# AWS Identity and Access Management

## Using IAM

## API Version 2010-05-08

# Amazon Web Services

# AWS Identity and Access Management: Using IAM

Amazon Web Services

# Welcome

**Topics**



AWS Identity and Access Management (IAM) helps you securely control access to Amazon Web Services and your account resources. IAM can also keep your account credentials private. With IAM, you can create multiple IAM users under the umbrella of your AWS account or enable temporary access through identity federation with your corporate directory. In some cases, you can also enable access to resources across AWS accounts.

Without IAM, however, you must either create multiple AWS accounts—each with its own billing and subscriptions to AWS products—or your employees must share the security credentials of a single AWS account. In addition, without IAM, you cannot control the tasks a particular user or system can do and what AWS resources they might use.

To learn more about IAM and its features, see What Is IAM? (p. 13)

This guide provides a conceptual overview of IAM, describes business use cases, and explains AWS permissions and policies.

# Using IAM to Give Users Access to Your AWS Resources

Here are the ways you can use IAM to control access to your AWS resources.

| Type of access | Why would I use it? | Where can I get more information? |
|---|---|---|
| Access for users under your AWS account | You want to add users under the umbrella of your AWS account, and you want to use IAM to create users and manage their permissions. | To learn how to use the AWS Management Console to create users and to manage their permissions under your AWS account, see Getting Started (p. 4).<br><br>To learn about using the IAM application programming interface (API) or command line interface (CLI) to create users under your AWS account, see Setting Up an Administrator's Group.<br><br>For more information about working with IAM users, see Working with Users and Groups. |
| Non-AWS user access via identity federation between your authorization system and AWS | You have non-AWS users in your identity and authorization system, and they need access to your AWS resources. | To learn how to use security tokens to give your users access to your AWS account resources through federation with your corporate directory, go to Using Temporary Security Credentials. For information about the AWS Security Token Service API, go to the AWS Security Token Service API Reference. |
| Cross-account access between AWS accounts | You want to share access to certain AWS resources with users under other AWS accounts. | To learn how to use IAM to create policies that grant permissions to other AWS accounts, and how those accounts can delegate access to your resources to their users, see Enabling Cross-Account Access. |

# Do I Need to Sign Up for IAM?

IAM is a feature of your AWS account. If you are already signed up for a product that is integrated with IAM, you don't need to do anything else to sign up for IAM, nor will you be charged extra for using it.

> **Note**
>
> IAM works only with AWS products that are integrated with IAM. For a list of such products, see Integrating with Other AWS Products.

If you don't already have an AWS account, you need to create one to use IAM. You create an AWS account when you sign up to use an AWS product for the first time.

### To sign up for AWS

1. Go to http://aws.amazon.com, and then click **Sign Up Now**.
2. Follow the on-screen instructions.

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

AWS product documentation is available at AWS Documentation.

# How Do I... ?

Here are some relevant resources to help you get things done with AWS Identity and Access Management.

| How Do I... | Relevant Resources |
|---|---|
| Learn more about the business case for AWS Identity and Access Management | Business Use Cases (p. 23) |
| Get started with IAM | Getting Started (p. 4) |
| Get the release notes | Release Notes |
| Get the FAQ | AWS Identity and Access Management FAQ |
| Learn more about how IAM works | What Is IAM? (p. 13) |
| Get developer tools | Developer Tools |
| Get the Java library | Sample Code & Libraries |
| Get technical support | AWS Support Center |
| Get premium technical support | AWS Premium Support Center |
| Get community support | IAM Discussion Forums |
| Contact AWS | Contact Us |

For definitions of AWS terms, go to the Amazon Web Services Glossary.

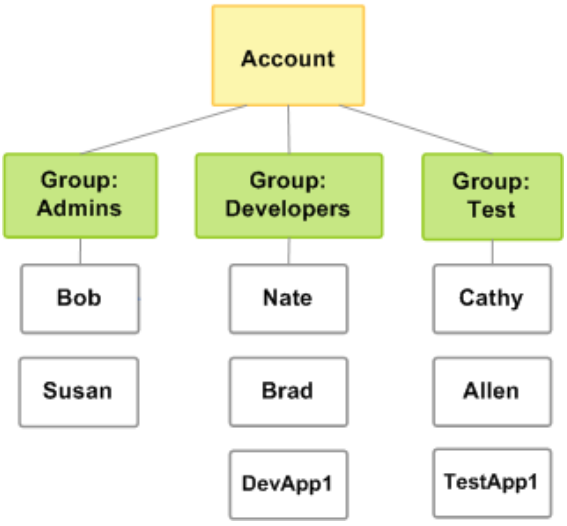
# Getting Started

**Topics**



This topic shows you how to give access to your AWS resources by creating users under your AWS account. First you'll learn concepts you should understand before you create groups and users, and then you'll walk through how to perform the necessary tasks using the AWS Management Console. The first task is to set up an administrators group for your AWS account. Having an administrators group for your AWS account isn't required, but we strongly recommend it.

The following figure shows a simple example of an AWS account with three groups. A group is a collection of users who have similar responsibilities. In this example, one group is for administrators (it's called *Admins*). There's also a *Developers* group and a *Test* group. Each group has multiple users. Each user can be in more than one group, although the figure doesn't illustrate that. You can't put groups inside other groups. You use policies to grant permissions to groups.




In the procedure that follows, you will perform the following tasks:

- Create an Admins group
- Create the policy controlling permissions for the group
- Create or add the users who will be in the Admins group
- Create access keys for users who need them
- Create passwords for users who need them

You will grant the Admins group permission to access all your available AWS account resources. Available resources are any AWS products you use, or that you are signed up for. Users cannot access your AWS account information, including the following:

- Account profile information
- Billing and metering information
- Security credentials

**Tip**

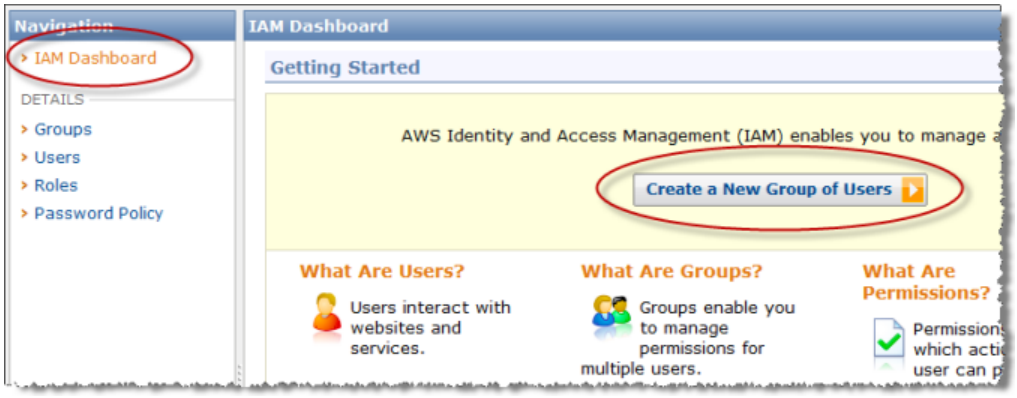
You should create a user for yourself and add it to your Admins group. Then, after you establish the Admins group and yourself as a user in the group, all interaction with your AWS account should be at the user level, not at the AWS account level. Limiting the use of your AWS account credentials will help ensure that when you want to rotate credentials for a user or for the AWS account, potential impact is limited. For more information about the credentials and the security benefits of rotating credentials, go to Managing User Keys and Certificates in *Using AWS Identity and Access Management*.

# Creating an Admins Group

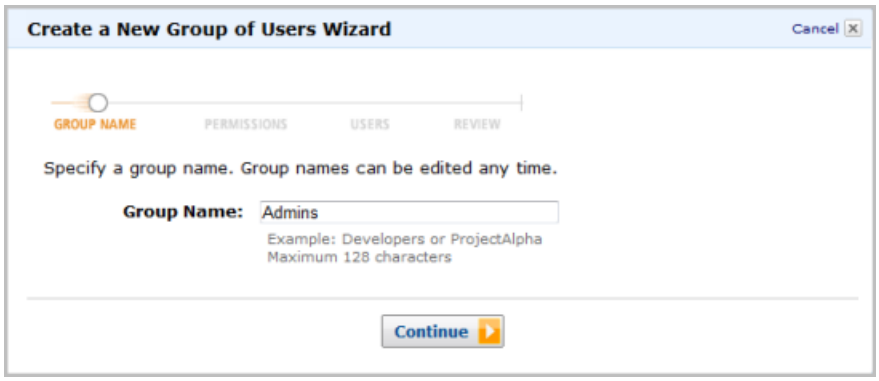
This procedure describes how to create an Admins group and grant the group the necessary permissions to access your AWS resources.

### To create the Admins group

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. From the **IAM Dashboard**, click **Create a New Group of Users**.



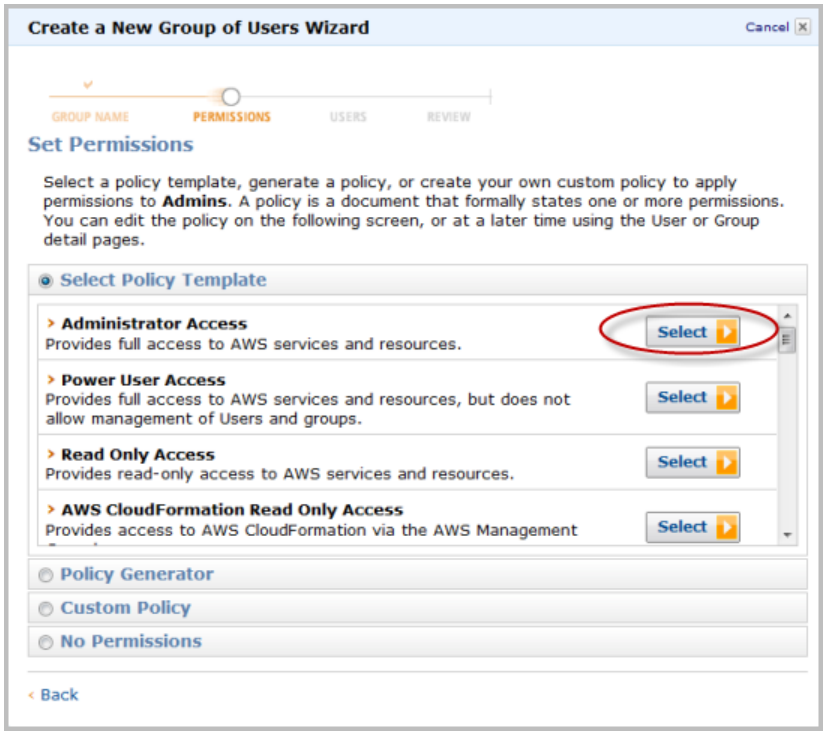

3. Name the group *Admins*, and then click **Continue**.




**Note**

You can use only certain characters to name a group. For information about limitations on group names, see Limitations on IAM Entities in *Using AWS Identity and Access Management*.

4. Next, you need to use a policy to assign permissions to your Admins group. A policy is a document that formally states one or more permissions. To select a policy template, next to **Administrator Access**, click **Select**.




IAM provides several policy templates you can use to automatically assign permissions to the groups you create. The Administrator Access policy template gives the Admins group permission to access all account resources, *except* your AWS account information as described previously.

5. Next, you can optionally edit the policy and the policy name. If you used a policy template, the default policy name includes the template name and today's date. If you want to make any changes to the policy before you apply it to the group, you can use the **Edit Permissions** screen to edit the policy. If you don't want to edit the policy, or if you are finished making edits, click **Continue**. (Policies are described in detail in Permissions and Policies in *Using AWS Identity and Access Management*.)


Your Admins group has permissions; now it needs one or more users.

6. Add yourself as an administrator for your AWS account. Also add any other users you want to be administrators for your AWS account.

   a. To add yourself as a user to your Admins group, select the **Create New Users** tab and enter the user name you want to assign to yourself.


   b. Use the same process to create new users or add existing users to the Admins group.

   c. If you want to automatically generate security credentials for your new users, on the **Create New Users** tab, make sure that **Generate an access key for each user** is selected. Users

need security credentials if they will be working with an AWS API. For information about creating security credentials for existing users, go to Managing User Keys and Certificates in *Using AWS Identity and Access Management*.

**Note**

If you have users who will be working with the AWS Management Console, you will need to create passwords for each of them. Creating passwords is described later in this procedure.

**Note**

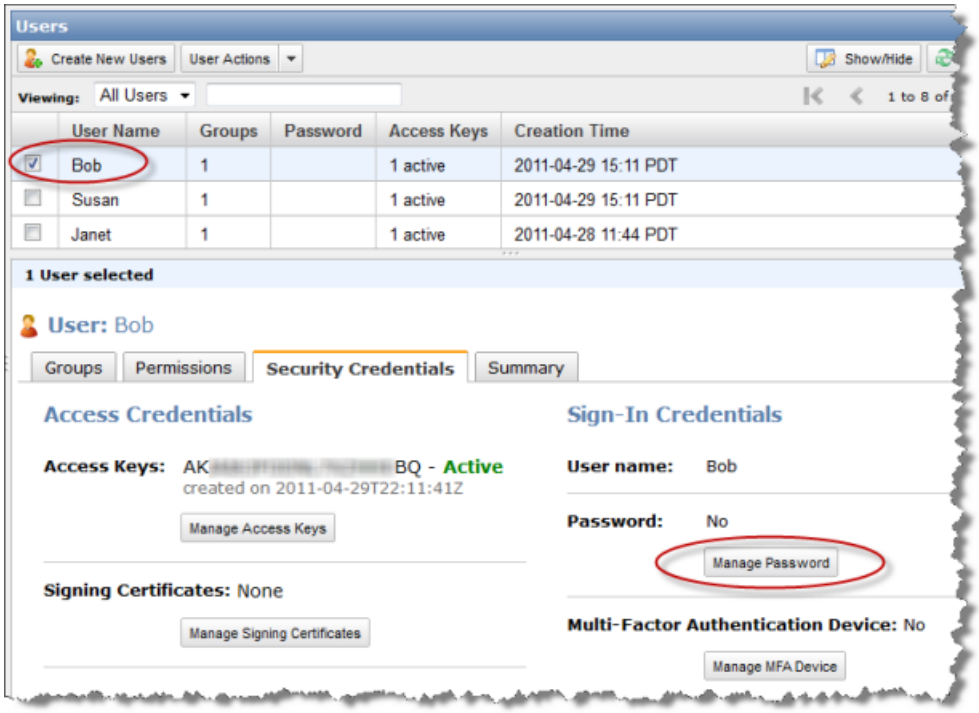
You can edit user properties later, but you cannot use the console to change the user name. For information about editing user properties, go to Working with Users and Groups in *Using AWS Identity and Access Management*. For information on limitations on user names, see Limitations on IAM Entities in *Using AWS Identity and Access Management*.

d. When you are finished adding users to this group, click **Continue**.

7. Review the group details on the confirmation screen, and then click **Finish**.
8. If you chose to create security credentials for the users, click **Download Credentials** to save the Access Key IDs and Secret Access Keys to a .csv file on your computer. You will need to provide each user with their Access Key ID and Secret Access Key before they can begin using an AWS API. For security reasons, you cannot retrieve the Secret Access Key after this step.

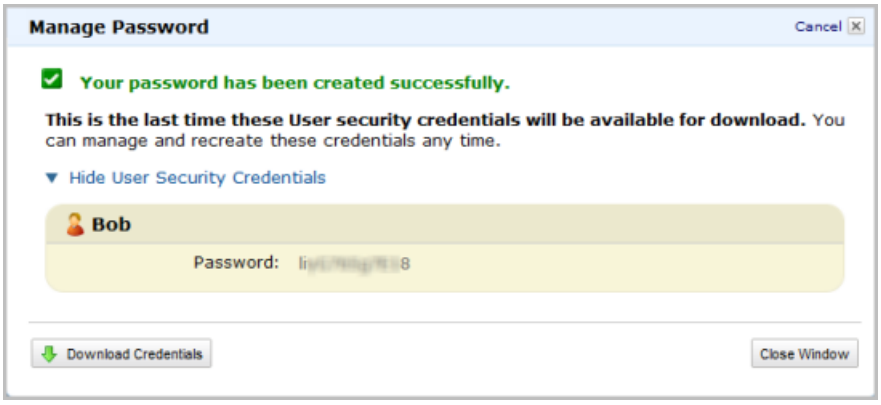

9. When you are finished downloading your users' security credentials, click **Close Window** to continue. Now you are now ready to add passwords for your users.
10. Users who will access the AWS Management Console will need a password. To add a password for a user

    a. On the **Navigation** pane, click **Users**.
    b. Select the user who you want to create a password for, and then select the user **Security Credentials** tab.
    c. Click **Manage Password**.




d. You can create a custom password, or you can have IAM automatically generate a password.

- To create a custom password, select **Assign a custom password**, and then enter and confirm the password. When you are finished, click **Apply**. The selected user can begin using the password. For information about how users access your sign-in page, see The AWS Management Console Sign-in Page in *Using AWS Identity and Access Management*.
- To have IAM generate a password, select **Assign an auto-generated password**, and then click **Apply**. Click **Download Credentials** to save the password as a .csv file to your computer. You will need to provide this password to the user, and you will not be able to access the password after completing this step. Click **Close Window** to continue. For more information, see What Your Users Need to Know (p. 10).




Congratulations, you have created an Admins group, added permissions for the group, and added users to the group. You can use the same process to create more groups and users, and to give

your users access to your AWS account resources. To learn about using policies to restrict user access to specific AWS resources, go to Integrating with Other AWS Products in *Using AWS Identity and Access Management*.

Continue to What Your Users Need to Know (p. 10)

# What Your Users Need to Know

When you are finished creating groups, assigning permissions, and adding users, you need to provide each user with the following information:

- The user name
- The password (if you created one for the user)
- The Access Key ID and Secret Access Key (if you created these for the user)
- The AWS account sign-in page URL (if the user will be accessing your account through the AWS Management Console)

Your AWS account sign-in page URL is displayed on the IAM Dashboard under **AWS Account Alias**. For information about creating an account alias for the URL, go to Using an Alias for Your AWS Account ID in *Using AWS Identity and Access Management*.


Continue to Where to Go Next (p. 10)

# Where to Go Next

**Topics**



The Getting Started shows you how to use AWS Identity and Access Management to create groups and users within your AWS account, but IAM also enables you to do many tasks not covered there. This section provides links to additional resources that will help you deepen your understanding of permissions and how to use IAM with other AWS products to control users' access.

# Learn More About IAM

To learn more about IAM, read the following sections:

- Business Use Cases describes how you might use IAM with other AWS products.
- Working with Users and Groups has important details you need to know about managing users and groups in your AWS account.
- Integrating with Other AWS Products links to information about how IAM works with other AWS products (for example, Amazon EC2, Amazon S3, etc.), and what you can do to control your users' access to specific AWS products and resources.
- *Friendly Names and Paths* in Identifiers for IAM Entities explains how to use *paths* to logically separate groups and users based on organizational structure.

# Learn About Policies and Permissions

To learn more about IAM policies and permissions, refer to the following resources:

- Permissions and Policies describes permissions, policies, and the access policy language you use to write policies.
- Example Policies for IAM Entities provides examples of policies that control access for your IAM resources.
- The AWS Policy Generator is a tool you can use to generate AWS policies automatically.

# Other Ways to Access IAM

This guide has shown you how to create users and groups using the AWS Management Console. You can continue using IAM through the console, or you can try one of the other interfaces.

## Use the Command Line Interface to Issue Commands

If you want to issue commands with the IAM command line interface (CLI), go to the AWS Identity and Access Management Command Line Interface Reference. The guide describes how to set up and use the IAM CLI, describes the commands, and lists available commands by function.

## Use an Existing Library

AWS offers SDKs that let you access IAM programmatically to create groups, users, and so on. The following SDKs are available:

- AWS SDK for Java
- AWS SDK for PHP
- AWS SDK for .NET

## Code Directly to the Web Service API

If you want to write code directly to the IAM Query API, go to AWS Identity and Access Management API Reference. The guide describes how to create and authenticate API requests. Making Query Requests describes the basics about using the Query API.

# IAM Resources

The following table lists related resources that you'll find useful as you work with this service.

| Resource | Description |
|---|---|
| Using AWS Identity and Access Management | Describes how to use the service and all its features through the AWS Management Console, the CLI, or API. |
| AWS Identity and Access Management Command Line Interface Reference | Gives complete descriptions of the commands in the CLI. |
| AWS Identity and Access Management API Reference | Gives the WSDL and schema location; complete descriptions of the API actions, parameters, and data types; and a list of errors that the service returns. |
| AWS Identity and Access Management Quick Reference Card | Gives a concise listing of the commands you use with the CLI. |
| Product Information for IAM | The primary web page for information about IAM. |
| IAM Release Notes | The release notes give a high-level overview of the current release. They specifically note any new features, corrections, and known issues. |
| AWS Developer Resource Center | A central starting point to find documentation, code samples, release notes, and other information to help you build innovative applications with AWS. |
| IAM Discussion Forum | A community-based forum for developers to discuss technical questions related to IAM. |
| AWS Support Center | The home page for AWS Technical Support, including access to AWS developer forums, technical FAQs, service health dashboard, and premium support (if you are subscribed to this program). |
| AWS Premium Support Information | The primary web page for information about AWS Premium Support, a one-on-one, fast-response support channel to help you build and run applications on AWS Infrastructure Services. |
| Contact Us | A central contact point for inquiries concerning AWS billing, your AWS account, events, abuse, etc. |
| Conditions of Use | Detailed information about copyright and trademark usage at Amazon.com and other topics. |

# Introduction to IAM

**Topics**



This section provides an introduction to IAM.

## What Is IAM?

**Topics**



AWS Identity and Access Management is a web service that enables Amazon Web Services (AWS) customers to manage users and user permissions in AWS. The service is targeted at organizations with multiple users or systems that use AWS products such as Amazon EC2, Amazon SimpleDB, and the AWS Management Console. With IAM, you can centrally manage users, security credentials such as access keys, and permissions that control which AWS resources users can access.

Without IAM, organizations with multiple users and systems must either create multiple AWS accounts, each with its own billing and subscriptions to AWS products, or employees must all share the security credentials of a single AWS account. Also, without IAM, you have no control over the tasks a particular user or system can do and what AWS resources they might use.

IAM addresses this issue by enabling organizations to create multiple *users* (each user is a person, system, or application) who can use AWS products, each with individual security credentials, all controlled by and billed to a single AWS account. With IAM, each user is allowed to do only what they *need* to do as part of the user's job.

# Features of IAM

IAM includes the following features:

- **Central control of users and security credentials—**You can control creation, rotation, and revocation of each user's AWS security credentials (such as access keys)
- **Central control of user access—**You can control what data in the AWS system users can access and how they access it
- **Shared AWS resources—**Users can share data for collaborative projects
- **Permissions based on organizational groups—**You can restrict users' AWS access based on their job duties (for example, admin, developer, etc.) or departments. When users move inside the organization, you can easily update their AWS access to reflect the change in their role
- **Central control of AWS resources—**Your organization maintains central control of the AWS data the users create, with no breaks in continuity or lost data as users move around within or leave the organization
- **Control over resource creation—**You can help make sure that users create AWS data only in sanctioned places
- **Networking controls—**You can help make sure that users can access AWS resources only from within the organization's corporate network, using SSL
- **Single AWS bill—**Your organization's AWS account gets a single AWS bill for all your users' AWS activity

# Supported AWS Products

IAM is integrated with many AWS products. For information about which products are integrated with IAM, see Integrating with Other AWS Products (p. 169). As AWS products integrate with IAM, they will be added to the list on that page.

> **Important**
>
> If you're an existing AWS account owner, you should know that the APIs for these products do not change because of their integration with IAM. Products that integrate with IAM have no new API actions related to access control.

If the users in your AWS account make API calls to any AWS products other than those that are integrated with IAM, they'll get an error. However, the AWS account itself (the umbrella entity above all the users) can call any AWS product the AWS account is signed up for.

Regarding IAM and Amazon DevPay:

- Users in your AWS account can't create or sign up for products that use Amazon DevPay; only the AWS account can
- If your AWS account purchases an Amazon EC2 paid Amazon Machine Image (AMI), the AWS account's users can launch and use instances of the AMI (assuming they have an IAM policy giving them permission to use the necessary Amazon EC2 actions)
- If your AWS account purchases an Amazon S3 product that uses Amazon DevPay, the AWS account's users can't use the product; only the AWS account can

# Migration to IAM

If your organization already uses AWS, migrating to IAM can be easy or potentially more challenging, depending on how your organization currently allocates its AWS resources. Here are the three scenarios.

1. **Your organization has just a single AWS account.** In this case, you can easily migrate to using IAM, because all the organization's AWS resources are already together under a single AWS account.
2. **Your organization has multiple AWS accounts, with each AWS account belonging to a division in the organization.** If these divisions don't need to share resources or users, then migrating is easy. Each division can keep its own AWS account and use IAM separately from the other divisions. You could also use Consolidated Billing, which would allow your organization to get a single bill across the AWS accounts (see IAM and Consolidated Billing (p. 15)).
3. **Your organization has multiple AWS accounts that don't represent logical boundaries between divisions.** If you need the AWS accounts to share their resources and have common users, migrating to IAM will be more of a challenge. You will need to move the resources that need to be shared so they're under the ownership of a single AWS account. However, there's no automatic way to transfer the AWS resources from one AWS account to another. You need to create those resources again under the single AWS account.

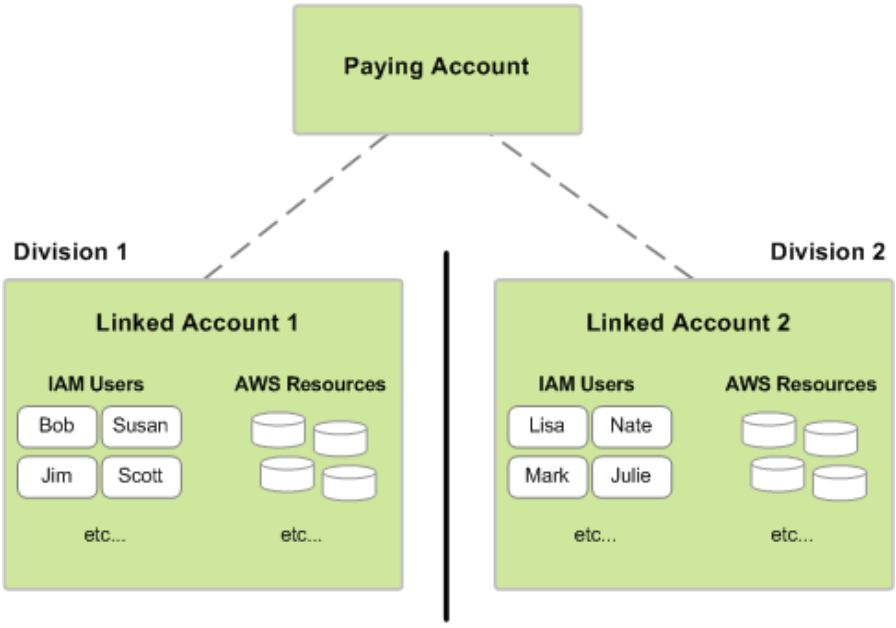
## No Change to Basic AWS Account Functions

There's no change to how an AWS account functions in terms of its login/password, security credentials, payment method, AWS account activity page, usage report, and so on. At this time, the AWS account activity page does not show a breakdown by user.

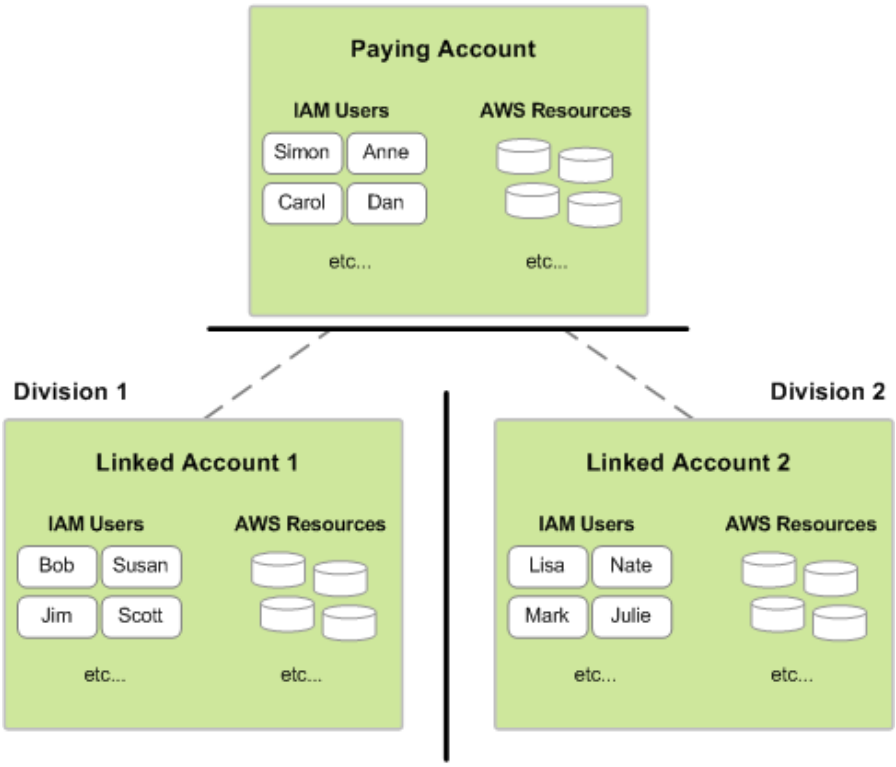
# IAM and Consolidated Billing

AWS offers a billing feature called *Consolidated Billing* that is complementary to IAM. Consolidated Billing lets you receive a single bill for multiple AWS accounts. (For more information, go to the AWS Consolidated Billing Guide.) Compare this to IAM, which gives you a single bill across all the *users* in an AWS account.

Your organization could use both Consolidated Billing and IAM together. You might do this if your organization has multiple large divisions, and you want to isolate the users and AWS resources in each division from the other divisions. You could have a separate AWS account for each division, and use IAM in each division to create users and control their access to the division's AWS resources. You could then use Consolidated Billing to get a single bill across all the AWS accounts. The following diagram illustrates the concept.




With Consolidated Billing, one AWS account becomes the *paying account*, and pays for its own charges plus the charges of any *linked AWS accounts*. Each linked AWS account doesn't need to maintain a payment method with AWS, only the paying account does. Each month, AWS charges the paying account only. The paying account still functions like a normal AWS account; it could have its own users and AWS resources. Just as with the other AWS accounts, the users and resources in the paying account are isolated from the users and resources in the divisions' AWS accounts. The following diagram shows the paying account with its own users and AWS resources.




# IAM Concepts

**Topics**



To help you understand IAM, we recommend you think about it in two parts:

- The basic *entities* that comprise your AWS account (such as users and groups)
- The *permissions* you grant to the entities in your AWS account

## Concepts Related to AWS Account Entities

This section describes the basic entities in your AWS account and how they fit together. They're presented in a logical order, with the first items you need to know at the start of the list.

### AWS Account

**Tip**

If you're already an AWS customer, you're probably already familiar with AWS accounts and their characteristics. With IAM, an AWS account remains essentially the same, except the account can now have *users* under its umbrella.

An *AWS account* is the first entity you create when initiating a relationship with AWS. The AWS account centrally controls all the resources created under its umbrella and pays for all AWS activity for those resources.

Any permissions created for users or groups within the AWS account don't apply to the AWS account itself. The AWS account has permission to do anything and everything with all the AWS account resources. In this way, the AWS account is similar in concept to the UNIX *root* or *superuser*.

The AWS account has its own set of security credentials that can be used to interact with AWS programmatically. The AWS account also has an email address login and password, giving it access to the AWS Management Console and to the secure pages on the AWS website. The secure pages display the AWS account's security credentials and payment method, among other data.

**Note**

To help keep that sensitive information secure, we recommend that you use Multi-Factor Authentication (MFA) with your AWS account's email login and password. For detailed information about AWS MFA, see the AWS Multi-Factor Authentication FAQs. For information about using MFA with IAM, see Using Multi-Factor Authentication (MFA) Devices with AWS (p. 99).

Ideally, someone in your organization uses the AWS account credentials to set up an administrator group for the AWS account. The group has admin users responsible for all subsequent management of users and permissions. After setting up the admins group, your organization would no longer use the AWS account credentials, and only users (with their own credentials) would interact with AWS from then on.

**Note**

If your users need to interact with an AWS product that doesn't integrate with IAM, then they must use the AWS account's credentials. For a list of AWS products that integrate with IAM, see Supported AWS Products (p. 14).

Before using IAM, your organization might have had a single AWS account for all the employees, or the organization might have given each division or each employee a separate AWS account. With IAM, your organization will probably have one or only a few AWS accounts, but many users. The organization won't need to have an individual AWS account per employee. If your organization already has an AWS account, you don't need to get a new or different one for your organization to use IAM. In fact, we recommend you keep the existing one for your organization when you begin to use IAM, because any AWS resources that your organization has already created can't be moved to a different AWS account.

## User

A *user* is an individual, system, or application that interacts with AWS programmatically. Each user has a unique name within the AWS account, and a set of *security credentials* not shared with other users. These credentials are separate from the AWS account's security credentials. Each user is associated with one and only one AWS account. Users don't need to sign up for AWS products (such as Amazon EC2), nor do they need to have a payment method on file with AWS. The AWS account is the entity that is subscribed to AWS products and pays for the users' activity with AWS.

Users are the primary actors who interact with AWS. They can use the AWS Management Console, an API, or a command line interface (if the AWS product provides one). Authentication happens at the user level by means of the user's login and password (for the AWS Management Console), or the user's security credentials (for the API or command line interface). Users access the AWS Management Console via a link to your AWS account sign-in page that you provide to them. (For more information on your AWS account sign-in page, see The AWS Management Console Sign-in Page (p. 164).)

By default, newly created users have no password, no security credentials, and no *permissions* to do anything. The AWS account owner (or any user with the authority, such as an administrator) must provide each user with what they need.

There's a limit to the number of users you can have. For more information, see Limitations on IAM Entities (p. 56).

For more information about creating users, see Adding a New User to Your AWS Account (p. 65).

## Group

A *group* is a collection of users. Groups don't directly interact with AWS; only users do. The main reason to create groups is to collectively assign permissions to the users so they can do their jobs. For example, you could have a group called *Admins* and give that group the types of permissions admins typically need.

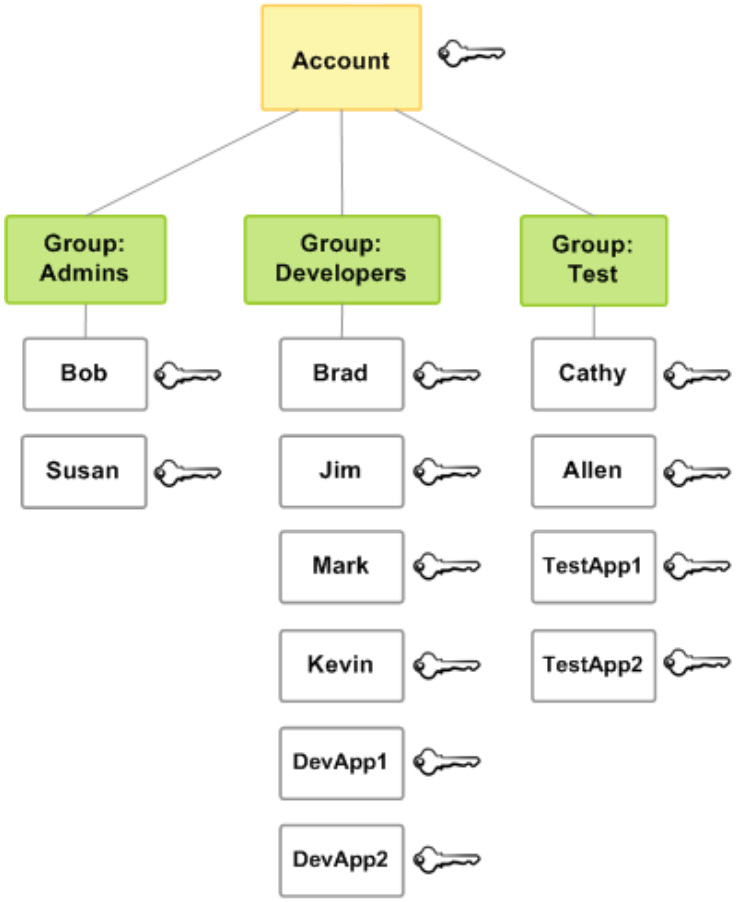
Following are some important characteristics of groups:

- A group can contain many users, and a user can belong to multiple groups.
- Groups can't be nested; they can contain only users.
- There's no default group that automatically includes all users in the AWS account. If you'd like to have a group like that, you need to create it yourself and assign each new user to it.
- There's a limit to the number of groups you can have, and a limit to how many groups a user can be in. For more information, see Limitations on IAM Entities (p. 56).

For more information about creating and managing groups, see Working with Users and Groups (p. 65).

### Example

The following diagram shows a simple example of a small company. The company owner uses the AWS account credentials to create an Admins group that can create and manage the users as the company grows. The Admins group establishes a Development group and a Test group. Each of these two groups consists of users (humans and applications) that interact with AWS (Jim, Brad, DevApp1, and so on). Each user has an individual set of security credentials. In this example, each user belongs to a single group. However, users can belong to multiple groups.




## Role

A *role* is an entity that has a set of permissions, and that another entity assumes to make calls to access your AWS resources. The entity who assumes the role uses temporary security credentials to make calls. For more information about roles and how they differ from users or groups, see Working with Roles (p. 129).

## Security Credentials

Any person or application making API calls to AWS needs *security credentials*. The entity making the call can be the AWS account, a user, a role. AWS uses these credentials to identify who is making the call and whether to allow the requested access.

The basic credentials consist of a *Secret Access Key*, and a corresponding *Access Key ID*. The requester signs each request with the Secret Access Key and includes the Access Key ID in the request. How this works for a given AWS product is covered in the product's technical documentation.

### AWS Account Credentials

As mentioned elsewhere, when you create an AWS account, AWS gives the AWS account its own Secret Access Key and Access Key ID by default. The AWS account can make API calls to AWS with them. We expect that you won't use those credentials on a regular basis, but will use them only to initially set up an administrators group for your organization. We recommend that all further API interaction between

your AWS account and your AWS resources be at the user level (for example, using users' security credentials).

To get your AWS account's Secret Access Key and Access Key ID, go to http://aws.amazon.com/security-credentials and sign in with your AWS account's login and password.

**Note**

To help control who has access to the AWS account's Secret Access Key, we recommend that you use Multi-Factor Authentication (MFA) with your AWS account's login and password. For detailed information about AWS MFA, see the AWS Multi-Factor Authentication FAQs. For information about using MFA with IAM, see Using Multi-Factor Authentication (MFA) Devices with AWS (p. 99).

## User Credentials

By default, a user has no security credentials. You create security credentials for your users as needed. The type of credentials a user needs depends on how the user will access AWS.

### Secret Access Keys and Access Key IDs

To make API calls or to work with the command line interface, the user needs a Secret Access Key and Access Key ID. The IAM API and command line interface provide actions that create these for a user. You can give your users permission to create and manage their own credentials if you like, or you can have an administrators group in your organization handle this. For more information about creating keys for a user, see Adding a New User to Your AWS Account (p. 65).

### X.509 Certificates

Another type of credential a user might have is an *X.509 certificate* (referred to here as a *signing certificate*) and corresponding *certificate ID*. Some AWS products use this instead of a Secret Access Key for access to certain interfaces. For example, Amazon EC2 uses a Secret Access Key for access to its Query interface, but it uses a signing certificate for access to its SOAP interface and command line tool interface.

Although you can use IAM to create an access key, you can't use IAM to create a signing certificate. However, you can use free third-party tools such as OpenSSL to create the certificate. (For information about OpenSSL, go to http://www.openssl.org/.) After you have the signing certificate, you must upload it to IAM; the user needs to keep the corresponding private key to use for signing requests. You can use IAM to upload the certificate. For more information about using signing certificates, see Managing User Keys and Certificates (p. 117).

**Important**

For security purposes, we recommend that you rotate your users' credentials on a regular basis. A user can have multiple access keys or signing certificates at a given time for this purpose. For more information, see Rotating Credentials (p. 127).

### Passwords

A password enables a user to sign in to the AWS Management Console. You need to create a password for each user who needs to use the AWS Management Console. For more information about managing passwords, see Managing Passwords (p. 88).

## Multi-Factor Authentication for Users

AWS offers Multi-Factor Authentication (MFA). MFA is an optional feature that requires the user to possess an authentication device and provide a randomly generated, six-digit code from the device in addition to the standard security credentials. For detailed information about AWS MFA, see the AWS Multi-Factor Authentication FAQs.

Your users can use MFA in these situations:

- When logging in to the AWS Management Console
- When requesting secure API actions

An example of a secure API action is the Amazon S3 action for deleting versioned objects. You can configure Amazon S3 versioning to require the requester to provide an MFA code in order to delete a versioned object. If you do, and you give a particular user permission to delete versioned objects, the user must provide an MFA code in the API call.

You can use IAM to enable an MFA device for a user. You can also use IAM to resynchronize the device, delete it, and list (discover) a user's MFA device. For information about using MFA devices, see Using Multi-Factor Authentication (MFA) Devices with AWS (p. 99).

# Concepts Related to Permissions

This section summarizes the basic concepts related to permissions. For a more detailed discussion of these concepts, see Permissions and Policies (p. 26).

## Resource

A *resource* is an entity in an AWS service that a user can interact with, such as an Amazon S3 bucket or object, an Amazon SQS queue, and so on.

Resources typically have a friendly name (such as example_bucket), and then an *Amazon Resource Name (ARN)*, which uses a standardized format and uniquely identifies the resource in AWS. For more information about ARNs, see Identifiers for IAM Entities (p. 52).

## Permission

A *permission* is the concept of allowing (or disallowing) an entity such as a user, group, or role some type of access to one or more resources. For example, Bob has permission to read and write objects to a particular Amazon S3 bucket named example_bucket.

There are two general types or permissions you might use within AWS: *user-based* and *resource-based*. The easiest way to understand the difference is to think of the question each type of permission answers:

- **User-based—**What does a particular entity have access to?
  For example, Bob might have permission to use the Amazon EC2 `RunInstance` action with any of the AWS account's resources, permission to use any Amazon SimpleDB actions with any of the AWS account's domains that start with the string `bob`, and permission to use any of the IAM actions with his own security credentials.
- **Resource-based—**Who has access to a particular resource?
  For example, the example_bucket resource might have a permission that states that Bob, Susan, and DevApp1 have read, write, and list permission.

For more information about permissions, see Overview of Permissions (p. 26).

## Policy

A *policy* is a document that provides a formal statement of one or more permissions. With IAM, you can assign a policy to an entity, permissions stated in the policy. You can assign multiple policies to an entity. If you want to assign the same policy to multiple users, we recommend you put the users in a group and assign the policy to the group.

For more information about policies, see Overview of Policies (p. 28) and Managing IAM Policies (p. 147).

## Other Permissions Systems

IAM has its own permissions system that you use to give entities the ability to do tasks with IAM resources in the AWS account.

IAM also integrates with individual AWS products so you can control an entity's access to those products' resources. Some of the AWS products that IAM integrates with have their own resource-based permissions systems for giving access to specific resources. How IAM works with the different permissions systems is covered elsewhere in this guide. For more information, see the product-specific sections described in Integrating with Other AWS Products (p. 169).

# Business Use Cases

**Topics**



This section describes a simple business use case for IAM to help you understand basic ways you might implement the service to control the AWS access your users have. The use case is described at a high level, without the mechanics of how you'd use the IAM API to achieve the results you want.

The use case centers on a fictional company called Example Corp. After setting up an AWS account for Example Corp., we show two typical examples of how the company might use IAM—first, with Amazon Elastic Compute Cloud (Amazon EC2), and then with Amazon Simple Storage Service (Amazon S3).

For more information about using IAM with other AWS products, including how to implement individual APIs, see Integrating with Other AWS Products (p. 169).

# Initial Setup of Example Corp.

Joe is the founder of Example Corp. Upon starting the company, he creates his own AWS account and he uses AWS products by himself. Then he hires employees to work as developers, admins, testers, managers, and system administrators.

Joe uses the IAM API with the AWS account's security credentials to create a user for himself called Joe, and a group called *Admins*. He gives the Admins group the permissions it needs to administer users, groups, and permissions for the AWS account, and he gives the Admins group permissions to perform all actions on all the AWS account's resources (for example, root privileges).

Joe then assigns himself (as Joe the user) to the Admins group. At this point, he stops using the AWS account's credentials to interact with AWS, and instead he begins using his user credentials.

Joe also creates a group called *AllUsers* so he can easily apply any account-wide permissions to all users in the AWS account. He adds himself to the group. He then creates a group called *Developers*, a group called *Testers*, a group called *Managers*, and a group called *SysAdmins*. He creates users for each of his employees, and puts the users in their respective groups. He also adds them all to the AllUsers group.

For information about how to set up an Admins group, see Setting Up an Administrators Group (p. 59). For information about creating users, see Adding a New User to Your AWS Account (p. 65).

# Use Case for IAM with Amazon EC2

This use case illustrates how Example Corp. uses IAM with Amazon EC2. To understand this part of the use case, you need to have a basic understanding of Amazon EC2. For more information about Amazon EC2, go to the Amazon Elastic Compute Cloud User Guide.

## Amazon EC2 Permissions for the Groups

To provide "perimeter" control, Joe adds a policy to the AllUsers group that denies any AWS request from a user if the originating IP address is outside the Example Corp.'s corporate network.

At Example Corp., different groups require different permissions:

- **System Administrators** - Need permission to create and manage AMIs, instances, snapshots, volumes, security groups, and so on. Joe adds a policy to the SysAdmins group that gives members of the group permission to use all the EC2 actions.
- **Developers** - Need the ability to work with instances only. Joe therefore adds a policy to the Developers group that allows developers to call `DescribeInstances`, `RunInstances`, `StopInstances`, `StartInstances`, and `TerminateInstances`. Amazon EC2 currently doesn't support IAM policies that restrict access to a particular AMI, volume, instance, etc., so Example Corp. can control only which Amazon EC2 APIs the developers can call.

  **Note**

  Amazon EC2 uses SSH keys, Windows passwords, and security groups to control who has access to specific Amazon EC2 instances. There's no method in the IAM system to allow or deny access to a specific instance.
- **Managers** - Should not be able to perform any EC2 actions except listing the Amazon EC2 resources currently available. Therefore, Joe adds a policy to the Managers group that only lets them call EC2 "Describe" APIs.

For examples of what these policies might look like, see Example Policies for IAM Entities (p. 153) and Using AWS Identity and Access Management in the *Amazon Elastic Compute Cloud User Guide*.

## User's Role Change

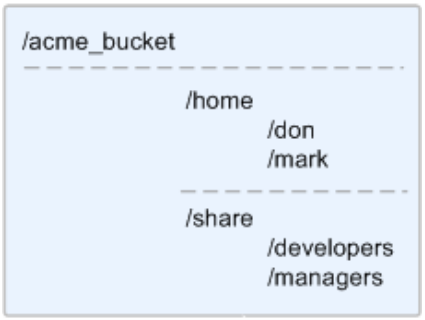
At some point, one of the developers, Don, changes roles and becomes a manager. Joe moves Don from the Developers group to the Managers group. Now that he's in the Managers group, Don's ability to interact with Amazon EC2 instances is limited. He can't launch or start instances. He also can't stop or terminate existing instances, even if he was the user who launched or started the instance. He can list only the instances that Example Corp. users have launched.

# Use Case for IAM with Amazon S3

This use case illustrates how Example Corp. uses IAM with Amazon S3. Joe has created an Amazon S3 bucket for the company called *example_bucket*.

## Creation of Other Users and Groups

As employees, Don and Mark each need to be able to create their own data in the company's bucket, as well as read and write shared data that all developers will work on. To enable this, Joe logically arranges the data in example_bucket using an Amazon S3 key prefix scheme as shown in the following figure.




Joe divides the master /example_bucket into a set of home directories for each employee, and a shared area for groups of developers and managers.

Now Joe creates a set of policies to assign permissions to the users and groups:

- **Home directory access for Don:** Joe assigns a policy to Don that lets him read, write, and list any objects with the Amazon S3 key prefix /example_bucket/home/don/
- **Home directory access for Mark:** Joe assigns a policy to Mark that lets him read, write, and list any objects with the Amazon S3 key prefix /example_bucket/home/mark/
- **Shared directory access for the Developers group:** Joe assigns a policy to the group that lets developers read, write, and list any objects in /example_bucket/share/developers/
- **Shared directory access for the Managers group:** Joe assigns a policy to the group that lets managers read, write, and list objects in /example_bucket/share/managers/

> **Note**
>
> Amazon S3 doesn't automatically give a user who creates a bucket or object permission to perform other actions on that bucket or object. Therefore, in your IAM policies, you must explicitly give users permission to use the Amazon S3 resources they create.

The preceding set of policies clearly defines the actions and resources available IAM bucket policies or bucket Access Control Lists (ACLs) when anyone in the company attempts to work on data in the corporate space. For examples of what these policies might look like, see Access Control in the *Amazon Simple Storage Service Developer Guide*. For information on how policies are evaluated at run time, see Evaluation Logic.

## User's Role Change

At some point, one of the developers, Don, changes roles and becomes a manager. We'll assume he no longer needs access to the documents in the share/developers directory. Joe, as an admin, moves Don to the Managers group and out of the Developers group. With just that simple reassignment, Don automatically gets all permissions granted to the Managers group, but can no longer access data in the share/developers directory.

## Integration with a Third-Party Business

Organizations often work with partner companies, consultants, and contractors. Example Corp. has a partner called the Widget Company, and a Widget Company employee named Nate needs to put data into a bucket for Example Corp.'s use. Joe creates a group called WidgetCo and a user named Nate and adds Nate to the WidgetCo group. Joe also creates a special bucket called example_partner_bucket for Nate to use.

Joe updates existing policies or adds new ones to accommodate the partner Widget Company. For example, Joe can create a new policy that denies members of the WidgetCo group the ability to use any actions other than write. This policy would be necessary only if there's a broad policy that gives all users access to a wide set of Amazon S3 actions.

# Permissions and Policies

**Topics**



This section describes permissions, policies, and the access policy language you use to write policies.

## Overview of Permissions

**Topics**



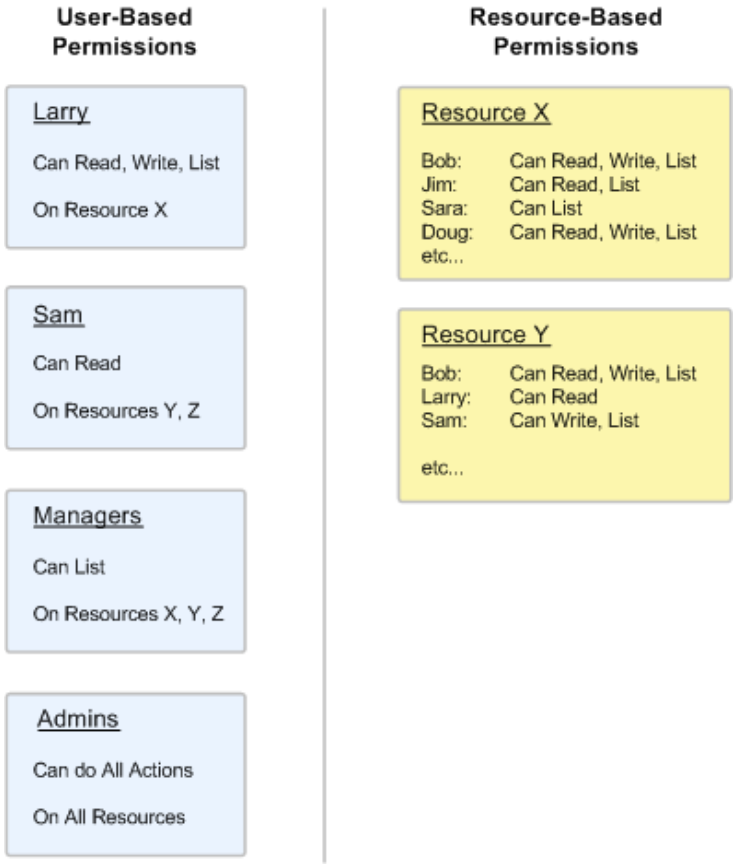
A *permission* is a general term we use to mean the ability to perform an action against a resource. For example, you might have permission to read but not write data in an Amazon SimpleDB domain.

### Types of Permissions

There are two general types of permissions we talk about in this guide: *user-based* and *resource-based*. With IAM, you work entirely with user-based permissions; whereas with Amazon S3 and other products, you work with resource-based permissions only. The permissions answer different questions, which are outlined in the following table.

| Question It Answers | Permission Type | Example |
|---|---|---|
| What does a particular entity (user, group, or role) have access to? | User-based | IAM policy for the user Bob, stating that he has permission to use the Amazon EC2 `RunInstance` action with any of the AWS account's resources, permission to use any Amazon SimpleDB actions with any of the AWS account's domains that start with the string `bob`, and permission to use any of the IAM actions with his own security credentials.<br>The policy resides in the IAM system with Bob. |
| Who has access to a particular resource? | Resource-based | Amazon S3 ACL on a specific bucket, stating that Bob, Susan, and DevApp1 have read, write, and list permission to that bucket.<br>The ACL resides in the Amazon S3 system with the bucket. |

The following figure illustrates the difference between the two types of permissions. Each user-based permission focuses on a specific entity; each resource-based permission focuses on a specific resource.




You can have both resource-based permissions and user-based permissions that apply to the same resource or user, even though the permissions are located in separate places (with the resource in the AWS service versus with the user in the IAM system). Both types of permissions are taken into account when AWS evaluates whether to grant a particular user access to the resource.

Every user you create in the IAM system starts with no permissions. In other words, by default, users can do nothing, not even view their own access keys. To give a user permission to do something, you can either add the permission to the user (that is, attach a policy to the user), or add the user to a group that has the desired permission. We expect that you'll typically do the latter for most permissions you want to give to a user.

For example, one type of permission you might add to a user is the ability for the user to list his or her own access keys. You could expand on that permission and also let each user create, update, and delete their own keys (for example, if you're letting users rotate their own credentials).

When you give permissions to a group, all users in that group get those permissions. For example, you can give the Admins group permission to perform any of the IAM actions on any of the AWS account resources. Another example: You can give the Managers group permission to list all the Amazon SimpleDB domains, and describe the AWS account's Amazon EC2 instances.

You can grant permissions that cover IAM resources and actions, and permissions that cover other AWS products such as Amazon SimpleDB, Amazon EC2, and so on. For more information, see Integrating with Other AWS Products (p. 169).

## No Default Permissions for Resource Creators

The AWS account (that is, someone using the AWS account's security credentials) always has the ability to use any of the API actions for any AWS products the AWS account is signed up to use. This means that when the AWS account creates a resource such as an Amazon SimpleDB domain, the AWS account can then automatically do anything with it (and no one can revoke that access). This isn't true of the users within the AWS account. Just because the user Bob is the creator of a particular domain, he doesn't automatically get full control over that domain. He can only do whatever he's been given permission to do with the domain. His permission can be revoked at any time by the AWS account or any user in the AWS account who has the permission to revoke Bob's permissions.

## User Permissions Across AWS Accounts

In most cases, a user belongs to an AWS account and works within the context of that account. However, in some cases, IAM also enables users to work *across* AWS accounts. You enable cross-account access by employing a combination of resource policies and user policies. For more information, see Enabling Cross-Account Access (p. 172).

Although IAM provides a way to share resources between some AWS accounts and resources, there are also product permissions systems in AWS that provide similar functionality (such as the Amazon S3 ACL system). Those systems still apply even when you're using IAM.

## Permissions Across Services

If an AWS product that a user wants to use automatically makes API calls to other AWS products, a user only needs permission to use the first product. For example, Auto Scaling automatically launches Amazon EC2 instances as needed for an AWS account. A user who wants to use Auto Scaling must have permission to use it, but doesn't need permission to use Amazon EC2.

# Overview of Policies

You give a permission to a user or group with a *policy*. A policy is a document that formally states one or more permissions. The distinction between a *permission* and a *policy* is important. To give a particular IAM entity a permission, you simply write a policy according to the access policy language IAM uses, then attach the policy to the entity you want it to apply to (a particular user or group in your AWS account). You don't actually specify the entity in the policy itself; the act of attaching the policy to the entity grants it the permission stated in the policy. For information about the access policy language, see The Access Policy Language (p. 29). For an example of how to attach a policy to an entity, see Adding a Policy to the Group (p. 61).

You can attach more than one policy to a particular entity. For information about the maximum number you can attach, see Limitations on IAM Entities (p. 56). If you have multiple permissions you want to grant an entity, you can put them in separate policies, or you can put them all in one policy. For more information about the structure of policies and how to write them, see The Access Policy Language (p. 29).

Each user will probably have multiple policies that apply to them (but aren't necessarily *attached* to them). For example, Bob could have policies attached to him, and other policies attached to the groups he's in. AWS evaluates all of the relevant policies at request time to determine whether Bob can perform a certain action, under what conditions, and on what resources. If there are relevant permissions that an AWS product has in its own system separate from IAM (for example, a policy in the Amazon SQS system specifying access control for the queue of interest), we also include those in the evaluation. Because of how the evaluation process is designed, there's never a conflict or uncertain result. The result is always a Boolean; access is either granted or denied. For more information about the permissions that the AWS products provide separately from IAM, see Integrating with Other AWS Products (p. 169). For more information about the evaluation logic we use, see Evaluation Logic (p. 33).

When you specify a particular resource in an IAM policy (for example, a user, an Amazon SimpleDB domain, and so on), you must use the *Amazon Resource Name (ARN)* format, which is a standardized format that AWS uses. You only need to use this format when specifying a resource *in the policy*, and not when specifying a resource in API calls. The API calls use the resource's friendly name. For example, when creating a user named Bob, you call `CreateUser` with *`UserName`*=`Bob`. For more information about the ARN format, see Identifiers for IAM Entities (p. 52).

**Note**

IAM policies control access regardless of the interface. For example, you could provide a user with a password to access the AWS Management Console, and the policies for that user (or any groups the user belongs to) would control what the user can do in the AWS Management console. Or, you could provide the user with AWS access keys for making API calls to AWS, and the policies would control what actions the user could call through a library or client that uses those access keys for authentication.

For basic example policies that cover common scenarios, see Example Policies for IAM Entities (p. 153), Integrating with Other AWS Products (p. 169), and the AWS Policy Examples page in the *AWS Sample Code & Libraries* section of the AWS website.

IAM policy templates and the policy generator are available from the IAM console of the AWS Management Console. For more information about creating policies in the console, see Managing IAM Policies (p. 147). Also, you can use the AWS Policy Generator online to create policies for AWS products without accessing the console.

# The Access Policy Language

**Topics**



To write policies for IAM, you use the *access policy language*. This section gives complete information about the access policy language, including details specific to IAM's use of the access policy language.

## Key Concepts

The following sections describe the concepts you need to understand to use the access policy language. They're presented in a logical order, with the first terms you need to know at the top of the list.

### Permission

A *permission* is the concept of allowing or disallowing some kind of access to a particular resource or action. Permissions essentially follow this form: "A is/isn't allowed to do B to C where D applies." For example, *Jane* (A) has permission to *receive messages* (B) from *Amazon SQS queue named queue12345* (C), as long as *she asks to receive them before midnight on May 30, 2010* (D). Whenever Jane sends a request to Amazon SQS to use queue12345, the service checks to see if she has permission and if the request satisfies the conditions set forth in the permission.

### Statement

A *statement* is the formal description of a single permission, written in the access policy language. You always write a statement as part of a broader container document known as a *policy* (see the next concept).

## Policy

A *policy* is a document (written in the access policy language) that acts as a container for one or more statements. For example, a policy could have two statements in it: one that states that Jane can use the Amazon SQS `SendMessage` action, and another that states that Jane can use all the Amazon S3 actions. As shown in the following figure, an equivalent scenario would be to have two policies, one containing the statement that Jane can use `SendMessage`, and another containing the statement that Jane can use all Amazon S3 actions.


AWS uses the information in the statements (whether they're contained in a single policy or multiple) to determine if someone requesting access to a resource should be granted that access. We often use the term *policy* interchangeably with *statement*, as they generally represent the same concept (an entity that represents a permission).

## Principal

The *principal* is the person or persons who receive the permission in the policy. The principal is A in the statement "A has permission to do B to C where D applies." When you write a policy specifically to grant permission to a user or group, you don't explicitly state that user or group as the principal in the policy. Instead, you attach the policy to a user or group, and the principal is therefore implied.

## Action

The *action* is the activity the principal has permission to perform. The action is B in the statement "A has permission to do B to C where D applies." Typically, the action is just the operation in the request to AWS. For example, Jane sends a request to Amazon SQS with `Action=ReceiveMessage`. You can specify one or multiple actions in a policy.

For the names of the actions you can specify in a policy, see Integrating with Other AWS Products (p. 169).

## Resource

The *resource* is the object the principal is requesting access to. The resource is C in the statement "A has permission to do B to C where D applies." You can specify one or more resources in a policy. For information about to specify a resource in a policy, see ARNs (p. 53).

## Conditions and Keys

The *conditions* are any restrictions or details about the permission. The condition is D in the statement "A has permission to do B to C where D applies." The part of the policy that specifies the conditions can be the most detailed and complex of all the parts. Typical conditions are related to:

- Date and time (e.g., the request must arrive before a specific day)
- IP address (e.g., the requester's IP address must be part of a particular CIDR range)

A *key* is the specific characteristic that is the basis for access restriction. For example, the date and time of request.

You use both *conditions* and *keys* together to express the restriction. The easiest way to understand how you actually implement a restriction is with an example: If you want to restrict access to before May 30, 2010, you use the condition called `DateLessThan`. You use the key called `aws:CurrentTime` and set it to the value `2010-05-30T00:00:00Z`. AWS defines the conditions and keys you can use. The AWS product of interest itself (e.g., Amazon SimpleDB) might also define service-specific keys. For more information about conditions, see Condition (p. 42). For more information about the available keys, see Available Keys (p. 45).

## Requester

The *requester* is the person who sends a request to an AWS service and asks for access to a particular resource. The requester sends a request to AWS that essentially says: "Will you allow me to do B to C where D applies?"

## Evaluation

*Evaluation* is the process the AWS service uses to determine if an incoming request should be denied or allowed based on the applicable policies. For information about the evaluation logic, see Evaluation Logic (p. 33).

## Effect

The *effect* is the result that you want a policy statement to return at evaluation time. You specify this value when you write the statements in a policy, and the possible values are *deny* and *allow*.

For example, you could write a policy that has a statement that *denies* all requests that come from Antarctica (effect=deny given that the request uses an IP address allocated to Antarctica). Alternately, you could write a policy that has a statement that *allows* all requests that *don't* come from Antarctica (effect=allow, given that the request doesn't come from Antarctica). Although the two statements sound like they do the same thing, in the access policy language logic, they are different. For more information, see Evaluation Logic (p. 33).

Although there are only two possible values you can specify for the effect (allow or deny), there can be three different results at policy evaluation time: *default deny*, *allow*, or *explicit deny*. For more information, see the following concepts and Evaluation Logic (p. 33).

## Default Deny

A *default deny* is the default result from a policy in the absence of an allow or explicit deny. For example, if a user requests to use Amazon SQS, but the only policy that applies to the user states that the user can use Amazon SimpleDB, then that policy results in a default deny.

## Allow

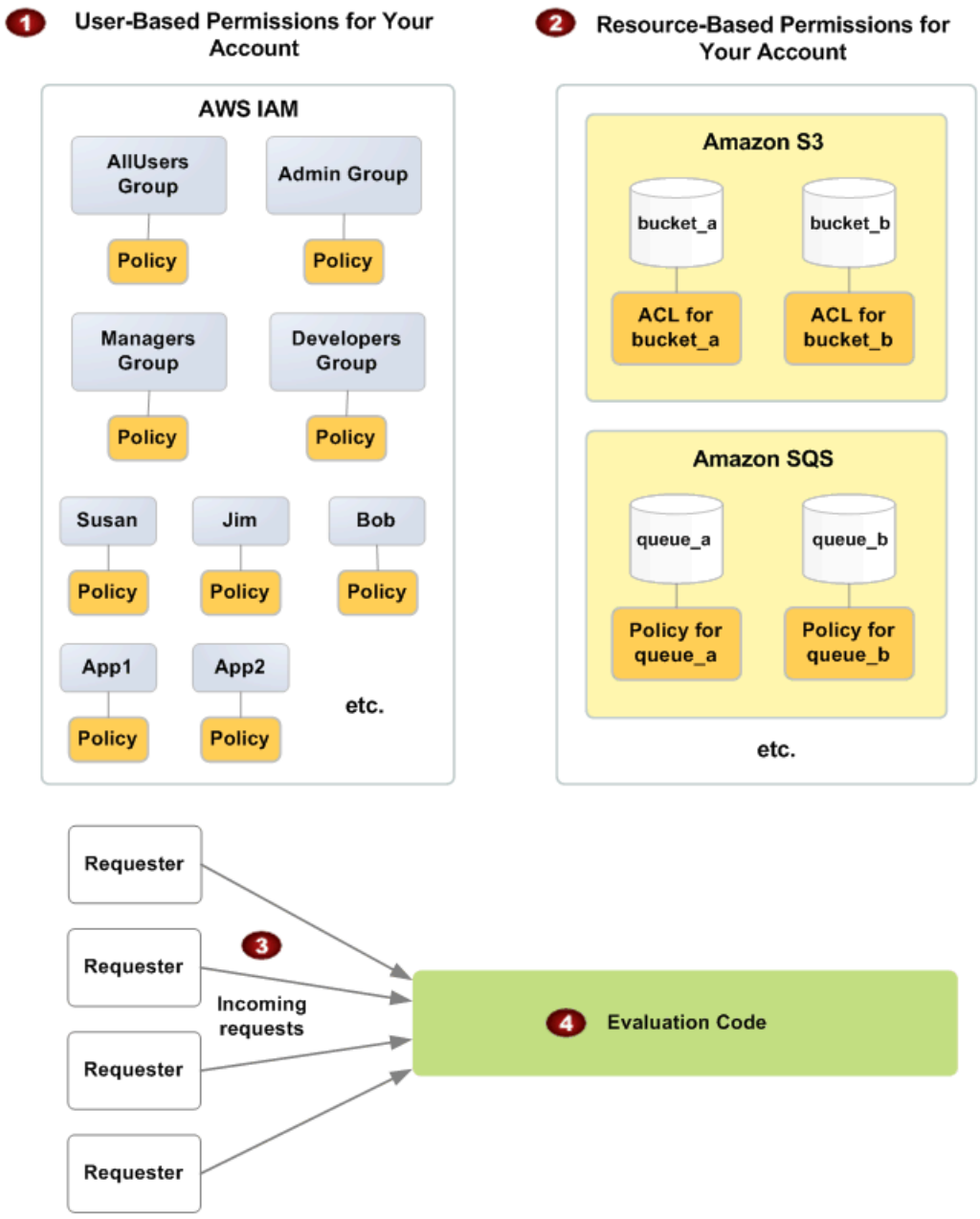
An *allow* results from a statement that has effect=allow, assuming any stated conditions are met. Example: Allow requests if they are received before 1:00 p.m. on April 30, 2010. An allow overrides all default denies, but never an explicit deny.

## Explicit Deny

An *explicit deny* results from a statement that has effect=deny, assuming any stated conditions are met. Example: Deny all requests if they are from Antarctica. Any request that comes from Antarctica will always be denied no matter what any other policies might allow.

# Architectural Overview

The following figure and table describe the main components that interact to provide access control for your resources.




| | |
|---|---|
| 1 | Your user-based permissions (policies attached to users or groups within the IAM system).<br>These are created by someone in your AWS account who has permission to manage policies for your AWS account. In the diagram, each user or group has a single policy attached to it, although in practice, there could be multiple. |

| | |
|---|---|
| 2 | Your resource-based permissions (ACLs attached to your Amazon S3 buckets and objects, policies attached to your Amazon SQS queues, etc.).<br>These are created by someone in your AWS account who has permission to manage ACLs, policies, etc., for the AWS resources in your AWS account. |
| 3 | Requesters and their incoming requests to AWS to use your AWS account's resources. They might be from inside or outside your own AWS account. |
| 4 | The evaluation code.<br>This is the set of code that evaluates incoming requests against the applicable user-based permissions and resource-based permissions and determines whether the requester is allowed access to the resource. For information about how AWS makes the decision, see Evaluation Logic (p. 33). |

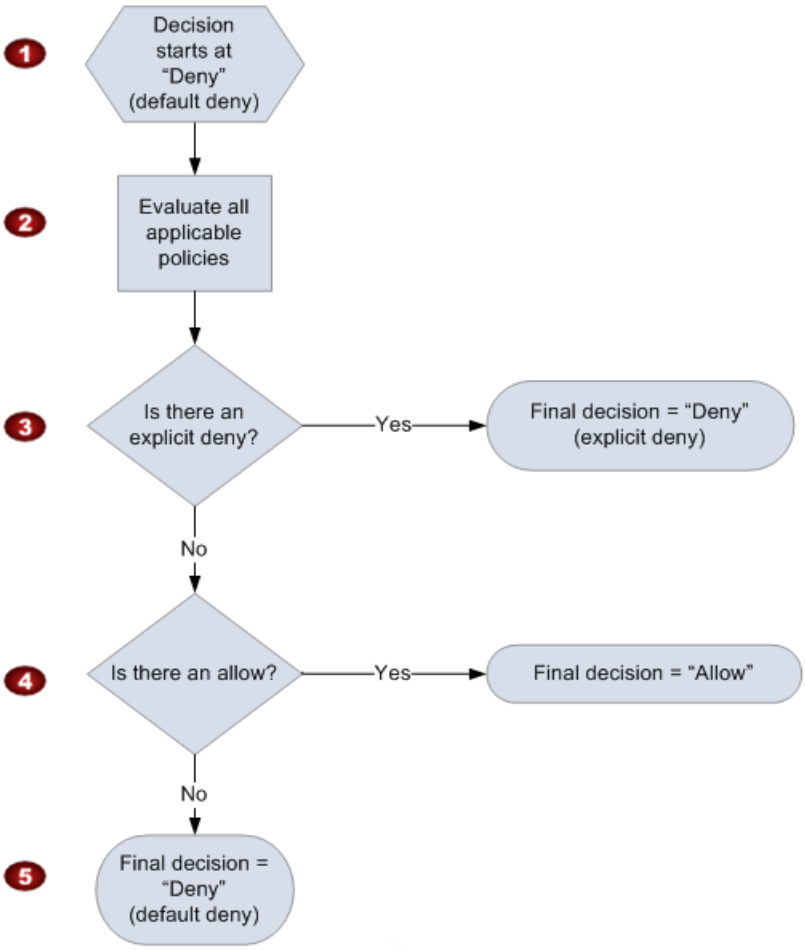
## Evaluation Logic

The goal at evaluation time is to decide whether a given request should be allowed or denied. The evaluation logic follows several basic rules:

- By default, all requests receive a default deny, except for requests that use the AWS account's root security credentials
- An allow overrides any default denies
- An explicit deny overrides any allows
- The order in which the policies are evaluated is not important

The evaluation logic never results in a conflict. There is always a true/false result that either allows or denies the requested access.

The following flow chart and discussion describe in more detail how the decision is made.




| | |
|---|---|
| 1 | The decision starts with a default deny. |
| 2 | The enforcement code then evaluates all the applicable user-based policies and resource-based policies/ACLs, etc. that are applicable to the request (based on the resource, principal, action, and conditions).<br>The order in which the enforcement code evaluates the policies is not important. |
| 3 | In all those policies, the enforcement code looks for an explicit deny instruction that would apply to the request.<br>If it finds even one, the enforcement code returns a decision of "deny" and the process is finished (this is an explicit deny; for more information, see Explicit Deny (p. 31)). |
| 4 | If no explicit deny is found, the enforcement code looks for any "allow" instructions that would apply to the request.<br>If it finds even one, the enforcement code returns a decision of "allow" and the process is done (the service continues to process the request). |
| 5 | If no allow is found, then the final decision is "deny" (because there was no explicit deny or allow, this is considered a *default deny* (for more information, see Default Deny (p. 31)). |

IAM policies you write address only users and groups within your AWS account, and the policies provide a default deny for any requests from a different AWS account. A default deny can be overriden by an allow, which means any allow permissions you've given to another AWS account through another permissions system override the default deny. For example, if a different AWS account sends a request to use one of your AWS account's Amazon S3 buckets, the IAM result is a deny by default. But, if you've updated the bucket's ACL and given that AWS account permission to use the bucket, then that AWS account can use the bucket. The IAM policies in this case won't prevent it.

## Example of an Explicit Deny Overriding an Allow

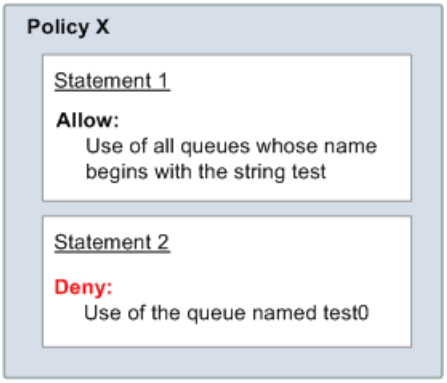
This example illustrates how you might use an explicit deny to override a broad policy that allows access to a wide set of resources. For example, let's say you give a group access to use any Amazon SQS queues in your AWS account whose names begin with the string `test`.

The following diagram represents that set of queues.


Let's say that you have a particular queue called test0 that you want to remove the group's access to.

The following diagram represents that set of queues.


You could add another policy to the group (or just add a statement to the existing policy) that explicitly denies the group's access to just that queue. The group would still have access to all other queues whose names begin with the string `test`. The following diagram illustrates those two statements in the policy.



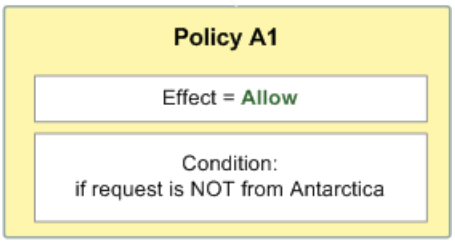

When someone in the group requests to use the queue test0, the explicit deny overrides the allow, and the user is denied access to the queue.

## The Interplay of Explicit and Default Denials

A policy results in a default deny if it doesn't directly apply to the request. For example, if a user requests to use Amazon SQS, but the only policy that applies to the user states that the user can use Amazon SimpleDB, then that policy results in a default deny.

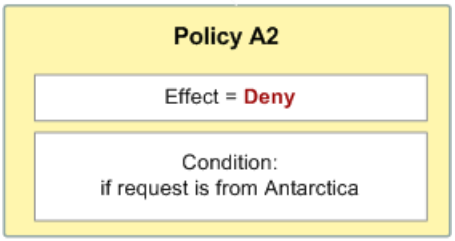
A policy also results in a default deny if a condition in a statement isn't met. If all conditions in the statement are met, then the policy results in either an allow or an explicit deny, based on the value of the Effect element in the policy. Policies don't specify what to do if a condition isn't met, and so the default result in that case is a default deny.

For example, let's say you want to prevent requests coming in from Antarctica. You write a policy (called Policy A1) that allows a request only if it doesn't come from Antarctica. The following diagram illustrates the policy.



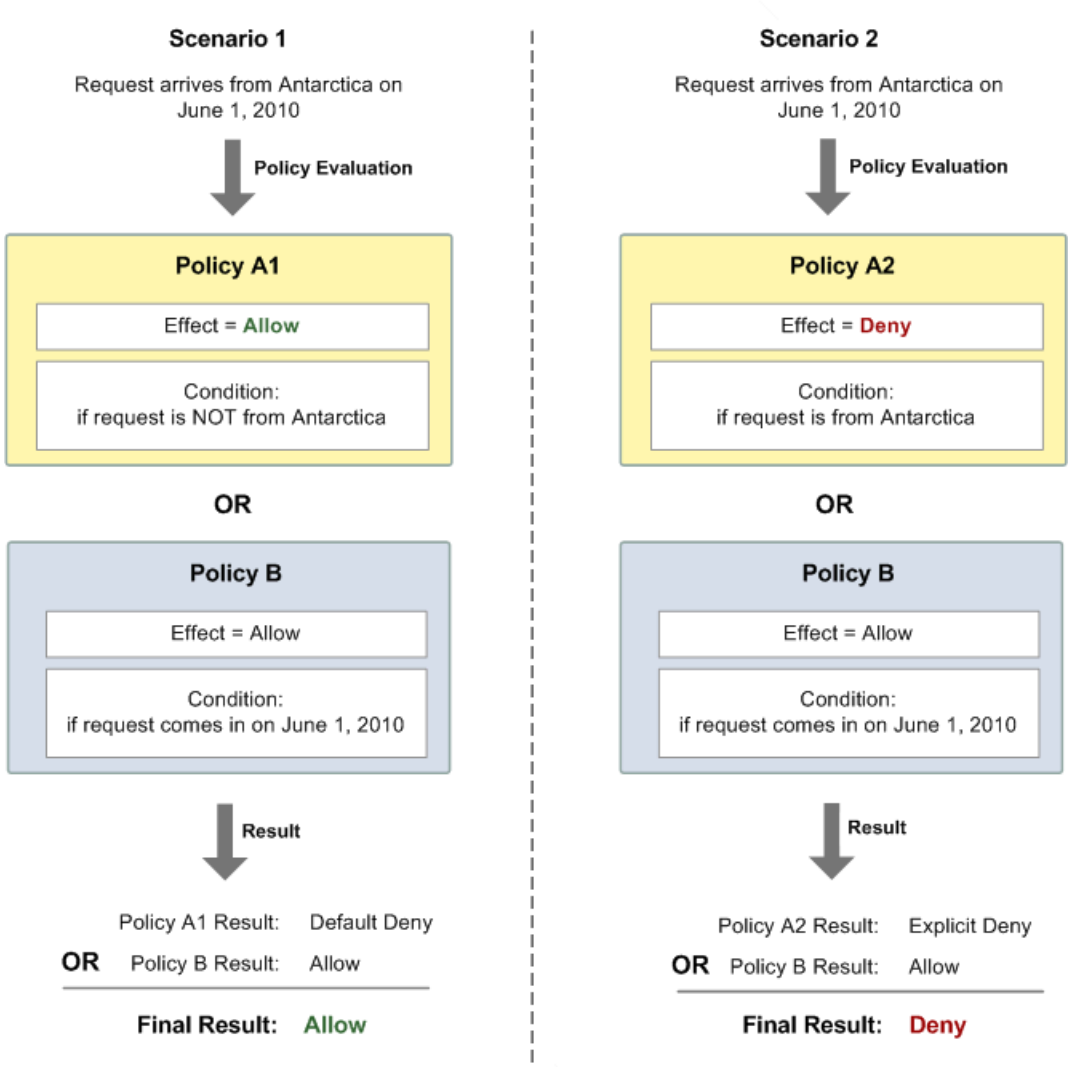

If someone sends a request from the U.S., the condition is met (the request is not from Antarctica). Therefore, the request is allowed. But, if someone sends a request from Antarctica, the condition isn't met, and the policy's result is therefore a default deny.

You could turn the result into an explicit deny by rewriting the policy (named Policy A2) as in the following diagram. Here, the policy explicitly denies a request if it comes from Antarctica.




If someone sends a request from Antarctica, the condition is met, and the policy's result is therefore an explicit deny.

The distinction between a default deny and an explicit deny is important because a default deny can be overridden by an allow, but an explicit deny can't. For example, let's say there's another policy that allows requests if they arrive on June 1, 2010. How does this policy affect the overall outcome when coupled with the policy restricting access from Antarctica? We'll compare the overall outcome when coupling the date-based policy (we'll call Policy B) with the preceding policies A1 and A2. Scenario 1 couples Policy A1 with Policy B, and Scenario 2 couples Policy A2 with Policy B. The following figure and discussion show the results when a request comes in from Antarctica on June 1, 2010.




In Scenario 1, Policy A1 returns a default deny, as described earlier in this section. Policy B returns an allow because the policy (by definition) allows requests that come in on June 1, 2010. The allow from Policy B overrides the default deny from Policy A1, and the request is therefore allowed.

In Scenario 2, Policy B2 returns an explicit deny, as described earlier in this section. Again, Policy B returns an allow. The explicit deny from Policy A2 overrides the allow from Policy B, and the request is therefore denied.

# How to Write a Policy

**Topics**



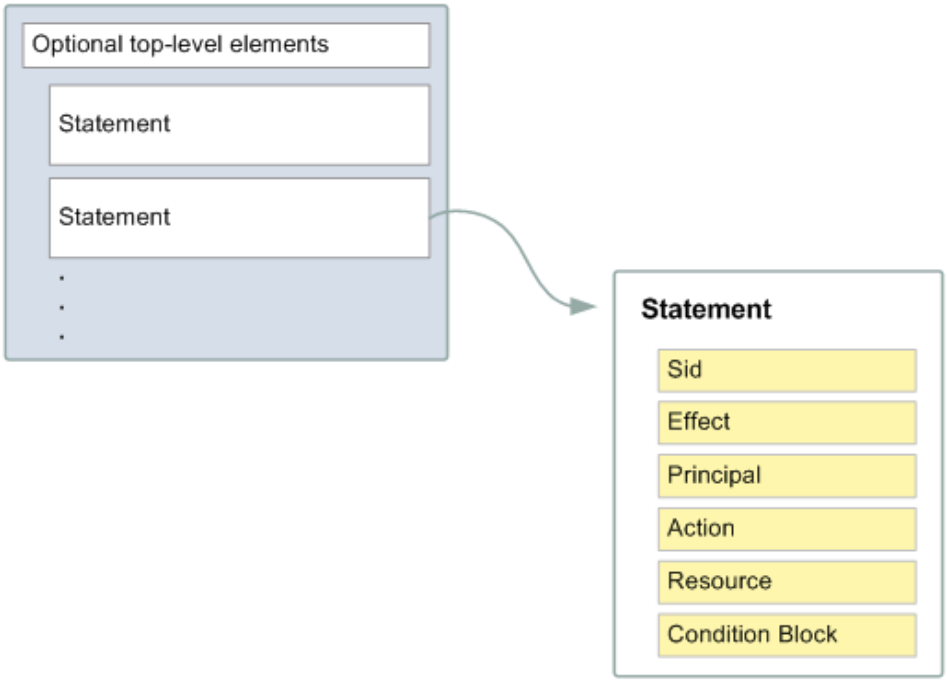
This section describes how to write policies and gives reference information about each policy element.

## Basic Policy Structure

Each policy is a JSON document. As illustrated in the following figure, a policy includes:

- Optional policy-wide information (at the top of the document)
- One or more individual *statements*

Each statement includes the core information about a single permission. If a policy includes multiple statements, we apply a logical `OR` across the statements at evaluation time. If multiple policies are applicable to a request, we apply a logical `OR` across the policies at evaluation time.




The information in a statement is contained within a series of *elements*. For information about these elements, see Element Descriptions (p. 40).

### Example

The following policy has two statements. By definition, the user (or group) the policy is attached to is in the AWS account with ID 123456789012 (policies can't reference resources in other accounts). The policy lets the user do the following:

- Manage the access keys for any user in the AWS account, starting on July 1, 2010
- Create and delete Amazon SimpleDB domains in the 123456789012 AWS account for any region

```
{
   "Statement":[{
      "Effect":"Allow",
     "Action":["iam:CreateAccessKey","iam:ListAccessKeys","iam:UpdateAccessKey",
 "iam:DeleteAccessKey"],
      "Resource":"arn:aws:iam::123456789012:user/*",
      "Condition":{
         "DateGreaterThan":{
            "aws:CurrentTime":"2010-07-01T00:00Z"
            }
         }
      },
      {
      "Effect":"Allow",
      "Action":["sdb:CreateDomain","sdb:DeleteDomain"],
      "Resource":"arn:aws:sdb:*:123456789012:domain/*"
      }
   ]
}
```

The `Resource` in each statement could instead be stated as `*`. AWS would determine the applicable resources based on which AWS account owns the policy and the actions specified.

## Element Descriptions

**Topics**



This section describes the elements you can use in a policy and its statements. The elements are listed here in the general order you use them in a policy. `Version` and `Statement` are top-level policy elements; the rest are statement-level elements. JSON examples are provided.

All elements are optional for the purposes of parsing the policy document itself. The order of the elements doesn't matter (e.g., the `Resource` element can come before the `Action` element). You're not required to specify any Conditions in the policy.

### Version

The `Version` is the access policy language version. This is an optional element, and currently the only allowed value is `2008-10-17`.

```
"Version":"2008-10-17"
```

### Statement

The `Statement` is the main element for a statement. It can include multiple elements (see the subsequent sections in this guide).

The `Statement` element contains an array of individual statements. Each individual statement is a distinct JSON block enclosed in curly brackets { }.

```
"Statement":[{...},{...},{...}]
```

### Sid

The `Sid` (statement ID) is an optional identifier you provide for the policy statement. The Sid must be unique within a single policy.

The `Sid` is not exposed in the IAM API. You can't retrieve a particular statement based on this ID.

```
"Sid" : "1"
```

### Effect

The `Effect` is a required element that indicates whether you want the statement to result in an allow or an explicit deny (for more information, see Explicit Deny (p. 31)).

Valid values for `Effect` are `Allow` and `Deny`.

```
"Effect":"Allow"
```

### Principal

The `Principal` is the person or persons who receive or are denied permission according to the policy. Although `Principal` is a legitimate element in the access policy language, you must *not* include it in IAM policies. The principal is implied and is the user or group the policy is attached to. The `Principal` element is applicable if you're writing a resource-based policy for an SQS queue, for example.

### Action

The `Action` is the specific type or types of access allowed or denied (for example, read or write). You can specify one or multiple values for this element.

```
"Action":["iam:CreateAccessKey","iam:ListAccessKeys"]
```

The values must be one of the expected values for the particular AWS product in question, and the value must be prefixed with a namespace value indicating the AWS product in question. The prefix and the action name are case insensitive. For example, `iam:ListAccessKeys` is equivalent to `IAM:listaccesskeys`. For information about the correct namespaces and actions to use, see Integrating with Other AWS Products (p. 169).

You can use a wildcard (*) to give access to all the actions the specific AWS product offers. For example, the following `Action` element applies to all IAM actions.

```
"Action":"iam:*"
```

You can also use wildcards (* or ?) within the action name itself. For example, the following `Action` element applies to all IAM actions that include the string `AccessKey`.

```
"Action":"iam:*AccessKey*"
```

### NotAction

The `NotAction` element is useful if you want to make an exception to a list of actions. You could use this, for example, if you want your users to be able to use only the SQS `SendMessage`.

The following example refers to all actions *other* than the SQS `SendMessage`. You would use this in a policy with `"Effect":"Deny"` to keep users from accessing any other actions.

```
"NotAction":"sqs:SendMessage"
```

### Resource

The `Resource` is the object or objects the policy covers. For a list of the types of resources you can specify in a policy, and the format you must use (called the *Amazon Resource Name (ARN)*), see Identifiers for IAM Entities (p. 52) and also Integrating with Other AWS Products (p. 169).

You can specify one or multiple resources in the policy, and you can use wildcards. The following example refers to the user named Bob with path /division_abc/subdivision_xyz/ in your AWS account.

```
"Resource":"arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/Bob"
```

The following example refers to all users whose path is /division_abc/subdivision_xyz/.

```
"Resource":"arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/*"
```

### NotResource

The `NotResource` element is useful if you want to make an exception to a list of resources. You could use this, for example, if you want your users to be able to access a specific Amazon SQS queue belonging to the AWS account. If the AWS account were to create a new queue for the company, an admin wouldn't have to update the policy with the new queue's name in order to prevent users from being able to use the queue. By default, the users wouldn't be able to use it.

The following example refers to all resources *other* than your company's queue called my_corporate_queue. You would use this in a policy with `"Effect":"Deny"` to keep users from accessing any queue besides my_corporate_queue.

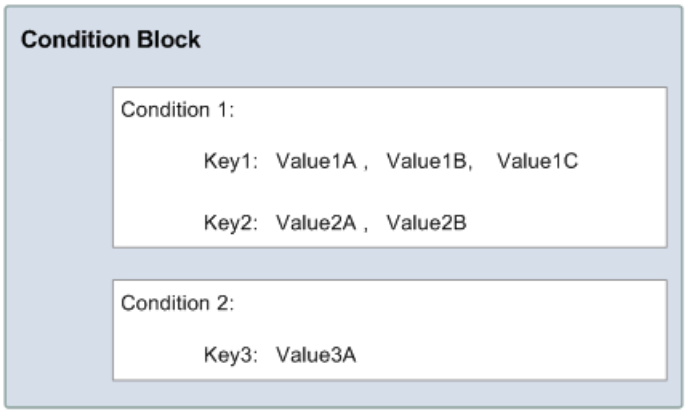
```
"NotResource":"arn:aws:sqs:*:123456789012:my_corporate_queue"
```

### Condition

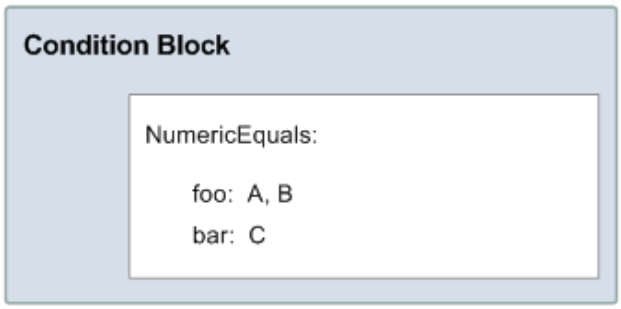
This section describes the `Condition` element and the information you can use inside the element.

### The Condition Block

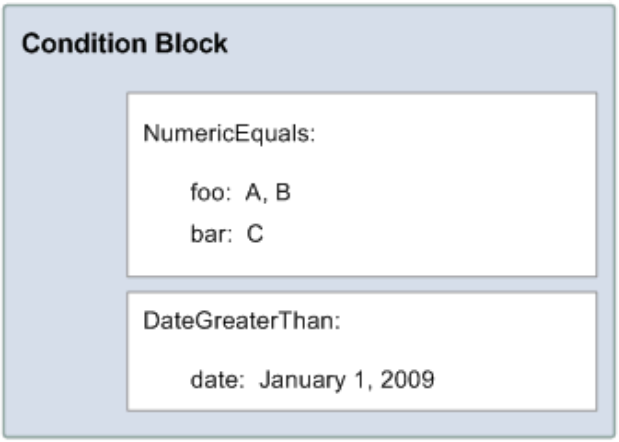
The `Condition` element is the most complex part of the policy statement. We refer to it as the *condition block*, because although it has a single `Condition` element, it can contain multiple conditions, and each condition can contain multiple key-value pairs. The following figure illustrates this. Unless otherwise specified for a particular key, all keys can have multiple values.



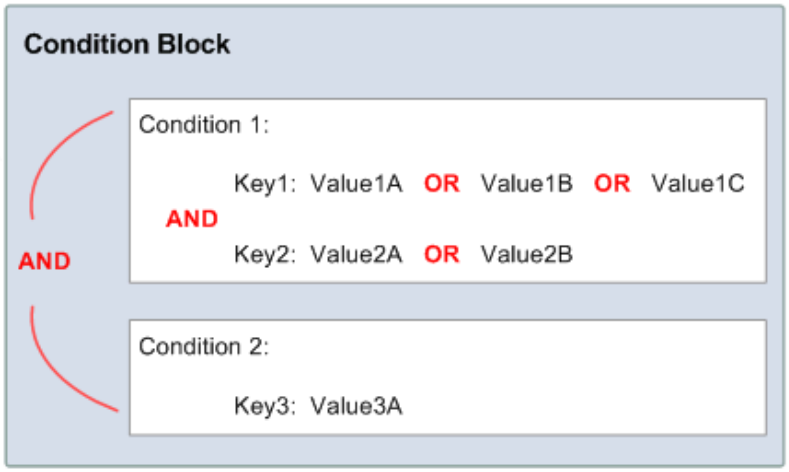

When creating a condition block, you specify the name of each condition, and at least one key-value pair for each condition. AWS defines the conditions and keys you can use (they're listed in the subsequent sections). An example of a condition is `NumericEquals`. Let's say you have a fictional resource, and you want to let John use it only if some particular numeric value *foo* equals either A or B, and another numeric value *bar* equals C. Then you would create a condition block that looks like the following figure.




Let's say you also want to restrict John's access to after January 1, 2009. Then you would add another condition, `DateGreaterThan`, with a date equal to January 1, 2009. The condition block would then look like the following figure.




As illustrated in the following figure, we always apply a logical `AND` to the conditions within a condition block, and to the keys within a condition. We always apply a logical `OR` to the values for a single key. All conditions must be met to return an allow or an explicit deny decision. If a condition isn't met, the result is a default deny.




As mentioned, AWS defines the conditions and keys you can use (for example, one of the keys is `aws:CurrentTime`, which lets you restrict access based on the date and time). The AWS service itself can also define its own service-specific keys. For a list of available keys, see Available Keys (p. 45).

For a concrete example that uses real keys, let's say you want to let John access your Amazon resource under the following three conditions:

- The time is after 12:00 noon on 8/16/2010
- The time is before 3:00 p.m. on 8/16/2010
- The request comes from an IP address within the 192.168.176.0/24 range or the 192.168.143.0/24 range

Your condition block has three separate conditions, and all three of them must be met for John to have access to your resource.

The following shows what the condition block looks like in your policy.

```
"Condition" :  {
      "DateGreaterThan" : {
         "aws:CurrentTime" : "2009-04-16T12:00:00Z"
       },
      "DateLessThan": {
         "aws:CurrentTime" : "2009-04-16T15:00:00Z"
       },
       "IpAddress" : {
          "aws:SourceIp" : ["192.168.176.0/24","192.168.143.0/24"]
      }
}
```

### Available Keys

AWS provides a set of common keys supported by all AWS services that adopt the access policy language for access control. These keys are:

- `aws:CurrentTime`–For date/time conditions (see Date Conditions (p. 47))
- `aws:EpochTime`–The date in epoch or UNIX time, for use with date/time conditions (see Date Conditions (p. 47))
- `aws:MultiFactorAuthAge`–Key that provides a numeric value indicating how long ago (in seconds) the MFA-validated security credentials making the request were issued using Multi-Factor Authentication (MFA). Unlike other keys, if MFA is not used successfully, this key is not present (see Existence of Condition Keys (p. 49), Numeric Conditions (p. 46) and Using Multi-Factor Authentication (MFA) Devices with AWS).
- `aws:SecureTransport`–Boolean representing whether the request was sent using SSL (see Boolean Conditions (p. 48))
- `aws:SourceIp`–The requester's IP address, for use with IP address conditions (see IP Address (p. 49))
- `aws:UserAgent`–Information about the requester's client application, for use with string conditions (see String Conditions (p. 46))

The key names are case insensitive. For example, `aws:CurrentTime` is equivalent to `AWS:currenttime`.

> **Note**
>
> If you use `aws:SourceIp`, and the request comes from an Amazon EC2 instance, we evaluate the instance's public IP address to determine if access is allowed.

Each AWS product that uses the access policy language might also provide product-specific keys. For a list of any product-specific keys you can use, see Integrating with Other AWS Products (p. 169).

### Condition Types

These are the general types of conditions you can specify:

- String
- Numeric
- Date and time
- Boolean
- IP address
- Existence of condition keys

### String Conditions

String conditions let you constrain using string matching rules. The actual data type you use is a string.

| Condition | Description |
|---|---|
| `StringEquals` | Strict matching<br>Short version: `streq` |
| `StringNotEquals` | Strict negated matching<br>Short version: `strneq` |
| `StringEqualsIgnoreCase` | Strict matching, ignoring case<br>Short version: `streqi` |
| `StringNotEqualsIgnoreCase` | Strict negated matching, ignoring case<br>Short version: `strneqi` |
| `StringLike` | Loose case-sensitive matching. The values can include a multi-character match wildcard (*) or a single-character match wildcard (?) anywhere in the string.<br>Short version: `strl` |
| `StringNotLike` | Negated loose case-insensitive matching. The values can include a multi-character match wildcard (*) or a single-character match wildcard (?) anywhere in the string.<br>Short version: `strnl` |

For example, the following statement uses the `StringEquals` condition with the `aws:UserAgent` key to specify that the request must have a specific user agent.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"iam:*AccessKey*",
      "Resource":"arn:aws:iam::123456789012:user/*",
      "Condition":{
         "StringEquals":{
            "aws:UserAgent":"Example Corp Java Client"
            }
         }
      }
   ]
}
```

### Numeric Conditions

Numeric conditions let you constrain using numeric matching rules. You can use both whole integers or decimal numbers. Fractional or irrational syntax is not supported.

| Condition | Description |
|---|---|
| `NumericEquals` | Strict matching<br>Short version: `numeq` |

| Condition | Description |
|---|---|
| `NumericNotEquals` | Strict negated matching<br>Short version: `numneq` |
| `NumericLessThan` | "Less than" matching<br>Short version: `numlt` |
| `NumericLessThanEquals` | "Less than or equals" matching<br>Short version: `numlteq` |
| `NumericGreaterThan` | "Greater than" matching<br>Short version: `numgt` |
| `NumericGreaterThanEquals` | "Greater than or equals" matching<br>Short version: `numgteq` |

For example, the following statement uses the `NumericLessThanEquals` condition with the s3:max-keys policy key to specify that the requester can list up to 10 objects in example_bucket at a time.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"s3:ListBucket",
      "Resource":"arn:aws:s3:::example_bucket",
      "Condition":{
         "NumericLessThanEquals":{
            "s3:max-keys":"10"
            }
         }
      }
   ]
}
```

### Date Conditions

Date conditions let you constrain using date and time matching rules. You must specify all date/time values with one of the W3C implementations of the ISO 8601 date formats (for more information, go to http://www.w3.org/TR/NOTE-datetime), or in epoch (UNIX) time. You use these conditions with the `aws:CurrentTime` key to restrict access based on request time.

#### Note

Wildcards are not permitted for date conditions.

| Condition | Description |
|---|---|
| `DateEquals` | Strict matching<br>Short version: `dateeq` |
| `DateNotEquals` | Strict negated matching<br>Short version: `dateneq` |

| Condition | Description |
|---|---|
| `DateLessThan` | A point in time at which a key stops taking effect<br>Short version: `datelt` |
| `DateLessThanEquals` | A point in time at which a key stops taking effect<br>Short version: `datelteq` |
| `DateGreaterThan` | A point in time at which a key starts taking effect<br>Short version: `dategt` |
| `DateGreaterThanEquals` | A point in time at which a key starts taking effect<br>Short version: `dategteq` |

For example, the following statement uses the `DateLessThan` condition with the `aws:CurrentTime` key to specify that the request must be received before June 30, 2010.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"iam:*AccessKey*",
      "Resource":"arn:aws:iam::123456789012:user/*",
      "Condition":{
         "DateLessThan":{
            "aws:CurrentTime":"2010-06-30T00:00:00Z"
            }
         }
      }
   ]
}
```

### Boolean Conditions

| Condition | Description |
|---|---|
| `Bool` | Strict Boolean matching |

For example, the following statement uses the `Bool` condition with the `aws:SecureTransport` key to specify that the request must use SSL.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"iam:*AccessKey*",
      "Resource":"arn:aws:iam::123456789012:user/*",
      "Condition":{
         "Bool":{
            "aws:SecureTransport":"true"
            }
         }
      }
   ]
}
```

### IP Address

IP address conditions let you constrain based on IP address matching rules. You use these with the `aws:SourceIp` key. The value must be in the standard CIDR format (for example, 10.52.176.0/24). For more information, go to RFC 4632.

| Condition | Description |
|---|---|
| `IpAddress` | Approval based on the IP address or range |
| `NotIpAddress` | Denial based on the IP address or range |

For example, the following statement uses the `IpAddress` condition with the `aws:SourceIp` key to specify that the request must come from the 192.168.176.0/24 IP address range.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"iam:*AccessKey*",
      "Resource":"arn:aws:iam::123456789012:user/*",
      "Condition":{
         "IpAddress":{
            "aws:SourceIp":"192.168.176.0/24"
            }
         }
     }
  ]
}
```

### Existence of Condition Keys

Use a `Null` condition to check if a condition key is present at the time of authorization. In the policy statement, use either `true` (the key doesn't exist) or `false` (the key exists and its value is not null). You can use this condition to determine if a user has authenticated with MFA (Multi-Factor Authentication). For example, the following condition states that MFA authentication must exist (be *not null*) for the user to use the Amazon EC2 API.

```
{
  "Statement":[{
      "Action":["ec2:*"],
      "Effect":"Allow",
      "Resource":["*"],
      "Condition":{
         "Null":{"aws:MultiFactorAuthAge":"false"}
      }
    }
  ]
}
```

## Supported Data Types

This section lists the set of data types the access policy language supports. The language doesn't support all types for each policy element (for the supported data types for each element, see Element Descriptions (p. 40)).

The access policy language supports the following data types:

- Strings
- Numbers (Ints and Floats)
- Boolean
- Null
- Lists
- Maps
- Structs (which are just nested Maps)

The following table maps each data type to the serialization. Note that all policies must be in UTF-8. For information about the JSON data types, go to RFC 4627.

| Type | JSON |
|---|---|
| String | String |
| Integer | Number |
| Float | Number |
| Boolean | true false |
| Null | null |
| Date | String adhering to the W3C Profile of ISO 8601 |
| IpAddress | String adhering to RFC 4632 |
| List | Array |
| Object | Object |

# Ways to Access IAM

AWS Identity and Access Management is available through the following interfaces:

- AWS Management Console
- Command line interface (CLI)
- IAM Query API
- Existing libraries

If you don't want to write code, you can use IAM through the AWS Management Console, or through a Java-based command line interface (CLI). The AWS Management Console enables you to do almost everything you can do with any of the code-based interfaces. You should already have read Getting Started (p. 4), which shows you how to use the AWS Management Console to do the following:

- Create groups and assign permissions to groups
- Add users
- Create security credentials for your users
- Assign passwords to your users

For more information about accessing IAM through the console, see How Users Sign In to the AWS Management Console (p. 164).

The CLI commands are not mirror images of the API actions; instead, the CLI combines API actions into multi-function commands. For example, to set up a new user with the API, you must make separate API calls to create the user, create an access key for the user, and add the user to groups. In the CLI, you can perform all those functions with one command. For information about setting up and using the IAM CLI, go to the AWS Identity and Access Management Command Line Interface Reference.

You can also code directly to the IAM Query API, which is an interface that accepts basic HTTPS requests. The interface is designed to provide low-level building blocks that perform atomic functions, giving you the flexibility to create work flows that match your needs. In most cases, the API provides CRUD actions (create, read, update, delete) for the different IAM entities (users, groups, policies, and so on).

If you prefer to use IAM through an existing programmatic interface, AWS offers SDKs for:

- Java
- .NET

# About IAM Entities

**Topics**



This section describes identifiers and limitations for the basic IAM entities (users, groups, and so on).

# Identifiers for IAM Entities

**Topics**



IAM uses a few different identifiers for users, groups, roles and server certificates. This section describes the identifiers and when you use each.

## Friendly Names and Paths

When you create a user, a role, or a group, or when you upload a server certificate, you give it a friendly name, such as Bob, TestApp1, Developers, or ProdServerCert. Whenever you need to specify a particular entity in an API call to IAM (for example, to delete a user, or update a group with a new user), you use the friendly name.

If you are using the API or command line interface to create users, you can also optionally give the entity a path that you define. You might use the path to identify which division or part of the organization the entity belongs in. For example: /division_abc/subdivision_xyz/product_1234/engineering/. Examples of how you might use paths are shown in the next section (see ARNs (p. 53)).

Just because you give a user and group the same path doesn't automatically put that user in that group. For example, you might create a Developers group and specify its path as /division_abc/subdivision_xyz/product_1234/engineering/. Just because you create a user named Bob and give him that same path doesn't automatically put Bob in the Developers group.

IAM doesn't enforce any boundaries between users or groups based on their paths. Users with different paths can use the same resources (assuming they've been granted permission to). For information about limitations on names, see Limitations on IAM Entities (p. 56).

# ARNs

Although most resources have a friendly name (for example, a user named Bob or a group named Developers), the access policy language requires you to specify the resource or resources using the following *Amazon Resource Name (ARN)* format.

```
arn:aws:<service>:<region>:<namespace>:<relative-id>
```

Where:

- `service` identifies the AWS product (for example, iam)
- `region` is the Region the resource resides in (for example, us-east-1), if any
- `namespace` is the AWS account ID with no hyphens (for example, 123456789012)
- `relative-id` is the portion that identifies the specific resource

This format is applicable to all types of AWS resources (IAM users and federated users, groups, roles, server certificates, virtual MFA devices, Amazon SimpleDB domains, Amazon SQS queues, and so on). The specific values to use in the ARN (such as the service and region) depend on the AWS product itself. The following information covers the format to use for IAM resources. For information about the format to use for other AWS products, see Integrating with Other AWS Products (p. 169).

IAM has several types of resources you can specify in a policy: users (IAM and federated), groups, roles, instance profiles, virtual MFA devices, and server certificates. The following table shows the ARN format for each and an example. The region portion of the ARN is blank because IAM resources are global. (For more information about using server certificates, see Managing Server Certificates (p. 177).)

| Resource type | Format for ARN |
|---|---|
| User | arn:aws:iam::*{account_ID}*:user/*{path/to/user/UserName}*<br>Example: arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/Bob |
| Federated user | arn:aws:sts::*{account_ID}*:federated-user/*{UserName}*<br>Example: arn:aws:sts::123456789012:federated-user/Bob |
| Group | arn:aws:iam::*{account_ID}*:group/*{path/to/group/GroupName}*<br>Example:<br>arn:aws:iam::123456789012:group/division_abc/subdivision_xyz/product_A/Developers |
| Role | arn:aws:iam::*{account_ID}*:role/*{path/to/role/RoleName}*<br>Example: arn:aws:iam::123456789012:role/application_abc/component_xyz/S3Access |
| Instance profile | arn:aws:iam::*{account_ID}*:instance-profile/*{path/to/instance-profile/InstanceProfileName}*<br>Example:<br>arn:aws:iam::123456789012:instance-profile/application_abc/component_xyz/Webserver |
| Virtual MFA | arn:aws:iam::*{account_ID}*:mfa/*{path/to/virtual device/VirtualDeviceName}*<br>Example: arn:aws:iam::123456789012:mfa/division_abc/subdivision_xyz/BobJonesMFA<br>For virtual MFA devices, the ARN is the serial number of the device. |

| Resource type | Format for ARN |
|---|---|
| Server certificate | arn:aws:iam::*{account_ID}*:server-certificate/*{path/to/server certificate/ServerCertName}*<br>Example: arn:aws:iam::123456789012:server-certificate/division_abc/subdivision_xyz/ProdServerCert |
| AWS account (root) | arn:aws:iam::*{account_ID}*:root<br>Example: arn:aws:iam::123456789012:root |

When you create a user, group, role, or virtual MFA device, or when you upload a server certificate, we return the ARN to you as a convenience. For more information about federated users, see Using Temporary Security Credentials.

The following example shows a policy you could assign to Bob to allow him to manage his own access keys. Notice that the resource is Bob himself.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action"["iam:*AccessKey*",
      "Resource":"arn:aws:iam::123456789012:user/division_abc/subdivi
sion_xyz/Bob"
      }
   ]
}
```

You can use wildcards in the `relative-id` portion of the ARN to specify multiple users or groups. For example, to specify all users working on product_1234, you would use:

```
arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/product_1234/*
```

Let's say you have users whose names start with the string `app_`. You could refer to them all with the following ARN.

```
arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/product_1234/app_*
```

To specify all users or groups in the AWS account, use a wildcard after the `user/` or `group/` part of the ARN, respectively.

```
arn:aws:iam::123456789012:user/*

arn:aws:iam::123456789012:group/*
```

Don't use a wildcard in the `user/` or `group/` part of the ARN. In other words, the following is not allowed:

```
arn:aws:iam::123456789012:u*
```

### Example 1: Use of Paths and ARNs for Distributed Administrator Groups

Dave is the main administrator in Example Corp., and he decides to use paths to help delineate the users in the company and set up a separate administrator group for each path-based division. Following is a subset of the full list of paths he plans to use:

- /marketing
- /sales
- /legal

Dave creates an administrator group for the marketing part of the company and calls it Marketing_Admin. He assigns it the /marketing path. The group's ARN is arn:aws:iam::123456789012:group/marketing/Marketing_Admin.

Dave assigns the following policy to the Marketing_Admin group that gives the group permission to use all IAM actions with all groups and users in the /marketing path. The policy also gives the Marketing_Admin group permission to perform any Amazon S3 actions on the objects in the portion of the corporate bucket dedicated to the marketing employees in the company.

```
{
   "Statement":[{
         "Effect":"Allow",
         "Action":"iam:*",
         "Resource":["arn:aws:iam::123456789012:group/marketing/*",
                     "arn:aws:iam::123456789012:user/marketing/*"]
      },
      {
         "Effect":"Allow",
         "Action":"s3:*",
         "Resource":"arn:aws:s3:::example_bucket/marketing/*"
      },
      {
         "Effect":"Allow",
         "Action":"s3:ListBucket*",
         "Resource":"arn:aws:s3:::example_bucket",
         "Condition":{
            "StringLike":{
               "s3:prefix":"marketing/*"
            }
         }
      }
   ]
}
```

The policy has a separate statement that is necessary to let the group list the objects only in the portion of the bucket dedicated to the marketing group. For more information about constructing policies to control user and group access to Amazon S3, go to Using IAM Policies in the *Amazon Simple Storage Service Developer Guide*.

Dave then creates a user named Jules in the /marketing path, and assigns Jules to the Marketing_Admin group. Jules can now create and manage new users and groups in the /marketing path, and work with the objects in the marketing part of the bucket.

Dave then sets up similar administrator groups for the other paths (for example, /sales, etc.).

### Example 2: Use of Paths and ARNs for a Project-Based Group

In this example, Jules in the Marketing_Admin group creates a project-based group within the /marketing path, and assigns users from different parts of the company to the group. This example illustrates that a user's path isn't related to the groups the user is in.

The marketing group has a new product they'll be launching, so Jules creates a new group in the /marketing path called Widget_Launch. Jules then assigns the following policy to the group, which gives the group access to objects in the part of the example_bucket designated to this particular launch.

```
{
   "Statement":[{
         "Effect":"Allow",
         "Action":"s3:*",
        "Resource":"arn:aws:s3:::example_bucket/marketing/newproductlaunch/wid
get/*"
      },
      {
         "Effect":"Allow",
         "Action":"s3:ListBucket*",
         "Resource":"arn:aws:s3:::example_bucket",
         "Condition":{
            "StringLike":{
               "s3:prefix":"marketing/newproductlaunch/widget/*"
            }
         }
      }
   ]
}
```

Jules then assigns the users who are working on this launch to the group. This includes Pat and Eli from the /marketing path. It also includes Chris and Carl in the /sales path, and Aline and Jim from the /legal path.

## GUIDs

We assign each user, group, and server certificate a globally unique identifier (GUID), which we return to you when you use the API or CLI to create it. We recommend you store the GUID in your own database along with the user, group, or certificate name. Internally we use the GUID to identify the user, group, or certificate, and we translate the value into the ARN or friendly name as appropriate when displaying the user, group, or certificate information to you. If you delete a user, group, or server certificate, any residual remote references to that item display the GUID as the friendly name part in the ARN. If you've stored the GUID in your own system, you can then use the displayed GUID to identify the deleted item being referred to.

# Limitations on IAM Entities

This section lists restrictions on IAM entities, and describes how to get information about entity usage and quotas.

**Note**

To retrieve account level information about entity usage and quotas, use the GetAccountSummary API action or the iam-accountgetsummary CLI command.

### Following are restrictions on names:

- Names of users, groups, roles, instance profiles, and server certificates must be alphanumeric, including the following common characters: plus (+), equal (=), comma (,), period (.), at (@), and dash (-).
- Path names must begin with a forward slash (/).
- Policy names must be unique to the user, group, or role they are attached to, and can contain any Basic Latin (ASCII) characters, minus the following reserved characters: backward slash (\), forward slash (/), asterisk (*), question mark (?), and white space. These characters are reserved according to RFC 3986 (for more information, see http://www.ietf.org/rfc/rfc3986.txt).
- User passwords (login profiles) can contain any Basic Latin (ASCII) characters.
- AWS account ID aliases must be unique across AWS products, and must be alphanumeric following DNS naming conventions. An alias must be lowercase, it must not start or end with a hyphen, it cannot contain two consecutive hyphens, and it cannot be a 12 digit number.

For a list of Basic Latin (ASCII) characters, go to the Library of Congress Basic Latin (ASCII) Code Table.

Names for entities are case sensitive and must be unique within the scope of your AWS account (regardless of the path you might give the entity).

### Following are the default maximums for your entities:

- Groups per AWS account: 100
- Users per AWS account: 5000
  If you need to add a large number of users, consider using temporary security credentials. For more information about temporary security credentials, go to Using Temporary Security Credentials.
- Roles per AWS account: 250
- Instance Profiles per AWS account: 100
- Number of groups per user: 10 (that is, the user can be in this many groups)
- Access keys per user: 2
- Signing certificates per user: 2
- MFA devices in use per user: 1
- MFA devices in use per AWS account (at the root account level): 1
- Virtual MFA devices (assigned or unassigned) per AWS account: equal to the user quota for the account
- Server certificates per AWS account: 10
- AWS account aliases per AWS account: 1
- Login profiles per user: 1

You can request to increase these quotas for your AWS account on the IAM Limit Increase Contact Us Form.

### Following are the maximum lengths for entities:

- Path: 512 characters
- User name: 64 characters
- Group name: 128 characters
- Role name: 64 characters
- Instance profile name: 128 characters
- GUID (applicable to users, groups, roles, and server certificates): 32 characters
- Policy name: 128 characters
- Certificate ID: 128 characters
- Login profile password: 1 to 128 characters

- AWS account ID alias: 3 to 63 characters.
- Total aggregate policy size per user or role: 2,048 characters (that is, you can have as many policies as you want for a given user or role as long as the sum size of the policies doesn't exceed 2,048 characters)
- Total aggregate policy size per group: 10,240 characters (that is, you can have as many policies as you want for a given group as long as the sum size of the policies doesn't exceed 10,240 characters)

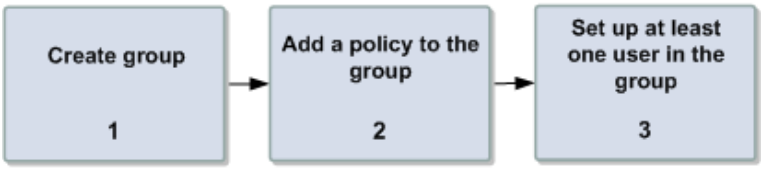
# Setting Up an Administrators Group

The first thing we recommend you do after creating an AWS account is to set up an administrators group. It's not required, but is highly recommended. Going forward, the users in the administrators group should set up the groups, users, and so on, for the AWS account, and all future key-based interaction should be through the AWS account's users and their own keys. You can stop using the AWS account's security credentials to make API calls to AWS.

**Tip**

If you read through the Getting Started (p. 4), you used the AWS Management Console to set up an administrators group for your AWS account. We've repeated the information here if you're interested in using a different interface than the one presented in the *Getting Started*.

The following diagram shows the basic steps required to create an administrators group.




**Process for Setting Up an Administrators Group**

| | |
|---|---|
| 1 | Create a group with a name of your choice (e.g., *Admins*). For more information, see Creating a Group (p. 60). |
| 2 | Add a policy that gives the group access to all AWS actions and resources. For more information, see Adding a Policy to the Group (p. 61). |
| 3 | Set up at least one user in the group. For more information, see Adding a New User to Your AWS Account (p. 65). |

# Creating a Group

This section shows how to create a group in the IAM system. For information about the limitations on the group's name and the maximum number of groups you can have, see Limitations on IAM Entities (p. 56).

## Command Line Interface

### To create an administrators group

1. Use the `iam-groupcreate` command with the name you've chosen for the group and an optional path you've chosen. For more information about paths, see Friendly Names and Paths (p. 52).

   In this example, you create a group called *Admins* with the default path ( / ).

   ```
   PROMPT> iam-groupcreate -g Admins
   ```

   If the command is successful, there's no response.
2. Use the `iam-grouplistbypath` command to list the groups in your AWS account and confirm the group was created.

   ```
   PROMPT> iam-grouplistbypath
   ```

   Sample response:

   ```
   arn:aws:iam::123456789012:group/Admins
   ```

   The response lists the Amazon Resource Name (ARN) for your Admins group. The ARN is a standard format that AWS uses to identify resources. The 12-digit number in the ARN is your AWS account ID. The friendly name you assigned to the group (Admins) appears at the end of the group's ARN.

## API

### To create an administrators group

1. Use the `CreateGroup` action with the name you've chosen for the group and an optional path you've chosen. The following example uses *Admins* as the name of the group.

   How you structure the `AUTHPARAMS` depends on how you are signing your API request. For information on `AUTHPARAMS` in Signature Version 4, go to Examples of Signed Signature Version 4 Requests. For information on `AUTHPARAMS` in Signature Version 2, go to Signature Version 2 Signing Process.

   For more information about the `CreateGroup` action, refer to the *AWS Identity and Access Management API Reference*, or refer to your SDK's documentation.

   ```
   https://iam.amazonaws.com/
   ?Action=CreateGroup
   &Path=/
   &GroupName=Admins
   &Version=2010-05-08
   &AUTHPARAMS
   ```

IAM returns output similar to the following:

```
<CreateGroupResponse>
   <CreateGroupResult>
      <Group>
         <Path>/</Path>
         <GroupName>Admins</GroupName>
         <GroupId>AGPACKCEVSQ6C2EXAMPLE</GroupId>
         <Arn>arn:aws:iam::123456789012:group/Admins</Arn>
      </Group>
   </CreateGroupResult>
   <ResponseMetadata>
      <RequestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</RequestId>
   </ResponseMetadata>
</CreateGroupResponse>
```

2. Use the `ListGroups` action to list the groups in your AWS account and confirm the group was created.

```
https://iam.amazonaws.com/
?Action=ListGroups
&Version=2010-05-08
&AUTHPARAMS
```

Sample response:

```
<ListGroupsResponse>
   <ListGroupsResult>
      <Groups>
         <member>
            <Path>/</Path>
            <GroupName>Admins</GroupName>
            <GroupId>AGPACKCEVSQ6C2EXAMPLE</GroupId>
            <Arn>arn:aws:iam::123456789012:group/Admins</Arn>
         </member>
      </Groups>
      <IsTruncated>False</IsTruncated>
   </ListGroupsResult>
   <ResponseMetadata>
      <RequestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</RequestId>
   </ResponseMetadata>
</ListGroupsResponse>
```

# Adding a Policy to the Group

This section shows how to add a policy that lets any user in the group perform any action on any resource in the AWS account. You write the policy using the *access policy language*, and then attach the policy to the Admins group. For more information about the access policy language, see The Access Policy Language (p. 29).

# Command Line Interface

### To add a policy giving root privileges

1. Create a policy document by copying and pasting the following JSON block into a text file.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"*",
      "Resource":"*"
      }
   ]
}
```

2. Save the text file as `MyPolicy.txt` in the main CLI installation directory.
3. Type the following command to upload this policy to IAM and attach it to your Admins group. The command assigns the following name to the policy: *AdminRoot*.

```
PROMPT> iam-groupuploadpolicy -g Admins -p AdminRoot -f MyPolicy.txt
```

   If the command is successful, there's no response.
4. Type the following command to confirm the policy is attached to the Admins group.

```
PROMPT> iam-grouplistpolicies -g Admins
```

   The response lists the names of the policies attached to the Admins group. Sample response:

```
AdminRoot
```

In the preceding policy, you could have used `iam-groupaddpolicy` instead of the `iam-groupuploadpolicy`. The `iam-groupaddpolicy` command lets you specify the contents of the policy as parameters instead of uploading a JSON policy document file. Following is an example of what the `iam-groupaddpolicy` command would look like. The `-o` option causes the output to include the JSON policy document we construct for you based on the parameters you provided.

```
PROMPT> iam-groupaddpolicy -g Admins -p AdminRoot -e Allow -a "*" -r "*" -o
```

Sample response:

```
{"Version":"2008-10-17","Statement":[{"Effect":"Allow","Action":["*"],"Re
source":["*"]}]}
```

# API

### To add a policy giving root privileges

1. Create the following JSON policy.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":"*",
      "Resource":"*"
      }
   ]
}
```

2. Issue a `PutPolicy` request. The following example names the policy *AdminRoot* and attaches it to the Admins group. The policy document in the request doesn't include white space or line feeds, and it's not URL encoded here so you can more easily see what it looks like (normally you must form URL encode it as part of POST request). For more information about how to do a POST request, go to Examples of Signed Signature Version 4 Requests, or Signature Version 2 Signing Process.

```
POST / HTTP/1.1
Host: iam.amazonaws.com
Content-Type: application/x-www-form-urlencoded

Action=PutPolicy
&GroupName=Admins
&PolicyName=AdminRoot
&PolicyDocument={"Statement":[{"Effect":"Allow","Action":"*","Resource":"*"}]}
&Version=2010-05-08
&AUTHPARAMS
```

Sample response:

```
<PutPolicyResponse>
   <ResponseMetadata>
      <RequestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</RequestId>
   </ResponseMetadata>
</PutPolicyResponse>
```

3. Issue a `ListGroupPolicies` request to confirm the policy is attached to the Admins group.

```
https://iam.amazonaws.com/
?Action=ListGroupPolicies
&GroupName=Admins
&Version=2010-05-08
&AUTHPARAMS
```

Sample response:

```
<ListGroupPoliciesResponse>
   <ListGroupPoliciesResult>
      <PolicyNames>
         <member>AdminRoot</member>
      </PolicyNames>
      <IsTruncated>false</IsTruncated>
   </ListGroupPoliciesResult>
   <ResponseMetadata>
```

```
      <RequestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</RequestId>
   </ResponseMetadata>
</ListGroupPoliciesResponse>
```

You can confirm the contents of a particular policy with the `GetUserPolicy` or `GetGroupPolicy` actions. For information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

**Important**

After you have the administrators group set up, you must add at least one user to it. For more information about adding users to a group, see Adding a New User to Your AWS Account (p. 65).

# Working with Users and Groups

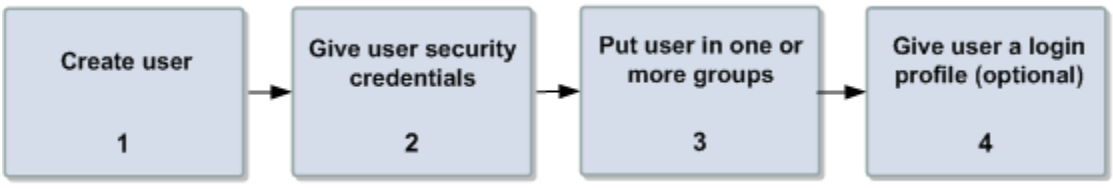
**Topics**



This section describes how to create and manage users and groups.

## Adding a New User to Your AWS Account

When someone joins your organization, or if you have a new application or system that needs to make API calls to AWS, you need to add a new user to your AWS account. This section describes the process for setting up a user in IAM.




**Process for Adding a New User**

| | |
|---|---|
| 1 | Create a user. |

| | |
|---|---|
| 2 | Optionally, if the user will be making API calls or using the command line interface, you need to create security credentials for the user and give them to the user. |
| 3 | Optionally add the user to one or more groups. If you've decided to create a group that includes all your AWS account's users (for example, an *AllUsers* group), make sure to add the new user to that group. |
| 4 | Optionally give the user a password, which is required if the user needs to use the AWS Management Console. For more information about passwords and optional MFA devices for securing passwords, see Passwords (p. 21) and Multi-Factor Authentication for Users (p. 21). |

How you actually execute the tasks in the preceding table depends on which interface you're using to access IAM. The interface-specific details are covered in the sections that follow.

**Note**

There are character limitations for user names. For more information, see Limitations on IAM Entities (p. 56).

# AWS-Assigned User Identifiers

When you create a user, in return you receive the following AWS-assigned identifiers:

- Amazon Resource Name (ARN) for the user
- Globally unique identifier (GUID) for the user (this identifier is returned only when you use the API or CLI to create the user)

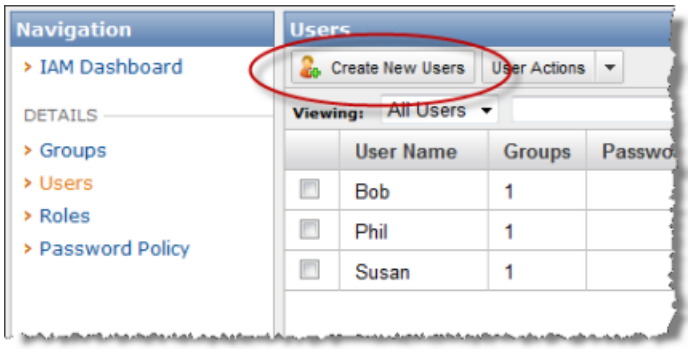
For more information about these identifiers, see Identifiers for IAM Entities (p. 52).

# AWS Management Console

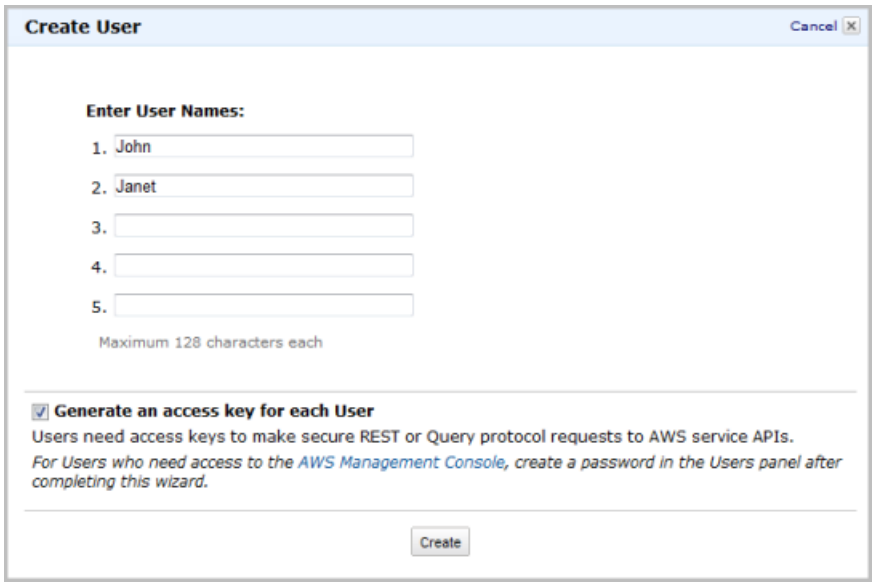
If you're accessing IAM through the AWS Management Console, you can create and manage users and their security credentials in a few simple steps.

### To add a user

1. On the **Navigation** pane of the console, click **Users**, and then click **Create New Users**.



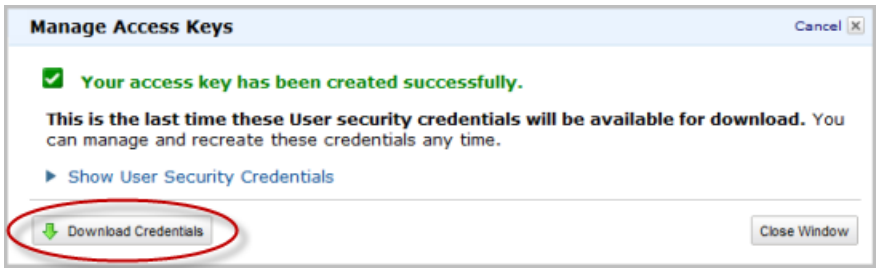

2. Enter the user names for users you want to create. You can create up to five users at one time.




3. If you want to automatically generate an Access Key ID and Secret Access Key for your new users, select **Generate an access key for each user**. Users need keys if they will be working with an AWS API. For more information about creating user keys for existing users, go to Managing User Keys and Certificates in *Using AWS Identity and Access Management*.

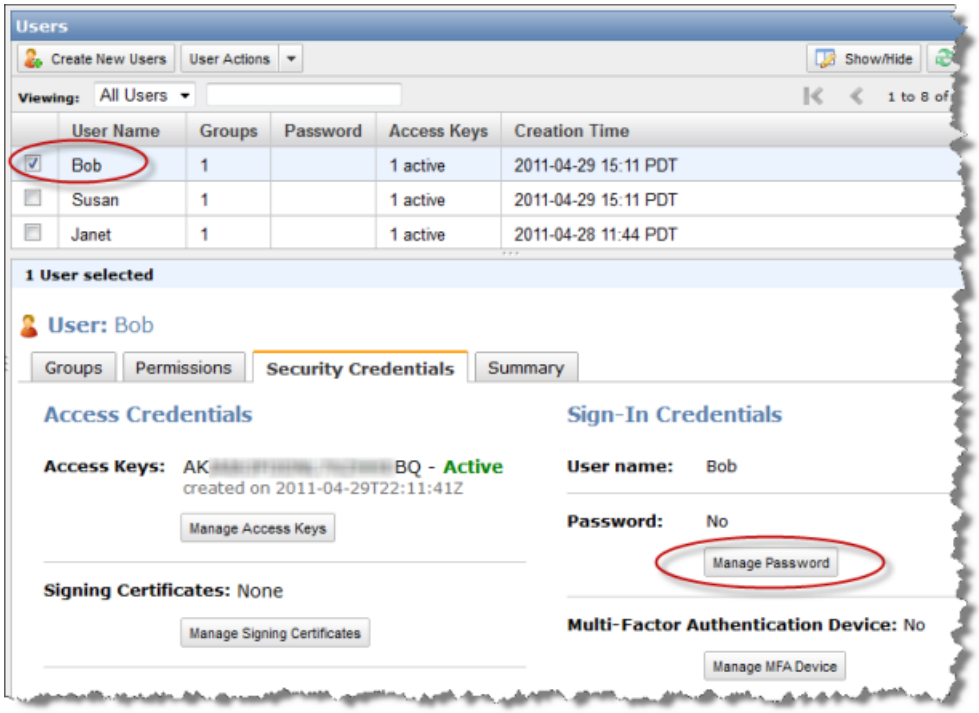
   **Note**

   If you have users who will be working with the AWS Management Console, you will need to create passwords for each of them. Creating passwords is described later in this procedure.
4. Click **Create**.
5. If you chose to create security credentials for the users, click **Download Credentials** to save the Access Key IDs and Secret Access Keys to a .CSV file on your computer. You will not have access to the Secret Access Keys again after this dialog box closes, and you will need to provide this information to your users before they can begin using an AWS API.



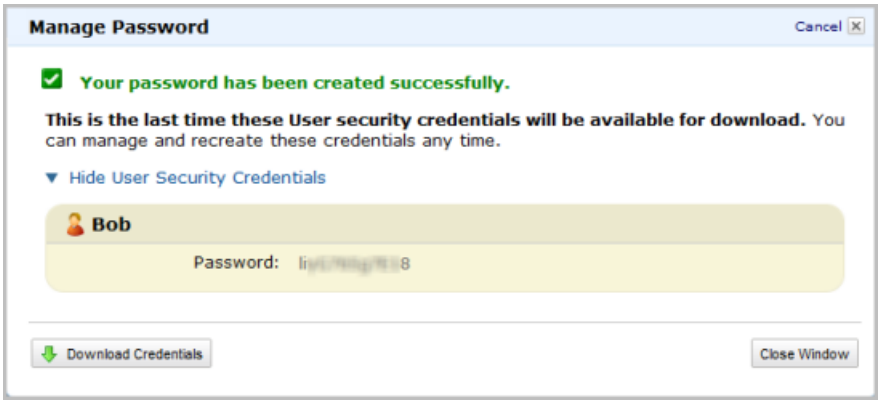

6. When you are finished downloading your users' security credentials, click **Close Window** to continue.
7. Users who will access the AWS Management Console will need a password. To add a password for a user

   a. On the **Navigation** pane, click **Users**.
   b. Select the user who you want to create a password for, and then select the user **Security Credentials** tab.
   c. Click **Manage Password**.



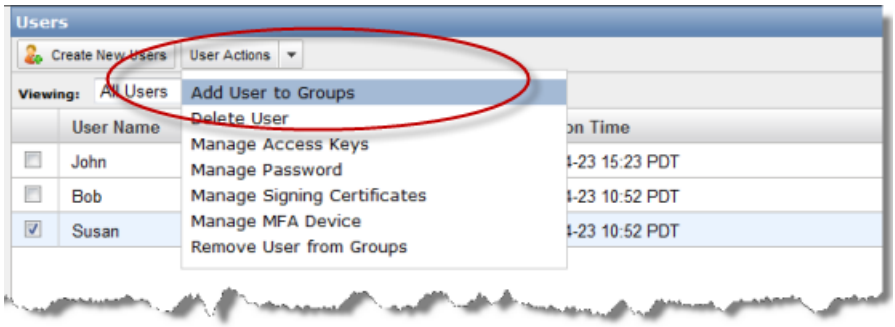

d. You can create a custom password, or you can have IAM automatically generate a password.

- To create a custom password, select **Assign a custom password**, and then enter and confirm the password. When you are finished, click **Apply**. The selected user can begin using the password. For information about how users access your sign-in page, see The AWS Management Console Sign-in Page (p. 164).
- To have IAM generate a password, select **Assign an auto-generated password**, and then click **Apply**. Next, click **Download Credentials** to save the password as a .CSV file to your computer. You will need to provide this password to the user, and you will not be able to access the password after completing this step. Click **Close Window** to continue.

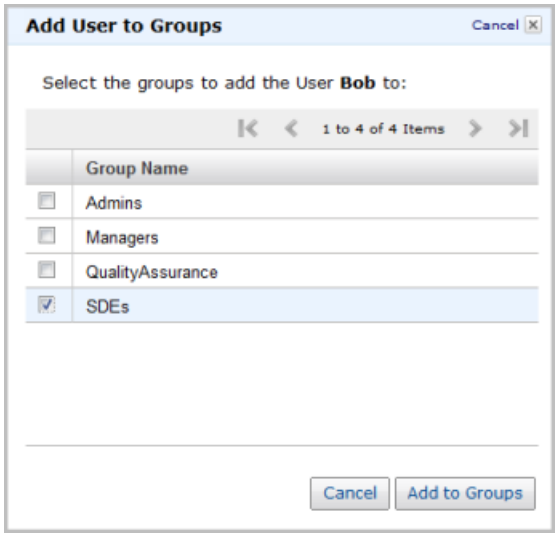



8. To add the user to a group

   a. Select the user name, and then, from the **User Actions** list, select **Add User to Groups**.



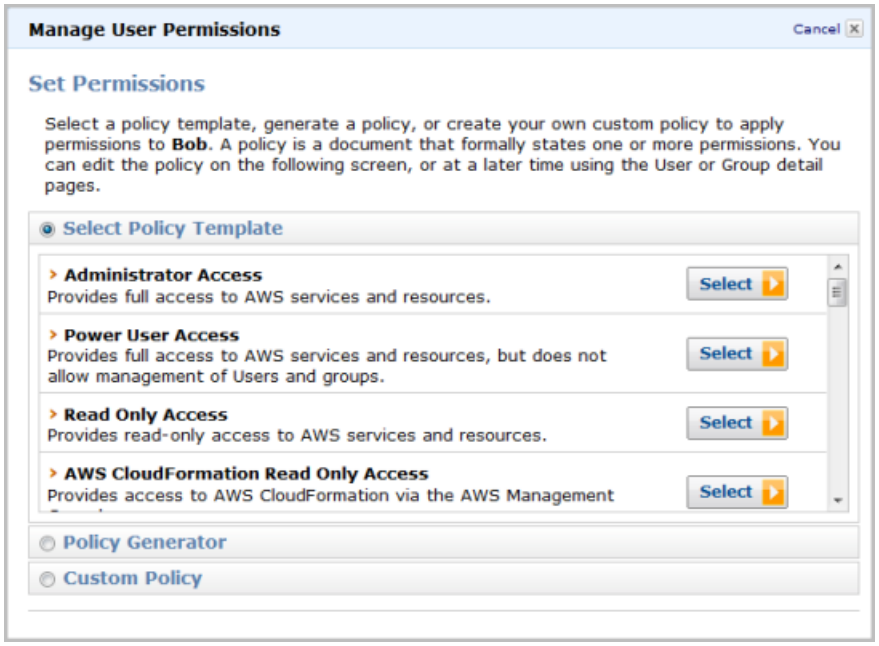

b. Select the groups you want to add the user to, and then click **Add to Groups**.




9. To attach a policy to the user

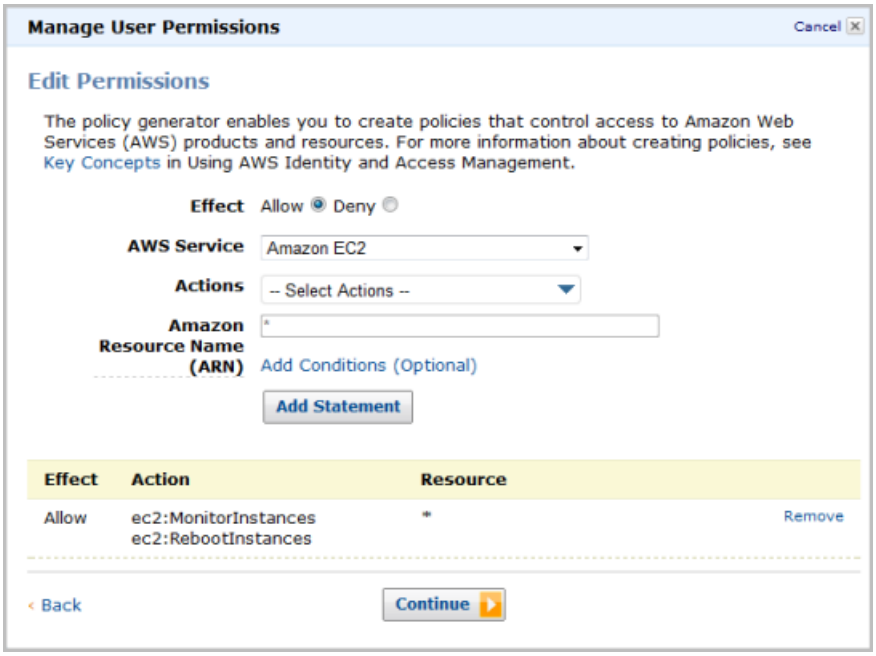
   a. Select the **Permissions** tab, and then click **Attach User Policy**.


   b. Choose the method for creating the policy document by clicking either **Select Policy Template**, **Policy Generator**, or **Custom Policy**. Then click **Select**.

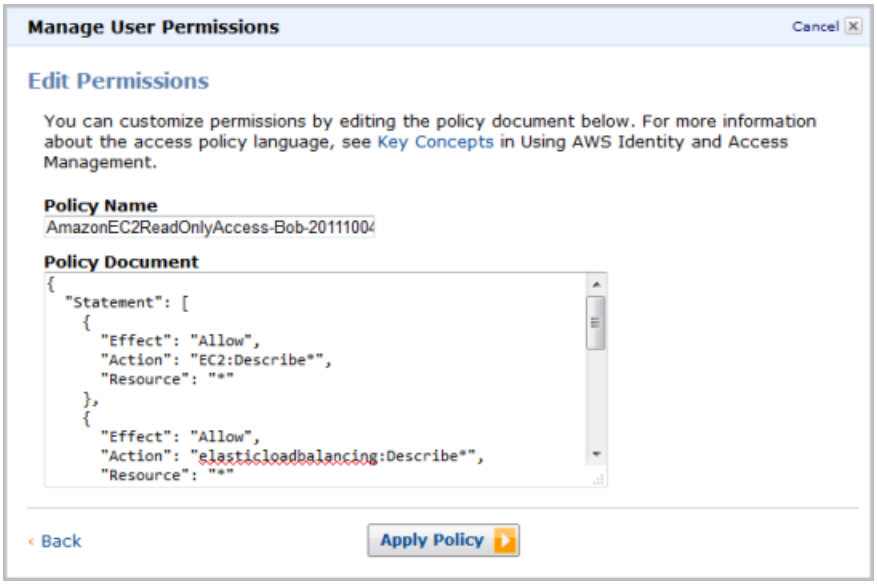



c. How you complete the next step depends on the method you selected to create the policy.

- If you are using a template to create the policy, review the policy content in the dialog box, then click **Apply Policy**.
- If you are using the policy generator, select the appropriate **Effect**, **AWS Service**, and **Actions** options, enter the ARN (if applicable), and add any conditions you want to include. Then click **Add Statement**. You can add as many statements as you want to the policy. When you are finished adding statements, click **Continue**. Review the generated output, then click **Apply Policy**.



- If you are using a custom policy, enter a name for the policy under **Policy Name** and write the policy or paste the policy document from your text editor into the **Policy Document** box. When you are finished, click **Apply Policy**.




IAM applies the policy to the user.

**Note**

There are limitations on policy names and on policy size. For information about policy limitations, see Limitations on IAM Entities (p. 56).

For information about optionally giving users permission to manage their own security credentials, see Adding a Credentials Management Policy to the User (p. 126).

# Command Line Interface

If you're using the IAM command line interface, you can do tasks 1-3 in the preceding table with one command: `iam-usercreate`. The command's main purpose is task 1 (creating the user), and it optionally does tasks 2 and 3. You can perform tasks 2 and 3 separately with other commands (`iam-useraddkey` and `iam-groupadduser`).

To give the user a password use the `iam-useraddloginprofile` command. To give the user permission to manage his or her own security credentials, use the `iam-useraddpolicy` or `iam-useruploadpolicy` commands.

The following example creates a user named Bob, creates an access key for Bob, and assigns Bob to the Developers group.

```
PROMPT> iam-usercreate -u Bob -g Developers -k -v
```

Sample response:

```
arn:aws:iam::123456789012:user/Bob
AIDACKCEVSQ6C2EXAMPLE
```

The command used verbose mode (`-v`), so the response includes the user's ARN and GUID. If you don't use verbose mode, the response is empty.

We recommend saving the user's new Access Key ID and Secret Access Key to a text file, such as `Bob-credentials.txt`. You can give that file to Bob so he'll have his credentials to use with calls to AWS.

The following example creates the password *Welcome* for the user Bob.

```
PROMPT> iam-useraddloginprofile -u Bob -p Welcome
```

If the command is successful, there is no response.

You can list the users in your AWS account or in a particular group with the `iam-userlistbypath` and `iam-grouplistusers` commands.

For information about optionally giving users permission to manage their own security credentials, see Adding a Credentials Management Policy to the User (p. 126).

## API

If you're programmatically accessing IAM, you use a separate API call for each of the tasks involved in setting up a new user. The following table lists the API actions to use.

**Process for Adding a New User**

| | |
|---|---|
| 1 | Create a user: `CreateUser` |
| 2 | Create security credentials for the user: `CreateAccessKey` |
| 3 | Optionally add the user to one or more groups: `AddUserToGroup` |
| 4 | Optionally give the user a password, which is required if the user needs to use the AWS Management Console: `CreateLoginProfile` |

You can also optionally give the user permission to manage his or her own security credentials. For more information, go to `PutUserPolicy`.

For more information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

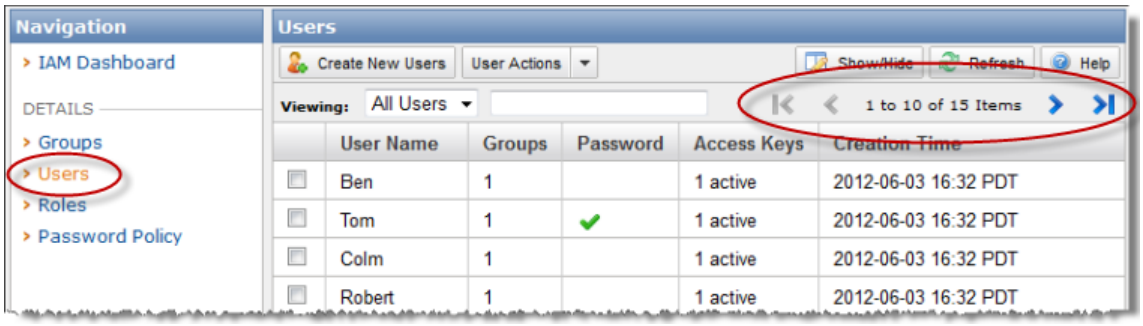
# Listing Users

This section describes how to list the users in your AWS account or in a particular group.

# AWS Management Console

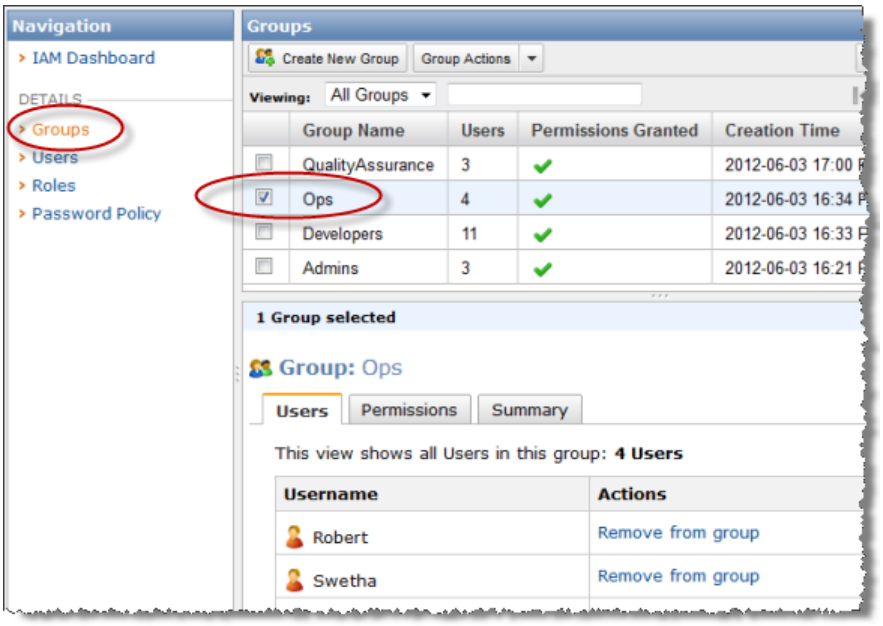
### To list all users in your AWS account

- On the **Navigation** pane, click **Users**. The console displays ten users per screen. To see more users, use the page controls on the right side of the console to advance to the next screen.




### To list all users in a group

- On the **Navigation** pane of the console, click **Groups**, and then select the group name. The console displays group details. If necessary, select the **Users** tab to display all users belonging to the group.




# Command Line Interface

The `iam-userlistbypath` command lets you list all the users in the AWS account or list all the users with a particular path prefix. The output lists the ARN for each resulting user.

The `iam-userlistgroups` command lists all the groups a particular user is in. The output lists the ARNs for the groups the user is in. For more information about ARNs and paths, see Identifiers for IAM Entities (p. 52).

For more information about these commands, refer to the *AWS Identity and Access Management Command Line Interface Reference*.

# API

The `ListUsers` action lets you list all the users in the AWS account, or list all the users with a particular path prefix. The response lists the path, ARN, and GUID for each resulting user. For more information about paths, ARNs, and GUIDs, see Identifiers for IAM Entities (p. 52).

If you want to get a list of users in a particular group, use `GetGroup`.

For more information about `ListUsers` and `GetGroup`, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

## Paginating the Results

Some of the API actions such as `ListUsers` and `GetGroup` let you paginate the results (they limit the number of users returned in the response, so that you must call the action multiple times to get the full list of users).

### To paginate the list results

1. In the first request, specify a *`MaxItems`* parameter specifying how many users you want in the response.

```
https://iam.amazonaws.com/
?Action=ListUsers
&MaxItems=10
&Version=2010-05-08
&AUTHPARAMS
```

   The response includes up to *`MaxItems`* number of users (assuming there are at least that many total). If there are more users left beyond that maximum, the response includes an element called `IsTruncated` with a `true` value (otherwise the value is `false`). The response also includes a `Marker` element with a long string as the value.

```
<ListUsersResponse>
   <ListUsersResult>
      <Users>
         <member>
            ...
         </member>
         <member>
            ...
        </member>
      ...
      </Users>
      <IsTruncated>true</IsTruncated>
      <Marker>AAHu6JklqUhsapsw5lZ5xq/bjVoYLSbLeLoLhUS4GlRQK2UYzMW40g
39qbmiJeRLnkYI4WUSXIT45gZEXAMPLE</Marker>
   </ListUsersResult>
   <ResponseMetadata>
```

```
      <RequestId>7a62c49f-347e-4fc4-9331-6e8eEXAMPLE</RequestId>
   </ResponseMetadata>
</ListUsersResponse>
```

2. In the subsequent request to continue listing the users, again include the *MaxItems* request parameter, and a *Marker* request parameter set to that long `Marker` value from the response.

```
https://iam.amazonaws.com/
?Action=ListUsers
&MaxItems=10
&Marker=AAHu6JklqUhsapsw5lZ5xq/bjVoYLSbLeLoLhUS4GlRQK2UYzMW40g39qbmiJeRLnkYI4
WUSXIT45gZEXAMPLE
&Version=2010-05-08
&AUTHPARAMS
```

   If there are still more users to be listed, the `IsTruncated` value in the response is `true`, and there's a new value for `Marker` for you to use in the next request to continue listing.

# Deleting a User from Your AWS Account

**Topics**



You can remove a user from your AWS account at any time. You might do this if someone quits the company. The process of removing a user deletes the user's credentials and policies. If the user is only temporarily leaving the company, you could instead just disable the user's credentials instead of deleting the user entirely from the AWS account. That way, you can easily prevent the user from accessing the AWS account's resources during the absence, without removing the user's credentials or policies. For more information about disabling credentials, see Managing User Keys and Certificates (p. 117).

## Using the AWS Management Console to Delete a User

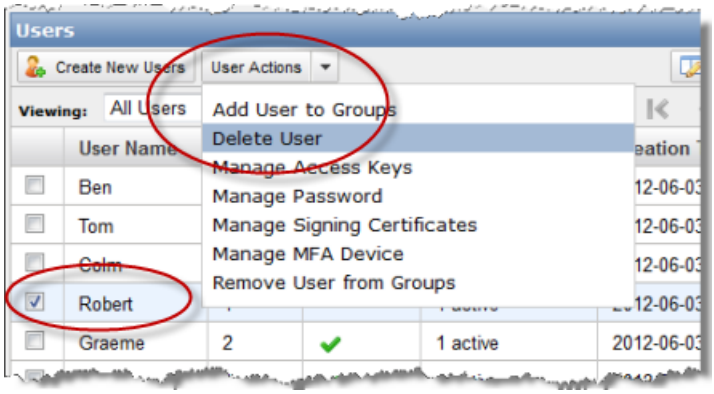
When you use the AWS Management Console to delete an IAM user, IAM also deletes all the information associated with the user. IAM deletes the following information when you delete a user:

- The user
- Any signing certificates belonging to the user
- Any access keys belonging to the user
- Any associated MFA device
- Any password associated with the user
- All policies attached to the user (policies that are applied to a user via group permissions are not affected)

Also, the user is removed from any groups it belongs to.

### To use the AWS Management Console to delete a user

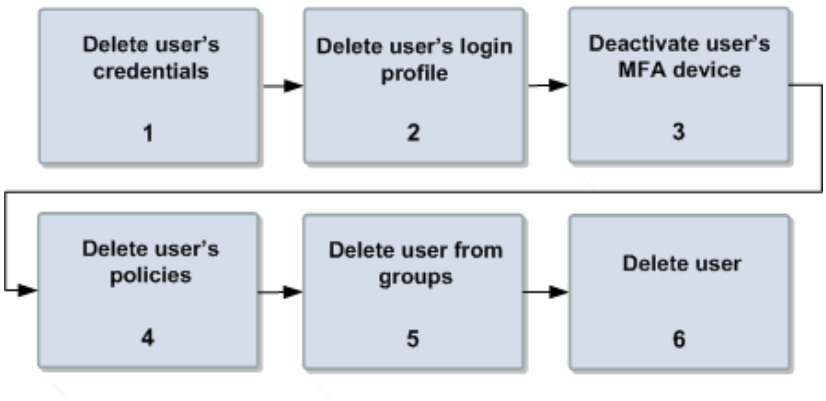
1. On the **Navigation** pane, click **Users**, and then select the user name.
2. From the **User Actions** list, select **Delete User**.




3. Review your changes, and then click **Yes, Delete**.

# Using the IAM API or CLI to Delete a User

The following figure and table describe the process for using the IAM CLI or API to delete a user from your AWS account.




### Process for Deleting a User from Your AWS Account

| | |
|---|---|
| 1 | Delete the user's keys and certificates. This helps ensure that the user can't access your AWS account's resources anymore. Note that when you delete a security credential, it's gone forever and can't be retrieved. |
| 2 | Delete the user's password, if the user has one. For a general description of using IAM to manage passwords, see Passwords (p. 21). |
| 3 | Deactivate the user's MFA device, if the user has one. For a general description of MFA, see Multi-Factor Authentication for Users (p. 21). |
| 4 | Delete any policies that were attached to the user. |

| | |
|---|---|
| 5 | Get a list of any groups the user was in, and delete the user from those groups. |
| 6 | Delete the user. |

**Note**

If you delete a user, any residual remote references to that user (e.g., an Amazon SQS policy) display the GUID in the user's ARN instead of the user's friendly name. If you've stored the GUID in your own system, you can then use the displayed GUID to identify the deleted user being referred to.

How you actually execute the tasks in the preceding table depends on which interface you're using to access IAM. The interface-specific details are covered in the sections that follow.

## Command Line Interface

If you're using the command line interface to access IAM, you can use a single command for each of the tasks involved in deleting a user from your AWS account, or you can perform each step individually. The following table lists the commands to use when deleting the user in steps.

To delete the user recursively, use the `iam-userdel` with the `-r` option. Recursively deleting the user automatically deletes it from any associated groups and deletes any attached entities such as keys, signing certificates, and policies. Use the `-r` option with caution. Before performing a recursive delete, to ensure you are not deleting anything you don't want to, use the `-p` option along with the `-r` option to list all the user's associated entities and groups without actually performing the recursive deletion. For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

### Process for Deleting a User from Your AWS Account

| | |
|---|---|
| 1 | Delete the user's keys and certificates: `iam-userdelkey` and `iam-userdelcert` |
| 2 | Delete the user's password, if the user has one: `iam-userdelloginprofile` |
| 3 | Deactivate the user's MFA device, if the user has one: `iam-userdeactivatemfadevice` or `iam-virtualmfadevicedelete` (if the user has a virtual MFA device) |
| 4 | Delete any policies that were attached to the user: `iam-userlistpolicies` (to list the policies attached to the user) and `iam-userdelpolicy` |
| 5 | Get a list of any groups the user was in, and delete the user from those groups: `iam-userlistgroups` and `iam-groupremoveuser` |
| 6 | Delete the user: `iam-userdel` |

## API

If you're programmatically accessing IAM, you use a separate API call for each of the tasks involved in setting up a new user. The following table lists the API actions to use.

### Process for Deleting a User from Your AWS Account

| | |
|---|---|
| 1 | Delete the user's keys and certificates: `DeleteAccessKey` and `DeleteSigningCertificate` |

| | |
|---|---|
| 2 | Delete the user's password, if the user has one: `DeleteLoginProfile` |
| 3 | Deactivate the user's MFA device, if the user has one: `DeactivateMFADevice` or `DeleteVirtualMFADevice` (if the user has a virtual MFA device) |
| 4 | Delete any policies that were attached to the user: `ListUserPolicies` (to list the policies attached to the user) and `DeleteUserPolicy` |
| 5 | Get a list of any groups the user was in and delete the user from those groups: `ListGroupsForUser` and `RemoveUserFromGroup` |
| 6 | Delete the user: `DeleteUser` |

For more information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

# Creating and Listing Groups

**Topics**



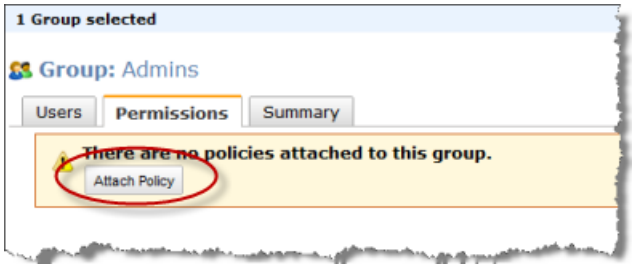
To set up a group, you need to create the group and then give it permissions based on the type of work you expect the users in the group to do. For an example of how to set up a group, go to the Getting Started (p. 4).

## Attaching a Policy to a Group

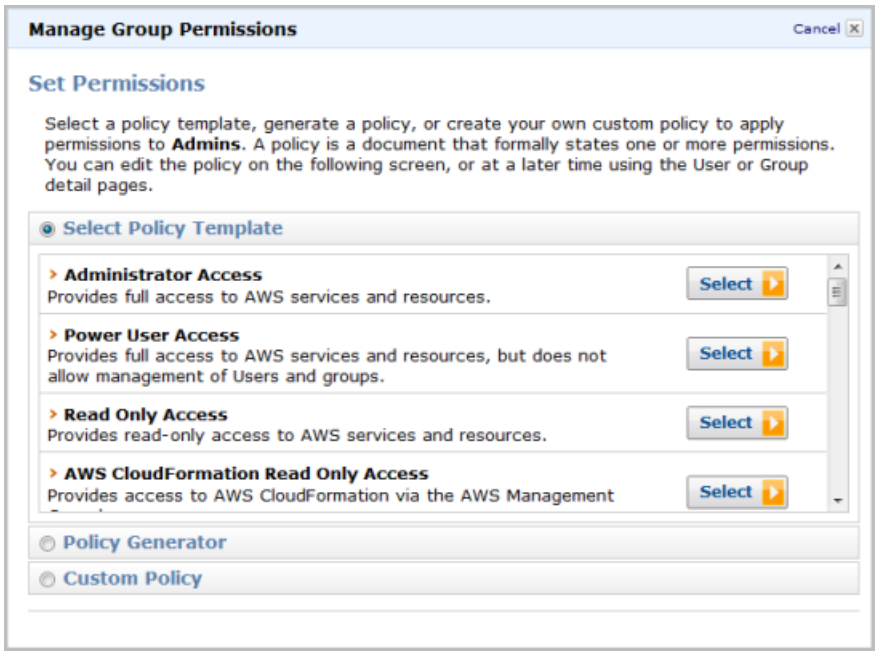
To give a group permissions, you attach a policy to the group as described in the following procedure. For information about permissions and policies, see Permissions and Policies (p. 26).

### To attach a policy to a group

1. From the Navigation pane, select **Groups**.
2. Under **Group Name**, select the group that you want to attach a policy to.
3. Select the **Permissions** tab, and then click **Attach Policy**.

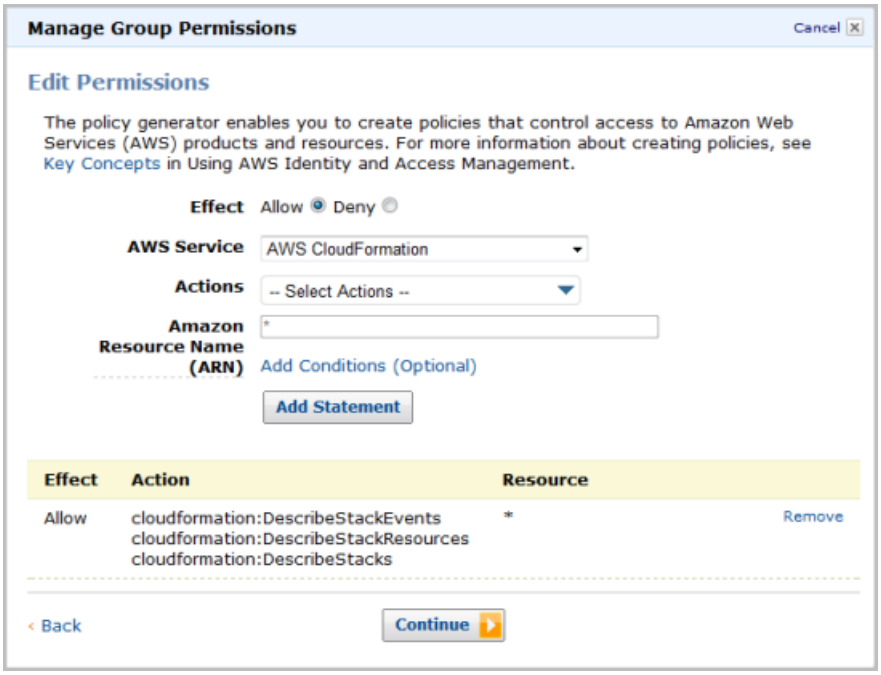



4. Choose the method for creating the policy document by clicking either **Select Policy Template**, **Policy Generator**, or **Custom Policy**. Then click **Select**.

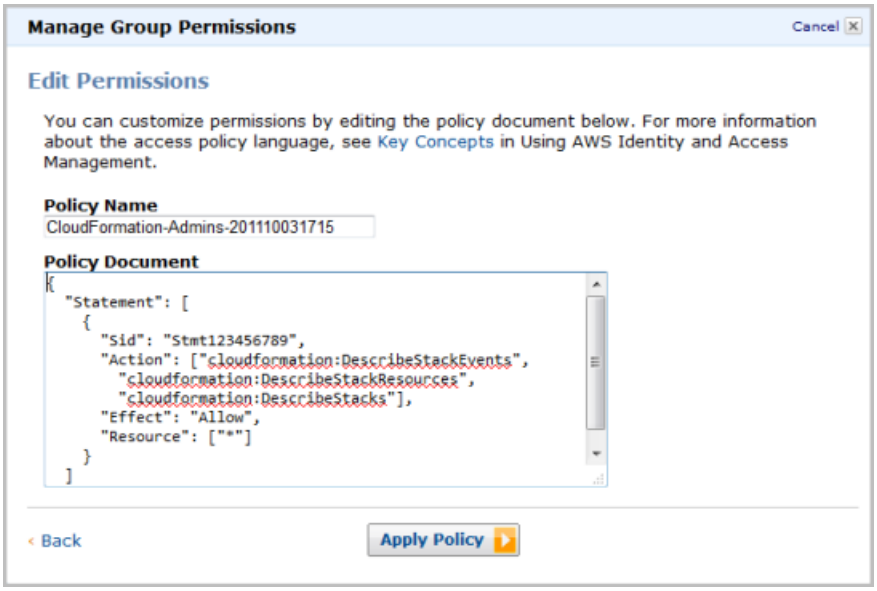



5. How you complete the next step depends on the method you selected to create the policy.

   - If you are using a template to create the policy, review the policy content in the dialog box, then click **Apply Policy**.
   - If you are using the policy generator, select the appropriate **Effect**, **AWS Service**, and **Actions** options, enter the ARN (if applicable), and add any conditions you want to include. Then click **Add Statement**. You can add as many statements as you want to the policy. When you are finished adding statements, click **Continue**. Review the generated output, then click **Apply Policy**.



- If you are using a custom policy, enter a name for the policy under **Policy Name** and write the policy or paste the policy document from your text editor into the **Policy Document** box. When you are finished, click **Apply Policy**.




IAM applies the policy to the group.

**Note**

There are limitations on policy names and on policy size. For information about policy limitations, see Limitations on IAM Entities (p. 56).

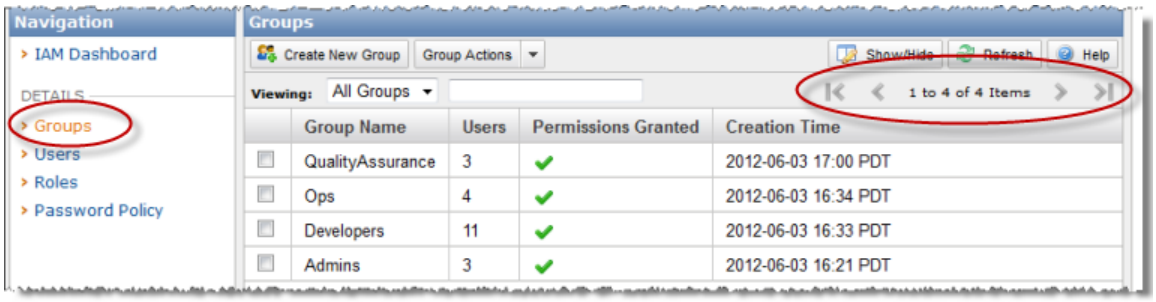
# Listing Groups

You can list the groups that a particular user is in, get a list of the groups in the AWS account, or, if you are using the IAM API or CLI, you can get a list of the groups with a certain path prefix. How you perform these tasks depends on the interface you use to access IAM.

## AWS Management Console

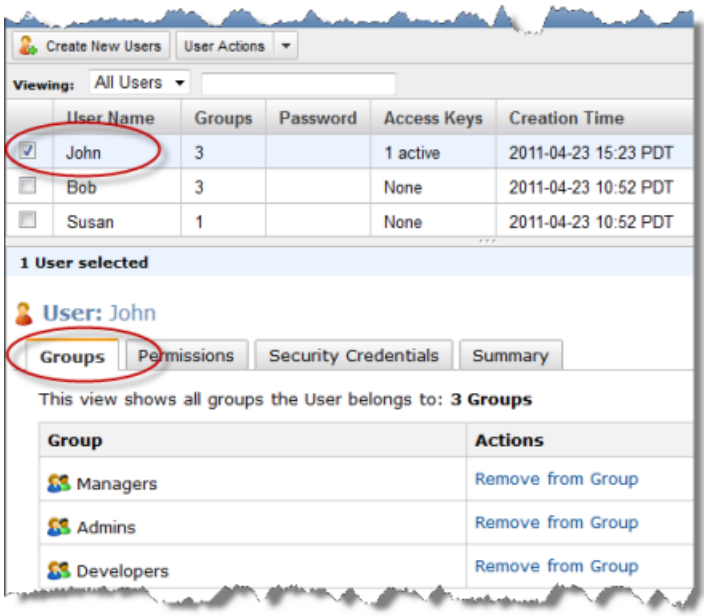
### To list all groups in your AWS account

- Click **Groups**. If you have more than 50 groups, you can use the page controls on the right side of the console to advance to the next screen.




### To list all the groups a user belongs to

1. On the **Navigation** pane of the console, click **Users**, and then select the user name.
2. To view the groups the user belongs to, select the **Groups** tab.




## Command Line Interface

The `iam-grouplistbypath` command lets you list all the groups in the AWS account, or list all the groups with a particular path prefix. To get a list of each of the users in a particular group, use the `iam-grouplistusers` command. The output lists the ARN for each resulting group. For more information about ARNs and paths, see Identifiers for IAM Entities (p. 52).

For more information about `iam-grouplistbypath` or `iam-grouplistusers` commands, go to iam-grouplistbypath or iam-grouplistusers in the *AWS Identity and Access Management Command Line Interface Reference*.

## API

The `ListGroups` action lets you list all the groups in the AWS account, or list all the groups with a particular path prefix. The response lists the path, ARN, and GUID for each resulting group. For more information about paths, ARNs, and GUIDs, see Identifiers for IAM Entities (p. 52).

If you have a large number of groups, you might want to paginate the results. For an example of how to do that, see Listing Users (p. 72).

If you want to get a list of the groups a particular user is in, use `ListGroupsForUser`.

For more information about `ListGroups` and `ListGroupsForUser`, go to AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

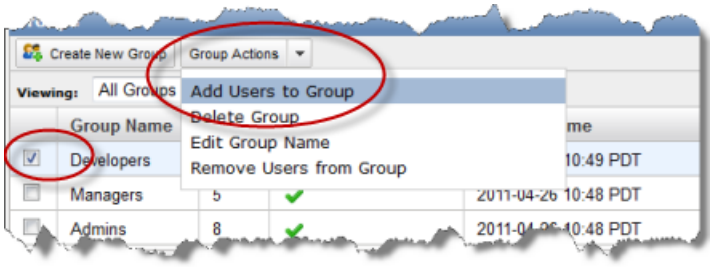
# Adding Users to and Removing Users from a Group

You can use the AWS Management Console, the command line interface, or the API to add users to a group, or to remove them.

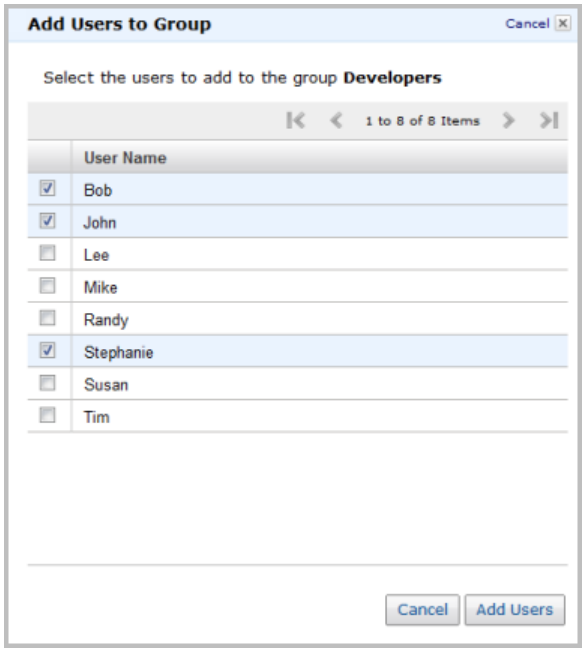
## AWS Management Console

### To add a user to a group

1. On the **Navigation** pane of the console, click **Groups**, and then select the group name.
2. From the **Group Actions** list, select **Add Users to Group**.

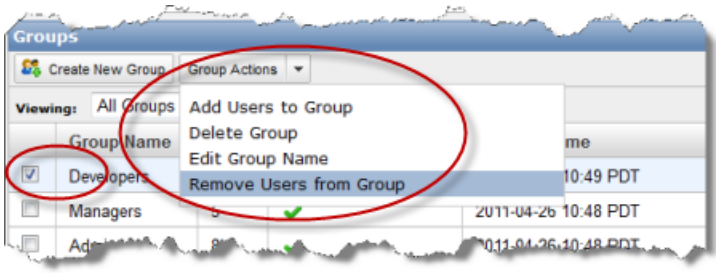



3. Select the users to add to the group, and then click **Add Users**.

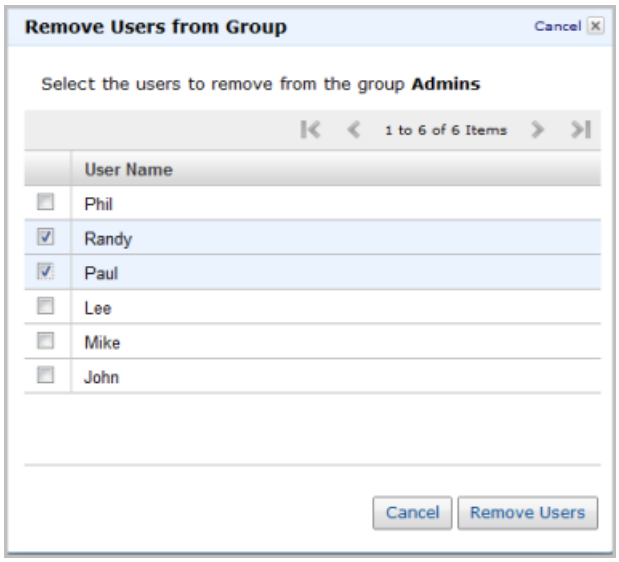



### To remove a user from a group

1. On the **Navigation** pane of the console, click **Groups**, and then select the group name.
2. From the **Group Actions** list, select **Remove Users from Group**.




3. Select the users to remove from the group, and then click **Remove Users**.




## Command Line Interface

To add a user to a group, use the `iam-groupadduser` command. Use the `iam-groupremoveuser` to remove a user from a group.

## API

To add a user to a group, use the `AddUserToGroup` action. To remove a user from a group, use the `RemoveUserFromGroup` action. You can add or remove only a single user to or from a single group with a single API call. For more information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

The response doesn't include an updated list of the users in the group; it just contains the basic information about the group. If you want to get a list of users in the group, use `GetGroup`. For more information about listing users, see Listing Users (p. 72).

# Deleting a Group

**Topics**



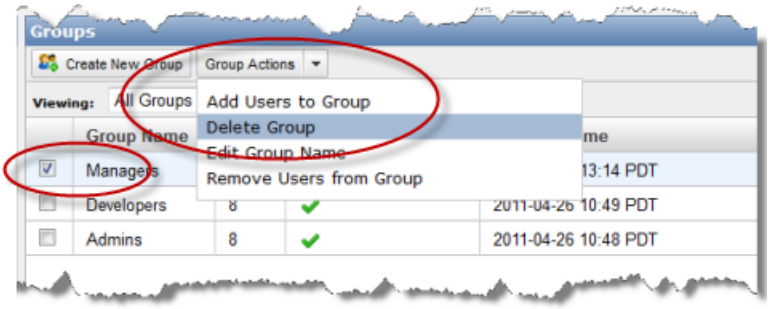
You might want to delete a group that you no longer need. When you use the AWS Management Console to delete a group, IAM deletes the group and any associated policies, but leaves the users intact. If you use the IAM CLI or API to remove the group, you must remove the users and policies before you can remove the group.

# Using the AWS Management Console to Remove a Group

When you use the console to remove a group, IAM removes any policies associated with the group, and it removes the group. Users are removed from the group, and permissions the users had because they belonged to the group will no longer apply to them.

### To use the AWS Management Console to delete a Group

1. On the **Navigation** pane of the console, click **Groups**, and then select the group name.
2. From the **Group Actions** list, select **Delete Group**.




3. Review your changes, and then click **Yes, Delete**.

# Using the IAM CLI or API to Remove a Group

The following diagram and table describe the general process for deleting a group.


### Process for Deleting a Group from Your AWS Account

| | |
|---|---|
| 1 | Remove all users from the group. |
| 2 | Delete all policies attached to the group. |
| 3 | Delete the group. |

How you actually execute the tasks in the preceding table depends on which interface you're using to access IAM. The interface-specific details are covered in the sections that follow.

## Command Line Interface

If you're using the command line interface to access IAM, you can use a separate command for each of the tasks involved in deleting a group from your AWS account. Or, optionally, you can recursively delete

the group and any attached policies by specifying an option with the command. The following table lists the commands to use. For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

**Process for Deleting a Group from Your AWS Account**

| | |
|---|---|
| 1 | Individually remove all users from the group: `iam-groupremoveuser` |
| 2 | Delete the policies attached to the group: `iam-groupdelpolicy` |
| 3 | Delete the group:`iam-groupdel`<br>This function works only when the users have been removed from the group, and when the policies are no longer attached. If you want to delete the group and all attached policies without first removing the users and policies, use the `iam-groupdel -r` option. For more information about this command, go to the AWS Identity and Access Management Command Line Interface Reference. |

## API

If you're programmatically accessing IAM, you use a separate API call for each of the tasks involved in setting up a new user. The following table lists the API actions to use. Before deleting the group, you must delete all users from the group and remove any policies attached to it.

**Process for Deleting a User from Your AWS Account**

| | |
|---|---|
| 1 | Remove all users from the group: `GetGroup` (to get the list of users in the group), and `RemoveUserFromGroup` |
| 2 | Delete all policies attached to the group: `ListGroupPolicies` (to get a list of the group's policies), and `DeleteGroupPolicy` |
| 3 | Delete the group:`DeleteGroup` |

For more information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

# Renaming Users and Groups

**Topics**



This section shows how to rename or change the path for a user or group.

## Permission to Rename

Administrators in your AWS account are probably the only types of users who will have permission to rename users and groups (or change their paths). To understand why, think of changing the name or path of a user or group as a "move" operation. Whoever wants to rename the user or group needs to have permission to do it on both sides of the "move."

For example, let's say a user is changing from one division in the company to another. You need to change the user's path from /division_abc/ to /division_efg/. So, you need permission to remove the user from /division_abc/, and you need permission to put the user into /division_efg/. Effectively this means you need permission to call `UpdateUser` on both `arn:aws:iam::123456789012:user/division_abc/*` and `arn:aws:iam::123456789012:user/division_efg/*`. It's possible that the only people within the organization who have that type of permission are administrators.

# Changing a User's Name or Path

You must use the IAM CLI or API to change a user's name. When you change a user's name or path, the following happens:

- Any policies attached to the user stay with the user under the new name
- The user stays in the same groups under the new name
- The GUID for the user remains the same (for more information about GUIDs, see GUIDs (p. 56))

In addition, any policies that refer to the user *as the principal* (the user being granted access) are automatically updated to use the new name or path. For example, any queue-based policies in the Amazon SQS system that give the user access to a particular queue are automatically updated to use the new name and path. Amazon S3 bucket policies are also automatically updated.

However, we do not automatically update policies that refer to the user *as a resource* to use the new name or path; you must manually do that. For example, let's say Bob has a policy attached to him that lets him manage his security credentials. If an administrator renames Bob to Robert, the admin also needs to update that policy to change the resource from `arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/Bob` to `arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/Robert`. This is also true if the admin changes the path; the admin needs to update the policy to reflect the new path for the user.

## Command Line Tools

The `iam-usermod` command lets you change the user's name or path. For more information about the command, go to the AWS Identity and Access Management Command Line Interface Reference.

## API

The `UpdateUser` action lets you change the user's name or path. For more information about the action, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

# Changing a Group's Name or Path

You can use the AWS Management Console to change a group's name, or you can use the IAM CLI or API.

When you change a group's name or path, the following happens:

- Any policies attached to the group stay with the group under the new name
- The group retains all its users under the new name
- The GUID for the group remains the same (for more information about GUIDs, see GUIDs (p. 56))

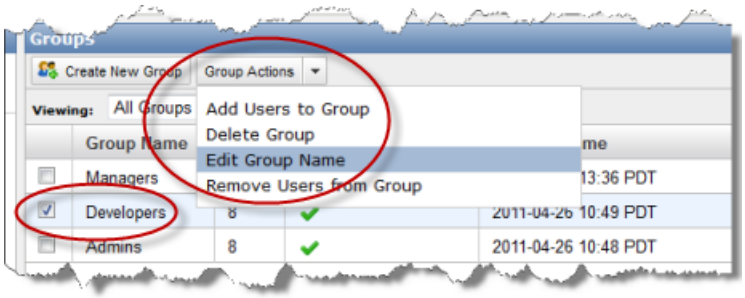
We do not automatically update policies that refer to the group as a resource to use the new name; you must manually do that. For example, let's say Bob is the manager of the testing part of the organization, and he has a policy attached to him that lets him use `UpdateGroup` specifically with the Test group (to add and remove users). Let's say that an admin changes the name of the group to Test_1 (or changes

the path for the group). The admin also needs to update the policy attached to Bob to use the new name (or new path) so that Bob can continue to add and remove users from the group.

## AWS Management Console

### To change a group's name

1. On the **Navigation** pane of the console, click **Groups**, and then select the group name.
2. From the **Group Actions** list, select **Edit Group Name**.




3. Enter the new group name, and then click **Yes, Edit**.

## Command Line Tools

The `iam-groupmod` command lets you change the group's name or path. For more information about the command, go to the AWS Identity and Access Management Command Line Interface Reference.

## API

The `UpdateGroup` action lets you change the group's name or path. For more information about the action, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

# Managing Passwords

**Topics**



To access your AWS account resources from the AWS Management Console, an IAM user must have a password (formerly referred to as a *login profile*). This topic explains how to create, change, and delete a user's password. It also shows how to change the AWS account password, how you can enable users to change their own passwords, and how to set the password policy for users of your AWS account.

**Note**

Users who access your services only through the API or command line interface do not need a password.

For information about how users access your account sign-in page, see How Users Sign In to the AWS Management Console (p. 164).

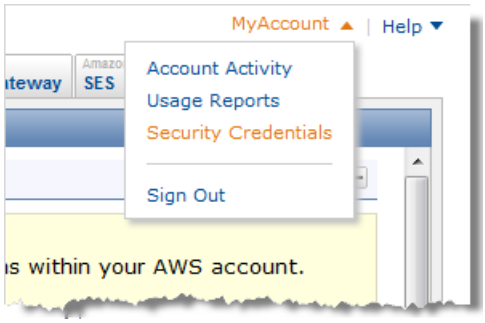
# Changing Your AWS Account Password

**To change the password for your AWS account**

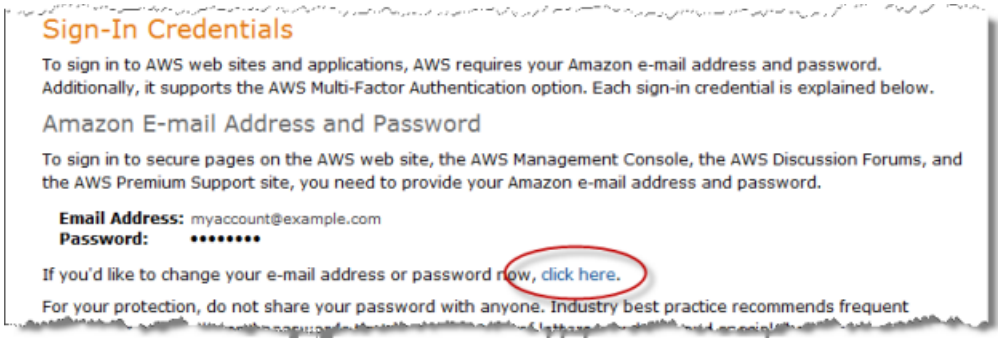
1. Use your AWS account email address and password to sign in to the AWS Management Console.

   **Note**

   If you previously signed in to the console with your IAM user credentials, your browser may remember this preference and open your account-specific sign-in page by default. You cannot use this page to sign in with your root credentials (your email address and password). In this case, to access the regular AWS sign-in page, click **Sign in using AWS Account credentials** near the bottom of the page.
2. In the upper right corner of the console, click the arrow next to the account name or number and then click **Security Credentials**.




3. On the AWS Security Credentials page, under **Sign-in Credentials**, click the link at: *If you'd like to change your e-mail address or password now, **click here**.*




4. Follow the on-screen instructions.

# Managing an IAM Password Policy

**Topics**

Use password policies to enforce creation of strong passwords by your IAM users. A password policy sets the rules that apply when users change their password. For example, your password policy might require that a password include both uppercase and lowercase letters, or that it include numbers. When you set a password policy, as part of that process, you can also enforce an account-wide policy that grants permission to all users to change their own password.

When you create or change a password policy, the change is enforced immediately when users change their passwords. IAM will not force users to change pre-existing passwords.

The IAM password policy does not apply to your AWS root account password.

**Note**

If you do not want to allow all users to change their password, you can use an IAM policy to grant only some users permission to change their password. For information about using an IAM policy to grant users permission to change their own password, see Granting IAM Users Permission to Change Their Own Password (p. 97).

For enhanced security, use password policies together with multi-factor authentication (MFA). For more information about MFA, see Using Multi-Factor Authentication (MFA) Devices with AWS (p. 99).

# Granting an IAM User Permission to Manage the Password Policy

To grant a user permission to manage the password policy on your AWS account, you attach an IAM policy to the user (or to a group of users) that grants the user access to the IAM password policy APIs. This policy allows users to use the AWS Management Console to change the password policy. It also enables users to call the corresponding API actions directly, and to use the corresponding CLI commands.

The following policy is an example of what your policy might look like.

```
{
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "iam:*AccountPasswordPolicy*",
      "Resource": "*"
    }
  ]
}
```

For information about attaching policies to users or groups, see Managing IAM Policies (p. 147).

# Displaying, Creating, Changing, or Deleting a Password Policy (AWS Management Console)

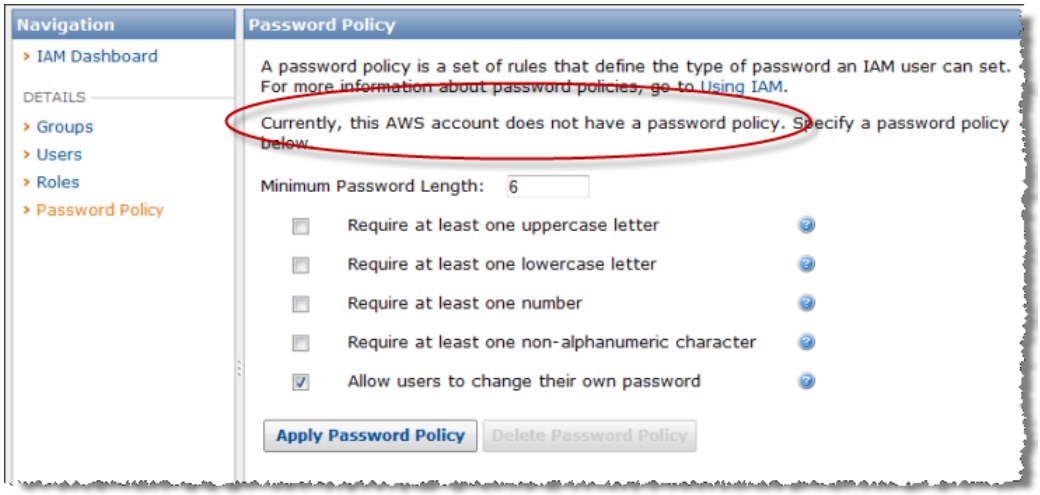
**Topics**

You can use the AWS Management Console to display, create, change, or delete a password policy. For general information about password policies and how they work, see the overview topic Managing an IAM Password Policy (p. 89).

## Displaying, Creating, or Changing the Password Policy

### To display, create, or change a password policy

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. To display your current password policy, on the **Navigation** pane of the console, click **Password Policy**. If you do not have a password policy, you will see a message indicating that a password policy hasn't been set for your AWS account.

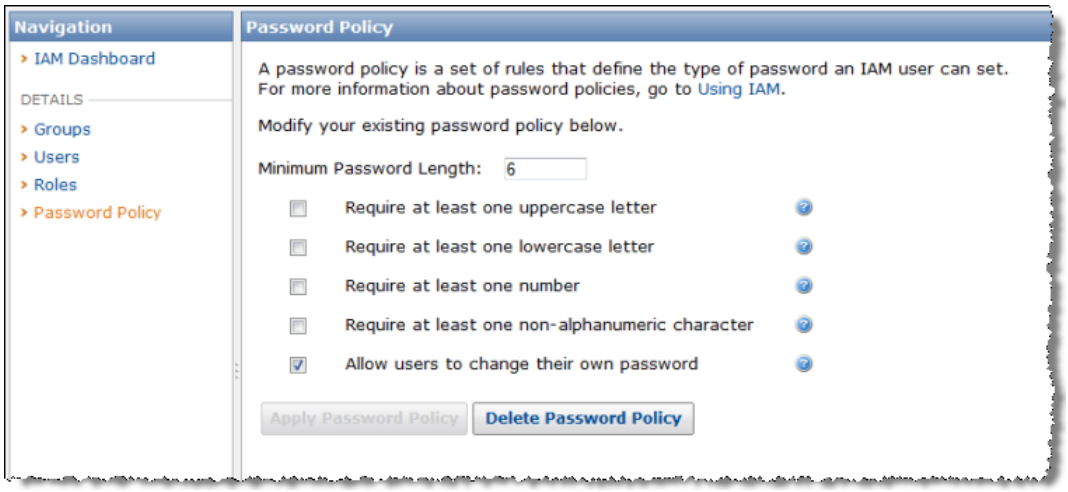



3. To create a new password policy or to change your existing policy, select the check box for the rules you want to apply to your password policy. You can specify the minimum length for the password, and you can require that passwords contain at least one of certain types of characters. If you require that passwords contain non-alphanumeric characters, users must use at least one of the following characters: ! @ # $ % ^ & * ( ) _ + - = [ ] { } | '.
4. To enable all your users to change their password, make sure **Allow users to change their own password** is checked. If you prefer to enable only some users to change their password, uncheck this option. For more information about enabling users to change their own password, see Granting IAM Users Permission to Change Their Own Password (p. 97).
5. To save your changes, click **Apply Password Policy**.

## Deleting a Password Policy

### To delete a password policy

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. On the **Navigation** pane of the console, click **Password Policy**, and then click **Delete Password Policy**.




# Displaying, Creating, Changing, or Deleting a Password Policy (API and CLI)

**Topics**



You can use the IAM API or CLI to manage the password policy for your AWS account. These topics show the API actions and CLI commands you use to complete these tasks.

## Using the API to Create, Change, Display, or Delete a Password Policy

| Action | Use |
|---|---|
| `UpdateAccountPasswordPolicy` | Create or change a password policy. |
| `GetAccountPasswordPolicy` | Display the current password policy. |
| `DeleteAccountPasswordPolicy` | Delete a password policy. |

For more information about the actions, go to the AWS Identity and Access Management API Reference.

## Using the CLI to Create, Change, Display, or Delete an IAM User Password

| Command | Use |
|---|---|
| `iam-accountmodpasswordpolicy` | Create or change a password policy. |
| `iam-accountgetpasswordpolicy` | Display a password policy. |
| `iam-accountdelpasswordpolicy` | Delete a password policy. |

For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

# Creating, Changing, or Deleting a Password for an IAM User

**Topics**



IAM users who access your AWS resources from the AWS Management Console must have a password in order to sign in. This topic explains how to create, change, or delete a password for a user under your AWS account. To complete these tasks, you can use the AWS Management Console, the IAM API, or the command line interface.

After you have created passwords for your users, you can grant them permission to change their own passwords. For more information, see Granting IAM Users Permission to Change Their Own Password (p. 97). For information about how users access your account sign-in page, see How Users Sign In to the AWS Management Console (p. 164).

> **Note**
>
> Users who access your services only through the API or command line interface do not need a password.

# Creating, Changing, or Deleting an IAM User Password (AWS Management Console)

**Topics**

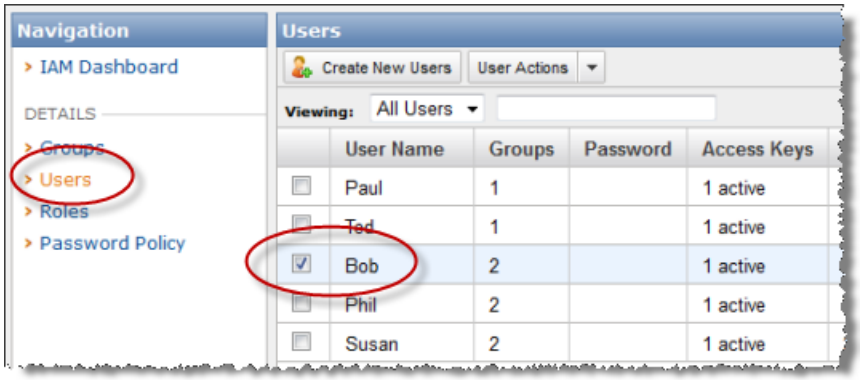


You can use the AWS Management Console to create, change, or delete a password for an IAM user.

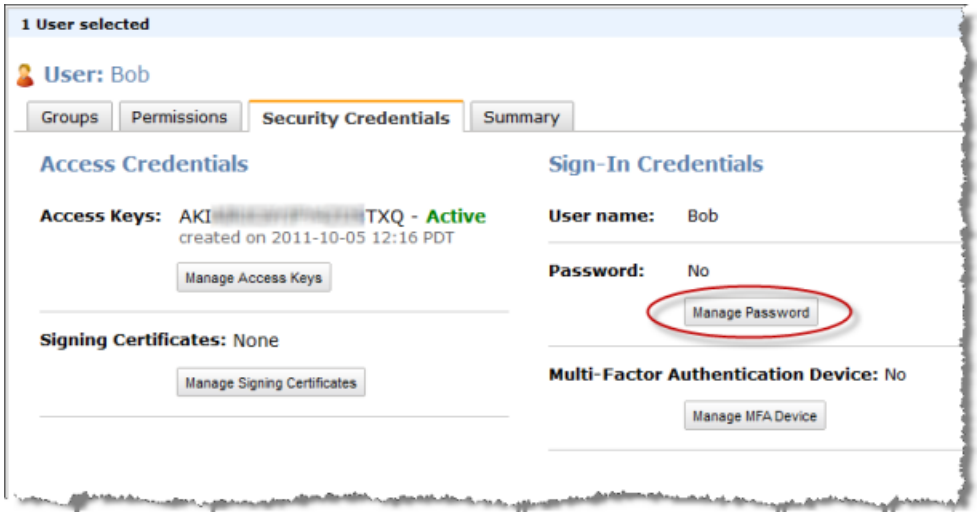
## Creating or Changing an IAM User Password

### To create or change a password for a user

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the **Navigation** pane, click **Users**. In the Users pane, click the user whose password you want to create or change.



3. In the user details pane, click the **Security Credentials** tab, and then click **Manage Password**.

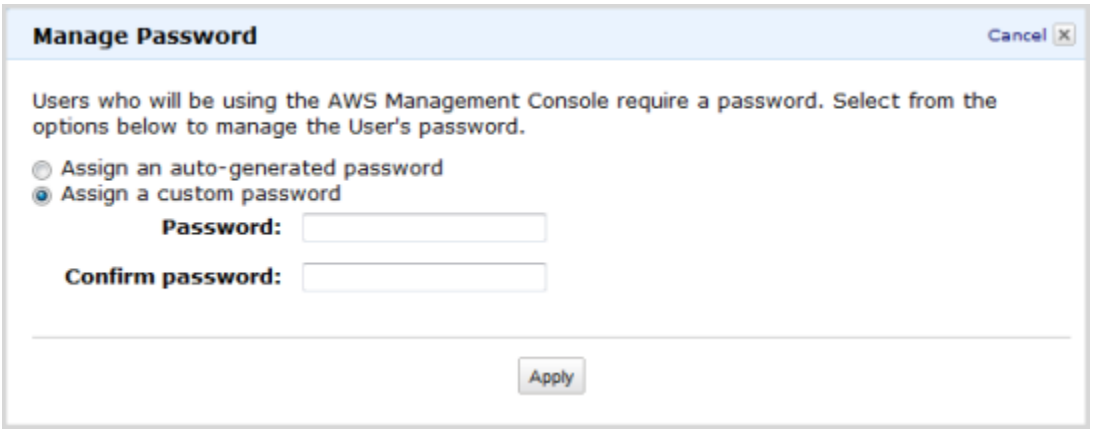



4. You can create a custom password, or you can have IAM automatically generate a password.

   **Important**

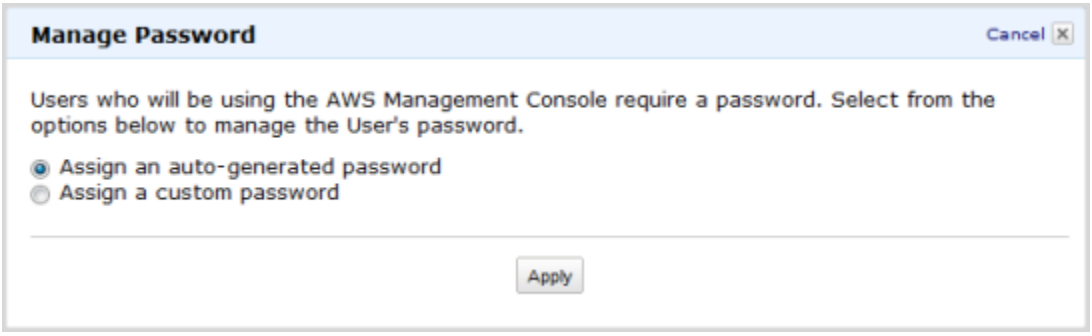
   When you create the password, you should save it in a safe place. For security reasons, neither you nor the user will be able to retrieve the password after this step.

   - To create a custom password
     a. In the **Manage Password** dialog box, click **Assign a custom password** (or **Replace existing password with a new custom password** if this is a replacement password). In the boxes provided, enter and confirm the password, and then click **Apply**.

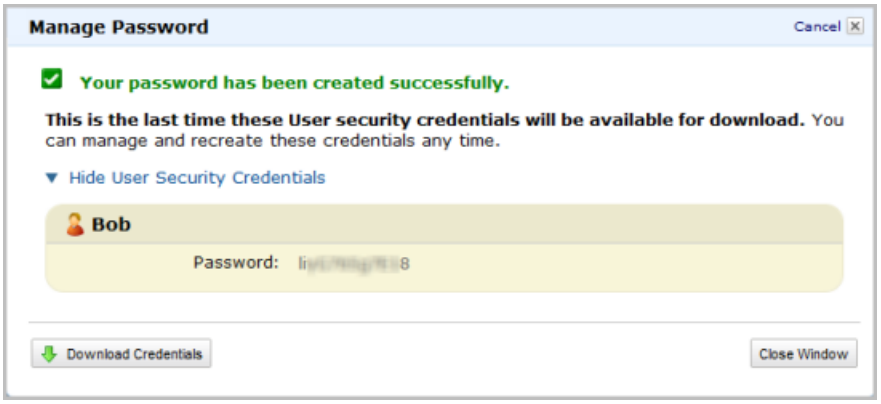



     The password must conform to your password policy, if you have one configured. For more information about password policies, see Managing an IAM Password Policy (p. 89).

   - To have IAM generate a password
     a. In the **Manage Password** dialog box, click **Assign an auto-generated password** (or **Replace existing password with new auto-generated password** if this is a replacement password), and then click **Apply**.




b. Click **Download Credentials** to save the password as a .CSV file to your computer.




After you create the password, you must provide the user with the following information so the user can sign in from your account sign-in page. IAM does not send this information to the user.

- The user's name and password
- The URL to your account sign-in page

For information on accessing the account sign-in page, see How Users Sign In to the AWS Management Console (p. 164).

**Note**

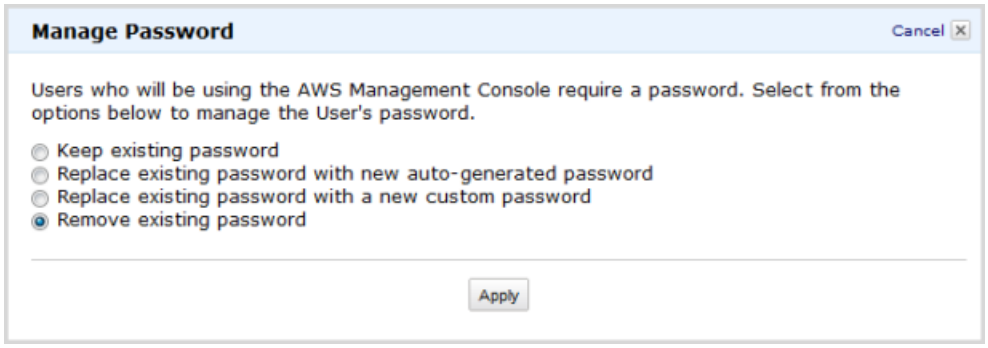
Even if your users have a password, they still need permission to access your AWS resources. By default, a new user has no permissions. To give your users the permissions they need, you assign policies to them or to the groups they belong to. For information about creating users and groups, see Working with Users and Groups (p. 65). For information about using policies to set permissions, see Permissions and Policies (p. 26).

## Deleting an IAM User Password

### To delete a user's password

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. On the **Navigation** pane of the console, click **Users**. In the **Users** pane, click the user whose password you want to delete, and then click **Manage Password**.

3. Click **Remove existing password**, and then click **Apply**.




**Note**

Without a password, a user cannot sign in to AWS website features such as the AWS Management Console or the AWS forums.

# Creating, Changing, or Deleting an IAM User Password (API and CLI)

**Topics**



You can use the IAM API or CLI to manage user passwords. These topics show the API actions and CLI commands you use to complete these tasks.

**Note**

If you use the API to delete a user from your AWS account, you must delete the password as a separate step in the process of removing the user. For more information about deleting a user, see Deleting a User from Your AWS Account (p. 75).

## Using the API to Create, Change, or Delete an IAM User Password

| Action | Use |
|---|---|
| `CreateLoginProfile` | Create a password for a user. |
| `UpdateLoginProfile` | Change a user's password. |
| `DeleteLoginProfile` | Delete a user's password. |

For more information about the actions, go to the AWS Identity and Access Management API Reference.

## Using the CLI to Create, Change, or Delete an IAM User Password

| Command | Use |
|---|---|
| `iam-useraddloginprofile` | Create a password for a user. |

| Command | Use |
|---|---|
| `iam-usermodloginprofile` | Change a user's password. |
| `iam-userdelloginprofile` | Delete a user's password. |

For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

# Granting IAM Users Permission to Change Their Own Password

When you set a password policy, as part of that process, you can also set an account-wide policy that grants permission to all of your IAM users to change their own password. If you prefer to allow only some users to change their password, you can create a group for your users and then use an IAM policy to grant permission to the group. This topic describes how to use an IAM policy to grant permission to a group of users to change their own password. For information about enabling all of your users to change their own password when setting the account-wide password policy, see Managing an IAM Password Policy (p. 89).

**Important**

Setting a password policy is recommended because it enforces creation of strong passwords by your users.

### To grant a group of users permission to change their password

1. Create a group and add the users whom you want to grant permission to. For more information, see Creating and Listing Groups (p. 78).
2. Create an IAM policy that grants users permission to change their password and apply that policy to the new group.

   Your policy might look like the following policy. This policy enables users to call `ChangePassword` directly, to use the corresponding `iam-userchangepassword` CLI command, and to use the AWS Management Console to change their password themselves. This policy also allows users to call the `GetAccountPasswordPolicy` action which enables users to view the applicable password policy.

```
{
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
         "iam:ChangePassword",
         "iam:GetAccountPasswordPolicy"
         ],
      "Resource": "*"
    }
  ]
}
```

   For information about attaching a policy to a group, see Managing IAM Policies (p. 147).

3. Next, create a new password policy or modify your existing password policy, and make sure that the **Allow users to change their own password** check box is *not* checked. For more information about creating or viewing a password policy, see Managing an IAM Password Policy (p. 89).

   **Note**

   You can enable users to change their password without setting a password policy, but it is not recommended. To enforce use of strong passwords by your users, you should use a password policy when you enable users to manage their own password.

### Related topics

- Managing an IAM Password Policy (p. 89)
- Managing IAM Policies (p. 147)
- How IAM Users Change Their Own Password (p. 98)
- Creating, Changing, or Deleting a Password for an IAM User (p. 93)

# How IAM Users Change Their Own Password

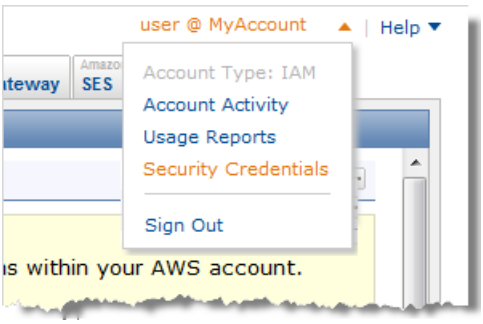
To change their password, users can use the AWS Management Console, the IAM API, or the command line interface. This topic describes how a user uses the AWS Management Console to change a password. The IAM APIs and CLI commands your users need to change their passwords are listed at the end of this topic.

The following procedure shows how users change their own passwords. You should provide this information to your users after you grant them permission to change their passwords. For information about how to grant users permission to change their passwords, see the previous topic, Granting IAM Users Permission to Change Their Own Password (p. 97).

### To change your IAM user password

1. Use your user name and password to sign in to your company's AWS Management Console sign-in page.

   To obtain the URL for your company's sign-in page, contact your administrator. For more information about using a sign-in page to access the AWS Management Console, see The AWS Management Console Sign-in Page (p. 164).
2. In the upper right corner of the console, click the arrow next to your user name, and then click **Security Credentials**.




3. On the **My Password** pane, in the **Old Password** box, type your password.


4. In the **New Password** box, type your new password. In the **Confirm New Password** box, retype your new password, and then click **Change Password**.

   **Note**

   The requirements for your password, such as minimum length and whether your password must contain a number, are defined by the password policy settings selected by your administrator.

## Related API Actions and CLI Commands

To change their own password, users can use the `ChangePassword` API action or the `iam-userchangepassword` CLI command. For more information, see ChangePassword in the *AWS Identity and Access Management API Reference*, or iam-userchangepassword in the *AWS Identity and Access Management Command Line Interface Reference*.

# Using Multi-Factor Authentication (MFA) Devices with AWS

**Topics**



For increased security, we recommend that you protect your AWS resources by configuring AWS Multi-Factor Authentication (MFA). MFA adds extra security by requiring users to enter a unique authentication code from their authentication device when accessing AWS websites or services.

For MFA to work, you must assign an MFA device (hardware or virtual) to the IAM user or root account. The MFA device must be unique for each user; a user cannot enter a code from another user's device to authenticate.

To get started setting up an MFA device for root account or IAM user access to the console, see Setting up an MFA Device (p. 100).

To set up MFA-protected API access for IAM users with an enabled MFA device, see Configuring MFA-Protected API Access (p. 113).

# Setting up an MFA Device

This section shows you how to set up and enable a new MFA device, as well as how to synchronize and deactivate existing devices, and what to do when your device is lost or stops working. For answers to commonly asked questions about AWS MFA, go to the AWS Multi-Factor Authentication FAQs.

The following table describes the process for setting up and using an MFA device, and provides links to related information.

### Process for Setting Up an MFA Device

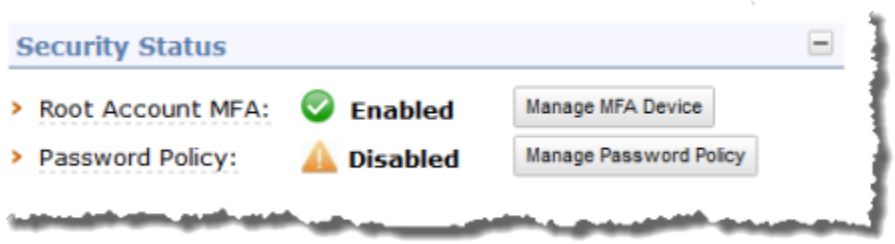
| | |
|---|---|
| 1 | *Get an MFA device.* The device can be a hardware MFA device or a virtual MFA device.<br>If you want to use a hardware device, you can find information about where to purchase the devices that AWS supports at http://aws.amazon.com/mfa. If you want to use a virtual MFA device, or if you just want to learn more about virtual MFA, see Using a Virtual MFA Device with AWS (p. 101). |
| 2 | *Enable the MFA device.* You can enable the MFA device for use with AWS using the AWS Management Console, the IAM command line tools, or the IAM API.<br>For information about enabling an MFA device, see either Using a Virtual MFA Device with AWS (p. 101) or Enabling a Hardware MFA Device For Use with AWS (p. 107). |
| 3 | *Use the MFA device.* For access to an AWS website, you need a username, password, and MFA code. For access to MFA-protected APIs, you need access keys and an MFA code.<br>For information about user passwords, see Managing Passwords (p. 88). For information about using MFA with the AWS Management Console, see MFA Devices and Your IAM-Enabled Sign-in Page (p. 168). For information about the AWS service APIs that use MFA, go to Does AWS MFA affect how I access AWS Service APIs? on the AWS Multi-Factor Authentication FAQs page. |

# Checking MFA Status

Use the **IAM** console to verify that an MFA device is enabled and configured for the root account or IAM user. In this section, you'll learn how to check whether a root account or IAM user has a valid MFA device enabled.

### To check the MFA status of a root account

1. Open the **IAM** console at https://console.aws.amazon.com/iam.
2. In the **IAM Dashboard**, check the **Security Status** of the account MFA (whether enabled or disabled).




3. Click **Manage MFA Device** to change the current setting.

### To check the MFA status of an IAM user

1. Open the **IAM** console at https://console.aws.amazon.com/iam.
2. Select **Users**.
3. Select the user.
   In the **Security Credentials** tab of the user's details pane, the **Multi-Factor Authentication Device** item shows a value for the MFA device, if the user has one enabled.


   The **Multi-Factor Authentication Device** is either a value for a virtual device, such as `arn:aws:iam::123456789012:mfa/user`, or it is the device serial number for a hardware device (usually the number from the back of the device), such as `GAHT12345678`.
4. Click **Manage MFA Device** to change the current setting.

   For virtual device information, see Using a Virtual MFA Device with AWS (p. 101).

   For hardware device information, see Enabling a Hardware MFA Device For Use with AWS (p. 107).

# Using a Virtual MFA Device with AWS

**Topics**

- Installing the AWS Virtual MFA Mobile Application (p. 107)

To use a virtual MFA device with AWS, you must configure it for use with AWS, and then enable it. In this section you'll learn what a virtual MFA device is and what you need to do to configure and enable it.

A virtual MFA device uses a software application that generates six-digit authentication codes that are compatible with the Time-Based One-Time Password (TOTP) standard, as described in RFC 6238. The software application can run on any mobile hardware device, including a smartphone. Most virtual MFA applications allow you to host more than one virtual MFA device, which makes them more convenient than hardware MFA devices. However, you should be aware that because a virtual MFA might be run on a less secure device such as a smartphone, a virtual MFA might not provide the same level of security as a hardware MFA device.

**Tip**

The AWS Virtual MFA application is one example of an TOTP-compatible virtual MFA device. The AWS Virtual MFA application runs on the Android mobile operating system and is available for download from the Amazon Appstore for Android. For more information about downloading and installing the AWS Virtual MFA, see Installing the AWS Virtual MFA Mobile Application (p. 107).

## Configuring and Enabling a Virtual MFA Device For a User

You can use IAM in the AWS Management Console to configure and enable a virtual MFA device for a user under your account. This section shows you how to use the console to complete these tasks. If you prefer to use the CLI or API, see Using the IAM CLI or API With Virtual MFA Devices (p. 106).

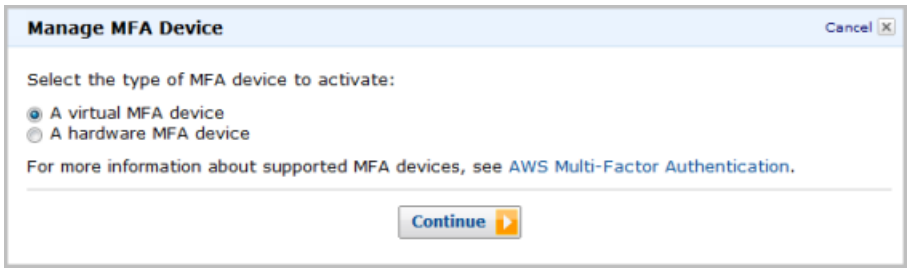
**Note**

As an example, the following procedure uses the AWS Virtual MFA mobile application, but the same general steps will apply regardless of the virtual MFA application you use.

### To configure and enable a virtual MFA device for a user

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the **Navigation** pane, click **User** and then select the user you want to enable the virtual MFA for.
3. In the user details pane, select **Security Credentials**, and then click **Manage MFA Device**.


4. Select **A virtual MFA device**, then click **Continue**.




5. Confirm that a virtual MFA application is installed on the user's mobile device, then click **Continue**. IAM generates and displays configuration information for your virtual MFA device, including a QR code similar to the following graphic.

6. To configure the device, keep the Manage MFA Device dialog box open, and open the virtual MFA application on your smartphone. The easiest way to configure the application is to use the application to scan the QR code. If you cannot scan the code, you can enter the secret configuration key manually.

   - To use the QR code to configure the virtual MFA device, in the AWS Virtual MFA application, tap **Scan account barcode**, and then use your phone camera to scan the code.

- If you cannot scan the code, you can enter the configuration information manually by typing the **Secret Configuration Key** value into the application. To do this in the AWS Virtual MFA application, tap **Manually add account**, then type the secret configuration key and click **Create**.

  **Note**

  The QR code and secret configuration key are unique and cannot be reused.

7. Next, you need to enable the device for use with AWS. After you have configured the device, the device will start generating six-digit numbers. In the IAM Manage MFA Device dialog box, in the **Authentication Code 1** box, type the six-digit number displayed by the MFA device. Wait 30 seconds while the device refreshes, and then type the next six-digit number into the **Authentication Code 2** box.


8. Click **Activate Virtual MFA**.

The device is ready for use with AWS. For information about using MFA with the AWS Management Console, see MFA Devices and Your IAM-Enabled Sign-in Page (p. 168).

## Configuring and Enabling a Virtual MFA Device For Your AWS Account

You can use IAM in the AWS Management Console to configure and enable a virtual MFA device for your root account. This section describes how to use the console to complete these tasks. If you prefer to use the CLI or API, see Using the IAM CLI or API With Virtual MFA Devices (p. 106).

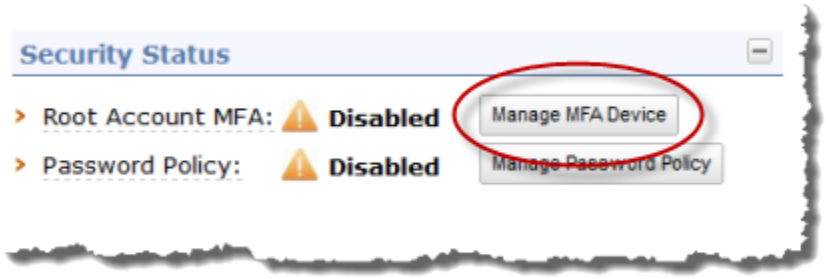
To manage MFA devices for the AWS account, you must be signed in to AWS using your root account credentials. You cannot manage MFA devices for the root account using other credentials.

**Note**

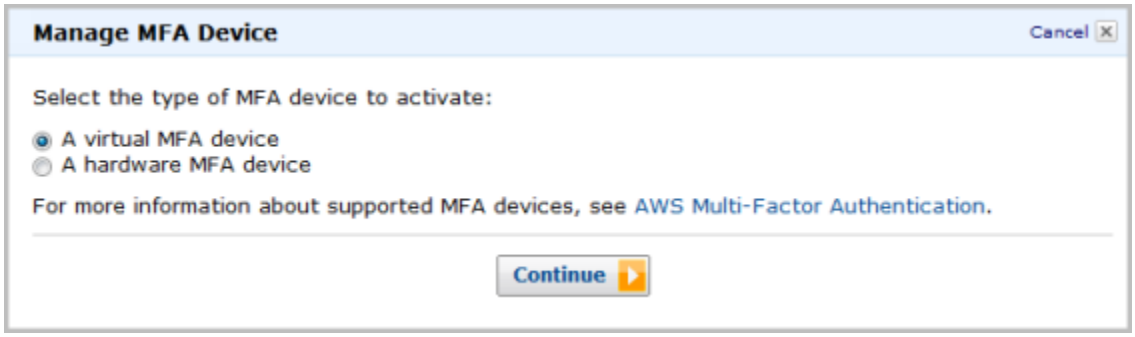
As an example, the following procedure uses the AWS Virtual MFA mobile application to configure a device for your root account, but the same general steps will apply regardless of the virtual MFA application you use.

### To configure and enable a virtual MFA device for use with your root account

1. Use your root credentials to sign in to the AWS Management Console, and then go to the **IAM** console.
2. On the **IAM Dashboard**, click **Manage MFA Device**.




3. Select **A virtual MFA device**, then click **Continue**.




4. Confirm that a virtual MFA application is installed on your mobile device, then click **Continue**. IAM generates and displays configuration information for your virtual MFA device, including a QR code similar to the following graphic.

5. To configure the device, keep the Manage MFA Device dialog box open, and open the virtual MFA application on your smartphone. The easiest way to configure the application is to use the application to scan the QR code. If you cannot scan the code, you can enter the configuration information manually.

   - To use the QR code to configure the virtual MFA device, in the AWS Virtual MFA application, tap **Scan account barcode**, and then use your phone camera to scan the code.


- If you cannot scan the code, you can enter the configuration information manually by typing the **Secret Configuration Key** value into the application. To do this in the AWS Virtual MFA application, tap **Manually add account**, then type the secret configuration key and click **Create**.

  **Note**

  The QR code and secret configuration key are unique and cannot be reused.

After you have configured the virtual MFA device, the device will start generating six-digit numbers.

6. Next, you need to enable the device for use with AWS. In the IAM Manage MFA Device dialog box, click the link to enable the device.
7. The Enable AWS Multi-Factor Authentication page opens on the AWS portal. (You might be prompted to sign in again before you can access this page.) In the **Authentication Code 1** box, type the six-digit number displayed by the MFA device. Wait 30 seconds while the device refreshes, and then type the second number into **Authentication Code 2**.
8. Click **Activate Authentication Device**.

The device is ready for use with AWS. For information about using MFA with the AWS Management Console, see MFA Devices and Your IAM-Enabled Sign-in Page (p. 168).

## Using the IAM CLI or API With Virtual MFA Devices

The following table shows the command line commands or API actions to use to configure and enable a virtual MFA device. Use these commands in the order listed in the table. Other related commands and actions are listed after the following table.

### IAM CLI Commands for Configuring and Enabling a Virtual MFA Device

| | Task | CLI command | API action |
|---|---|---|---|
| 1 | Create the configuration information for the virtual MFA device | iam-virtualmfadevicecreate | CreateVirtualMFADevice |
| 2 | Enable the device for use with AWS | iam-userenablemfadevice | EnableMFADevice |

### Other Commands and Actions Related to Virtual MFA

| Task | CLI command | API action |
|---|---|---|
| Deactivate a device | iam-userdeactivatemfadevice | DeactivateMFADevice |
| List virtual MFA devices | iam-virtualmfadevicelist | ListVirtualMFADevices |
| Re-sync an MFA device | iam-userresyncmfadevice | ResyncMFADevice |
| Delete a virtual MFA device | iam-virtualmfadevicedel | DeleteVirtualMFADevice |

## Installing the AWS Virtual MFA Mobile Application

To download and install the AWS Virtual MFA application, go to the Amazon Appstore for Android and locate the AWS Virtual MFA application. Download the application and follow the on-screen instructions to complete the installation.

For information about configuring and enabling the AWS Virtual MFA device for use with AWS, see Using a Virtual MFA Device with AWS (p. 101).

To open the Amazon Appstore for Android on your smartphone, scan this code with any QR code reader application.

# Enabling a Hardware MFA Device For Use with AWS

You can enable a hardware MFA device using either the AWS Management Console, the command line, or the IAM API. The following procedure shows you how to use the AWS Management Console to enable the device for a user under your AWS account. To enable an MFA device for your root account, see Enabling a Hardware MFA Device for Your AWS Root Account (p. 109).

**Note**

If you want to enable the device from the command line, use `iam-userenablemfadevice`, described in the AWS Identity and Access Management Command Line Interface Reference.

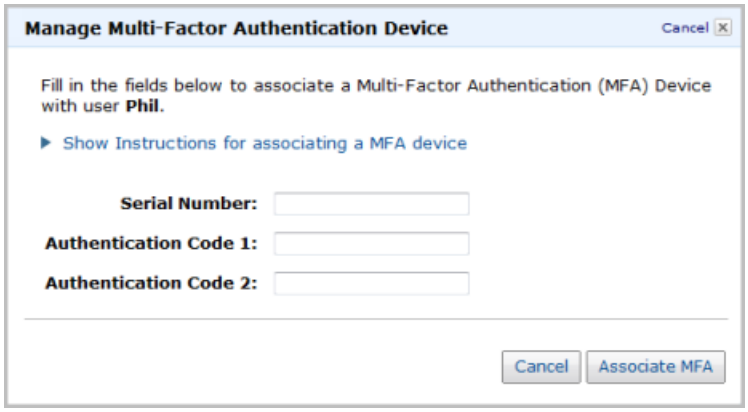
To enable the MFA device with the IAM API, use the `EnableMFADevice` action, described in the AWS Identity and Access Management API Reference.

# Enabling a User's Hardware MFA Device

**To use IAM in the AWS Management Console to enable a hardware MFA device for a user**

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. On the Navigation pane, choose **Users**.
3. Select the user for whom you want to enable an MFA device, and then click **Manage MFA Device**.


4. Enter the device serial number. The serial number is on the back of the device.




5. In the **Authentication Code 1** box, type the six-digit number displayed by the MFA device. You might need to press the button on the front of the device to display the number.

6. Wait 30 seconds while the device refreshes, and then type the next six-digit number into the **Authentication Code 2** box. You might need to press the button on the front of the device again to display the second number.
7. Click **Associate MFA**.

The device is ready for use with AWS. For information about using MFA with the AWS Management Console, see MFA Devices and Your IAM-Enabled Sign-in Page (p. 168).

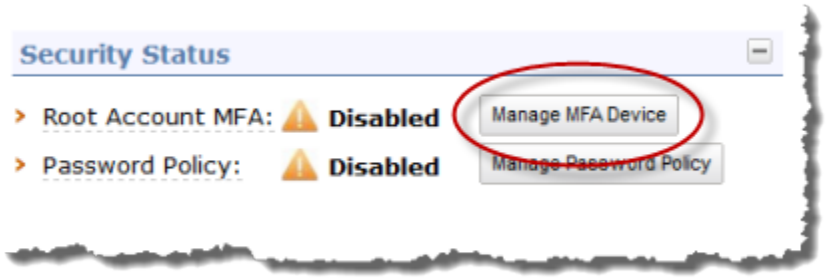
# Enabling a Hardware MFA Device for Your AWS Root Account

**Important**

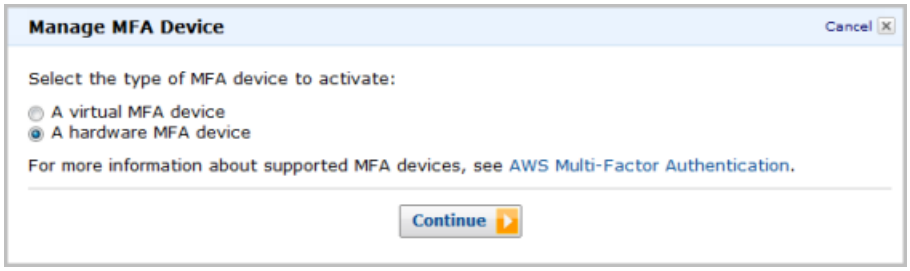
To manage MFA devices for the AWS account, you must sign in to AWS using your root account credentials. You cannot manage MFA devices for the root account using other credentials.

### To enable the MFA device for your AWS account

1. Use your root credentials to sign in to the AWS Management Console, then go to the **IAM** console.
2. From the **IAM Dashboard**, click **Manage MFA Device**.




3. Select **A hardware MFA device**, then click **Continue**.




4. To complete the remainder of this process, you need to go to the AWS portal. To go to the portal, click **Click here to enable your device**.
5. In the **Serial Number** box, enter the serial number displayed on the back of your MFA device. Re-enter the serial number in the **Re-Enter Serial Number** box.


6. In the **Authentication Code 1** box, type the six-digit number displayed by the MFA device. You might need to press the button on the front of the device to display the number.


7. Wait 30 seconds while the device refreshes, and then type the next six-digit number into the **Authentication Code 2** box. You might need to press the button on the front of the device again to display the second number.
8. Click **Activate Authentication Device**. The MFA device is now associated with the AWS Account.
9. In the AWS Management Console, click **Close** to dismiss the confirmation dialog box.

   The next time anyone signs in using the AWS account credentials, they will need to enter a code from the MFA device.

For information about using MFA with the AWS Management Console, see MFA Devices and Your IAM-Enabled Sign-in Page (p. 168).

# Synchronizing an MFA Device

It's possible for an MFA device to get out of synchronization. If the device is not synchronized when the user tries to use it, the user's login will fail. If the user is using the MFA device to sign in to the AWS Management Console, IAM prompts the user to resynchronize the device.

If the user is using the MFA device with the API, IAM has an API call that performs synchronization. In this case, we recommend that you give your users with MFA devices permission to access this API call. You should build a tool based on that API call that lets your users resynchronize their devices whenever they need to. To use the API to synchronize an MFA device for a user, use `ResyncMFADevice`. To use the command line to synchronize the device, use `iam-userresyncmfadevice`.

You can also use the AWS Management Console to resynchronize the device for a user under your AWS account.

### To resynchronize a user's MFA device

1. On the AWS Management Console **IAM** console, click **Users**, then select the name of the user for whom you want to synchronize a device.
2. Click the **Security Credentials** tab, then click **Manage MFA Device**.
3. Select **Resynchronize MFA device**.
4. Type the six-digit number the MFA device is displaying into the **Authentication Code 1** box. If you are using a hardware MFA device, you will need to press the button on the front of the device to display the number.


5. Wait 30 seconds while the device refreshes, and then type the next six-digit number into the **Authentication Code 2** box. If you are using a hardware device, you will need to press the device button again to display the second number.
6. Click **Update**.

# Deactivating an MFA Device

You can temporarily disable an MFA device by deactivating it. If you are using the IAM API or CLI, then you deactivate an MFA device with the IAM `DeactivateMFADevice` API action or the `iam-userdeactivatemfadevice` command.

> **Note**
>
> If you use the API or CLI to delete a user from your AWS account, you must deactivate or delete the user's MFA device as part of the process of removing the user. For more information about deleting users, see Deleting a User from Your AWS Account (p. 75).

If you are using the AWS Management Console to deactivate the device for a user under your AWS account, the following procedure describes the steps. The process to deactivate an MFA device for the root account is described in Deactivating Your AWS Account's MFA Device (p. 112).

# Deactivating a User's MFA Device

### To deactivate a user's MFA device

1. On the **IAM** console, click **Users**, then select the name of the user for whom you want to deactivate a device.
2. Click the **Security Credentials** tab, then click **Manage MFA Device**.
3. Select **Deactivate MFA device**.


4. Click **Update**.

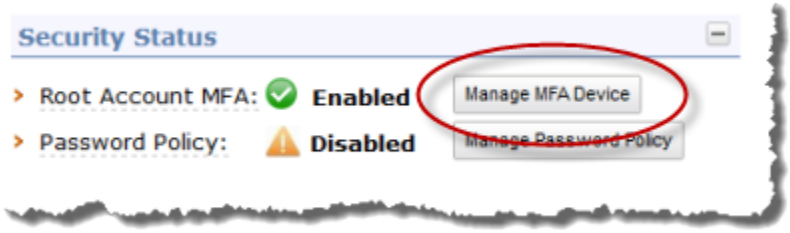
The user's device is deactivated.

## Deactivating Your AWS Account's MFA Device

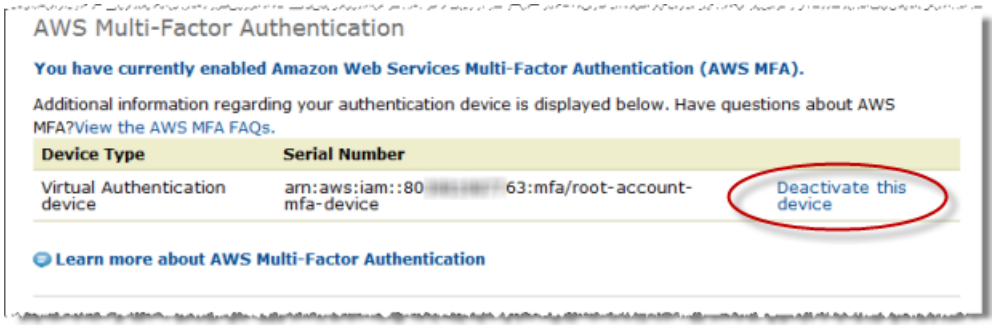
To manage MFA devices for the AWS account, you must be signed in to AWS using your root account credentials. You cannot manage MFA devices for the root account using other credentials.

### To deactivate the MFA device for your AWS account

1. Use your root credentials to sign in to the AWS Management Console, then go to the **IAM** console.
2. From the **IAM Dashboard**, click **Manage MFA Device**.




3. Select **Deactivate this device**.




The MFA device is deactivated for the AWS account.

# Configuring MFA-Protected API Access

MFA-protected API access is an optional feature that offers an extra layer of security by requiring users to authenticate with an MFA device before they can use APIs you specify in a policy. Users can authenticate through the AWS Management Console or programmatically through the AWS Security Token Service (STS).

MFA-protected API access is available only to services that support temporary security credentials. For a complete list of these services, and for information about using the AWS STS API for requesting temporary security credentials, see Using Temporary Security Credentials to Access AWS.

If the user is denied access to APIs because of an authorization failure, AWS returns an "Access Denied" error message (as it does for any unauthorized access). With MFA-protected API policies in place, AWS denies access to the APIs specified in the policy if the user attempts to use the APIs without valid MFA authentication, or if the time of the request for the APIs is beyond the duration specified in the policy. The user must re-authenticate with MFA, either through the console, or by requesting new temporary security credentials using an MFA code and device serial number.

**Note**

MFA-protected API access cannot be applied to root accounts accessing their own resources.

Federated users cannot be assigned an MFA device for use with AWS services, so they cannot access AWS resources controlled by MFA.

## Using MFA-Protected APIs Through the Console

AWS evaluates MFA-protected API policies for actions in the console, such as terminating an Amazon EC2 instance. Set up the IAM user with an MFA device, enable an MFA-protected API policy, and the user simply logs into the console with MFA authentication and is subject to the policies for MFA-protected APIs. For users who already have an assigned MFA device, the console experience doesn't change (except for optional time limits on certain MFA-protected APIs that require more frequent re-authentication). For more information on setting up an IAM user with an MFA device, see Setting up an MFA Device (p. 100).

## Using MFA-Protected APIs Programmatically

MFA-protected API policies also apply to IAM users who access MFA-protected API programmatically, either through their own application or an application provided to them— specifically:

1. An MFA-protected API policy is attached to a user, group, or resource.
2. The IAM user acquires temporary security credentials using an MFA code and device serial number, programmatically, in a request to the AWS Security Token Service (STS). The temporary security credentials include the MFA authentication status.

   An application can use the STS API and custom code to prompt the user to provide the MFA code and serial number in the application. For information on implementing MFA authentication using STS, see Creating Temporary Security Credentials in *Using Temporary Security Credentials*.
3. When the IAM user tries to use an API directly or through an application, AWS uses the condition in the MFA-protected API policy to check whether the IAM user is allowed access to the API.
4. AWS grants the IAM user access to the MFA-protected API (or prevents access) according to the policy.

# Policies for MFA-Protected APIs

MFA-protected API policies are attached to a user, group, or resource, such as an Amazon Simple Storage Service (Amazon S3) bucket, Amazon Simple Queue Service (Amazon SQS) queue, or Amazon Simple Notification Service (Amazon SNS) topic).

MFA-protected API policies include a condition statement (or statements) with the `aws:MultiFactorAuthAge` key. The policy can use the key in two ways:

- Existence—To verify that MFA authentication is present, use an existence check with a `Null` statement to evaluate whether the `aws:MultiFactorAuthAge` key exists (is not null, matching the Boolean value "false") or not (is null, matching the Boolean value "true").
- Duration—For situations that require control over the duration of the MFA authentication, independent of the lifetime of the temporary security credentials, use a numeric condition type to compare the key's age to a value (such as 3600 seconds). If a policy checks for existence, only, the access is available for the entire authentication session (the default is 12 hours). A numeric condition enables the policy to restrict access to APIs for a user who does not have recent MFA authentication, even if the user's authorization session is still valid. If necessary, an IAM user can refresh their MFA authentication, either through the console, or by requesting new temporary security credentials using an MFA code and device serial number.

For more information on the condition types for `aws:MultiFactorAuthAge`, see Existence of Condition Keys (p. 49) and Numeric Conditions (p. 46).

The following policies demonstrate several use-cases that require MFA authentication.

**Topics**



## Example 1: Granting access after MFA authentication

The following example shows a policy attached to a user or group that grants Amazon EC2 access only after valid MFA authentication. Specifically, AWS grants access only when the existence check for a `Null` value evaluates to `false`. In other words, the `aws:MultiFactorAuthAge` key value is not null.

```
{
  "Statement":[{
      "Action":["ec2:*"],
      "Effect":"Allow",
      "Resource":["*"],
      "Condition":{
        "Null":{"aws:MultiFactorAuthAge":"false"}
      }
    }
  ]
}
```

## Example 2: Granting access after recent MFA authentication

The following example shows a policy attached to a user or group that grants Amazon EC2 access only after checking for a valid MFA authentication within an hour of the request. Specifically, AWS grants access only when the `aws:MultiFactorAuthAge` key value is present and less than 3600 seconds (1 hour).

```
{
  "Statement":[{
      "Action":["ec2:*"],
      "Effect":"Allow",
      "Resource":["*"],
      "Condition":{
        "NumericLessThan":{"aws:MultiFactorAuthAge":"3600"}
      }
    }
  ]
}
```

## Example 3: Denying access to specific APIs without valid MFA authentication

The following example shows a policy attached to a user or group that grants access to the entire Amazon EC2 API, but restricts access to `StopInstances` and `TerminateInstances` until valid MFA authentication is present. Specifically, AWS denies access to `StopInstances` and `TerminateInstances` when the existence check for a `Null` value evaluates to `true`, meaning the `aws:MultiFactorAuthAge` key value is null.

```
{
  "Statement":[
    {
      "Action":["ec2:*"],
      "Effect":"Allow",
      "Resource":["*"]
    },
    {
      "Action":["ec2:StopInstances","ec2:TerminateInstances"],
      "Effect":"Deny",
      "Resource":["*"],
      "Condition":{
        "Null":{"aws:MultiFactorAuthAge":"true"}
      }
    }
  ]
}
```

## Example 4: Denying access to specific APIs without recent valid MFA authentication

The following example shows a policy attached to a user or group that grants access to the entire Amazon EC2 API, but restricts access to `StopInstances` and `TerminateInstances` unless valid MFA authentication occurred within the last hour. Specifically, AWS denies access to `StopInstances` and `TerminateInstances` when the existence check for a `Null` value evaluates to `true`, meaning the `aws:MultiFactorAuthAge` key value is null. Additionally, AWS denies access to `StopInstances` and

`TerminateInstances` when `aws:MultiFactorAuthAge` key value is present and greater than 3600 seconds (1 hour).

**Note**

MFA-protected API policies using `Deny` statements that check for the numeric value of `aws:MultiFactorAuthAge` should include an existence check. AWS evaluates existence and duration independently; evaluating only for duration does not enforce a `Deny` condition if MFA has not been used at all.

```
{
  "Statement":[
    {
      "Action":["ec2:*"],
      "Effect":"Allow",
      "Resource":["*"]
    },
    {
      "Action":["ec2:StopInstances","ec2:TerminateInstances"],
      "Effect":"Deny",
      "Resource":["*"],
      "Condition":{
        "Null":{"aws:MultiFactorAuthAge":"true"}
      }
    },
    {
      "Action":["ec2:StopInstances","ec2:TerminateInstances"],
      "Effect":"Deny",
      "Resource":["*"],
      "Condition":{
        "NumericGreaterThan":{"aws:MultiFactorAuthAge":"3600"}
      }
    }
  ]
}
```

## Example 5: Granting access to a resource after MFA authentication

MFA-protected API policies can be attached to a resource, as well, such as Amazon S3 bucket policies. The following policy is attached to an Amazon S3 bucket. This policy grants access to the Amazon S3 actions `PutObject` and `DeleteObject` only after valid MFA authentication for all IAM users with access to the bucket. Specifically, AWS grants access only when the existence check for a `Null` value evaluates to `false`. In other words, the `aws:MultiFactorAuthAge` key value is not null.

```
{
  "Statement":[
    {
      "Effect":"Allow",
      "Principal":{
        "AWS": "111122223333"
      },
      "Action":["s3:PutObject","s3:DeleteObject"],
      "Resource": "arn:aws:s3:::myawsbucket/*",
      "Condition":{
        "Null":{"aws:MultiFactorAuthAge":"false"}
      }
    }
```

```
  ]
}
```

**Note**

Amazon S3 offers an MFA Delete feature for *root* account (only) access. You can enable Amazon S3 MFA Delete when you set the versioning state of the bucket. Amazon S3 MFA Delete cannot be applied to an IAM user, and is managed independently from MFA-protected API access. An IAM user with permission to delete a bucket cannot delete a bucket with Amazon S3 MFA Delete enabled. For more information on Amazon S3 MFA Delete, see MFA Delete.

## What If Your MFA Device Is Lost or Stops Working?

If your MFA device stops working, is lost, or is destroyed, and you can't sign in to the AWS portal or the AWS Management Console, then you need to deactivate the device. AWS can help you deactivate the device. The way you get help depends on whether your MFA device is assigned to the root account or to a user under an AWS account.

**Note**

If your device appears to be functioning properly, but you cannot use it to access your AWS resources, then it simply might be out of synchronization with the AWS system. For information about synchronizing an MFA device, see Synchronizing an MFA Device (p. 110).

### To get help for an MFA device associated with an AWS root account

1. Go to the AWS Contact Us page for help with disabling AWS MFA so that you can temporarily access secure pages on the AWS website and the AWS Management Console using just your user name and password.
2. Change your AWS password in case an attacker has stolen your authentication device and might also have your current password.
3. If you are using a hardware MFA device, for help fixing or replacing your device contact the third party provider Gemalto using their website. If you are using a virtual MFA device, on your mobile device you need to delete the old MFA account entry before creating a new one.
4. After you have the new physical MFA device or you have completed deleting the old entry from your mobile device, return to the AWS website and activate the MFA device to re-enable AWS MFA for your AWS account. To manage a hardware MFA for your AWS account, go to **Sign-In Credentials** on the AWS Security Credentials page.

### To get help for an MFA device associated with an IAM user

- Contact the system administrator or other person who gave you the user name and password for the IAM user. They will need to deactivate the MFA device using the procedure described at Deactivating a User's MFA Device (p. 111).

# Managing User Keys and Certificates

**Topics**

This section describes how to create and manage access keys and signing certificates (also known as X.509 certificates). Each user needs an access key to make programmatic calls to AWS. If the user needs to use the SOAP API or command line tools for Amazon EC2, you should also give the user a signing certificate. For more detailed information about the credentials, see Security Credentials (p. 20) and Adding a New User to Your AWS Account (p. 65).

Each user can have multiple active keys and certificates for the purposes of credential rotation. For more information about the number of allowed credentials, see Limitations on IAM Entities (p. 56).

# Creating, Modifying, or Viewing User Security Credentials

This section shows how to create, modify, or view a user's security credentials. Security credentials consist of an Access Key ID and a Secret Access Key for a user. If you've read through the Getting Started (p. 4), then you've created security credentials for a user.

By default, each key's status upon creation is `Active`, which means the user can use the key for API calls. At any point, you can disable the key, which means it can't be used for API calls. You might switch the status of a key if you're rotating keys (for more information, see Rotating Credentials (p. 127)).

When you create the key, IAM returns the Secret Access Key and an Access Key ID, which is a public identifier for the key. You need to save these keys and give them to the user.

> **Important**
>
> To ensure the security of your AWS account, the Secret Access Key is accessible only during key and user creation. You must save the key (for example, in a text file) if you want to be able to access it again. If a secret key is lost, you can delete the access keys for the associated user and then create new keys

You can give your users permission to list and manage their own keys. For more information, see Adding a Credentials Management Policy to the User (p. 126).

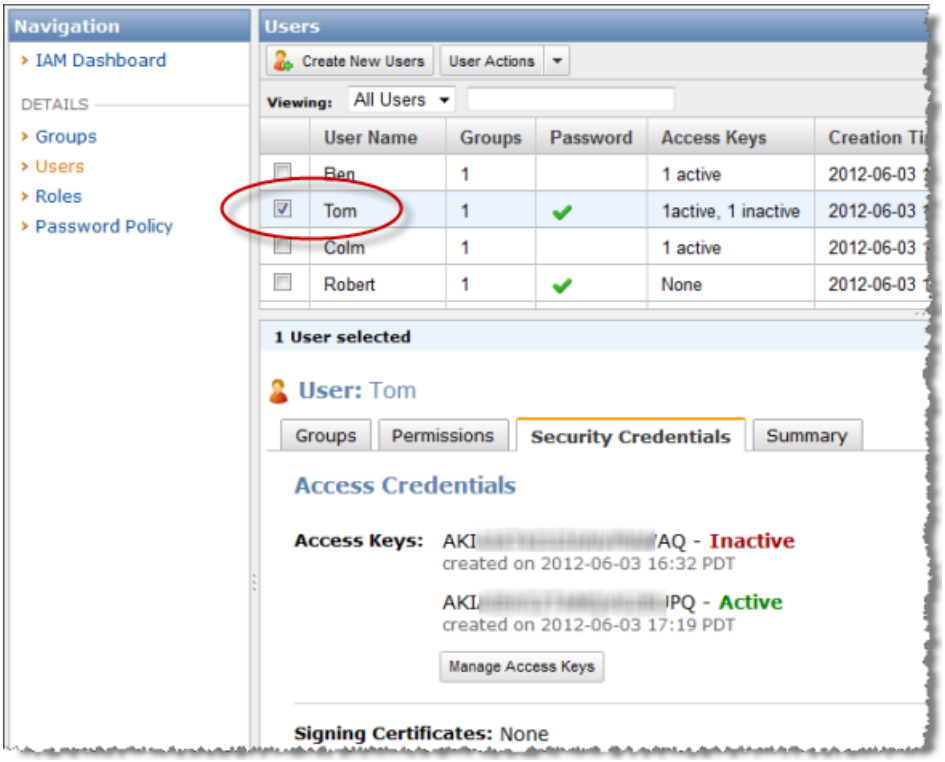
You can delete an access key at any time. However, when you delete an access key, it's gone forever and cannot be retrieved.

How you actually execute the preceding tasks depends on which interface you're using to access IAM. The interface-specific details are covered in the following sections.

## AWS Management Console

### To view a list of access keys belonging to a user

- On the **Navigation** pane, click **Users**, and then select the name of the user whose access keys you want to view.



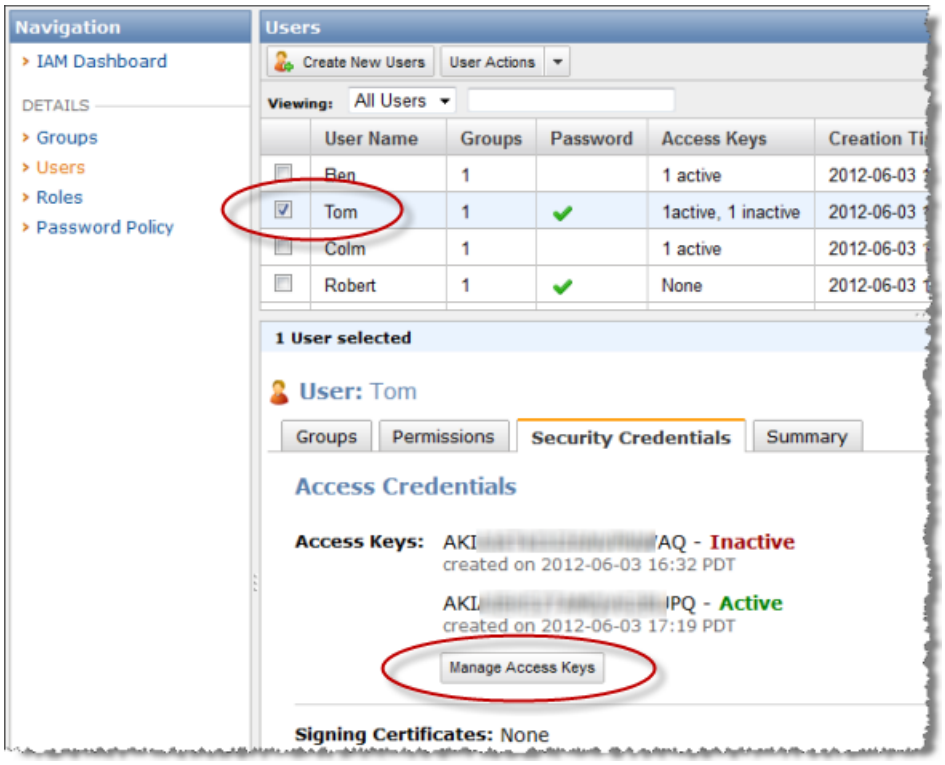

Access keys and the status of each key is displayed on the **Security Credentials** tab. Users cannot have more than two sets of access keys.

### Important

The user's Access Key ID is visible. The Secret Access Key cannot be retrieved after you are finished creating it.

### To create or modify access keys for a user

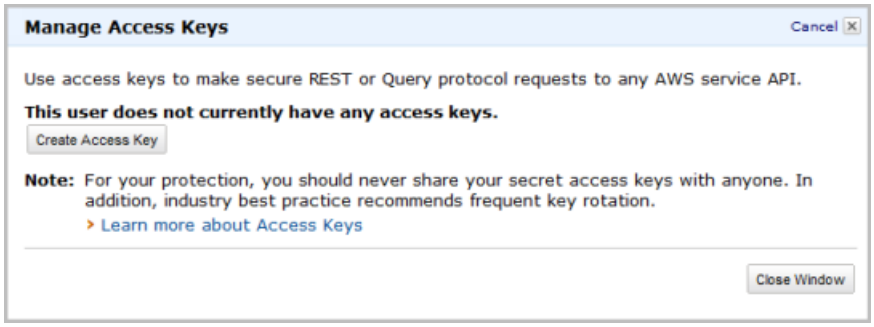
1. Select the name of the user you want to create or manage access keys for.



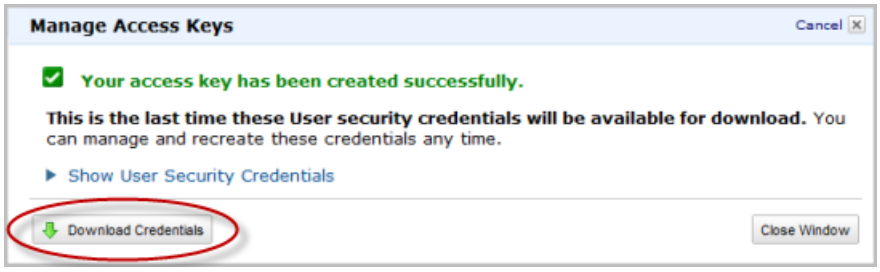

2. Click **Manage Access Keys**.

   a. If you want to create an access key

      i. Click **Create Access Key**.

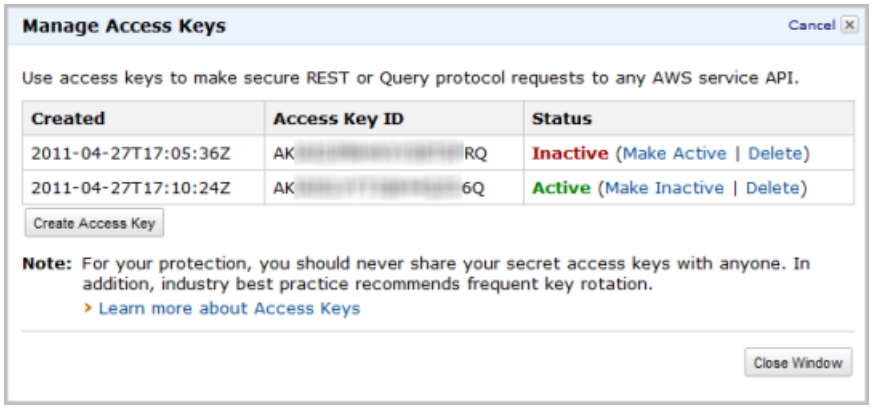



      ii. Click **Download Credentials** to save the Access Key ID and Secret Access Key to a .CSV file on your computer. You will not have access to the Secret Access Key again after this dialog box closes, and you will need to provide this information to your users before they can begin using an AWS API.




b. If you want to disable or re-enable an access key

   i. Click **Make Active** to enable the key, or click **Make Inactive** to disable the key.




c. If you want to delete a user's access key, click **Delete**.

d. When you are finished, click **Close Window**.

## Command Line Tools

The following table lists which command to use for each task you want to perform with an access key. For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

| Task | Command to Use |
|---|---|
| Create an access key | `iam-useraddkey` |
| Disable or re-enable an access key | `iam-usermodkey` |
| List a user's access keys | `iam-userlistkeys` |
| Delete an access key | `iam-userdelkey` |

## API

The following table lists which actions to use for each task you want to perform with an access key. For more information about the actions, go to the AWS Identity and Access Management API Reference.

| Task | Action to Use |
|---|---|
| Create an access key | `CreateAccessKey` |
| Disable or re-enable an access key | `UpdateAccessKey` |
| List a user's access keys | `ListAccessKeys` |
| Delete an access key | `DeleteAccessKey` |

# Uploading a Signing Certificate

If a user needs a signing certificate (for example, to use the Amazon EC2 command line tools), you need to first get a signing certificate and then upload it to the IAM system.

IAM doesn't have an API action to create signing certificates, so you must use a third-party tool such as OpenSSL to create the certificate first. We recommend you create an RSA key that is either 1024-bit or 2048-bit in length. The certificate can be self-signed, and the key and certificate must be in PEM format. For more information about OpenSSL, go to http://www.openssl.org/.

> **Note**
>
> You can't use the AWS website to create signing certificates for your users. If you log in to the website with your AWS account's credentials and create a signing certificate (that is, an X.509 certificate), you can't upload that certificate for the user.

Just as with access keys, each certificate can have a status of either `Active` or `Inactive`. The status is `Active` by default upon upload.

When you upload the certificate, it returns a certificate ID. You should store that certificate ID; however, at any time you can list the IDs for the user's certificates. You can delete a certificate from the IAM system at any time.

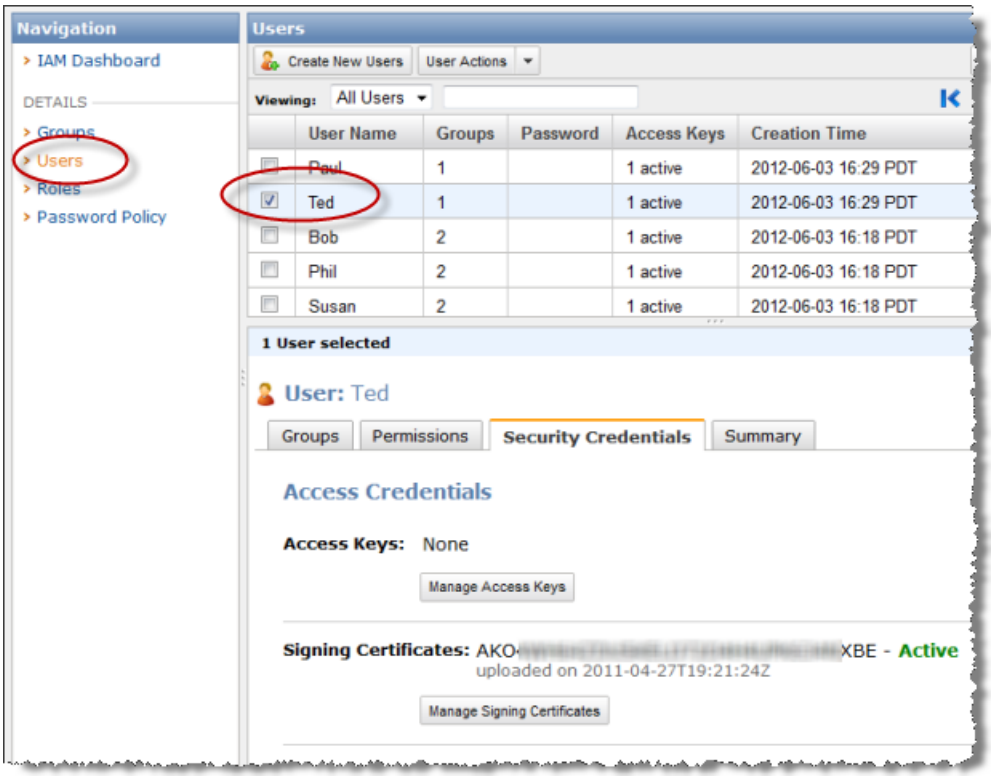
You can give your users permission to list and manage their own certificates. For more information, see Adding a Credentials Management Policy to the User (p. 126).

How you actually execute the preceding tasks depends on which interface you're using to access IAM. The interface-specific details are covered in the following sections.

## AWS Management Console

### To view a list of signing certificates belonging to a user

- On the **Navigation** pane, click **Users**, and then select the name of the user whose signing certificate you want to view.



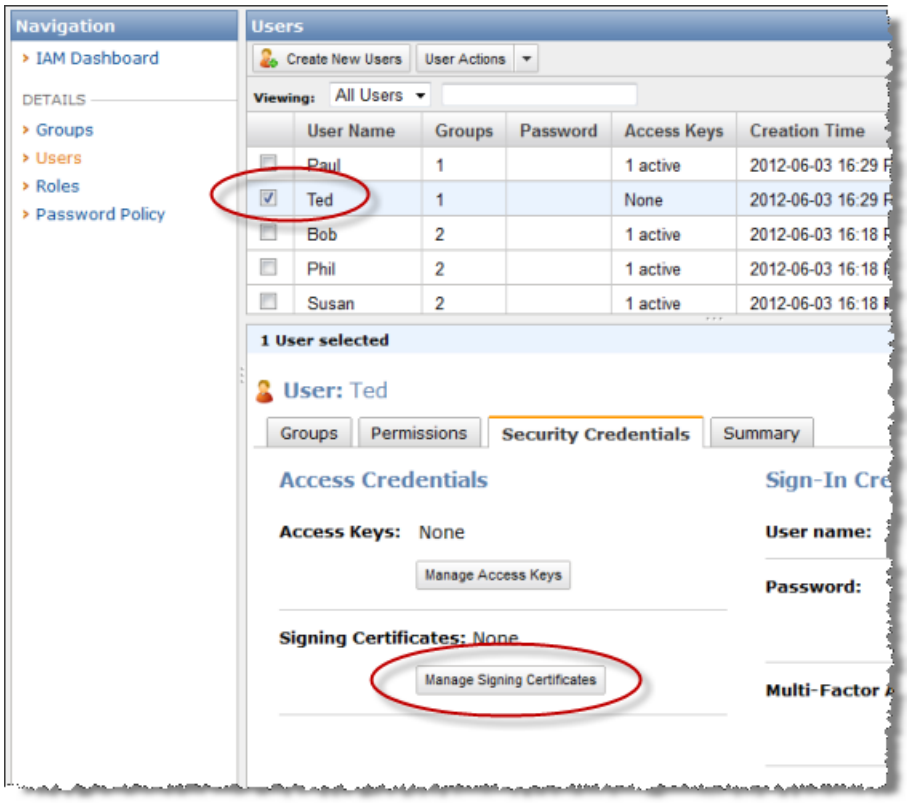

Signing certificates and the status of certificate is displayed on the **Security Credentials** tab. Users cannot have more than two signing certificates.

### Note

After the certificate has been uploaded, it cannot be retrieved, its contents cannot be viewed, and it cannot be reused.

### To upload or modify a signing certificate for a user

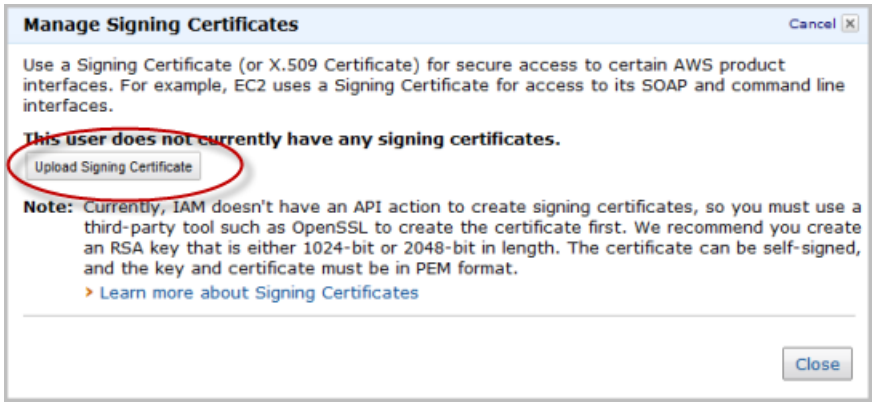
1. Select the name of the user you want to manage certificates for.



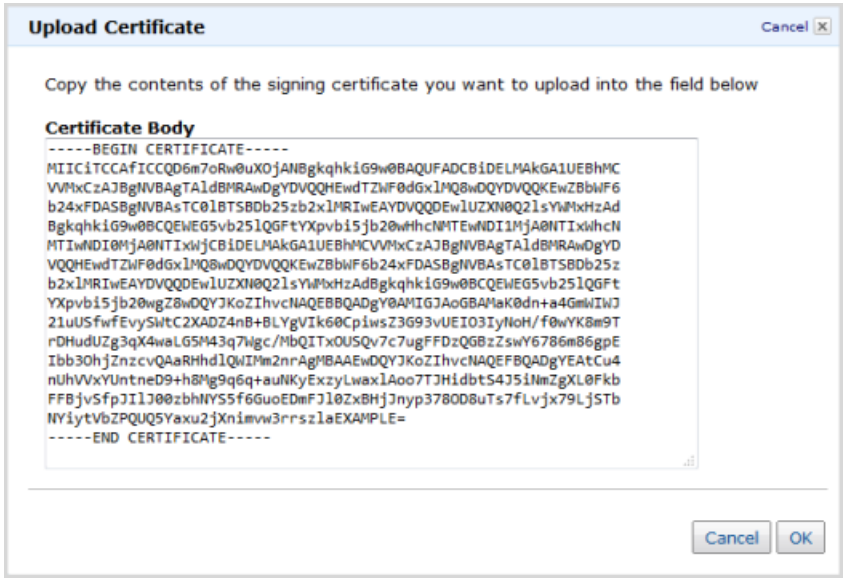

2. Click **Manage Signing Certificates**.

   a. If you want to upload a certificate

      i. Click **Upload Signing Certificate**.

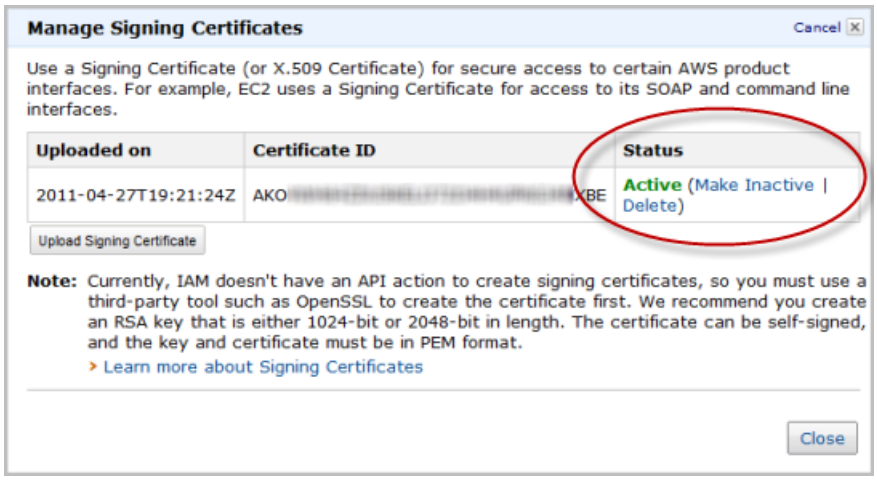



      ii. Paste the contents of the user's signing certificate into the **Certificate Body** field.




b. If you want to disable or re-enable a signing certificate

   i. Click **Make Active** to enable the certificate, or click **Make Inactive** to disable the certificate.




c. If you want to delete a user's signing certificate, click **Delete**.

d. When you are finished, click **Close**.

## Command Line Tools

The following table lists which command to use for each task you want to perform with a signing certificate. For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

| Task | Command to Use |
|---|---|
| Upload a certificate | `iam-useraddcert` |
| Disable or re-enable a certificate | `iam-usermodcert` |
| List a user's certificates | `iam-userlistcerts` |
| Delete a certificate | `iam-userdelcert` |

## API

The following table lists which actions to use for each task you want to perform with a signing certificate. For more information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

| Task | Action to Use |
|---|---|
| Upload a certificate | `UploadSigningCertificate` |
| Disable or re-enable a certificate | `UpdateSigningCertificate` |
| List a user's certificates | `ListSigningCertificates` |
| Delete a certificate | `DeleteSigningCertificate` |

**Note**

Use a POST when uploading a signing certificate because of the certificate's size.

# Adding a Credentials Management Policy to the User

You might want to give your users the ability to manage their own security credentials. This section shows how to add a policy that lets a specific user create and manage his or her own credentials.

There's a limit to how many credentials a user can have (for more information, see Limitations on IAM Entities (p. 56)). Typically the only reason a user might have more than one active at a time is for the purposes of rotating credentials (for more information, see Rotating Credentials (p. 127)).

You could give the user access to only some of the actions related to the credentials (perhaps just listing them), or to a wider set if you want the user to be able to create and rotate the credentials. Following is an example policy that lets the user named Bob perform any of the credential-related actions on his own credentials.

```
{
   "Statement":[{
      "Effect":"Allow",
      "Action":["iam:*AccessKey*","iam:*SigningCertificate*"],
      "Resource":"arn:aws:iam::123456789012:user/division_abc/subdivi
sion_xyz/Bob"
      }
```

```
    ]
}
```

Notice that the resource in the policy is the Amazon Resource Name (ARN) for Bob. If you want to let another user named Jane manage her own credentials, then you would simply need to replace the ARN for Bob with the ARN for Jane in the policy, and attach the policy to Jane. You must explicitly name the user in the resource; for purposes of referential integrity, there's no way to use a wildcard that automatically refers to *self* (that is, the user the policy is attached to). In other words, there's no group-level policy you can write that will give all your users credential management permissions only for their own credentials. You need to write an individual policy for each user, and attach the policy to the user. For more information, see Example 3 in Example Policies for IAM Entities (p. 153)

The preceding policy uses wildcards (`"Action":"iam:*AccessKey*"`, where the * matches zero or multiple characters). You could instead explicitly list each of the IAM actions related to access keys and certificates (for example, `CreateAccessKey`, `UploadSigningCertificate`, and so on). If you use the wildcards in your policy, be aware that if we were to add any new IAM actions that include the string `AccessKey` or `SigningCertificate` in their names, this policy would automatically give Bob access to those new actions to use with his own credentials.

For information about uploading and managing policies, see Managing IAM Policies (p. 147).

# Rotating Credentials

For the purposes of security, we recommend that you, an administrator, or your users regularly rotate the users' credentials (we recommend a frequency of every 90 days).

> **Note**
>
> If you're using the AWS account's credentials on a regular basis, we recommend you also regularly rotate those. Users can't manage credentials for the AWS account, so you must use the AWS account's credentials (and not a user's) when making the required API calls to rotate the credentials.

Following is the general process for rotating either a key or a certificate without interrupting your applications.

### Process for Rotating Credentials

| | |
|---|---|
| 1 | While the first set of credentials is still active, create a second set of credentials (or upload a second one, in the case of a certificate), which will be active by default.<br>At this point, the user has two active sets of credentials.<br>Related action: `CreateAccessKey` or `UploadSigningCertificate`<br>Related command: `iam-useraddkey` or `iam-useraddcert` |
| 2 | Update all applications to use the new credentials. |
| 3 | Change the state of the first set of credentials to `Inactive`.<br>Related action: `UpdateAccessKey` or `UpdateSigningCertificate`<br>Related command: `iam-usermodkey` or `iam-usermodcert` |
| 4 | Using only the new credentials, confirm that your applications are working well. If you need to, you can revert to using the original credentials by switching its state back to `Active`. |
| 5 | Delete the first credentials.<br>Related action: `DeleteAccessKey` or `DeleteSigningCertificate`<br>Related command: `iam-userdelkey` or `iam-userdelcert` |

Creating and enabling/disabling access keys in the AWS Management Console is described at Creating, Modifying, or Viewing User Security Credentials (p. 118). Uploading and enabling/disabling signing certificates in the console is described at Uploading a Signing Certificate (p. 122).

# Working with Roles

**Topics**



A role is an entity that has a set of permissions that can be assumed by another entity. Use roles to enable applications running on your Amazon EC2 instances to securely access your AWS resources. You grant a specific set of permissions to a role, use the role to launch an EC2 instance, and let EC2 automatically handle AWS credential management for your applications that run on Amazon EC2. Use AWS Identity and Access Management (IAM) to create a role and to grant permissions to the role.

> **Note**
>
> Currently, permission to assume a role is limited to Amazon EC2 instances in your AWS account only. You can use Auto Scaling and AWS CloudFormation to launch EC2 instances that use roles. You cannot launch an EC2 instance with a role in AWS Elastic Beanstalk. Applications running on your EC2 instances that have assumed a role can make calls to any of your AWS resources that you have granted the role permission to access.

IAM roles for Amazon EC2 provide:

- AWS access keys for applications running on Amazon EC2 instances
- Automatic rotation of the AWS access keys on the Amazon EC2 instance
- Granular permissions for applications running on Amazon EC2 instances that make requests to your AWS services

### How is a role different from other IAM entities?

The following table summarizes the differences between roles and other IAM entities.

| Entity | Permissions | Has credentials? | Can make calls? |
|---|---|---|---|
| User | Users have their own permissions plus any permissions applied through groups or granted via resource policies. | Yes | Yes |
| Federated user | Federated users have any permissions applied through their temporary security credentials, plus any permissions granted via resource policies. | Temporary security credentials | Yes |
| Group | Groups have only the permissions applied to them, but users in groups might have additional permissions via other groups or by policies applied to them directly. | No | No |
| Role | Roles are assumed by entities who can make calls. Entities who assume roles only have the permissions applied to the roles, or permissions granted to the role via resources such as an Amazon S3 bucket. Roles can be assumed only by entities who have permission to assume them. (Currently, only Amazon EC2 instances can assume roles.) | No, but the entity who assumes the role gets temporary security credentials. | No, but the entity who assumes the role can use the temporary security credentials to make calls. |

You can add only a limited number of roles to your account. For more information, see Limitations on IAM Entities (p. 56).

### Role ARNs

When you create a role IAM automatically assigns it an Amazon Resource Name (ARN). For example, for a role named *myrole* in account number 123456789012, the ARN would be arn:aws:iam::123456789012:role/myrole. For more information about ARNs, see ARNs (p. 53).

# Process for Working With a Role

This topic shows the overall process for working with roles. The following diagram shows the three basic tasks for working with roles.

Watch the video, Getting Started with IAM Roles for EC2 Instances, for a demonstration of the process.

The following table describes these tasks and where to go for more information.

| | |
|---|---|
| 1 | Use IAM to create a role. For more information, see Creating a Role (p. 132). |
| 2 | Use EC2 to launch an instance with the role. For more information, go to Running an Instance in *Amazon Elastic Compute Cloud User Guide*. |
| 3 | Access the credentials on the instance. For more information, go to Using AWS Identity and Access Management in *Amazon Elastic Compute Cloud User Guide*.<br><br>The credentials returned are temporary security credentials. Your applications running on Amazon EC2 use these credentials to access your AWS resources. For information about how to use temporary security credentials, go to Using Temporary Security Credentials to Access AWS in Using Temporary Security Credentials. |

**Note**

If you use the AWS Management Console or the AWS SDK to create and manage roles, IAM takes care of some of the details behind the scenes for you. For more information about using the SDK to work with roles, refer to one of the following AWS SDK guide topics:

- Using IAM Roles for EC2 Instances with the SDK for Java in *AWS SDK for Java*
- Using IAM Roles for EC2 Instances with the SDK for .NET in *AWS SDK for .NET*
- Using IAM Roles for EC2 Instances with the SDK for PHP in *AWS SDK for PHP*
- Using IAM Roles for EC2 Instances with the SDK for Ruby in *AWS SDK for Ruby*
- Launch an Amazon EC2 Instance from an AMI in the *AWS Toolkit for Eclipse Getting Started Guide*
- Launching an Amazon EC2 Instance and Identity and Access Management in the *AWS Toolkit for Visual Studio User Guide*

If you prefer to work with the IAM API or the command line interface (CLI), you will need to create and manage IAM instance profiles. For more information about instance profiles, see About Instance Profiles (p. 131).

# About Instance Profiles

An instance profile is a container for a role. If you use the AWS Management Console or the AWS SDK to create and manage roles, you don't need to know much about instance profiles; the console and the SDK manage instance profiles behind the scenes for you. If you use the IAM API or command line interface (CLI) to create and manage roles, then you must also create instance profiles for the roles. Creating instance profiles is described as part of the process of using the CLI or API to create roles in Creating a Role (p. 132).

**Note**

Currently, each instance profile can contain only one role.

**Important**

When you use the Amazon EC2 console to launch an EC2 instance with an IAM role, you use the **IAM Role** list. The IAM Role list is populated with instance profile names. If you used the AWS Management Console or the AWS SDK to create your role, the instance profile was created

automatically and its name is identical to the name of the role it corresponds to. However, if you used the IAM API, the IAM command line interface, or a third-party tool to create your roles and instance profiles, the names of your instance profiles might not correspond to the names of your roles. In this case, you need to know the names of your instance profiles as well as the names of roles they contain so that you can choose the correct instance profile.

# Creating a Role

**Topics**



The process you use to create a role depends on whether you use the AWS Management Console, the command line interface (CLI), or the API. This section describes each of these processes.

**Note**

There are character limitations for role names, as well as limitations on the number of roles and policy size. For more information, see Limitations on IAM Entities (p. 56). After a role has been created, it cannot be renamed.

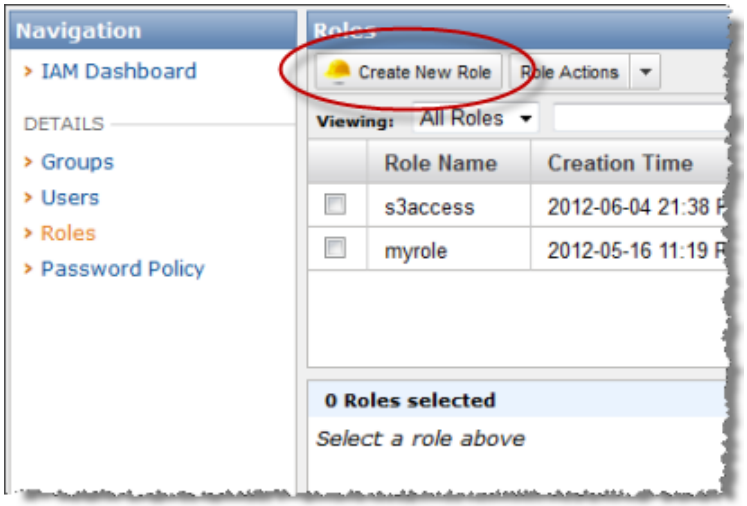
After you create an IAM role or instance profile, it may take several seconds for the appropriate permissions to propagate. If your first attempt to launch an EC2 instance with a role fails, you may need to wait a few seconds before trying again.

## Creating a Role (AWS Management Console)

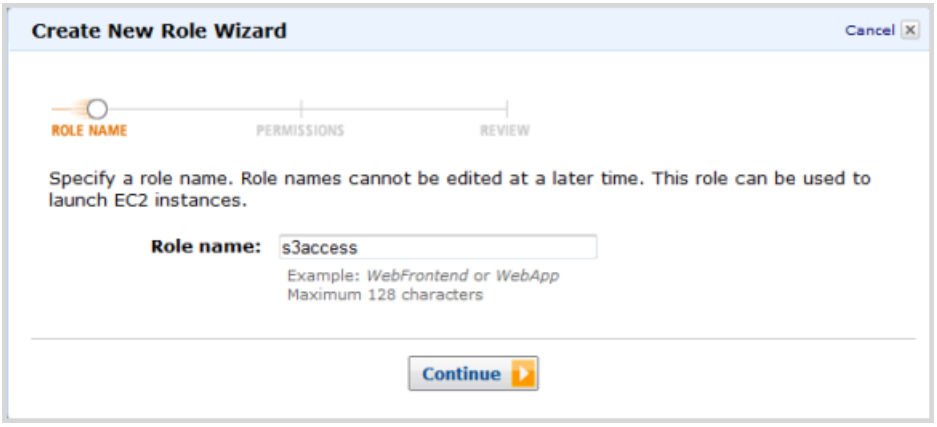
If you're accessing IAM through the AWS Management Console, you can create roles in a few simple steps.

**To create a role**

1. On the **Navigation** pane of the console, click **Roles**, and then click **Create New Role**.




2. Enter the role name.

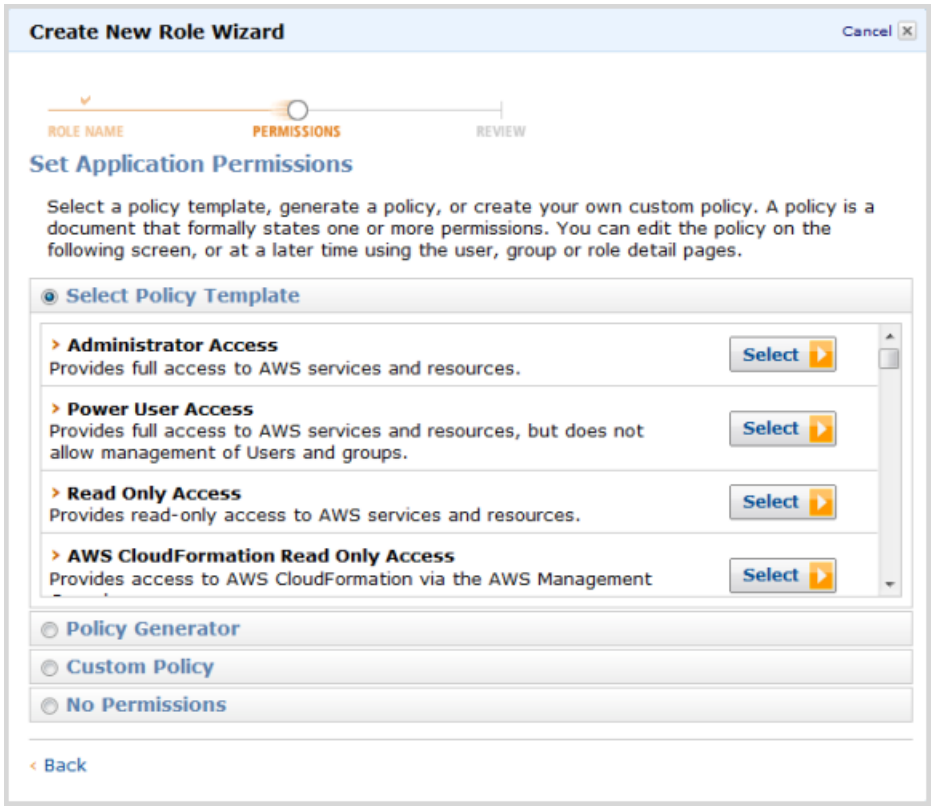



3. To grant permissions to the entity who assumes the role, attach a policy to the role. By default, roles have no permissions.

   **Note**

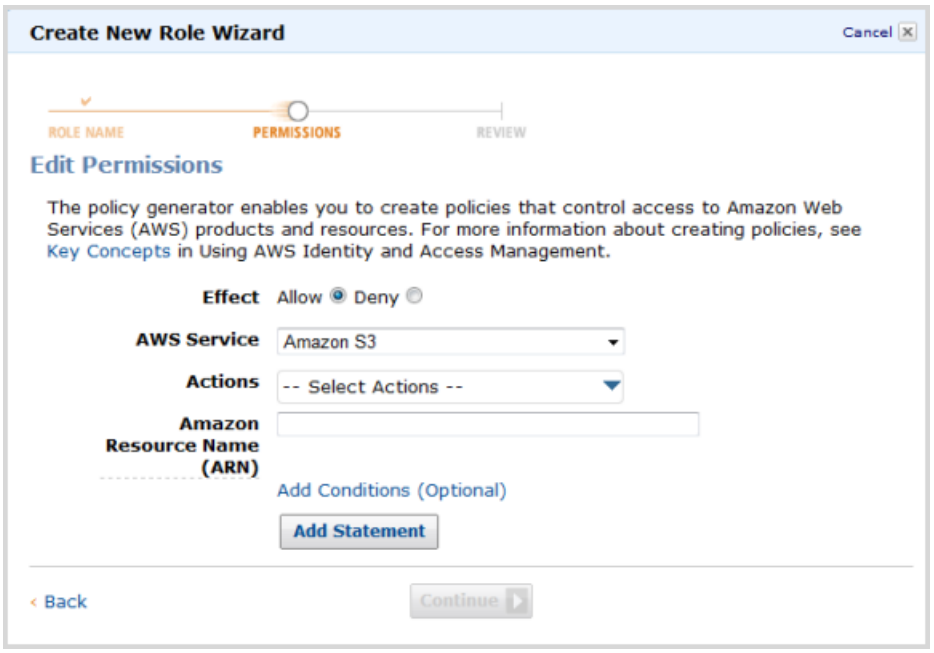
   Roles have two sets of permissions: permissions controlling who can assume the role, and permissions that apply to the entity who assumes the role. Currently, permission to assume a role is limited only to Amazon EC2 instances under your AWS account. The permissions granted in this step control only what the entity who assumes the role can do.

   a. Choose the method for creating the policy document by clicking either **Select Policy Template**, **Policy Generator**, or **Custom Policy**. Then click **Select**.

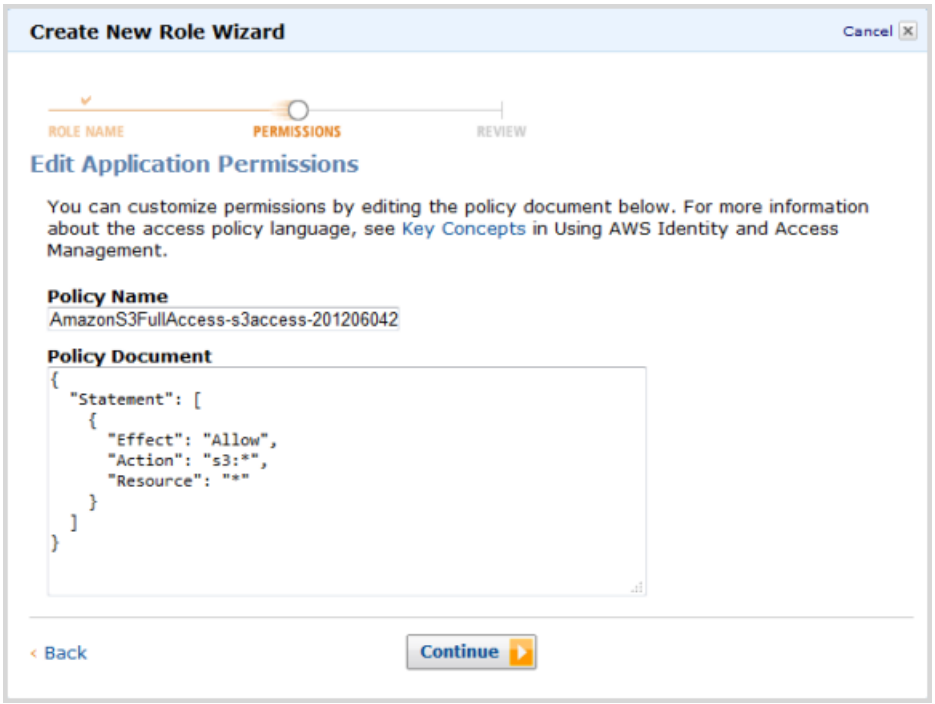



   b. How you complete the next step depends on the method you selected to create the policy.

- If you are using a template to create the policy, review the policy content in the dialog box.
- If you are using the policy generator, select the appropriate **Effect**, **AWS Service**, and **Actions** options, enter the ARN (if applicable), and add any conditions you want to include. Then click **Add Statement**. You can add as many statements as you want to the policy. When you are finished adding statements, click **Continue**.




- If you are using a custom policy, enter a name for the policy under **Policy Name** and write the policy or paste the policy document from your text editor into the **Policy Document** box.



When you are satisfied with the policy, click **Apply Policy**. IAM applies the policy to the role.

**Note**

There are limitations on policy names and on policy size. For information about policy limitations, see Limitations on IAM Entities (p. 56).

For information about how to launch an instance with the role you just created, go to Running an Instance in *Amazon Elastic Compute Cloud User Guide*. The overall process for using roles is described in Process for Working With a Role (p. 130). For information about managing policies, see Managing IAM Policies (p. 147).

# Creating a Role (CLI)

This topic shows the process for using the IAM command line interface (CLI) to create a role.

### Process for creating a role

| | |
|---|---|
| 1 | Create a role: `iam-rolecreate` |
| 2 | Add a policy to the role: `iam-roleaddpolicy` |
| 3 | Create an IAM instance profile: `iam-instanceprofilecreate`<br><br>For more information about instance profiles, see About Instance Profiles (p. 131). |
| 4 | Add the role to your IAM instance profile: `iam-instanceprofileaddrole`<br><br>Currently, each instance profile can contain only one role. |

For more information about IAM commands, go to the AWS Identity and Access Management Command Line Interface Reference.

For information about how to launch an instance with the role you just created, go to Running an Instance in *Amazon Elastic Compute Cloud User Guide*. The overall process for using roles is described in Process for Working With a Role (p. 130). For information about managing policies, see Managing IAM Policies (p. 147).

# Creating a Role (API)

This topic shows the process for using the IAM API to create a role.

### Process for Creating a Role

| | |
|---|---|
| 1 | Create a role: `CreateRole` |
| 2 | Add a policy to the role: `PutRolePolicy` |
| 3 | Create an instance profile: `CreateInstanceProfile` |
| 4 | Add the role to the instance profile: `AddRoleToInstanceProfile`<br><br>Currently, each instance profile can contain only one role. |

For more information about IAM API actions, go to the AWS Identity and Access Management API Reference.

For information about how to launch an instance with the role you just created, go to Running an Instance in *Amazon Elastic Compute Cloud User Guide*. The overall process for using roles is described in Process for Working With a Role (p. 130). For information about managing policies, see Managing IAM Policies (p. 147).

# Changing Role Permissions

To change the permissions on a role, you can either modify the existing policy, or you can attach a new policy to the role. Adding or editing policies is described in Managing IAM Policies (p. 147).

For general information about what policies are and how they work, see Permissions and Policies (p. 26). For information about the specific permissions a user needs to work with roles, see Permissions Users Need to Work with Roles (p. 140).

# Listing Roles and Their Attributes

**Topics**



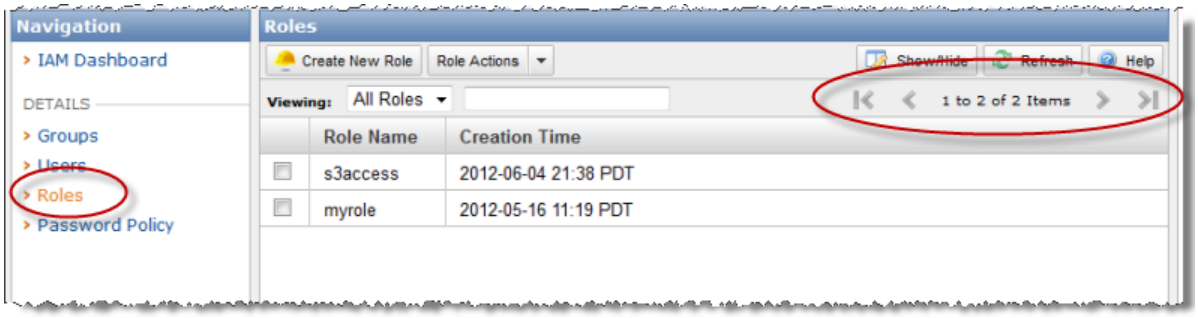
This section describes how to list roles and view role attributes, such as the role's Amazon Resource Name (ARN). How you list roles and their attributes depends on how you access IAM.

For more information about ARNs and paths, see Identifiers for IAM Entities (p. 52).

## Listing Roles and Their Attributes (AWS Management Console)

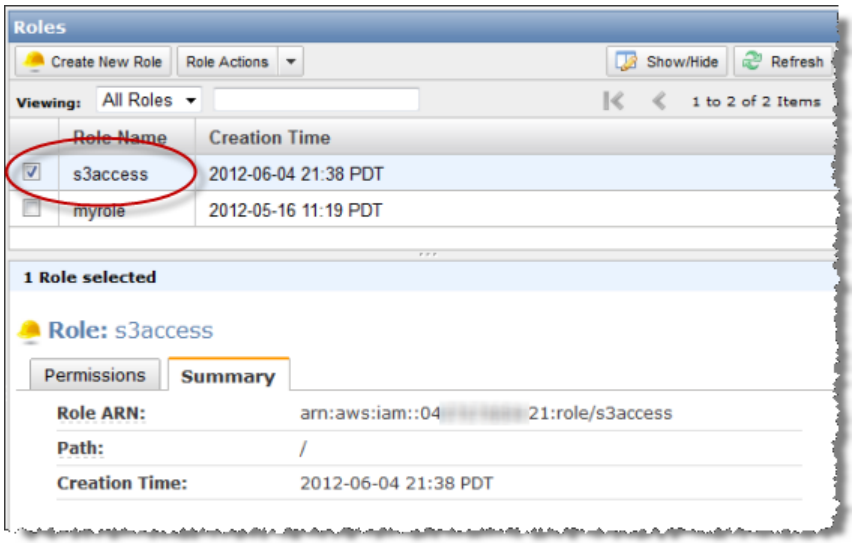
### To list all roles in your AWS account

- On the **Navigation** pane, click **Roles**. The console displays ten roles per screen. To see more roles, use the page controls on the right side of the console to advance to the next screen.



### To view role attributes

- Select the name of the role to view attributes for, and then click the **Summary** tab. Attributes such as the ARN, path, and creation date are displayed. Click the **Permissions** tab to view and manage role policies. For more information about managing policies, see Managing IAM Policies (p. 147).




# Listing Roles and Their Attributes (CLI)

Use the `iam-rolelistbypath` command to list all the roles in the AWS account, or all the roles with a particular path prefix. The output lists the ARN for each role.

The `iam-rolegetattributes` command returns a given role's ARN, its GUID, and the assume policy (the policy that gives an entity permission to assume a role).

> **Note**
>
> Currently, the only entity that can assume a role is an Amazon EC2 instance. Roles do not work with EC2 instances running in AWS Elastic Beanstalk.

For information about managing policies on roles, see Managing IAM Policies (p. 147). For more information about IAM commands, go to the *AWS Identity and Access Management Command Line Interface Reference*.

# Listing Roles and Their Attributes (API)

Use the `ListRoles` action to list all the roles in the AWS account, or list all the roles with a particular path prefix. The output lists the ARN for each role.

The `GetRole` command returns a given role's ARN, its GUID, and the assume policy (the policy that gives an entity permission to assume a role). For more information about ARNs and paths, see Identifiers for IAM Entities (p. 52).

> **Note**
>
> Currently, the only entity that can assume a role is an Amazon EC2 instance. Roles do not work with EC2 instances running in AWS Elastic Beanstalk.

For more information about these actions, go to the AWS Identity and Access Management API Reference.

# Listing Instance Profiles and Their Attributes

**Topics**



This section describes how to list instance profiles and view their attributes. How you list instance profiles and their attributes depends on whether you are using the command line interface (CLI) or the API. Currently, instance profiles are not accessible on the AWS Management Console.

## Listing Instance Profiles and Their Attributes (CLI)

Use the `iam-instanceprofilelistbypath` command to list all the instance profiles in the AWS account, or all the instance profiles with a particular path prefix. The output lists the ARN for each instance profile.

The `iam-instanceprofilelistforrole` command lists the ARNs of the instance profiles associated with a particular role. For more information about ARNs, see Identifiers for IAM Entities (p. 52).

> **Note**
>
> A role can be associated with many instance profiles, but an instance profile can be associated only with one role.

The `iam-getinstanceprofile` command lists the ARN and GUID for a given instance profile. Optionally, you can also use this command to list all the associated role for the instance profile. For more information about ARNs and GUIDs, see Identifiers for IAM Entities (p. 52).

For more information about IAM commands, refer to the *AWS Identity and Access Management Command Line Interface Reference*.

## Listing Instance Profiles and Their Attributes (API)

Use the `ListInstanceProfiles` action to list all the instance profiles in the AWS account, or all the instance profiles with a particular path prefix. The output lists the ARN for each instance profile.

The `ListInstanceProfilesForRole` action lists the ARNs of the instance profiles associated with a particular role. For more information about ARNs, see Identifiers for IAM Entities (p. 52).

> **Note**
>
> A role can be associated with many instance profiles, but an instance profile can be associated only with one role.

The `GetInstanceProfile` action lists the ARN and GUID for a given instance profile. Optionally, you can also use this action to list all the associated role for the instance profile. For more information about ARNs and GUIDs, see Identifiers for IAM Entities (p. 52).

For more information about IAM API actions, refer to the *AWS Identity and Access Management API Reference*.

# Deleting a Role or Instance Profile

**Topics**



This topic shows how to delete a role or an instance profile from your AWS account. It also shows how to remove roles from instance profiles.

**Caution**

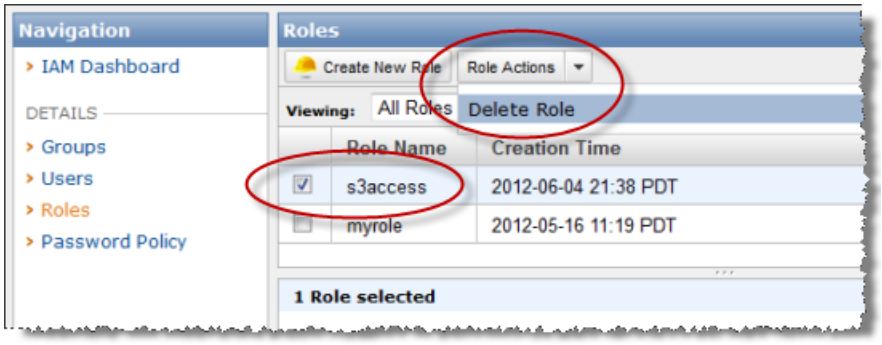
Make sure you do not have any Amazon EC2 instances running with the role or instance profile you are about to delete. Deleting a role or instance profile that is associated with a running instance will break any applications running on the instance.

## Deleting a Role from an AWS Account (AWS Management Console)

When you use the AWS Management Console to delete a role, IAM also automatically deletes the policies associated with the role, and the instance profile that contains the role. For more information about instance profiles, see About Instance Profiles (p. 131).

### To use the AWS Management Console to delete a role

1. On the **Navigation** pane, click **Roles**, and then select the role name.
2. From the **Role Actions** list, select **Delete Role**.




3. Review your changes, and then click **Yes, Delete**.

**Note**

You cannot use the console to delete an instance profile, except when you delete it as part of the process of deleting a role as described in the preceding procedure. To delete an instance profile without also deleting the role, you must use the command line interface (CLI) or the API. For information about using the CLI or API to remove an instance profile, see Deleting a Role or Instance Profile from an AWS Account (CLI and API) (p. 140).

# Deleting a Role or Instance Profile from an AWS Account (CLI and API)

When you use the IAM CLI or API to delete a role, you must first delete the policies associated with the role. Also, if you want to delete the associated instance profile that contains the role, you must delete it separately.

### Using the CLI

| | |
|---|---|
| Delete a role policy | `iam-roledelpolicy` |
| Delete a role | `iam-roledel` |
| Delete an instance profile | `iam-instanceprofiledel` |

### Using the API

| | |
|---|---|
| Delete role policies | `DeleteRolePolicy` |
| Delete a role | `DeleteRole` |
| Delete an instance profile | `DeleteInstanceProfile` |

For general information about instance profiles, see About Instance Profiles (p. 131).

# Removing a Role from an Instance Profile

You can remove a role from an instance profile. Use the CLI `iam-instanceprofileremoverole` command to remove a role from an instance profile. Or, if using the API, use the `RemoveRoleFromInstanceProfile` action to remove a role from an instance profile.

# Permissions Users Need to Work with Roles

To work with IAM roles for EC2 instances, you must grant permissions to users who create roles and users who will run EC2 instances with roles. This section lists the permissions necessary for each of these tasks, and shows example policies granting these permissions.

For information about adding or editing policies, see Managing IAM Policies (p. 147). For general information about what policies are and how they work, see Permissions and Policies (p. 26).

### Permissions necessary to create or manage a role

- In addition to the applicable role and instance profile permissions, a user also needs permission to use a role as input to other API requests: `iam:PassRole` (`PassRole` is a virtual action; it does not have a corresponding API.)

  **Note**

  Even if a user will be creating roles via the console only, the user still must have instance profile permissions. For information about instance profiles, see About Instance Profiles (p. 131).

### Minimum permissions necessary to launch an EC2 instance with a role

- Permission to use a role as input to other API requests: `iam:PassRole` (using the role's Amazon Resource Name (ARN))
- Permission to launch an EC2 instance: `ec2:RunInstances`
- Permission to list all instance profiles: `iam:ListInstanceProfiles` (required only when the user is launching instances via the EC2 console)

### Example 1: Grant a user permission to launch an instance with any role, using the EC2 console

```
{
   "Statement": [{
      "Effect":"Allow",
      "Action":"iam:PassRole",
      "Resource":"*"
    },
    {
      "Effect":"Allow",
      "Action":"iam:ListInstanceProfiles",
      "Resource":"*"
    },
    {
      "Effect":"Allow",
      "Action":"ec2:*",
      "Resource":"*"
    }]
}
```

### Example 2: Grant a user permission to launch an instance with a role, using the EC2 APIs

Note that the `Resource` element references the ARN of the role. In this example, the role is named *myrole*.

```
{
  "Statement": [{
      "Effect":"Allow",
      "Action":"ec2:RunInstances",
      "Resource":"*"
    },
    {
      "Effect":"Allow",
      "Action":"iam:PassRole",
      "Resource":"arn:aws:iam::123456789012:role/myrole"
    }]
}
```

**Example 3: Use an Amazon S3 bucket policy to grant an entity who has assumed a role permission to access an Amazon S3 bucket**

This bucket policy would apply to any EC2 instances that have assumed the role named *myrole*. (Granting access via resource policies for a particular EC2 instance is not supported.)

```
{
   "Statement":[{
      "Effect":"Allow",
      "Principal":{"AWS":"arn:aws:iam::123456789012:role/myrole"},
      "Action":"s3:PutObject",
      "Resource":"arn:aws:s3:::MyBucket/*"
   }]
}
```

# Troubleshooting Working with Roles

**Topics**



This section offers solutions to common issues you might encounter while working with IAM roles.

## Using the AWS Management Console

### When attempting to launch an instance, I don't see the role I expected to see in the Amazon EC2 console IAM Role list.

Check the following:

- If you are signed in as an IAM user, check that you have permission to call the IAM `ListInstanceProfiles` API. For information about the permissions necessary to work with roles, see Permissions Users Need to Work with Roles (p. 140). For information about adding permissions to a user, see Managing IAM Policies (p. 147).
- If the role was created using the IAM command line interface (CLI) or the IAM API, the role might not be contained in an instance profile. The IAM console creates an instance profile for every role created. The IAM CLI and API do not. You will need to use the IAM CLI or IAM API to find the instance profile that contains the role. For information about listing instance profiles, see Listing Instance Profiles and Their Attributes (p. 138). If an instance profile doesn't exist, then you need to create one. Creating instance profiles is described as part of the process of using the CLI or API to create roles in Creating a Role (p. 132).
- If a role was created using the IAM CLI or the IAM API the role might have a different name than the instance profile. In that case, the name you need to select from the list is the instance profile name. (The EC2 console lists the instance profiles for the account even though the list is named **IAM Role**.)

### When I attempt to launch an instance with a role, I get an `AccessDenied` error.

See the following topic, Working with the Amazon EC2 API (p. 143).

## Working with the IAM API

### When attempting to call the IAM `CreateRole`, `PutRolePolicy`, or `CreateInstanceProfile` APIs, I get an `AccessDenied` error.

If you are making requests as an IAM user, verify that you have permission to call the IAM `CreateRole`, `PutRolePolicy`, and `CreateInstanceProfile` APIs. For more information about the permissions necessary to work with roles, see Permissions Users Need to Work with Roles (p. 140). For information about adding permissions to a user, see Managing IAM Policies (p. 147).

### When I attempt to call the IAM `AddRoleToInstanceProfile` API, I get an `AccessDenied` error.

If you are making requests as an IAM user, verify that you have the following permissions:

- `iam:AddRoleToInstanceProfile` with the resource matching the instance profile ARN (for example, arn:aws:iam::1234567890:instance-profile/MyInstanceProfile).
- `iam:PassRole` with the resource matching the role ARN (for example, arn:aws:iam::1234567890:role/MyRole).

For more information about the permissions necessary to work with roles, see Permissions Users Need to Work with Roles (p. 140). For information about adding permissions to a user, see Managing IAM Policies (p. 147).

## Working with the Amazon EC2 API

### When I attempt to launch an instance with a role, I get an `AccessDenied` error.

Check the following:

- Launch an instance without an instance profile. This will help ensure that the problem is limited to IAM roles for EC2 instances.
- Call the IAM `GetInstanceProfile` API to ensure that you are using a valid instance profile name or a valid instance profile ARN. For more information, see Listing Instance Profiles and Their Attributes (p. 138).
- Call the IAM `GetInstanceProfile` API to ensure that the instance profile has a role. Empty instance profiles will fail with an `AccessDenied` error. For more information, see Listing Instance Profiles and Their Attributes (p. 138).
- If you are making requests as an IAM user, verify that you have the following permissions:
  - `ec2:RunInstances` with a wildcard resource ("*")
  - `iam:PassRole` with the resource matching the role ARN (for example, arn:aws:iam::1234567890:role/MyRole)

For more information about the permissions necessary to work with roles, see Permissions Users Need to Work with Roles (p. 140). For information about adding permissions to a user, see Managing IAM Policies (p. 147).

# Working with an EC2 Instance

## I can't access the security credentials on my instance.

Check the following:

- Can you can access another part of the instance metatdata service (IMDS)? If not, check that you have no firewall rules blocking access to requests to IMDS.

```
[ec2-user@domU-12-31-39-0A-8D-DE ~]$ GET http://169.254.169.254/latest/meta-data/hostname; echo
```

- Does the `iam` subtree of IMDS exist? If not, verify that your instance has an IAM instance profile associated with it calling `ec2:DescribeInstances`.

```
[ec2-user@domU-12-31-39-0A-8D-DE ~]$ GET http://169.254.169.254/latest/meta-data/iam; echo
```

- Does the `info` document in the IAM subtree indicate an error? (The following sections describe what to do if an error is indicated.)

```
[ec2-user@domU-12-31-39-0A-8D-DE ~]$ GET http://169.254.169.254/latest/meta-data/iam/info; echo
```

## My EC2 instance has an IAM instance profile, but I don't see credentials.

Check the `info` document in the IAM subtree for an indication of an error. (The following sections describe what to do if an error is indicated.)

```
[ec2-user@domU-12-31-39-0A-8D-DE ~]$ GET http://169.254.169.254/latest/meta-data/iam/info; echo
```

## The credentials on my instance are for the wrong role.

If the role in the instance profile was replaced recently, your application will need to wait for the next automatically scheduled credential rotation before credentials for your role become available.

## The `iam/info` document indicates `"Code":"InstanceProfileNotFound"`

This means that your IAM instance profile has been deleted and EC2 can no longer provide credentials to your instance. You will need to terminate your instances and restart with a valid instance profile.

If an instance profile with that name exists, check that the instance profile wasn't deleted and another recreated with the same name.

**To verify the status of the instance profile:**

1. Call the IAM `GetInstanceProfile` API to get the `InstanceProfileId`
2. Call the EC2 `DescribeInstances` API to get the `IamInstanceProfileId` for the instance
3. Verify that the `InstanceProfileId` from the IAM API matches the `IamInstanceProfileId` from the EC2 API

If the IDs are different, then the instance profile attached to your instances is no longer valid. You will need to terminate your instances and restart with a valid instance profile.

### The `iam/info` document indicates a success but indicates `"Message":"Instance Profile does not contain a role..."`

This means that the role has been removed from the instance profile via the IAM `RemoveRoleFromInstanceProfile` API. You can use the IAM `AddRoleToInstanceProfile` API to attach a role to the instance profile. Your application will need to wait until the next scheduled refresh to have access to credentials for the role.

### The `iam/security-credentials/[role-name]` document indicates `"Code":"AssumeRoleUnauthorizedAccess"`

This means that EC2 does not have permission to assume the role. Permission to assume the role is controlled by the assume role policy attached to the role. Use the IAM `UpdateAssumeRolePolicy` API to update the assume role policy.

```
{"Version":"2008-10-17","Statement":[{"Effect":"Allow","Principal":{"Ser
vice":["ec2.amazonaws.com"]},"Action":["sts:AssumeRole"]}]}
```

Your application will need to wait until the next automatically scheduled refresh to have access to credentials for the role.

# Accessing AWS Service APIs

## I cannot successfully make requests to an AWS service

This section is dependent on the client toolkit you use to call AWS service APIs. For information about the AWS SDKs, refer to the AWS SDK documentation on the AWS Documentation page.

- Verify that the service accepts temporary security credentials. See Using Temporary Security Credentials to Access AWS.
- Verify that your requests are being signed correctly and that the request is well-formed. Consult your toolkit documentation for more information or see Using Temporary Security Credentials to Authenticate an AWS Request.
- Verify that your temporary security credentials haven't expired. For more information, see Using Temporary Security Credentials.
- Verify that the permissions on the role are correct. Use the IAM `PutRolePolicy` API to update role permissions. For information about the permissions necessary to work with roles, see Permissions Users Need to Work with Roles (p. 140). For information about adding permissions to a user, see Managing IAM Policies (p. 147).
- If you are managing permissions via resource policies, verify that permission is granted to the role. For example, the following policy allows a role access to an Amazon S3 bucket.

```
{
   "Version":"2008-10-17",
   "Statement":[{
      "Sid":"BucketPolicy",
      "Effect":"Allow",
      "Principal": {
      "AWS": ["arn:aws:iam::111122223333:role/MyRole"]
      },
      "Action":["s3:PutObject"],
      "Resource":["arn:aws:s3:::MyBucket/*"]
   }]
}
```

This policy would apply to any EC2 instances that have assumed the role. Granting access via resource policies for a particular EC2 instance is not supported.

# Managing IAM Policies

**Topics**



This section describes creating, viewing, listing, and deleting policies. For general information about what policies are and how they work, see Overview of Policies (p. 28).

When you want to add a permission to an IAM entity such as a user, group, or role, you create a policy in the access policy language that contains the permission, and then attach the policy to the entity. You can attach multiple policies to an entity. Or, instead of creating a new policy, you can edit an existing policy to add the permission. Policy names must be unique to the entity the policy is attached to. For information about how permissions are evaluated when permissions are applied to an IAM entity, see Evaluation Logic.

> **Note**
>
> There are limits on the cumulative size of the policy and on the policy name. For more information, see Limitations on IAM Entities (p. 56).

You can get a list of the policies attached to a user, group, or role. But, there's no single IAM action that gets a list of all the policies you've created for all entities in the AWS account.

You can delete a policy at any time. If you use the API or CLI to delete a user, group, or role, you must delete the attached policies separately. For more information, see Deleting a User from Your AWS Account (p. 75), Deleting a Group (p. 84), or Deleting a Role or Instance Profile (p. 139).

How you create, view, list, or delete a policy depends on which interface you're using to access IAM. The interface-specific details are covered in the following sections.

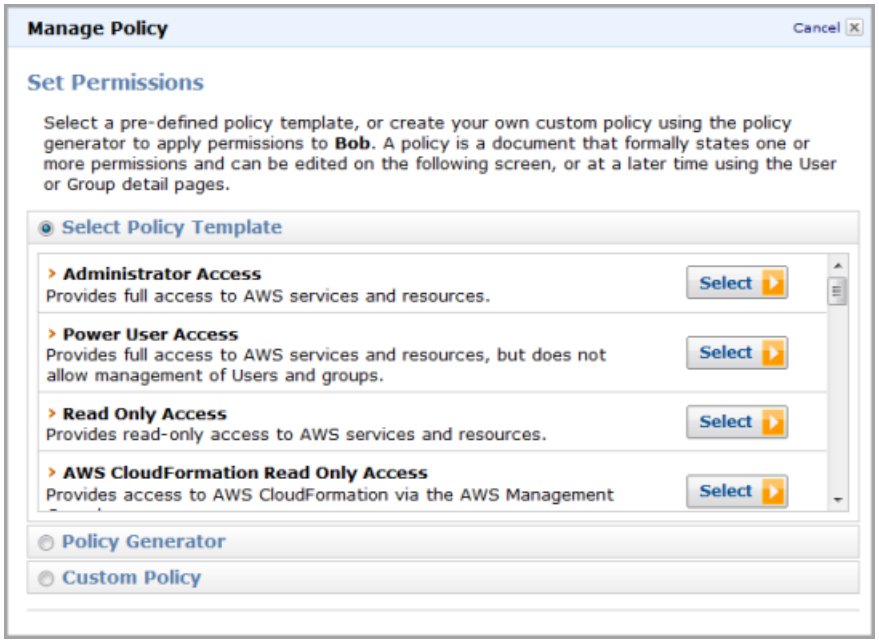
> **Tip**
>
> Policy templates and the policy generator are available in the AWS Management Console. You can use the AWS Policy Generator online to create policies for AWS products without accessing the console. For more information about the access policy language, see The Access Policy Language (p. 29).

# Managing Policies (AWS Management Console)

### To create a policy and attach it to a group, user, or role

1. On the **Navigation** pane, click **Groups**, **Users**, or **Roles**.
2. Select the group, user, or role you want to create a policy for, and then select the **Permissions** tab.
3. If you are creating a policy for a user, click **Attach User Policy**. If you are creating a policy for a group or role, click **Attach Policy**.

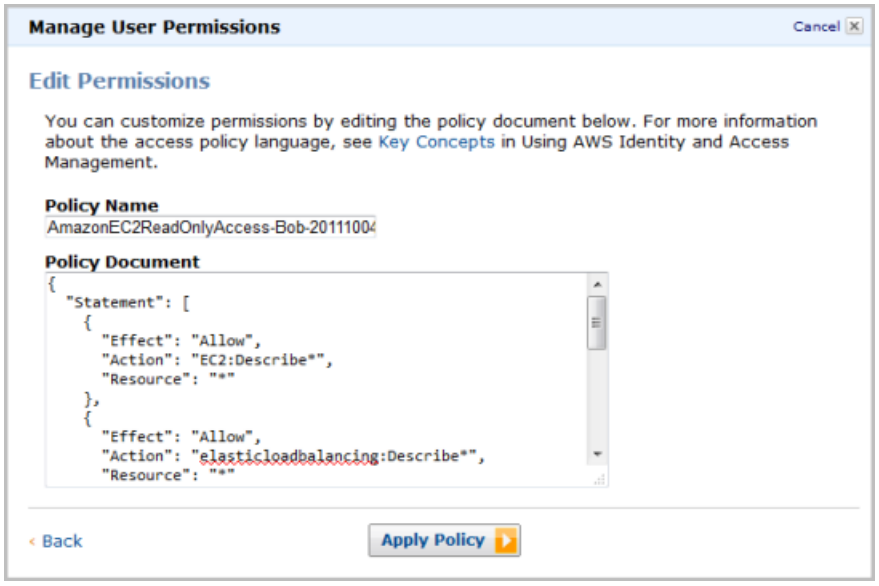

4. Choose the method for creating the policy document by clicking either **Select Policy Template**, **Policy Generator**, or **Custom Policy**. Then click **Select**.




5. In the **Edit Permissions** screen, you can name the policy and create or edit your policy document. Or, if you are using the policy generator to create your policy, select the appropriate **Effect**, **AWS Service**, and **Actions** options, enter the ARN (if applicable), and add any conditions you want to

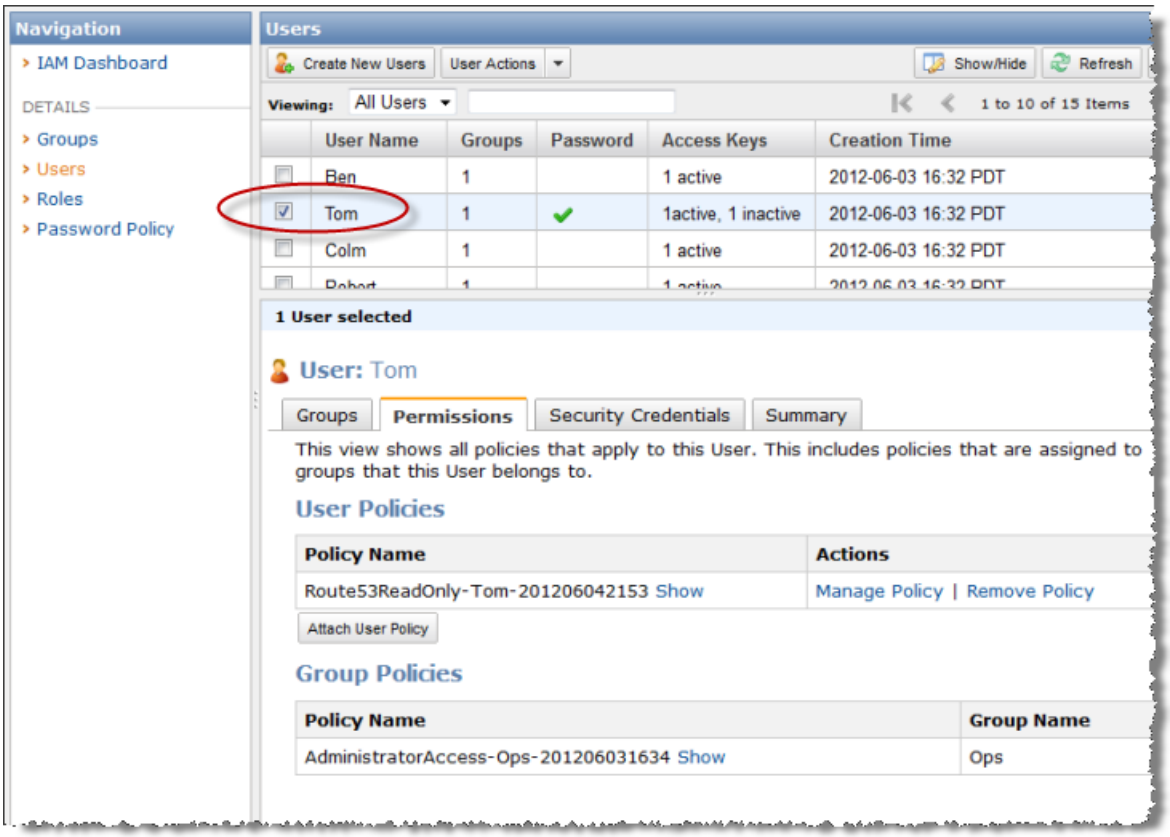
include. Then click **Add Statement**. You can add as many statements as you want to the policy. When you are finished adding statements, click **Continue**.

When you are satisfied with the policy, click **Apply Policy**. IAM applies the policy to the selected entity.




### To view a policy or a list of policies associated with a user, group, or role

- On the **Navigation** pane of the console, click **Users**, **Groups**, or **Roles** and then select the name of the entity whose policies you want to view.




IAM lists all policies associated with the entity on the **Permissions** tab. If you want to see the contents of a policy, click **Show**.

### Note

For users, under **User Policies**, you can see any policies attached to the user directly. IAM lists policies attached to any groups that the user belongs to under **Group Policies**. You cannot modify group policies from a user's **Permissions** tab. To create or modify group permissions, you must go to the **Permissions** tab for the group whose permissions you want to change.

### Note

Currently, permission to assume a role is limited only to Amazon EC2 instances in your AWS account. The permissions described in this step control only what the entity who assumes the role can do.

### To edit or delete a policy for a group, user, or role

1. On the **Navigation** pane, click **Groups**, **Users**, or **Roles**.
2. Select the group, user, or role you want to modify a policy for, and then select the **Permissions** tab.
3. If you're editing a policy, click **Manage Policy**. You can edit the policy in the **Edit Permissions** screen (shown in the preceding task), or, if you prefer to work from a policy template, click **View Policy Templates** and select a template. You can also use the policy generator to modify a policy.
4. To delete a policy, click **Remove Policy**. The policy is deleted and permissions associated with the policy no longer apply to the selected group, user, or role.

# Managing Policies (CLI)

The following table lists which CLI command to use for each task you want to perform with a policy. For more information about the commands, go to the AWS Identity and Access Management Command Line Interface Reference.

For an example of attaching a policy and listing policies, see Adding a Policy to the Group (p. 61).

| Task | Command to Use |
|---|---|
| Attach a simple policy by passing in the contents of the policy as parameters in the command | `iam-groupaddpolicy`<br>`iam-useraddpolicy`<br>`iam-roleaddpolicy` |
| Attach a JSON policy document you've written | `iam-groupuploadpolicy`<br>`iam-useruploadpolicy`<br>`iam-roleuploadpolicy` |
| List policies | `iam-grouplistpolicies`<br>`iam-userlistpolicies`<br>`iam-rolelistpolicies` |
| Delete a policy | `iam-groupdelpolicy`<br>`iam-userdelpolicy`<br>`iam-roledelpolicy` |

# Managing Policies (API)

The following table lists which API actions to use for each task you want to perform with a policy. For more information about the actions, go to the AWS Identity and Access Management API Reference, or refer to your SDK's documentation.

For an example of attaching a policy and listing policies, see Adding a Policy to the Group (p. 61).

| Task | Action to Use |
|---|---|
| Attach a JSON policy document you've written | `PutGroupPolicy`<br>`PutUserPolicy`<br>`PutRolePolicy` |
| List policies | `ListGroupPolicies`<br>`ListUserPolicies`<br>`ListRolePolicies` |
| Get the contents of a policy | `GetGroupPolicy`<br>`GetUserPolicy`<br>`GetRolePolicy` |

| Task | Action to Use |
| --- | --- |
| Delete a policy | `DeleteGroupPolicy`<br>`DeleteUserPolicy`<br>`DeleteRolePolicy` |

# Example Policies for IAM Entities

This section shows some basic examples of policies that control access for your IAM resources.

### Example 1: Allow requests only if they come from a certain IP address or range

In this example we create a group called *AllUsers* for all the users in the AWS account. We attach a policy to the group that covers all AWS products and resources in the AWS account. This policy assumes the valid IP address ranges for the company are 10.1.2.0/24 and 10.1.3.0/24. The policy denies any traffic to AWS from the AWS account that doesn't come from those IP address ranges.

> **Note**
>
> If you're using Amazon VPC, you might expect all your users' requests to originate from a particular IP address, and so you want to deny requests from any other address.

The policy uses the AWS-wide key called `aws:SourceIp`. For information about the AWS-wide policy keys, see Available Keys (p. 45).

```
{
  "Statement":[{
    "Effect":"Deny",
    "Action":"*",
    "Resource":"*",
    "Condition":{
       "NotIpAddress":{
          "aws:SourceIp":["10.1.2.0/24","10.1.3.0/24"]
          }
       }
    }
  ]
}
```

### Example 2: Allow users to work only with a specific set of AWS products and resources

In this example we create a group called *AllUsers* for all the users in the AWS account. We attach a policy to the group that gives users access to only the following:

- The AWS account's Amazon SimpleDB domain called mySDBDomain (which exists only in the us-east-1 Region)
- The AWS account's corporate Amazon S3 bucket called my_corporate_bucket and all the objects it contains

```
{
  "Statement":[{
    "Effect":"Allow",
    "Action":["sdb:*","s3:*"],
    "Resource":["arn:aws:sdb:us-east-1:123456789012:domain/mySDBDomain",
    "arn:aws:s3:::my_corporate_bucket",
    "arn:aws:s3:::my_corporate_bucket/*"]
    },
    {
    "Effect":"Deny",
    "Action":["sdb:*","s3:*"],
    "NotResource":["arn:aws:sdb:us-east-1:123456789012:domain/mySDBDomain",
    "arn:aws:s3:::my_corporate_bucket",
    "arn:aws:s3:::my_corporate_bucket/*"]
    }
  ]
}
```

The explicit deny statement helps to ensure that the users can't use any other AWS products or resources than those specified in the policy.

### Example 3: Allow a user to manage his or her own security credentials

In this example we give Bob permission to access any of the IAM actions related to access keys and signing certificates, but only with his own credentials.

We attach a policy to Bob that covers all the actions that include the literal string `AccessKey` or `SigningCertificate`. The policy specifies Bob as the resource.

```
{
  "Statement":[{
    "Effect":"Allow",
    "Action":["iam:*AccessKey*","iam:*SigningCertificate*"],
   "Resource":"arn:aws:iam::123456789012:user/division_abc/subdivision_xyz/Bob"

    }
  ]
}
```

**Note**

The policy uses wildcards to specify all the IAM actions related to access keys and certificates (the * matches zero or multiple characters). You could instead list each action explicitly. If you use the wildcards instead of explicitly listing each action, be aware that if we were to add any new IAM actions that include the string `AccessKey` or `SigningCertificate` in their names, this policy would automatically give Bob access to those new actions to use with his own credentials.

If you want to let another user named Jane manage her own credentials, then you would simply need to replace the ARN for Bob with the ARN for Jane in the policy, and attach the policy to Jane. You must explicitly name the user in the resource; there's no way to use a wildcard that automatically refers to "self" (i.e., the user the policy is attached to). In other words, there's no group-level policy you can write that will give all your users credential management permissions only for their own credentials. You need to write an individual policy for each user, and assign the policy to the user.

### Example 4: Allow a user to manage a group's membership

In this example we create a policy that allows the user to update the membership of the group called *MarketingGroup*.

```
{
  "Statement":[{
    "Effect":"Allow",
    "Action":[
       "iam:AddUserToGroup",
       "iam:RemoveUserFromGroup",
       "iam:GetGroup"
    ],
   "Resource":"arn:aws:iam::123456789012:group/division_abc/subdivision_xyz/Mar
ketingGroup"
    }
  ]
}
```

### Example 5: Allow a user to list the AWS account's groups and users for reporting purposes

In this example we create a policy that allows the user to call any IAM action that starts with the literal string `Get` or `List`. You probably don't want the user reading the Access Key IDs of other users, so the policy includes a statement that denies the user access to the `ListAccessKeys` action.

```
{
  "Statement":[{
    "Effect":"Allow",
    "Action":[
      "iam:Get*",
      "iam:List*"
      ],
    "Resource":"*"
    },
    {
    "Effect":"Deny",
    "Action":"iam:ListAccessKeys",
    "Resource":"*"
    }
  ]
}
```

#### Note

If we were to add new types of security credentials in the future, the access granted in the policy to all `List*` actions would automatically allow the user to list those new credentials.

# Controlling User Access to Your AWS Account Billing Information

The AWS website integrates with AWS Identity and Access Management (IAM) so you can grant users access to billing information. You can control access to the Account Activity page and the Usage Reports page. The **Account Activity** page displays invoices, and detailed information about charges and account activity, itemized by service and by usage type. The **Usage Reports** page provides detailed usage reports for each service you are subscribed to.

You can control your users' access to your account billing information in three steps:

1. Configure your security challenge questions.
2. Create custom policies for your IAM users.
3. Activate access to the AWS website.

By default, users do not have access to these pages. However, if you used a wildcard policy to grant users administrator-level access to AWS, then, after you activate access to these pages, those users will have access to these pages unless you use a policy to specifically deny them access. The following topics have examples on using policies to control access to the Account Activity and Usage Reports pages.

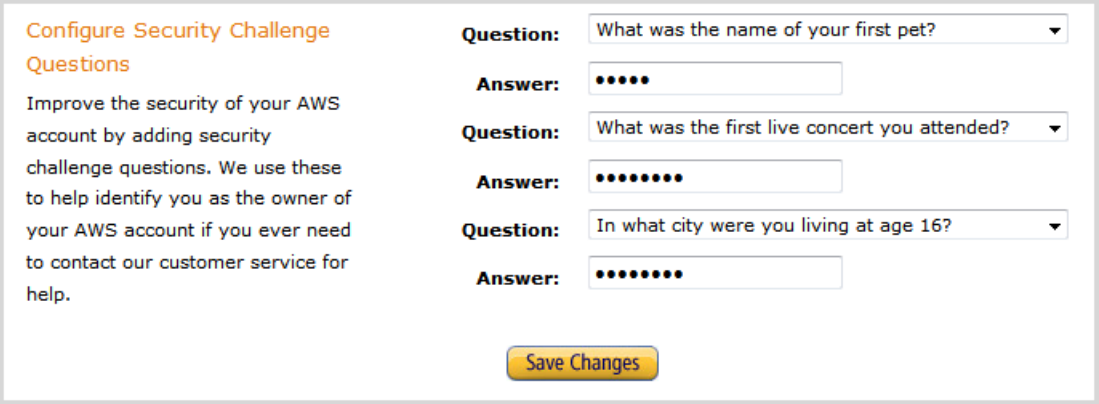
For information about deactivating access to the AWS website, see Deactivate Access to the AWS Website (p. 161).

## Configure Your Security Challenge Questions

If you haven't already configured your security challenge questions, you need to do this first. Amazon uses these questions to identify you as the owner of your AWS account if you contact our customer service.

### To configure your security challenge questions

1. In the **Configure Security Challenge Questions** section on the Personal Information page, configure three security challenge questions.




2. Click **Save questions**.

After you have saved your security challenge questions, you can create custom IAM policies for your IAM users to control access to the AWS website.

# Create Custom Policies for IAM Users

By default, users that you create in IAM do not have access to billing information such as the Account Activity page and the Usage Reports page. Access to your account's billing information is controlled with IAM policies that you can assign to either a single user or a group of users. For instructions, see Managing IAM Policies.

This rest of this section provides simple example policies that you can attach to your user or your group to control access to your account's billing information.

### Example 1: Allow users to access the Account Activity page

This policy allows the user to access the **Account Activity** page.

```
{
  "Statement":[{
     "Effect":"Allow",
     "Action":"aws-portal:ViewBilling",
     "Resource":"*"
     }
  ]
}
```

### Example 2: Allow users to access the Usage Reports page

This policy allows the user to access the **Usage Reports** page.

```
{
  "Statement":[{
     "Effect":"Allow",
     "Action":"aws-portal:ViewUsage",
     "Resource":"*"
     }
  ]
}
```

### Example 3: Deny users access to the Account Activity page

This policy denies the user access to the **Account Activity** page.

```
{
  "Statement":[{
     "Effect":"Deny",
     "Action":"aws-portal:ViewBilling",
     "Resource":"*"
     }
  ]
}
```

### Example 4: Deny users access to the Usage Reports page

This policy denies the user access to the **Usage Reports** page.

```
{
  "Statement":[{
     "Effect":"Deny",
     "Action":"aws-portal:ViewUsage",
     "Resource":"*"
     }
  ]
}
```

### Example 5: Allow full access to AWS services but deny users access to billing information

This policy enables full access to all AWS services but denies the user access to the **Account Activity** or **Usage Reports** page.

```
{
  "Statement":[{
     "Effect":"Allow",
     "Action":"*",
     "Resource":"*"
     },
     {
     "Effect":"Deny",
     "Action":"aws-portal:*",
     "Resource":"*"
     }
  ]
}
```

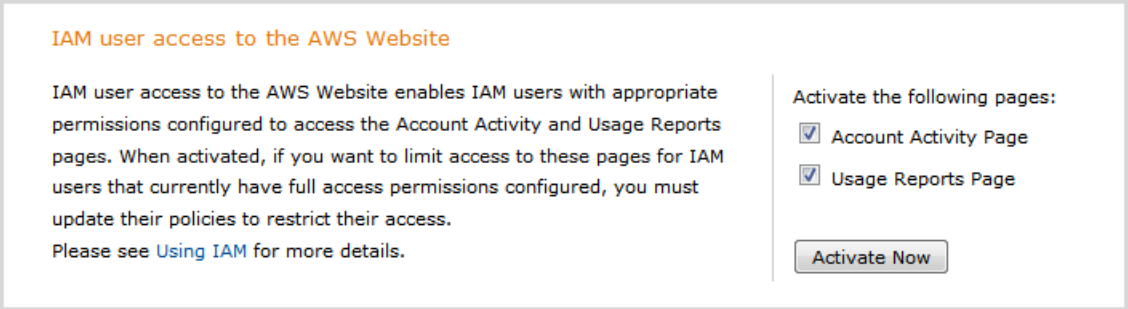
After you set custom IAM policies for your IAM users, you can activate access to the AWS website.

# Activate Access to the AWS Website

To grant your IAM users access to your account's billing information, you need to activate the functionality.

### To activate access to the AWS website

- In the **IAM user access to the AWS website** section on the Manage Your Account page, click **Activate Now**.



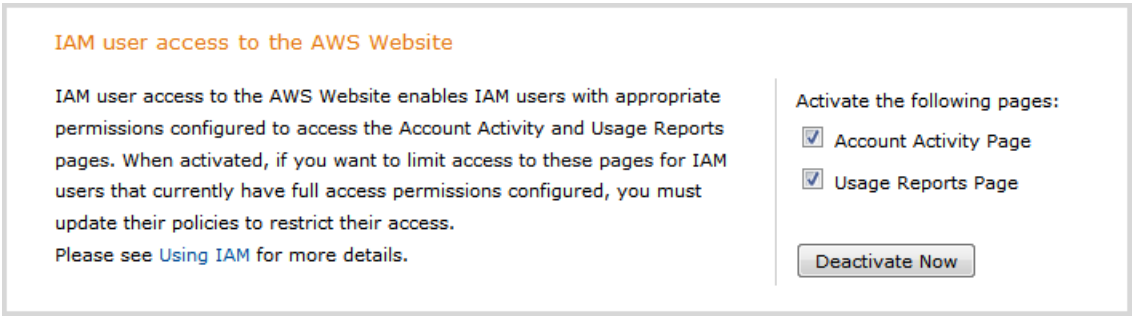

#### Note

Note that by activating IAM user access to the AWS website, all users for whom you have granted full access to AWS APIs will now also have access to the AWS website. As always, you may restrict their access by applying a more constrained set of permissions. See Example 5: Allow full access to AWS services but deny users access to billing information (p. 160).

# Deactivate Access to the AWS Website

**To deactivate access to the AWS website**

- In the **IAM user access to the AWS Website** section on the Manage Your Account page, click **Deactivate Now**.



# Controlling User Access to the AWS Management Console

Users who sign in to your AWS account through the sign-in page can access your AWS resources through the AWS Management Console to the extent that you grant them permission. The following table shows the ways you can grant users access to your AWS account resources through the AWS Management Console. It also shows how users can access other AWS account features through the AWS website.

| AWS feature | User access |
| --- | --- |
| The AWS Management Console | You create a password for each user who needs access to the AWS Management Console. Users access the console via your IAM-enabled AWS account sign-in page. For information about accessing the sign-in page, see The AWS Management Console Sign-in Page (p. 164). For information about creating passwords, see Managing Passwords (p. 88). |
| Your AWS resources, such as Amazon EC2, Amazon S3, and so on | Even if your users have passwords, they still need permission to access your AWS resources. When you create a user, that user has no permissions by default. To give your users the permissions they need, you assign policies to them. If you have many users who will be performing the same tasks with the same resources, you can assign those users to a group, then assign that group permissions under a single policy. For information about creating users and groups, see Working with Users and Groups (p. 65). For information about using policies to set permissions, see Permissions and Policies (p. 26). |
| AWS Discussion Forums | Anyone can read the posts on the AWS Discussion Forums. Users who want to post questions or comments to the AWS Discussion Forum can do so using their user name. The first time a user posts to the AWS Discussion Forum, the user is prompted to enter a nickname and email address for use only by that user in the AWS Discussion Forums. |
| Your AWS account billing and usage information | You can grant users access your AWS account billing and usage information. For more information, see Controlling User Access to Your AWS Account Billing Information (p. 157). |

| AWS feature | User access |
| --- | --- |
| Your AWS account profile information | Users cannot access your AWS account profile information. |
| Your AWS account security credentials | Users cannot access your AWS account security credentials. |

**Note**

IAM policies control access regardless of the interface. For example, you could provide a user with a password to access the AWS Management Console, and the policies for that user (or any groups the user belongs to) would control what the user can do in the AWS Management Console. Or, you could provide the user with AWS access keys for making API calls to AWS, and the policies would control which actions the user could call through a library or client that uses those access keys for authentication.

# How Users Sign In to the AWS Management Console

**Topics**



The AWS Management Console provides a web-based interface for many AWS product APIs (such as the API for Amazon S3, Amazon EC2, and so on). Users can make requests directly to an API, or users can use the AWS Management Console to make requests to a service's API. Users who work with your AWS resources through the AWS Management Console will use your AWS account's IAM-enabled sign-in page and the passwords you create for them to access the console.

This section provides information about the IAM-enabled AWS Management Console sign-in page and explains how to create an AWS account alias for your sign-in page. For information about creating user passwords, see Managing Passwords (p. 88).

**Note**

Some AWS products are not supported on the AWS Management Console. For a list of AWS products that are supported on the console, go to AWS Management Console.

## The AWS Management Console Sign-in Page

Users who use the AWS Management Console must sign in to your AWS account through the IAM-enabled sign-in page. You provide your users with the URL they need to access the sign-in page. You might consider sending the link through email to the users who need it, or you might create a link to the sign-in page from a page in your company intranet.

Your IAM-enabled AWS Management Console sign-in page will look similar to the following page.


**Important**

In addition to providing users with a URL to your IAM-enabled sign-in page, for users to sign in to your page, you must provide each user with a password and, if appropriate, an MFA device. For detailed information about passwords and MFA devices, see Managing Passwords (p. 88) and Using Multi-Factor Authentication (MFA) Devices with AWS (p. 99).

The IAM-enabled sign-in page URL is created automatically when you begin using IAM. It has the following format.

```
https://your_AWS_Account_ID.signin.aws.amazon.com/console/ec2
```

**Note**

Your AWS account ID is the same as your account number, but without hyphens. To locate your AWS account number, go to the AWS Manage Your Account page. Your account number is located near the top right corner of the page.

If you want the URL for your sign-in page to contain your company name (or other friendly identifier) instead of your AWS account ID, you can create an alias for your AWS account ID. For more information about AWS account ID aliases, see Using an Alias for Your AWS Account ID (p. 166).

**Note**

When a user signs in, the console opens to the console referenced by the abbreviation at the end of your URL. In the preceding sample, signing in opens the Amazon EC2 console. If the URL ended with *s3*, then the AWS Management Console would open to the Amazon S3 console.

# Using AWS Account Credentials to Sign In to the AWS Management Console

When users sign in to your AWS account, they sign in via an IAM-enabled user sign-in page. For their convenience, this sign-in page uses a cookie to remember user status so that the next time a user goes to the AWS Management Console, the AWS Management Console calls the IAM-enabled user sign-in page by default.

If you want to sign in to the AWS Management Console under your AWS account credentials instead of as an AWS account user, from the user sign-in page, click **Sign in using AWS account credentials**. The Amazon Web Services sign-on page appears, from which you can sign in using your AWS account credentials.

# Using an Alias for Your AWS Account ID

If you want the URL for your sign-in page to contain your company name (or other friendly identifier) instead of your AWS account ID, you can create an alias for your AWS account ID. This section provides information about AWS account aliases and lists the API actions you use to create an alias.

Your sign-in page URL has the following format, by default.

```
https://your_AWS_Account_ID.signin.aws.amazon.com/console/ec2
```

If you create an AWS account alias for your AWS account ID, your sign-in page URL will look like the following example.

```
https://youralias.signin.aws.amazon.com/console/ec2
```

**Note**

The original URL containing your AWS account ID remains active after you create your AWS account alias.

# Creating, Deleting, and Listing an AWS Account Alias

You can use the AWS Management Console, the IAM API, or the command line interface to create or delete your AWS account alias.

**Important**

Your AWS account cannot have more than one alias. If you create a new alias for your AWS account, the new alias overwrites the old alias, and the URL containing the old alias will no longer work.

## AWS Management Console

### To create an account alias

1. On the **Navigation** pane, select **IAM Dashboard**.

2. Under **AWS Account Alias**, click **Create Account Alias**.


3. Enter the name you want to use for your alias, then click **Yes, Create**.

### To remove an account alias

1. On the **Navigation** pane, select **IAM Dashboard**.
2. Under **AWS Account Alias**, click **Remove Account Alias**.


3. Review your change, and then click **Yes, Delete**.

## API or CLI

The following table lists the API actions or command line interface (CLI) commands to use to create, delete, or list an AWS account ID sign-in page alias.

| Task | Command to Use |
|---|---|
| Create an alias for your AWS Management Console sign-in page URL | CLI: `iam-accountaliascreate`<br>API: `CreateAccountAlias` |
| Delete an AWS account ID alias | CLI: `iam-accountaliasdelete`<br>API: `DeleteAccountAlias` |
| List your AWS account ID alias | CLI: `iam-accountaliaslist`<br>API: `ListAccountAliases` |

**Note**

The alias must be unique across all Amazon Web Services products, and the number of characters it can contain is limited. For more information on limitations on AWS account entities, see Limitations on IAM Entities (p. 56).

For more information on the IAM API actions or CLI commands, go to the AWS Identity and Access Management API Reference or AWS Identity and Access Management Command Line Interface Reference.

# MFA Devices and Your IAM-Enabled Sign-in Page

If a user must use an MFA device to sign in to your IAM-enabled sign-in page, the user is prompted to enter the MFA device authentication code after entering a user name and password. In most cases, the user will be able to use the AWS Management Console after entering the required information.

However, it's possible for an MFA device to get out of synchronization. If after several unsuccessful tries a user cannot sign in to the AWS Management Console, the user will be prompted to synchronize the MFA device. The user can follow the on-screen prompts to synchronize the MFA device. For information about how you can synchronize a device for a user under your AWS account, see Synchronizing an MFA Device (p. 110).

# Integrating with Other AWS Products

This section links to topics that describe how IAM integrates with the different AWS products, and how to write policies to control access to a particular AWS product and its resources.

The following table summarizes whether you can grant IAM permissions that control access to a service's actions, resources, or both. For example, you can use IAM to control which Amazon EC2 actions users have access to, but you can't use IAM to control users' access to AMIs, volumes, instances, etc.

| AWS Product | Actions | Resources | For more information, see... |
|---|---|---|---|
| AWS Identity and Access Management (IAM) | ✓ | ✓ | Example Policies for IAM Entities (p. 153) |
| Amazon Web Services Account Billing Information | ✓* | | Controlling User Access to Your AWS Account Billing Information<br><br>*You can use IAM policies to control user access to your account's Account Activity page and Usage Reports page. |
| Amazon CloudFront | ✓ | | Controlling User Access to Your AWS Account in the *Amazon CloudFront Developer Guide* |
| Amazon CloudWatch | ✓ | | Controlling User Access to Your AWS Account in the *Amazon CloudWatch Developer Guide* |
| Amazon DynamoDB | ✓ | ✓ | Controlling Access to Amazon DynamoDB Resources in the *Amazon DynamoDB Developer Guide* |
| Amazon ElastiCache | ✓ | | Controlling User Access to Your AWS Account in the *Amazon ElastiCache User Guide* |

| AWS Product | Actions | Resources | For more information, see... |
|---|---|---|---|
| Amazon Elastic Compute Cloud (EC2) | ✓ | | Using AWS Identity and Access Management in the *Amazon Elastic Compute Cloud User Guide* |
| Amazon Elastic MapReduce | ✓ | | Configuring User Permissions in the *Amazon Elastic MapReduce Developer Guide* |
| Amazon Relational Database Service (RDS) | ✓ | | Controlling User Access to Your AWS Account in the *Amazon Relational Database Service (RDS) User Guide* |
| Amazon Route 53 | ✓ | ✓ | Controlling User Access with IAM in the *Amazon Route 53 Developer Guide* |
| Amazon SimpleDB | ✓ | ✓ | Managing Users of Amazon SimpleDB in the *Amazon SimpleDB Developer Guide* |
| Amazon Simple Email Service (SES) | ✓ | | Controlling User Access with IAM in the *Amazon Simple Email Service Developer Guide* |
| Amazon Simple Notification Service (SNS) | ✓ | ✓ | Controlling User Access to Your AWS Account in the *Amazon Simple Notification Service Getting Started Guide* |
| Amazon Simple Queue Service (SQS) | ✓ | ✓ | Controlling User Access to Your AWS Account in the *Amazon Simple Queue Service Developer Guide* |
| Amazon Simple Storage Service (S3) | ✓ | ✓ | Using IAM Policies in the *Amazon Simple Storage Service Developer Guide* |
| Amazon Simple Workflow Service (SWF) | ✓** | | Managing Access to Your Amazon SWF Workflows in the *Amazon Simple Workflow Service Developer Guide*<br>**For Amazon SWF, IAM can only grant access to all Amazon SWF functionality within an account. |
| Amazon Virtual Private Cloud (VPC) | ✓ | | Controlling VPC Management in the *Amazon Virtual Private Cloud User Guide* |
| Auto Scaling | ✓ | | Auto Scaling and AWS Identity and Access Management in the *Auto Scaling Developer Guide* |

| AWS Product | Actions | Resources | For more information, see... |
|---|---|---|---|
| AWS CloudFormation | ✓ | | Controlling User Access With AWS Identity and Access Management in the *AWS CloudFormation User Guide* |
| AWS Storage Gateway | ✓ | ✓ | Access Control Using AWS Identity and Access Management (IAM) in the *AWS Storage Gateway User Guide* |
| AWS Elastic Beanstalk | ✓ | ✓ | Using AWS Elastic Beanstalk with AWS Identity and Access Management (IAM) in the *AWS Elastic Beanstalk Developer Guide* |
| Elastic Load Balancing | ✓ | | Controlling User Access to Your AWS Account in the *Elastic Load Balancing Developer Guide* |

# Enabling Cross-Account Access

**Topics**



You can enable trusted entities outside of your AWS account to access certain resources within your AWS account. In addition, when the trusted entity is another AWS account, that account can delegate access to its AWS Identity and Access Management (IAM) users. This process is referred to as *cross-account access*. Cross-account access enables you to share access to your resources with users under other AWS accounts.

Cross-account access is a two-step process. First you give another AWS account access to specific resources, and then that AWS account delegates access to its users. An AWS account can delegate access only to the extent that it has been granted access. This section links to information about enabling access to particular AWS account resources, and then describes how to use IAM to delegate access to users within an account.

## Access to AWS Resources

Certain AWS products enable you to grant access to your AWS resources to trusted entities outside of your AWS account. For example, you can use Amazon S3 ACLs and policies to grant other AWS accounts access to your Amazon S3 buckets.

The following table shows the AWS products that use policies to control access to resources, lists the resources available, and provides links to detailed information about how to use policies with each product.

| AWS product | Resource | Reference |
|---|---|---|
| Amazon S3 | buckets | The policy is attached to the bucket, but the policy controls access to both the bucket and the objects in it; you can use ACLs to control access to individual objects. For more information, go to Access Control in the *Amazon Simple Storage Service Developer Guide*. |
| Amazon SNS | topics | For more information, go to Appendix: Managing Access to Your Amazon SNS Topics in the *Amazon Simple Notification Service Getting Started Guide*. |

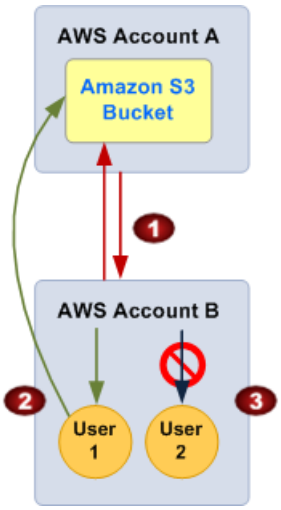
| AWS product | Resource | Reference |
|---|---|---|
| Amazon SQS | queues | For more information, go to Appendix: The Access Policy Language in the *Amazon Simple Queue Service Developer Guide*. |

**Important**

Give access only to entities you trust, and give the minimum amount of access necessary. Granting access to an AWS account enables it to delegate access to its users. An AWS account can delegate access only to the extent that it has access.

# Delegating AWS Account Permissions to IAM Users

An AWS account with access to another AWS account's resources can use an IAM policy to delegate access to the users under its account, as described in the following figure and table. (For information about permissions, policies, and the access policy language you use to write policies, see Permissions and Policies (p. 26).)




| | |
|---|---|
| 1 | Account A gives Account B full access to Account A's Amazon S3 bucket. As a result, Account B can perform any action on Account A's bucket, and Account B can grant access to users under Account B. |
| 2 | Account B gives User 1 read access to Account A's Amazon S3 bucket. User 1 can view the objects in Account A's bucket. The level of access Account B can delegate is equivalent to, or less than, the access it has. |
| 3 | Account B does not give access to User 2. Because User 2 has not been granted access to Account A's Amazon S3 bucket by Account B, by default, User 2 cannot access the bucket or the objects in the bucket. |

**Important**

In the preceding example, be aware that if Account B had used wildcards (*) to give a user full access to all its resources, that user would automatically have access to any resources that Account B has access to, including access granted by another account to its own resources. In this case, the user would have access to Account A's resources even though Account B did not specifically apply the permission.

Policies are late-binding. This means that IAM evaluates a user's permissions at the time the user makes a request. Therefore, if you use wildcards (*) to give users full access to your resources, users are able to access any resources your AWS account has access to, even resources you add or gain access to after creating the user's policy.

# How to Delegate AWS Account Permissions

To delegate permissions to users under your AWS account, you attach a policy to the user or group that you want to delegate your permissions to. You can delegate permissions equivalent to, or less than, the permissions you have.

For example, if your account has full access to the resources of another AWS account, you can delegate full access, list access, or any other partial access to users under your AWS account. If you have been granted list access only, you can delegate only list access. This means that where you have list access only, but you grant users under your AWS account full access, your users will have list access only. (For information about attaching a policy to a user or group, see Managing IAM Policies (p. 147).)

### Example 1: Use a policy to delegate access to another AWS account's Amazon S3 bucket

In this example, Account A uses a bucket policy to grant Account B full access to Account A's Amazon S3 bucket. Then, Account B creates an IAM user policy to delegate access to Account A's bucket to one of the users under Account B.

Account A's bucket policy might look like the following policy. In this example, Account A's Amazon S3 bucket is named *mybucket*, and Account B's account number is 1111-2222-3333. Account A uses Amazon S3 to implement this policy.

```
{
   "Statement" : {
      "Effect":"Allow",
      "Sid":"AccountBAccess1",
      "Principal" : {
          "AWS":"111122223333"
      },
      "Action":"s3:*",
      "Resource":"arn:aws:s3:::mybucket/*"
   }
   }
```

**Note**

Alternatively, Account A could use Amazon S3 Access Control Lists (ACLs) to grant Account B access to an Amazon S3 bucket or a single object within a bucket. In this case, the only thing that would change is how Account A grants access to Account B. Account B would still use a policy to delegate access to a user under Account B, as described in the second part of this example. For more information about controlling access on Amazon S3 buckets and objects, go to Access Control in the *Amazon Simple Storage Service Developer Guide*.

The next example shows the IAM user (or group) policy that Account B might create to delegate read access to a user under Account B. In this policy, the `Action` element is explicitly defined to allow only `List` actions, and the `Resource` element of this policy matches the `Resource` for the bucket policy implemented by Account A.

Account B implements this policy by using IAM to attach it to the appropriate user (or group) under Account B.

```
{
   "Statement":{
      "Effect":"Allow",
      "Action":"s3:List*",
      "Resource":"arn:aws:s3:::mybucket/*"
   }
}
```

### Example 2: Delegate access to another AWS account's Amazon SQS queue

In this example, Account A has an Amazon SQS queue and Account A uses a queue policy to grant queue access to Account B. Then, Account B uses an IAM user policy to delegate access to a user under Account B.

The following example queue policy gives Account B `SendMessage` and `ReceiveMessage` permission for Account A's queue named *1234-5678-9012/queue1*, but only between noon and 3:00 p.m. on November 30, 2011. Account B's account number is 1111-2222-3333. Account A uses Amazon SQS to implement this policy.

```
{
   "Statement":{
      "Effect": "Allow",
      "Action": ["sqs:SendMessage","sqs:ReceiveMessage"],
      "Principal": {
        "AWS": "111122223333"
      }
      "Resource": "arn:aws:sqs:*:/123456789012:queue1",
      "Condition": {
        "DateGreaterThan": {
          "aws:CurrentTime": "2011-11-30T12:00Z"
        }
        "DateLessThan": {
          "aws:CurrentTime": "2011-11-30T15:00Z"
        },
      },
   }
}
```

Account B's policy delegating access to a user under Account B might look like the following example. Account B uses IAM to attach this policy to a user (or group).

```
{
   "Statement":{
     "Effect":"Allow",
     "Action":"sqs:*",
     "Resource":"arn:aws:sqs:*:/123456789012:queue1"
   }
}
```

In the preceding IAM user policy example, Account B uses a wildcard to grant its user access to Account A's queue. But, because Account B can delegate access only to the extent that Account B has been granted access, Account B's user can access the queue only between noon and 3:00 p.m. on November 30, 2011, and the user can only perform `SendMessage` and `ReceiveMessage` actions, as defined in Account A's Amazon SQS queue policy.

### Example 3: Cannot delegate access when the account is denied access

By default, other AWS accounts and their users cannot access your AWS account resources. But, when you use a policy to explicitly deny an AWS account access to your resources, the deny propagates to the users under that account regardless of whether the users have existing policies granting them access. This means that an AWS account cannot delegate access to another account's resources if the other account has explicitly denied access to the user's parent account.

For example, Account A writes a bucket policy on Account A's Amazon S3 bucket that explicitly denies Account B access to Account A's bucket. But Account B writes an IAM user policy that grants a user under Account B access to Account A's bucket. The explicit deny applied to Account A's Amazon S3 bucket propagates to the users under Account B and overrides the IAM user policy granting access to the user under Account B. (For detailed information how permissions are evaluated, see Evaluation Logic (p. 33).)

Account A's bucket policy might look like the following policy. In this example, Account A's Amazon S3 bucket is named *mybucket*, and Account B's account number is 1111-2222-3333. Account A uses Amazon S3 to implement this policy.

```
{
   "Statement" : {
      "Effect":"Deny",
      "Sid":"AccountBDeny",
      "Principal" : {
          "AWS":"111122223333"
      },
      "Action":"s3:*",
      "Resource":"arn:aws:s3:::mybucket/*"
   }
}
```

Account B implements the following IAM user policy by using IAM to attach it to the a user under Account B.

```
{
   "Statement":{
      "Effect":"Allow",
      "Action":"s3:*",
      "Resource":"arn:aws:s3:::mybucket/*"
   }
}
```

Because Account A's bucket policy explicitly denies Account B access to *mybucket*, the deny propagates to the user under Account B, and Account B's IAM user policy granting Account B's user access to Account A's bucket has no effect. The user cannot access Account A's bucket.

# Managing Server Certificates

**Topics**



This section lists the IAM server certificate actions, describes what you need to know about renaming server certificates, and describes how to create and upload server certificates.

> **Note**
>
> Currently, Amazon Elastic Load Balancing is the only service to support the use of server certificates with IAM. Using server certificates with Amazon Elastic Load Balancing is described in the Amazon Elastic Load Balancing Developer Guide.

## Actions on Server Certificates

The following table describes actions you can use to manage server certificates in IAM.

| Action | API | Command Line Interface |
|---|---|---|
| Delete a server certificate | DeleteServerCertificate | iam-servercertdel |
| Get server certificate information | GetServerCertificate | iam-servercertgetattributes |
| List server certificates | ListServerCertificates | iam-servercertlistbypath |
| Update server certificates | UpdateServerCertificate | iam-servercertmod |
| Upload server certificates | Upload ServerCertificate | iam-servercertupload |

For more information about these actions, see the AWS Identity and Access Management API Reference or the AWS Identity and Access Management Command Line Interface Reference.

# Renaming Server Certificates

When you rename a server certificate, the GUID for the server certificate remains the same (for more information about GUIDs, see *GUIDs* in Identifiers for IAM Entities (p. 52)). However, IAM does not automatically update policies that refer to the server certificate as a resource to use the new name. You must manually do that. For example, Bob is a developer in the company ABC and has a policy attached to him that lets him manage the company's build server certificate, `arn:aws:iam::123456789012:server-certificate/abc/certs/build`. If an admin changes the name of the build server certificate to `build_01` or changes the path for the server certificate, the admin also needs to update the policy attached to Bob to use the new name or path so that Bob can continue to manage that server certificate.

# Creating and Uploading Server Certificates

**Topics**



This section describes the process of generating a digital certificate and preparing it to use with AWS products through IAM. The following table shows the tasks involved in this process in order that you need to complete them. Following the table, you'll find detailed instructions for each task.

**Tasks for Creating and Uploading Server Certificates**

| | |
|---|---|
| 1 | Install and Configure OpenSSL |
| 2 | Create a Private Key |
| 3 | Create a Certificate Signing Request |
| 4 | Submit CSR to Certificate Authority |
| 5 | Upload the Signed Certificate |
| 6 | Verify the Certificate Object |

## Install and Configure OpenSSL

To upload certificates on IAM, you can use the IAM command line interface (IAM CLI). For more information about installing the IAM command line toolkit, refer to Getting the Command Line Tools in the *AWS IAM Command Line Reference*.

Creating and uploading server certificates requires a tool that supports the SSL and TLS protocols. OpenSSL is an open-source tool that provides the basic cryptographic functions necessary to create an RSA token and sign it with your private key.

The following procedure assumes that your computer does not already have OpenSSL installed.

### To install OpenSSL

- Get the package from www.ssl.org:

  #### On Linux and UNIX:

  1. Go to OpenSSL: Source, Tarballs (http://www.openssl.org/source/).
  2. Download the latest source.
  3. Build the package.

  #### On Windows:

  1. Go to OpenSSL: Binary Distributions (http://www.openssl.org/related/binaries.html).
  2. Click **OpenSSL for Windows**.
     A new page displays with links to the Windows downloads.
  3. If not already installed on your system, select the **Microsoft Visual C++ 2008 Redistributables** link appropriate for your environment and click **Download**. Follow the instructions provided by the **Microsoft Visual C++ 2008 Redistributable Setup Wizard**.
  4. After you have installed the Microsoft Visual C++ 2008 Redistributables, select the appropriate version of the OpenSSL binaries for your environment and save the file locally. The **OpenSSL Setup Wizard** launches.
  5. Follow the instructions described in the **OpenSSL Setup Wizard**. Save the OpenSSL binaries to a folder in your working directory.

You must create an environment variable that points to the OpenSSL install point.

### To set the OpenSSL_HOME variable

- Enter the path to the OpenSSL installation:
  - On Linux and UNIX computers, enter the following command:

    ```
    & export OpenSSL_HOME=path_to_your_OpenSSL_installation
    ```

  - On Windows computers, enter the following command:

    ```
    c:\ set OpenSSL_HOME=path_to_your_OpenSSL_installation
    ```

You must add the path to the OpenSSL binaries to your computer's path variable.

### To include OpenSSL in your path

- Open a terminal or command interface and enter the appropriate command for your operating system:
  - On Linux and UNIX, enter the following command:

    ```
    & export PATH=$PATH:$OpenSSL_HOME/bin
    ```

- On Windows, enter the following command:

```
c:\ set Path=OpenSSL_HOME\bin;%Path%
```

# Create a Private Key

You need a unique private key to create your Certificate Signing Request (CSR). You must have administrator rights to perform this task.

### To create a private key

- Use the `genrsa` command to create a key:
  - On Linux and UNIX computers, enter the following command:

```
& openssl genrsa 1024 > private-key.pem
```

  - On Windows computers, enter the following command:

```
c:\ openssl genrsa 1024 > private-key.pem
```

**Note**

AWS supports 1024-, 2048-, and 4096-bit encryption.

# Create a Certificate Signing Request

A Certificate Signing Request (CSR) is a file sent to a Certificate Authority (CA) to apply for a digital identity certificate. You must have administrator rights to perform this task.

### To create a CSR

- Use the `req` command to create a CSR:
  - On Linux and UNIX computers, enter the following command:

```
& openssl req -new -key private-key.pem -out csr.pem
```

  - On Windows computers, enter the following command:

```
c:\ openssl req -new -key private-key.pem -out csr.pem
```

The output will look similar to the following example:

```
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
```

The following table can help you create your certificate request.

| Name | Description | Example |
|---|---|---|
| Country Name | The two-letter ISO abbreviation for your country. | US = United States |
| State or Province | The name of the state or province where your organization is located. This name cannot be abbreviated. | Washington |
| Locality Name | The name of the city where your organization is located. | Seattle |
| Organization Name | The full legal name of your organization. Do not abbreviate your organization name. | Example Corp. |
| Organizational Unit | Optional, for additional organization information. | Marketing |
| Common Name | The fully qualified domain name for your CNAME. You will receive a certificate name check warning if this is not an exact match. | www.yourdomain.com |
| Email address | The server administrator's email address | someone@yourdomain.com |

**Note**

The Common Name field is often misunderstood and is completed incorrectly. The common name is typically your host plus domain name. It will look like "www.company.com" or "company.com". You need to create a CSR using your correct common name.

# Submit the CSR to Certificate Authority

Your CSR contains information identifying you. To apply for a digital certificate, send your CSR to a Certificate Authority (CA). The CA might require other credentials or proofs of identity.

If the request for a certificate is successful, the CA returns an identity certificate (and possibly a chain certificate) that is digitally signed.

AWS does not recommend any one CA. For information on currently available CAs, go to Third-Party Certificate Authorities.

# Upload the Signed Certificate

When you receive your digitally signed certificate, you can upload it on IAM to use with other AWS products.

Your digitally signed certificate can include a chain certificate. A chain certificate contains a list of certificates used to authenticate an entity. If your signed certificate does not include a chain certificate, omit the *-c* parameter.

### To upload a signed certificate

- Use the `iam-servercertupload` command to upload a signed certificate:
  - On Linux and UNIX computers, enter the following command:

```
& ./iam-servercertupload -b public_key_certificate_file  -c certific
ate_chain_file -k privatekey.pem -s certificate_object_name
```

  - On Windows computers, enter the following command:

```
c:\ iam-servercertupload -b public_key_certificate_file  -c certific
ate_chain_file -k privatekey.pem -s certificate_object_name
```

# Verify the Certificate Object

After the digitally signed certificate is uploaded, you can verify that the information is stored in IAM. Each certificate object has a unique Amazon Resource Name (ARN) and GUID. You can request these details for a specific certificate object by referencing the name of the certificate object.

### To view the certificate object's ARN and GUID

- Use the `iam-servercertgetattributes` command to verify the certificate object:
  - On Linux and UNIX computers, enter the following command:

```
& ./iam-servercertgetattributes -s certificate_object_name
```

  - On Windows computers, enter the following command:

```
c:\ iam-servercertgetattributes -s certificate_object_name
```

The output will look similar to the following example.

```
arn:aws:iam::Your_AWS_Account_ID:server-certificate/Your_Certificate_Ob
ject_Name Certificate_Object_GUID
```

You have now completed the process for creating and uploading signed certificates. For information about setting up a load balancer using Amazon ELB's HTTPS support, see the command line interface (CLI) examples in the How to Set Up a LoadBalancer with HTTPS Support section of the Amazon Elastic Load Balancing Developer Guide.

# Making Query Requests

**Topics**



This section contains general information about using the Query API. For details about the API actions and errors for the IAM API or the AWS Security Token Service API, go to the AWS Identity and Access Management API Reference or the AWS Security Token Service API Reference.

IAM and AWS Security Token Service support Query requests for calling service actions. Query requests are simple HTTPS requests, using the GET or POST method. Query requests must contain an `Action` parameter to indicate the action to be performed.

The response is an XML document that conforms to a schema. The schema is included in the WSDL. The IAM WSDL is located at https://iam.amazonaws.com/doc/2010-05-08/AWSIdentityManagement.wsdl. The AWS Security Token Service WSDL is located at: https://sts.amazonaws.com/doc/2011-06-15/AWSSecurityTokenService.wsdl.

## Endpoints

IAM and AWS Security Token Service each have a single global endpoint. The IAM endpoint is https://iam.amazonaws.com. The AWS Security Token Service endpoint is https://sts.amazonaws.com.

For more information about AWS product endpoints and regions go to Regions and Endpoints in the *Amazon Web Services General Reference*.

## HTTPS Required

Because the Query API returns sensitive information such as security credentials, you must use HTTPS with all API requests.

# Signing AWS API Requests

To sign your API requests, we recommend using AWS Signature Version 4. For information about using Signature Version 4, go to Signature Version 4 Signing Process in the *AWS General Reference*.

If you need to use Signature Version 2, information about using Signature Version 2 is also available in the AWS General Reference.

# Document History

This Document History is associated with the 2010-05-08 release of AWS Identity and Access Management. This guide was last updated on 10 July 2012.

The following table describes important changes since the last release of *Using AWS Identity and Access Management*.

| Change | Description | Release Date |
|---|---|---|
| MFA-Protected API Access | This release introduces MFA-protected API access, a feature that enables you to add an extra layer of security over AWS APIs using AWS Multi-Factor Authentication (MFA), see Configuring MFA-Protected API Access (p. 113). | This release |
| Business Use Cases | This section has been rewritten and updated. For more information, see Business Use Cases (p. 23) | June 22, 2012 |
| IAM Roles for Amazon EC2 Instances | This release introduces IAM roles for Amazon EC2 instances. Use roles to enable applications running on your Amazon EC2 instances to securely access your AWS resources. For more information about IAM roles for EC2 instances, see Working with Roles (p. 129). | June 07, 2012 |
| AWS Storage Gateway | This release introduces AWS Storage Gateway integration with IAM. For more information about using IAM with AWS Storage Gateway, go to Access Control Using AWS Identity and Access Management (IAM) in the *AWS Storage Gateway User Guide*. For a general description of AWS Storage Gateway, go to AWS Storage Gateway. | May 14, 2012 |
| Updated Documentation | The IAM Getting Started Guide was merged into Using IAM, and Using IAM was reorganized to enhance usability. The Getting Started is now available at Getting Started (p. 4). | May 02, 2012 |
| Signature Version 4 | With this release of IAM, you can use Signature Version 4 to sign your IAM API requests. For more information about Signature Version 4, go to Signature Version 4 Signing Process in the *AWS General Reference*. | March 15, 2012 |
| User Password Management | With this release of IAM, you can enable your IAM users to change their password. For more information, see Managing Passwords (p. 88). | March 08, 2012 |

| Change | Description | Release Date |
| --- | --- | --- |
| Account Password Policy | IAM now includes an account-wide password policy you can use to ensure your IAM users create strong passwords. For more information, see Managing an IAM Password Policy (p. 89). | March 08, 2012 |
| IAM User Access to Your AWS Account Billing Information | With this release of IAM, you can enable your IAM users to access your AWS account billing and usage information. For more information, see Controlling User Access to Your AWS Account Billing Information (p. 157). | March 08, 2012 |
| Amazon Simple Workflow Service (SWF) | This release introduces Amazon Simple Workflow Service (SWF) integration with IAM. For more information about using IAM with Amazon Simple Workflow Service, go to Managing Access to Your Amazon SWF Workflows in the *Amazon Simple Workflow Service Developer Guide*. For a general description of Amazon Simple Workflow Service, go to Amazon Simple Workflow Service. | February 22, 2012 |
| Single Sign-on Access to the AWS Management Console for Federated Users | With this release, you can give your federated users single sign-on access to the AWS Management Console through your identity and authorization system, without requiring users to sign in to Amazon Web Services (AWS). For more information, go to Giving Federated Users Direct Access to the AWS Management Console in *Using Temporary Security Credentials*. | January 19, 2012 |
| New Documentation: Using Temporary Security Credentials | The documentation that describes creating temporary security credentials for federated users and mobile applications has been moved to a new, expanded stand-alone guide named Using Temporary Security Credentials. | January 19, 2012 |
| Amazon DynamoDB | This release introduces Amazon DynamoDB integration with IAM. For more information about using IAM with Amazon DynamoDB, go to Controlling Access to Amazon DynamoDB Resources in the *Amazon DynamoDB Developer Guide*. For a general description of Amazon DynamoDB, go to Amazon DynamoDB. | January 18, 2012 |
| AWS Elastic Beanstalk | This release introduces AWS Elastic Beanstalk integration with IAM. For more information about using IAM with AWS Elastic Beanstalk, go to Using AWS Elastic Beanstalk with AWS Identity and Access Management (IAM) in the *AWS Elastic Beanstalk Developer Guide*. For a general description of AWS Elastic Beanstalk, go to AWS Elastic Beanstalk. For IAM use cases, see Business Use Cases (p. 23). | November 21, 2011 |
| AWS Virtual MFA | With this release, you can use IAM to configure and enable a virtual MFA device. A virtual MFA device uses a software application that can generate six-digit authentication codes that are compatible with the Time-Based One-Time Password (TOTP) standard, as described in RFC 6238. The software application can run on any mobile hardware device, including a smartphone. For more information about virtual MFA and about using IAM to configure and enable a virtual MFA device, see Using a Virtual MFA Device with AWS (p. 101). | November 02, 2011 |

| Change | Description | Release Date |
|---|---|---|
| Policy Generator Integration with the AWS Identity and Access Management Console | This release introduces the integration of the policy generator with the AWS Identity and Access Management (IAM) console. Integrating the policy generator with the IAM console makes it even easier to set permissions for your IAM users and groups. To use the policy generator in the console, select **Policy Generator** in the user or group permissions dialogs.<br>For more information about the AWS access policy language, see Key Concepts in *Using AWS Identity and Access Management*. If you want to use the policy generator online to create policies for AWS products without accessing the console, go to the AWS Policy Generator. | October 06, 2011 |
| Amazon ElastiCache | This release introduces Amazon ElastiCache integration with IAM. For more information about using IAM with ElastiCache, go to Controlling User Access to Your AWS Account in the *Amazon ElastiCache User Guide*. For a general description of Amazon ElastiCache, go to Amazon ElastiCache. For IAM use cases, see Business Use Cases (p. 23). | August 22, 2011 |
| Temporary Security Credentials | This release of IAM introduces temporary security credentials that you can use to grant temporary access to non-AWS users (federated users), to IAM users who need temporary access to your AWS resources, and to your mobile and browser-based applications that need to access your AWS resources securely. For more information, go to Using Temporary Security Credentials. | August 03, 2011 |
| Cross-Account Access for IAM Users | This release of IAM introduces cross-account access for IAM users. For more information, see Enabling Cross-Account Access (p. 172). | June 06, 2011 |
| The AWS Management Console IAM Tab | This release of IAM introduces AWS Management Console support. The **IAM** tab of the console is a graphical user interface (GUI) that enables you to do almost everything you can do with the IAM APIs. For more information, see Ways to Access IAM (p. 51) and the AWS Identity and Access Management Getting Started Guide. | May 03, 2011 |
| Amazon CloudFront | This release of IAM includes integration with Amazon CloudFront. For more information, go to Controlling User Access to Your AWS Account in the CloudFront Developer Guide. | March 10, 2011 |
| AWS CloudFormation | This release introduces AWS CloudFormation integration with IAM. For more information, go to Controlling User Access With AWS Identity and Access Management in the *AWS CloudFormation User Guide*. | 24 February 2011 |
| Amazon Elastic MapReduce | This release introduces Amazon Elastic MapReduce integration with IAM. For more information, go to *Amazon Elastic MapReduce* in Business Use Cases in the *Using AWS Identity and Access Management* guide. | 22 February 2011 |

| Change | Description | Release Date |
| --- | --- | --- |
| IAM-Enabled User Access to the AWS Management Console and AWS Developer Forums | IAM now provides an IAM-enabled sign-in page for the AWS Management Console. You provide your users with a login profile and with appropriate permissions so they can access your available AWS resources through the AWS Management Console. For information about accessing the AWS Management Console through IAM, see How Users Sign In to the AWS Management Console (p. 164). For information about the AWS Management Console, see AWS Management Console. | 14 February 2011 |
| Amazon Simple Email Service | This release introduces Amazon Simple Email Service (Amazon SES) integration with IAM. For more information, see Controlling User Access with IAM. | 24 January 2011 |
| AWS IAM Integration with Amazon Route 53 | Amazon Route 53 DNS service is now integrated with IAM. For information about using Amazon Route 53 with IAM, see Integrating with Other AWS Products (p. 169). For more information about Amazon Route 53, go to Amazon Route 53 on the AWS website. | 05 December 2010 |
| AWS IAM Integration with Amazon CloudWatch | Amazon CloudWatch is now integrated with IAM. For information about using Amazon CloudWatch with IAM, see Controlling User Access to Your AWS Account. For more information about Amazon CloudWatch, see Amazon CloudWatch on the AWS website. | 29 November 2010 |
| Server Certificate Support | IAM now provides server certificate APIs for use with Elastic Load Balancing server certificates. For information about using IAM to manage server certificates, see Managing Server Certificates (p. 177). | 14 October 2010 |
| Initial Release | This is the first release of *Using AWS Identity and Access Management*. | 02 September 2010 |