, you can subscribe to an RSS feed.

- **API version: 2025-04-30**

Change	Description	Date
Update supported Regions and downloads for AWSTOE	AWSTOE is supported in all AWS Regions where Image Builder is available. The supported Regions list now refers to the Image Builder endpoints page, which reflec ts new Regions at launch. Also added the application download link for macOS on ARM64.	September 17, 2026
Resource name to ARN mapping	Documented how Image Builder generates resource ARNs from a normalized form of the resource name, and how normalization affects name uniqueness within your account for each AWS Region. For more information, see Resource names and ARNs.	September 9, 2026
Variables in AWSTOE component documents	Documented AWSTOE runtime variables that you can reference in a component document, including environment variables (`env:`),	September 8, 2026

	instance metadata variables (`aws:imds:`), and context variables (`context:`). Also documented the environment variables that Image Builder provides to components. For more information, see Use variables in your custom component document and Environment variables that Image Builder provides.	
Feature release: Workflow step retries	You can configure Image Builder to automatically retry a workflow step that fails. To set up retries, add the `retry` attribute to a step in your workflow document. For more information, see Retry failed workflow steps.	September 8, 2026
Feature release: Dry run for create actions	You can validate the configuration for an Image Builder resource without creating the resource. To perform a dry run, set the `dryRun` parameter to `true` in your create request. For more information, see Validate Image Builder resource creation with a dry run.	September 8, 2026

Structured failure context	Documented the failure context that Image Builder returns on a failed image, which names the stage (`imageStatus`), the workflow step, the component step, and the destination Regions that caused the failure. For more information, see Find the cause of a failed image build with failure context.	September 4, 2026
Security guidance for ISO disk image import	Documented that executables resolved from the supplied ISO and the applied Windows image run with SYSTEM privileges on the build instance, under the instance profile role from the infrastructure configuration. Verifying the authenticity of the ISO is your responsibility. For more information, see Security considerations for ISO disk image import and Your responsibility for imported ISO disk images.	September 4, 2026

Sample projects on GitHub	Added a page for the Image Builder samples repository on GitHub. The repository contai ns complete sample projects in AWS CloudFormation, AWS CDK, and Terraform, plus AWSTOE component documents. Also added links to individual samples from related pages. For more information, see Explore Image Builder sample projects on GitHub.	September 1, 2026
Agent Toolkit for AWS skill	Documented the `amazon-ec2-image-builder` skill in the Agent Toolkit for AWS, which helps AI coding agents diagnose failed builds and create images with Image Builder. For more information, see Troubleshoot builds with an AI coding agent.	September 1, 2026
Expanded AWS Marketplace integration content	Documented how to specify an AWS Marketplace product ID as the parent image in the **create-image-recipe** command, and how to inspect the product codes on a base AMI. For more informati on, see AWS Marketplace integration in Image Builder.	August 11, 2026

Opt-in Region prerequisite for SSM output parameters	Added the opt-in Region (Region that is disabled by default) prerequisite for AMI distributions that include SSM output parameters. For more information, see Prerequisites for SSM output parameters.	July 31, 2026
Post-build clean up script updates for Linux	Updated the Linux Required post-build clean up script to show the steps that uninstall the Systems Manager agent. The script also removes the `cronie` package when Image Builder installed a crontab during the build. This applies to Amazon Linux 1, Amazon Linux 2, and Amazon Linux 2023. Documented how to keep `cronie` in the final image by removing the `crontab_installed` marker file before clean up runs. Also updated Override the Linux clean up script to list the `/var/lib/cloud/` files that the `CLOUD_INIT_FILES` section removes. Added a note describing the clean up steps that always run and can't be skipped.	July 27, 2026

Expanded Amazon EventBridge integration content	Reorganized the EventBridge pipeline page to cover both starting builds from rules and reacting to the events Image Builder sends. Added event-pattern rule examples and AWS CLI procedures, documented the fields and preconditions for each event, and clarified the difference between a pipeline schedule and an EventBridge schedule rule. For more information, see Use EventBridge with Image Builder pipelines.	July 21, 2026
Updated managed policies for AMI watermarks	Image Builder added the `ec2:AttachImageWatermark` permission to the AWSServiceRoleForImageBuilder and EC2ImageBuilderExecutionPolicy managed policies so that Image Builder can attach AMI watermarks to the output AMIs it creates. For more information, see AWS managed policies for Image Builder.	June 22, 2026

Feature release: AMI watermarks	Image Builder supports AMI watermarks for tracking image lineage. You can specify watermark names in your image recipe, and Image Builder automatically attaches them to output AMIs during the build process. Watermarks propagate automatically when you copy or distribute AMIs across Regions or accounts. For more information, see Track AMI lineage with watermarks.	June 22, 2026
macOS post-build clean up script correction	Corrected the macOS Required post-build clean up script, which previousl y contained Linux-specific logic. The script now runs `ec2-macos-init clean -all`, removes macOS SSH keys from `/Users` and `/var/root` , and uses macOS file paths. Added the Override the macOS clean up script reference.	June 12, 2026

IAM policy release: execution policy	Image Builder added the new `EC2ImageBuilderExecutionPolicy` AWS managed policy. You can attach this policy to a custom IAM role that you pass to Image Builder as an execution role, instead of passing the service-linked role. For more information, see the EC2ImageBuilderExecutionPolicy policy.	June 4, 2026
Added support for Windows Server 2025	Added support for Windows Server 2025 STIG versions and applied STIGs for the 2026 first quarter release for all compliance levels (low/medium/high).	March 10, 2026
IAM policy update: service role policy	Removed `ssm:StartAutomationExecution` from the service-linked role policy, as the service completed its migration away from SSM Automation in 2023. For more information, see the AWSServiceRoleForImageBuilder policy.	February 26, 2026

Feature release: Lifecycle policy enhancements	Lifecycle policy enhancements include streamlined role management with console-based role creation using service defaults, wildcard semantic version support for recipe-based policies (1.0.x, 1.x.x, x.x.x) to target multiple recipe versions with a single policy, tag-based resource collection for lifecycle policies, and console support for exclusion rules on both AMI and tag-based policies.	February 26, 2026
Image distribution enhancements	Enhancements include the ability to directly perform distribution activities without the need to re-run a complete image build.	November 20, 2025
Auto-versioning and IaC enhancements	Automatic version incrementing and wildcard version referencing now eliminate manual version management for recipes, components, and workflows. Component testing experience with dry-run and enhanced authoring capability in the console.	November 20, 2025

Image workflow supports Lambda and Step Functions	Image workflow now supports invoking Lambda functions and executing Step Functions state machine, enabling complex, multi-step workflows and custom validation logic in image creation.	November 13, 2025
Image pipeline enhancements	Enhancements include support for pipeline execution logs, configurable CloudWatch Logs groups, and configuration to automatically disable scheduled pipelines that are failing repeatedly. Additional updates include expanded pipeline schedule information and updated CloudWatch Logs event message examples.	September 29, 2025
New script for Amazon Linux 2023	Added support for the SUSE Linux Enterprise Server (SLES) operating system. STIG versions and applied STIGS for the 2025 third quarter release for all compliance levels (low/medium/high).	September 4, 2025
New script for Amazon Linux 2023	Added a new script specifically tailored to Amazon Linux 2023.	August 26, 2025

IAM policy update: service role policy	Updated the service-linked role policy to support the use of SSM Parameters in recipes and during image distribut ion. For more information, see the AWSServiceRoleForI mageBuilder policy.	July 23, 2025
STIG Q2 2025 updates	Updated Windows STIG versions and applied STIGS for 2025 second quarter release.	June 26, 2025
IAM policy update: instance profile policy	Add `.iso` and `.Iso` as valid file extensions for downloading ISO disk images from Amazon S3. For more information, see the EC2InstanceProfileForImageB uilder policy.	May 19, 2025
STIG Q1 2025 updates	Updated Windows STIG versions and applied STIGS and SCAP component versions for 2025 first quarter release.	May 5, 2025
Feature release: Support SSM Parameters	Image Builder now supports the use of AWS Systems Manager(SSM) Parameter Store Parameters in recipes and during image distribution.	April 30, 2025
STIG Q4 updates	Updated Windows STIG versions and applied STIGS for 2024 fourth quarter relea se.	February 4, 2025

IAM policy update: service role policy	Updated the service-linked role policy to support image creation from imported official Microsoft client OS ISO files. For more information, see the AWSServiceRoleForImageBuilder policy.	December 30, 2024
IAM policy update: instance profile policy	Updated the instance profile role policy to support image creation from disk image files. For more information, see the EC2InstanceProfileForImageBuilder policy.	December 30, 2024
Feature release: ISO to AMI	Image Builder can now create an image from official ISO disk files for Microsoft Windows 11 and later client operating systems.	December 30, 2024
STIG Q4 updates	Updated Linux STIG versions and applied STIGS for 2024 fourth quarter release. Added information about two new input parameters for the Linux components.	December 10, 2024
IAM policy update: instance profile policy	Updated the instance profile policy to grant access to get AWS Marketplace components. For more information, see the EC2InstanceProfileForImageBuilder policy.	December 2, 2024

Feature release: AWS Marketplace components	Added support for AWS Marketplace software components.	December 2, 2024
Feature release: macOS support	Added support for macOS images.	October 22, 2024
Document support for logical operators in AWS Task Orchestrator and Executor	Use logical operators to add or modify condition al expressions in your component document.	August 16, 2024
Document support for conditional constructs in AWS Task Orchestrator and Executor	Use conditional construct s like the "if" statement to direct the flow of control for component actions in your component document.	August 16, 2024
Document support for comparison operators in AWS Task Orchestrator and Executor	Use comparison operators to compare values in your component document.	August 16, 2024
Added Assert action module	Added documentation for the `Assert` action module under `General execution` .	August 14, 2024
Operating system support	Added support for RHEL 9 and Ubuntu 24.04 LTS.	August 2, 2024
Document update: Reorganize content	Reorganized documentation to improve presentation and navigation.	June 21, 2024

STIG Q2 updates	Updated Linux STIG versions and applied STIGS for 2024 second quarter release. Adde d support for RHEL 9, CentOS Stream 9, and Ubuntu 22.04. There were no changes to Windows versions.	May 10, 2024
STIG Q1 updates	Updated Linux STIG versions and applied STIGS for 2024 first quarter release. There were no changes to Windows versions.	February 23, 2024
STIG Q1 updates	Updated Linux STIG versions and applied STIGS for 2024 first quarter release. There were no changes to Windows versions.	February 23, 2024
Feature release: Image workflow management	With image workflows, you have more flexibilit y, and control over the image creation process. You can customize build and test steps for your workflows, or you can use the Image Builder default workflow.	December 12, 2023
STIG Q4 updates	Updated Linux STIG versions and applied STIGS for 2023 fourth quarter release. There were no changes to Windows versions. Also updated Linux and Windows SCAP for new component, software, and benchmark numbers.	December 7, 2023

Feature release: Image lifecycle management	With image lifecycle management policies and rules, you can define your resource management strategy to ensure that outdated images and their associated resources go through a process of tagging and removal.	November 17, 2023
IAM policy update: service role	Updated the service-linked role policy for instance placement support. For more information, see the AWSServiceRoleForImageBuilder policy.	October 19, 2023
STIG Q3 updates	Updated STIG versions and applied STIGS for 2023 third quarter release. Additionally updated messaging to clarify that third-party packages are not automatically installed, with very few exceptions. All skipped STIGs are logged.	October 5, 2023
New STIG Versions	Updated STIG versions and applied STIGS for 2023 second quarter release.	May 3, 2023
New STIG Versions	Updated STIG versions and applied STIGS for 2023 first quarter release. Added support for AL2023.	April 14, 2023

Update supported Regions for AWSTOE	Added AWSTOE support for the following AWS Regions: Asia Pacific (Hyderabad), Asia Pacific (Jakarta), Europe (Zurich), Europe (Spain), and Middle East (UAE).	April 13, 2023
AWSTOE application download updates	Updated the signature for the AWSTOE installation download on Windows. Also updated TLS note that application downloads from S3 buckets now require TLS version 1.2 or later.	March 31, 2023
Feature release: Enhanced build workflows	Added runtime details for image builds in the new workflow tab in the image build version details. Improved information for troubleshooting builds.	March 30, 2023

Feature release: CVE detection and reporting	For accounts that have activated Amazon Inspector scans, Image Builder can capture the common vulnerability and exposures (CVE) findings from Amazon Inspector during the test stage of the build process for new images, including container images stored in Amazon ECR. Image Builder creates a snapshot of the findings to support detail analysis. Image Builder also reports on findings counts that can be filtered by account, by pipeline, or by image, with the ability to drill down on details.	March 30, 2023
Added version history	Added version history to the Windows and Linux sections.	February 17, 2023
New STIG Versions	Updated STIG versions and applied STIGS for 2022 fourth quarter release.	February 1, 2023
Feature release: AWS Marketplace integration and CIS hardening	Added AWS Marketplace integration to easily find and use a subscribed image as the baseline for a new custom image, including CIS Hardened Images and a new CIS Hardening component from the Center for Internet Security.	January 13, 2023

CIS hardening components	Added CIS hardening components that are owned and maintained by CIS.	January 13, 2023
New STIG Versions	Introduced Ubuntu support, updated STIG versions, and applied STIGS for 2022 second quarter release.	July 20, 2022
Document update: Navigation for Create YAML component document page	Moved the Create YAML component document content to its own page, and updated other pages to reference it.	June 7, 2022
New STIG Versions	Updated STIG versions and applied STIGS for 2022 first quarter release.	April 25, 2022
Added ExecuteDocument action module	Added documentation for the `ExecuteDocument` action module under `General execution` .	March 28, 2022
Feature release: Support for faster launching Windows AMI	Added distribution configuration settings to support faster launching for Windows AMIs.	February 21, 2022
Maintenance release: Update AWSTOE binary thumbprint	Updated binary thumbprint for AWSTOE signer certificate.	February 18, 2022
Feature release: Configure input for AWSTOE	Added support for using a JSON configuration file as input for the AWSTOE **run** command.	February 3, 2022

New STIG Versions	Updated STIG versions and applied STIGS for 2021 fourth quarter release. Also added a section for new SCAP Compliance Checker (SCC) components.	December 22, 2021
Feature release: VM Import/ Export (VMIE) integration	Added support for VM import via all channels (console, API/ CLI, etc.), and for VM export via API/CLI. VM export is not currently available from the Image Builder console.	December 20, 2021
Feature release: AMI sharing for AWS Organizations and OUs	Updated distribution configuration to add support for sharing output AMIs with AWS Organizations and OUs.	November 24, 2021
Document update: Update component stages and phases	Expanded content for component stages in Image Builder, and how those intera ct with AWSTOE component phases.	September 22, 2021
Document update: Add CloudTrail integration content	Added monitoring summary and CloudTrail integration content.	September 17, 2021
New STIG Versions	Updated STIG versions and applied STIGS for 2021 third quarter release.	September 10, 2021

Feature release: Amazon EventBridge integration	Added EventBridge support that enables you to connect Image Builder with events from related AWS services, and initiate events based on rules defined in EventBridge.	August 18, 2021
Document update: Reorder AWSTOE pages	Rearranged AWSTOE pages for clarity.	August 11, 2021
Feature release: Parameterized components and additional instance configuration	Added support for specifying parameters to customize components for recipes. Expanded configuration of the EC2 instances that are used for building and testing images, including the ability to specify commands to run on launch, and more control over installation and removal of the Systems Manager agent.	July 7, 2021
New STIG versions	Updated STIG versions and applied STIGS for 2021 second quarter release.	June 30, 2021
Enhancement: Tagging enhancements	Improved messaging around resource tagging.	June 25, 2021
Feature release: Launch template integration	Added support for using Amazon EC2 launch templates for AMI distribution in the Distribution settings.	April 7, 2021

Feature release: Container build enhancements	Added support for configuring block device mappings and specifying AMIs to use as the base image for container builds.	April 7, 2021
New STIG versions	Updated STIG versions and applied STIGS.	March 5, 2021
Update cron expressions	Image Builder cron processing is updated to increase cron expression granularity to the minute, and use a standard cron scheduling engine. Examples are updated with the new format.	February 8, 2021
Feature release: Container support	Added support for creating Docker container images using Image Builder, with registration and storage of the resulting images on Amazon Elastic Container Registry (Amazon ECR). Content has been rearranged to reflect new functionality and accomodate future growth.	December 17, 2020

Restructured cron documentation	This page now highlights more information about how cron works with Image Builder pipeline builds, and includes details about UTC time. Wildcards that are not allowed for specific fields have been removed. Examples now include expression samples for both console and CLI.	November 13, 2020
Console version 2.0: updated pipeline editing	Content changes in getting started and create pipeline tutorials, plus the manage image pipelines page, to incorporate new console features and flow.	November 13, 2020
New STIG versions	Updated STIG versions and applied STIGS. Note - list format changed to show STIGs that are applied by default.	October 15, 2020
Support for looping constructs in AWSTOE	Create looping constructs to define a repeated sequence of instructions in the AWSTOE application.	July 29, 2020
Support for local development of AWSTOE components	Develop and test image components locally with the AWSTOE application.	July 28, 2020
Encrypted AMIs	EC2 Image Builder adds support for encrypted AMI distribution.	July 1, 2020

AutoScaling deprecation	Deprecation of the use of AutoScaling to launch instances.	June 15, 2020
Support for connectivity through AWS PrivateLink	You can establish a private connection between your VPC and EC2 Image Builder by creating an interface VPC endpoint. Interface endpoints are powered by AWS PrivateLink, a technology that enables you to privately access Image Builder APIs without an internet gateway, NAT device, VPN connection, or AWS Direct Connect connection. Instances in your VPC don't need public IP addresses to communicate with Image Builder APIs. Traffic between your VPC and Image Builder does not leave the Amazon network.	June 10, 2020
New STIG versions	Updated STIG versions and applied STIGS.	January 23, 2020
Troubleshooting	Added general troublesh ooting scenarios.	January 22, 2020
STIG Components	You can create STIG-comp liant images with AWSTOE STIG components.	January 22, 2020