
Amazon EC2 Auto Scaling

User Guide



Amazon EC2 Auto Scaling: User Guide

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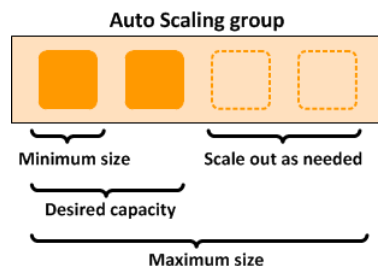
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What Is Amazon EC2 Auto Scaling?

Amazon EC2 Auto Scaling helps you ensure that you have the correct number of Amazon EC2 instances available to handle the load for your application. You create collections of EC2 instances, called *Auto Scaling groups*. You can specify the minimum number of instances in each Auto Scaling group, and Amazon EC2 Auto Scaling ensures that your group never goes below this size. You can specify the maximum number of instances in each Auto Scaling group, and Amazon EC2 Auto Scaling ensures that your group never goes above this size. If you specify the desired capacity, either when you create the group or at any time thereafter, Amazon EC2 Auto Scaling ensures that your group has this many instances. If you specify scaling policies, then Amazon EC2 Auto Scaling can launch or terminate instances as demand on your application increases or decreases.



For example, the following Auto Scaling group has a minimum size of 1 instance, a desired capacity of 2 instances, and a maximum size of 4 instances. The scaling policies that you define adjust the number of instances, within your minimum and maximum number of instances, based on the criteria that you specify.



For more information about the benefits of Amazon EC2 Auto Scaling, see [Benefits of Auto Scaling](#) (p. 3).

Auto Scaling Components

The following table describes the key components of Amazon EC2 Auto Scaling.

	<p>Groups</p> <p>Your EC2 instances are organized in to <i>groups</i> so that they can be treated as a logical unit for the purposes of scaling and management. When you create a group, you can specify its minimum, maximum, and, desired number of EC2 instances. For more information, see Auto Scaling Groups (p. 37).</p>
	<p>Launch configurations</p> <p>Your group uses a <i>launch configuration</i> as a template for its EC2 instances. When you create a launch configuration, you can specify information such as the AMI ID, instance type, key pair, security groups, and block device mapping for your instances. For more information, see Launch Configurations (p. 26).</p>



Scaling options

Amazon EC2 Auto Scaling provides several ways for you to scale your Auto Scaling groups. For example, you can configure a group to scale based on the occurrence of specified conditions (dynamic scaling) or on a schedule. For more information, see [Scaling Options \(p. 58\)](#).

Getting Started

If you're new to Amazon EC2 Auto Scaling, we recommend that you review [Auto Scaling Lifecycle \(p. 7\)](#) before you begin.

To begin, complete the [Getting Started with Amazon EC2 Auto Scaling \(p. 12\)](#) tutorial to create an Auto Scaling group and see how it responds when an instance in that group terminates. If you already have running EC2 instances, you can create an Auto Scaling group using an existing EC2 instance, and remove the instance from the group at any time.

Accessing Amazon EC2 Auto Scaling

AWS provides a web-based user interface, the AWS Management Console. If you've signed up for an AWS account, you can access Amazon EC2 Auto Scaling by signing into the AWS Management Console. To get started, choose **EC2** from the console home page, and then choose **Launch Configurations** from the navigation pane.

If you prefer to use a command line interface, you have the following options:

AWS Command Line Interface (CLI)

Provides commands for a broad set of AWS products, and is supported on Windows, Mac, and Linux. To get started, see [AWS Command Line Interface User Guide](#). For more information about the commands for Amazon EC2 Auto Scaling, see [autoscaling](#) in the *AWS CLI Command Reference*.

AWS Tools for Windows PowerShell

Provides commands for a broad set of AWS products for those who script in the PowerShell environment. To get started, see the [AWS Tools for Windows PowerShell User Guide](#). For more information about the cmdlets for Amazon EC2 Auto Scaling, see the [AWS Tools for PowerShell Cmdlet Reference](#).

Amazon EC2 Auto Scaling provides a Query API. These requests are HTTP or HTTPS requests that use the HTTP verbs GET or POST and a Query parameter named `Action`. For more information about the API actions for Amazon EC2 Auto Scaling, see [Actions](#) in the *Amazon EC2 Auto Scaling API Reference*.

If you prefer to build applications using language-specific APIs instead of submitting a request over HTTP or HTTPS, AWS provides libraries, sample code, tutorials, and other resources for software developers. These libraries provide basic functions that automate tasks such as cryptographically signing your requests, retrying requests, and handling error responses, making it is easier for you to get started. For more information, see [AWS SDKs and Tools](#).

For information about your credentials for accessing AWS, see [AWS Security Credentials](#) in the *Amazon Web Services General Reference*.

Pricing for Amazon EC2 Auto Scaling

There are no additional fees with Amazon EC2 Auto Scaling, so it's easy to try it out and see how it can benefit your AWS architecture.

PCI DSS Compliance

Auto Scaling supports the processing, storage, and transmission of credit card data by a merchant or service provider, and has been validated as being compliant with Payment Card Industry (PCI) Data Security Standard (DSS). For more information about PCI DSS, including how to request a copy of the AWS PCI Compliance Package, see [PCI DSS Level 1](#).

Related Services

To configure automatic scaling for all of the scalable resources for your application, use AWS Auto Scaling. For more information, see the [AWS Auto Scaling User Guide](#).

To automatically distribute incoming application traffic across multiple instances in your Auto Scaling group, use Elastic Load Balancing. For more information, see the [Elastic Load Balancing User Guide](#).

To monitor basic statistics for your instances and Amazon EBS volumes, use Amazon CloudWatch. For more information, see the [Amazon CloudWatch User Guide](#).

To monitor the calls made to the Amazon EC2 Auto Scaling API for your account, including calls made by the AWS Management Console, command line tools, and other services, use AWS CloudTrail. For more information, see the [AWS CloudTrail User Guide](#).

Benefits of Auto Scaling

Adding Amazon EC2 Auto Scaling to your application architecture is one way to maximize the benefits of the AWS cloud. When you use Amazon EC2 Auto Scaling, your applications gain the following benefits:

- Better fault tolerance. Amazon EC2 Auto Scaling can detect when an instance is unhealthy, terminate it, and launch an instance to replace it. You can also configure Amazon EC2 Auto Scaling to use multiple Availability Zones. If one Availability Zone becomes unavailable, Amazon EC2 Auto Scaling can launch instances in another one to compensate.
- Better availability. Amazon EC2 Auto Scaling can help you ensure that your application always has the right amount of capacity to handle the current traffic demand.
- Better cost management. Amazon EC2 Auto Scaling can dynamically increase and decrease capacity as needed. Because you pay for the EC2 instances you use, you save money by launching instances when they are actually needed and terminating them when they aren't needed.

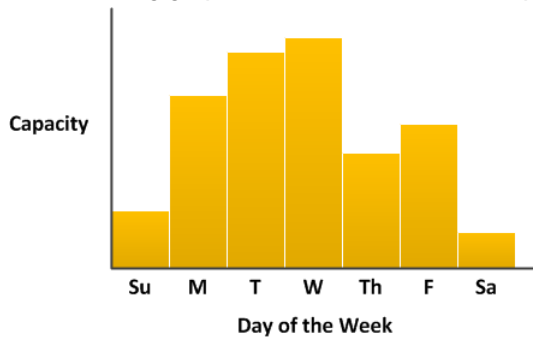
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- [Example: Covering Variable Demand \(p. 4\)](#)
- [Example: Web App Architecture \(p. 5\)](#)
- [Example: Distributing Instances Across Availability Zones \(p. 6\)](#)

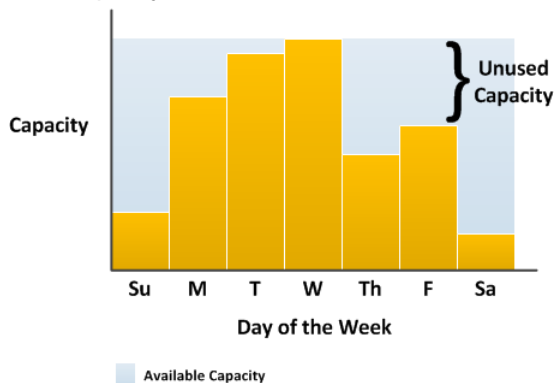
Example: Covering Variable Demand

To demonstrate some of the benefits of Amazon EC2 Auto Scaling, consider a basic Web application running on AWS. This application allows employees to search for conference rooms that they might want to use for meetings. During the beginning and end of the week, usage of this application is minimal. During the middle of the week, more employees are scheduling meetings, so the demand on the application increases significantly.

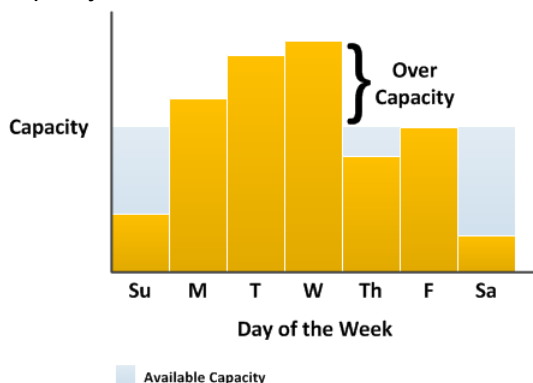
The following graph shows how much of the application's capacity is used over the course of a week.



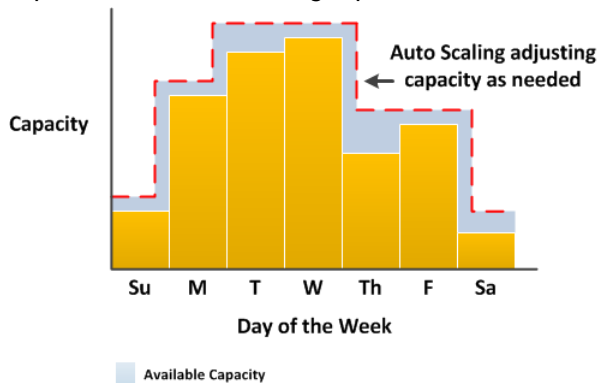
Traditionally, there are two ways to plan for these changes in capacity. The first option is to add enough servers so that the application always has enough capacity to meet demand. The downside of this option, however, is that there are days in which the application doesn't need this much capacity. The extra capacity remains unused and, in essence, raises the cost of keeping the application running.



The second option is to have enough capacity to handle the average demand on the application. This option is less expensive, because you aren't purchasing equipment that you'll only use occasionally. However, you risk creating a poor customer experience when the demand on the application exceeds its capacity.

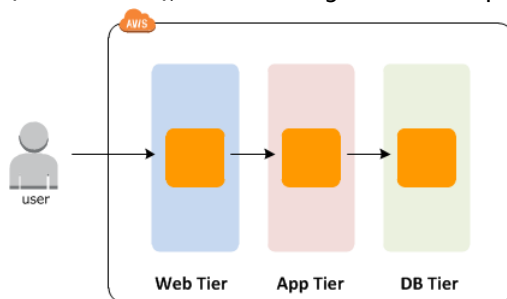


By adding Amazon EC2 Auto Scaling to this application, you have a third option available. You can add new instances to the application only when necessary, and terminate them when they're no longer needed. Because Amazon EC2 Auto Scaling uses EC2 instances, you only have to pay for the instances you use, when you use them. You now have a cost-effective architecture that provides the best customer experience while minimizing expenses.

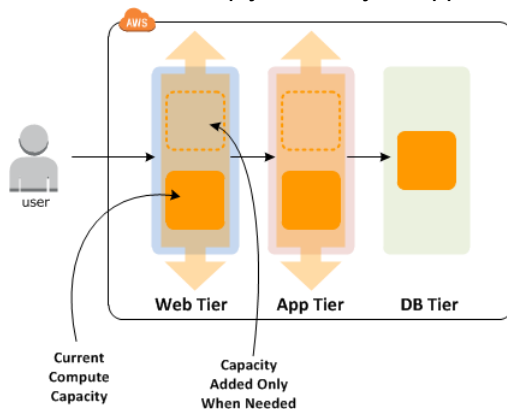


Example: Web App Architecture

In a common web app scenario, you run multiple copies of your app simultaneously to cover the volume of your customer traffic. These multiple copies of your application are hosted on identical EC2 instances (cloud servers), each handling customer requests.



Amazon EC2 Auto Scaling manages the launch and termination of these EC2 instances on your behalf. You define a set of criteria (such as an Amazon CloudWatch alarm) that determines when the Auto Scaling group launches or terminates EC2 instances. Adding Auto Scaling groups to your network architecture can help you make your application more highly available and fault tolerant.



You can create as many Auto Scaling groups as you need. For example, you can create an Auto Scaling group for each tier.

To distribute traffic between the instances in your Auto Scaling groups, you can introduce a load balancer into your architecture. For more information, see [Using a Load Balancer With an Auto Scaling Group](#) (p. 48).

Example: Distributing Instances Across Availability Zones

AWS resources, such as EC2 instances, are housed in highly-available data centers. To provide additional scalability and reliability, these data centers are in different physical locations. *Regions* are large and widely dispersed geographic locations. Each region contains multiple distinct locations, called *Availability Zones*, that are engineered to be isolated from failures in other Availability Zones and provide inexpensive, low-latency network connectivity to other Availability Zones in the same region. For more information, see [Regions and Endpoints: Amazon EC2 Auto Scaling](#) in the *Amazon Web Services General Reference*.

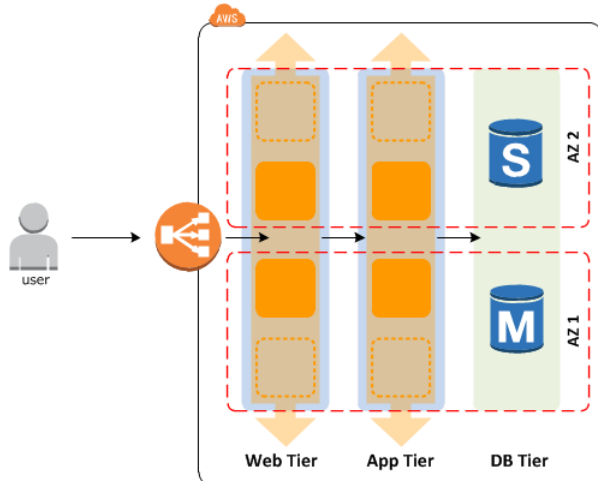
Amazon EC2 Auto Scaling enables you to take advantage of the safety and reliability of geographic redundancy by spanning Auto Scaling groups across multiple Availability Zones within a region. When one Availability Zone becomes unhealthy or unavailable, Auto Scaling launches new instances in an unaffected Availability Zone. When the unhealthy Availability Zone returns to a healthy state, Auto Scaling automatically redistributes the application instances evenly across all of the designated Availability Zones.

An Auto Scaling group can contain EC2 instances in one or more Availability Zones within the same region. However, Auto Scaling groups cannot span multiple regions.

For Auto Scaling groups in a VPC, the EC2 instances are launched in subnets. You select the subnets for your EC2 instances when you create or update the Auto Scaling group. You can select one or more subnets per Availability Zone. For more information, see [Launching Auto Scaling Instances in a VPC](#) (p. 32).

Instance Distribution

Amazon EC2 Auto Scaling attempts to distribute instances evenly between the Availability Zones that are enabled for your Auto Scaling group. Amazon EC2 Auto Scaling does this by attempting to launch new instances in the Availability Zone with the fewest instances. If the attempt fails, however, Amazon EC2 Auto Scaling attempts to launch the instances in another Availability Zone until it succeeds. For Auto Scaling groups in a VPC, if there are multiple subnets in an Availability Zone, Amazon EC2 Auto Scaling selects a subnet from the Availability Zone at random.



Rebalancing Activities

After certain actions occur, your Auto Scaling group can become unbalanced between Availability Zones. Amazon EC2 Auto Scaling compensates by rebalancing the Availability Zones. The following actions can lead to rebalancing activity:

- You change the Availability Zones for your group.
- You explicitly terminate or detach instances and the group becomes unbalanced.
- An Availability Zone that previously had insufficient capacity recovers and has additional capacity available.
- An Availability Zone that previously had a Spot market price above your Spot bid price now has a market price below your bid price.

When rebalancing, Amazon EC2 Auto Scaling launches new instances before terminating the old ones, so that rebalancing does not compromise the performance or availability of your application.

Because Amazon EC2 Auto Scaling attempts to launch new instances before terminating the old ones, being at or near the specified maximum capacity could impede or completely halt rebalancing activities. To avoid this problem, the system can temporarily exceed the specified maximum capacity of a group by a 10 percent margin (or by a 1-instance margin, whichever is greater) during a rebalancing activity. The margin is extended only if the group is at or near maximum capacity and needs rebalancing, either because of user-requested rezoning or to compensate for zone availability issues. The extension lasts only as long as needed to rebalance the group typically a few minutes.

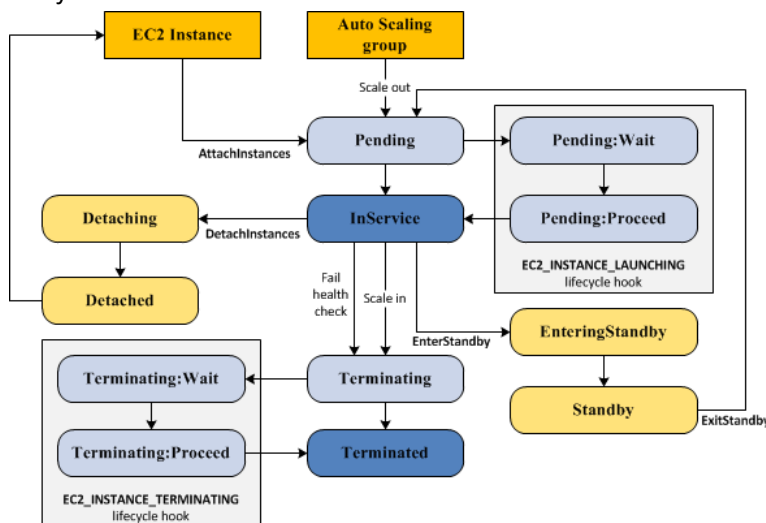
Auto Scaling Lifecycle

The EC2 instances in an Auto Scaling group have a path, or lifecycle, that differs from that of other EC2 instances. The lifecycle starts when the Auto Scaling group launches an instance and puts it into service. The lifecycle ends when you terminate the instance, or the Auto Scaling group takes the instance out of service and terminates it.

Note

You are billed for instances as soon as they are launched, including the time that they are not yet in service.

The following illustration shows the transitions between instance states in the Amazon EC2 Auto Scaling lifecycle.



Scale Out

The following scale out events direct the Auto Scaling group to launch EC2 instances and attach them to the group:

- You manually increase the size of the group. For more information, see [Manual Scaling \(p. 61\)](#).
- You create a scaling policy to automatically increase the size of the group based on a specified increase in demand. For more information, see [Dynamic Scaling for Amazon EC2 Auto Scaling \(p. 71\)](#).
- You set up scaling by schedule to increase the size of the group at a specific time. For more information, see [Scheduled Scaling for Amazon EC2 Auto Scaling \(p. 68\)](#).

When a scale out event occurs, the Auto Scaling group launches the required number of EC2 instances, using its assigned launch configuration. These instances start in the `Pending` state. If you add a lifecycle hook to your Auto Scaling group, you can perform a custom action here. For more information, see [Lifecycle Hooks \(p. 9\)](#).

When each instance is fully configured and passes the Amazon EC2 health checks, it is attached to the Auto Scaling group and it enters the `InService` state. The instance is counted against the desired capacity of the Auto Scaling group.

Instances In Service

Instances remain in the `InService` state until one of the following occurs:

- A scale in event occurs, and Amazon EC2 Auto Scaling chooses to terminate this instance in order to reduce the size of the Auto Scaling group. For more information, see [Controlling Which Auto Scaling Instances Terminate During Scale In \(p. 90\)](#).
- You put the instance into a `Standby` state. For more information, see [Enter and Exit Standby \(p. 9\)](#).
- You detach the instance from the Auto Scaling group. For more information, see [Detach an Instance \(p. 9\)](#).
- The instance fails a required number of health checks, so it is removed from the Auto Scaling group, terminated, and replaced. For more information, see [Health Checks for Auto Scaling Instances \(p. 109\)](#).

Scale In

It is important that you create a corresponding scale in event for each scale out event that you create. This helps ensure that the resources assigned to your application match the demand for those resources as closely as possible.

The following scale in events direct the Auto Scaling group to detach EC2 instances from the group and terminate them:

- You manually decrease the size of the group.
- You create a scaling policy to automatically decrease the size of the group based on a specified decrease in demand.
- You set up scaling by schedule to decrease the size of the group at a specific time.

When a scale in event occurs, the Auto Scaling group detaches one or more instances. The Auto Scaling group uses its termination policy to determine which instances to terminate. Instances that are in the process of detaching from the Auto Scaling group and shutting down enter the `Terminating` state, and

can't be put back into service. If you add a lifecycle hook to your Auto Scaling group, you can perform a custom action here. Finally, the instances are completely terminated and enter the `Terminated` state.

Attach an Instance

You can attach a running EC2 instance that meets certain criteria to your Auto Scaling group. After the instance is attached, it is managed as part of the Auto Scaling group.

For more information, see [Attach EC2 Instances to Your Auto Scaling Group \(p. 63\)](#).

Detach an Instance

You can detach an instance from your Auto Scaling group. After the instance is detached, you can manage it separately from the Auto Scaling group or attach it to a different Auto Scaling group.

For more information, see [Detach EC2 Instances from Your Auto Scaling Group \(p. 66\)](#).

Lifecycle Hooks

You can add a lifecycle hook to your Auto Scaling group so that you can perform custom actions when instances launch or terminate.

When Amazon EC2 Auto Scaling responds to a scale out event, it launches one or more instances. These instances start in the `Pending` state. If you added an `autoscaling:EC2_INSTANCE_LAUNCHING` lifecycle hook to your Auto Scaling group, the instances move from the `Pending` state to the `Pending:Wait` state. After you complete the lifecycle action, the instances enter the `Pending:Proceed` state. When the instances are fully configured, they are attached to the Auto Scaling group and they enter the `InService` state.

When Amazon EC2 Auto Scaling responds to a scale in event, it terminates one or more instances. These instances are detached from the Auto Scaling group and enter the `Terminating` state. If you added an `autoscaling:EC2_INSTANCE_TERMINATING` lifecycle hook to your Auto Scaling group, the instances move from the `Terminating` state to the `Terminating:Wait` state. After you complete the lifecycle action, the instances enter the `Terminating:Proceed` state. When the instances are fully terminated, they enter the `Terminated` state.

For more information, see [Amazon EC2 Auto Scaling Lifecycle Hooks \(p. 95\)](#).

Enter and Exit Standby

You can put any instance that is in an `InService` state into a `Standby` state. This enables you to remove the instance from service, troubleshoot or make changes to it, and then put it back into service.

Instances in a `Standby` state continue to be managed by the Auto Scaling group. However, they are not an active part of your application until you put them back into service.

For more information, see [Temporarily Removing Instances from Your Auto Scaling Group \(p. 101\)](#).

Auto Scaling Limits

To view the current limits for your Auto Scaling resources, use the **Limits** page of the Amazon EC2 console or the [describe-account-limits](#) (AWS CLI) command. To request a limit increase, use the [Auto Scaling Limits form](#).

The following limits are related to your Auto Scaling resources.

Regional Limits

- Launch configurations per region: 200
- Auto Scaling groups per region: 200

Auto Scaling Group Limits

- Scaling policies per Auto Scaling group: 50
- Scheduled actions per Auto Scaling group: 125
- Lifecycle hooks per Auto Scaling group: 50
- SNS topics per Auto Scaling group: 10
- Classic Load Balancers per Auto Scaling group: 50
- Target groups per Auto Scaling group: 50

Scaling Policy Limits

- Step adjustments per scaling policy: 20

Auto Scaling API Limits

- You can use [AttachInstances](#), [DetachInstances](#), [EnterStandby](#), and [ExitStandby](#) with at most 20 instance IDs at a time.
- You can use [AttachLoadBalancers](#) and [DetachLoadBalancers](#) with at most 10 load balancers at a time.
- You can use [AttachLoadBalancerTargetGroups](#) and [DetachLoadBalancerTargetGroups](#) with at most 10 target groups at a time.

Setting Up Amazon EC2 Auto Scaling

Before you start using Amazon EC2 Auto Scaling, complete the following tasks.

Tasks

- [Sign Up for AWS](#) (p. 11)
- [Prepare to Use Amazon EC2](#) (p. 11)

Sign Up for AWS

When you create an AWS account, we automatically sign up your account for all AWS services. You pay only for the services that you use. You can use Amazon EC2 Auto Scaling at no additional charge beyond what you are paying for your EC2 instances.

If you don't have an AWS account, sign up for AWS as follows.

To sign up for an AWS account

1. Open <https://aws.amazon.com/>, and then choose **Create an AWS Account**.

Note

If you previously signed in to the AWS Management Console using AWS account root user credentials, choose **Sign in to a different account**. If you previously signed in to the console using IAM credentials, choose **Sign-in using root account credentials**. Then choose **Create a new AWS account**.

2. Follow the online instructions.

Part of the sign-up procedure involves receiving a phone call and entering a verification code using the phone keypad.

AWS sends you a confirmation e-mail after the sign-up process is complete.

Prepare to Use Amazon EC2

If you haven't used Amazon EC2 before, complete the tasks described in the Amazon EC2 documentation. For more information, see [Setting Up with Amazon EC2](#) in the *Amazon EC2 User Guide for Linux Instances* or [Setting Up with Amazon EC2](#) in the *Amazon EC2 User Guide for Windows Instances*, depending on which operating system you plan to use for your EC2 instances.

Getting Started with Amazon EC2 Auto Scaling

When you use Amazon EC2 Auto Scaling, you must use certain building blocks to get started. This tutorial walks you through the process for setting up the basic infrastructure for Amazon EC2 Auto Scaling.

Before you create an Auto Scaling group for use with your application, review your application thoroughly as it runs in the AWS cloud. Take note of the following:

- How long it takes to launch and configure a server.
- What metrics have the most relevance to your application's performance.
- How many Availability Zones you want the Auto Scaling group to span.
- What existing resources, such as EC2 instances or Amazon Machine Images (AMIs), you can use.
- Do you want to scale to increase or decrease capacity, or do you just want to ensure that a specific number of servers are always running? Keep in mind that Amazon EC2 Auto Scaling can do both simultaneously.

The better you understand your application, the more effective you can make your Auto Scaling architecture.

The following step-by-step instructions help you create a configuration template that defines your EC2 instances, create an Auto Scaling group to maintain the healthy number of instances at all times, and optionally delete this basic infrastructure. This tutorial assumes that you are familiar with launching EC2 instances and have already created a key pair and a security group.

Tasks

- [Step 1: Create a Launch Template](#) (p. 12)
- [Step 2: Create an Auto Scaling Group](#) (p. 14)
- [Step 3: Verify Your Auto Scaling Group](#) (p. 15)
- [Step 4: \(Optional\) Delete Your Scaling Infrastructure](#) (p. 16)

Step 1: Create a Launch Template

For this step, you create a launch template that specifies the type of EC2 instance that Amazon EC2 Auto Scaling creates for you. When you create a launch template, you include information such as the ID of the Amazon Machine Image (AMI) to use for launching the EC2 instance, the instance type, key pairs, security groups, and block device mappings, among other settings.

To create a launch template for an Auto Scaling group

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar, select a region. The Amazon EC2 Auto Scaling resources that you create are tied to the region you specify and are not replicated across regions. For more information, see [Example: Distributing Instances Across Availability Zones](#) (p. 6).
3. On the navigation pane, choose **Instances, Launch Templates**.
4. Choose **Create launch template**.
5. Choose **Create a new template**. Provide a name and description for the launch template.

6. For **AMI ID**, choose an AMI ID from which to launch an instance. The Amazon Machine Image (AMI) serves as templates for your instances.
7. For **Instance type**, choose a hardware configuration that is compatible with the AMI that you specified.
8. (Optional) For **Key pair name**, type the name of the key pair to use when connecting to your instances.
9. (Optional) For **Network type**, choose whether to launch your instances into a **VPC** or **EC2-Classic**, if applicable.

Important

When you create an Auto Scaling group, the network type, subnet, and Availability Zone settings of the launch template are ignored in favor of the settings of the Auto Scaling group

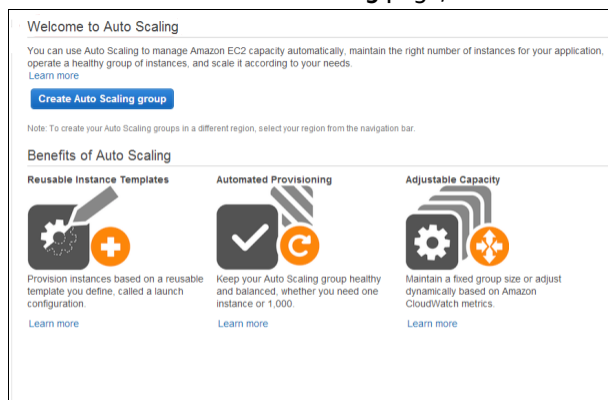
10. Skip **Security Groups** to configure a security group as part of the network interface. You cannot specify security groups in both places.
11. For **Network interfaces**, configure **Auto-assign public IP** and **Security group ID**. To launch instances into a VPC, you must specify a security group that is created for that VPC. You can leave the other fields empty and this creates a primary network interface with IP addresses that we select for your instances.
12. (Optional) For **Storage (Volumes)**, specify volumes to attach to the instances in addition to the volumes specified by the AMI you specified.
13. (Optional) For **Tags**, specify one or more tags to associate with the instances and volumes.
14. Choose **Create launch template**.
15. On the confirmation page, choose **Create Auto Scaling group**.

If you are not currently using launch templates, you can create a launch configuration instead.

A launch configuration is similar to a launch template, in that it specifies the type of EC2 instance that Amazon EC2 Auto Scaling creates for you. You create the launch configuration by including information such as the ID of the Amazon Machine Image (AMI) to use, the instance type, the key pair, security groups, and block device mapping.

To create a launch configuration

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar, select a region. The Auto Scaling resources that you create are tied to the region you specify and are not replicated across regions. For more information, see [Example: Distributing Instances Across Availability Zones \(p. 6\)](#).
3. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
4. On the **Welcome to Auto Scaling** page, choose **Create Auto Scaling group**.



5. On the **Create Auto Scaling Group** page, choose **Launch Configuration, Create a new launch configuration**, and then choose **Next Step**.
6. For the **Choose AMI** step, there is a list of basic configurations, called Amazon Machine Images (AMIs), that serve as templates for your instances. Choose **Select** for the Amazon Linux AMI.
7. For the **Choose Instance Type** step, select a hardware configuration for your instances. We recommend that you keep the default, a `t2.micro` instance. Choose **Next: Configure details**.

Note

T2 instances must be launched into a subnet of a VPC. If you select a `t2.micro` instance but don't have a VPC, one is created for you. This VPC includes a public subnet in each Availability Zone in the region.

8. For the **Configure details** step, do the following:
 - a. For **Name**, type a name for your launch configuration (for example, `my-first-lc`).
 - b. For **Advanced Details**, select an IP address type. If you want to connect to an instance in a VPC, you must select an option that assigns a public IP address. If you want to connect to your instance but aren't sure whether you have a default VPC, select **Assign a public IP address to every instance**.
 - c. Choose **Skip to review**.
9. For the **Review** step, choose **Edit security groups**. Follow the instructions to choose an existing security group, and then choose **Review**.
10. For the **Review** step, choose **Create launch configuration**.
11. Complete the **Select an existing key pair or create a new key pair** step as instructed. Note that you won't connect to your instance as part of this tutorial. Therefore, you can select **Proceed without a key pair** unless you intend to connect to your instance.
12. Choose **Create launch configuration**. The launch configuration is created and the wizard to create an Auto Scaling group is displayed.

Step 2: Create an Auto Scaling Group

An Auto Scaling group is a collection of EC2 instances, and the core of Amazon EC2 Auto Scaling. When you create an Auto Scaling group, you include information such as the subnets for the instances and the initial number of instances to start with.

Use the following procedure to continue where you left off after creating the launch template.

To create an Auto Scaling group

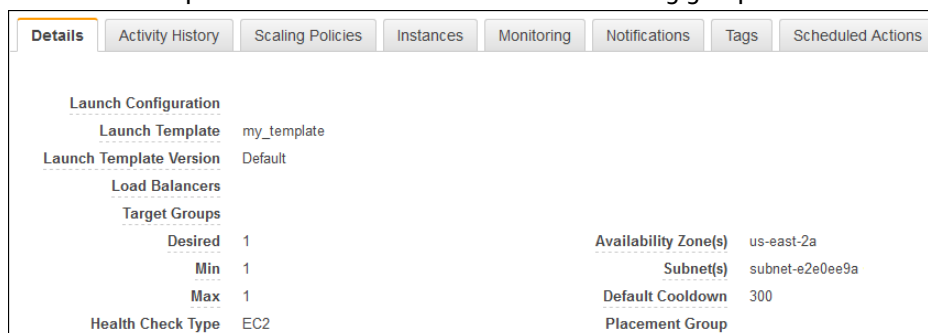
1. For the **Configure Auto Scaling group details** step, do the following:
 - a. For **Group name**, type a name for your Auto Scaling group (for example, `my-first-asg`).
 - b. For **Launch template version**, choose whether the Auto Scaling group uses the default, the latest, or a specific version of the launch template when scaling out.
 - c. For **Fleet Composition**, choose **Adhere to the launch template**.
 - d. Keep **Group size** set to the default value of 1 instance for this tutorial.
 - e. Keep **Network** set to the default VPC for the region, or select your own VPC.
 - f. For **Subnet**, choose a subnet for the VPC.
 - g. Choose **Next: Configure scaling policies**.
2. On the **Configure scaling policies** page, select **Keep this group at its initial size** and choose **Review**.
3. On the **Review** page, choose **Create Auto Scaling group**.
4. On the **Auto Scaling group creation status** page, choose **Close**.

Step 3: Verify Your Auto Scaling Group

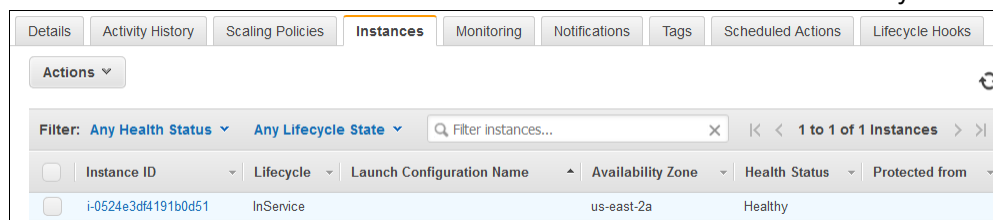
Now that you have created your Auto Scaling group, you are ready to verify that the group has launched an EC2 instance.

To verify that your Auto Scaling group has launched an EC2 instance

1. On the **Auto Scaling Groups** page, select the Auto Scaling group that you just created.
2. The **Details** tab provides information about the Auto Scaling group.



3. On the **Activity History** tab, the **Status** column shows the current status of your instance. While your instance is launching, the status column shows `In progress`. The status changes to `Successful` after the instance is launched. You can also use the refresh button to see the current status of your instance.
4. On the **Instances** tab, the **Lifecycle** column shows the state of your instance. You can see that your Auto Scaling group has launched your EC2 instance, and that it is in the `InService` lifecycle state. The **Health Status** column shows the result of the EC2 instance health check on your instance.



5. (Optional) If you want, you can try the following experiment to learn more about Amazon EC2 Auto Scaling. The minimum size for your Auto Scaling group is 1 instance. Therefore, if you terminate the running instance, Amazon EC2 Auto Scaling must launch a new instance to replace it.
 - a. On the **Instances** tab, select the ID of the instance. This shows you the instance on the **Instances** page.
 - b. Choose **Actions**, **Instance State**, **Terminate**. When prompted for confirmation, choose **Yes, Terminate**.
 - c. On the navigation pane, choose **Auto Scaling Groups**. Select your Auto Scaling group and choose the **Activity History** tab. The default cooldown for the Auto Scaling group is 300 seconds (5 minutes), so it takes about 5 minutes until you see the scaling activity. When the scaling activity starts, you'll see an entry for the termination of the first instance and an entry for the launch of a new instance. The **Instances** tab shows the new instance only.
 - d. On the navigation pane, choose **Instances**. This page shows both the terminated instance and the running instance.

Go to the next step if you would like to delete your basic infrastructure for automatic scaling. Otherwise, you can use this infrastructure as your base and try one or more of the following:

- [Maintaining the Number of Instances in Your Auto Scaling Group \(p. 60\)](#)
- [Manual Scaling \(p. 61\)](#)
- [Dynamic Scaling for Amazon EC2 Auto Scaling \(p. 71\)](#)
- [Getting SNS Notifications When Your Auto Scaling Group Scales \(p. 121\)](#)

Step 4: (Optional) Delete Your Scaling Infrastructure

You can either delete your scaling infrastructure or delete just your Auto Scaling group and keep your launch template to use at a later time.

To delete your Auto Scaling group

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group (for example, **my-first-asg**).
4. Choose **Actions**, **Delete**. When prompted for confirmation, choose **Yes, Delete**.

The **Name** column indicates that the Auto Scaling group is being deleted. The **Desired**, **Min**, and **Max** columns shows 0 instances for the Auto Scaling group.

Skip this procedure if you would like to keep your launch template.

To delete your launch template

1. On the navigation pane, choose **Instances**, **Launch Templates**.
2. Select your launch template (for example, **my-first-lt**).
3. Choose **Actions**, **Delete template**. When prompted for confirmation, choose **Delete launch template**.

Skip this procedure if you would like to keep your launch configuration.

To delete your launch configuration

1. On the navigation pane, under **Auto Scaling**, choose **Launch Configurations**.
2. Select your launch configuration (for example, **my-first-lc**).
3. Choose **Actions**, **Delete launch configuration**. When prompted for confirmation, choose **Yes, Delete**.

Tutorial: Set Up a Scaled and Load-Balanced Application

You can attach a load balancer to your Auto Scaling group. The load balancer automatically distributes incoming traffic across the instances in the group. For more information about the benefits of using Elastic Load Balancing with Auto Scaling, see [Using a Load Balancer With an Auto Scaling Group](#) (p. 48).

This tutorial attaches a load balancer to an Auto Scaling group when you create the group. To attach a load balancer to an existing Auto Scaling group, see [Attaching a Load Balancer to Your Auto Scaling Group](#) (p. 48).

Contents

- [Prerequisites](#) (p. 17)
- [Configure Scaling and Load Balancing Using the AWS Management Console](#) (p. 17)
- [Configure Scaling and Load Balancing Using the AWS CLI](#) (p. 20)

Prerequisites

- (Optional) Create an IAM role that grants your application the access to AWS that it needs.
- Launch an instance; be sure to specify the IAM role (if you created one) and specify any configuration scripts that you need as user data. Connect to the instance and customize it. For example, you can install software and applications and copy data. Test your application on your instance to ensure that your instance is configured correctly. Create a custom Amazon Machine Image (AMI) from your instance. You can terminate the instance if you no longer need it.
- Create a load balancer. Elastic Load Balancing supports three types of load balancers: Application Load Balancers, Network Load Balancers, and Classic Load Balancers. You can attach any of these types of load balancers to your Auto Scaling group. For more information, see the [Elastic Load Balancing User Guide](#).

With Classic Load Balancers, instances are registered with the load balancer. With Application Load Balancers and Network Load Balancers, instances are registered as targets with a target group. When you plan to use your load balancer with an Auto Scaling group, you don't need to register your EC2 instances with the load balancer or target group. After you attach a load balancer or target group to your Auto Scaling group, Auto Scaling registers your instances with the load balancer or target group when it launches them.

Configure Scaling and Load Balancing Using the AWS Management Console

Complete the following tasks to set up a scaled and load-balanced application when you create your Auto Scaling group.

Tasks

- [Create or Select a Launch Configuration](#) (p. 18)
- [Create an Auto Scaling Group](#) (p. 19)

- (Optional) [Verify that Your Load Balancer is Attached to Your Auto Scaling Group](#) (p. 19)

Create or Select a Launch Configuration

A launch configuration specifies the type of EC2 instance that Amazon EC2 Auto Scaling creates for you. When you create a launch configuration, you include information such as the ID of the Amazon Machine Image (AMI) to use, the instance type, key pair, and block device mapping. If you created a launch template, you can use your launch template to create an Auto Scaling group instead of using a launch configuration. For more information, see [Creating an Auto Scaling Group Using a Launch Template](#) (p. 38).

If you already have a launch configuration that you'd like to use, select it using the following procedure.

To select an existing launch configuration

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar at the top of the screen, select the region that you used when creating your load balancer.
3. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
4. On the next page, choose **Create Auto Scaling group**.
5. On the **Create Auto Scaling Group** page, choose **Launch Configuration**, select an existing launch configuration, and then choose **Next Step**.

To create a new launch configuration, use the following procedure:

To create a launch configuration

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar at the top of the screen, select the region that you used when creating your load balancer.
3. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
4. On the next page, choose **Create Auto Scaling group**.
5. On the **Create Auto Scaling Group** page, choose **Launch Configuration**, **Create a new launch configuration**, and then choose **Next Step**.
6. On the **Choose AMI** page, select your custom AMI.
7. On the **Choose Instance Type** page, select a hardware configuration for your instance, and then choose **Next: Configure details**.
8. On the **Configure Details** page, do the following:
 - a. For **Name**, type a name for your launch configuration.
 - b. (Optional) To securely distribute credentials to your EC2 instance, select your IAM role.
 - c. (Optional) If you need to connect to an instance in a nondefault VPC, for **Advanced Details**, **IP Address Type**, choose **Assign a public IP address to every instance**.
 - d. (Optional) To specify user data or a configuration script for your instance, for **Advanced Details**, **User data**, paste your configuration script.
 - e. Choose **Skip to review**.
9. On the **Review** page, choose **Edit security groups**. Follow the instructions to choose an existing security group, and then choose **Review**.
10. On the **Review** page, choose **Create launch configuration**.
11. On the **Select an existing key pair or create a new key pair** page, select one of the listed options. Select the acknowledgment check box, and then choose **Create launch configuration**.

Warning

Do not choose **Proceed without a key pair** if you need to connect to your instance.

After completing the instructions above, you're ready to proceed with the wizard to create an Auto Scaling group.

Create an Auto Scaling Group

Use the following procedure to continue where you left off after selecting or creating your launch configuration.

To create an Auto Scaling group

1. On the **Configure Auto Scaling group details** page, do the following:
 - a. For **Group name**, type a name for your Auto Scaling group.
 - b. For **Group size**, type the initial number of instances for your Auto Scaling group.
 - c. If you selected an instance type for your launch configuration that requires a VPC, such as a T2 instance, you must select a VPC for **Network**. Otherwise, if your account supports EC2-Classic and you selected an instance type that doesn't require a VPC, you can select either **Launch into EC2-Classic** or a VPC.
 - d. If you selected a VPC in the previous step, select one or more subnets from **Subnet**. If you selected EC2-Classic instead, select one or more Availability Zones from **Availability Zone(s)**.
 - e. For **Advanced Details**, select **Receive traffic from Elastic Load Balancer(s)** and then do one of the following:
 - [Classic Load Balancers] Select your load balancer from **Load Balancers**.
 - [Target groups] Select your target group from **Target Groups**.
 - f. (Optional) To use Elastic Load Balancing health checks, choose **ELB** for **Advanced Details, Health Check Type**.
 - g. Choose **Next: Configure scaling policies**.
2. On the **Configure scaling policies** page, select **Keep this group at its initial size**, and then choose **Review**.

If you want to configure scaling policies for your Auto Scaling group, see [Create an Auto Scaling Group with Target Tracking Scaling Policies \(p. 73\)](#).
3. Review the details of your Auto Scaling group. You can choose **Edit** to make changes. When you are finished, choose **Create Auto Scaling group**.

(Optional) Verify that Your Load Balancer is Attached to Your Auto Scaling Group

To verify that your load balancer is attached to your Auto Scaling group

1. Select your Auto Scaling group.
2. On the **Details** tab, **Load Balancers** shows any attached load balancers and **Target Groups** shows any attached target groups.
3. On the **Details** tab, **Load Balancers** shows any attached load balancers.
4. On the **Activity History** tab, the **Status** column shows you the status of your Auto Scaling instances. While an instance is launching, its status is **In progress**. The status changes to **Successful** after the instance is launched.

- On the **Instances** tab, the **Lifecycle** column shows the state of your Auto Scaling instances. After an instance is ready to receive traffic, its state is **InService**.

The **Health Status** column shows the result of the health checks on your instances.

Configure Scaling and Load Balancing Using the AWS CLI

Complete the following tasks to set up a scaled and load-balanced application.

Tasks

- [Create a Launch Configuration \(p. 20\)](#)
- [Create an Auto Scaling Group with a Load Balancer \(p. 20\)](#)

Create a Launch Configuration

If you already have a launch configuration that you'd like to use, skip this step.

To create the launch configuration

Use the following [create-launch-configuration](#) command:

```
aws autoscaling create-launch-configuration --launch-configuration-name my-lc \  
--image-id ami-514ac838 --instance-type m1.small
```

Create an Auto Scaling Group with a Load Balancer

You can attach an existing load balancer to an Auto Scaling group when you create the group.

To create an Auto Scaling group with an attached Classic Load Balancer

Use the following [create-auto-scaling-group](#) command with the `--load-balancer-names` option to create an Auto Scaling group with an attached Classic Load Balancer:

```
aws autoscaling create-auto-scaling-group --auto-scaling-group-name my-lb-asg \  
--launch-configuration-name my-lc \  
--availability-zones "us-west-2a" "us-west-2b" \  
--load-balancer-names "my-lb" \  
--max-size 5 --min-size 1 --desired-capacity 2
```

To create an Auto Scaling group with an attached target group

Use the following [create-auto-scaling-group](#) command with the `--target-group-arns` option to create an Auto Scaling group with an attached target group:

```
aws autoscaling create-auto-scaling-group --auto-scaling-group-name my-lb-asg \  
--launch-configuration-name my-lc \  
--vpc-zone-identifier "subnet-41767929" \  
--vpc-zone-identifier "subnet-b7d581c0" \  
--target-group-arns "arn:aws:elasticloadbalancing:us-west-2:123456789012:targetgroup/my-  
targets/1234567890123456" \  
--max-size 5 --min-size 1 --desired-capacity 2
```

Launch Templates

A launch template is similar to a [launch configuration \(p. 26\)](#), in that it specifies instance configuration information such as the ID of the Amazon Machine Image (AMI), the instance type, a key pair, security groups, and other parameters that you use to launch EC2 instances. However, defining a launch template instead of a launch configuration allows you to have multiple versions of a template. With versioning, you can create a subset of the full set of parameters and then reuse it to create other templates or template versions. For example, you can create a default template that defines common configuration parameters such as tags or network configurations, and allow the other parameters to be specified as part of another version of the same template.

We recommend that you use launch templates instead of launch configurations to ensure that you can use the latest features of Amazon EC2, such as T2 Unlimited instances.

With launch templates, you can also provision capacity across multiple instance types using both On-Demand Instances and Spot Instances to achieve the desired scale, performance, and cost. For more information, see [Using Multiple Instance Types and Purchase Options \(p. 37\)](#).

If you currently use launch configurations, you can specify a launch template when you update an Auto Scaling group that was created using a launch configuration.

To create a launch template to use with an Auto Scaling group, you can create the template from scratch, create a new version of an existing template, or copy the parameters from a launch configuration, a running instance, or another template.

The following topics describe the most common procedures for creating and working with launch templates for use with your Auto Scaling groups. For more information about launch templates, see the [launch templates](#) section of the *Amazon EC2 User Guide for Linux Instances*.

Contents

- [Creating a Launch Template for an Auto Scaling group \(p. 21\)](#)
- [Copying a Launch Configuration to a Launch Template \(p. 24\)](#)
- [Replacing a Launch Configuration with a Launch Template \(p. 25\)](#)

Creating a Launch Template for an Auto Scaling group

Before you can create an Auto Scaling group using a launch template, you must create a launch template that includes the parameters required to launch an EC2 instance, such as the ID of the Amazon Machine Image (AMI) and an instance type.

The following procedure works for creating a new launch template using parameters that you define (starting from scratch), or using an existing launch template as the basis for a new launch template. After you create your launch template, you can create the Auto Scaling group by following the instructions in [Creating an Auto Scaling Group Using a Launch Template \(p. 38\)](#).

Prerequisites

For information about the required IAM permissions, see [Controlling the Use of Launch Templates](#) in the *Amazon EC2 User Guide for Linux Instances*.

Considerations

Keep the following considerations in mind when creating a launch template for use with an Auto Scaling group:

- Launch templates give you the flexibility of launching one type of instance, or a combination of instance types and On-Demand and Spot purchase options. For more information, see [Using Multiple Instance Types and Purchase Options \(p. 37\)](#). Launching instances with such a combination is not supported:
 - if you specify a Spot Instance request in **Additional Details**.
 - in EC2-Classic.
- If you configure a network type (VPC or EC2-Classic), subnet, and Availability Zone for your template, these settings will be ignored in favor of what is specified in the Auto Scaling group.
- If you specify a network interface, you must configure the security group as part of the network interface, and not in the **Security Groups** section of the template.
- You cannot specify multiple network interfaces.
- You cannot specify private IP addresses.
- To specify a network interface to use, its device index must be 0 (eth0).
- You cannot use host placement affinity.

To create a new launch template for an Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Launch Templates**.
3. Choose **Create a new template**. Provide a name and description for the launch template.
4. If you choose to create the new template based on another template:
 - a. For **Source template**, choose an existing launch template.
 - b. Choose the launch template version on which to base the new launch template from **Source template version**.
5. Under **Launch template contents**, provide the following information.
 - a. **AMI ID**: Choose an AMI ID from which to launch the instances. You can search through all available AMIs using the **Search for AMI** dialog. On the **Quick Start** tab, select from one of the commonly used AMIs in the list. If you don't see the AMI that you need, select the **AWS Marketplace** or **Community AMIs** tab to [find a suitable AMI](#).
 - b. **Instance type**: Choose the [instance type](#). Ensure that the instance type is compatible with the AMI you've specified.
 - c. **Key pair name**: Specify the [key pair](#) to use when connecting to your instances.
 - d. **Network type**: While you may choose to specify whether to launch instances into a VPC or EC2-Classic, if applicable; the network type and Availability Zone settings of the launch template are ignored in favor of the settings of the Auto Scaling group.
 - e. **Security Groups**: Choose one or more [security groups](#), or leave blank to configure the security group as part of the network interface. You cannot specify security groups in both places. To launch instances into a VPC, you must specify a security group that is created for that VPC.
6. Under **Network interfaces**, choose **Add network interface** and provide the following optional information. You can only specify one network interface. The only fields you need to pay attention to are listed below.
 - a. **Device**: Specify eth0 as the device name (the device for which the device index is 0).
 - b. **Network interface**: Leave blank to let AWS create a new network interface when an instance is launched, or enter the ID of an existing network interface. If you specify an ID, this limits your Auto Scaling group to one instance.
 - c. **Description**: Enter a descriptive name.
 - d. **Subnet**: While you may choose to specify a subnet, it will be ignored in favor of the subnets specified in the Auto Scaling group.

- e. **Auto-assign public IP:** Specify whether to automatically assign a public IP address to the network interface.
 - f. **Security group ID:** Enter the IDs of one or more security groups with which to associate the primary network interface (eth0). To launch instances into a VPC, you must specify a security group that is created for that VPC.
 - g. **Delete on termination:** Choose whether the network interface is deleted when the Auto Scaling group scales in and the instance that the network interface is attached to is terminated.
7. If you choose to specify volumes to attach to the instances not including the volumes specified by the AMI, under **Storage (Volumes)**, provide the following information:
- a. **Volume type:** Choose instance store or Amazon EBS volumes. The type of volume depends on the instance type that you've chosen. For more information, see [Amazon EC2 Instance Store](#) and [Amazon EBS Volumes](#) in the *Amazon EC2 User Guide for Linux Instances*.
 - b. **Device name:** Specify a device name for the volume.
 - c. **Snapshot:** Enter the ID of the snapshot from which to create the volume.
 - d. **Size:** For Amazon EBS-backed volumes, specify a storage size. If you're creating the volume from a snapshot and don't specify a volume size, the default is the snapshot size.
 - e. **Volume type:** For Amazon EBS volumes, choose the [volume type](#).
 - f. **IOPS:** With a Provisioned IOPS SSD volume, enter the maximum number of input/output operations per second (IOPS) that the volume should support.
 - g. **Delete on termination:** For Amazon EBS volumes, choose whether to delete the volume when the associated instance is terminated.
 - h. **Encrypted:** Choose **Yes** to encrypt new Amazon EBS volumes. Amazon EBS volumes that are restored from encrypted snapshots are automatically encrypted. Encrypted volumes can only be attached to [supported instance types](#).
 - i. **Key:** If you chose to encrypt in the previous step, enter the master key you want to use when encrypting the volumes. You can enter the default master key for your account, or you can enter any customer master key (CMK) that you have previously created using the AWS Key Management Service. You can paste the full ARN of any key that you have access to. For more information, see the [AWS Key Management Service Developer Guide](#).
8. For **Tags**, specify tags by providing key and value combinations. You can tag the instances, the volumes, or both.
9. For **Advanced Details**, expand the section to view the fields and specify any additional parameters for the instances. For more information about this section and how each parameter can be used, see [Creating a Launch Template](#) in the *Amazon EC2 User Guide for Linux Instances*.
- **Purchasing option:** You have the option to request Spot Instances and specify the maximum price you are willing to pay per instance hour. For this to work with an Auto Scaling group, you must specify a one-time request with no end date.

Important

If you will specify multiple instance types and purchase options when you configure your Auto Scaling group, leave these fields empty. For more information, see [Using Multiple Instance Types and Purchase Options \(p. 37\)](#).

- **IAM instance profile:** Specify an AWS Identity and Access Management (IAM) instance profile to associate with the instances.
- **Shutdown behavior:** You can leave this field blank because it is ignored for Amazon EC2 Auto Scaling. The default behavior of Auto Scaling is to terminate the instance.
- **Termination protection:** You can leave this field blank because it is ignored for Amazon EC2 Auto Scaling when scaling your Auto Scaling group. To control whether an Auto Scaling group can terminate a particular instance when scaling in, use [Instance Protection \(p. 93\)](#).

- **Monitoring:** Choose whether to enable detailed monitoring of the instances using Amazon CloudWatch. Additional charges apply. For more information, see [Monitoring Your Auto Scaling Groups and Instances Using Amazon CloudWatch \(p. 111\)](#).
 - **T2/T3 Unlimited:** (Only valid for T2 and T3 instances) Choose whether to enable applications to burst beyond the baseline for as long as needed. Additional charges may apply.
 - **Placement group name:** Specify a placement group in which to launch the instances. Not all instance types can be launched in a placement group. Note: If you configure an Auto Scaling group using a CLI command that specifies a different placement group, the Auto Scaling group ignores the placement group in the launch template in favor of the one specified for the Auto Scaling group.
 - **EBS-optimized instance:** Provides additional, dedicated capacity for Amazon EBS I/O. Not all instance types support this feature, and additional charges apply.
 - **Tenancy:** You can choose to run your instances either on shared hardware (**Shared**), or on isolated, dedicated hardware (**Dedicated**). Additional charges may apply. You cannot choose **Dedicated host**.
 - **RAM disk ID:** The ID of the RAM disk associated with the AMI. Only valid for paravirtual (PV) AMIs.
 - **Kernel ID:** The ID of the kernel associated with the AMI. Only valid for paravirtual (PV) AMIs.
 - **User data:** You can specify user data to configure an instance during launch, or to run a configuration script.
10. Choose **Create launch template**.

To create a launch template using the command line

You can use one of the following commands:

- [create-launch-template](#) (AWS CLI)
- [New-EC2LaunchTemplate](#) (AWS Tools for Windows PowerShell)

Copying a Launch Configuration to a Launch Template

Use the following procedure to copy the options from an existing launch configuration to create a new launch template.

You can create launch templates from existing launch configurations to make it easy for you to update your Auto Scaling groups to use launch templates. Like launch configurations, launch templates can contain all or some of the parameters to launch an instance. With launch templates, you can also create multiple versions of a template to make it faster and easier to launch new instances.

To create a launch template from a launch configuration

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Launch Configurations**.
3. Select the launch configuration you want to copy and choose **Copy to launch template**. This sets up a new launch template with the same name and options as the launch configuration you selected.
4. For **New launch template name**, you can use the name of the launch configuration (the default) or type a new name. Note that launch template names must be unique.
5. (Optional) To create an Auto Scaling group using the new launch template, select **Create an Auto Scaling group using the new template**. For more information, see [Creating an Auto Scaling Group Using a Launch Template \(p. 38\)](#).

6. Choose **Submit**.

After creating your launch template, you can update your existing Auto Scaling groups, as needed, with the launch template that you created. For more information, see [Replacing a Launch Configuration with a Launch Template \(p. 25\)](#).

Replacing a Launch Configuration with a Launch Template

When you edit an Auto Scaling group that has an existing launch configuration, you have the option of replacing the launch configuration with a launch template. This lets you use launch templates with any Auto Scaling groups you currently use. In doing so, you can take advantage of the versioning and other features of launch templates.

After you replace the launch configuration for an Auto Scaling group, any new instances are launched using the new launch template, but existing instances are not affected.

Prerequisites

Before you can replace a launch configuration in an Auto Scaling group, you must first create your launch template. The easiest way to create a launch template is to copy it from the launch configuration. For more information, see [Copying a Launch Configuration to a Launch Template \(p. 24\)](#).

To replace the launch configuration for an Auto Scaling group

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group and choose **Details, Edit**.
4. For **Launch Instances Using**, choose the **Launch Template** option.
5. For **Launch Template**, select your launch template.
6. For **Launch Template Version**, select the launch template version, as needed. After you create versions of a launch template, you can choose whether the Auto Scaling group uses the default or the latest version of the launch template when scaling out.
7. When you have finished, choose **Save**.

Launch Configurations

A *launch configuration* is an instance configuration template that an Auto Scaling group uses to launch EC2 instances. When you create a launch configuration, you specify information for the instances such as the ID of the Amazon Machine Image (AMI), the instance type, a key pair, one or more security groups, and a block device mapping. If you've launched an EC2 instance before, you specified the same information in order to launch the instance.

You can specify your launch configuration with multiple Auto Scaling groups. However, you can only specify one launch configuration for an Auto Scaling group at a time, and you can't modify a launch configuration after you've created it. Therefore, if you want to change the launch configuration for an Auto Scaling group, you must create a launch configuration and then update your Auto Scaling group with the new launch configuration.

Keep in mind that whenever you create an Auto Scaling group, you must specify a launch configuration, a launch template, or an EC2 instance. When you create an Auto Scaling group using an EC2 instance, Amazon EC2 Auto Scaling automatically creates a launch configuration for you and associates it with the Auto Scaling group. For more information, see [Creating an Auto Scaling Group Using an EC2 Instance \(p. 41\)](#). Alternatively, if you are using launch templates, you can specify a launch template instead of a launch configuration or an EC2 instance. For more information, see [Launch Templates \(p. 21\)](#).

Contents

- [Creating a Launch Configuration \(p. 26\)](#)
- [Creating a Launch Configuration Using an EC2 Instance \(p. 27\)](#)
- [Changing the Launch Configuration for an Auto Scaling Group \(p. 31\)](#)
- [Launching Auto Scaling Instances in a VPC \(p. 32\)](#)

Creating a Launch Configuration

When you create a launch configuration, you must specify information about the EC2 instances to launch, such as the Amazon Machine Image (AMI), instance type, key pair, security groups, and block device mapping. Alternatively, you can create a launch configuration using attributes from a running EC2 instance. For more information, see [Creating a Launch Configuration Using an EC2 Instance \(p. 27\)](#).

Note

When you create an Auto Scaling group, you can specify a launch template, launch configuration, or an EC2 instance. We recommend that you use a launch template to ensure that you can use the latest features of Amazon EC2. For more information, see [Launch Templates \(p. 21\)](#).

After you create a launch configuration, you can create an Auto Scaling group. For more information, see [Creating an Auto Scaling Group Using a Launch Configuration \(p. 40\)](#).

An Auto Scaling group is associated with one launch configuration at a time, and you can't modify a launch configuration after you've created it. Therefore, if you want to change the launch configuration for an existing Auto Scaling group, you must update it with the new launch configuration. For more information, see [Changing the Launch Configuration for an Auto Scaling Group \(p. 31\)](#).

To create a launch configuration using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar at the top of the screen, the current region is displayed. Select a region for your Auto Scaling group that meets your needs.

3. On the navigation pane, under **Auto Scaling**, choose **Launch Configurations**.
4. On the next page, choose **Create launch configuration**.
5. On the **Choose AMI** page, select an AMI.
6. On the **Choose Instance Type** page, select a hardware configuration for your instance. Choose **Next: Configure details**.

Note

T2 instances must be launched into a subnet of a VPC. If you select a `t2.micro` instance but don't have a VPC, one is created for you. This VPC includes a public subnet in each Availability Zone in the region.

7. On the **Configure Details** page, do the following:
 - a. For **Name**, type a name for your launch configuration.
 - b. (Optional) For **IAM role**, select a role to associate with the instances. For more information, see [Launch Auto Scaling Instances with an IAM Role \(p. 144\)](#).
 - c. (Optional) By default, basic monitoring is enabled for your Auto Scaling instances. To enable detailed monitoring for your Auto Scaling instances, select **Enable CloudWatch detailed monitoring**.
 - d. For **Advanced Details, IP Address Type**, select an option. To connect to instances in a VPC, you must select an option that assigns a public IP address. If you want to connect to your instances but aren't sure whether you have a default VPC, select **Assign a public IP address to every instance**.
 - e. Choose **Skip to review**.
8. On the **Review** page, choose **Edit security groups**. Follow the instructions to choose an existing security group, and then choose **Review**.
9. On the **Review** page, choose **Create launch configuration**.
10. For **Select an existing key pair or create a new key pair**, select one of the listed options. Select the acknowledgment check box, and then choose **Create launch configuration**.

Warning

Do not select **Proceed without a key pair** if you need to connect to your instance.

To create a launch configuration using the command line

You can use one of the following commands:

- [create-launch-configuration](#) (AWS CLI)
- [New-ASLaunchConfiguration](#) (AWS Tools for Windows PowerShell)

Creating a Launch Configuration Using an EC2 Instance

Amazon EC2 Auto Scaling provides you with an option to create a launch configuration using the attributes from a running EC2 instance.

Tip

You can [create an Auto Scaling group directly from an EC2 instance \(p. 41\)](#). When you use this feature, Amazon EC2 Auto Scaling automatically creates a launch configuration for you as well.

If the specified instance has properties that are not currently supported by launch configurations, the instances launched by the Auto Scaling group might not be identical to the original EC2 instance.

There are differences between creating a launch configuration from scratch and creating a launch configuration from an existing EC2 instance. When you create a launch configuration from scratch, you specify the image ID, instance type, optional resources (such as storage devices), and optional settings (like monitoring). When you create a launch configuration from a running instance, Amazon EC2 Auto Scaling derives attributes for the launch configuration from the specified instance, plus the block device mapping for the AMI that the instance was launched from (ignoring any additional block devices that were added to the instance after launch).

When you create a launch configuration using a running instance, you can override the following attributes by specifying them as part of the same request: AMI, block devices, key pair, instance profile, instance type, kernel, monitoring, placement tenancy, ramdisk, security groups, Spot price, user data, whether the instance has a public IP address is associated, and whether the instance is EBS-optimized.

The following examples show you to create a launch configuration from an EC2 instance.

Examples

- [Create a Launch Configuration Using an EC2 Instance \(p. 28\)](#)
- [Create a Launch Configuration from an Instance and Override the Block Devices \(p. 29\)](#)
- [Create a Launch Configuration and Override the Instance Type \(p. 30\)](#)

Create a Launch Configuration Using an EC2 Instance

To create a launch configuration using the attributes of an existing EC2 instance, specify the ID of the instance.

Important

The AMI used to launch the specified instance must still exist.

Create a Launch Configuration from an EC2 Instance Using the AWS Management Console

You can use the console to create a launch configuration and an Auto Scaling group from a running EC2 instance and add the instance to the new Auto Scaling group. For more information, see [Attach EC2 Instances to Your Auto Scaling Group \(p. 63\)](#).

Create a Launch Configuration from an EC2 Instance Using the AWS CLI

Use the following `create-launch-configuration` command to create a launch configuration from an instance using the same attributes as the instance (other than any block devices added after launch, which are ignored):

```
aws autoscaling create-launch-configuration --launch-configuration-name my-lc-from-instance
--instance-id i-a8e09d9c
```

You can use the following `describe-launch-configurations` command to describe the launch configuration and verify that its attributes match those of the instance:

```
aws autoscaling describe-launch-configurations --launch-configuration-names my-lc-from-instance
```

The following is an example response:

```
{
  "LaunchConfigurations": [
```

```
{
  "UserData": null,
  "EbsOptimized": false,
  "LaunchConfigurationARN": "arn",
  "InstanceMonitoring": {
    "Enabled": false
  },
  "ImageId": "ami-05355a6c",
  "CreatedTime": "2014-12-29T16:14:50.382Z",
  "BlockDeviceMappings": [],
  "KeyName": "my-key-pair",
  "SecurityGroups": [
    "sg-8422d1eb"
  ],
  "LaunchConfigurationName": "my-lc-from-instance",
  "KernelId": "null",
  "RamdiskId": null,
  "InstanceType": "t1.micro",
  "AssociatePublicIpAddress": true
}
```

Create a Launch Configuration from an Instance and Override the Block Devices

By default, Amazon EC2 Auto Scaling uses the attributes from the EC2 instance you specify to create the launch configuration, except that the block devices come from the AMI used to launch the instance, not the instance. To add block devices to the launch configuration, override the block device mapping for the launch configuration.

Important

The AMI used to launch the specified instance must still exist.

Create a Launch Configuration and Override the Block Devices Using the AWS CLI

Use the following [create-launch-configuration](#) command to create a launch configuration using an EC2 instance but with a custom block device mapping:

```
aws autoscaling create-launch-configuration --launch-configuration-name my-lc-from-
instance-bdm --instance-id i-a8e09d9c
--block-device-mappings "[{\"DeviceName\":\"/dev/sda1\",\"Ebs\":{\"SnapshotId\":
\\\"snap-3decf207\\\"}}, {\"DeviceName\":\"/dev/sdf\",\"Ebs\":{\"SnapshotId\":\\\"snap-
eed6ac86\\\"}}]"
```

Use the following [describe-launch-configurations](#) command to describe the launch configuration and verify that it uses your custom block device mapping:

```
aws autoscaling describe-launch-configurations --launch-configuration-names my-lc-from-
instance-bdm
```

The following example response describes the launch configuration:

```
{
  "LaunchConfigurations": [
    {
      "UserData": null,
```

```
{
  "EbsOptimized": false,
  "LaunchConfigurationARN": "arn",
  "InstanceMonitoring": {
    "Enabled": false
  },
  "ImageId": "ami-c49c0dac",
  "CreatedTime": "2015-01-07T14:51:26.065Z",
  "BlockDeviceMappings": [
    {
      "DeviceName": "/dev/sda1",
      "Ebs": {
        "SnapshotId": "snap-3decf207"
      }
    },
    {
      "DeviceName": "/dev/sdf",
      "Ebs": {
        "SnapshotId": "snap-ee6ac86"
      }
    }
  ],
  "KeyName": "my-key-pair",
  "SecurityGroups": [
    "sg-8637d3e3"
  ],
  "LaunchConfigurationName": "my-lc-from-instance-bdm",
  "KernelId": null,
  "RamdiskId": null,
  "InstanceType": "t1.micro",
  "AssociatePublicIpAddress": true
}
```

Create a Launch Configuration and Override the Instance Type

By default, Amazon EC2 Auto Scaling uses the attributes from the EC2 instance you specify to create the launch configuration. Depending on your requirements, you might want to override attributes from the instance and use the values that you need. For example, you can override the instance type.

Important

The AMI used to launch the specified instance must still exist.

Create a Launch Configuration and Override the Instance Type Using the AWS CLI

Use the following [create-launch-configuration](#) command to create a launch configuration using an EC2 instance but with a different instance type (for example `t2.medium`) than the instance (for example `t2.micro`):

```
aws autoscaling create-launch-configuration --launch-configuration-name my-lc-from-
instance-change-type --instance-id i-a8e09d9c --instance-type t2.medium
```

Use the following [describe-launch-configurations](#) command to describe the launch configuration and verify that the instance type was overridden:

```
aws autoscaling describe-launch-configurations --launch-configuration-names my-lc-from-
instance-change-type
```

The following example response describes the launch configuration:

```
{
  "LaunchConfigurations": [
    {
      "UserData": null,
      "EbsOptimized": false,
      "LaunchConfigurationARN": "arn",
      "InstanceMonitoring": {
        "Enabled": false
      },
      "ImageId": "ami-05355a6c",
      "CreatedTime": "2014-12-29T16:14:50.382Z",
      "BlockDeviceMappings": [],
      "KeyName": "my-key-pair",
      "SecurityGroups": [
        "sg-8422d1eb"
      ],
      "LaunchConfigurationName": "my-lc-from-instance-changetype",
      "KernelId": "null",
      "RamdiskId": null,
      "InstanceType": "t2.medium",
      "AssociatePublicIpAddress": true
    }
  ]
}
```

Changing the Launch Configuration for an Auto Scaling Group

An Auto Scaling group is associated with one launch configuration at a time, and you can't modify a launch configuration after you've created it. To change the launch configuration for an Auto Scaling group, you can use an existing launch configuration as the basis for a new launch configuration and then update the Auto Scaling group to use the new launch configuration.

After you change the launch configuration for an Auto Scaling group, any new instances are launched using the new configuration options, but existing instances are not affected.

To change the launch configuration for an Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Launch Configurations**.
3. Select the launch configuration and choose **Actions, Copy launch configuration**. This sets up a new launch configuration with the same options as the original, but with "Copy" added to the name.
4. On the **Copy Launch Configuration** page, edit the configuration options as needed and choose **Create launch configuration**.
5. On the confirmation page, choose **View your Auto Scaling groups**.
6. Select the Auto Scaling group and choose **Details, Edit**.
7. Select the new launch configuration from **Launch Configuration** and choose **Save**.

To change the launch configuration for an Auto Scaling group using the AWS CLI

1. Describe the current launch configuration using the [describe-launch-configurations](#) command.
2. Create a new launch configuration using the [create-launch-configuration](#) command.

3. Update the launch configuration for the Auto Scaling group using the [update-auto-scaling-group](#) command with the `--launch-configuration-names` parameter.

To change the launch configuration for an Auto Scaling group using the Tools for Windows PowerShell

1. Describe the current launch configuration using the [Get-ASLaunchConfiguration](#) command.
2. Create a new launch configuration using the [New-ASLaunchConfiguration](#) command.
3. Update the launch configuration for the Auto Scaling group using the [Update-ASAutoScalingGroup](#) command with the `-LaunchConfigurationName` parameter.

Launching Auto Scaling Instances in a VPC

Amazon Virtual Private Cloud (Amazon VPC) enables you to define a virtual networking environment in a private, isolated section of the AWS cloud. You have complete control over your virtual networking environment. For more information, see the [Amazon VPC User Guide](#).

Within a virtual private cloud (VPC), you can launch AWS resources such as an Auto Scaling group. An Auto Scaling group in a VPC works essentially the same way as it does on Amazon EC2 and supports the same set of features.

A subnet in Amazon VPC is a subdivision within an Availability Zone defined by a segment of the IP address range of the VPC. Using subnets, you can group your instances based on your security and operational needs. A subnet resides entirely within the Availability Zone it was created in. You launch Auto Scaling instances within the subnets.

To enable communication between the Internet and the instances in your subnets, you must create an Internet gateway and attach it to your VPC. An Internet gateway enables your resources within the subnets to connect to the Internet through the Amazon EC2 network edge. If a subnet's traffic is routed to an Internet gateway, the subnet is known as a *public* subnet. If a subnet's traffic is not routed to an Internet gateway, the subnet is known as a *private* subnet. Use a public subnet for resources that must be connected to the Internet, and a private subnet for resources that need not be connected to the Internet.

Prerequisites

Before you can launch your Auto Scaling instances in a VPC, you must first create your VPC environment. After you create your VPC and subnets, you launch Auto Scaling instances within the subnets. The easiest way to create a VPC with one public subnet is to use the VPC wizard. For more information, see the [Amazon VPC Getting Started Guide](#).

Contents

- [Default VPC \(p. 32\)](#)
- [IP Addressing in a VPC \(p. 33\)](#)
- [Instance Placement Tenancy \(p. 33\)](#)
- [Linking EC2-Classic Instances to a VPC \(p. 34\)](#)
- [Examples \(p. 35\)](#)

Default VPC

If you have created your AWS account after 2013-12-04 or you are creating your Auto Scaling group in a new region, we create a default VPC for you. Your default VPC comes with a default subnet in each

Availability Zone. If you have a default VPC, your Auto Scaling group is created in the default VPC by default.

For information about default VPCs and checking whether your account comes with a default VPC, see [Your Default VPC and Subnets](#) in the *Amazon VPC Developer Guide*.

IP Addressing in a VPC

When you launch your Auto Scaling instances in a VPC, your instances are automatically assigned a private IP address in the address range of the subnet. This enables your instances to communicate with other instances in the VPC.

You can configure your launch configuration to assign public IP addresses to your instances. Assigning public IP addresses to your instances enables them to communicate with the Internet or other services in AWS.

When you enable public IP addresses for your instances, they receive both IPv4 and IPv6 addresses if you launch them into a subnet that is configured to automatically assign IPv6 addresses to instances. Otherwise, they receive IPv4 addresses. For more information, see [IPv6 Addresses](#) in the *Amazon EC2 User Guide for Linux Instances*.

Instance Placement Tenancy

Dedicated Instances are physically isolated at the host hardware level from instances that aren't dedicated and from instances that belong to other AWS accounts. When you create a VPC, by default its tenancy attribute is set to `default`. In such a VPC, you can launch instances with a tenancy value of `dedicated` so that they run as single-tenancy instances. Otherwise, they run as shared-tenancy instances by default. If you set the tenancy attribute of a VPC to `dedicated`, all instances launched in the VPC run as single-tenancy instances. For more information, see [Dedicated Instances](#) in the *Amazon VPC User Guide*. For pricing information, see the [Amazon EC2 Dedicated Instances](#) product page.

When you create a launch configuration, the default value for the instance placement tenancy is `null` and the instance tenancy is controlled by the tenancy attribute of the VPC. The following table summarizes the instance placement tenancy of the Auto Scaling instances launched in a VPC.

Launch Configuration Tenancy	VPC Tenancy = default	VPC Tenancy = dedicated
not specified	shared-tenancy instance	Dedicated Instance
default	shared-tenancy instance	Dedicated Instance
dedicated	Dedicated Instance	Dedicated Instance

You can specify the instance placement tenancy for your launch configuration as `default` or `dedicated` using the [create-launch-configuration](#) command with the `--placement-tenancy` option. For example, the following command sets the launch configuration tenancy to `dedicated`:

```
aws autoscaling create-launch-configuration --launch-configuration-name my-launch-config --placement-tenancy dedicated --image-id ...
```

You can use the following [describe-launch-configurations](#) command to verify the instance placement tenancy of the launch configuration:

```
aws autoscaling describe-launch-configurations --launch-configuration-names my-launch-config
```

The following is example output for a launch configuration that creates Dedicated Instances. Note that `PlacementTenancy` is not part of the output for this command unless you have explicitly set the instance placement tenancy.

```
{
  "LaunchConfigurations": [
    {
      "UserData": null,
      "EbsOptimized": false,
      "PlacementTenancy": "dedicated",
      "LaunchConfigurationARN": "arn",
      "InstanceMonitoring": {
        "Enabled": true
      },
      "ImageId": "ami-b5a7ea85",
      "CreatedTime": "2015-03-08T23:39:49.011Z",
      "BlockDeviceMappings": [],
      "KeyName": null,
      "SecurityGroups": [],
      "LaunchConfigurationName": "my-launch-config",
      "KernelId": null,
      "RamdiskId": null,
      "InstanceType": "m3.medium"
    }
  ]
}
```

Linking EC2-Classic Instances to a VPC

If you are launching the instances in your Auto Scaling group in EC2-Classic, you can link them to a VPC using *ClassicLink*. ClassicLink enables you to associate one or more security groups for the VPC with the EC2-Classic instances in your Auto Scaling group, enabling communication between these linked EC2-Classic instances and instances in the VPC using private IP addresses. For more information, see [ClassicLink](#) in the *Amazon EC2 User Guide for Linux Instances*.

If you have running EC2-Classic instances in your Auto Scaling group, you can link them to a VPC with ClassicLink enabled. For more information, see [Linking an Instance to a VPC](#) in the *Amazon EC2 User Guide for Linux Instances*. Alternatively, you can update the Auto Scaling group to use a launch configuration that automatically links the EC2-Classic instances to a VPC at launch, then terminate the running instances and let the Auto Scaling group launch new instances that are linked to the VPC.

Link to a VPC Using the AWS Management Console

Use the following procedure to create a launch configuration that links EC2-Classic instances to the specified VPC and update an existing Auto Scaling group to use the launch configuration.

To link EC2-Classic instances in an Auto Scaling group to a VPC using the console

1. Verify that the VPC has ClassicLink enabled. For more information, see [Viewing Your ClassicLink-Enabled VPCs](#) in the *Amazon EC2 User Guide for Linux Instances*.
2. Create a security group for the VPC that you are going to link EC2-Classic instances to, with rules to control communication between the linked EC2-Classic instances and instances in the VPC.
3. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
4. On the navigation pane, choose **Launch Configurations**.
5. Choose **Create launch configuration**.
6. On the **Choose AMI** page, select an AMI.
7. On the **Choose an Instance Type** page, select an instance type, and then choose **Next: Configure details**.

8. On the **Configure details** page, do the following:
 - a. Type a name for your launch configuration.
 - b. Expand **Advanced Details**, select the **IP Address Type** that you need, and then select **Link to VPC**.
 - c. For **VPC**, select the VPC with ClassicLink enabled from step 1.
 - d. For **Security Groups**, select the security group from step 2.
 - e. Choose **Skip to review**.
9. On the **Review** page, make any changes that you need, and then choose **Create launch configuration**. For **Select an existing key pair or create a new key pair**, select an option, select the acknowledgment check box (if present), and then choose **Create launch configuration**.
10. When prompted, follow the directions to create an Auto Scaling group that uses the new launch configuration. Be sure to select **Launch into EC2-Classic** for **Network**. Otherwise, choose **Cancel** and then add your launch configuration to an existing Auto Scaling group as follows:
 - a. On the navigation pane, choose **Auto Scaling Groups**.
 - b. Select your Auto Scaling group, choose **Actions**, **Edit**.
 - c. For **Launch Configuration**, select your new launch configuration and then choose **Save**.

Link to a VPC Using the AWS CLI

Use the following procedure to create a launch configuration that links EC2-Classic instances to the specified VPC and update an existing Auto Scaling group to use the launch configuration.

To link EC2-Classic instances in an Auto Scaling group to a VPC using the AWS CLI

1. Verify that the VPC has ClassicLink enabled. For more information, see [Viewing Your ClassicLink-Enabled VPCs](#) in the *Amazon EC2 User Guide for Linux Instances*.
2. Create a security group for the VPC that you are going to link EC2-Classic instances to, with rules to control communication between the linked EC2-Classic instances and instances in the VPC.
3. Create a launch configuration using the [create-launch-configuration](#) command as follows, where *vpd_id* is the ID of the VPC with ClassicLink enabled from step 1 and *group_id* is the security group from step 2:

```
aws autoscaling create-launch-configuration --launch-configuration-name classiclink-config
--image-id ami_id --instance-type instance_type
--classic-link-vpc-id vpc_id --classic-link-vpc-security-groups group_id
```

4. Update your existing Auto Scaling group, for example *my-asg*, with the launch configuration that you created in the previous step. Any new EC2-Classic instances launched in this Auto Scaling group are linked EC2-Classic instances. Use the [update-auto-scaling-group](#) command as follows:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg
--launch-configuration-name classiclink-config
```

Alternatively, you can use this launch configuration with a new Auto Scaling group that you create using [create-auto-scaling-group](#).

Examples

For examples, see the following tutorials:

- [Getting Started with Amazon EC2 Auto Scaling \(p. 12\)](#)
- [Hosting a Web App on Amazon Web Services](#)
- [Hosting a .NET Web App on Amazon Web Services](#)

Auto Scaling Groups

An *Auto Scaling group* contains a collection of EC2 instances that share similar characteristics and are treated as a logical grouping for the purposes of instance scaling and management. For example, if a single application operates across multiple instances, you might want to increase the number of instances in that group to improve the performance of the application, or decrease the number of instances to reduce costs when demand is low. You can use the Auto Scaling group to scale the number of instances automatically based on criteria that you specify, or maintain a fixed number of instances even if an instance becomes unhealthy. This automatic scaling and maintaining the number of instances in an Auto Scaling group is the core functionality of the Amazon EC2 Auto Scaling service.

An Auto Scaling group starts by launching enough EC2 instances to meet its desired capacity. The Auto Scaling group maintains this number of instances by performing periodic health checks on the instances in the group. If an instance becomes unhealthy, the group terminates the unhealthy instance and launches another instance to replace it. For more information about health check replacements, see [Maintaining the Number of Instances in Your Auto Scaling Group](#) (p. 60).

You can use scaling policies to increase or decrease the number of instances in your group dynamically to meet changing conditions. When the scaling policy is in effect, the Auto Scaling group adjusts the desired capacity of the group and launches or terminates the instances as needed. You can also manually scale or scale on a schedule. For more information, see [Scaling the Size of Your Auto Scaling Group](#) (p. 58).

Contents

- [Using Multiple Instance Types and Purchase Options](#) (p. 37)
- [Creating an Auto Scaling Group Using a Launch Template](#) (p. 38)
- [Creating an Auto Scaling Group Using a Launch Configuration](#) (p. 40)
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- [Deleting Your Auto Scaling Infrastructure](#) (p. 56)

Using Multiple Instance Types and Purchase Options

To maximize your cost savings and obtain the desired scale for your application, you can provision and automatically scale Spot Instances with On-Demand and Reserved Instances within a single Auto Scaling group.

You specify the common configuration parameters in a launch template and choose it when you create an Auto Scaling group that specifies the instance types, the distribution of On-Demand Instances and Spot Instances, the maximum price to pay for Spot Instances, and other settings that tell the Auto Scaling group how to allocate instance types to fulfill capacity. Deploying your application across multiple instance types is used to enhance availability, while giving you the benefit of the least expensive and available instance types.

When you configure the Auto Scaling group, you can choose a low or high number of Spot pools (instances of the same type and OS within an Availability Zone) to allocate your Spot Instances across. For example, if you run batch processing, we recommend specifying a low number of Spot pools (for

example, two Spot pools) to ensure that your queue always has compute capacity while maximizing cost savings. If you run a web service, we recommend specifying a high number of Spot pools (for example, 10 Spot pools) to minimize the impact if a Spot pool becomes temporarily unavailable.

If you choose to specify a base capacity of On-Demand Instances, the Auto Scaling group ensures that this base capacity is provisioned first when the group scales out. Anything beyond the base capacity uses percentages to determine how many On-Demand Instances and Spot Instances to launch. For example, if you specify a base capacity of 10 On-Demand Instances, and specify percentages of 0% for On-Demand Instances and 100% for Spot Instances, the behavior of the Auto Scaling group as it increases in size is as follows:

Example: Before your Auto Scaling group can start launching Spot Instances, it must first provision the base portion of On-Demand Instances

Total Number of Running Instances	On-Demand Instances (10)	Spot Instances (100%)
5	5	0
10	10	0
15	10	5
20	10	10

To learn how to configure a group to use multiple instance types and purchase options, see [Creating an Auto Scaling Group Using a Launch Template \(p. 38\)](#).

To learn about Amazon EC2 pricing and purchase options, see [Amazon EC2 Pricing](#).

Creating an Auto Scaling Group Using a Launch Template

When you create an Auto Scaling group, you must specify the information needed to configure the EC2 instances, the subnets for the instances, and the initial number of instances to start with.

To configure Auto Scaling instances, you can specify a launch configuration, a launch template, or an EC2 instance. The following procedure demonstrates how to create an Auto Scaling group using a launch template.

With launch templates, you select the launch template and which specific version of the launch template the group uses to launch EC2 instances. You can change these selections anytime by updating the group.

Alternatively, you can configure the Auto Scaling group to select either the default version or the latest version of the launch template dynamically when a scale-out event occurs. For example, if you configure your Auto Scaling group to select the default version of a launch template dynamically, you can change the configuration of the EC2 instances to be launched by the group by creating or designating a new default version of the launch template.

For more information, see [Launch Templates \(p. 21\)](#).

Prerequisites

- You must have an existing launch template that includes the parameters required to launch an EC2 instance. For information about these parameters and the limitations that apply when creating a launch template for use with an Auto Scaling group, see [Creating a Launch Template for an Auto Scaling group \(p. 21\)](#).

- An IAM user or role that creates an Auto Scaling group using a launch template must have permission to use the `ec2:RunInstances` action and permission to create or use the resources for the instance. For example, access to the `iam:PassRole` action is required to use an instance profile. You can use the **AmazonEC2FullAccess** policy to grant full access to all Amazon EC2 resources. You can use resource-level permissions to restrict access to specific launch templates. For more information, see [Require a Launch Template \(p. 134\)](#) or [Working with launch templates](#) in the *Amazon EC2 User Guide for Linux Instances*.

To create an Auto Scaling group using a launch template

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar at the top of the screen, select the same region that you used when you created the launch template.
3. In the navigation pane, choose **Auto Scaling Groups**.
4. Choose **Create Auto Scaling group**.
5. Choose **Launch Template**, select your launch template, and then choose **Next Step**.
6. On the **Configure Auto Scaling group details** page, for **Group name**, type a name for your Auto Scaling group.
7. For **Launch template version**, choose whether the Auto Scaling group uses the default, the latest, or a specific version of the launch template when scaling out.
8. For **Fleet Composition**, choose **Adhere to the launch template** to use the EC2 instance type and purchase option specified in the launch template or **Combine purchase options and instances** to launch instances across multiple instance types using both On-Demand and Spot purchase options.
9. If you chose to combine purchase options and instance types:
 - a. For **Instance Types**, choose the optimal instance family and instance size (such as `c5.large`) that may be launched. The order in which you add instance types sets their priority for On-Demand Instances. The instance type at the top of the list is prioritized the highest when the Auto Scaling group launches your On-Demand capacity. You must specify at least two instance types, up to a maximum of 20.
 - b. For **Instances Distribution**, choose whether to keep or replace the default instance distribution settings.
 - c. If you chose to replace the default settings, provide the following information:
 - For **Maximum Spot Price**, choose **Use default** to cap your maximum Spot price at the On-Demand price or **Set your maximum price** to specify the maximum price you are willing to pay per instance per hour for Spot Instances. For information about Amazon EC2 pricing, see [Amazon EC2 Pricing](#).
 - For **Spot Allocation Strategy**, choose the number of Spot pools (instances of the same type and OS within an Availability Zone) to allocate your Spot Instances across.
 - For **Optional On-Demand Base**, specify the minimum amount of the Auto Scaling group's initial capacity that must be fulfilled by On-Demand Instances, or leave blank to launch On-Demand Instances as a percentage of the group's desired capacity.
 - For **On-Demand Percentage Above Base**, specify the percentages of On-Demand Instances and Spot Instances for your additional capacity beyond the optional On-Demand base amount.
10. For **Group size**, enter the initial number of instances for your Auto Scaling group.
11. For **Network**, select a VPC for your Auto Scaling group.

Note
Launching instances using a combination of instance types and On-Demand and Spot purchase options is not supported in EC2-Classic.
12. For **Subnet**, select one or more subnets in the specified VPC.

13. (Optional) To register your Auto Scaling instances with a load balancer, select **Receive traffic from one or more load balancers** and select one or more Classic Load Balancers or target groups.
14. Choose **Next: Configure scaling policies**.
15. On the **Configure scaling policies** page, select one of the following options, and then choose **Next: Configure Notifications**:
 - To manually adjust the size of the Auto Scaling group as needed, select **Keep this group at its initial size**. For more information, see [Manual Scaling \(p. 61\)](#).
 - To automatically adjust the size of the Auto Scaling group based on criteria that you specify, select **Use scaling policies to adjust the capacity of this group** and follow the directions. For more information, see [Configure Scaling Policies \(p. 74\)](#).
16. (Optional) To receive notifications, choose **Add notification**, configure the notification, and then choose **Next: Configure Tags**.
17. (Optional) To add tags, choose **Edit tags**, provide a tag key and value for each tag, and then choose **Review**.

Alternatively, you can add tags later on. For more information, see [Tagging Auto Scaling Groups and Instances \(p. 44\)](#).
18. On the **Review** page, choose **Create Auto Scaling group**.
19. On the **Auto Scaling group creation status** page, choose **Close**.

To create an Auto Scaling group using the command line

You can use one of the following commands:

- [create-auto-scaling-group](#) (AWS CLI)
- [New-ASAutoScalingGroup](#) (AWS Tools for Windows PowerShell)

Creating an Auto Scaling Group Using a Launch Configuration

When you create an Auto Scaling group, you must specify the information needed to configure the Auto Scaling instances, the subnets for the instances, and the initial number of instances to start with.

Important

To configure the Auto Scaling instances, you can specify a launch template, a launch configuration, or an EC2 instance. We recommend that you use a launch template to ensure that you can use the latest features of Amazon EC2. For more information, see [Launch Templates \(p. 21\)](#).

The following procedure demonstrates how to create an Auto Scaling group using a launch configuration. You cannot modify a launch configuration after it is created, but you can replace the launch configuration for an Auto Scaling group. For more information, see [Changing the Launch Configuration for an Auto Scaling Group \(p. 31\)](#).

Prerequisites

Create a launch configuration. For more information, see [Creating a Launch Configuration \(p. 26\)](#).

To create an Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation bar at the top of the screen, select the same region that you used when you created the launch configuration.

3. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
4. Choose **Create Auto Scaling group**.
5. On the **Create Auto Scaling Group** page, choose **Launch Configuration**, select an existing launch configuration, and then choose **Next Step**.

Note

If you do not have any launch configurations, you're first prompted to create one before you can continue with the steps to create an Auto Scaling group.

6. On the **Configure Auto Scaling group details** page, do the following:
 - a. For **Group name**, type a name for your Auto Scaling group.
 - b. For **Group size**, type the initial number of instances for your Auto Scaling group.
 - c. For **Network**, select a VPC for your Auto Scaling group.
 - d. For **Subnet**, select one or more subnets in your VPC.
 - e. (Optional) To register your Auto Scaling instances with a load balancer, select **Receive traffic from one or more load balancers** and select one or more Classic Load Balancers or target groups.
 - f. Choose **Next: Configure scaling policies**.
7. On the **Configure scaling policies** page, select one of the following options, and then choose **Next: Configure Notifications**:
 - To manually adjust the size of the Auto Scaling group as needed, select **Keep this group at its initial size**. For more information, see [Manual Scaling \(p. 61\)](#).
 - To automatically adjust the size of the Auto Scaling group based on criteria that you specify, select **Use scaling policies to adjust the capacity of this group** and follow the directions. For more information, see [Configure Scaling Policies \(p. 74\)](#).
8. (Optional) To receive notifications, choose **Add notification**, configure the notification, and then choose **Next: Configure Tags**.
9. (Optional) To add tags, choose **Edit tags**, provide a tag key and value for each tag, and then choose **Review**.

Alternatively, you can add tags later on. For more information, see [Tagging Auto Scaling Groups and Instances \(p. 44\)](#).

10. On the **Review** page, choose **Create Auto Scaling group**.
11. On the **Auto Scaling group creation status** page, choose **Close**.

To create an Auto Scaling group using the command line

You can use one of the following commands:

- [create-auto-scaling-group](#) (AWS CLI)
- [New-ASAutoScalingGroup](#) (AWS Tools for Windows PowerShell)

Creating an Auto Scaling Group Using an EC2 Instance

When you create an Auto Scaling group, you must specify the information needed to configure the Auto Scaling instances, the subnets for the instances, and the initial number of instances to start with.

To configure Auto Scaling instances, you can specify a launch configuration, a launch template, or an EC2 instance. The following procedure demonstrates how to create an Auto Scaling group using an EC2

instance. To use a launch configuration or a launch template, see [Creating an Auto Scaling Group Using a Launch Configuration \(p. 40\)](#) or [Creating an Auto Scaling Group Using a Launch Template \(p. 38\)](#).

When you create an Auto Scaling group using an EC2 instance, Amazon EC2 Auto Scaling creates a launch configuration for you and associates it with the Auto Scaling group. This launch configuration has the same name as the Auto Scaling group, and it derives its attributes from the specified instance, such as AMI ID, instance type, and Availability Zone.

Limitations

The following are limitations when creating an Auto Scaling group from an EC2 instance:

- If the identified instance has tags, the tags are not copied to the `Tags` attribute of the new Auto Scaling group.
- The Auto Scaling group includes the block device mapping from the AMI used to launch the instance; it does not include any block devices attached after instance launch.
- If the identified instance is registered with one or more load balancers, the load balancer names are not copied to the `LoadBalancerNames` attribute of the new Auto Scaling group.

Prerequisites

Before you begin, find the ID of the EC2 instance using the Amazon EC2 console or the [describe-instances](#) command (AWS CLI). The EC2 instance must meet the following criteria:

- The instance is in the Availability Zone in which to create the Auto Scaling group.
- The instance is not a member of another Auto Scaling group.
- The instance is in the `running` state.
- The AMI used to launch the instance must still exist.

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- [Create an Auto Scaling Group from an EC2 Instance Using the Console \(p. 42\)](#)
- [Create an Auto Scaling Group from an EC2 Instance Using the AWS CLI \(p. 42\)](#)

Create an Auto Scaling Group from an EC2 Instance Using the Console

You can use the console to create an Auto Scaling group from a running EC2 instance and add the instance to the new Auto Scaling group. For more information, see [Attach EC2 Instances to Your Auto Scaling Group \(p. 63\)](#).

Create an Auto Scaling Group from an EC2 Instance Using the AWS CLI

Use the following [create-auto-scaling-group](#) command to create an Auto Scaling group, *my-asg-from-instance*, from the EC2 instance `i-7f12e649`.

```
aws autoscaling create-auto-scaling-group --auto-scaling-group-name my-asg-from-instance --instance-id i-7f12e649 --min-size 1 --max-size 2 --desired-capacity 2
```

Use the following [describe-auto-scaling-groups](#) command to create the Auto Scaling group.


```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg-from-instance
```

The following example response shows that the desired capacity of the group is 2, the group has 2 running instances, and the launch configuration is also named *my-asg-from-instance*:

```
{
  "AutoScalingGroups": [
    {
      "AutoScalingGroupARN": "arn",
      "HealthCheckGracePeriod": 0,
      "SuspendedProcesses": [],
      "DesiredCapacity": 2,
      "Tags": [],
      "EnabledMetrics": [],
      "LoadBalancerNames": [],
      "AutoScalingGroupName": "my-asg-from-instance",
      "DefaultCooldown": 300,
      "MinSize": 1,
      "Instances": [
        {
          "InstanceId": "i-6bd79d87",
          "AvailabilityZone": "us-west-2a",
          "HealthStatus": "Healthy",
          "LifecycleState": "InService",
          "LaunchConfigurationName": "my-asg-from-instance"
        },
        {
          "InstanceId": "i-6cd79d80",
          "AvailabilityZone": "us-west-2a",
          "HealthStatus": "Healthy",
          "LifecycleState": "InService",
          "LaunchConfigurationName": "my-asg-from-instance"
        }
      ],
      "MaxSize": 2,
      "VPCZoneIdentifier": "subnet-6bea5f06",
      "TerminationPolicies": [
        "Default"
      ],
      "LaunchConfigurationName": "my-asg-from-instance",
      "CreatedTime": "2014-12-29T16:14:50.397Z",
      "AvailabilityZones": [
        "us-west-2a"
      ],
      "HealthCheckType": "EC2"
    }
  ]
}
```

Use the following `describe-launch-configs` command to describe the launch configuration *my-asg-from-instance*.

```
aws autoscaling describe-launch-configurations --launch-configuration-names my-asg-from-instance
```

Creating an Auto Scaling Group Using the Amazon EC2 Launch Wizard

You can create a launch configuration and an Auto Scaling group in a single procedure by using the Amazon EC2 launch wizard. This is useful if you're launching more than one instance, and want to create a new launch configuration and Auto Scaling group from settings you've already selected in the Amazon EC2 launch wizard. You cannot use this option to create an Auto Scaling group using an existing launch configuration.

To create a launch configuration and Auto Scaling group using the launch wizard

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. From the dashboard, choose **Launch Instance**.
3. Choose an AMI, then choose an instance type on the next page, and then choose **Next: Configure Instance Details**.
4. In **Number of instances**, type the number of instances that you want to launch, and then choose **Launch into Auto Scaling Group**. You do not need to add any other configuration details on the page.
5. On the confirmation page, choose **Create Launch Configuration**.
6. You are switched to step 3 of the launch configuration wizard. The AMI and instance type are already selected based on the selection you made in the Amazon EC2 launch wizard. Enter a name for the launch configuration, configure any other settings as required, and then choose **Next: Add Storage**.
7. Configure any additional volumes, and then choose **Next: Configure Security Group**.
8. Create a new security group, or choose an existing group, and then choose **Review**.
9. Review the details of the launch configuration, and then choose **Create launch configuration** to choose a key pair and create the launch configuration.
10. On the **Configure Auto Scaling group details** page, the launch configuration you created is already selected for you, and the number of instances you specified in the Amazon EC2 launch wizard is populated for **Group size**. Enter a name for the group, specify a VPC and subnet (if required), and then choose **Next: Configure scaling policies**.
11. On the **Configure scaling policies** page, choose one of the following options, and then choose **Review**:
 - To manually adjust the size of the Auto Scaling group as needed, select **Keep this group at its initial size**. For more information, see [Manual Scaling \(p. 61\)](#).
 - To automatically adjust the size of the Auto Scaling group based on criteria that you specify, select **Use scaling policies to adjust the capacity of this group** and follow the directions. For more information, see [Configure Scaling Policies \(p. 74\)](#).
12. On the **Review** page, you can optionally add tags or notifications, and edit other configuration details. When you have finished, choose **Create Auto Scaling group**.

Tagging Auto Scaling Groups and Instances

You can organize and manage your Auto Scaling groups by assigning your own metadata to each group in the form of *tags*. You specify a *key* and a *value* for each tag. A key can be a general category, such as "project", "owner", or "environment", with specific associated values. For example, to differentiate between your testing and production environments, you could assign each Auto Scaling group a tag with a key of "environment", and either a value of "test" to indicate your test environment or "production" to indicate your production environment. We recommend that you use a consistent set of tags to make it easier to track your Auto Scaling groups.

You can specify that the tags for your Auto Scaling group should be added to the EC2 instances that it launches. The Auto Scaling group applies the tags while the instances are in the `Pending` lifecycle state. If you have a lifecycle hook, the tags are available when the instance enters the `Pending:Wait` lifecycle state. For more information, see [Auto Scaling Lifecycle \(p. 7\)](#).

Tagging your EC2 instances enables you to see instance cost allocation by tag in your AWS bill. For more information, see [Using Cost Allocation Tags](#) in the *AWS Billing and Cost Management User Guide*.

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- [Tag Restrictions \(p. 45\)](#)
- [Tagging Lifecycle \(p. 45\)](#)
- [Add or Modify Tags for Your Auto Scaling Group \(p. 45\)](#)
- [Delete Tags \(p. 47\)](#)

Tag Restrictions

The following basic restrictions apply to tags:

- The maximum number of tags per resource is 50.
- The maximum number of tags that you can add or remove using a single call is 25.
- The maximum key length is 127 Unicode characters.
- The maximum value length is 255 Unicode characters.
- Tag keys and values are case-sensitive.
- Do not use the `aws:` prefix in your tag names or values, because it is reserved for AWS use. You can't edit or delete tag names or values with this prefix, and they do not count against toward your limit of tags per Auto Scaling group.

You can add tags to your Auto Scaling group when you create it or when you update it. You can remove tags from your Auto Scaling group at any time. For information about assigning tags when you create your Auto Scaling group, see [Step 2: Create an Auto Scaling Group \(p. 14\)](#).

Tagging Lifecycle

If you have opted to propagate tags to your Auto Scaling instances, the tags are managed as follows:

- When an Auto Scaling group launches instances, it adds the tags to the instances. In addition, it adds a tag with a key of `aws:autoscaling:groupName` and a value of the name of the Auto Scaling group.
- When you attach existing instances, the Auto Scaling group adds the tags to the instances, overwriting any existing tags with the same tag key. In addition, it adds a tag with a key of `aws:autoscaling:groupName` and a value of the name of the Auto Scaling group.
- When you detach an instance from an Auto Scaling group, it removes only the `aws:autoscaling:groupName` tag.
- When you scale in manually or the Auto Scaling group automatically scales in, it removes all tags from the instances that are terminating.

Add or Modify Tags for Your Auto Scaling Group

When you add a tag to your Auto Scaling group, you can specify whether it should be added to instances launched in the Auto Scaling group. If you modify a tag, the updated version of the tag is added to instances launched in the Auto Scaling group after the change. If you create or modify a tag for an Auto

Scaling group, these changes are not made to instances that are already running in the Auto Scaling group.

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- [Add or Modify Tags Using the AWS Management Console \(p. 46\)](#)
- [Add or Modify Tags Using the AWS CLI \(p. 46\)](#)

Add or Modify Tags Using the AWS Management Console

Use the Amazon EC2 console to add or modify tags.

To add or modify tags

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Tags** tab, choose **Add/Edit tags**. The **Add/Edit Auto Scaling Group Tags** page lists any existing tags for the Auto Scaling group.
5. To modify existing tags, edit **Key** and **Value**.
6. To add a new tag, choose **Add tag** and edit **Key** and **Value**. You can keep **Tag New Instances** selected to add the tag to the instances launched in the Auto Scaling group automatically, and deselect it otherwise.
7. When you have finished adding tags, choose **Save**.

Add or Modify Tags Using the AWS CLI

Use the [create-or-update-tags](#) command to create or modify a tag. For example, the following command adds a tag with a key of "environment" and a value of "test" that is also added to any instances launched in the Auto Scaling group after this change. If a tag with this key already exists, the existing tag is replaced.

```
aws autoscaling create-or-update-tags --tags "ResourceId=my-asg,ResourceType=auto-scaling-group,Key=environment,Value=test,PropagateAtLaunch=true"
```

The following is an example response:

```
OK-Created/Updated tags
```

Use the following [describe-tags](#) command to list the tags for the specified Auto Scaling group.

```
aws autoscaling describe-tags --filters Name=auto-scaling-group,Values=my-asg
```

The following is an example response:

```
{
  "Tags": [
    {
      "ResourceType": "auto-scaling-group",
      "ResourceId": "my-asg",
      "PropagateAtLaunch": true,
      "Value": "test",
```

```
        "Key": "environment"
      }
    ]
  }
}
```

Alternatively, use the following [describe-auto-scaling-groups](#) command to verify that the tag is added to the Auto Scaling group.

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg
```

The following is an example response:

```
{
  "AutoScalingGroups": [
    {
      "AutoScalingGroupARN": "arn",
      "HealthCheckGracePeriod": 0,
      "SuspendedProcesses": [],
      "DesiredCapacity": 1,
      "Tags": [
        {
          "ResourceType": "auto-scaling-group",
          "ResourceId": "my-asg",
          "PropagateAtLaunch": true,
          "Value": "test",
          "Key": "environment"
        }
      ],
      "EnabledMetrics": [],
      "LoadBalancerNames": [],
      "AutoScalingGroupName": "my-asg",
      ...
    }
  ]
}
```

Delete Tags

You can delete a tag associated with your Auto Scaling group at any time.

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- [Delete Tags Using the AWS Management Console \(p. 47\)](#)
- [Delete Tags Using the AWS CLI \(p. 48\)](#)

Delete Tags Using the AWS Management Console

To delete a tag using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Tags** tab, choose **Add/Edit tags**. The **Add/Edit Auto Scaling Group Tags** page lists any existing tags for the Auto Scaling group.
5. Choose the delete icon next to the tag.
6. Choose **Save**.

Delete Tags Using the AWS CLI

Use the `delete-tags` command to delete a tag. For example, the following command deletes a tag with a key of "environment".

```
aws autoscaling delete-tags --tags "ResourceId=my-asg,ResourceType=auto-scaling-group,Key=environment"
```

You must specify the tag key, but you don't need to specify the value. If you specify a value and the value is incorrect, the tag is not deleted.

Using a Load Balancer With an Auto Scaling Group

You can automatically increase the size of your Auto Scaling group when demand goes up and decrease it when demand goes down. As the Auto Scaling group adds and removes EC2 instances, you must ensure that the traffic for your application is distributed across all of your EC2 instances. The Elastic Load Balancing service automatically routes incoming web traffic across such a dynamically changing number of EC2 instances. Your load balancer acts as a single point of contact for all incoming traffic to the instances in your Auto Scaling group. For more information, see the [Elastic Load Balancing User Guide](#).

To use a load balancer with your Auto Scaling group, create the load balancer and then attach it to the group.

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- [Attaching a Load Balancer to Your Auto Scaling Group \(p. 48\)](#)
- [Using Elastic Load Balancing Health Checks with Auto Scaling \(p. 50\)](#)
- [Expanding Your Scaled and Load-Balanced Application to an Additional Availability Zone \(p. 51\)](#)

Attaching a Load Balancer to Your Auto Scaling Group

Amazon EC2 Auto Scaling integrates with Elastic Load Balancing to enable you to attach one or more load balancers to an existing Auto Scaling group. After you attach the load balancer, it automatically registers the instances in the group and distributes incoming traffic across the instances. To use an Elastic Load Balancing health check with your instances to ensure that traffic is routed only to the healthy instances, see [Using Elastic Load Balancing Health Checks with Auto Scaling \(p. 50\)](#).

When you attach a load balancer, it enters the `Adding` state while registering the instances in the group. After all instances in the group are registered with the load balancer, it enters the `Added` state. After at least one registered instance passes the health checks, it enters the `InService` state. After the load balancer enters the `InService` state, Amazon EC2 Auto Scaling can terminate and replace any instances that are reported as unhealthy. If no registered instances pass the health checks (for example, due to a misconfigured health check), the load balancer doesn't enter the `InService` state, so Amazon EC2 Auto Scaling wouldn't terminate and replace the instances.

When you detach a load balancer, it enters the `Removing` state while deregistering the instances in the group. The instances remain running after they are deregistered. If connection draining is enabled, Elastic Load Balancing waits for in-flight requests to complete or for the maximum timeout to expire (whichever comes first) before deregistering the instances. Connection draining is always enabled for Application Load Balancers but must be enabled for Classic Load Balancers. For more information, see [Connection Draining](#) in the *User Guide for Classic Load Balancers*.

Elastic Load Balancing sends data about your load balancers and EC2 instances to Amazon CloudWatch. CloudWatch collects performance data for your resources and presents it as metrics. For more information, see [Monitoring Your Auto Scaling Groups and Instances Using Amazon CloudWatch](#) (p. 111). After you attach a load balancer to your Auto Scaling group, you can create scaling policies that use Elastic Load Balancing metrics to scale your application automatically. For more information, see [Create an Auto Scaling Group with Target Tracking Scaling Policies](#) (p. 73).

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- [Add a Load Balancer Using the Console](#) (p. 49)
- [Add a Load Balancer Using the AWS CLI](#) (p. 50)

Prerequisites

Before you begin, create a load balancer in the same region as the Auto Scaling group. Elastic Load Balancing supports three types of load balancers: Application Load Balancers, Network Load Balancers, and Classic Load Balancers. You can attach any of these types of load balancers to your Auto Scaling group. For more information, see the [Elastic Load Balancing User Guide](#).

With Classic Load Balancers, instances are registered with the load balancer. With Application Load Balancers and Network Load Balancers, instances are registered as targets with a target group. When you plan to use your load balancer with an Auto Scaling group, you don't need to register your EC2 instances with the load balancer or target group. After you attach a load balancer or target group to your Auto Scaling group, the group registers your instances with the load balancer or target group when it launches them.

Add a Load Balancer Using the Console

Use the following procedure to attach a load balancer to an existing Auto Scaling group. To attach your load balancer to your Auto Scaling group when you create the group, see [Tutorial: Set Up a Scaled and Load-Balanced Application](#) (p. 17).

To attach a load balancer to a group

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your group.
4. On the **Details** tab, choose **Edit**.
5. Do one of the following:
 - a. [Classic Load Balancers] For **Load Balancers**, select your load balancer.
 - b. [Target groups] For **Target Groups**, select your target group.
6. Choose **Save**.

When you no longer need the load balancer, use the following procedure to detach it from your Auto Scaling group.

To detach a load balancer from a group

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your group.
4. On the **Details** tab, choose **Edit**.

5. Do one of the following:
 - a. [Classic Load Balancers] For **Load Balancers**, remove the load balancer.
 - b. [Target groups] For **Target Groups**, remove the target group.
6. Choose **Save**.

Add a Load Balancer Using the AWS CLI

To attach a Classic Load Balancer

Use the following [attach-load-balancers](#) command to attach the specified load balancer to your Auto Scaling group:

```
aws autoscaling attach-load-balancers --auto-scaling-group-name my-asg --load-balancer-names my-lb
```

To attach a target group

Use the following [attach-load-balancer-target-groups](#) command to attach the specified target group to your Auto Scaling group:

```
aws autoscaling attach-load-balancer-target-groups --auto-scaling-group-name my-asg --target-group-arns my-targetgroup-arn
```

To detach a Classic Load Balancer

Use the following [detach-load-balancers](#) command to detach a load balancer from your Auto Scaling group if you no longer need it:

```
aws autoscaling detach-load-balancers --auto-scaling-group-name my-asg --load-balancer-names my-lb
```

To detach a target group

Use the following [detach-load-balancer-target-groups](#) command to detach a target group from your Auto Scaling group if you no longer need it:

```
aws autoscaling detach-load-balancer-target-groups --auto-scaling-group-name my-asg --target-group-arns my-targetgroup-arn
```

Using Elastic Load Balancing Health Checks with Auto Scaling

An Auto Scaling group periodically checks the health status of each instance. It can use Amazon EC2 status checks only, or EC2 status checks plus Elastic Load Balancing health checks. If it determines that an instance is unhealthy, it replaces the instance.

If you configure an Auto Scaling group to determine health status using EC2 status checks only (the default), the instance is unhealthy if it fails the EC2 status checks. However, if you have attached one or more load balancers or target groups to the Auto Scaling group and a load balancer reports that an instance is unhealthy, the instance is not considered unhealthy. Therefore, the instance is not replaced.

If you configure your Auto Scaling group to determine health status using both EC2 status checks and Elastic Load Balancing health checks, it considers the instance unhealthy if it fails either the status checks or the health check. If you attach multiple load balancers to an Auto Scaling group, all of them

must report that the instance is healthy in order for it to consider the instance healthy. If one load balancer reports an instance as unhealthy, the Auto Scaling group replaces the instance, even if other load balancers report it as healthy.

For more information, see [Health Checks for Auto Scaling Instances \(p. 109\)](#).

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- [Adding Health Checks Using the Console \(p. 51\)](#)
- [Adding Health Checks Using the AWS CLI \(p. 51\)](#)

Adding Health Checks Using the Console

Use the following procedure to add an ELB health check with a grace period of 300 seconds to an Auto Scaling group with an attached load balancer.

To add health checks using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your group.
4. On the **Details** tab, choose **Edit**.
5. For **Health Check Type**, select **ELB**.
6. For **Health Check Grace Period**, enter 300.
7. Choose **Save**.
8. On the **Instances** tab, the **Health Status** column displays the results of the newly added health checks.

Adding Health Checks Using the AWS CLI

Use the following `update-auto-scaling-group` command to create a health check with a grace period of 300 seconds:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-lb-asg --health-check-type ELB --health-check-grace-period 300
```

Expanding Your Scaled and Load-Balanced Application to an Additional Availability Zone

You can take advantage of the safety and reliability of geographic redundancy by spanning your Auto Scaling group across multiple Availability Zones within a Region and then attaching a load balancer to distribute incoming traffic across those zones. Incoming traffic is distributed equally across all Availability Zones enabled for your load balancer.

Note

An Auto Scaling group can contain EC2 instances from multiple Availability Zones within the same Region. However, an Auto Scaling group can't contain EC2 instances from multiple Regions.

When one Availability Zone becomes unhealthy or unavailable, Amazon EC2 Auto Scaling launches new instances in an unaffected zone. When the unhealthy Availability Zone returns to a healthy state, Amazon EC2 Auto Scaling automatically redistributes the application instances evenly across all of the zones for your Auto Scaling group. Amazon EC2 Auto Scaling does this by attempting to launch new

instances in the Availability Zone with the fewest instances. If the attempt fails, however, Amazon EC2 Auto Scaling attempts to launch in other Availability Zones until it succeeds.

You can expand the availability of your scaled and load-balanced application by adding an Availability Zone to your Auto Scaling group and then enabling that zone for your load balancer. After you've enabled the new Availability Zone, the load balancer begins to route traffic equally among all the enabled zones.

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- [Add an Availability Zone Using the Console \(p. 52\)](#)
- [Add an Availability Zone Using the AWS CLI \(p. 52\)](#)

Add an Availability Zone Using the Console

Use the following procedure to expand your Auto Scaling group to an additional subnet (EC2-VPC) or Availability Zone (EC2-Classic).

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your group.
4. On the **Details** tab, choose **Edit**.
5. Do one of the following:
 - [EC2-VPC] In **Subnet(s)**, select the subnet corresponding to the Availability Zone.
 - [EC2-Classic] In **Availability Zones(s)**, select the Availability Zone.
6. Choose **Save**.
7. On the navigation pane, choose **Load Balancers**.
8. Select your load balancer.
9. Do one of the following:
 - [Classic Load Balancer in EC2-Classic] On the **Instances** tab, choose **Edit Availability Zones**. On the **Add and Remove Availability Zones** page, select the Availability Zone to add.
 - [Classic Load Balancer in a VPC] On the **Instances** tab, choose **Edit Availability Zones**. On the **Add and Remove Subnets** page, for **Available subnets**, choose the add icon (+) for the subnet to add. The subnet is moved under **Selected subnets**.
 - [Application Load Balancer] On the **Description** tab, for **Availability Zones**, choose **Edit**. Choose the add icon (+) for one of the subnets for the Availability Zone to add. The subnet is moved under **Selected subnets**.
10. Choose **Save**.

Add an Availability Zone Using the AWS CLI

The commands that you use depend on whether your load balancer is a Classic Load Balancer in a VPC, a Classic Load Balancer in EC2-Classic, or an Application Load Balancer.

For an Auto Scaling group with a Classic Load Balancer in a VPC

1. Add a subnet to the Auto Scaling group using the following `update-auto-scaling-group` command:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg --vpc-zone-  
identifier subnet-41767929 subnet-cb663da2 --min-size 2
```

2. Verify that the instances in the new subnet are ready to accept traffic from the load balancer using the following `describe-auto-scaling-groups` command:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg
```

3. Enable the new subnet for your Classic Load Balancer using the following [attach-load-balancer-to-subnets](#) command:

```
aws elb attach-load-balancer-to-subnets --load-balancer-name my-lb --  
subnets subnet-41767929
```

For an Auto Scaling group with a Classic Load Balancer in EC2-Classic

1. Add an Availability Zone to the Auto Scaling group using the following [update-auto-scaling-group](#) command:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg --  
availability-zones us-west-2a us-west-2b us-west-2c --min-size 3
```

2. Verify that the instances in the new Availability Zone are ready to accept traffic from the load balancer using the following [describe-auto-scaling-groups](#) command:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg
```

3. Enable the new Availability Zone for your Classic Load Balancer using the following [enable-availability-zones-for-load-balancer](#) command:

```
aws elb enable-availability-zones-for-load-balancer --load-balancer-name my-lb --  
availability-zones us-west-2c
```

For an Auto Scaling group with an Application Load Balancer

1. Add a subnet to the Auto Scaling group using the following [update-auto-scaling-group](#) command:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg --vpc-zone-  
identifier subnet-41767929 subnet-cb663da2 --min-size 2
```

2. Verify that the instances in the new subnet are ready to accept traffic from the load balancer using the following [describe-auto-scaling-groups](#) command:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg
```

3. Enable the new subnet for your Application Load Balancer using the following [set-subnets](#) command:

```
aws elbv2 set-subnets --load-balancer-arn my-lb-arn --subnets subnet-41767929 subnet-  
cb663da2
```

Launching Spot Instances in Your Auto Scaling Group

Spot Instances are a cost-effective choice compared to On-Demand Instances, if you can be flexible about when your applications run and if your applications can be interrupted.

Before launching Spot Instances using Amazon EC2 Auto Scaling, we recommend that you become familiar with launching and managing Spot Instances using Amazon EC2. For more information, see [Spot Instances](#) in the *Amazon EC2 User Guide for Linux Instances*.

Important

The information in this section is applicable to configuring a Spot Instance purchase option as part of a launch configuration or launch template. To launch both On-Demand Instances and Spot Instances in your Auto Scaling group, see [Using Multiple Instance Types and Purchase Options](#) (p. 37) instead.

When you create a launch configuration or template to launch Spot Instances instead of On-Demand Instances, keep the following considerations in mind:

- **Setting your maximum price.** You set the maximum price you are willing to pay as part of the launch configuration or template.
- **Changing your maximum price.** You must create a launch configuration or template version with the new price. With a new launch configuration, you must associate it with your Auto Scaling group. With a launch template, you can configure the Auto Scaling group to use the default template or the latest version of the template, so it is automatically be associated with the Auto Scaling group. The existing instances continue to run as long as the maximum price specified in the launch configuration or template used for those instances is higher than the current Spot market price.
- **Spot market price and your maximum price.** If the market price for Spot Instances rises above your maximum price for a running instance in your Auto Scaling group, Amazon EC2 terminates your instance. If the Spot market price is within your maximum price, whether your request is fulfilled depends on Spot Instance capacity.
- **Maintaining your Spot Instances.** When your Spot Instance is terminated, the Auto Scaling group attempts to launch a replacement instance to maintain the desired capacity for the group. If your maximum price is higher than the Spot market price, then it launches a Spot Instance. Otherwise (or if the request is unsuccessful), it keeps trying.
- **Balancing across Availability Zones.** If you specify multiple Availability Zones, Auto Scaling distributes the Spot requests across these Availability Zones. If your maximum price is too low in one Availability Zone for any requests to be fulfilled, Amazon EC2 Auto Scaling checks whether requests were fulfilled in the other zones. If so, Amazon EC2 Auto Scaling cancels the requests that failed and redistributes them across the Availability Zones that have requests fulfilled. If the price in an Availability Zone with no fulfilled requests drops enough that future requests succeed, Auto Scaling rebalances across all the Availability Zones. For more information, see [Rebalancing Activities](#) (p. 7).
- **Spot Instance termination.** Amazon EC2 Auto Scaling can terminate or replace Spot Instances just as it can terminate or replace On-Demand Instances. For more information, see [Controlling Which Auto Scaling Instances Terminate During Scale In](#) (p. 90).

Merging Your Auto Scaling Groups into a Single Multi-Zone Group

To merge separate single-zone Auto Scaling groups into a single Auto Scaling group spanning multiple Availability Zones, rezone one of the single-zone groups into a multi-zone group, and then delete the other groups. This process works for groups with or without a load balancer, as long as the new multi-zone group is in one of the same Availability Zones as the original single-zone groups.

The following examples assume that you have two identical groups in two different Availability Zones, `us-west-2a` and `us-west-2c`. These two groups share the following specifications:

- Minimum size = 2
- Maximum size = 5

- Desired capacity = 3

Merge Zones Using the AWS CLI

Use the following procedure to merge `my-group-a` and `my-group-c` into a single group that covers both `us-west-2a` and `us-west-2c`.

To merge separate single-zone groups into a single multi-zone group

1. Use the following [update-auto-scaling-group](#) command to add the `us-west-2c` Availability Zone to the supported Availability Zones for `my-group-a` and increase the maximum size of this group to allow for the instances from both single-zone groups:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-group-a --availability-zones "us-west-2a" "us-west-2c" --max-size 10 --min-size 4
```

2. Use the following [set-desired-capacity](#) command to increase the size of `my-group-a`:

```
aws autoscaling set-desired-capacity --auto-scaling-group-name my-group-a --desired-capacity 6
```

3. (Optional) Use the following [describe-auto-scaling-groups](#) command to verify that `my-group-a` is at its new size:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-group-a
```

4. Use the following [update-auto-scaling-group](#) command to remove the instances from `my-group-c`:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-group-c --min-size 0 --max-size 0
```

5. (Optional) Use the following [describe-auto-scaling-groups](#) command to verify that no instances remain in `my-group-c`:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-group-c
```

The following is example output:

```
{
  "AutoScalingGroups": [
    {
      "AutoScalingGroupARN": "arn",
      "HealthCheckGracePeriod": 300,
      "SuspendedProcesses": [],
      "DesiredCapacity": 0,
      "Tags": [],
      "EnabledMetrics": [],
      "LoadBalancerNames": [],
      "AutoScalingGroupName": "my-group-c",
      "DefaultCooldown": 300,
      "MinSize": 0,
      "Instances": [],
      "MaxSize": 0,
      "VPCZoneIdentifier": "null",
      "TerminationPolicies": [
        "Default"
      ],
      "LaunchConfigurationName": "my-lc",
    }
  ]
}
```

```
        "CreatedTime": "2015-02-26T18:24:14.449Z",  
        "AvailabilityZones": [  
            "us-west-2c"  
        ],  
        "HealthCheckType": "EC2"  
    }  
]
```

6. Use the `delete-auto-scaling-group` command to delete `my-group-c`:

```
aws autoscaling delete-auto-scaling-group --auto-scaling-group-name my-group-c
```

Deleting Your Auto Scaling Infrastructure

To completely delete your scaling infrastructure, complete the following tasks.

Tasks

- [Delete Your Auto Scaling Group \(p. 56\)](#)
- [\(Optional\) Delete the Launch Configuration \(p. 56\)](#)
- [\(Optional\) Delete the Load Balancer \(p. 57\)](#)
- [\(Optional\) Delete CloudWatch Alarms \(p. 57\)](#)

Delete Your Auto Scaling Group

When you delete an Auto Scaling group, its desired, minimum, and maximum values are set to 0. As a result, the Auto Scaling instances are terminated. Alternatively, you can terminate or detach the instances before you delete the Auto Scaling group.

To delete your Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. On the Auto Scaling groups page, select your Auto Scaling group and choose **Actions, Delete**.
4. When prompted for confirmation, choose **Yes, Delete**.

To delete your Auto Scaling group using the AWS CLI

Use the following `delete-auto-scaling-group` command to delete the Auto Scaling group:

```
aws autoscaling delete-auto-scaling-group --auto-scaling-group-name my-asg
```

(Optional) Delete the Launch Configuration

You can skip this step to keep the launch configuration for future use.

To delete the launch configuration using the console

1. On the navigation pane, under **Auto Scaling**, choose **Launch Configurations**.
2. On the **Launch Configurations** page, select your launch configuration and choose **Actions, Delete launch configuration**.

3. When prompted for confirmation, choose **Yes, Delete**.

To delete the launch configuration using the AWS CLI

Use the following [delete-launch-configuration](#) command:

```
aws autoscaling delete-launch-configuration --launch-configuration-name my-lc
```

(Optional) Delete the Load Balancer

You can skip this step if your Auto Scaling group is not registered with an Elastic Load Balancing load balancer, or if you want to keep the load balancer for future use.

To delete your load balancer

1. On the navigation pane, under **LOAD BALANCING**, choose **Load Balancers**.
2. Select the load balancer and choose **Actions, Delete**.
3. When prompted for confirmation, choose **Yes, Delete**.

To delete the load balancer associated with the Auto Scaling group using the AWS CLI

For Application Load Balancers and Network Load Balancers, use the following [delete-load-balancer](#) command:

```
aws elbv2 delete-load-balancer --load-balancer-arn my-load-balancer-arn
```

For Classic Load Balancers, use the following [delete-load-balancer](#) command:

```
aws elb delete-load-balancer --load-balancer-name my-load-balancer
```

(Optional) Delete CloudWatch Alarms

You can skip this step if your Auto Scaling group is not associated with any CloudWatch alarms, or if you want to keep the alarms for future use.

To delete the CloudWatch alarms using the console

1. Open the CloudWatch console at <https://console.aws.amazon.com/cloudwatch/>.
2. On the navigation pane, choose **Alarms**.
3. Select the alarms and choose **Delete**.
4. When prompted for confirmation, choose **Yes, Delete**.

To delete the CloudWatch alarms using the AWS CLI

Use the [delete-alarms](#) command. For example, use the following command to delete the AddCapacity and RemoveCapacity alarms:

```
aws cloudwatch delete-alarms --alarm-name AddCapacity RemoveCapacity
```

Scaling the Size of Your Auto Scaling Group

Scaling is the ability to increase or decrease the compute capacity of your application. Scaling starts with an event, or scaling action, which instructs an Auto Scaling group to either launch or terminate Amazon EC2 instances.

Amazon EC2 Auto Scaling provides a number of ways to adjust scaling to best meet the needs of your applications. As a result, it's important that you have a good understanding of your application. Keep the following considerations in mind:

- What role should Amazon EC2 Auto Scaling to play in your application's architecture? It's common to think about automatic scaling as a way to increase and decrease capacity, but it's also useful for maintaining a steady number of servers.
- What cost constraints are important to you? Because Amazon EC2 Auto Scaling uses EC2 instances, you only pay for the resources that you use. Knowing your cost constraints helps you decide when to scale your applications, and by how much.
- What metrics are important to your application? Amazon CloudWatch supports a number of different metrics that you can use with your Auto Scaling group. We recommend reviewing them to see which of these metrics are the most relevant to your application.

Contents

- [Scaling Options \(p. 58\)](#)
- [Multiple Scaling Policies \(p. 59\)](#)
- [Maintaining the Number of Instances in Your Auto Scaling Group \(p. 60\)](#)
- [Manual Scaling \(p. 61\)](#)
- [Scheduled Scaling for Amazon EC2 Auto Scaling \(p. 68\)](#)
- [Dynamic Scaling for Amazon EC2 Auto Scaling \(p. 71\)](#)
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Scaling Options

Amazon EC2 Auto Scaling provides several ways for you to scale your Auto Scaling group.

Maintain current instance levels at all times

You can configure your Auto Scaling group to maintain a minimum or specified number of running instances at all times. To maintain the current instance levels, Amazon EC2 Auto Scaling performs a

periodic health check on running instances within an Auto Scaling group. When Amazon EC2 Auto Scaling finds an unhealthy instance, it terminates that instance and launches a new one. For information about configuring your Auto Scaling group to maintain the current instance levels, see [Maintaining the Number of Instances in Your Auto Scaling Group \(p. 60\)](#).

Manual scaling

Manual scaling is the most basic way to scale your resources. Specify only the change in the maximum, minimum, or desired capacity of your Auto Scaling group. Amazon EC2 Auto Scaling manages the process of creating or terminating instances to maintain the updated capacity. For more information, see [Manual Scaling \(p. 61\)](#).

Scale based on a schedule

Sometimes you know exactly when you will need to increase or decrease the number of instances in your group, simply because that need arises on a predictable schedule. Scaling by schedule means that scaling actions are performed automatically as a function of time and date. For more information, see [Scheduled Scaling for Amazon EC2 Auto Scaling \(p. 68\)](#).

Scale based on demand

A more advanced way to scale your resources, scaling by policy, lets you define parameters that control the scaling process. For example, you can create a policy that calls for enlarging your fleet of EC2 instances whenever the average CPU utilization rate stays above ninety percent for fifteen minutes. This is useful for scaling in response to changing conditions, when you don't know when those conditions will change. You can set up Amazon EC2 Auto Scaling to respond for you. For more information, see [Dynamic Scaling for Amazon EC2 Auto Scaling \(p. 71\)](#).

Multiple Scaling Policies

An Auto Scaling group can have more than one scaling policy attached to it. You can sometimes combine scaling policies to maximize the performance of an Auto Scaling group.

To illustrate how multiple policies work together, consider an application that uses an Auto Scaling group and an Amazon SQS queue to send requests to the EC2 instances in that group. To help ensure that the application performs at optimum levels, there are two policies that control when the Auto Scaling group should scale out. One policy uses the Amazon CloudWatch `CPUUtilization` metric to detect when an instance is at 90% of capacity. The other uses a custom metric to detect when the SQS queue is becoming overwhelmed with messages. For more information about scaling based on message activity in your SQS queue, see [Scaling Based on Amazon SQS \(p. 83\)](#).

When you have more than one policy attached to an Auto Scaling group, there's a chance that both policies could instruct it to scale out (or in) at the same time. In our previous example, it's possible that an EC2 instance could trigger the CloudWatch alarm for the `CPUUtilization` metric at the same time that the SQS queue triggers the alarm for the custom metric.

When these situations occur, Amazon EC2 Auto Scaling chooses the policy that has the greatest impact on the Auto Scaling group. For example, suppose that the policy for CPU utilization launches one instance, while the policy for the SQS queue launches two instances. If the scale-out criteria for both policies are met at the same time, Amazon EC2 Auto Scaling gives precedence to the SQS queue policy, because it has the greatest impact on the Auto Scaling group. This results in the Auto Scaling group launching two instances. This precedence applies even when the policies use different criteria for scaling out. For instance, if one policy launches three instances, and another increases capacity by 25 percent, Amazon EC2 Auto Scaling give precedence to whichever policy has the greatest impact on the group at that time.

Maintaining the Number of Instances in Your Auto Scaling Group

After you have created your launch configuration and Auto Scaling group, the Auto Scaling group starts by launching the minimum number of EC2 instances (or the desired capacity, if specified). If there are no other scaling conditions attached to the Auto Scaling group, the Auto Scaling group maintains this number of running instances at all times.

To maintain the same number of instances, Amazon EC2 Auto Scaling performs a periodic health check on running instances within an Auto Scaling group. When it finds that an instance is unhealthy, it terminates that instance and launches a new one.

All instances in your Auto Scaling group start in the healthy state. Instances are assumed to be healthy unless Amazon EC2 Auto Scaling receives notification that they are unhealthy. This notification can come from one or more of the following sources: Amazon EC2, Elastic Load Balancing, or your customized health check.

Determining Instance Health

By default, the Auto Scaling group determines the health state of each instance by periodically checking the results of EC2 instance status checks. If the instance status is any state other than `running` or if the system status is `impaired`, Amazon EC2 Auto Scaling considers the instance to be unhealthy and launches a replacement. For more information about EC2 instance status checks, see [Monitoring the Status of Your Instances](#) in the *Amazon EC2 User Guide for Linux Instances*.

If you have associated your Auto Scaling group with a load balancer or a target group and have chosen to use the Elastic Load Balancing health checks, Amazon EC2 Auto Scaling determines the health status of the instances by checking both the instance status checks and the Elastic Load Balancing health checks. Amazon EC2 Auto Scaling marks an instance as unhealthy if the instance is in a state other than `running`, the system status is `impaired`, or Elastic Load Balancing reports that the instance failed the health checks.

You can customize the health check conducted by your Auto Scaling group by specifying additional checks. Or, if you have your own health check system, you can send the instance's health information directly from your system to Amazon EC2 Auto Scaling.

Replacing Unhealthy Instances

After an instance has been marked unhealthy because of an Amazon EC2 or Elastic Load Balancing health check, it is almost immediately scheduled for replacement. It never automatically recovers its health. You can intervene manually by calling the [SetInstanceHealth](#) action (or the `as-set-instance-health` command) to set the instance's health status back to healthy. If the instance is already terminating, you get an error. Because the interval between marking an instance unhealthy and its actual termination is so small, attempting to set an instance's health status back to healthy with the `SetInstanceHealth` action (or, `as-set-instance-health` command) is probably useful only for a suspended group. For more information, see [Suspending and Resuming Scaling Processes](#) (p. 105).

Amazon EC2 Auto Scaling creates a new scaling activity for terminating the unhealthy instance and then terminates it. Later, another scaling activity launches a new instance to replace the terminated instance.

When your instance is terminated, any associated Elastic IP addresses are disassociated and are not automatically associated with the new instance. You must associate these Elastic IP addresses with the new instance manually. Similarly, when your instance is terminated, its attached EBS volumes are detached. You must attach these EBS volumes to the new instance manually.

Manual Scaling

At any time, you can change the size of an existing Auto Scaling group. Update the desired capacity of the Auto Scaling group, or update the instances that are attached to the Auto Scaling group.

Contents

- [Change the Size of Your Auto Scaling Group Using the Console \(p. 61\)](#)
- [Change the Size of Your Auto Scaling Group Using the AWS CLI \(p. 61\)](#)
- [Attach EC2 Instances to Your Auto Scaling Group \(p. 63\)](#)
- [Detach EC2 Instances from Your Auto Scaling Group \(p. 66\)](#)

Change the Size of Your Auto Scaling Group Using the Console

When you change the size of your Auto Scaling group, Amazon EC2 Auto Scaling manages the process of launching or terminating instances to maintain the new group size.

The following example assumes that you've created an Auto Scaling group with a minimum size of 1 and a maximum size of 5. Therefore, the group currently has one running instance.

To change the size of your Auto Scaling group

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Details** tab, choose **Edit**.
5. For **Desired**, increase the desired capacity by one. For example, if the current value is 1, type 2.

The desired capacity must be less than or equal to the maximum size of the group. If your new value for **Desired** is greater than **Max**, you must update **Max**.

When you are finished, choose **Save**.

Now, verify that your Auto Scaling group has launched one additional instance.

To verify that the size of your Auto Scaling group has changed

1. On the **Activity History** tab, the **Status** column shows the current status of your instance. You can use the refresh button until you see the status of your instance change to **Successful**, indicating that your Auto Scaling group has successfully launched a new instance.
2. On the **Instances** tab, the **Lifecycle** column shows the state of your instances. It takes a short time for an instance to launch. After the instance starts, its state changes to **InService**. You can see that your Auto Scaling group has launched 1 new instance, and it is in the **InService** state.

Change the Size of Your Auto Scaling Group Using the AWS CLI

When you change the size of your Auto Scaling group, Amazon EC2 Auto Scaling manages the process of launching or terminating instances to maintain the new group size.

The following example assumes that you've created an Auto Scaling group with a minimum size of 1 and a maximum size of 5. Therefore, the group currently has one running instance.

Use the `set-desired-capacity` command to change the size of your Auto Scaling group, as shown in the following example:

```
aws autoscaling set-desired-capacity --auto-scaling-group-name my-asg --desired-capacity 2
```

By default, the command does not wait for the cooldown period specified for the group to complete. You can override the default behavior and wait for the cooldown period to complete by specifying the `--honor-cooldown` option as shown in the following example. For more information, see [Scaling Cooldowns for Amazon EC2 Auto Scaling](#) (p. 87).

```
aws autoscaling set-desired-capacity --auto-scaling-group-name my-asg --desired-capacity 2  
--honor-cooldown
```

Use the `describe-auto-scaling-groups` command to confirm that the size of your Auto Scaling group has changed, as in the following example:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg
```

The following is example output, with details about the group and instances launched.

```
{  
  "AutoScalingGroups": [  
    {  
      "AutoScalingGroupARN": "arn",  
      "HealthCheckGracePeriod": 300,  
      "SuspendedProcesses": [],  
      "DesiredCapacity": 2,  
      "Tags": [],  
      "EnabledMetrics": [],  
      "LoadBalancerNames": [],  
      "AutoScalingGroupName": "my-asg",  
      "DefaultCooldown": 300,  
      "MinSize": 1,  
      "Instances": [  
        {  
          "InstanceId": "i-33388a3f",  
          "AvailabilityZone": "us-west-2a",  
          "HealthStatus": "Healthy",  
          "LifecycleState": "InService",  
          "LaunchConfigurationName": "my-lc"  
        }  
      ],  
      "MaxSize": 5,  
      "VPCZoneIdentifier": "subnet-e4f33493",  
      "TerminationPolicies": [  
        "Default"  
      ],  
      "LaunchConfigurationName": "my-lc",  
      "CreatedTime": "2014-12-12T23:30:42.611Z",  
      "AvailabilityZones": [  
        "us-west-2a"  
      ],  
      "HealthCheckType": "EC2"  
    }  
  ]  
}
```

Notice that `DesiredCapacity` shows the new value. Your Auto Scaling group has launched an additional instance.

Attach EC2 Instances to Your Auto Scaling Group

Amazon EC2 Auto Scaling provides you with an option to enable automatic scaling for one or more EC2 instances by attaching them to your existing Auto Scaling group. After the instances are attached, they become a part of the Auto Scaling group.

The instance to attach must meet the following criteria:

- The instance is in the `running` state.
- The AMI used to launch the instance must still exist.
- The instance is not a member of another Auto Scaling group.
- The instance is in the same Availability Zone as the Auto Scaling group.
- If the Auto Scaling group has an attached load balancer, the instance and the load balancer must both be in EC2-Classic or the same VPC. If the Auto Scaling group has an attached target group, the instance and the load balancer must both be in the same VPC.

When you attach instances, the desired capacity of the group increases by the number of instances being attached. If the number of instances being attached plus the desired capacity exceeds the maximum size of the group, the request fails.

If you attach an instance to an Auto Scaling group that has an attached load balancer, the instance is registered with the load balancer. If you attach an instance to an Auto Scaling group that has an attached target group, the instance is registered with the target group.

Contents

- [Attaching an Instance Using the AWS Management Console \(p. 63\)](#)
- [Attaching an Instance Using the AWS CLI \(p. 64\)](#)

The examples use an Auto Scaling group with the following configuration:

- Auto Scaling group name = `my-asg`
- Minimum size = `1`
- Maximum size = `5`
- Desired capacity = `2`
- Availability Zone = `us-west-2a`

Attaching an Instance Using the AWS Management Console

You can attach an existing instance to an existing Auto Scaling group, or to a new Auto Scaling group as you create it.

To attach an instance to a new Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, choose **Instances**.
3. Select the instance.
4. Choose **Actions**, **Instance Settings**, **Attach to Auto Scaling Group**.

5. On the **Attach to Auto Scaling Group** page, select a **new Auto Scaling group**, type a name for the group, and then choose **Attach**.

The new Auto Scaling group is created using a new launch configuration with the same name that you specified for the Auto Scaling group. The launch configuration gets its settings (for example, security group and IAM role) from the instance that you attached. The Auto Scaling group gets settings (for example, Availability Zone and subnet) from the instance that you attached, and has a desired capacity and maximum size of 1.

6. (Optional) To edit the settings for the Auto Scaling group, on the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**. Select the new Auto Scaling group, choose **Edit**, change the settings as needed, and then choose **Save**.

To attach an instance to an existing Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. (Optional) On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**. Select the Auto Scaling group and verify that the maximum size of the Auto Scaling group is large enough that you can add another instance. Otherwise, choose **Edit**, increase the maximum size, and then choose **Save**.
3. On the navigation pane, choose **Instances**.
4. Select the instance.
5. Choose **Actions, Instance Settings, Attach to Auto Scaling Group**.
6. On the **Attach to Auto Scaling Group** page, select an **existing Auto Scaling group**, select the instance, and then choose **Attach**.
7. If the instance doesn't meet the criteria (for example, if it's not in the same Availability Zone as the Auto Scaling group), you get an error message with the details. Choose **Close** and try again with an instance that meets the criteria.

Attaching an Instance Using the AWS CLI

To attach an instance to an Auto Scaling group using the AWS CLI

1. Describe a specific Auto Scaling group using the following `describe-auto-scaling-groups` command:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-names my-asg
```

The following example response shows that the desired capacity is 2 and the group has 2 running instances:

```
{
  "AutoScalingGroups": [
    {
      "AutoScalingGroupARN": "arn",
      "HealthCheckGracePeriod": 300,
      "SuspendedProcesses": [],
      "DesiredCapacity": 2,
      "Tags": [],
      "EnabledMetrics": [],
      "LoadBalancerNames": [],
      "AutoScalingGroupName": "my-asg",
      "DefaultCooldown": 300,
      "MinSize": 1,
      "Instances": [
        {
          "InstanceId": "i-a5e87793",
```

```
        "AvailabilityZone": "us-west-2a",
        "HealthStatus": "Healthy",
        "LifecycleState": "InService",
        "LaunchConfigurationName": "my-lc"
      },
      {
        "InstanceId": "i-a4e87792",
        "AvailabilityZone": "us-west-2a",
        "HealthStatus": "Healthy",
        "LifecycleState": "InService",
        "LaunchConfigurationName": "my-lc"
      }
    ],
    "MaxSize": 5,
    "VPCZoneIdentifier": "subnet-e4f33493",
    "TerminationPolicies": [
      "Default"
    ],
    "LaunchConfigurationName": "my-lc",
    "CreateTime": "2014-12-12T23:30:42.611Z",
    "AvailabilityZones": [
      "us-west-2a"
    ],
    "HealthCheckType": "EC2"
  }
]
```

2. Attach an instance to the Auto Scaling group using the following [attach-instances](#) command:

```
aws autoscaling attach-instances --instance-ids i-a8e09d9c --auto-scaling-group-  
name my-asg
```

3. To verify that the instance is attached, use the following `describe-auto-scaling-groups` command:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-names my-asg
```

The following example response shows that the desired capacity has increased by 1 to 3, and that there is a new instance, `i-a8e09d9c`:

```
{
  "AutoScalingGroups": [
    {
      "AutoScalingGroupARN": "arn",
      "HealthCheckGracePeriod": 300,
      "SuspendedProcesses": [],
      "DesiredCapacity": 3,
      "Tags": [],
      "EnabledMetrics": [],
      "LoadBalancerNames": [],
      "AutoScalingGroupName": "my-asg",
      "DefaultCooldown": 300,
      "MinSize": 1,
      "Instances": [
        {
          "InstanceId": "i-a8e09d9c",
          "AvailabilityZone": "us-west-2a",
          "HealthStatus": "Healthy",
          "LifecycleState": "InService",
          "LaunchConfigurationName": "my-lc"
        },
        {

```

```
        "InstanceId": "i-a5e87793",
        "AvailabilityZone": "us-west-2a",
        "HealthStatus": "Healthy",
        "LifecycleState": "InService",
        "LaunchConfigurationName": "my-lc"
    },
    {
        "InstanceId": "i-a4e87792",
        "AvailabilityZone": "us-west-2a",
        "HealthStatus": "Healthy",
        "LifecycleState": "InService",
        "LaunchConfigurationName": "my-lc"
    }
],
"MaxSize": 5,
"VPCZoneIdentifier": "subnet-e4f33493",
"TerminationPolicies": [
    "Default"
],
"LaunchConfigurationName": "my-lc",
"CreatedTime": "2014-12-12T23:30:42.611Z",
"AvailabilityZones": [
    "us-west-2a"
],
"HealthCheckType": "EC2"
}
]
```

Detach EC2 Instances from Your Auto Scaling Group

You can remove an instance from an Auto Scaling group. After the instances are detached, you can manage them independently from the rest of the Auto Scaling group. By detaching an instance, you can:

- Move an instance out of one Auto Scaling group and attach it to a different one. For more information, see [Attach EC2 Instances to Your Auto Scaling Group \(p. 63\)](#).
- Test an Auto Scaling group by creating it using existing instances running your application, and then detach these instances from the Auto Scaling group when your tests are complete.

When you detach instances, you have the option of decrementing the desired capacity for the Auto Scaling group by the number of instances being detached. If you choose not to decrement the capacity, Amazon EC2 Auto Scaling launches new instances to replace the ones that you detached. If you decrement the capacity but detach multiple instances from the same Availability Zone, Amazon EC2 Auto Scaling can rebalance the Availability Zones unless you suspend the `AZRebalance` process. For more information, see [Scaling Processes \(p. 105\)](#).

If the number of instances that you are detaching will drop the size of the Auto Scaling group below its minimum capacity, you must decrement the minimum capacity for the Auto Scaling group before you can detach the instances.

If you detach an instance from an Auto Scaling group that has an attached load balancer, the instance is deregistered from the load balancer. If you detach an instance from an Auto Scaling group that has an attached target group, the instance is deregistered from the target group. If connection draining is enabled for your load balancer, Amazon EC2 Auto Scaling waits for in-flight requests to complete.

Contents

- [Detaching Instances Using the AWS Management Console \(p. 67\)](#)
- [Detaching Instances Using the AWS CLI \(p. 67\)](#)

The examples use an Auto Scaling group with the following configuration:

- Auto Scaling group name = `my-asg`
- Minimum size = 1
- Maximum size = 5
- Desired capacity = 4
- Availability Zone = `us-west-2a`

Detaching Instances Using the AWS Management Console

Use the following procedure to detach an instance from your Auto Scaling group.

To detach an instance from an existing Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Instances** tab, select the instance and choose **Actions, Detach**.
5. On the **Detach Instance** page, select the check box to launch a replacement instance, or leave it unchecked to decrement the desired capacity. Choose **Detach Instance**.

Detaching Instances Using the AWS CLI

Use the following procedure to detach an instance from your Auto Scaling group.

To detach an instance from an existing Auto Scaling group using the AWS CLI

1. List the current instances using the following [describe-auto-scaling-instances](#) command:

```
aws autoscaling describe-auto-scaling-instances
```

The following example response shows that the group has four running instances:

```
{
  "AutoScalingInstances": [
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-2a2d8978",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    },
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-5f2e8a0d",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    },
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-a52387f7",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    },
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-2a2d8978",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    }
  ]
}
```

```
        "LifecycleState": "InService",
        "LaunchConfigurationName": "my-lc"
      }
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-f42d89a6",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    }
  ]
}
```

2. Detach an instance and decrement the desired capacity using the following [detach-instances](#) command:

```
aws autoscaling detach-instances --instance-ids i-2a2d8978 --auto-scaling-group-  
name my-asg --should-decrement-desired-capacity
```

3. Verify that the instance is detached using the following `describe-auto-scaling-instances` command:

```
aws autoscaling describe-auto-scaling-instances
```

The following example response shows that there are now three running instances:

```
{
  "AutoScalingInstances": [
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-5f2e8a0d",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    }
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-a52387f7",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    }
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-f42d89a6",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    }
  ]
}
```

Scheduled Scaling for Amazon EC2 Auto Scaling

Scaling based on a schedule allows you to scale your application in response to predictable load changes. For example, every week the traffic to your web application starts to increase on Wednesday, remains

high on Thursday, and starts to decrease on Friday. You can plan your scaling activities based on the predictable traffic patterns of your web application.

To configure your Auto Scaling group to scale based on a schedule, you create a scheduled action, which tells Amazon EC2 Auto Scaling to perform a scaling action at specified times. To create a scheduled scaling action, you specify the start time when the scaling action should take effect, and the new minimum, maximum, and desired sizes for the scaling action. At the specified time, Amazon EC2 Auto Scaling updates the group with the values for minimum, maximum, and desired size specified by the scaling action.

You can create scheduled actions for scaling one time only or for scaling on a recurring schedule.

You can also use scheduled scaling with Application Auto Scaling. For more information, see [Scheduled Scaling](#) in the *Application Auto Scaling User Guide*.

Contents

- [Considerations for Scheduled Actions](#) (p. 69)
- [Create a Scheduled Action Using the Console](#) (p. 69)
- [Update a Scheduled Action](#) (p. 70)
- [Create or Update a Scheduled Action Using the AWS CLI](#) (p. 70)
- [Delete a Scheduled Action](#) (p. 71)

Considerations for Scheduled Actions

When you create a scheduled action, keep the following in mind.

- The order of execution for scheduled actions is guaranteed within the same group, but not for scheduled actions across groups.
- A scheduled action generally executes within seconds. However, the action may be delayed for up to two minutes from the scheduled start time. Because actions within an Auto Scaling group are executed in the order they are specified, scheduled actions with scheduled start times close to each other can take longer to execute.
- You can create a maximum of 125 scheduled actions per Auto Scaling group.
- A scheduled action must have a unique time value. If you attempt to schedule an activity at a time when another scaling activity is already scheduled, the call is rejected with an error message noting the conflict.
- Cooldown periods are not supported.

Create a Scheduled Action Using the Console

Complete the following procedure to create a scheduled action to scale your Auto Scaling group.

To create a scheduled action

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Scheduled Actions** tab, choose **Create Scheduled Action**.
5. On the **Create Scheduled Action** page, do the following:
 - Specify the size of the group using at least one of **Min**, **Max**, and **Desired Capacity**.

- Choose an option for **Recurrence**. If you choose **Once**, the action is performed at the specified time. If you select **Cron**, type a Cron expression that specifies when to perform the action, in UTC. If you select an option that begins with **Every**, the Cron expression is created for you.
 - If you chose **Once** for **Recurrence**, specify the time for the action in **Start Time**.
 - If you specified a recurring schedule, you can specify values for **Start Time** and **End Time**. If you specify a start time, the action is performed at this time, and then performs the action based on the recurring schedule. If you specify an end time, the action is not performed after this time.
6. Choose **Create**.

Update a Scheduled Action

If your requirements change, you can update a scheduled action.

To update a scheduled action

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Scheduled Actions** tab, select the scheduled action.
5. Choose **Actions, Edit**.
6. On the **Edit Scheduled Action** page, do the following:
 - Update the size of the group as needed using **Min**, **Max**, or **Desired Capacity**.
 - Update the specified recurrence as needed.
 - Update the start and end time as needed.
 - Choose **Save**.

Create or Update a Scheduled Action Using the AWS CLI

You can create a schedule for scaling one time only or for scaling on a recurring schedule.

To schedule scaling for one time only

To increase the number of running instances in your Auto Scaling group at a specific time, in "YYYY-MM-DDThh:mm:ssZ" format in UTC, use the following [put-scheduled-update-group-action](#) command:

```
aws autoscaling put-scheduled-update-group-action --scheduled-action-name ScaleUp --auto-scaling-group-name my-asg --start-time "2013-05-12T08:00:00Z" --desired-capacity 3
```

To decrease the number of running instances in your Auto Scaling group at a specific time, in "YYYY-MM-DDThh:mm:ssZ" format in UTC, use the following `put-scheduled-update-group-action` command:

```
aws autoscaling put-scheduled-update-group-action --scheduled-action-name ScaleDown --auto-scaling-group-name my-asg --start-time "2013-05-13T08:00:00Z" --desired-capacity 1
```

To schedule scaling on a recurring schedule

You can specify a recurrence schedule, in UTC, using the Cron format. For more information about this format, see [Crontab](#).

Use the following `put-scheduled-update-group-action` command to create a scheduled action that runs at 00:30 hours on the first of January, June, and December each year:

```
aws autoscaling put-scheduled-update-group-action --scheduled-action-name scaleup-schedule-year --auto-scaling-group-name my-asg --recurrence "30 0 1 1,6,12 0" --desired-capacity 3
```

Delete a Scheduled Action

When you are finished with a scheduled action, you can delete it.

To delete a scheduled action using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Scheduled Actions** tab, select the scheduled action.
5. Choose **Actions, Delete**.
6. When prompted for confirmation, choose **Yes, Delete**.

To delete a scheduled action using the AWS CLI

Use the following `delete-scheduled-action` command:

```
aws autoscaling delete-scheduled-action --scheduled-action-name ScaleUp
```

Dynamic Scaling for Amazon EC2 Auto Scaling

When you configure dynamic scaling, you must define how to scale in response to changing demand. For example, you have a web application that currently runs on two instances and you do not want the CPU utilization of the Auto Scaling group to exceed 70 percent. You can configure your Auto Scaling group to scale automatically to meet this need. The policy type determines how the scaling action is performed.

Contents

- [Scaling Policy Types \(p. 71\)](#)
- [Target Tracking Scaling Policies for Amazon EC2 Auto Scaling \(p. 72\)](#)
- [Simple and Step Scaling Policies for Amazon EC2 Auto Scaling \(p. 75\)](#)
- [Add a Scaling Policy to an Existing Auto Scaling Group \(p. 82\)](#)
- [Scaling Based on Amazon SQS \(p. 83\)](#)

Scaling Policy Types

Amazon EC2 Auto Scaling supports the following types of scaling policies:

- **Target tracking scaling**—Increase or decrease the current capacity of the group based on a target value for a specific metric. This is similar to the way that your thermostat maintains the temperature of your home – you select a temperature and the thermostat does the rest.
- **Step scaling**—Increase or decrease the current capacity of the group based on a set of scaling adjustments, known as *step adjustments*, that vary based on the size of the alarm breach.
- **Simple scaling**—Increase or decrease the current capacity of the group based on a single scaling adjustment.

If you are scaling based on a utilization metric that increases or decreases proportionally to the number of instances in an Auto Scaling group, we recommend that you use target tracking scaling policies. Otherwise, we recommend that you use step scaling policies.

Target Tracking Scaling Policies for Amazon EC2 Auto Scaling

Target tracking scaling policies simplify how you configure dynamic scaling. You select a predefined metric or configure a customized metric, and set a target value. Amazon EC2 Auto Scaling creates and manages the CloudWatch alarms that trigger the scaling policy and calculates the scaling adjustment based on the metric and the target value. The scaling policy adds or removes capacity as required to keep the metric at, or close to, the specified target value. In addition to keeping the metric close to the target value, a target tracking scaling policy also adjusts to the fluctuations in the metric due to a fluctuating load pattern and minimizes rapid fluctuations in the capacity of the Auto Scaling group.

For example, you could use target tracking scaling to:

- Configure a target tracking scaling policy to keep the average aggregate CPU utilization of your Auto Scaling group at 50 percent.
- Configure a target tracking scaling policy to keep the request count per target of your Elastic Load Balancing target group at 1000 for your Auto Scaling group.

You can also use target tracking scaling with Application Auto Scaling. For more information, see [Target Tracking Scaling Policies](#) in the *Application Auto Scaling User Guide*.

When specifying a customized metric, be aware that not all metrics work for target tracking. The metric must be a valid utilization metric and describe how busy an instance is. The metric value must increase or decrease proportionally to the number of instances in the Auto Scaling group so that the metric data can be used to proportionally scale out or in the number of instances. For example, the CPU utilization of an Auto Scaling group (that is, the Amazon EC2 metric `CPUUtilization` with the dimension `AutoScalingGroupName`) works, if the load on the Auto Scaling group is distributed across the instances. The following metrics do not work:

- The number of requests received by the load balancer fronting the Auto Scaling group (that is, the Elastic Load Balancing metric `RequestCount`), because the number of requests received by the load balancer doesn't change based on the utilization of the Auto Scaling group.
- Load balancer request latency (that is, the Elastic Load Balancing metric `Latency`), because request latency can increase based on increasing utilization, but doesn't necessarily change proportionally.
- The CloudWatch SQS queue metric `ApproximateNumberOfMessagesVisible`, because the number of messages in a queue may not change proportionally to the size of the Auto Scaling group that processes messages from the queue. However, a custom metric that measures the number of messages in the queue per EC2 instance in the Auto Scaling group can work. For more information, see [Scaling Based on Amazon SQS](#) (p. 83).

You can have multiple target tracking scaling policies for an Auto Scaling group, provided that each of them is using a different metric. The Auto Scaling group scales based on the policy that provides the largest capacity in the group for both scale in and scale out. This allows you greater flexibility to cover multiple scenarios and ensure that there is always enough capacity to process your application workloads.

You can also optionally disable the scale-in portion of a target tracking scaling policy. This feature provides you with the flexibility to scale in your Auto Scaling group using a different method, for example a different scaling policy type, while using a target tracking scaling policy to scale out your Auto Scaling group.

Considerations

Keep the following considerations in mind:

- A target tracking scaling policy assumes that it should scale out your Auto Scaling group when the specified metric is above the target value. You cannot use a target tracking scaling policy to scale out your Auto Scaling group when the specified metric is below the target value.
- A target tracking scaling policy does not scale your Auto Scaling group when the specified metric has insufficient data. It does not scale in your Auto Scaling group because it does not interpret insufficient data as low utilization. To scale in your Auto Scaling group when the specified metric has insufficient data, create a simple or step scaling policy and have an alarm invoke the scaling policy when it changes to the `INSUFFICIENT_DATA` state. For example, the metric `RequestCountPerTarget`, which is one of the predefined metrics, has no data points when no requests are routed to the target group. To scale in your Auto Scaling group when no requests are routed to the target group, create a simple or step scaling policy, create an alarm on the metric, and have it invoke the scaling policy when it changes to the `INSUFFICIENT_DATA` state. For information about alarm states, see [Alarm States](#) in the *Amazon CloudWatch User Guide*.
- You may see gaps between the target value and the actual metric data points. This is because we act conservatively by rounding up or down when determining how many instances to add or remove. This prevents us from adding an insufficient number of instances or removing too many instances. However, for smaller Auto Scaling groups with fewer instances, the utilization of the group may seem far from the target value. For example, if you set a target value of 50 percent for CPU utilization and your Auto Scaling group then exceeds the target, we might determine that adding 1.5 instances will decrease the CPU utilization to close to 50 percent. Because it is not possible to add 1.5 instances, we round up and add two instances. This might decrease the CPU utilization to a value below 50 percent, but it ensures that your application has enough resources to support it. Similarly, if we determine that removing 1.5 instances increases your CPU utilization to above 50 percent, we remove just one instance. For larger Auto Scaling groups with more instances, the utilization is spread over a larger number of instances. Adding or removing instances causes less of a gap between the target value and the actual metric data points.
- We recommend that you scale on metrics with a 1-minute frequency because that ensures a faster response to utilization changes. Scaling on metrics with a 5-minute frequency can result in slower response time and scaling on stale metric data. By default, Amazon EC2 instances are enabled for basic monitoring, which means metric data for instances is available at 5-minute intervals. You can enable detailed monitoring to get metric data for instances at 1-minute frequency. For more information, see [Configure Monitoring for Auto Scaling Instances](#).
- To ensure application availability, the Auto Scaling group scales out proportionally to the metric as fast as it can, but scales in more gradually.
- Do not edit or delete the CloudWatch alarms that Amazon EC2 Auto Scaling manages for a target tracking scaling policy. The alarms are deleted automatically when you delete the scaling policy.

Create an Auto Scaling Group with Target Tracking Scaling Policies

Use the console to create an Auto Scaling group with a target tracking scaling policy.

To create an Auto Scaling group with scaling based on metrics

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Choose **Create Auto Scaling group**.
4. On the **Create Auto Scaling Group** page, do one of the following:

- Select **Create an Auto Scaling group from an existing launch configuration**, select an existing launch configuration, and then choose **Next Step**.
 - If you don't have a launch configuration that you'd like to use, choose **Create a new launch configuration** and follow the directions. For more information, see [Creating a Launch Configuration](#) (p. 26).
5. On the **Configure Auto Scaling group details** page, do the following:
 - a. For **Group name**, type a name for your Auto Scaling group.
 - b. For **Group size**, type the desired capacity for your Auto Scaling group.
 - c. If the launch configuration specifies instances that require a VPC, such as T2 instances, you must select a VPC from **Network**. Otherwise, if your AWS account supports EC2-Classic and the instances don't require a VPC, you can select either **Launch info EC2-Classic** or a VPC.
 - d. If you selected a VPC in the previous step, select one or more subnets from **Subnet**. If you selected EC2-Classic in the previous step, select one or more Availability Zones from **Availability Zone(s)**.
 - e. Choose **Next: Configure scaling policies**.
 6. On the **Configure scaling policies** page, do the following:
 - a. Select **Use scaling policies to adjust the capacity of this group**.
 - b. Specify the minimum and maximum size for your Auto Scaling group using the row that begins with **Scale between**. For example, if your group is already at its maximum size, specify a new maximum in order to scale out.
 - c. For **Scale Group Size**, specify a scaling policy. You can optionally specify a name for the policy, then choose a value for **Metric type**.
 - d. Specify a **Target value** for the metric.
 - e. Specify an instance warm-up value for **Instances need**, which allows you to control the time until a newly launched instance can contribute to the CloudWatch metrics.
 - f. Check the **Disable scale-in** option to create only a scale-out policy. This allows you to create a separate scale-in policy of a different type if wanted.
 - g. Choose **Review**.
 - h. On the **Review** page, choose **Create Auto Scaling group**.

Instance Warmup

You can specify the number of seconds that it takes for a newly launched instance to warm up. Until its specified warm-up time has expired, an instance is not counted toward the aggregated metrics of the Auto Scaling group.

While scaling out, we do not consider instances that are warming up as part of the current capacity of the group. This ensures that we don't add more instances than you need.

While scaling in, we consider instances that are terminating as part of the current capacity of the group. Therefore, we don't remove more instances from the Auto Scaling group than necessary.

A scale-in activity can't start while a scale-out activity is in progress.

Configure Scaling Policies Using the AWS CLI

Use the AWS CLI as follows to configure target tracking scaling policies for your Auto Scaling group.

Tasks

- [Step 1: Create an Auto Scaling Group](#) (p. 75)

- [Step 2: Create Scaling Policies \(p. 75\)](#)

Step 1: Create an Auto Scaling Group

Use the [create-auto-scaling-group](#) command to create an Auto Scaling group named `my-asg` using the launch configuration `my-lc`. If you don't have a launch configuration that you'd like to use, you can create one. For more information, see [create-launch-configuration](#).

```
aws autoscaling create-auto-scaling-group --auto-scaling-group-name my-asg --launch-configuration-name my-lc --max-size 5 --min-size 1 --availability-zones "us-west-2c"
```

Step 2: Create Scaling Policies

You can create scaling policies that tell the Auto Scaling group what to do when the specified conditions change.

Example: target tracking configuration file

The following is an example of a target tracking configuration file, which you should save as `config.json`:

```
{
  "TargetValue": 40.0,
  "PredefinedMetricSpecification":
    {
      "PredefinedMetricType": "ASGAverageCPUUtilization"
    }
}
```

Example: my-scaleout-policy

Use the [put-scaling-policy](#) command, along with the `config.json` file you created previously, to create a scaling policy named `cpu40` that keeps the average CPU utilization of the Auto Scaling group at 40 percent:

```
aws autoscaling put-scaling-policy --policy-name cpu40 --auto-scaling-group-name my-asg --policy-type TargetTrackingScaling --target-tracking-configuration file://config.json
```

Simple and Step Scaling Policies for Amazon EC2 Auto Scaling

Amazon EC2 Auto Scaling originally supported only simple scaling policies. If you created your scaling policy before target tracking and step policies were introduced, your policy is treated as a simple scaling policy.

We recommend that you use step scaling policies instead of simple scaling policies even if you have a single step adjustment, because we continuously evaluate alarms and do not lock the group during scaling activities or health check replacements. If you are scaling based on a metric that is a utilization metric that increases or decreases proportionally to the number of instances in the Auto Scaling group, we recommend that you use a target tracking scaling policy instead. For more information, see [Target Tracking Scaling Policies for Amazon EC2 Auto Scaling \(p. 72\)](#).

Simple Scaling Policies

After a scaling activity is started, the policy must wait for the scaling activity or health check replacement to complete and the cooldown period to expire before it can respond to additional alarms.

Cooldown periods help to prevent the initiation of additional scaling activities before the effects of previous activities are visible. You can use the default cooldown period associated with your Auto Scaling group, or you can override the default by specifying a cooldown period for your policy. For more information, see [Scaling Cooldowns for Amazon EC2 Auto Scaling \(p. 87\)](#).

Step Scaling Policies

After a scaling activity is started, the policy continues to respond to additional alarms, even while a scaling activity or health check replacement is in progress. Therefore, all alarms that are breached are evaluated by Amazon EC2 Auto Scaling as it receives the alarm messages. If you are creating a policy to scale out, you can specify the estimated warm-up time that it takes for a newly launched instance to be ready to contribute to the aggregated metrics. For more information, see [Instance Warmup \(p. 78\)](#).

Note

Amazon EC2 Auto Scaling does not support cooldown periods for step scaling policies. Therefore, you can't specify a cooldown period for these policies and the default cooldown period for the group doesn't apply.

Scaling Adjustment Types

When a step scaling or simple scaling policy is executed, it changes the current capacity of your Auto Scaling group using the scaling adjustment specified in the policy. A scaling adjustment can't change the capacity of the group above the maximum group size or below the minimum group size.

Amazon EC2 Auto Scaling supports the following adjustment types for step scaling and simple scaling:

- **ChangeInCapacity**—Increase or decrease the current capacity of the group by the specified number of instances. A positive value increases the capacity and a negative adjustment value decreases the capacity.

Example: If the current capacity of the group is 3 instances and the adjustment is 5, then when this policy is performed, there are 5 instances added to the group for a total of 8 instances.

- **ExactCapacity**—Change the current capacity of the group to the specified number of instances. Specify a positive value with this adjustment type.

Example: If the current capacity of the group is 3 instances and the adjustment is 5, then when this policy is performed, the capacity is set to 5 instances.

- **PercentChangeInCapacity**—Increment or decrement the current capacity of the group by the specified percentage. A positive value increases the capacity and a negative value decreases the capacity. If the resulting value is not an integer, it is rounded as follows:
 - Values greater than 1 are rounded down. For example, 12.7 is rounded to 12.
 - Values between 0 and 1 are rounded to 1. For example, .67 is rounded to 1.
 - Values between 0 and -1 are rounded to -1. For example, -.58 is rounded to -1.
 - Values less than -1 are rounded up. For example, -6.67 is rounded to -6.

Example: If the current capacity is 10 instances and the adjustment is 10 percent, then when this policy is performed, 1 instance is added to the group for a total of 11 instances.

With **PercentChangeInCapacity**, you can also specify the minimum number of instances to scale (using the `MinAdjustmentMagnitude` parameter or **Add instances in increments of at least** in the console). For example, suppose that you create a policy that adds 25 percent and you specify a minimum increment of 2 instances. If you have an Auto Scaling group with 4 instances and the scaling policy is executed, 25 percent of 4 is 1 instance. However, because you specified a minimum increment of 2, there are 2 instances added.

Step Adjustments

When you create a step scaling policy, you add one or more step adjustments that enable you to scale based on the size of the alarm breach. Each step adjustment specifies a lower bound for the metric value, an upper bound for the metric value, and the amount by which to scale, based on the scaling adjustment type.

There are a few rules for the step adjustments for your policy:

- The ranges of your step adjustments can't overlap or have a gap.
- Only one step adjustment can have a null lower bound (negative infinity). If one step adjustment has a negative lower bound, then there must be a step adjustment with a null lower bound.
- Only one step adjustment can have a null upper bound (positive infinity). If one step adjustment has a positive upper bound, then there must be a step adjustment with a null upper bound.
- The upper and lower bound can't be null in the same step adjustment.
- If the metric value is above the breach threshold, the lower bound is inclusive and the upper bound is exclusive. If the metric value is below the breach threshold, the lower bound is exclusive and the upper bound is inclusive.

Amazon EC2 Auto Scaling applies the aggregation type to the metric data points from all instances. It compares the aggregated metric value against the upper and lower bounds defined by the step adjustments to determine which step adjustment to perform.

If you are using the AWS Management Console, you specify the upper and lower bounds as absolute values. If you are using the API or the CLI, you specify the upper and lower bounds relative to the breach threshold. For example, suppose that you have an alarm with a breach threshold of 50 and a scaling adjustment type of `PercentChangeInCapacity`. You also have scale-out and scale-in policies with the following step adjustments:

Scale out policy			
Lower bound	Upper bound	Adjustment	Metric value
0	10	0	$50 \leq \text{value} < 60$
10	20	10	$60 \leq \text{value} < 70$
20	null	30	$70 \leq \text{value} < +\text{infinity}$
Scale in policy			
Lower bound	Upper bound	Adjustment	Metric value
-10	0	0	$40 < \text{value} \leq 50$
-20	-10	-10	$30 < \text{value} \leq 40$
null	-20	-30	$-\text{infinity} < \text{value} \leq 30$

Your group has both a current capacity and a desired capacity of 10 instances. The group maintains its current and desired capacity while the aggregated metric value is greater than 40 and less than 60.

If the metric value gets to 60, the desired capacity of the group increases by 1 instance, to 11 instances, based on the second step adjustment of the scale-out policy (add 10 percent of 10 instances). After the new instance is running and its specified warm-up time has expired, the current capacity of the group increases to 11 instances. If the metric value rises to 70 even after this increase in capacity, the

desired capacity of the group increases by another 3 instances, to 14 instances, based on the third step adjustment of the scale-out policy (add 30 percent of 11 instances, 3.3 instances, rounded down to 3 instances).

If the metric value gets to 40, the desired capacity of the group decreases by 1 instance, to 13 instances, based on the second step adjustment of the scale-in policy (remove 10 percent of 14 instances, 1.4 instances, rounded down to 1 instance). If the metric value falls to 30 even after this decrease in capacity, the desired capacity of the group decreases by another 3 instances, to 10 instances, based on the third step adjustment of the scale-in policy (remove 30 percent of 13 instances, 3.9 instances, rounded down to 3 instances).

Instance Warmup

With step scaling policies, you can specify the number of seconds that it takes for a newly launched instance to warm up. Until its specified warm-up time has expired, an instance is not counted toward the aggregated metrics of the Auto Scaling group. While scaling out, AWS also does not consider instances that are warming up as part of the current capacity of the group. Therefore, multiple alarm breaches that fall in the range of the same step adjustment result in a single scaling activity. This ensures that we don't add more instances than you need.

Using the example in the previous section, suppose that the metric gets to 60, and then it gets to 62 while the new instance is still warming up. The current capacity is still 10 instances, so 1 instance is added (10 percent of 10 instances), but the desired capacity of the group is already 11 instances, so AWS does not increase the desired capacity further. If the metric gets to 70 while the new instance is still warming up, we should add 3 instances (30 percent of 10 instances). However, the desired capacity of the group is already 11, so we add only 2 instances, for a new desired capacity of 13 instances.

While scaling in, AWS considers instances that are terminating as part of the current capacity of the group. Therefore, we don't remove more instances from the Auto Scaling group than necessary.

A scale-in activity can't start while a scale-out activity is in progress.

Create an Auto Scaling Group with Step Scaling Policies

You can create a scaling policy that uses CloudWatch alarms to determine when your Auto Scaling group should scale out or scale in. Each CloudWatch alarm watches a single metric and sends messages to Amazon EC2 Auto Scaling when the metric breaches a threshold that you specify in your policy. You can use alarms to monitor any of the metrics that the services in AWS that you're using send to CloudWatch. Or, you can create and monitor your own custom metrics.

When you create a CloudWatch alarm, you can specify an Amazon SNS topic to send an email notification to when the alarm changes state. For more information, see [Create Amazon CloudWatch Alarms](#) (p. 115).

Use the console to create an Auto Scaling group with two scaling policies: a scale-out policy that increases the capacity of the group by 30 percent, and a scale-in policy that decreases the capacity of the group to two instances.

To create an Auto Scaling group with scaling based on metrics

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Choose **Create Auto Scaling group**.
4. On the **Create Auto Scaling Group** page, do one of the following:
 - Select **Create an Auto Scaling group from an existing launch configuration**, select an existing launch configuration, and then choose **Next Step**.

- If you don't have a launch configuration that you'd like to use, choose **Create a new launch configuration** and follow the directions. For more information, see [Creating a Launch Configuration](#) (p. 26).
5. On the **Configure Auto Scaling group details** page, do the following:
 - a. For **Group name**, type a name for your Auto Scaling group.
 - b. For **Group size**, type the desired capacity for your Auto Scaling group.
 - c. If the launch configuration specifies instances that require a VPC, such as T2 instances, you must select a VPC from **Network**. Otherwise, if your AWS account supports EC2-Classic and the instances don't require a VPC, you can select either **Launch info EC2-Classic** or a VPC.
 - d. If you selected a VPC in the previous step, select one or more subnets from **Subnet**. If you selected EC2-Classic in the previous step, select one or more Availability Zones from **Availability Zone(s)**.
 - e. Choose **Next: Configure scaling policies**.
 6. On the **Configure scaling policies** page, do the following:
 - a. Select **Use scaling policies to adjust the capacity of this group**.
 - b. Specify the minimum and maximum size for your Auto Scaling group using the row that begins with **Scale between**. For example, if your group is already at its maximum size, you need to specify a new maximum in order to scale out.

Scale between and instances. These will be the minimum and maximum size of your group.
 - c. Specify your scale-out policy under **Increase Group Size**. You can optionally specify a name for the policy, then choose **Add new alarm**.
 - d. On the **Create Alarm** page, choose **create topic**. For **Send a notification to**, type a name for the SNS topic. For **With these recipients**, type one or more email addresses to receive notification. You can replace the default name for your alarm with a custom name. Next, specify the metric and the criteria for the policy. For example, you can leave the default settings for **Whenever** (Average of CPU Utilization). For **Is**, choose **>=** and type 80 percent. For **For at least**, type 1 consecutive period of 5 Minutes. Choose **Create Alarm**.

Create Alarm

You can use CloudWatch alarms to be notified automatically whenever metric data reaches a level you define.
To edit an alarm, first choose whom to notify and then define when the notification should be sent.

☒ **Send a notification to:** [cancel](#)

With these recipients:

Whenever: **Average** of **CPU Utilization**

Is: **>=** **Percent**

For at least: consecutive period(s) of **5 Minutes**

Name of alarm:

[Cancel](#) [Create Alarm](#)

CPU Utilization Percent

80
60
40
20
0

12/10 02:00 12/10 04:00 12/10 06:00

my-test-asg

- e. For **Take the action**, choose **Add**, type 30 in the next field, and then choose **percent of group**. By default, the lower bound for this step adjustment is the alarm threshold and the upper bound is null (positive infinity).

To add another step adjustment, choose **Add step**. To set a minimum number of instances to scale, update the number field in **Add instances in increments of at least 1 instance(s)**.

(Optional) We recommend that you use the default to create scaling policies with steps. To create simple scaling policies, choose **Create a simple scaling policy**. For more information, see [Simple and Step Scaling Policies for Amazon EC2 Auto Scaling](#) (p. 75).

Increase Group Size

Name: AddCapacity

Execute policy when: AddCapacityAlarm [Edit](#) [Remove](#)
breaches the alarm threshold: CPUUtilization >= 80 for 300 seconds
for the metric dimensions AutoScalingGroupName = my-asg

Take the action: Add 30 percent of group when 80 <= CPUUtilization < +infinity
[Add step](#) ⓘ

Add instances in increments of at least 7 instance(s)

Instances need: 300 seconds to warm up after each step

[Create a simple scaling policy](#) ⓘ

- f. Specify an instance warm-up value for **Instances need**, which allows you to control the amount of time until a newly launched instance can contribute to the CloudWatch metrics.
- g. Specify your scale-in policy under **Decrease Group Size**. You can optionally specify a name for the policy, then choose **Add new alarm**.
- h. On the **Create Alarm** page, you can select the same notification that you created for the scale-out policy or create a new one for the scale-in policy. You can replace the default name for your alarm with a custom name. Keep the default settings for **Whenever** (Average of CPU Utilization). For **Is**, choose <= and type 40 percent. For **For at least**, type 1 consecutive period of 5 Minutes. Choose **Create Alarm**.
- i. For **Take the action**, choose Remove, type 2 in the next field, and then choose instances. By default, the upper bound for this step adjustment is the alarm threshold and the lower bound is null (negative infinity). To add another step adjustment, choose **Add step**.

(Optional) We recommend that you use the default to create scaling policies with steps. To create simple scaling policies, choose **Create a simple scaling policy**. For more information, see [Scaling Policy Types \(p. 71\)](#).

Decrease Group Size

Name: DecreaseCapacity

Execute policy when: DecreaseCapacityAlarm [Edit](#) [Remove](#)
breaches the alarm threshold: CPUUtilization <= 40 for 300 seconds
for the metric dimensions AutoScalingGroupName = my-asg

Take the action: Remove 2 instances when 40 >= CPUUtilization > -infinity
[Add step](#) ⓘ

[Create a simple scaling policy](#) ⓘ

- j. Choose **Review**.
 - k. On the **Review** page, choose **Create Auto Scaling group**.
7. Use the following steps to verify the scaling policies for your Auto Scaling group.
- a. The **Auto Scaling Group creation status** page confirms that your Auto Scaling group was successfully created. Choose **View your Auto Scaling Groups**.
 - b. On the **Auto Scaling Groups** page, select the Auto Scaling group that you just created.
 - c. On the **Activity History** tab, the **Status** column shows whether your Auto Scaling group has successfully launched instances.
 - d. On the **Instances** tab, the **Lifecycle** column contains the state of your instances. It takes a short time for an instance to launch. After the instance starts, its lifecycle state changes to InService.

The **Health Status** column shows the result of the EC2 instance health check on your instance.

- e. On the **Scaling Policies** tab, you can see the policies that you created for the Auto Scaling group.

Configure Scaling Policies Using the AWS CLI

Use the AWS CLI as follows to configure step scaling policies for your Auto Scaling group.

Tasks

- [Step 1: Create an Auto Scaling Group \(p. 81\)](#)
- [Step 2: Create Scaling Policies \(p. 81\)](#)
- [Step 3: Create CloudWatch Alarms \(p. 82\)](#)

Step 1: Create an Auto Scaling Group

Use the following [create-auto-scaling-group](#) command to create an Auto Scaling group named `my-asg` using the launch configuration `my-lc`. If you don't have a launch configuration that you'd like to use, you can create one. For more information, see [create-launch-configuration](#).

```
aws autoscaling create-auto-scaling-group --auto-scaling-group-name my-asg --launch-configuration-name my-lc --max-size 5 --min-size 1 --availability-zones "us-west-2c"
```

Step 2: Create Scaling Policies

You can create scaling policies that tell the Auto Scaling group what to do when the specified conditions change.

Example: my-scaleout-policy

Use the following [put-scaling-policy](#) command to create a scaling policy named `my-scaleout-policy` with an adjustment type of `PercentChangeInCapacity` that increases the capacity of the group by 30 percent:

```
aws autoscaling put-scaling-policy --policy-name my-scaleout-policy --auto-scaling-group-name my-asg --scaling-adjustment 30 --adjustment-type PercentChangeInCapacity
```

The output includes the ARN that serves as a unique name for the policy. Later, you can use either the ARN or a combination of the policy name and group name to specify the policy. Store this ARN in a safe place. You need it to create CloudWatch alarms.

```
{
  "PolicyARN": "arn:aws:autoscaling:us-west-2:123456789012:scalingPolicy:ac542982-cbeb-4294-891c-a5a941dfa787:autoScalingGroupName/my-asg:policyName/my-scaleout-policy"
}
```

Example: my-scalein-policy

Use the following [put-scaling-policy](#) command to create a scaling policy named `my-scalein-policy` with an adjustment type of `ChangeInCapacity` that decreases the capacity of the group by two instances:

```
aws autoscaling put-scaling-policy --policy-name my-scalein-policy --auto-scaling-group-name my-asg --scaling-adjustment -2 --adjustment-type ChangeInCapacity
```

The output includes the ARN for the policy. Store this ARN in a safe place. You need it to create CloudWatch alarms.

```
{
  "PolicyARN": "arn:aws:autoscaling:us-
west-2:123456789012:scalingPolicy:4ee9e543-86b5-4121-b53b-
aa4c23b5bbcc:autoScalingGroupName/my-asg:policyName/my-scalein-policy"
}
```

Step 3: Create CloudWatch Alarms

In step 2, you created scaling policies that provided instructions to the Auto Scaling group about how to scale out and scale in when the conditions that you specify change. In this step, you create alarms by identifying the metrics to watch, defining the conditions for scaling, and then associating the alarms with the scaling policies.

Example: AddCapacity

Use the following CloudWatch [put-metric-alarm](#) command to create an alarm that increases the size of the Auto Scaling group when the value of the specified metric breaches 80. For example, you can add capacity when the average CPU usage of all the instances (CPUUtilization) increases to 80 percent. To use your own custom metric, specify its name in `--metric-name` and its namespace in `--namespace`.

```
aws cloudwatch put-metric-alarm --alarm-name AddCapacity --metric-name CPUUtilization --
namespace AWS/EC2 --statistic Average --period 120 --threshold 80 --comparison-operator
GreaterThanOrEqualToThreshold --dimensions "Name=AutoScalingGroupName,Value=my-asg" --
evaluation-periods 2 --alarm-actions PolicyARN
```

Example: RemoveCapacity

Use the following CloudWatch [put-metric-alarm](#) command to create an alarm that decreases the size of the Auto Scaling group when the value of the specified metric breaches 40. For example, you can remove capacity when the average CPU usage of all the instances (CPUUtilization) decreases to 40 percent. To use your own custom metric, specify its name in `--metric-name` and its namespace in `--namespace`.

```
aws cloudwatch put-metric-alarm --alarm-name RemoveCapacity --metric-name CPUUtilization
--namespace AWS/EC2 --statistic Average --period 120 --threshold 40 --comparison-operator
LessThanOrEqualToThreshold --dimensions "Name=AutoScalingGroupName,Value=my-asg" --
evaluation-periods 2 --alarm-actions PolicyARN
```

Add a Scaling Policy to an Existing Auto Scaling Group

Use the console to add a scaling policy to an existing Auto Scaling group. A scaling policy is used to increase and decrease the number of running EC2 instances in the group dynamically to meet changing conditions. For more information, see [Dynamic Scaling for Amazon EC2 Auto Scaling \(p. 71\)](#).

To update an Auto Scaling group with scaling based on metrics

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group.
4. On the **Scaling Policies** tab, choose **Add policy**.

The page displays all the available resources.

5. If you are adding a target tracking scaling policy, use the following steps. If you are using a simple or step scaling policy, skip to the next step.
 - a. For **Name**, type a name for the policy.
 - b. Choose a **Metric type** and specify a **Target value** for the metric.
 - c. Specify an instance warm-up value for **Instances need**, which allows you to control the amount of time until a newly launched instance can contribute to the CloudWatch metrics.
 - d. Check the **Disable scale-in** option if you only want a scale-out policy created. This allows you to create a separate scale-in policy if wanted.
 - e. Choose **Create**.
6. If you are using a step scaling policy, choose **Create a scaling policy with steps**, and then do the following:

Note

We recommend that you use the option to create scaling policies with steps. To use a simple scaling policy, choose **Create a simple scaling policy** instead. For more information about simple scaling, see [Simple and Step Scaling Policies for Amazon EC2 Auto Scaling \(p. 75\)](#).

- a. For **Name**, type a name for the policy, and then choose **Create new alarm**.
- b. On the **Create Alarm** page, choose **create topic**. For **Send a notification to**, type a name for the SNS topic. For **With these recipients**, type one or more email addresses to receive notification. You can replace the default name for your alarm with a custom name. Next, specify the metric and the criteria for the alarm, using **Whenever**, **Is**, and **For at least**. Choose **Create Alarm**.
- c. Specify the scaling activity for the policy using **Take the action**. By default, the lower bound for this step adjustment is the alarm threshold and the upper bound is null (positive infinity). To add another step adjustment, choose **Add step**.
- d. Specify an instance warm-up value for **Instances need**, which allows you to control the amount of time until a newly launched instance can contribute to the CloudWatch metrics.
- e. Choose **Create**.

Scaling Based on Amazon SQS

This section shows you how to scale your Auto Scaling group in response to changing demand from an Amazon Simple Queue Service (Amazon SQS) queue. Amazon SQS offers a secure, durable, and available hosted queue that lets you integrate and decouple distributed software systems and components. If you're not familiar with Amazon SQS, see the [Amazon Simple Queue Service Developer Guide](#) for more information.

There are several scenarios where you might think about scaling in response to activity in an Amazon SQS queue. Suppose that you have a web app that lets users upload images and use them online. Each image requires resizing and encoding before it can be published. The app runs on EC2 instances in an Auto Scaling group that is configured to handle your typical upload rates. Unhealthy instances are terminated and replaced to maintain current instance levels at all times. The app places the raw bitmap data of the images in an Amazon SQS queue for processing, processes the images, and then publishes the processed images where they can be viewed by users.

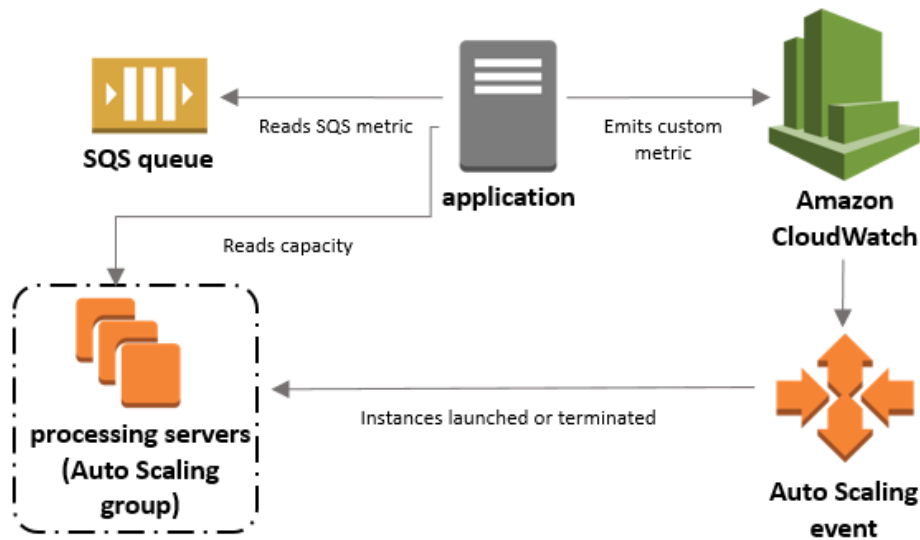
This architecture works well if the number of image uploads doesn't vary over time. What happens if your upload levels change? If your uploads increase and decrease on a predictable schedule, you can specify the time and date to perform scaling activities. For more information, see [Scheduled Scaling for Amazon EC2 Auto Scaling \(p. 68\)](#). A more dynamic way to scale your Auto Scaling group, scaling by policy, lets you define parameters that control the scaling process. For example, you can create a policy that calls for enlarging your fleet of EC2 instances whenever the average number of uploads reaches a

certain level. This is useful for scaling in response to changing conditions, when you don't know when those conditions will change.

There are three main parts to this configuration:

- An Auto Scaling group to manage EC2 instances for the purposes of processing messages from an SQS queue.
- A custom metric to send to Amazon CloudWatch that measures the number of messages in the queue per EC2 instance in the Auto Scaling group.
- A target tracking policy that configures your Auto Scaling group to scale based on the custom metric and a set target value. CloudWatch alarms invoke the scaling policy.

The following diagram illustrates the architecture of this configuration.



Choosing an Effective Metric and Target Value

The number of messages in your Amazon SQS queue does not solely define the number of instances needed. In fact, the number of instances in the fleet can be driven by a number of factors, including the amount of time it takes to process a message and the amount of latency (queue delay) that is acceptable to your application.

The solution is to use a *backlog per instance* metric with the target value being the *acceptable backlog per instance* to maintain. You can calculate these numbers as follows:

- **Backlog per instance:** To determine your backlog per instance, start with the Amazon SQS metric `ApproximateNumberOfMessages` to determine the length of the SQS queue (number of messages available for retrieval from the queue). Divide that number by the fleet's running capacity, which for an Auto Scaling group is the number of instances in the `InService` state, to get the backlog per instance.
- **Acceptable backlog per instance:** To determine your target value, first calculate what your application can accept in terms of latency. Then, take the acceptable latency value and divide it by the average time that an EC2 instance takes to process a message.

To illustrate with an example, the current `ApproximateNumberOfMessages` is 1500 and the fleet's running capacity is 10. If the average processing time is 0.1 seconds for each message and the longest acceptable latency is 10 seconds, then the acceptable backlog per instance is $10 / 0.1$, which equals

100. This means that 100 is the target value for your target tracking policy. Because the backlog per instance is currently at 150 (1500 / 10), your fleet scales out by five instances to maintain proportion to the target value.

The following examples create the custom metric and target tracking scaling policy that configures your Auto Scaling group to scale based on these calculations.

Scaling with Amazon SQS Using the AWS CLI

The following section shows you how to set up automatic scaling for an SQS queue using the AWS CLI. The procedures assume that you already have a queue (standard or FIFO), an Auto Scaling group, and EC2 instances running the application that uses the queue.

Step 1: Create the CloudWatch Custom Metric

Create the custom calculated metric by reading metrics from your AWS account, calculating the backlog per instance metric recommended in an earlier section, and then publishing this number to CloudWatch at 1-minute granularity.

Wherever possible, you should scale on metrics with a 1-minute frequency (also known as detailed monitoring) because that ensures a faster response to utilization changes. Scaling on metrics with a 5-minute frequency can result in slower response time and scaling on stale metric data. By default, Auto Scaling instances are enabled for basic monitoring, which means metric data for instances is available at 5-minute intervals. You can enable detailed monitoring to get metric data for instances at 1-minute frequency. For more information, see [Monitoring Your Auto Scaling Groups and Instances Using Amazon CloudWatch](#) (p. 111).

To create the CloudWatch custom metric

1. Use the SQS [get-queue-attributes](#) command to get the number of messages waiting in the queue (ApproximateNumberOfMessages):

```
aws sqs get-queue-attributes --queue-url https://sqs.us-west-2.amazonaws.com/123456789/MyQueue --attribute-names ApproximateNumberOfMessages
```

2. Use the [describe-auto-scaling-groups](#) command to get the running capacity of the group, which is the number of instances in the InService lifecycle state. This command returns the instances of an Auto Scaling group along with their lifecycle state.

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-names MyAutoScalingGroup
```

3. Calculate the backlog per instance by dividing the ApproximateNumberOfMessages metric by the fleet's running capacity metric.
4. Publish the results at 1-minute granularity as a CloudWatch custom metric using the AWS CLI or an API. A custom metric is defined using a metric name and namespace of your choosing. Namespaces for custom metrics cannot start with "AWS/". For more information about publishing custom metrics, see the [Publish Custom Metrics](#) topic in the *Amazon CloudWatch User Guide*.

Here is an example CLI [put-metric-data](#) command:

```
aws cloudwatch put-metric-data --metric-name MyBacklogPerInstance --namespace MyNamespace --unit None --value 20
```

After your application is emitting the desired metric, the data is sent to CloudWatch. The metrics are visible in the CloudWatch console. You can access them by logging into the AWS Management Console

and navigating to the CloudWatch page. You can view the metric by navigating to the metrics page or searching for your metric using the search box. For help viewing metrics, see [View Available Metrics](#) in the *Amazon CloudWatch User Guide*.

Step 2: Create the Scaling Policies

Next, create a scaling policy that tells the Auto Scaling group what to do when conditions change.

To create scaling policies

1. Use the following command to specify a target value for your scaling policy in a `config.json` file in your home directory.

For the `TargetValue`, calculate the acceptable backlog per instance metric and enter it here. To calculate this number, decide on a normal latency value and divide it by the average time that it takes to process a message.

```
$ cat ~/config.json
{
  "TargetValue":100,
  "CustomizedMetricSpecification":{
    "MetricName":"MyBacklogPerInstance",
    "Namespace":"MyNamespace",
    "Statistic":"Average",
    "Unit":"None"
  }
}
```

2. Use the `put-scaling-policy` command, along with the `config.json` file that you created in the previous step, to create your scaling policy:

```
aws autoscaling put-scaling-policy --policy-name MyScalingPolicy --auto-scaling-
group-name MyAutoScalingGroup --policy-type TargetTrackingScaling --target-tracking-
configuration file://~/config.json
```

This creates two alarms: one for scaling out and one for scaling in. It also returns the Amazon Resource Name (ARN) of the policy that is registered with CloudWatch, which CloudWatch uses to invoke scaling whenever the metric is in breach.

Step 3: Test Your Scaling Policies

You can test your scale-out policy by increasing the number of messages in your SQS queue and then verifying that your Auto Scaling group has launched an additional EC2 instance. Similarly, you can test your scale-in policy by decreasing the number of messages in your SQS queue and then verifying that the Auto Scaling group has terminated an EC2 instance.

To test the scale-out policy

1. Follow the steps in [Tutorial: Sending a Message to an Amazon SQS Queue](#) to add messages to your queue. Make sure that you have increased the number of messages in the queue so that the backlog per instance metric exceeds the target value.

It can take a few minutes for your changes to trigger the CloudWatch alarm.

2. Use the `describe-auto-scaling-groups` command to verify that the group has launched an instance:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-
name MyAutoScalingGroup
```

To test the scale-in policy

1. Follow the steps in [Tutorial: Sending a Message to an Amazon SQS Queue](#) to remove messages from the queue. Make sure that you have decreased the number of messages in the queue so that the backlog per instance metric is below the target value.

It can take a few minutes for your changes to trigger the CloudWatch alarm.

2. Use the `describe-auto-scaling-groups` command to verify that the group has terminated an instance:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-  
name MyAutoScalingGroup
```

For more in-depth information about target tracking, see [Target Tracking Scaling Policies for Amazon EC2 Auto Scaling](#) (p. 72).

Scaling Cooldowns for Amazon EC2 Auto Scaling

The cooldown period is a configurable setting for your Auto Scaling group that helps to ensure that it doesn't launch or terminate additional instances before the previous scaling activity takes effect. After the Auto Scaling group dynamically scales using a simple scaling policy, it waits for the cooldown period to complete before resuming scaling activities.

Important

Amazon EC2 Auto Scaling supports cooldown periods when using simple scaling policies, but not when using target tracking policies, step scaling policies, or scheduled scaling.

When you manually scale your Auto Scaling group, the default is not to wait for the cooldown period, but you can override the default and honor the cooldown period. If an instance becomes unhealthy, the Auto Scaling group does not wait for the cooldown period to complete before replacing the unhealthy instance.

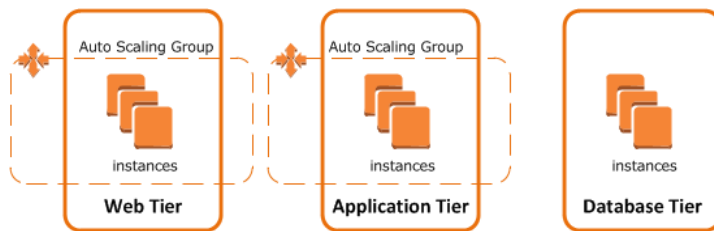
Amazon EC2 Auto Scaling supports both default cooldown periods and scaling-specific cooldown periods.

Contents

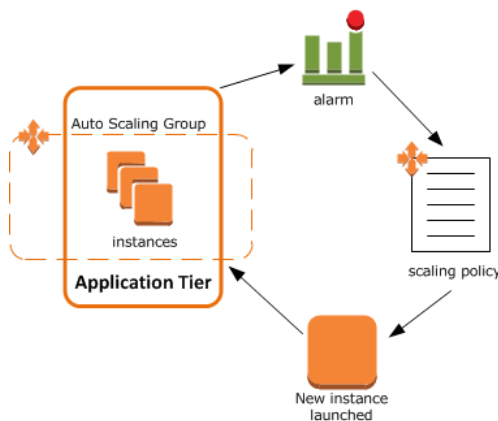
- [Example: Cooldowns](#) (p. 87)
- [Default Cooldowns](#) (p. 88)
- [Scaling-Specific Cooldowns](#) (p. 89)
- [Cooldowns and Multiple Instances](#) (p. 89)
- [Cooldowns and Lifecycle Hooks](#) (p. 89)
- [Cooldowns and Spot Instances](#) (p. 90)

Example: Cooldowns

Consider the following scenario: you have a web application running in AWS. This web application consists of three basic tiers: web, application, and database. To make sure that the application always has the resources to meet traffic demands, you create two Auto Scaling groups: one for your web tier and one for your application tier.



To help ensure that the Auto Scaling group for the application tier has the appropriate number of EC2 instances, [create a CloudWatch alarm \(p. 115\)](#) to scale out whenever the **CPUUtilization** metric for the instances exceeds 90 percent. When the alarm occurs, the Auto Scaling group launches and configures another instance.



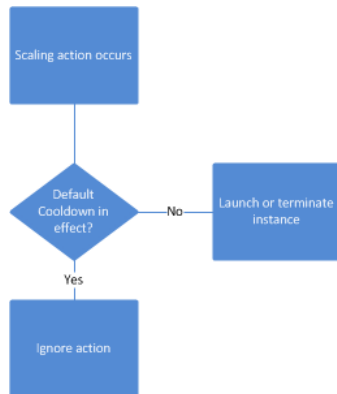
These instances use a configuration script to install and configure software before the instance is put into service. As a result, it takes around two or three minutes from the time the instance launches until it comes in service. The actual time depends on several factors, such as the size of the instance and whether there are startup scripts to complete.

Now a spike in traffic occurs, causing the CloudWatch alarm to fire. When it does, the Auto Scaling group launches an instance to help with the increase in demand. However, there's a problem: the instance takes a couple of minutes to launch. During that time, the CloudWatch alarm could continue to fire, causing the Auto Scaling group to launch another instance each time the alarm fires.

However, with a cooldown period in place, the Auto Scaling group launches an instance and then suspends scaling activities due to simple scaling policies or manual scaling until the specified time elapses. (The default is 300 seconds.) This gives newly launched instances time to start handling application traffic. After the cooldown period expires, any suspended scaling actions resume. If the CloudWatch alarm fires again, the Auto Scaling group launches another instance, and the cooldown period takes effect again. If, however, the additional instance was enough to bring the CPU utilization back down, then the group remains at its current size.

Default Cooldowns

The default cooldown period is applied when you create your Auto Scaling group. Its default value is 300 seconds. This cooldown period automatically applies to any [dynamic scaling \(p. 71\)](#) activities for simple scaling policies, and you can optionally request that it apply to your [manual scaling \(p. 61\)](#) activities.



You can configure the default cooldown period when you create the Auto Scaling group, using the AWS Management Console, the [create-auto-scaling-group](#) command (AWS CLI), or the [CreateAutoScalingGroup](#) API operation.

You can change the default cooldown period at any time, using the AWS Management Console, the [update-auto-scaling-group](#) command (AWS CLI), or the [UpdateAutoScalingGroup](#) API operation.

Scaling-Specific Cooldowns

In addition to specifying the default cooldown period for your Auto Scaling group, you can create cooldowns that apply to a specific simple scaling policy or manual scaling. A scaling-specific cooldown period overrides the default cooldown period.

One common use for scaling-specific cooldowns is with a scale-in policy—a policy that terminates instances based on a specific criteria or metric. Because this policy terminates instances, Amazon EC2 Auto Scaling needs less time to determine whether to terminate additional instances. The default cooldown period of 300 seconds is too long—you can reduce costs by applying a scaling-specific cooldown period of 180 seconds to the scale-in policy.

You can create a scaling-specific cooldown period using the AWS Management Console, the [put-scaling-policy](#) command (AWS CLI), or the [PutScalingPolicy](#) API operation.

Cooldowns and Multiple Instances

The preceding sections have provided examples that show how cooldown periods affect Auto Scaling groups when a single instance launches or terminates. However, it is not uncommon for Auto Scaling groups to launch more than one instance at a time. For example, you might choose to have the Auto Scaling group launch three instances when a specific metric threshold is met.

With multiple instances, the cooldown period (either the default cooldown or the scaling-specific cooldown) takes effect starting when the last instance launches.

Cooldowns and Lifecycle Hooks

You can add lifecycle hooks to your Auto Scaling groups. These hooks enable you to control how instances launch and terminate within an Auto Scaling group; you can perform actions on the instance before it is put into service or before it is terminated.

Lifecycle hooks can affect the impact of any cooldown periods configured for the Auto Scaling group, manual scaling, or a simple scaling policy. The cooldown period does not begin until after the instance moves out of the wait state.

Cooldowns and Spot Instances

You can create Auto Scaling groups to use [Spot Instances \(p. 53\)](#) instead of On-Demand or Reserved Instances. The cooldown period begins when the bid for any Spot Instance is successful.

Controlling Which Auto Scaling Instances Terminate During Scale In

With each Auto Scaling group, you control when it adds instances (referred to as *scaling out*) or remove instances (referred to as *scaling in*) from your network architecture. You can scale the size of your group manually by attaching and detaching instances, or you can automate the process through the use of a scaling policy.

When you configure automatic scale in, you must decide which instances should terminate first and set up a termination policy.

You can also use instance protection to prevent specific instances from being terminated during automatic scale in.

Note

The information in this section about maximizing usage to the hour is currently applicable to instances running Microsoft Windows or Linux distributions that have an hourly charge. If your Auto Scaling group uses Amazon Linux or Ubuntu, your EC2 usage is billed in one-second increments. For more information about per-second billing, see [Amazon EC2 Pricing](#).

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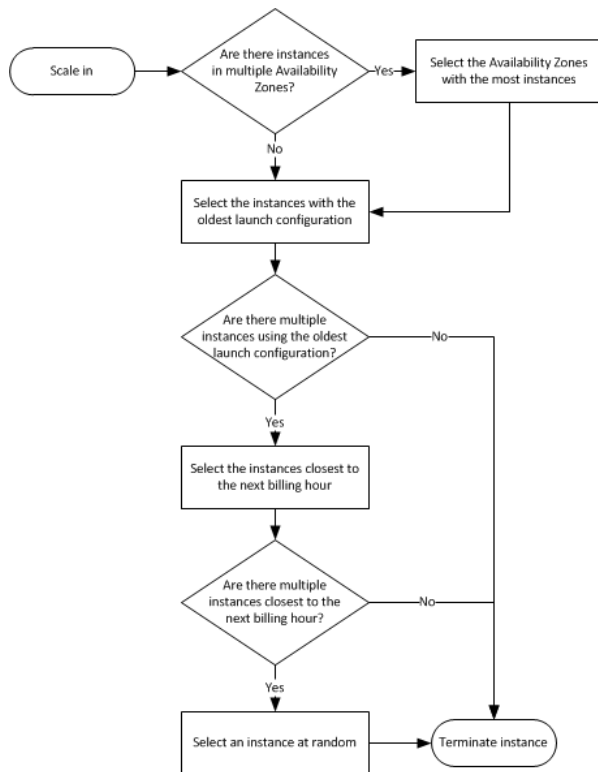
- [Default Termination Policy \(p. 90\)](#)
- [Customizing the Termination Policy \(p. 92\)](#)
- [Instance Protection \(p. 93\)](#)

Default Termination Policy

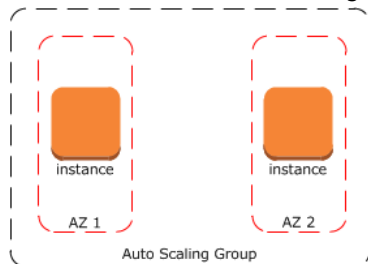
The default termination policy is designed to help ensure that your network architecture spans Availability Zones evenly. With the default termination policy, the behavior of the Auto Scaling group is as follows:

1. If there are instances in multiple Availability Zones, choose the Availability Zone with the most instances and at least one instance that is not protected from scale in. If there is more than one Availability Zone with this number of instances, choose the Availability Zone with the instances that use the oldest launch configuration.
2. Determine which unprotected instances in the selected Availability Zone use the oldest launch configuration. If there is one such instance, terminate it.
3. If there are multiple instances to terminate based on the above criteria, determine which unprotected instances are closest to the next billing hour. (This helps you maximize the use of your EC2 instances and manage your Amazon EC2 usage costs.) If there is one such instance, terminate it.
4. If there is more than one unprotected instance closest to the next billing hour, choose one of these instances at random.

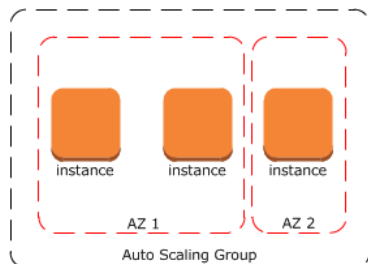
The following flow diagram illustrates how the default termination policy works.



Consider an Auto Scaling group that has two Availability Zones, a desired capacity of two instances, and scaling policies that increase and decrease the number of instances by 1 when certain thresholds are met. The two instances in this group are distributed as follows.



When the threshold for the scale-out policy is met, the policy takes effect and the Auto Scaling group launches a new instance. The Auto Scaling group now has three instances, distributed as follows.



When the threshold for the scale-in policy is met, the policy takes effect and the Auto Scaling group terminates one of the instances. If you did not assign a specific termination policy to the group, it uses the default termination policy. It selects the Availability Zone with two instances, and terminates the instance launched from the oldest launch configuration. If the instances were launched from the same

launch configuration, then the Auto Scaling group selects the instance that is closest to the next billing hour and terminates it.

Customizing the Termination Policy

The default termination policy assigned to an Auto Scaling group is typically sufficient for most situations. However, you have the option of replacing the default policy with a customized one.

When you customize the termination policy, if one Availability Zone has more instances than the other Availability Zones that are used by the group, then your termination policy is applied to the instances from the imbalanced Availability Zone. If the Availability Zones used by the group are balanced, then the termination policy is applied across all the Availability Zones for the group.

Amazon EC2 Auto Scaling supports the following custom termination policies:

- `OldestInstance`. Terminate the oldest instance in the group. This option is useful when you're upgrading the instances in the Auto Scaling group to a new EC2 instance type. You can gradually replace instances of the old type with instances of the new type.
- `NewestInstance`. Terminate the newest instance in the group. This policy is useful when you're testing a new launch configuration but don't want to keep it in production.
- `OldestLaunchConfiguration`. Terminate instances that have the oldest launch configuration. This policy is useful when you're updating a group and phasing out the instances from a previous configuration.
- `ClosestToNextInstanceHour`. Terminate instances that are closest to the next billing hour. This policy helps you maximize the use of your instances and manage your Amazon EC2 usage costs.
- `Default`. Terminate instances according to the default termination policy. This policy is useful when you have more than one scaling policy for the group.

To customize a termination policy using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group.
4. For **Actions**, choose **Edit**.
5. On the **Details** tab, locate **Termination Policies**. Choose one or more termination policies. If you choose multiple policies, list them in the order in which they should apply. If you use the `Default` policy, make it the last one in the list.
6. Choose **Save**.

To customize a termination policy using the AWS CLI

Use one of the following commands:

- `create-auto-scaling-group`
- `update-auto-scaling-group`

You can use these policies individually, or combine them into a list of policies. For example, use the following command to update an Auto Scaling group to use the `OldestLaunchConfiguration` policy first and then use the `ClosestToNextInstanceHour` policy:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg --termination-policies "OldestLaunchConfiguration" "ClosestToNextInstanceHour"
```

If you use the `Default` termination policy, make it the last one in the list of termination policies. For example, `--termination-policies "OldestLaunchConfiguration" "Default"`.

Instance Protection

To control whether an Auto Scaling group can terminate a particular instance when scaling in, use instance protection. You can enable the instance protection setting on an Auto Scaling group or an individual Auto Scaling instance. When the Auto Scaling group launches an instance, it inherits the instance protection setting of the Auto Scaling group. You can change the instance protection setting for an Auto Scaling group or an Auto Scaling instance at any time.

Instance protection starts when the instance state is `InService`. If you detach an instance that is protected from termination, its instance protection setting is lost. When you attach the instance to the group again, it inherits the current instance protection setting of the group.

If all instances in an Auto Scaling group are protected from termination during scale in and a scale-in event occurs, its desired capacity is decremented. However, the Auto Scaling group can't terminate the required number of instances until their instance protection settings are disabled.

Instance protection does not protect Auto Scaling instances from the following:

- Manual termination through the Amazon EC2 console, the `terminate-instances` command, or the `TerminateInstances` action. To protect Auto Scaling instances from manual termination, enable termination protection. For more information, see [Enabling Termination Protection](#) in the *Amazon EC2 User Guide for Linux Instances*.
- Health check replacement if the instance fails health checks.
- Spot Instance interruption.

Tasks

- [Enable Instance Protection for a Group \(p. 93\)](#)
- [Modify the Instance Protection Setting for a Group \(p. 94\)](#)
- [Modify the Instance Protection Setting for an Instance \(p. 95\)](#)

Enable Instance Protection for a Group

You can enable instance protection when you create an Auto Scaling group. By default, instance protection is disabled.

To enable instance protection using the console

When you create the Auto Scaling group, on the **Configure Auto Scaling group details** page, under **Advanced Details**, select the `Protect From Scale In` option from **Instance Protection**.

▼ Advanced Details

Load Balancing ⓘ

You currently don't have any load balancers

[Learn about Elastic Load Balancing](#)

Health Check Grace Period ⓘ

300 seconds

Monitoring ⓘ

Amazon EC2 Detailed Monitoring metrics, which are provided at 1 minute frequency, are not enabled for the launch configuration my-lc. Instances launched from it will use Basic Monitoring metrics, provided at 5 minute frequency.

[Learn more](#)

Instance Protection ⓘ

Protect From Scale In

To enable instance protection using the AWS CLI

Use the following [create-auto-scaling-group](#) command to enable instance protection:

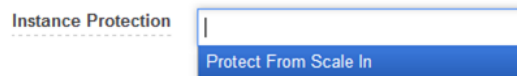
```
aws autoscaling create-auto-scaling-group --auto-scaling-group-name my-asg --new-instances-protected-from-scale-in ...
```

Modify the Instance Protection Setting for a Group

You can enable or disable the instance protection setting for an Auto Scaling group.

To change the instance protection setting for a group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group.
4. On the **Details** tab, choose **Edit**.
5. For **Instance Protection**, select **Protect From Scale In**.



6. Choose **Save**.

To change the instance protection setting for a group using the AWS CLI

Use the following [update-auto-scaling-group](#) command to enable instance protection for the specified Auto Scaling group:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg --new-instances-protected-from-scale-in
```

Use the following command to disable instance protection for the specified group:

```
aws autoscaling update-auto-scaling-group --auto-scaling-group-name my-asg --no-new-instances-protected-from-scale-in
```

Modify the Instance Protection Setting for an Instance

By default, an instance gets its instance protection setting from its Auto Scaling group. However, you can enable or disable instance protection for an instance at any time.

To change the instance protection setting for an instance using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group.
4. On the **Instances** tab, select the instance.
5. To enable instance protection, choose **Actions, Instance Protection, Set Scale In Protection**. When prompted, choose **Set Scale In Protection**.
6. To disable instance protection, choose **Actions, Instance Protection, Remove Scale In Protection**. When prompted, choose **Remove Scale In Protection**.

To change the instance protection setting for an instance using the AWS CLI

Use the following [set-instance-protection](#) command to enable instance protection for the specified instance:

```
aws autoscaling set-instance-protection --instance-ids i-5f2e8a0d --auto-scaling-group-name my-asg --protected-from-scale-in
```

Use the following command to disable instance protection for the specified instance:

```
aws autoscaling set-instance-protection --instance-ids i-5f2e8a0d --auto-scaling-group-name my-asg --no-protected-from-scale-in
```

Amazon EC2 Auto Scaling Lifecycle Hooks

Lifecycle hooks enable you to perform custom actions by pausing instances as an Auto Scaling group launches or terminates them. For example, while your newly launched instance is paused, you could install or configure software on it.

Each Auto Scaling group can have multiple lifecycle hooks. However, there is a limit on the number of hooks per Auto Scaling group. For more information, see [Auto Scaling Limits](#) (p. 9).

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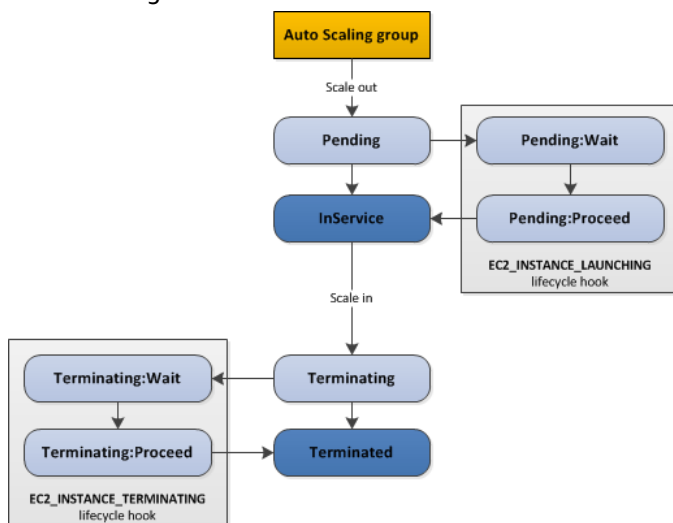
- [How Lifecycle Hooks Work](#) (p. 95)
- [Considerations When Using Lifecycle Hooks](#) (p. 96)
- [Prepare for Notifications](#) (p. 98)
- [Add Lifecycle Hooks](#) (p. 100)
- [Complete the Lifecycle Hook](#) (p. 100)
- [Test the Notification](#) (p. 101)

How Lifecycle Hooks Work

After you add lifecycle hooks to your Auto Scaling group, they work as follows:

1. Responds to scale-out events by launching instances and scale-in events by terminating instances.
2. Puts the instance into a wait state (`Pending:Wait` or `Terminating:Wait`). The instance is paused until either you continue or the timeout period ends.
3. You can perform a custom action using one or more of the following options:
 - Define a CloudWatch Events target to invoke a Lambda function when a lifecycle action occurs. The Lambda function is invoked when Amazon EC2 Auto Scaling submits an event for a lifecycle action to CloudWatch Events. The event contains information about the instance that is launching or terminating, and a token that you can use to control the lifecycle action.
 - Define a notification target for the lifecycle hook. Amazon EC2 Auto Scaling sends a message to the notification target. The message contains information about the instance that is launching or terminating, and a token that you can use to control the lifecycle action.
 - Create a script that runs on the instance as the instance starts. The script can control the lifecycle action using the ID of the instance on which it runs.
4. By default, the instance remains in a wait state for one hour, and then the Auto Scaling group continues the launch or terminate process (`Pending:Proceed` or `Terminating:Proceed`). If you need more time, you can restart the timeout period by recording a heartbeat. If you finish before the timeout period ends, you can complete the lifecycle action, which continues the launch or termination process.

The following illustration shows the transitions between instance states in this process:



For more information about the complete lifecycle of instances in an Auto Scaling group, see [Auto Scaling Lifecycle](#) (p. 7).

Considerations When Using Lifecycle Hooks

Adding lifecycle hooks to your Auto Scaling group gives you greater control over how instances launch and terminate. Here are some things to consider when adding a lifecycle hook to your Auto Scaling group, to help ensure that the group continues to perform as expected.

Considerations

- [Keeping Instances in a Wait State](#) (p. 97)
- [Cooldowns and Custom Actions](#) (p. 97)
- [Health Check Grace Period](#) (p. 97)
- [Lifecycle Action Result](#) (p. 97)
- [Spot Instances](#) (p. 97)

Keeping Instances in a Wait State

Instances can remain in a wait state for a finite period of time. The default is 1 hour (3600 seconds). You can adjust this time in the following ways:

- Set the heartbeat timeout for the lifecycle hook when you create the lifecycle hook. With the [put-lifecycle-hook](#) command, use the `--heartbeat-timeout` parameter. With the `PutLifecycleHook` operation, use the `HeartbeatTimeout` parameter.
- Continue to the next state if you finish before the timeout period ends, using the [complete-lifecycle-action](#) command or the `CompleteLifecycleAction` operation.
- Restart the timeout period by recording a heartbeat, using the [record-lifecycle-action-heartbeat](#) command or the `RecordLifecycleActionHeartbeat` operation. This increments the heartbeat timeout by the timeout value specified when you created the lifecycle hook. For example, if the timeout value is 1 hour, and you call this command after 30 minutes, the instance remains in a wait state for an additional hour, or a total of 90 minutes.

The maximum amount of time that you can keep an instance in a wait state is 48 hours or 100 times the heartbeat timeout, whichever is smaller.

Cooldowns and Custom Actions

When an Auto Scaling group launches or terminates an instance due to a simple scaling policy, a [cooldown](#) (p. 87) takes effect. The cooldown period helps ensure that the Auto Scaling group does not launch or terminate more instances than needed.

Consider an Auto Scaling group with a lifecycle hook that supports a custom action at instance launch. When the application experiences an increase in demand, the group launches instances to add capacity. Because there is a lifecycle hook, the instance is put into the `Pending:Wait` state, which means that it is not available to handle traffic yet. When the instance enters the wait state, scaling actions due to simple scaling policies are suspended. When the instance enters the `InService` state, the cooldown period starts. When the cooldown period expires, any suspended scaling actions resume.

Health Check Grace Period

If you add a lifecycle hook to perform actions as your instances launch, the health check grace period does not start until you complete the lifecycle hook and the instance enters the `InService` state.

Lifecycle Action Result

At the conclusion of a lifecycle hook, the result is either `ABANDON` or `CONTINUE`.

If the instance is launching, `CONTINUE` indicates that your actions were successful, and that the instance can be put into service. Otherwise, `ABANDON` indicates that your custom actions were unsuccessful, and that the instance can be terminated.

If the instance is terminating, both `ABANDON` and `CONTINUE` allow the instance to terminate. However, `ABANDON` stops any remaining actions, such as other lifecycle hooks, while `CONTINUE` allows any other lifecycle hooks to complete.

Spot Instances

You can use lifecycle hooks with Spot Instances. However, a lifecycle hook does not prevent an instance from terminating due to a change in the Spot price, which can happen at any time. In addition, when a Spot Instance terminates, you must still complete the lifecycle action (using the [complete-lifecycle-action](#) command or the `CompleteLifecycleAction` operation).

Prepare for Notifications

You can optionally configure notifications when the instance enters a wait state, which enables you to perform a custom action. You can use Amazon CloudWatch Events, Amazon SNS, or Amazon SQS to receive the notifications. Choose whichever option you prefer.

Alternatively, if you have a script that configures your instances when they launch, you do not need to receive notification when the lifecycle action occurs. If you are not doing so already, update your script to retrieve the instance ID of the instance from the instance metadata. For more information, see [Retrieving Instance Metadata](#).

Options

- [Receive Notification Using CloudWatch Events \(p. 98\)](#)
- [Receive Notification Using Amazon SNS \(p. 99\)](#)
- [Receive Notification Using Amazon SQS \(p. 99\)](#)

Receive Notification Using CloudWatch Events

You can use CloudWatch Events to set up a target to invoke a Lambda function when a lifecycle action occurs.

To set up notifications using CloudWatch Events

1. Create a Lambda function using the steps in [Create a Lambda Function \(p. 120\)](#) and note its Amazon Resource Name (ARN). For example, `arn:aws:lambda:us-west-2:123456789012:function:my-function`.
2. Create a CloudWatch Events rule that matches the lifecycle action using the following [put-rule](#) command:

```
aws events put-rule --name my-rule --event-pattern file://pattern.json --state ENABLED
```

The `pattern.json` for an instance launch lifecycle action is:

```
{
  "source": [ "aws.autoscaling" ],
  "detail-type": [ "EC2 Instance-launch Lifecycle Action" ]
}
```

The `pattern.json` for an instance terminate lifecycle action is:

```
{
  "source": [ "aws.autoscaling" ],
  "detail-type": [ "EC2 Instance-terminate Lifecycle Action" ]
}
```

3. Grant the rule permission to invoke your Lambda function using the following [add-permission](#) command. This command trusts the CloudWatch Events service principal (`events.amazonaws.com`) and scopes permissions to the specified rule.

```
aws lambda add-permission --function-name LogScheduledEvent --statement-id my-scheduled-event --action 'lambda:InvokeFunction' --principal events.amazonaws.com --source-arn arn:aws:events:us-east-1:123456789012:rule/my-scheduled-rule
```

4. Create a target that invokes your Lambda function when the lifecycle action occurs, using the following [put-targets](#) command:


```
aws events put-targets --rule my-rule --targets Id=1,Arn=arn:aws:lambda:us-west-2:123456789012:function:my-function
```

5. When the Auto Scaling group responds to a scale-out or scale-in event, it puts the instance in a wait state. While the instance is in a wait state, the Lambda function is invoked. For more information about the event data, see [Auto Scaling Events](#) (p. 116).

Receive Notification Using Amazon SNS

You can use Amazon SNS to set up a notification target to receive notifications when a lifecycle action occurs.

To set up notifications using Amazon SNS

1. Create the target using Amazon SNS. For more information, see [Create a Topic](#) in the *Amazon Simple Notification Service Developer Guide*. Note the ARN of the target (for example, `arn:aws:sns:us-west-2:123456789012:my-sns-topic`).
2. Create an IAM role to grant Amazon EC2 Auto Scaling permissions to access your notification target, using the steps in [Creating a Role to Delegate Permissions to an AWS Service](#) in the *IAM User Guide*. When prompted to select a role type, select **AWS Service Roles, AutoScaling Notification Access**. Note the ARN of the role. For example, `arn:aws:iam::123456789012:role/my-notification-role`.
3. When the Auto Scaling group responds to a scale-out or scale-in event, it puts the instance in a wait state. While the instance is in a wait state, a message is published to the notification target. The message includes the following event data:
 - **LifecycleActionToken** — The lifecycle action token.
 - **AccountId** — The AWS account ID.
 - **AutoScalingGroupName** — The name of the Auto Scaling group.
 - **LifecycleHookName** — The name of the lifecycle hook.
 - **EC2InstanceId** — The ID of the EC2 instance.
 - **LifecycleTransition** — The lifecycle hook type.

For example:

```
Service: AWS Auto Scaling
Time: 2016-09-30T20:42:11.305Z
RequestId: 18b2ec17-3e9b-4c15-8024-ff2e8ce8786a
LifecycleActionToken: 71514b9d-6a40-4b26-8523-05e7ee35fa40
AccountId: 123456789012
AutoScalingGroupName: my-asg
LifecycleHookName: my-hook
EC2InstanceId: i-0598c7d356eba48d7
LifecycleTransition: autoscaling:EC2_INSTANCE_LAUNCHING
NotificationMetadata: null
```

Receive Notification Using Amazon SQS

You can use Amazon SQS to set up a notification target to receive notifications when a lifecycle action occurs.

Important

FIFO queues are not compatible with lifecycle hooks.

To set up notifications using Amazon SQS

1. Create the target using Amazon SQS. For more information, see [Getting Started with Amazon SQS](#) in the *Amazon Simple Queue Service Developer Guide*. Note the ARN of the target.
2. Create an IAM role to grant Amazon EC2 Auto Scaling permission to access your notification target, using the steps in [Creating a Role to Delegate Permissions to an AWS Service](#) in the *IAM User Guide*. When prompted to select a role type, select **AWS Service Roles, AutoScaling Notification Access**. Note the ARN of the role. For example, `arn:aws:iam::123456789012:role/my-notification-role`.
3. When the Auto Scaling group responds to a scale-out or scale-in event, it puts the instance in a wait state. While the instance is in a wait state, a message is published to the notification target.

Add Lifecycle Hooks

You can create lifecycle hooks using the `put-lifecycle-hook` command.

To perform an action on scale out, use the following command:

```
aws autoscaling put-lifecycle-hook --lifecycle-hook-name my-hook --auto-scaling-group-name my-asg --lifecycle-transition autoscaling:EC2_INSTANCE_LAUNCHING
```

To perform an action on scale in, use the following command instead:

```
aws autoscaling put-lifecycle-hook --lifecycle-hook-name my-hook --auto-scaling-group-name my-asg --lifecycle-transition autoscaling:EC2_INSTANCE_TERMINATING
```

(Optional) To receive notifications using Amazon SNS or Amazon SQS, there are additional options. For example, add the following options to specify an SNS topic as the notification target:

```
--notification-target-arn arn:aws:sns:us-west-2:123456789012:my-sns-topic --role-arn arn:aws:iam::123456789012:role/my-notification-role
```

The topic receives a test notification with the following key-value pair:

```
"Event": "autoscaling:TEST_NOTIFICATION"
```

Complete the Lifecycle Hook

When an Auto Scaling group responds to a scale-out or scale-in event, it puts the instance in a wait state and sends any notifications. It continues the launch or terminate processes after you complete the lifecycle hook.

To complete a lifecycle hook

1. While the instance is in a wait state, you can perform a custom action. For more information, see [Prepare for Notifications \(p. 98\)](#).
2. If you need more time to complete the custom action, use the `record-lifecycle-action-heartbeat` command to restart the timeout period and keep the instance in a wait state. You can specify the lifecycle action token you received in the previous step, as shown in the following command:

```
aws autoscaling record-lifecycle-action-heartbeat --lifecycle-action-token bcd2f1b8-9a78-44d3-8a7a-4dd07d7cf635 --lifecycle-hook-name my-launch-hook --auto-scaling-group-name my-asg
```

Alternatively, you can specify the ID of the instance you retrieved in the previous step, as shown in the following command:

```
aws autoscaling record-lifecycle-action-heartbeat --instance-id i-1a2b3c4d --lifecycle-hook-name my-launch-hook --auto-scaling-group-name my-asg
```

3. If you finish the custom action before the timeout period ends, use the [complete-lifecycle-action](#) command so that the Auto Scaling group can continue launching or terminating the instance. You can specify the lifecycle action token, as shown in the following command:

```
aws autoscaling complete-lifecycle-action --lifecycle-action-result CONTINUE --lifecycle-action-token bcd2f1b8-9a78-44d3-8a7a-4dd07d7cf635 --lifecycle-hook-name my-launch-hook --auto-scaling-group-name my-asg
```

Alternatively, you can specify the ID of the instance, as shown in the following command:

```
aws autoscaling complete-lifecycle-action --lifecycle-action-result CONTINUE --instance-id i-1a2b3c4d --lifecycle-hook-name my-launch-hook --auto-scaling-group-name my-asg
```

Test the Notification

To generate a notification for a launch event, update the Auto Scaling group by increasing the desired capacity of the Auto Scaling group by 1. You receive a notification within a few minutes after instance launch.

To change the desired capacity using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Details** tab, choose **Edit**.
5. For **Desired**, increase the current value by 1. If this value exceeds **Max**, you must also increase the value of **Max** by 1.
6. Choose **Save**.
7. After a few minutes, you'll receive notification for the event. If you do not need the additional instance that you launched for this test, you can decrease **Desired** by 1. After a few minutes, you'll receive notification for the event.

Temporarily Removing Instances from Your Auto Scaling Group

You can put an instance that is in the `InService` state into the `Standby` state, update or troubleshoot the instance, and then return the instance to service. Instances that are on standby are still part of the Auto Scaling group, but they do not actively handle application traffic.

Important

You are billed for instances that are in a standby state.

For example, you can change the launch configuration for an Auto Scaling group at any time, and any subsequent instances that the Auto Scaling group launches use this configuration. However, the Auto

Scaling group does not update the instances that are currently in service. You can either terminate these instances and let the Auto Scaling group replace them, or you can put the instances on standby, update the software, and then put the instances back in service.

Contents

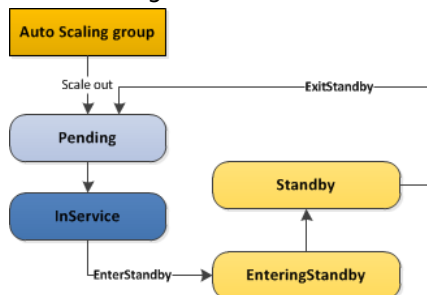
- [How the Standby State Works \(p. 102\)](#)
- [Health Status of an Instance in a Standby State \(p. 102\)](#)
- [Temporarily Remove an Instance Using the AWS Management Console \(p. 103\)](#)
- [Temporarily Remove an Instance Using the AWS CLI \(p. 103\)](#)

How the Standby State Works

The standby state works as follows to help you temporarily remove an instance from your Auto Scaling group:

1. You put the instance into the standby state. The instance remains in this state until you exit the standby state.
2. If there is a load balancer or target group attached to your Auto Scaling group, the instance is deregistered from the load balancer or target group.
3. By default, the desired capacity of your Auto Scaling group is decremented when you put an instance on standby. This prevents the launch of an additional instance while you have this instance on standby. Alternatively, you can specify that the capacity is not decremented. This causes the Auto Scaling group to launch an additional instance to replace the one on standby.
4. You can update or troubleshoot the instance.
5. You return the instance to service by exiting the standby state.
6. After you put an instance that was on standby back in service, the desired capacity is incremented. If you did not decrement the capacity when you put the instance on standby, the Auto Scaling group detects that you have more instances than you need, and applies the termination policy in effect to reduce the size of the group. For more information, see [Controlling Which Auto Scaling Instances Terminate During Scale In \(p. 90\)](#).
7. If there is a load balancer or target group attached to your Auto Scaling group, the instance is registered with the load balancer or target group.

The following illustration shows the transitions between instance states in this process:



For more information about the complete lifecycle of instances in an Auto Scaling group, see [Auto Scaling Lifecycle \(p. 7\)](#).

Health Status of an Instance in a Standby State

Amazon EC2 Auto Scaling does not perform health checks on instances that are in a standby state. While the instance is in a standby state, its health status reflects the status that it had before you put it on

standby. Amazon EC2 Auto Scaling does not perform a health check on the instance until you put it back in service.

For example, if you put a healthy instance on standby and then terminate it, Amazon EC2 Auto Scaling continues to report the instance as healthy. If you return the terminated instance to service, Amazon EC2 Auto Scaling performs a health check on the instance, determines that it is unhealthy, and launches a replacement instance.

Temporarily Remove an Instance Using the AWS Management Console

The following procedure demonstrates the general process for updating an instance that is currently in service.

To temporarily remove an instance using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group.
4. On the **Instances** tab, select the instance.
5. Choose **Actions, Set to Standby**.
6. On the **Set to Standby** page, select the check box to launch a replacement instance. Leave it unchecked to decrement the desired capacity. Choose **Set to Standby**.
7. You can update or troubleshoot your instance as needed. When you have finished, continue with the next step to return the instance to service.
8. Select the instance, choose **Actions, Set to InService**. On the **Set to InService** page, choose **Set to InService**.

Temporarily Remove an Instance Using the AWS CLI

The following procedure demonstrates the general process for updating an instance that is currently in service.

To temporarily remove an instance using the AWS CLI

1. Use the following [describe-auto-scaling-instances](#) command to identify the instance to update:

```
aws autoscaling describe-auto-scaling-instances
```

The following is an example response:

```
{
  "AutoScalingInstances": [
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-5b73d709",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    },
    ...
  ]
}
```

```
}
```

2. Move the instance into a Standby state using the following `enter-standby` command. The `--should-decrement-desired-capacity` option decreases the desired capacity so that the Auto Scaling group does not launch a replacement instance.

```
aws autoscaling enter-standby --instance-ids i-5b73d709 --auto-scaling-group-name my-asg --should-decrement-desired-capacity
```

The following is an example response:

```
{
  "Activities": [
    {
      "Description": "Moving EC2 instance to Standby: i-5b73d709",
      "AutoScalingGroupName": "my-asg",
      "ActivityId": "3b1839fe-24b0-40d9-80ae-bcd883c2be32",
      "Details": "{\"Availability Zone\":\"us-west-2a\"}",
      "StartTime": "2014-12-15T21:31:26.150Z",
      "Progress": 50,
      "Cause": "At 2014-12-15T21:31:26Z instance i-5b73d709 was moved to standby in response to a user request, shrinking the capacity from 4 to 3.",
      "StatusCode": "InProgress"
    }
  ]
}
```

3. (Optional) Verify that the instance is in Standby using the following `describe-auto-scaling-instances` command:

```
aws autoscaling describe-auto-scaling-instances --instance-ids i-5b73d709
```

The following is an example response. Notice that the status of the instance is now Standby.

```
{
  "AutoScalingInstances": [
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-5b73d709",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "Standby",
      "LaunchConfigurationName": "my-lc"
    }
  ]
}
```

4. You can update or troubleshoot your instance as needed. When you have finished, continue with the next step to return the instance to service.
5. Put the instance back in service using the following `exit-standby` command:

```
aws autoscaling exit-standby --instance-ids i-5b73d709 --auto-scaling-group-name my-asg
```

The following is an example response:

```
{
  "Activities": [
    {
      "Description": "Moving EC2 instance out of Standby: i-5b73d709",
```

```
    "AutoScalingGroupName": "my-asg",
    "ActivityId": "db12b166-cdcc-4c54-8aac-08c5935f8389",
    "Details": "{\"Availability Zone\":\"us-west-2a\"}",
    "StartTime": "2014-12-15T21:46:14.678Z",
    "Progress": 30,
    "Cause": "At 2014-12-15T21:46:14Z instance i-5b73d709 was moved out of
standby in
    response to a user request, increasing the capacity from 3 to 4.",
    "StatusCode": "PreInService"
  }
]
}
```

6. (Optional) Verify that the instance is back in service using the following `describe-auto-scaling-instances` command:

```
aws autoscaling describe-auto-scaling-instances --instance-ids i-5b73d709
```

The following is an example response. Notice that the status of the instance is `InService`.

```
{
  "AutoScalingInstances": [
    {
      "AvailabilityZone": "us-west-2a",
      "InstanceId": "i-5b73d709",
      "AutoScalingGroupName": "my-asg",
      "HealthStatus": "HEALTHY",
      "LifecycleState": "InService",
      "LaunchConfigurationName": "my-lc"
    }
  ]
}
```

Suspending and Resuming Scaling Processes

You can suspend and then resume one or more of the scaling processes for your Auto Scaling group. This can be useful for investigating a configuration problem or other issues with your web application and making changes to your application without invoking the scaling processes.

Amazon EC2 Auto Scaling can suspend processes for Auto Scaling groups that repeatedly fail to launch instances. This is known as an *administrative suspension*, and most commonly applies to Auto Scaling groups that have been trying to launch instances for over 24 hours but have not succeeded in launching any instances. You can resume processes suspended for administrative reasons.

Contents

- [Scaling Processes \(p. 105\)](#)
- [Suspend and Resume Processes Using the Console \(p. 107\)](#)
- [Suspend and Resume Processes Using the AWS CLI \(p. 107\)](#)

Scaling Processes

Amazon EC2 Auto Scaling supports the following scaling processes:

Launch

Adds a new EC2 instance to the group, increasing its capacity.

Warning

If you suspend `Launch`, this disrupts other processes. For example, you can't return an instance in a standby state to service if the `Launch` process is suspended, because the group can't scale.

`Terminate`

Removes an EC2 instance from the group, decreasing its capacity.

Warning

If you suspend `Terminate`, this disrupts other processes.

`HealthCheck`

Checks the health of the instances. Amazon EC2 Auto Scaling marks an instance as unhealthy if Amazon EC2 or Elastic Load Balancing tells Amazon EC2 Auto Scaling that the instance is unhealthy. This process can override the health status of an instance that you set manually.

`ReplaceUnhealthy`

Terminates instances that are marked as unhealthy and later creates new instances to replace them. This process works with the `HealthCheck` process, and uses both the `Terminate` and `Launch` processes.

`AZRebalance`

Balances the number of EC2 instances in the group across the Availability Zones in the region. If you remove an Availability Zone from your Auto Scaling group or an Availability Zone otherwise becomes unhealthy or unavailable, the scaling process launches new instances in an unaffected Availability Zone before terminating the unhealthy or unavailable instances. When the unhealthy Availability Zone returns to a healthy state, the scaling process automatically redistributes the instances evenly across the Availability Zones for the group. For more information, see [Rebalancing Activities \(p. 7\)](#).

If you suspend `AZRebalance` and a scale-out or scale-in event occurs, the scaling process still tries to balance the Availability Zones. For example, during scale out, it launches the instance in the Availability Zone with the fewest instances.

If you suspend the `Launch` process, `AZRebalance` neither launches new instances nor terminates existing instances. This is because `AZRebalance` terminates instances only after launching the replacement instances. If you suspend the `Terminate` process, your Auto Scaling group can grow up to ten percent larger than its maximum size, because this is allowed temporarily during rebalancing activities. If the scaling process cannot terminate instances, your Auto Scaling group could remain above its maximum size until you resume the `Terminate` process.

`AlarmNotification`

Accepts notifications from CloudWatch alarms that are associated with the group.

If you suspend `AlarmNotification`, Amazon EC2 Auto Scaling does not automatically execute policies that would be triggered by an alarm. If you suspend `Launch` or `Terminate`, it is not able to execute scale-out or scale-in policies, respectively.

`ScheduledActions`

Performs scheduled actions that you create.

If you suspend `Launch` or `Terminate`, scheduled actions that involve launching or terminating instances are affected.

`AddToLoadBalancer`

Adds instances to the attached load balancer or target group when they are launched.

If you suspend `AddToLoadBalancer`, Amazon EC2 Auto Scaling launches the instances but does not add them to the load balancer or target group. If you resume the `AddToLoadBalancer` process, it resumes adding instances to the load balancer or target group when they are launched. However, it

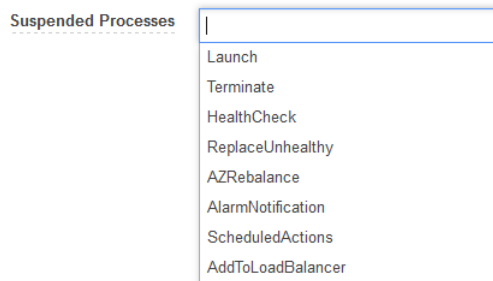
does not add the instances that were launched while this process was suspended. You must register those instances manually.

Suspend and Resume Processes Using the Console

You can suspend and resume individual processes using the AWS Management Console.

To suspend and resume processes using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select the Auto Scaling group.
4. On the **Details** tab, choose **Edit**.
5. For **Suspended Processes**, select the process to suspend.



To resume a suspended process, remove it from **Suspended Processes**.



6. Choose **Save**.

Suspend and Resume Processes Using the AWS CLI

You can suspend and resume individual processes or all processes.

To suspend a process

Use the `suspend-processes` command with the `--scaling-processes` option as follows:

```
aws autoscaling suspend-processes --auto-scaling-group-name my-asg --scaling-processes AlarmNotification
```

To suspend all processes

Use the `suspend-processes` command as follows (omitting the `--scaling-processes` option):

```
aws autoscaling suspend-processes --auto-scaling-group-name my-asg
```

To resume a suspended process

Use the `resume-processes` command as follows:

```
aws autoscaling resume-processes --auto-scaling-group-name my-asg --scaling-processes AlarmNotification
```

To resume all suspended processes

Use the `resume-processes` command as follows (omitting the `--scaling-processes` option):

```
aws autoscaling resume-processes --auto-scaling-group-name my-asg
```

Monitoring Your Auto Scaling Instances and Groups

You can use the following features to monitor your Auto Scaling instances and groups.

Health checks

Amazon EC2 Auto Scaling periodically performs health checks on the instances in your Auto Scaling group and identifies any instances that are unhealthy. You can configure Auto Scaling to determine the health status of an instance using Amazon EC2 status checks, Elastic Load Balancing health checks, or custom health checks. For more information, see [Health Checks for Auto Scaling Instances](#) (p. 109).

CloudWatch metrics

Amazon EC2 Auto Scaling publishes data points to Amazon CloudWatch about your Auto Scaling groups. CloudWatch enables you to retrieve statistics about those data points as an ordered set of time-series data, known as *metrics*. You can use these metrics to verify that your system is performing as expected. For more information, see [Monitoring Your Auto Scaling Groups and Instances Using Amazon CloudWatch](#) (p. 111).

CloudWatch Events

Amazon EC2 Auto Scaling can submit events to Amazon CloudWatch Events when your Auto Scaling groups launch or terminate instances, or when a lifecycle action occurs. This enables you to invoke a Lambda function when the event occurs. For more information, see [Getting CloudWatch Events When Your Auto Scaling Group Scales](#) (p. 116).

SNS notifications

Amazon EC2 Auto Scaling can send Amazon SNS notifications when your Auto Scaling groups launch or terminate instances. For more information, see [Getting SNS Notifications When Your Auto Scaling Group Scales](#) (p. 121).

CloudTrail logs

AWS CloudTrail enables you to keep track of the calls made to the Amazon EC2 Auto Scaling API by or on behalf of your AWS account. CloudTrail stores the information in log files in the Amazon S3 bucket that you specify. You can use these log files to monitor activity of your Auto Scaling groups by determining which requests were made, the source IP addresses where the requests came from, who made the request, when the request was made, and so on. For more information, see [Logging Amazon EC2 Auto Scaling API Calls with AWS CloudTrail](#) (p. 126).

Health Checks for Auto Scaling Instances

The health status of an Auto Scaling instance is either healthy or unhealthy. After an instance is fully configured and passes the initial health checks, it is considered healthy by Amazon EC2 Auto Scaling and enters the `InService` state. Amazon EC2 Auto Scaling periodically performs health checks on the instances in your Auto Scaling group and identifies any instances that are unhealthy. After Amazon EC2 Auto Scaling marks an instance as unhealthy, it is scheduled for replacement. For more information, see [Replacing Unhealthy Instances](#) (p. 60).

Instance Health Status

Amazon EC2 Auto Scaling determines the health status of an instance using one or more of the following:

- Status checks provided by Amazon EC2 (systems status checks and instance status checks. For more information, see [Status Checks for Your Instances](#) in the *Amazon EC2 User Guide for Linux Instances*.
- Health checks provided by Elastic Load Balancing. For more information, see [Health Checks for Your Target Groups](#) in the *User Guide for Application Load Balancers* or [Configure Health Checks for Your Classic Load Balancer](#) in the *User Guide for Classic Load Balancers*.
- Custom health checks.

By default, Amazon EC2 Auto Scaling health checks use the results of the EC2 status checks to determine the health status of an instance. Amazon EC2 Auto Scaling marks an instance as unhealthy if its instance fails one or more of the status checks.

If you attached a load balancer or target group to your Auto Scaling group, you can configure Amazon EC2 Auto Scaling to mark an instance as unhealthy if Elastic Load Balancing reports the instance as `OutOfService`. If connection draining is enabled for your load balancer, Amazon EC2 Auto Scaling waits for in-flight requests to complete or the maximum timeout to expire, whichever comes first, before terminating instances due to a scaling event or health check replacement. For more information, see [Using Elastic Load Balancing Health Checks with Auto Scaling](#) (p. 50).

Health Check Grace Period

Frequently, an Auto Scaling instance that has just come into service needs to warm up before it can pass the health check. Amazon EC2 Auto Scaling waits until the health check grace period ends before checking the health status of the instance. While the EC2 status checks and ELB health checks can complete before the health check grace period expires, Amazon EC2 Auto Scaling does not act on them until the health check grace period expires. To provide ample warm-up time for your instances, ensure that the health check grace period covers the expected startup time for your application. Note that if you add a lifecycle hook to perform actions as your instances launch, the health check grace period does not start until the lifecycle hook is completed and the instance enters the `InService` state.

Custom Health Checks

If you have custom health checks, you can send the information from your health checks to Amazon EC2 Auto Scaling so that Amazon EC2 Auto Scaling can use this information. For example, if you determine that an instance is not functioning as expected, you can set the health status of the instance to `Unhealthy`. The next time that Amazon EC2 Auto Scaling performs a health check on the instance, it will determine that the instance is unhealthy and then launch a replacement instance.

Use the following [set-instance-health](#) command to set the health state of the specified instance to `Unhealthy`:

```
aws autoscaling set-instance-health --instance-id i-123abc45d --health-status Unhealthy
```

Use the following `describe-auto-scaling-groups` command to verify that the instance state is `Unhealthy`:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-names my-asg
```

The following is an example response that shows that the health status of the instance is `Unhealthy` and that the instance is terminating:

```
{
  "AutoScalingGroups": [
    {
      ....
      "Instances": [
        {
          "InstanceId": "i-123abc45d",
          "AvailabilityZone": "us-west-2a",
          "HealthStatus": "Unhealthy",
          "LifecycleState": "Terminating",
          "LaunchConfigurationName": "my-lc"
        },
        ...
      ]
    }
  ]
}
```

Monitoring Your Auto Scaling Groups and Instances Using Amazon CloudWatch

Amazon CloudWatch enables you to retrieve statistics as an ordered set of time-series data, known as metrics. You can use these metrics to verify that your system is performing as expected.

Amazon EC2 sends metrics to CloudWatch that describe your Auto Scaling instances. These metrics are available for any EC2 instance, not just those in an Auto Scaling group. For more information, see [Instance Metrics](#) in the *Amazon EC2 User Guide for Linux Instances*.

Auto Scaling groups can send metrics to CloudWatch that describe the group itself. You must enable these metrics.

Contents

- [Auto Scaling Group Metrics \(p. 111\)](#)
- [Dimensions for Auto Scaling Group Metrics \(p. 112\)](#)
- [Enable Auto Scaling Group Metrics \(p. 112\)](#)
- [Configure Monitoring for Auto Scaling Instances \(p. 113\)](#)
- [View CloudWatch Metrics \(p. 114\)](#)
- [Create Amazon CloudWatch Alarms \(p. 115\)](#)

Auto Scaling Group Metrics

The `AWS/AutoScaling` namespace includes the following metrics.

Metric	Description
GroupMinSize	The minimum size of the Auto Scaling group.
GroupMaxSize	The maximum size of the Auto Scaling group.
GroupDesiredCapacity	The number of instances that the Auto Scaling group attempts to maintain.

Metric	Description
GroupInServiceInstances	The number of instances that are running as part of the Auto Scaling group. This metric does not include instances that are pending or terminating.
GroupPendingInstances	The number of instances that are pending. A pending instance is not yet in service. This metric does not include instances that are in service or terminating.
GroupStandbyInstances	The number of instances that are in a Standby state. Instances in this state are still running but are not actively in service.
GroupTerminatingInstances	The number of instances that are in the process of terminating. This metric does not include instances that are in service or pending.
GroupTotalInstances	The total number of instances in the Auto Scaling group. This metric identifies the number of instances that are in service, pending, and terminating.

Dimensions for Auto Scaling Group Metrics

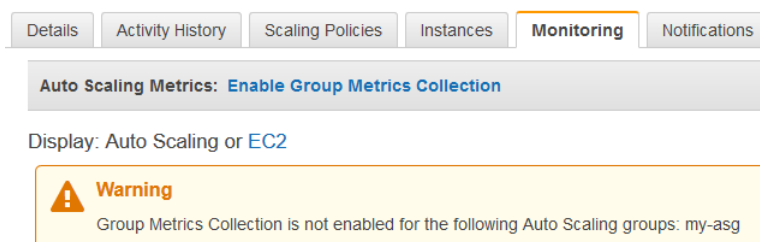
To filter the metrics for your Auto Scaling group by group name, use the `AutoScalingGroupName` dimension.

Enable Auto Scaling Group Metrics

When you enable Auto Scaling group metrics, Auto Scaling sends sampled data to CloudWatch every minute.

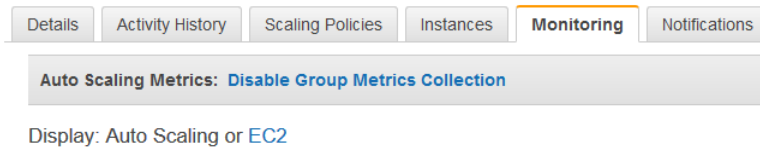
To enable group metrics using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Monitoring** tab, for **Auto Scaling Metrics**, choose **Enable Group Metrics Collection**. If you don't see this option, select **Auto Scaling** for **Display**.



To disable group metrics using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Monitoring** tab, for **Auto Scaling Metrics**, choose **Disable Group Metrics Collection**. If you don't see this option, select **Auto Scaling** for **Display**.



To enable group metrics using the AWS CLI

Enable one or more group metrics using the [enable-metrics-collection](#) command. For example, the following command enables the GroupDesiredCapacity metric.

```
aws autoscaling enable-metrics-collection --auto-scaling-group-name my-asg --metrics  
GroupDesiredCapacity --granularity "1Minute"
```

If you omit the `--metrics` option, all metrics are enabled.

```
aws autoscaling enable-metrics-collection --auto-scaling-group-name my-asg --granularity  
"1Minute"
```

To disable group metrics using the AWS CLI

Use the [disable-metrics-collection](#) command. For example, the following command disables all Auto Scaling group metrics:

```
aws autoscaling disable-metrics-collection --auto-scaling-group-name my-asg
```

Configure Monitoring for Auto Scaling Instances

You configure monitoring for EC2 instances using a launch configuration or template. Monitoring is enabled whenever an instance is launched, either basic monitoring (5-minute granularity) or detailed monitoring (1-minute granularity). For detailed monitoring, additional charges apply. For more information, see [Amazon CloudWatch Pricing](#).

Note

By default, basic monitoring is enabled when you create a launch template or when you use the AWS Management Console to create a launch configuration. Detailed monitoring is enabled by default when you create a launch configuration using the AWS CLI or an SDK.

To change the type of monitoring enabled on new EC2 instances, update the launch template or update the Auto Scaling group to use a new launch configuration. Existing instances continue to use the previously enabled monitoring type. To update all instances, terminate them so that they are replaced by your Auto Scaling group or update instances individually using [monitor-instances](#) and [unmonitor-instances](#).

If you have CloudWatch alarms associated with your Auto Scaling group, use the [put-metric-alarm](#) command to update each alarm so that its period matches the monitoring type (300 seconds for basic monitoring and 60 seconds for detailed monitoring). If you change from detailed monitoring to basic monitoring but do not update your alarms to match the five-minute period, they continue to check for statistics every minute and might find no data available for as many as four out of every five periods.

To configure CloudWatch monitoring using the console

When you create the launch configuration using the AWS Management Console, on the **Configure Details** page, select **Enable CloudWatch detailed monitoring**. Otherwise, basic monitoring is enabled. For more information, see [Creating a Launch Configuration](#) (p. 26).

To enable detailed monitoring for a launch template using the AWS Management Console, in the **Advanced Details** section, for **Monitoring**, choose **Enable**. Otherwise, basic monitoring is enabled. For more information, see [Creating a Launch Template for an Auto Scaling group](#) (p. 21).

To configure CloudWatch monitoring using the AWS CLI

For launch configurations, use the [create-launch-configuration](#) command with the `--instance-monitoring` option. Set this option to `true` to enable detailed monitoring or `false` to enable basic monitoring.

```
--instance-monitoring Enabled=true
```

For launch templates, use the [create-launch-template](#) command and pass a JSON file that contains the parameters and values for creating the launch template. Set the monitoring parameter to `"Monitoring": {"Enabled": true}` to enable detailed monitoring or `"Monitoring": {"Enabled": false}` to enable basic monitoring.

View CloudWatch Metrics

You can view the CloudWatch metrics for your Auto Scaling groups and instances using the Amazon EC2 console. These metrics are displayed as monitoring graphs.

Alternatively, you can view these metrics using the CloudWatch console.

To view metrics using the Amazon EC2 console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. In the navigation pane, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. Choose the **Monitoring** tab.
5. (Optional) To filter the results by time, select a time range from **Showing data for**.
6. To view the metrics for your groups, for **Display**, choose **Auto Scaling**. To get a larger view of a single metric, select its graph. The following metrics are available for groups:
 - Minimum Group Size — `GroupMinSize`
 - Maximum Group Size — `GroupMaxSize`
 - Desired Capacity — `GroupDesiredCapacity`
 - In Service Instances — `GroupInServiceInstances`
 - Pending Instances — `GroupPendingInstances`
 - Standby Instances — `GroupStandbyInstances`
 - Terminating Instances — `GroupTerminatingInstances`
 - Total Instances — `GroupTotalInstances`
7. To view metrics for your instances, for **Display**, choose **EC2**. To get a larger view of a single metric, select its graph. The following metrics are available for instances:
 - CPU Utilization — `CPUtilization`
 - Disk Reads — `DiskReadBytes`
 - Disk Read Operations — `DiskReadOps`
 - Disk Writes — `DiskWriteBytes`
 - Disk Write Operations — `DiskWriteOps`
 - Network In — `NetworkIn`
 - Network Out — `NetworkOut`

- Status Check Failed (Any) — `StatusCheckFailed`
- Status Check Failed (Instance) — `StatusCheckFailed_Instance`
- Status Check Failed (System) — `StatusCheckFailed_System`

To view metrics using the CloudWatch console

For more information, see [Aggregate Statistics by Auto Scaling Group](#).

To view CloudWatch metrics using the AWS CLI

To view all metrics for all your Auto Scaling groups, use the following [list-metrics](#) command:

```
aws cloudwatch list-metrics --namespace "AWS/AutoScaling"
```

To view the metrics for a single Auto Scaling group, specify the `AutoScalingGroupName` dimension as follows:

```
aws cloudwatch list-metrics --namespace "AWS/AutoScaling" --dimensions  
Name=AutoScalingGroupName,Value=my-asg
```

To view a single metric for all your Auto Scaling groups, specify the name of the metric as follows:

```
aws cloudwatch list-metrics --namespace "AWS/AutoScaling" --metric-name  
GroupDesiredCapacity
```

Create Amazon CloudWatch Alarms

A CloudWatch *alarm* is an object that monitors a single metric over a specific period. A metric is a variable that you want to monitor, such as average CPU usage of the EC2 instances, or incoming network traffic from many different EC2 instances. The alarm changes its state when the value of the metric breaches a defined range and maintains the change for a specified number of periods.

An alarm has three possible states:

- **OK**— The value of the metric remains within the range that you've specified.
- **ALARM**— The value of the metric is out of the range that you've specified for a specified time duration.
- **INSUFFICIENT_DATA**— The metric is not yet available or there is not enough data available to determine the alarm state.

When the alarm changes to the **ALARM** state and remains in that state for a number of periods, it invokes one or more actions. The actions can be a message sent to an Auto Scaling group to change the desired capacity of the group.

You configure an alarm by identifying the metrics to monitor. For example, you can configure an alarm to watch over the average CPU usage of the EC2 instances in an Auto Scaling group.

To create a CloudWatch alarm

1. Open the CloudWatch console at <https://console.aws.amazon.com/cloudwatch/>.
2. On the navigation pane, choose **Alarms**.
3. Choose **Create Alarm**.
4. Choose the **EC2 Metrics** category.

5. (Optional) You can filter the results. To see the instance metrics, choose **Per-Instance Metrics**. To see the Auto Scaling group metrics, choose **By Auto Scaling Group**.
6. Select a metric, and then choose **Next**.
7. Specify a threshold for the alarm and the action to take.

For more information, see [Creating CloudWatch Alarms](#) in the *Amazon CloudWatch User Guide*.

8. Choose **Create Alarm**.

Getting CloudWatch Events When Your Auto Scaling Group Scales

When you use Amazon EC2 Auto Scaling to scale your applications automatically, it is useful to know when Amazon EC2 Auto Scaling is launching or terminating the EC2 instances in your Auto Scaling group. You can configure Amazon EC2 Auto Scaling to send events to Amazon CloudWatch Events whenever your Auto Scaling group scales.

For more information, see the [Amazon CloudWatch Events User Guide](#).

Contents

- [Auto Scaling Events](#) (p. 116)
- [Create a Lambda Function](#) (p. 120)
- [Route Events to Your Lambda Function](#) (p. 120)

Auto Scaling Events

Amazon EC2 Auto Scaling supports sending events to CloudWatch Events when the following events occur:

- [EC2 Instance-launch Lifecycle Action](#) (p. 116)
- [EC2 Instance Launch Successful](#) (p. 117)
- [EC2 Instance Launch Unsuccessful](#) (p. 117)
- [EC2 Instance-terminate Lifecycle Action](#) (p. 118)
- [EC2 Instance Terminate Successful](#) (p. 118)
- [EC2 Instance Terminate Unsuccessful](#) (p. 119)

EC2 Instance-launch Lifecycle Action

Amazon EC2 Auto Scaling moved an instance to a `Pending:Wait` state due to a lifecycle hook.

Event Data

The following is example data for this event.

```
{
  "version": "0",
  "id": "12345678-1234-1234-1234-123456789012",
  "detail-type": "EC2 Instance-launch Lifecycle Action",
  "source": "aws.autoscaling",
  "account": "123456789012",
  "time": "yyyy-mm-ddThh:mm:ssZ",
  "region": "us-west-2",
```

```
"resources": [  
  "auto-scaling-group-arn"  
],  
"detail": {  
  "LifecycleActionToken": "87654321-4321-4321-4321-210987654321",  
  "AutoScalingGroupName": "my-asg",  
  "LifecycleHookName": "my-lifecycle-hook",  
  "EC2InstanceId": "i-1234567890abcdef0",  
  "LifecycleTransition": "autoscaling:EC2_INSTANCE_LAUNCHING",  
  "NotificationMetadata": "additional-info"  
}  
}
```

EC2 Instance Launch Successful

Amazon EC2 Auto Scaling successfully launched an instance.

Event Data

The following is example data for this event.

```
{  
  "version": "0",  
  "id": "12345678-1234-1234-1234-123456789012",  
  "detail-type": "EC2 Instance Launch Successful",  
  "source": "aws.autoscaling",  
  "account": "123456789012",  
  "time": "yyyy-mm-ddThh:mm:ssZ",  
  "region": "us-west-2",  
  "resources": [  
    "auto-scaling-group-arn",  
    "instance-arn"  
  ],  
  "detail": {  
    "StatusCode": "InProgress",  
    "Description": "Launching a new EC2 instance: i-12345678",  
    "AutoScalingGroupName": "my-auto-scaling-group",  
    "ActivityId": "87654321-4321-4321-4321-210987654321",  
    "Details": {  
      "Availability Zone": "us-west-2b",  
      "Subnet ID": "subnet-12345678"  
    },  
    "RequestId": "12345678-1234-1234-1234-123456789012",  
    "StatusMessage": "",  
    "EndTime": "yyyy-mm-ddThh:mm:ssZ",  
    "EC2InstanceId": "i-1234567890abcdef0",  
    "StartTime": "yyyy-mm-ddThh:mm:ssZ",  
    "Cause": "description-text",  
  }  
}
```

EC2 Instance Launch Unsuccessful

Amazon EC2 Auto Scaling failed to launch an instance.

Event Data

The following is example data for this event.

```
{  
  "version": "0",  
  "id": "12345678-1234-1234-1234-123456789012",
```

```
"detail-type": "EC2 Instance Launch Unsuccessful",
"source": "aws.autoscaling",
"account": "123456789012",
"time": "yyyy-mm-ddThh:mm:ssZ",
"region": "us-west-2",
"resources": [
  "auto-scaling-group-arn",
  "instance-arn"
],
"detail": {
  "StatusCode": "Failed",
  "AutoScalingGroupName": "my-auto-scaling-group",
  "ActivityId": "87654321-4321-4321-4321-210987654321",
  "Details": {
    "Availability Zone": "us-west-2b",
    "Subnet ID": "subnet-12345678"
  },
  "RequestId": "12345678-1234-1234-1234-123456789012",
  "StatusMessage": "message-text",
  "EndTime": "yyyy-mm-ddThh:mm:ssZ",
  "EC2InstanceId": "i-1234567890abcdef0",
  "StartTime": "yyyy-mm-ddThh:mm:ssZ",
  "Cause": "description-text",
}
```

EC2 Instance-terminate Lifecycle Action

Amazon EC2 Auto Scaling moved an instance to a `Terminating:Wait` state due to a lifecycle hook.

Event Data

The following is example data for this event.

```
{
  "version": "0",
  "id": "12345678-1234-1234-1234-123456789012",
  "detail-type": "EC2 Instance-terminate Lifecycle Action",
  "source": "aws.autoscaling",
  "account": "123456789012",
  "time": "yyyy-mm-ddThh:mm:ssZ",
  "region": "us-west-2",
  "resources": [
    "auto-scaling-group-arn"
  ],
  "detail": {
    "LifecycleActionToken": "87654321-4321-4321-4321-210987654321",
    "AutoScalingGroupName": "my-asg",
    "LifecycleHookName": "my-lifecycle-hook",
    "EC2InstanceId": "i-1234567890abcdef0",
    "LifecycleTransition": "autoscaling:EC2_INSTANCE_TERMINATING",
    "NotificationMetadata": "additional-info"
  }
}
```

EC2 Instance Terminate Successful

Amazon EC2 Auto Scaling successfully terminated an instance.

Event Data

The following is example data for this event.

```
{
  "version": "0",
  "id": "12345678-1234-1234-1234-123456789012",
  "detail-type": "EC2 Instance Terminate Successful",
  "source": "aws.autoscaling",
  "account": "123456789012",
  "time": "yyyy-mm-ddThh:mm:ssZ",
  "region": "us-west-2",
  "resources": [
    "auto-scaling-group-arn",
    "instance-arn"
  ],
  "detail": {
    "StatusCode": "InProgress",
    "Description": "Terminating EC2 instance: i-12345678",
    "AutoScalingGroupName": "my-auto-scaling-group",
    "ActivityId": "87654321-4321-4321-4321-210987654321",
    "Details": {
      "Availability Zone": "us-west-2b",
      "Subnet ID": "subnet-12345678"
    },
    "RequestId": "12345678-1234-1234-1234-123456789012",
    "StatusMessage": "",
    "EndTime": "yyyy-mm-ddThh:mm:ssZ",
    "EC2InstanceId": "i-1234567890abcdef0",
    "StartTime": "yyyy-mm-ddThh:mm:ssZ",
    "Cause": "description-text",
  }
}
```

EC2 Instance Terminate Unsuccessful

Amazon EC2 Auto Scaling failed to terminate an instance.

Event Data

The following is example data for this event.

```
{
  "version": "0",
  "id": "12345678-1234-1234-1234-123456789012",
  "detail-type": "EC2 Instance Terminate Unsuccessful",
  "source": "aws.autoscaling",
  "account": "123456789012",
  "time": "yyyy-mm-ddThh:mm:ssZ",
  "region": "us-west-2",
  "resources": [
    "auto-scaling-group-arn",
    "instance-arn"
  ],
  "detail": {
    "StatusCode": "Failed",
    "AutoScalingGroupName": "my-auto-scaling-group",
    "ActivityId": "87654321-4321-4321-4321-210987654321",
    "Details": {
      "Availability Zone": "us-west-2b",
      "Subnet ID": "subnet-12345678"
    },
    "RequestId": "12345678-1234-1234-1234-123456789012",
    "StatusMessage": "message-text",
    "EndTime": "yyyy-mm-ddThh:mm:ssZ",
    "EC2InstanceId": "i-1234567890abcdef0",
    "StartTime": "yyyy-mm-ddThh:mm:ssZ",
  }
}
```

```
    "Cause": "description-text",  
  }  
}
```

Create a Lambda Function

Use the following procedure to create a Lambda function to handle an Auto Scaling event.

To create a Lambda function

1. Open the AWS Lambda console at <https://console.aws.amazon.com/lambda/>.
2. If you are new to Lambda, you see a welcome page; choose **Get Started Now**; otherwise, choose **Create a Lambda function**.
3. On the **Select blueprint** page, type hello-world for **Filter**, and then select the **hello-world** blueprint.
4. On the **Configure triggers** page, choose **Next**.
5. On the **Configure function** page, do the following:
 - a. Type a name and description for the Lambda function.
 - b. Edit the code for the Lambda function. For example, the following code simply logs the event:

```
console.log('Loading function');  
  
exports.handler = function(event, context) {  
    console.log("AutoScalingEvent()");  
    console.log("Event data:\n" + JSON.stringify(event, null, 4));  
    context.succeed("...");  
};
```

- c. For **Role**, choose **Choose an existing role** if you have an existing role that you'd like to use, and then choose your role from **Existing role**. Alternatively, to create a new role, choose one of the other options for **Role** and then follow the directions.
 - d. (Optional) For **Advanced settings**, make any changes that you need.
 - e. Choose **Next**.
6. On the **Review** page, choose **Create function**.

Route Events to Your Lambda Function

Use the following procedure to route Auto Scaling events to your Lambda function.

To route events to your Lambda function

1. Open the CloudWatch console at <https://console.aws.amazon.com/cloudwatch/>.
2. On the navigation pane, choose **Events**.
3. Choose **Create rule**.
4. For **Event selector**, choose **Auto Scaling** as the event source. By default, the rule applies to all Auto Scaling events for all of your Auto Scaling groups. Alternatively, you can select specific events or a specific Auto Scaling group.
5. For **Targets**, choose **Add target**. Choose **Lambda function** as the target type, and then select your Lambda function.
6. Choose **Configure details**.
7. For **Rule definition**, type a name and description for your rule.

8. Choose **Create rule**.

To test your rule, change the size of your Auto Scaling group. If you used the example code for your Lambda function, it logs the event to CloudWatch Logs.

To test your rule

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, choose **Auto Scaling Groups**, and then select your Auto Scaling group.
3. On the **Details** tab, choose **Edit**.
4. Change the value of **Desired**, and then choose **Save**.
5. Open the CloudWatch console at <https://console.aws.amazon.com/cloudwatch/>.
6. On the navigation pane, choose **Logs**.
7. Select the log group for your Lambda function (for example, `/aws/lambda/my-function`).
8. Select a log stream to view the event data. The data is displayed, similar to the following:

```
Event Data
▼ 2016-02-22T17:48:20.778Z ealfjqinxq6pwo9d Loading function
▼ START RequestId: 7560439b-d98c-11e5-932d-f52757e7aee0 Version: $LATEST
▼ 2016-02-22T17:48:20.813Z 7560439b-d98c-11e5-932d-f52757e7aee0 AutoScalingEvent()
▼ 2016-02-22T17:48:20.814Z 7560439b-d98c-11e5-932d-f52757e7aee0 Event data:
{
  "version": "0",
  "id": "df9b0c8c-89c8-4748-92cb-ac68a9029ada",
  "detail-type": "EC2 Instance Launch Successful",
  "source": "aws.autoscaling",
```

Getting SNS Notifications When Your Auto Scaling Group Scales

When you use Amazon EC2 Auto Scaling to scale your applications automatically, it is useful to know when Amazon EC2 Auto Scaling is launching or terminating the EC2 instances in your Auto Scaling group. Amazon SNS coordinates and manages the delivery or sending of notifications to subscribing clients or endpoints. You can configure Amazon EC2 Auto Scaling to send an SNS notification whenever your Auto Scaling group scales.

Amazon SNS can deliver notifications as HTTP or HTTPS POST, email (SMTP, either plain-text or in JSON format), or as a message posted to an Amazon SQS queue. For more information, see [What Is Amazon SNS](#) in the *Amazon Simple Notification Service Developer Guide*.

For example, if you configure your Auto Scaling group to use the `autoscaling:EC2_INSTANCE_TERMINATE` notification type, and your Auto Scaling group terminates an instance, it sends an email notification. This email contains the details of the terminated instance, such as the instance ID and the reason that the instance was terminated.

Tip

If you prefer, you can use Amazon CloudWatch Events to configure a target to invoke a Lambda function when your Auto Scaling group scales or when a lifecycle action occurs. For more information, see [Getting CloudWatch Events When Your Auto Scaling Group Scales](#) (p. 116).

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- [Verify That You Received Notification of the Scaling Event \(p. 124\)](#)
- [Delete the Notification Configuration \(p. 125\)](#)

SNS Notifications

Amazon EC2 Auto Scaling supports sending Amazon SNS notifications when the following events occur.

Event	Description
autoscaling:EC2_INSTANCE_LAUNCH	Successful instance launch
autoscaling:EC2_INSTANCE_LAUNCH_ERROR	Failed instance launch
autoscaling:EC2_INSTANCE_TERMINATE	Successful instance termination
autoscaling:EC2_INSTANCE_TERMINATE_ERROR	Failed instance termination

The message includes the following information:

- **Event** — The event.
- **AccountId** — The AWS account ID.
- **AutoScalingGroupName** — The name of the Auto Scaling group.
- **AutoScalingGroupARN** — The ARN of the Auto Scaling group.
- **EC2InstanceId** — The ID of the EC2 instance.

For example:

```
Service: AWS Auto Scaling
Time: 2016-09-30T19:00:36.414Z
RequestId: 4e6156f4-a9e2-4bda-a7fd-33f2ae528958
Event: autoscaling:EC2_INSTANCE_LAUNCH
AccountId: 123456789012
AutoScalingGroupName: my-asg
AutoScalingGroupARN: arn:aws:autoscaling:us-west-2:123456789012:autoScalingGroup...
ActivityId: 4e6156f4-a9e2-4bda-a7fd-33f2ae528958
Description: Launching a new EC2 instance: i-0598c7d356eba48d7
Cause: At 2016-09-30T18:59:38Z a user request update of AutoScalingGroup constraints to ...
StartTime: 2016-09-30T19:00:04.445Z
EndTime: 2016-09-30T19:00:36.414Z
StatusCode: InProgress
StatusMessage:
Progress: 50
EC2InstanceId: i-0598c7d356eba48d7
Details: {"Subnet ID":"subnet-c9663da0","Availability Zone":"us-west-2b"}
```

Configure Amazon SNS

To use Amazon SNS to send email notifications, you must first create a *topic* and then subscribe your email addresses to the topic.

Create an Amazon SNS Topic

An SNS topic is a logical access point, a communication channel your Auto Scaling group uses to send the notifications. You create a topic by specifying a name for your topic.

For more information, see [Create a Topic](#) in the *Amazon Simple Notification Service Developer Guide*.

Subscribe to the Amazon SNS Topic

To receive the notifications that your Auto Scaling group sends to the topic, you must subscribe an endpoint to the topic. In this procedure, for **Endpoint**, specify the email address where you want to receive the notifications from Amazon EC2 Auto Scaling.

For more information, see [Subscribe to a Topic](#) in the *Amazon Simple Notification Service Developer Guide*.

Confirm Your Amazon SNS Subscription

Amazon SNS sends a confirmation email to the email address you specified in the previous step.

Make sure you open the email from AWS Notifications and choose the link to confirm the subscription before you continue with the next step.

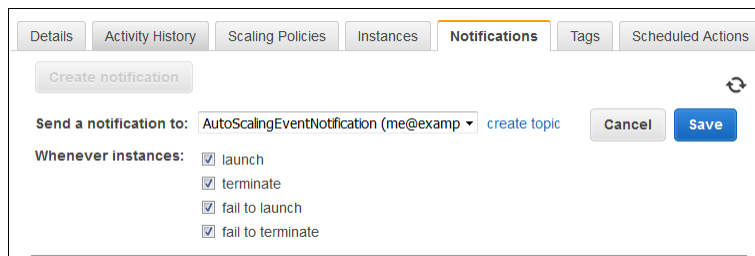
You will receive an acknowledgement message from AWS. Amazon SNS is now configured to receive notifications and send the notification as an email to the email address that you specified.

Configure Your Auto Scaling Group to Send Notifications

You can configure your Auto Scaling group to send notifications to Amazon SNS when a scaling event, such as launching instances or terminating instances, takes place. Amazon SNS sends a notification with information about the instances to the email address that you specified.

To configure Amazon SNS notifications for your Auto Scaling group using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Notifications** tab, choose **Create notification**.
5. On the **Create notifications** pane, do the following:
 - a. For **Send a notification to:**, select your SNS topic.
 - b. For **Whenever instances:**, select the events to send the notifications for.
 - c. Choose **Save**.



The screenshot shows the 'Create notification' pane in the Amazon EC2 console. At the top, there are tabs: Details, Activity History, Scaling Policies, Instances, Notifications (selected), Tags, and Scheduled Actions. Below the tabs is a 'Create notification' button. The main form has two sections. The first section is 'Send a notification to:' with a dropdown menu showing 'AutoScalingEventNotification (me@examp)' and a 'create topic' link. To the right of this section are 'Cancel' and 'Save' buttons. The second section is 'Whenever instances:' with four checkboxes: 'launch' (checked), 'terminate' (checked), 'fail to launch' (checked), and 'fail to terminate' (checked).

To configure Amazon SNS notifications for your Auto Scaling group using the AWS CLI

Use the following [put-notification-configuration](#) command:

```
aws autoscaling put-notification-configuration --auto-scaling-group-name my-  
asg --topic-arn arn --notification-types "autoscaling:EC2_INSTANCE_LAUNCH"  
"autoscaling:EC2_INSTANCE_TERMINATE"
```

Test the Notification Configuration

To generate a notification for a launch event, update the Auto Scaling group by increasing the desired capacity of the Auto Scaling group by 1. Amazon EC2 Auto Scaling launches the EC2 instance, and you'll receive an email notification within a few minutes.

To change the desired capacity using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Details** tab, choose **Edit**.
5. For **Desired**, increase the current value by 1. Note that if this value exceeds **Max**, you must also increase the value of **Max** by 1.
6. Choose **Save**.
7. After a few minutes, you'll receive a notification email for the launch event. If you do not need the additional instance that you launched for this test, you can decrease **Desired** by 1. After a few minutes, you'll receive a notification email for the terminate event.

To change the desired capacity using the AWS CLI

Use the following [set-desired-capacity](#) command:

```
aws autoscaling set-desired-capacity --auto-scaling-group-name my-asg --desired-capacity 2
```

Verify That You Received Notification of the Scaling Event

Check your email for a message from Amazon SNS and open the email. After you receive notification of a scaling event for your Auto Scaling group, you can confirm the scaling event by looking at the description of your Auto Scaling group. You'll need information from the notification email, such as the ID of the instance that was launched or terminated.

To verify that your Auto Scaling group has launched new instance using the console

1. Select your Auto Scaling group.
2. On the **Activity History** tab, the **Status** column shows the current status of your instance. For example, if the notification indicates that an instance has launched, use the refresh button to verify that the status of the launch activity is **Successful**.
3. On the **Instances** tab, you can view the current **Lifecycle** state of the instance whose ID you received in the notification email. After a new instance starts, its lifecycle state changes to **InService**.

To verify that your Auto Scaling group has launched new instance using the AWS CLI

Use the following [describe-auto-scaling-groups](#) command to confirm that the size of your Auto Scaling group has changed:

```
aws autoscaling describe-auto-scaling-groups --auto-scaling-group-name my-asg
```

The following example output shows that the group has two instances. Check for the instance whose ID you received in the notification email.

```
{
  "AutoScalingGroups": [
    {
      "AutoScalingGroupARN": "arn",
      "HealthCheckGracePeriod": 0,
      "SuspendedProcesses": [],
      "DesiredCapacity": 2,
      "Tags": [],
      "EnabledMetrics": [],
      "LoadBalancerNames": [],
      "AutoScalingGroupName": "my-asg",
      "DefaultCooldown": 300,
      "MinSize": 1,
      "Instances": [
        {
          "InstanceId": "i-d95eb0d4",
          "AvailabilityZone": "us-west-2b",
          "HealthStatus": "Healthy",
          "LifecycleState": "InService",
          "LaunchConfigurationName": "my-lc"
        },
        {
          "InstanceId": "i-13d7dc1f",
          "AvailabilityZone": "us-west-2a",
          "HealthStatus": "Healthy",
          "LifecycleState": "InService",
          "LaunchConfigurationName": "my-lc"
        }
      ],
      "MaxSize": 5,
      "VPCZoneIdentifier": null,
      "TerminationPolicies": [
        "Default"
      ],
      "LaunchConfigurationName": "my-lc",
      "CreatedTime": "2015-03-01T16:12:35.608Z",
      "AvailabilityZones": [
        "us-west-2b",
        "us-west-2a"
      ],
      "HealthCheckType": "EC2"
    }
  ]
}
```

Delete the Notification Configuration

You can delete your Amazon EC2 Auto Scaling notification configuration at any time.

To delete Amazon EC2 Auto Scaling notification configuration using the console

1. Open the Amazon EC2 console at <https://console.aws.amazon.com/ec2/>.
2. On the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.
3. Select your Auto Scaling group.
4. On the **Notifications** tab, choose **Delete** next to the notification.

To delete Amazon EC2 Auto Scaling notification configuration using the AWS CLI

Use the following `delete-notification-configuration` command:

```
aws autoscaling delete-notification-configuration --auto-scaling-group-name my-asg --topic-arn arn:aws:sns:us-west-2:123456789012:my-sns-topic
```

For information about deleting the Amazon SNS topic associated with your Auto Scaling group, and also deleting all the subscriptions to that topic, see [Clean Up](#) in the *Amazon Simple Notification Service Developer Guide*.

Logging Amazon EC2 Auto Scaling API Calls with AWS CloudTrail

Amazon EC2 Auto Scaling is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in Amazon EC2 Auto Scaling. CloudTrail captures all API calls for Amazon EC2 Auto Scaling as events. The calls captured include calls from the Amazon EC2 Auto Scaling console and code calls to the Amazon EC2 Auto Scaling API. If you create a trail, you can enable continuous delivery of CloudTrail events to an Amazon S3 bucket, including events for Amazon EC2 Auto Scaling. 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 Amazon EC2 Auto Scaling, 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](#).

Amazon EC2 Auto Scaling Information in CloudTrail

CloudTrail is enabled on your AWS account when you create the account. When activity occurs in Amazon EC2 Auto Scaling, 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 Amazon EC2 Auto Scaling, 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 Amazon EC2 Auto Scaling actions are logged by CloudTrail and are documented in the [Amazon EC2 Auto Scaling API Reference](#). For example, calls to the **CreateLaunchConfiguration**, **DescribeAutoScalingGroup**, and **UpdateAutoScalingGroup** 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](#).

Understanding Amazon EC2 Auto Scaling Log File Entries

A trail is a configuration that enables delivery of events as log files to an Amazon S3 bucket that you specify. CloudTrail log files contain one or more log entries. An event represents a single request from any source and includes information about the requested action, the date and time of the action, request parameters, and so on. CloudTrail log files aren't an ordered stack trace of the public API calls, so they don't appear in any specific order.

The following example shows a CloudTrail log entry that demonstrates the **CreateLaunchConfiguration** action.

```
{
  "eventVersion": "1.05",
  "userIdentity": {
    "type": "Root",
    "principalId": "123456789012",
    "arn": "arn:aws:iam::123456789012:root",
    "accountId": "123456789012",
    "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
    "sessionContext": {
      "attributes": {
        "mfaAuthenticated": "false",
        "creationDate": "2018-08-21T17:05:42Z"
      }
    }
  },
  "eventTime": "2018-08-21T17:07:49Z",
  "eventSource": "autoscaling.amazonaws.com",
  "eventName": "CreateLaunchConfiguration",
  "awsRegion": "us-west-2",
  "sourceIPAddress": "192.0.2.0",
  "userAgent": "Coral/Jakarta",
  "requestParameters": {
    "ebsOptimized": false,
    "instanceMonitoring": {
      "enabled": false
    },
    "instanceType": "t2.micro",
    "keyName": "EC2-key-pair-oregon",
    "blockDeviceMappings": [
      {
        "deviceName": "/dev/xvda",
        "ebs": {
          "deleteOnTermination": true,
          "volumeSize": 8,
          "snapshotId": "snap-01676e0a2c3c7de9e",
          "volumeType": "gp2"
        }
      }
    ]
  },
  "launchConfigurationName": "launch_configuration_1",
  "imageId": "ami-6cd6f714d79675a5",
```

```
    "securityGroups": [  
        "sg-00c429965fd921483"  
    ],  
    "responseElements": null,  
    "requestID": "0737e2ea-fb2d-11e3-bfd8-99133058e7bb",  
    "eventID": "3fcfb182-98f8-4744-bd45-b38835ab61cb",  
    "eventType": "AwsApiCall",  
    "recipientAccountId": "123456789012"  
}
```

Controlling Access to Your Amazon EC2 Auto Scaling Resources

Amazon EC2 Auto Scaling integrates with AWS Identity and Access Management (IAM), a service that enables you to do the following:

- Create users and groups under your organization's AWS account.
- Assign unique security credentials to each user under your AWS account.
- Control each user's permissions to perform tasks using AWS resources.
- Allow the users in another AWS account to share your AWS resources.
- Create roles for your AWS account and define the users or services that can assume them.
- Use existing identities for your enterprise to grant permissions to perform tasks using AWS resources.

For example, you can create an IAM policy that grants the Managers group permissions to use only the `DescribeAutoScalingGroups`, `DescribeLaunchConfigurations`, `DescribeScalingActivities`, and `DescribePolicies` API operations. Users in the Managers group could then use those operations with any Auto Scaling groups and launch configurations.

You can also create IAM policies that restrict access to a particular Auto Scaling group or launch configuration.

For more information, see [Identity and Access Management \(IAM\)](#) or the [IAM User Guide](#).

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Amazon EC2 Auto Scaling Actions

You can specify any and all Amazon EC2 Auto Scaling actions in an IAM policy. Use the following prefix with the name of the action: `autoscaling:`. For example:

```
"Action": "autoscaling:CreateAutoScalingGroup"
```

To specify multiple actions in a single statement, enclose them in square brackets and separate them with commas, as follows:

```
"Action": [  
    "autoscaling:CreateAutoScalingGroup",  
    "autoscaling:UpdateAutoScalingGroup"  
]
```

You can also use wildcards. For example, use `autoscaling:*` to specify all Amazon EC2 Auto Scaling actions.

```
"Action": "autoscaling:*"
```

Use `Describe:*` to specify all actions whose names start with `Describe`.

```
"Action": "autoscaling:Describe*"
```

For more information, see [Amazon EC2 Auto Scaling Actions](#) in the *Amazon EC2 Auto Scaling API Reference*.

Required Permissions

When calling the following actions, you must grant IAM users permissions to call the action itself, plus additional actions from Amazon EC2 or IAM.

CreateLaunchConfiguration

- `autoscaling:CreateLaunchConfiguration`
- `ec2:DescribeImages`
- `ec2:DescribeInstances`
- `ec2:DescribeInstanceAttribute`
- `ec2:DescribeKeyPairs`
- `ec2:DescribeSecurityGroups`
- `ec2:DescribeSpotInstanceRequests`
- `ec2:DescribeVpcClassicLink`

CreateAutoScalingGroup

- `autoscaling:CreateAutoScalingGroup`
- `iam:CreateServiceLinkedRole`

Amazon EC2 Auto Scaling Resources

For actions that support resource-level permissions, you can control the Auto Scaling group or launch configuration that users are allowed to access.

To specify an Auto Scaling group, you must specify its Amazon Resource Name (ARN) as follows:

```
"Resource":  
  "arn:aws:autoscaling:region:123456789012:autoScalingGroup:uuid:autoScalingGroupName/asg-name"
```

To specify an Auto Scaling group with `CreateAutoScalingGroup`, you must replace the UUID with `*` as follows:

```
"Resource":  
  "arn:aws:autoscaling:region:123456789012:autoScalingGroup*:autoScalingGroupName/asg-name"
```

To specify a launch configuration, you must specify its ARN as follows:

```
"Resource":  
  "arn:aws:autoscaling:region:123456789012:launchConfiguration:uuid:launchConfigurationName/lc-name"
```


To specify a launch configuration with `CreateLaunchConfiguration`, you must replace the UUID with * as follows:

```
"Resource":  
  "arn:aws:autoscaling:region:123456789012:launchConfiguration:*:launchConfigurationName/lc-  
name"
```

The following Amazon EC2 Auto Scaling actions do not support resource-level permissions:

- `DescribeAccountLimits`
- `DescribeAdjustmentTypes`
- `DescribeAutoScalingGroups`
- `DescribeAutoScalingInstances`
- `DescribeAutoScalingNotificationTypes`
- `DescribeLaunchConfigurations`
- `DescribeLifecycleHooks`
- `DescribeLifecycleHookTypes`
- `DescribeLoadBalancers`
- `DescribeLoadBalancerTargetGroups`
- `DescribeMetricCollectionTypes`
- `DescribeNotificationConfigurations`
- `DescribePolicies`
- `DescribeScalingActivities`
- `DescribeScalingProcessTypes`
- `DescribeScheduledActions`
- `DescribeTags`
- `DescribeTerminationPolicyTypes`

For actions that don't support resource-level permissions, you must use "*" as the resource.

```
"Resource": "*" 
```

Amazon EC2 Auto Scaling Condition Keys

When you create a policy, you can specify the conditions that control when the policy is in effect. Each condition contains one or more key-value pairs. There are global condition keys and service-specific condition keys.

The following condition keys are specific to Amazon EC2 Auto Scaling:

- `autoscaling:ImageId`
- `autoscaling:InstanceType`
- `autoscaling:LaunchConfigurationName`
- `autoscaling:LaunchTemplateVersionSpecified`
- `autoscaling:LoadBalancerNames`
- `autoscaling:MaxSize`
- `autoscaling:MinSize`
- `autoscaling:ResourceTag/key`

- `autoscaling:SpotPrice`
- `autoscaling:TargetGroupARNs`
- `autoscaling:VPCZoneIdentifiers`

For more information about global condition keys, see [AWS Global Condition Context Keys](#) in the *IAM User Guide*.

Supported Resource-Level Permissions

The following table describes the Amazon EC2 Auto Scaling API actions that support resource-level permissions, as well as the supported condition keys and resources for each action.

API Action	Condition Keys	Resource ARN
AttachInstances	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
AttachLoadBalancers	<code>autoscaling:LoadBalancerNames</code> , <code>autoscaling:ResourceTag/key</code>	Auto Scaling group
AttachLoadBalancerTargetGroups	<code>autoscaling:ResourceTag/key</code> , <code>autoscaling:TargetGroupARNs</code>	Auto Scaling group
CompleteLifecycleAction	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
CreateAutoScalingGroup	<code>autoscaling:LaunchConfigurationName</code> , <code>autoscaling:LaunchTemplateVersion</code> , <code>autoscaling:LoadBalancerNames</code> , <code>autoscaling:MaxSize</code> , <code>autoscaling:MinSize</code> , <code>autoscaling:ResourceTag/key</code> , <code>autoscaling:TargetGroupARNs</code> , <code>autoscaling:VPCZoneIdentifiers</code> , <code>aws:RequestTag/key</code> , <code>aws:TagKeys</code>	Auto Scaling group (replace UUID with *)
CreateLaunchConfiguration	<code>autoscaling:ImageId</code> , <code>autoscaling:InstanceType</code> , <code>autoscaling:SpotPrice</code>	Launch configuration (replace UUID with *)
CreateOrUpdateTags	<code>autoscaling:ResourceTag/key</code> , <code>aws:RequestTag/key</code> , <code>aws:TagKeys</code>	Auto Scaling group
DeleteAutoScalingGroup	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
DeleteLaunchConfiguration		Launch configuration
DeleteLifecycleHook	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
DeleteNotificationConfiguration	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group

API Action	Condition Keys	Resource ARN
DeletePolicy	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
DeleteScheduledAction	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
DeleteTags	<code>autoscaling:ResourceTag/key</code> , <code>aws:RequestTag/key</code> , <code>aws:TagKeys</code>	Auto Scaling group
DetachInstances	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
DetachLoadBalancers	<code>autoscaling:LoadBalancerNames</code> , <code>autoscaling:ResourceTag/key</code>	Auto Scaling group
DetachLoadBalancerTargetGroups	<code>autoscaling:ResourceTag/key</code> , <code>autoscaling:TargetGroupARNs</code>	Auto Scaling group
DisableMetricsCollection	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
EnableMetricsCollection	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
EnterStandby	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
ExecutePolicy	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
ExitStandby	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
PutLifecycleHook	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
PutNotificationConfiguration	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
PutScalingPolicy	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
PutScheduledUpdateGroupAction	<code>autoscaling:MaxSize</code> , <code>autoscaling:MinSize</code> , <code>autoscaling:ResourceTag/key</code>	Auto Scaling group
RecordLifecycleActionHeartbeat	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
ResumeProcesses	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
SetDesiredCapacity	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group
SetInstanceHealth	<code>autoscaling:ResourceTag/key</code>	Auto Scaling group

API Action	Condition Keys	Resource ARN
SetInstanceProtection	<code>autoscaling:ResourceTag/<i>key</i></code>	Auto Scaling group
SuspendProcesses	<code>autoscaling:ResourceTag/<i>key</i></code>	Auto Scaling group
TerminateInstanceInAutoScalingGroup	<code>autoscaling:ResourceTag/<i>key</i></code>	Auto Scaling group
UpdateAutoScalingGroup	<code>autoscaling:LaunchConfigurationName,</code> <code>autoscaling:LaunchTemplateVersionSpecified,</code> <code>autoscaling:MaxSize,</code> <code>autoscaling:MinSize,</code> <code>autoscaling:ResourceTag/<i>key</i>,</code> <code>autoscaling:VPCZoneIdentifiers</code>	Auto Scaling group

Predefined AWS Managed Policies

The managed policies created by AWS grant the required permissions for common use cases. You can attach these policies to your IAM users, based on the access that they need. Each policy grants access to all or some of the API actions for Amazon EC2 Auto Scaling, plus additional API actions for Amazon EC2, CloudWatch, Elastic Load Balancing, IAM, and Amazon SNS.

The following are the AWS managed policies for Amazon EC2 Auto Scaling:

- **AutoScalingConsoleFullAccess** — Grants full access to Amazon EC2 Auto Scaling using the AWS Management Console.
- **AutoScalingConsoleReadOnlyAccess** — Grants read-only access to Amazon EC2 Auto Scaling using the AWS Management Console.
- **AutoScalingFullAccess** — Grants full access to Amazon EC2 Auto Scaling.
- **AutoScalingReadOnlyAccess** — Grants read-only access to Amazon EC2 Auto Scaling.

Customer Managed Policies

You can create custom IAM policies that grant your IAM users permissions to perform specific actions on specific resources. The following are example policies for Amazon EC2 Auto Scaling.

Example: Require a Launch Template

When you create or update an Auto Scaling group, you can specify a launch template, a launch configuration, or an EC2 instance. When you specify a launch template, you can configure the Auto Scaling group to use a specific launch template version, the latest version, or the default version when launching instances.

The `autoscaling:LaunchTemplateVersionSpecified` condition key is a Boolean value that is set as follows:

- `null` - If no launch template is specified.
- `true` - If a specific launch template version is used.
- `false` - If either the latest or default launch template version is used.

The following policy grants users permissions to create or update an Auto Scaling group using a specific launch template version, and access the Amazon EC2 resources specified in the launch template.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "autoscaling:CreateAutoScalingGroup",
        "autoscaling:UpdateAutoScalingGroup"
      ],
      "Resource": "*",
      "Condition": {
        "Bool": {
          "autoscaling:LaunchTemplateVersionSpecified": "true"
        }
      }
    },
    {
      "Effect": "Allow",
      "Action": [
        "ec2:*"
      ],
      "Resource": "*"
    }
  ]
}
```

Example: Create and Manage Launch Configurations

The following policy grants users permissions to use all Amazon EC2 Auto Scaling actions that include the string `LaunchConfiguration` in their names. Alternatively, you can list each action explicitly instead of using wildcards. However, the policy does not automatically apply to any new Amazon EC2 Auto Scaling actions with `LaunchConfiguration` in their names.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": "autoscaling:*LaunchConfiguration*",
    "Resource": "*"
  }]
}
```

The following policy grants users permissions to create a launch configuration if the instance type is `t2.micro` and the name of the launch configuration starts with `t2micro-`. They can specify a launch configuration for an Auto Scaling group only if its name starts with `t2micro-`.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "autoscaling:CreateLaunchConfiguration",
      "Resource": [
        "arn:aws:autoscaling:us-east-2:123456789012:launchConfiguration:*:launchConfigurationName/t2micro-*"
      ],
      "Condition": {
        "StringEquals": { "autoscaling:InstanceType": "t2.micro" }
      }
    }
  ]
}
```

```
    }
  },
  {
    "Effect": "Allow",
    "Action": [
      "autoscaling:CreateAutoScalingGroup",
      "autoscaling:UpdateAutoScalingGroup"
    ],
    "Resource": "*",
    "Condition": {
      "StringLikeIfExists": { "autoscaling:LaunchConfigurationName": "t2micro-*" }
    }
  }
}
```

Example: Create and Manage Auto Scaling Groups and Scaling Policies

The following policy grants users permissions to use all Amazon EC2 Auto Scaling actions that include the string `Scaling` in their names.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": ["autoscaling:*Scaling*"],
    "Resource": "*"
  }]
}
```

The following policy grants users permissions to use all Amazon EC2 Auto Scaling actions that include the string `Scaling` in their names, as long as the Auto Scaling group has the tag **purpose=webserver**. Because the `Describe` actions do not support resource-level permissions, you must specify them in a separate statement without conditions.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": ["autoscaling:*Scaling*"],
      "Resource": "*",
      "Condition": {
        "StringEquals": { "autoscaling:ResourceTag/purpose": "webserver" }
      }
    },
    {
      "Effect": "Allow",
      "Action": "autoscaling:Describe*Scaling*",
      "Resource": "*"
    }
  ]
}
```

The following policy grants users permissions to use all Amazon EC2 Auto Scaling actions that include the string `Scaling` in their names, as long as they don't specify a minimum size less than 1 or a maximum size greater than 10. Because the `Describe` actions do not support resource-level permissions, you must specify them in a separate statement without conditions.

```
{
```

```
"Version": "2012-10-17",
"Statement": [
{
  "Effect": "Allow",
  "Action": ["autoscaling:*Scaling*"],
  "Resource": "*",
  "Condition": {
    "NumericGreaterThanEqualsIfExists": { "autoscaling:MinSize": 1 },
    "NumericLessThanEqualsIfExists": { "autoscaling:MaxSize": 10 }
  }
},
{
  "Effect": "Allow",
  "Action": "autoscaling:Describe*Scaling*",
  "Resource": "*"
}
]
```

Example: Control Access Using Tags

To grant users permissions to create or tag an Auto Scaling group only if they specify specific tags, use the `aws:RequestTag` condition key. To allow only specific tag keys, use the `aws:TagKeys` condition key with the `ForAnyValue` modifier.

The following policy requires users to tag any Auto Scaling groups with the tags **purpose=webserver** and **cost-center=cc123**, and allows only the **purpose** and **cost-center** tags (no other tags can be specified).

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": [
      "autoscaling:CreateAutoScalingGroup",
      "autoscaling:CreateOrUpdateTags"
    ],
    "Resource": "*",
    "Condition": {
      "StringEquals": {
        "aws:RequestTag/purpose": "webserver",
        "aws:RequestTag/cost-center": "cc123"
      },
      "ForAllValues:StringEquals": { "aws:TagKeys": ["purpose", "cost-center"] }
    }
  }]
}
```

The following policy requires users to specify a tag with the key **environment** in the request.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": [
      "autoscaling:CreateAutoScalingGroup",
      "autoscaling:CreateOrUpdateTags"
    ],
    "Resource": "*",
    "Condition": {
      "StringLike": { "aws:RequestTag/environment": "*" }
    }
  }]
}
```

```
}
```

The following policy requires users to specify at least one tag in the request, and allows only the **cost-center** and **owner** keys.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": [
      "autoscaling:CreateAutoScalingGroup",
      "autoscaling:CreateOrUpdateTags"
    ],
    "Resource": "*",
    "Condition": {
      "ForAnyValue:StringEquals": { "aws:TagKeys": ["cost-center", "owner"] }
    }
  }]
}
```

The following policy grants users access to Auto Scaling groups with the tag **allowed=true** and allows them to apply only the tag **environment=test**. Because launch configurations do not support tags and Describe actions do not support resource-level permissions, you must specify them in a separate statement without conditions.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": "autoscaling:*Scaling*",
    "Resource": "*",
    "Condition": {
      "StringEquals": { "autoscaling:ResourceTag/allowed": "true" },
      "StringEqualsIfExists": { "aws:RequestTag/environment": "test" },
      "ForAllValues:StringEquals": { "aws:TagKeys": "environment" }
    }
  },
  {
    "Effect": "Allow",
    "Action": [
      "autoscaling:*LaunchConfiguration*",
      "autoscaling:Describe*"
    ],
    "Resource": "*"
  }]
}
```

Example: Change the Capacity of Auto Scaling Groups

The following policy grants users permissions to use the **SetDesiredCapacity** action to change the capacity of any Auto Scaling group.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": "autoscaling:SetDesiredCapacity",
    "Resource": "*"
  }]
}
```



```
}
}
```

The following policy grants users permissions to use the `SetDesiredCapacity` action to change the capacity of the specified Auto Scaling groups. Including the UUID ensures that access is granted to the specific Auto Scaling group. If you were to delete an Auto Scaling group and create a new one with the same name, the UUID for the new group would be different than the UUID for the original group.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": "autoscaling:SetDesiredCapacity",
    "Resource": [
      "arn:aws:autoscaling:us-east-2:123456789012:autoScalingGroup:7fe02b8e-7442-4c9e-8c8e-85fa99e9b5d9:autoScalingGroupName/group-1",
      "arn:aws:autoscaling:us-east-2:123456789012:autoScalingGroup:9d8e8ea4-22e1-44c7-a14d-520f8518c2b9:autoScalingGroupName/group-2",
      "arn:aws:autoscaling:us-east-2:123456789012:autoScalingGroup:60d6b363-ae8b-467c-947f-f1d308935521:autoScalingGroupName/group-3"
    ]
  }]
}
```

The following policy grants users permissions to use the `SetDesiredCapacity` action to change the capacity of any Auto Scaling group whose name begins with **group-**.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": "autoscaling:SetDesiredCapacity",
    "Resource": [
      "arn:aws:autoscaling:us-east-2:123456789012:autoScalingGroup:*:autoScalingGroupName/group-*"
    ]
  }]
}
```

Service-Linked Roles for Amazon EC2 Auto Scaling

Amazon EC2 Auto Scaling uses service-linked roles for the permissions that it requires to call other AWS services on your behalf. A service-linked role is a unique type of AWS Identity and Access Management (IAM) role that is linked directly to an AWS service.

Service-linked roles provide a secure way to delegate permissions to AWS services because only the linked service can assume a service-linked role. For more information, see [Using Service-Linked Roles](#) in the *IAM User Guide*.

Permissions Granted by `AWSServiceRoleForAutoScaling`

Amazon EC2 Auto Scaling uses the service-linked role named **`AWSServiceRoleForAutoScaling`** to manage your Auto Scaling groups on your behalf. The **`AWSServiceRoleForAutoScaling`** role is automatically assigned to your Auto Scaling groups unless you specify a different service-linked role.

The **AWSServiceRoleForAutoScaling** role is predefined with permissions to make the following calls on your behalf:

- `ec2:AttachClassicLinkVpc`
- `ec2:CancelSpotInstanceRequests`
- `ec2:CreateTags`
- `ec2>DeleteTags`
- `ec2:Describe*`
- `ec2:DetachClassicLinkVpc`
- `ec2:ModifyInstanceAttribute`
- `ec2:RequestSpotInstances`
- `ec2:RunInstances`
- `ec2:TerminateInstances`
- `elasticloadbalancing:Register*`
- `elasticloadbalancing:Deregister*`
- `elasticloadbalancing:Describe*`
- `cloudwatch>DeleteAlarms`
- `cloudwatch:DescribeAlarms`
- `cloudwatch:PutMetricAlarm`
- `sns:Publish`

This role trusts the `autoscaling.amazonaws.com` service to assume it.

Create the Service-Linked Role (Automatic)

Under most circumstances, you don't need to manually create a service-linked role. Amazon EC2 Auto Scaling creates the **AWSServiceRoleForAutoScaling** service-linked role for you the first time that you create an Auto Scaling group but do not specify a different service-linked role.

If you created an Auto Scaling group before March 2018, when Amazon EC2 Auto Scaling began supporting service-linked roles, Amazon EC2 Auto Scaling created the **AWSServiceRoleForAutoScaling** role in your AWS account. For more information, see [A New Role Appeared in My AWS Account](#) in the *IAM User Guide*.

Important

Make sure that you have enabled the IAM permissions that allow an IAM entity (such as a user, group, or role) to create the service-linked role. Otherwise, the automatic creation fails. For more information, see [Service-Linked Role Permissions](#) in the *IAM User Guide*.

Create the Service-Linked Role (Manual)

Alternatively, you can create and then specify your own service-linked role with a custom suffix when you create your Auto Scaling group. This can be helpful if you must give different service-linked roles access to different KMS keys. You can also track which Auto Scaling group made an API call in your CloudTrail logs by noting the service-linked role in use.

To create a service-linked role, you can use the IAM console, AWS CLI, or IAM API. For more information, see [Creating a Service-Linked Role](#) in the *IAM User Guide*.

For example, use the following `create-service-linked-role` CLI command to create a service-linked role for Amazon EC2 Auto Scaling with the name **AWSServiceRoleForAutoScaling_***suffix*. The suffix helps you identify the purpose of the role.

```
aws iam create-service-linked-role --aws-service-name autoscaling.amazonaws.com --custom-suffix suffix
```

The output of this command includes the ARN of the service-linked role, which you can use to grant the service-linked role access to your KMS keys.

```
{
  "Role": {
    "RoleId": "ABCDEF0123456789ABCDEF",
    "CreateDate": "2018-08-30T21:59:18Z",
    "RoleName": "AWSServiceRoleForAutoScaling_suffix",
    "Arn": "arn:aws:iam:123456789012:role/aws-service-role/autoscaling.amazonaws.com/AWSServiceRoleForAutoScaling_suffix",
    "Path": "/aws-service-role/autoscaling.amazonaws.com/",
    "AssumeRolePolicyDocument": {
      "Version": "2012-10-17",
      "Statement": [
        {
          "Action": [
            "sts:AssumeRole"
          ],
          "Principal": {
            "Service": [
              "autoscaling.amazonaws.com"
            ]
          },
          "Effect": "Allow"
        }
      ]
    }
  }
}
```

Edit the Service-Linked Role

You can edit any service-linked role that you created for use with your Auto Scaling groups. For more information, see [Editing a Service-Linked Role](#) in the *IAM User Guide*.

With the **AWSServiceRoleForAutoScaling** role created by Amazon EC2 Auto Scaling, you can edit only its description and not its permissions.

Delete the Service-Linked Role

If you no longer need to use an Auto Scaling group, we recommend that you delete its service-linked role. You can delete a service-linked role only after first deleting the related AWS resources. If a service-linked role is used with multiple Auto Scaling groups, you must delete all Auto Scaling groups that use the service-linked role before you can delete it. This protects your Auto Scaling groups because you cannot inadvertently remove permissions to manage them. For more information, see [Deleting Your Auto Scaling Infrastructure](#) (p. 56).

You can use IAM to delete the default service-linked role or one that you've created. For more information, see [Deleting a Service-Linked Role](#) in the *IAM User Guide*.

If you delete the **AWSServiceRoleForAutoScaling** service-linked role, Amazon EC2 Auto Scaling creates the role again when you create an Auto Scaling group but do not specify a different service-linked role.

Required CMK Key Policy for Use with Encrypted Volumes

If you specify a customer managed Customer Master Key (CMK) for Amazon EBS encryption, you must give the appropriate service-linked role access to the CMK so that Amazon EC2 Auto Scaling can launch instances on your behalf. To do this, you must modify the CMK's key policy either when the CMK is created or at a later time.

Note

By default, Amazon EC2 Auto Scaling has access to the [AWS managed CMK](#) that is used for EBS encryption. This CMK is unique to your account and the AWS region in which it is used. The AWS managed CMK is used for encryption unless you specify a *customer managed CMK*. For information about creating customer managed CMKs, see [Creating Keys](#) in the *AWS Key Management Service Developer Guide*.

Example: CMK Key Policy Sections Allowing Access to the CMK

The following two policy sections grant the service-linked role named **AWSServiceRoleForAutoScaling** permissions to use the customer managed CMK.

```
{
  "Sid": "Allow use of the CMK",
  "Effect": "Allow",
  "Principal": {
    "AWS": [
      "arn:aws:iam::123456789012:role/aws-service-role/autoscaling.amazonaws.com/AWSServiceRoleForAutoScaling"
    ]
  },
  "Action": [
    "kms:Encrypt",
    "kms:Decrypt",
    "kms:ReEncrypt*",
    "kms:GenerateDataKey*",
    "kms:DescribeKey"
  ],
  "Resource": "*"
}
```

```
{
  "Sid": "Allow attachment of persistent resources",
  "Effect": "Allow",
  "Principal": {
    "AWS": [
      "arn:aws:iam::123456789012:role/aws-service-role/autoscaling.amazonaws.com/AWSServiceRoleForAutoScaling"
    ]
  },
  "Action": [
    "kms:CreateGrant"
  ],
  "Resource": "*",
  "Condition": {
    "Bool": {
      "kms:GrantIsForAWSResource": true
    }
  }
}
```

```
}  
}
```

When you add new sections to your CMK policy, do not change any existing sections in the policy. For information about editing key policies, see [Using Key Policies in AWS KMS](#) in the *AWS Key Management Service Developer Guide*.

Important

The Principal element of the key policy is the Amazon Resource Name (ARN) of the service-linked role. When launching On-Demand Instances, use the ARN of the service-linked role for Amazon EC2 Auto Scaling: **AWSServiceRoleForAutoScaling**. When launching Spot Instances, use the ARN of the **AWSServiceRoleForEC2Spot** role when using a launch configuration, or the service-linked role for Amazon EC2 Auto Scaling when using a launch template.

Example: CMK Key Policy Sections Allowing Cross-Account Access to the CMK

If your customer managed CMK is in a different account than the Auto Scaling group, you must use a grant in combination with the key policy to allow access to the CMK. For more information, see [Using Grants](#) in the *AWS Key Management Service Developer Guide*.

First, add the following two sections to the CMK's key policy so that you can use the CMK with the external account (root user).

```
{  
  "Sid": "Allow use of the key",  
  "Effect": "Allow",  
  "Principal": {  
    "AWS": [  
      "arn:aws:iam::111122223333:root"  
    ]  
  },  
  "Action": [  
    "kms:Encrypt",  
    "kms:Decrypt",  
    "kms:ReEncrypt*",  
    "kms:GenerateDataKey*",  
    "kms:DescribeKey"  
  ],  
  "Resource": "*"  
}
```

```
{  
  "Sid": "Allow attachment of persistent resources",  
  "Effect": "Allow",  
  "Principal": {  
    "AWS": [  
      "arn:aws:iam::111122223333:root"  
    ]  
  },  
  "Action": [  
    "kms:CreateGrant"  
  ],  
  "Resource": "*"  
}
```

Then, create a grant from the external account that delegates the relevant permissions to the appropriate service-linked role. The Grantee Principal element of the grant is the ARN of the appropriate service-linked role. The Key ID is the ARN of the CMK in your account. The following is an example [create](#)

a [grant](#) CLI command giving the service-linked role named **AWSServiceRoleForAutoScaling** permissions to use the CMK:

```
aws kms create-grant \  
--region us-west-2 \  
--key-id arn:aws:kms:us-west-2:444455556666:key/1a2b3c4d-5e6f-1a2b-3c4d-5e6f1a2b3c4d \  
--grantee-principal arn:aws:iam::111122223333:role/aws-service-role/  
autoscaling.amazonaws.com/AWSServiceRoleForAutoScaling \  
--operations "Encrypt" "Decrypt" "ReEncryptFrom" "ReEncryptTo" "GenerateDataKey"  
"GenerateDataKeyWithoutPlaintext" "DescribeKey" "CreateGrant"
```

If you have any problems configuring the cross-account access to a customer managed CMK that is required to launch an instance with an encrypted volume, see the [troubleshooting section \(p. 151\)](#).

Launch Auto Scaling Instances with an IAM Role

AWS Identity and Access Management (IAM) roles for EC2 instances make it easier for you to access other AWS services securely from within the EC2 instances. EC2 instances launched with an IAM role automatically have AWS security credentials available.

You can launch your Auto Scaling instances with an IAM role to automatically enable applications running on your instances to securely access other AWS resources. You do this by creating a launch configuration with an EC2 instance profile. An instance profile is a container for an IAM role. First, create an IAM role that has all the permissions required to access the AWS resources, then add your role to the instance profile.

For more information about IAM roles and instance profiles, see [IAM Roles](#) in the *IAM User Guide*.

Prerequisites

Create an IAM role for your EC2 instances. The console creates an instance profile with the same name as the IAM role.

To create an IAM role

1. Open the IAM console at <https://console.aws.amazon.com/iam/>.
2. In the navigation pane, choose **Roles**, **Create new role**.
3. On the **Select role type** page, choose **Select** next to **Amazon EC2**.
4. On the **Attach Policy** page, select an AWS managed policy that grants your instances access to the resources that they need.
5. On the **Set role name and review** page, type a name for the role and choose **Create role**.

Create a Launch Configuration

When you create the launch configuration using the AWS Management Console, on the **Configure Details** page, select the role from **IAM role**. For more information, see [Creating a Launch Configuration \(p. 26\)](#).

When you create the launch configuration using the [create-launch-configuration](#) command from the AWS CLI, specify the name of the instance profile as follows:

```
aws autoscaling create-launch-configuration --launch-configuration-name my-lc-with-  
instance-profile \  

```

```
--image-id ami-baba68d3 --instance-type m1.small \  
--iam-instance-profile my-instance-profile
```

Troubleshooting Amazon EC2 Auto Scaling

Amazon EC2 Auto Scaling provides specific and descriptive errors to help you troubleshoot issues. You can find the error messages in the description of the scaling activities.

Contents

- [Retrieving an Error Message \(p. 146\)](#)
- [Troubleshooting Amazon EC2 Auto Scaling: EC2 Instance Launch Failures \(p. 148\)](#)
- [Troubleshooting Amazon EC2 Auto Scaling: AMI Issues \(p. 152\)](#)
- [Troubleshooting Amazon EC2 Auto Scaling: Load Balancer Issues \(p. 154\)](#)
- [Troubleshooting Auto Scaling: Capacity Limits \(p. 155\)](#)

Retrieving an Error Message

To retrieve an error message from the description of scaling activities, use the [describe-scaling-activities](#) command as follows:

```
aws autoscaling describe-scaling-activities --auto-scaling-group-name my-asg
```

The following is an example response, where `StatusCode` contains the current status of the activity and `StatusMessage` contains the error message:

```
{
  "Activities": [
    {
      "Description": "Launching a new EC2 instance: i-4ba0837f",
      "AutoScalingGroupName": "my-asg",
      "ActivityId": "f9f2d65b-f1f2-43e7-b46d-d86756459699",
      "Details": "{\"Availability Zone\":\"us-west-2c\"}",
      "StartTime": "2013-08-19T20:53:29.930Z",
      "Progress": 100,
      "EndTime": "2013-08-19T20:54:02Z",
      "Cause": "At 2013-08-19T20:53:25Z a user request created an
AutoScalingGroup...",
      "StatusCode": "Failed",
      "StatusMessage": "The image id 'ami-4edb0327' does not exist. Launching EC2
instance failed."
    }
  ]
}
```

The following tables list the types of error messages and provide links to the troubleshooting resources that you can use to troubleshoot issues.

EC2 Instance Launch Failures

Issue	Error Message
Auto Scaling group	AutoScalingGroup <Auto Scaling group name> not found. (p. 149)

Issue	Error Message
Availability Zone	The requested Availability Zone is no longer supported. Please retry your request... (p. 150)
AWS account	You are not subscribed to this service. Please see http://aws.amazon.com . (p. 150)
Block device mapping	Invalid device name upload. Launching EC2 instance failed. (p. 150)
Block device mapping	Value (<name associated with the instance storage device>) for parameter virtualName is invalid... (p. 151)
Block device mapping	EBS block device mappings not supported for instance-store AMIs. (p. 151)
Instance type and Availability Zone	Your requested instance type (<instance type>) is not supported in your requested Availability Zone (<instance Availability Zone>)... (p. 150)
Key pair	The key pair <key pair associated with your EC2 instance> does not exist. Launching EC2 instance failed. (p. 149)
Launch configuration	The requested configuration is currently not supported. (p. 149)
Placement group	Placement groups may not be used with instances of type 'm1.large'. Launching EC2 instance failed. (p. 151)
Security group	The security group <name of the security group> does not exist. Launching EC2 instance failed. (p. 149)
Service-linked role	Client.InternalError: Client error on launch. (p. 151)

AMI Issues

Issue	Error Message
AMI ID	The AMI ID <ID of your AMI> does not exist. Launching EC2 instance failed. (p. 153)
AMI ID	AMI <AMI ID> is pending, and cannot be run. Launching EC2 instance failed. (p. 153)
AMI ID	Value (<ami ID>) for parameter virtualName is invalid. (p. 153)
Architecture mismatch	The requested instance type's architecture (i386) does not match the architecture in the manifest for ami-6622f00f (x86_64). Launching ec2 instance failed. (p. 153)

Load Balancer Issues

Issue	Error Message
Cannot find load balancer	Cannot find Load Balancer <your launch environment>. Validating load balancer configuration failed. (p. 154)
Instances in VPC	EC2 instance <instance ID> is not in VPC. Updating load balancer configuration failed. (p. 155)

Issue	Error Message
No active load balancer	There is no ACTIVE Load Balancer named <load balancer name>. Updating load balancer configuration failed. (p. 154)
Security token	The security token included in the request is invalid. Validating load balancer configuration failed. (p. 155)

Capacity Limits

Issue	Error Message
Capacity limits	<number of instances> instance(s) are already running. Launching EC2 instance failed. (p. 156)
Insufficient capacity in Availability Zone	We currently do not have sufficient <instance type> capacity in the Availability Zone you requested (<requested Availability Zone>)... (p. 155)

Troubleshooting Amazon EC2 Auto Scaling: EC2 Instance Launch Failures

This page provides information about your EC2 instances that fail to launch, potential causes, and the steps you can take to resolve the issues.

To retrieve an error message, see [Retrieving an Error Message](#) (p. 146).

When your EC2 instances fail to launch, you might get one or more of the following error messages:

Error Messages

- The security group <name of the security group> does not exist. Launching EC2 instance failed. (p. 149)
- The key pair <key pair associated with your EC2 instance> does not exist. Launching EC2 instance failed. (p. 149)
- The requested configuration is currently not supported. (p. 149)
- AutoScalingGroup <Auto Scaling group name> not found. (p. 149)
- The requested Availability Zone is no longer supported. Please retry your request... (p. 150)
- Your requested instance type (<instance type>) is not supported in your requested Availability Zone (<instance Availability Zone>)... (p. 150)
- You are not subscribed to this service. Please see <http://aws.amazon.com>. (p. 150)
- Invalid device name upload. Launching EC2 instance failed. (p. 150)
- Value (<name associated with the instance storage device>) for parameter virtualName is invalid... (p. 151)
- EBS block device mappings not supported for instance-store AMIs. (p. 151)
- Placement groups may not be used with instances of type 'm1.large'. Launching EC2 instance failed. (p. 151)
- Client.InternalError: Client error on launch. (p. 151)

The security group <name of the security group> does not exist. Launching EC2 instance failed.

- **Cause:** The security group specified in your launch configuration might have been deleted.
- **Solution:**
 1. Use the [describe-security-groups](#) command to get the list of the security groups associated with your account.
 2. From the list, select the security groups to use. To create a security group instead, use the [create-security-group](#) command.
 3. Create a new launch configuration.
 4. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

The key pair <key pair associated with your EC2 instance> does not exist. Launching EC2 instance failed.

- **Cause:** The key pair that was used when launching the instance might have been deleted.
- **Solution:**
 1. Use the [describe-key-pairs](#) command to get the list of the key pairs available to you.
 2. From the list, select the key pair to use. To create a key pair instead, use the [create-key-pair](#) command.
 3. Create a new launch configuration.
 4. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

The requested configuration is currently not supported.

- **Cause:** Some options in your launch configuration might not be currently supported.
- **Solution:**
 1. Create a new launch configuration.
 2. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

AutoScalingGroup <Auto Scaling group name> not found.

- **Cause:** The Auto Scaling group might have been deleted.
- **Solution:** Create a new Auto Scaling group.

The requested Availability Zone is no longer supported. Please retry your request...

- **Error Message:** The requested Availability Zone is no longer supported. Please retry your request by not specifying an Availability Zone or choosing <list of available Availability Zones>. Launching EC2 instance failed.
- **Cause:** The Availability Zone associated with your Auto Scaling group might not be currently available.
- **Solution:** Update your Auto Scaling group with the recommendations in the error message.

Your requested instance type (<instance type>) is not supported in your requested Availability Zone (<instance Availability Zone>)...

- **Error Message:** Your requested instance type (<instance type>) is not supported in your requested Availability Zone (<instance Availability Zone>). Please retry your request by not specifying an Availability Zone or choosing <list of Availability Zones that supports the instance type>. Launching EC2 instance failed.
- **Cause:** The instance type associated with your launch configuration might not be currently available in the Availability Zones specified in your Auto Scaling group.
- **Solution:** Update your Auto Scaling group with the recommendations in the error message.

You are not subscribed to this service. Please see <http://aws.amazon.com>.

- **Cause:** Your AWS account might have expired.
- **Solution:** Go to <http://aws.amazon.com> and choose **Sign Up Now** to open a new account.

Invalid device name upload. Launching EC2 instance failed.

- **Cause:** The block device mappings in your launch configuration might contain block device names that are not available or currently not supported.
- **Solution:**
 1. Use the [describe-volumes](#) command to see how the volumes are exposed to the instance.
 2. Create a new launch configuration using the device name listed in the volume description.
 3. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

Value (<name associated with the instance storage device>) for parameter virtualName is invalid...

- **Error Message:** Value (<name associated with the instance storage device>) for parameter virtualName is invalid. Expected format: 'ephemeralNUMBER'. Launching EC2 instance failed.
- **Cause:** The format specified for the virtual name associated with the block device is incorrect.
- **Solution:**
 1. Create a new launch configuration by specifying the device name in the `virtualName` parameter. For information about the device name format, see [Instance Store Device Names](#) in the *Amazon EC2 User Guide for Linux Instances*.
 2. Update your Auto Scaling group with the new launch configuration using the `update-auto-scaling-group` command.

EBS block device mappings not supported for instance-store AMIs.

- **Cause:** The block device mappings specified in the launch configuration are not supported on your instance.
- **Solution:**
 1. Create a new launch configuration with block device mappings supported by your instance type. For more information, see [Block Device Mapping](#) in the *Amazon EC2 User Guide for Linux Instances*.
 2. Update your Auto Scaling group with the new launch configuration using the `update-auto-scaling-group` command.

Placement groups may not be used with instances of type 'm1.large'. Launching EC2 instance failed.

- **Cause:** Your cluster placement group contains an invalid instance type.
- **Solution:**
 1. For information about valid instance types supported by the placement groups, see [Placement Groups](#) in the *Amazon EC2 User Guide for Linux Instances*.
 2. Follow the instructions detailed in the [Placement Groups](#) to create a new placement group.
 3. Alternatively, create a new launch configuration with the supported instance type.
 4. Update your Auto Scaling group with new placement group or launch configuration using the `update-auto-scaling-group` command.

Client.InternalError: Client error on launch.

- **Cause:** This error can be caused when an Auto Scaling group attempts to launch an instance that has an encrypted EBS volume, but the [service-linked role \(p. 139\)](#) does not have access to the [customer managed CMK](#) used to encrypt it.
- **Solution:** Additional setup is required to allow the Auto Scaling group to launch instances. The following table summarizes the steps for resolving the error. For more information, see <https://forums.aws.amazon.com/thread.jspa?threadID=277523>.

Scenario	Next Steps
Scenario 1: CMK and Auto Scaling group are in the same AWS account	Allow the service-linked role to use the CMK as follows: <ol style="list-style-type: none">1. Determine which service-linked role to use for this Auto Scaling group.2. Update the key policy on the CMK and allow the service-linked role to use the CMK.3. Update the Auto Scaling group to use the service-linked role.
Scenario 2: CMK and Auto Scaling group are in different AWS accounts	There are two possible solutions: Solution 1: Use a CMK in the same AWS account as the Auto Scaling group <ol style="list-style-type: none">1. Copy and re-encrypt the snapshot with another CMK that belongs to the same account as the Auto Scaling group.2. Allow the service-linked role to use the new CMK. See the steps for Scenario 1. Solution 2: Continue to use the CMK in a different AWS account from the Auto Scaling group <ol style="list-style-type: none">1. Determine which service-linked role to use for this Auto Scaling group.2. Allow the Auto Scaling group account (root user) access to the CMK.3. Define an IAM user or role in the Auto Scaling group account that can create a grant.4. Create a grant to the CMK with the service-linked role as the grantee principal.5. Update the Auto Scaling group to use the service-linked role.

Troubleshooting Amazon EC2 Auto Scaling: AMI Issues

This page provides information about the issues associated with your AMIs, potential causes, and the steps you can take to resolve the issues.

To retrieve an error message, see [Retrieving an Error Message \(p. 146\)](#).

When your EC2 instances fail to launch due to issues with your AMI, you might get one or more of the following error messages.

Error Messages

- [The AMI ID <ID of your AMI> does not exist. Launching EC2 instance failed. \(p. 153\)](#)
- [AMI <AMI ID> is pending, and cannot be run. Launching EC2 instance failed. \(p. 153\)](#)
- [Value \(<ami ID>\) for parameter virtualName is invalid. \(p. 153\)](#)

- The requested instance type's architecture (i386) does not match the architecture in the manifest for ami-6622f00f (x86_64). Launching ec2 instance failed. (p. 153)

The AMI ID <ID of your AMI> does not exist. Launching EC2 instance failed.

- **Cause:** The AMI might have been deleted after creating the launch configuration.
- **Solution:**
 1. Create a new launch configuration using a valid AMI.
 2. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

AMI <AMI ID> is pending, and cannot be run. Launching EC2 instance failed.

- **Cause:** You might have just created your AMI (by taking a snapshot of a running instance or any other way), and it might not be available yet.
- **Solution:** You must wait for your AMI to be available and then create your launch configuration.

Value (<ami ID>) for parameter virtualName is invalid.

- **Cause:** Incorrect value. The `virtualName` parameter refers to the virtual name associated with the device.
- **Solution:**
 1. Create a new launch configuration by specifying the name of the virtual device of your instance for the `virtualName` parameter.
 2. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

The requested instance type's architecture (i386) does not match the architecture in the manifest for ami-6622f00f (x86_64). Launching ec2 instance failed.

- **Cause:** The architecture of the `InstanceType` mentioned in your launch configuration does not match the image architecture.
- **Solution:**
 1. Create a new launch configuration using the AMI architecture that matches the architecture of the requested instance type.
 2. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

Troubleshooting Amazon EC2 Auto Scaling: Load Balancer Issues

This page provides information about issues caused by the load balancer associated with your Auto Scaling group, potential causes, and the steps you can take to resolve the issues.

To retrieve an error message, see [Retrieving an Error Message \(p. 146\)](#).

When your EC2 instances fail to launch due to issues with the load balancer associated with your Auto Scaling group, you might get one or more of the following error messages.

Error Messages

- [Cannot find Load Balancer <your launch environment>. Validating load balancer configuration failed. \(p. 154\)](#)
- [There is no ACTIVE Load Balancer named <load balancer name>. Updating load balancer configuration failed. \(p. 154\)](#)
- [EC2 instance <instance ID> is not in VPC. Updating load balancer configuration failed. \(p. 155\)](#)
- [EC2 instance <instance ID> is in VPC. Updating load balancer configuration failed. \(p. 155\)](#)
- [The security token included in the request is invalid. Validating load balancer configuration failed. \(p. 155\)](#)

Cannot find Load Balancer <your launch environment>. Validating load balancer configuration failed.

- **Cause 1:** The load balancer has been deleted.
- **Solution 1:**
 1. Check to see if your load balancer still exists. You can use the [describe-load-balancers](#) command.
 2. If you see your load balancer listed in the response, see **Cause 2**.
 3. If you do not see your load balancer listed in the response, you can either create a new load balancer and then create a new Auto Scaling group or you can create a new Auto Scaling group without the load balancer.
- **Cause 2:** The load balancer name was not specified in the right order when creating the Auto Scaling group.
- **Solution 2:** Create a new Auto Scaling group and specify the load balancer name at the end.

There is no ACTIVE Load Balancer named <load balancer name>. Updating load balancer configuration failed.

- **Cause:** The specified load balancer might have been deleted.
- **Solution:** You can either create a new load balancer and then create a new Auto Scaling group or create a new Auto Scaling group without the load balancer.

EC2 instance <instance ID> is not in VPC. Updating load balancer configuration failed.

- **Cause:** The specified instance does not exist in the VPC.
- **Solution:** You can either delete your load balancer associated with the instance or create a new Auto Scaling group.

EC2 instance <instance ID> is in VPC. Updating load balancer configuration failed.

- **Cause:** The load balancer is in EC2-Classic but the Auto Scaling group is in a VPC.
- **Solution:** Ensure that the load balancer and the Auto Scaling group are in the same network (EC2-Classic or a VPC).

The security token included in the request is invalid. Validating load balancer configuration failed.

- **Cause:** Your AWS account might have expired.
- **Solution:** Check whether your AWS account is valid. Go to <http://aws.amazon.com> and choose **Sign Up Now** to open a new account.

Troubleshooting Auto Scaling: Capacity Limits

This page provides information about issues with the capacity limits of your Auto Scaling group, potential causes, and the steps you can take to resolve the issues.

To retrieve an error message, see [Retrieving an Error Message \(p. 146\)](#).

If your EC2 instances fail to launch due to issues with the capacity limits of your Auto Scaling group, you might get one or more of the following error messages.

Error Messages

- [We currently do not have sufficient <instance type> capacity in the Availability Zone you requested \(<requested Availability Zone>\)... \(p. 155\)](#)
- [<number of instances> instance\(s\) are already running. Launching EC2 instance failed. \(p. 156\)](#)

We currently do not have sufficient <instance type> capacity in the Availability Zone you requested (<requested Availability Zone>)...

- **Error Message:** We currently do not have sufficient <instance type> capacity in the Availability Zone you requested (<requested Availability Zone>). Our system will be working on provisioning additional capacity. You can currently get <instance type> capacity by not specifying an Availability Zone in your request or choosing <list of Availability Zones that currently supports the instance type>. Launching EC2 instance failed.

- **Cause:** At this time, Auto Scaling cannot support your instance type in your requested Availability Zone.
- **Solution:**
 1. Create a new launch configuration by following the recommendations in the error message.
 2. Update your Auto Scaling group with the new launch configuration using the [update-auto-scaling-group](#) command.

<number of instances> instance(s) are already running. Launching EC2 instance failed.

- **Cause:** The Auto Scaling group has reached the limit set by the `DesiredCapacity` parameter.
- **Solution:**
 - Update your Auto Scaling group by providing a new value for the `--desired-capacity` parameter using the [update-auto-scaling-group](#) command.
 - If you've reached your limit for the number of EC2 instances, you can request an increase. For more information, see [AWS Service Limits](#).

Auto Scaling Resources

The following related resources can help you as you work with this service.

- [Amazon EC2 Auto Scaling](#) – The primary web page for information about Amazon EC2 Auto Scaling.
- [Amazon EC2 Technical FAQ](#) – The answers to questions customers ask about Amazon EC2 and Amazon EC2 Auto Scaling.
- [Amazon EC2 Discussion Forum](#) – Get help from the community.

The following additional resources are available to help you learn more about AWS.

- [Classes & Workshops](#) – Links to role-based and specialty courses as well as self-paced labs to help sharpen your AWS skills and gain practical experience.
- [AWS Developer Tools](#) – Links to developer tools, SDKs, IDE toolkits, and command line tools for developing and managing AWS applications.
- [AWS Whitepapers](#) – Links to a comprehensive list of technical AWS whitepapers, covering topics such as architecture, security, and economics and authored by AWS Solutions Architects or other technical experts.
- [AWS Support Center](#) – The hub for creating and managing your AWS Support cases. Also includes links to other helpful resources, such as forums, technical FAQs, service health status, and AWS Trusted Advisor.
- [AWS Support](#) – The primary web page for information about AWS Support, a one-on-one, fast-response support channel to help you build and run applications in the cloud.
- [Contact Us](#) – A central contact point for inquiries concerning AWS billing, account, events, abuse, and other issues.
- [AWS Site Terms](#) – Detailed information about our copyright and trademark; your account, license, and site access; and other topics.

Document History

The following table describes important additions to the Amazon EC2 Auto Scaling documentation, beginning in July 2018. For notification about updates to this documentation, you can subscribe to the RSS feed.

update-history-change	update-history-description	update-history-date
Support for combining instance types and purchase options (p. 158)	Provision and automatically scale instances across purchase options (Spot, On-Demand, and Reserved Instances) and instance types within a single Auto Scaling group. For more information, see Using Multiple Instance Types and Purchase Options in the <i>Amazon EC2 Auto Scaling User Guide</i> .	November 13, 2018
Updated topic for scaling based on Amazon SQS (p. 158)	Updated guide to explain how you can use custom metrics to scale an Auto Scaling group in response to changing demand from an Amazon SQS queue. For more information, see Scaling Based on Amazon SQS in the <i>Amazon EC2 Auto Scaling User Guide</i> .	July 26, 2018

The following table describes important changes to the Amazon EC2 Auto Scaling documentation before July 2018.

Feature	Description	Release Date
Support for target tracking scaling policies	Set up dynamic scaling for your application in just a few steps. For more information, see Target Tracking Scaling Policies for Amazon EC2 Auto Scaling .	12 July 2017
Support for resource-level permissions	Create IAM policies to control access at the resource level. For more information, see Controlling Access to Your Amazon EC2 Auto Scaling Resources .	15 May 2017
Monitoring improvements	Auto Scaling group metrics no longer require that you enable detailed monitoring. You can now enable group metrics collection and view metrics graphs from the Monitoring tab in the console. For more information, see Monitoring Your Auto Scaling Groups and Instances Using Amazon CloudWatch .	18 August 2016
Support for Application Load Balancers	Attach one or more target groups to a new or existing Auto Scaling group. For more information, see Attaching a Load Balancer to Your Auto Scaling Group .	11 August 2016

Feature	Description	Release Date
Events for lifecycle hooks	Amazon EC2 Auto Scaling sends events to CloudWatch Events when it executes lifecycle hooks. For more information, see Getting CloudWatch Events When Your Auto Scaling Group Scales .	24 February 2016
Instance protection	Prevent Amazon EC2 Auto Scaling from selecting specific instances for termination when scaling in. For more information, see Instance Protection .	07 December 2015
Step scaling policies	Create a scaling policy that enables you to scale based on the size of the alarm breach. For more information, see Scaling Policy Types .	06 July 2015
Update load balancer	Attach a load balancer to or detach a load balancer from an existing Auto Scaling group. For more information, see Attaching a Load Balancer to Your Auto Scaling Group .	11 June 2015
Support for ClassicLink	Link EC2-Classic instances in your Auto Scaling group to a VPC, enabling communication between these linked EC2-Classic instances and instances in the VPC using private IP addresses. For more information, see Linking EC2-Classic Instances to a VPC .	19 January 2015
Lifecycle hooks	Hold your newly launched or terminating instances in a pending state while you perform actions on them. For more information, see Amazon EC2 Auto Scaling Lifecycle Hooks .	30 July 2014
Detach instances	Detach instances from an Auto Scaling group. For more information, see Detach EC2 Instances from Your Auto Scaling Group .	30 July 2014
Put instances into a Standby state	Put instances that are in an InService state into a Standby state. For more information, see Temporarily Removing Instances from Your Auto Scaling Group .	30 July 2014
Manage tags	Manage your Auto Scaling groups using the AWS Management Console. For more information, see Tagging Auto Scaling Groups and Instances .	01 May 2014
Support for Dedicated Instances	Launch Dedicated Instances by specifying a placement tenancy attribute when you create a launch configuration. For more information, see Instance Placement Tenancy .	23 April 2014
Create a group or launch configuration from an EC2 instance	Create an Auto Scaling group or a launch configuration using an EC2 instance. For information about creating a launch configuration using an EC2 instance, see Creating a Launch Configuration Using an EC2 Instance . For information about creating an Auto Scaling group using an EC2 instance, see Creating an Auto Scaling Group Using an EC2 Instance .	02 January 2014
Attach instances	Enable automatic scaling for an EC2 instance by attaching the instance to an existing Auto Scaling group. For more information, see Attach EC2 Instances to Your Auto Scaling Group .	02 January 2014
View account limits	View the limits on Auto Scaling resources for your account. For more information, see Auto Scaling Limits .	02 January 2014

Feature	Description	Release Date
Console support for Amazon EC2 Auto Scaling	Access Amazon EC2 Auto Scaling using the AWS Management Console. For more information, see Getting Started with Amazon EC2 Auto Scaling .	10 December 2013
Assign a public IP address	Assign a public IP address to an instance launched into a VPC. For more information, see Launching Auto Scaling Instances in a VPC .	19 September 2013
Instance termination policy	Specify an instance termination policy for Amazon EC2 Auto Scaling to use when terminating EC2 instances. For more information, see Controlling Which Auto Scaling Instances Terminate During Scale In .	17 September 2012
Support for IAM roles	Launch EC2 instances with an IAM instance profile. You can use this feature to assign IAM roles to your instances, allowing your applications to access other AWS services securely. For more information, see Launch Auto Scaling Instances with an IAM Role .	11 June 2012
Support for Spot Instances	Request Spot Instances in Auto Scaling groups by specifying a Spot Instance bid price in your launch configuration. For more information, see Launching Spot Instances in Your Auto Scaling Group .	7 June 2012
Tag groups and instances	Tag Auto Scaling groups and specify that the tag also applies to EC2 instances launched after the tag was created. For more information, see Tagging Auto Scaling Groups and Instances .	26 January 2012
Support for Amazon SNS	<p>Use Amazon SNS to receive notifications whenever Amazon EC2 Auto Scaling launches or terminates EC2 instances. For more information, see Getting SNS Notifications When Your Auto Scaling Group Scales.</p> <p>Amazon EC2 Auto Scaling also added the following new features:</p> <ul style="list-style-type: none"> • The ability to set up recurring scaling activities using cron syntax. For more information, see the PutScheduledUpdateGroupAction API command. • A new configuration setting that allows you to scale out without adding the launched instance to the load balancer (LoadBalancer). For more information, see the ProcessType API data type. • The <code>ForceDelete</code> flag in the <code>DeleteAutoScalingGroup</code> command that tells Amazon EC2 Auto Scaling to delete the Auto Scaling group with the instances associated to it without waiting for the instances to be terminated first. For more information, see the DeleteAutoScalingGroup API command. 	20 July 2011
Scheduled scaling actions	Added support for scheduled scaling actions. For more information, see Scheduled Scaling for Amazon EC2 Auto Scaling .	2 December 2010

Feature	Description	Release Date
Support for Amazon VPC	Added support for Amazon VPC. For more information, see Launching Auto Scaling Instances in a VPC .	2 December 2010
Support for HPC clusters	Added support for high performance computing (HPC) clusters.	2 December 2010
Support for health checks	Added support for using Elastic Load Balancing health checks with Amazon EC2 Auto Scaling-managed EC2 instances. For more information, see Using ELB Health Checks with Auto Scaling .	2 December 2010
Support for CloudWatch alarms	Removed the older trigger mechanism and redesigned Amazon EC2 Auto Scaling to use the CloudWatch alarm feature. For more information, see Dynamic Scaling for Amazon EC2 Auto Scaling .	2 December 2010
Suspend and resume scaling	Added support to suspend and resume scaling processes.	2 December 2010
Support for IAM	Added support for IAM. For more information, see Controlling Access to Your Amazon EC2 Auto Scaling Resources .	2 December 2010