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# Amazon Simple Storage Service

## Developer Guide

### API Version 2006-03-01



## Amazon Simple Storage Service: Developer Guide

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# What Is Amazon S3?

Amazon Simple Storage Service is storage for the Internet. It is designed to make web-scale computing easier for developers.

Amazon S3 has a simple web services interface that you can use to store and retrieve any amount of data, at any time, from anywhere on the web. It gives any developer access to the same highly scalable, reliable, fast, inexpensive data storage infrastructure that Amazon uses to run its own global network of web sites. The service aims to maximize benefits of scale and to pass those benefits on to developers.

This guide explains the core concepts of Amazon S3, such as buckets and objects, and how to work with these resources using the Amazon S3 application programming interface (API).

## How Do I...?

Information	Relevant Sections
General product overview and pricing	<a href="#">Amazon S3</a>
Get a quick hands-on introduction to Amazon S3	<a href="#">Amazon Simple Storage Service Getting Started Guide</a>
Learn about Amazon S3 key terminology and concepts	<a href="#">Introduction to Amazon S3 (p. 2)</a>
How do I work with buckets?	<a href="#">Working with Amazon S3 Buckets (p. 58)</a>
How do I work with objects?	<a href="#">Working with Amazon S3 Objects (p. 106)</a>
How do I make requests?	<a href="#">Making Requests (p. 11)</a>
How do I manage access to my resources?	<a href="#">Managing Access Permissions to Your Amazon S3 Resources (p. 295)</a>

# Introduction to Amazon S3

This introduction to Amazon Simple Storage Service is intended to give you a detailed summary of this web service. After reading this section, you should have a good idea of what it offers and how it can fit in with your business.

## Topics

- [Overview of Amazon S3 and This Guide \(p. 2\)](#)
- [Advantages to Amazon S3 \(p. 2\)](#)
- [Amazon S3 Concepts \(p. 3\)](#)
- [Features \(p. 6\)](#)
- [Amazon S3 Application Programming Interfaces \(API\) \(p. 8\)](#)
- [Paying for Amazon S3 \(p. 9\)](#)
- [Related Services \(p. 9\)](#)

## Overview of Amazon S3 and This Guide

Amazon S3 has a simple web services interface that you can use to store and retrieve any amount of data, at any time, from anywhere on the web.

This guide describes how you send requests to create buckets, store and retrieve your objects, and manage permissions on your resources. The guide also describes access control and the authentication process. Access control defines who can access objects and buckets within Amazon S3, and the type of access (e.g., READ and WRITE). The authentication process verifies the identity of a user who is trying to access Amazon Web Services (AWS).

## Advantages to Amazon S3

Amazon S3 is intentionally built with a minimal feature set that focuses on simplicity and robustness. Following are some of advantages of the Amazon S3 service:

- **Create Buckets** – Create and name a bucket that stores data. Buckets are the fundamental container in Amazon S3 for data storage.
- **Store data in Buckets** – Store an infinite amount of data in a bucket. Upload as many objects as you like into an Amazon S3 bucket. Each object can contain up to 5 TB of data. Each object is stored and retrieved using a unique developer-assigned key.

- **Download data** – Download your data or enable others to do so. Download your data any time you like or allow others to do the same.
- **Permissions** – Grant or deny access to others who want to upload or download data into your Amazon S3 bucket. Grant upload and download permissions to three types of users. Authentication mechanisms can help keep data secure from unauthorized access.
- **Standard interfaces** – Use standards-based REST and SOAP interfaces designed to work with any Internet-development toolkit.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

## Amazon S3 Concepts

Topics

- [Buckets \(p. 3\)](#)
- [Objects \(p. 3\)](#)
- [Keys \(p. 4\)](#)
- [Regions \(p. 4\)](#)
- [Amazon S3 Data Consistency Model \(p. 4\)](#)

This section describes key concepts and terminology you need to understand to use Amazon S3 effectively. They are presented in the order you will most likely encounter them.

## Buckets

A bucket is a container for objects stored in Amazon S3. Every object is contained in a bucket. For example, if the object named `photos/puppy.jpg` is stored in the `johnsmith` bucket, then it is addressable using the URL `http://johnsmith.s3.amazonaws.com/photos/puppy.jpg`.

Buckets serve several purposes: they organize the Amazon S3 namespace at the highest level, they identify the account responsible for storage and data transfer charges, they play a role in access control, and they serve as the unit of aggregation for usage reporting.

You can configure buckets so that they are created in a specific region. For more information, see [Buckets and Regions \(p. 60\)](#). You can also configure a bucket so that every time an object is added to it, Amazon S3 generates a unique version ID and assigns it to the object. For more information, see [Versioning \(p. 448\)](#).

For more information about buckets, see [Working with Amazon S3 Buckets \(p. 58\)](#).

## Objects

Objects are the fundamental entities stored in Amazon S3. Objects consist of object data and metadata. The data portion is opaque to Amazon S3. The metadata is a set of name-value pairs that describe the object. These include some default metadata, such as the date last modified, and standard HTTP metadata, such as `Content-Type`. You can also specify custom metadata at the time the object is stored.

An object is uniquely identified within a bucket by a key (name) and a version ID. For more information, see [Keys \(p. 4\)](#) and [Versioning \(p. 448\)](#).

## Keys

A key is the unique identifier for an object within a bucket. Every object in a bucket has exactly one key. Because the combination of a bucket, key, and version ID uniquely identify each object, Amazon S3 can be thought of as a basic data map between "bucket + key + version" and the object itself. Every object in Amazon S3 can be uniquely addressed through the combination of the web service endpoint, bucket name, key, and optionally, a version. For example, in the URL <http://doc.s3.amazonaws.com/2006-03-01/AmazonS3.wsdl>, "doc" is the name of the bucket and "2006-03-01/AmazonS3.wsdl" is the key.

## Regions

You can choose the geographical region where Amazon S3 will store the buckets you create. You might choose a region to optimize latency, minimize costs, or address regulatory requirements. Amazon S3 currently supports the following regions:

- **US East (N. Virginia) Region** Uses Amazon S3 servers in Northern Virginia
- **US East (Ohio) Region** Uses Amazon S3 servers in Columbus Ohio
- **US West (N. California) Region** Uses Amazon S3 servers in Northern California
- **US West (Oregon) Region** Uses Amazon S3 servers in Oregon
- **Canada (Central) Region** Uses Amazon S3 servers in Montreal
- **Asia Pacific (Mumbai) Region** Uses Amazon S3 servers in Mumbai
- **Asia Pacific (Seoul) Region** Uses Amazon S3 servers in Seoul
- **Asia Pacific (Singapore) Region** Uses Amazon S3 servers in Singapore
- **Asia Pacific (Sydney) Region** Uses Amazon S3 servers in Sydney
- **Asia Pacific (Tokyo) Region** Uses Amazon S3 servers in Tokyo
- **EU (Frankfurt) Region** Uses Amazon S3 servers in Frankfurt
- **EU (Ireland) Region** Uses Amazon S3 servers in Ireland
- **EU (London) Region** Uses Amazon S3 servers in London
- **South America (São Paulo) Region** Uses Amazon S3 servers in São Paulo

Objects stored in a region never leave the region unless you explicitly transfer them to another region. For example, objects stored in the EU (Ireland) region never leave it. For more information about Amazon S3 regions and endpoints, go to [Regions and Endpoints](#) in the *AWS General Reference*.

## Amazon S3 Data Consistency Model

Amazon S3 provides read-after-write consistency for PUTS of new objects in your S3 bucket in all regions with one caveat. The caveat is that if you make a HEAD or GET request to the key name (to find if the object exists) before creating the object, Amazon S3 provides eventual consistency for read-after-write.

Amazon S3 offers eventual consistency for overwrite PUTS and Deletes in all regions.

Updates to a single key are atomic. For example, if you PUT to an existing key, a subsequent read might return the old data or the updated data, but it will never write corrupted or partial data.

Amazon S3 achieves high availability by replicating data across multiple servers within Amazon's data centers. If a PUT request is successful, your data is safely stored. However, information about the changes must replicate across Amazon S3, which can take some time, and so you might observe the following behaviors:

- A process writes a new object to Amazon S3 and immediately lists keys within its bucket. Until the change is fully propagated, the object might not appear in the list.

- A process replaces an existing object and immediately attempts to read it. Until the change is fully propagated, Amazon S3 might return the prior data.
- A process deletes an existing object and immediately attempts to read it. Until the deletion is fully propagated, Amazon S3 might return the deleted data.
- A process deletes an existing object and immediately lists keys within its bucket. Until the deletion is fully propagated, Amazon S3 might list the deleted object.

#### Note

Amazon S3 does not currently support object locking. If two PUT requests are simultaneously made to the same key, the request with the latest time stamp wins. If this is an issue, you will need to build an object-locking mechanism into your application.

Updates are key-based; there is no way to make atomic updates across keys. For example, you cannot make the update of one key dependent on the update of another key unless you design this functionality into your application.

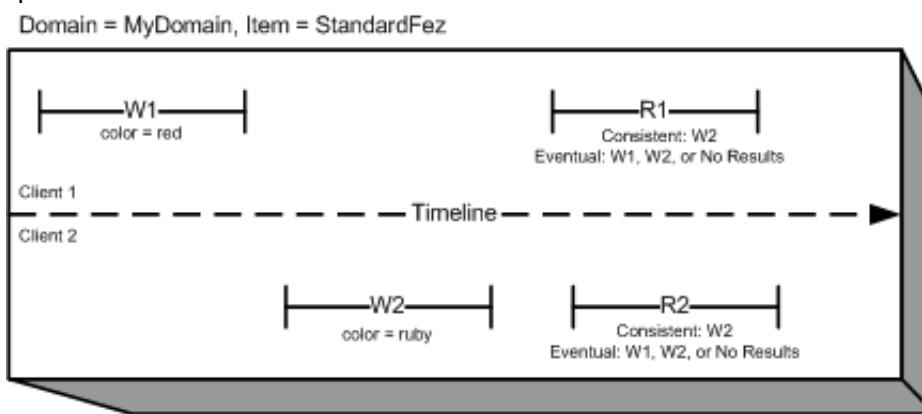
The following table describes the characteristics of eventually consistent read and consistent read.

Eventually Consistent Read	Consistent Read
Stale reads possible	No stale reads
Lowest read latency	Potential higher read latency
Highest read throughput	Potential lower read throughput

## Concurrent Applications

This section provides examples of eventually consistent and consistent read requests when multiple clients are writing to the same items.

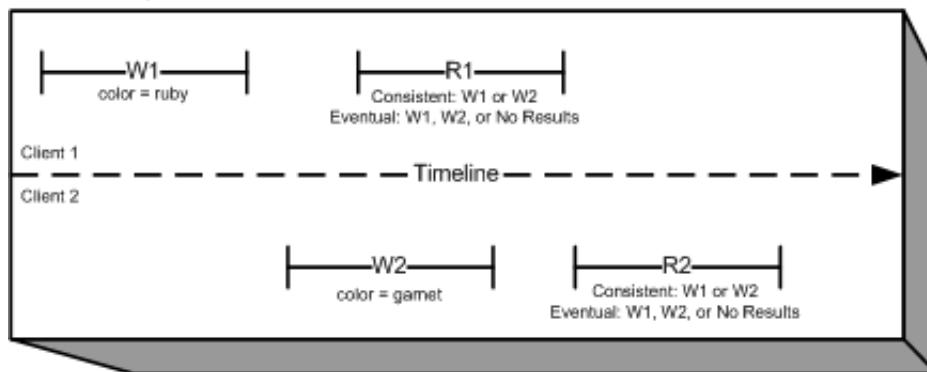
In this example, both W1 (write 1) and W2 (write 2) complete before the start of R1 (read 1) and R2 (read 2). For a consistent read, R1 and R2 both return `color = ruby`. For an eventually consistent read, R1 and R2 might return `color = red`, `color = ruby`, or no results, depending on the amount of time that has elapsed.



In the next example, W2 does not complete before the start of R1. Therefore, R1 might return `color = ruby` or `color = garnet` for either a consistent read or an eventually consistent read. Also, depending on the amount of time that has elapsed, an eventually consistent read might return no results.

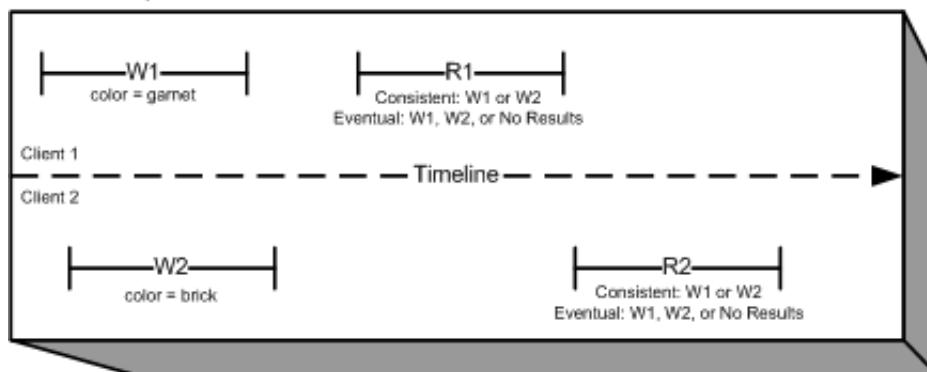
For a consistent read, R2 returns `color = garnet`. For an eventually consistent read, R2 might return `color = ruby`, `color = garnet`, or no results depending on the amount of time that has elapsed.

Domain = MyDomain, Item = StandardFez



In the last example, Client 2 performs W2 before Amazon S3 returns a success for W1, so the outcome of the final value is unknown (color = garnet or color = brick). Any subsequent reads (consistent read or eventually consistent) might return either value. Also, depending on the amount of time that has elapsed, an eventually consistent read might return no results.

Domain = MyDomain, Item = StandardFez



## Features

### Topics

- [Reduced Redundancy Storage \(p. 6\)](#)
- [Bucket Policies \(p. 7\)](#)
- [AWS Identity and Access Management \(p. 8\)](#)
- [Access Control Lists \(p. 8\)](#)
- [Versioning \(p. 8\)](#)
- [Operations \(p. 8\)](#)

This section describes important Amazon S3 features.

## Reduced Redundancy Storage

Customers can store their data using the Amazon S3 Reduced Redundancy Storage (RRS) option. RRS enables customers to reduce their costs by storing non-critical, reproducible data at lower levels of redundancy than Amazon S3 standard storage. RRS provides a cost-effective, highly available solution for distributing or sharing content that is durably stored elsewhere, or for storing thumbnails,

transcoded media, or other processed data that can be easily reproduced. The RRS option stores objects on multiple devices across multiple facilities, providing 400 times the durability of a typical disk drive, but does not replicate objects as many times as standard Amazon S3 storage, and thus is even more cost effective.

RRS provides 99.99% durability of objects over a given year. This durability level corresponds to an average expected loss of 0.01% of objects annually.

AWS charges less for using RRS than for standard Amazon S3 storage. For pricing information, see [Amazon S3 Pricing](#).

For more information, see [Storage Classes \(p. 111\)](#).

## Bucket Policies

Bucket policies provide centralized access control to buckets and objects based on a variety of conditions, including Amazon S3 operations, requesters, resources, and aspects of the request (e.g., IP address). The policies are expressed in our *access policy language* and enable centralized management of permissions. The permissions attached to a bucket apply to all of the objects in that bucket.

Individuals as well as companies can use bucket policies. When companies register with Amazon S3 they create an *account*. Thereafter, the company becomes synonymous with the account. Accounts are financially responsible for the Amazon resources they (and their employees) create. Accounts have the power to grant bucket policy permissions and assign employees permissions based on a variety of conditions. For example, an account could create a policy that gives a user write access:

- To a particular S3 bucket
- From an account's corporate network
- During business hours

An account can grant one user limited read and write access, but allow another to create and delete buckets as well. An account could allow several field offices to store their daily reports in a single bucket, allowing each office to write only to a certain set of names (e.g., "Nevada/\*" or "Utah/\*") and only from the office's IP address range.

Unlike access control lists (described below), which can add (grant) permissions only on individual objects, policies can either add or deny permissions across all (or a subset) of objects within a bucket. With one request an account can set the permissions of any number of objects in a bucket. An account can use wildcards (similar to regular expression operators) on Amazon resource names (ARNs) and other values, so that an account can control access to groups of objects that begin with a common prefix or end with a given extension such as *.html*.

Only the bucket owner is allowed to associate a policy with a bucket. Policies, written in the access policy language, *allow* or *deny* requests based on:

- Amazon S3 bucket operations (such as `PUT ?acl`), and object operations (such as `PUT Object`, or `GET Object`)
- Requester
- Conditions specified in the policy

An account can control access based on specific Amazon S3 operations, such as `GetObject`, `GetObjectVersion`, `DeleteObject`, or `DeleteBucket`.

The conditions can be such things as IP addresses, IP address ranges in CIDR notation, dates, user agents, HTTP referrer and transports (HTTP and HTTPS).

For more information, see [Using Bucket Policies and User Policies \(p. 335\)](#).

## AWS Identity and Access Management

For example, you can use IAM with Amazon S3 to control the type of access a user or group of users has to specific parts of an Amazon S3 bucket your AWS account owns.

For more information about IAM, see the following:

- [AWS Identity and Access Management \(IAM\)](#)
- [Getting Started](#)
- [IAM User Guide](#)

## Access Control Lists

For more information, see [Managing Access with ACLs \(p. 394\)](#)

## Versioning

For more information, see [Object Versioning \(p. 114\)](#).

## Operations

Following are the most common operations you'll execute through the API.

### Common Operations

- **Create a Bucket** – Create and name your own bucket in which to store your objects.
- **Write an Object** – Store data by creating or overwriting an object. When you write an object, you specify a unique key in the namespace of your bucket. This is also a good time to specify any access control you want on the object.
- **Read an Object** – Read data back. You can download the data via HTTP or BitTorrent.
- **Deleting an Object** – Delete some of your data.
- **Listing Keys** – List the keys contained in one of your buckets. You can filter the key list based on a prefix.

Details on this and all other functionality are described in detail later in this guide.

# Amazon S3 Application Programming Interfaces (API)

The Amazon S3 architecture is designed to be programming language-neutral, using our supported interfaces to store and retrieve objects.

Amazon S3 provides a REST and a SOAP interface. They are similar, but there are some differences. For example, in the REST interface, metadata is returned in HTTP headers. Because we only support HTTP requests of up to 4 KB (not including the body), the amount of metadata you can supply is restricted.

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

## The REST Interface

The REST API is an HTTP interface to Amazon S3. Using REST, you use standard HTTP requests to create, fetch, and delete buckets and objects.

You can use any toolkit that supports HTTP to use the REST API. You can even use a browser to fetch objects, as long as they are anonymously readable.

The REST API uses the standard HTTP headers and status codes, so that standard browsers and toolkits work as expected. In some areas, we have added functionality to HTTP (for example, we added headers to support access control). In these cases, we have done our best to add the new functionality in a way that matched the style of standard HTTP usage.

## The SOAP Interface

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

The SOAP API provides a SOAP 1.1 interface using document literal encoding. The most common way to use SOAP is to download the WSDL (go to <http://doc.s3.amazonaws.com/2006-03-01/AmazonS3.wsdl>), use a SOAP toolkit such as Apache Axis or Microsoft .NET to create bindings, and then write code that uses the bindings to call Amazon S3.

## Paying for Amazon S3

Pricing for Amazon S3 is designed so that you don't have to plan for the storage requirements of your application. Most storage providers force you to purchase a predetermined amount of storage and network transfer capacity: If you exceed that capacity, your service is shut off or you are charged high overage fees. If you do not exceed that capacity, you pay as though you used it all.

Amazon S3 charges you only for what you actually use, with no hidden fees and no overage charges. This gives developers a variable-cost service that can grow with their business while enjoying the cost advantages of Amazon's infrastructure.

Before storing anything in Amazon S3, you need to register with the service and provide a payment instrument that will be charged at the end of each month. There are no set-up fees to begin using the service. At the end of the month, your payment instrument is automatically charged for that month's usage.

For information about paying for Amazon S3 storage, see [Amazon S3 Pricing](#).

## Related Services

Once you load your data into Amazon S3, you can use it with other services that we provide. The following services are the ones you might use most frequently:

- **Amazon Elastic Compute Cloud** – This web service provides virtual compute resources in the cloud. For more information, go to the [Amazon EC2 product details page](#).
- **Amazon EMR** – This web service enables businesses, researchers, data analysts, and developers to easily and cost-effectively process vast amounts of data. It utilizes a hosted Hadoop framework running on the web-scale infrastructure of Amazon EC2 and Amazon S3. For more information, go to the [Amazon EMR product details page](#).

- **AWS Import/Export** – AWS Import/Export enables you to mail a storage device, such as a RAID drive, to Amazon so that we can upload your (terabytes) of data into Amazon S3. For more information, go to the [AWS Import/Export Developer Guide](#).

# Making Requests

## Topics

- [About Access Keys \(p. 11\)](#)
- [Request Endpoints \(p. 13\)](#)
- [Making Requests to Amazon S3 over IPv6 \(p. 13\)](#)
- [Making Requests Using the AWS SDKs \(p. 19\)](#)
- [Making Requests Using the REST API \(p. 50\)](#)

Amazon S3 is a REST service. You can send requests to Amazon S3 using the REST API or the AWS SDK (see [Sample Code and Libraries](#)) wrapper libraries that wrap the underlying Amazon S3 REST API, simplifying your programming tasks.

Every interaction with Amazon S3 is either authenticated or anonymous. Authentication is a process of verifying the identity of the requester trying to access an Amazon Web Services (AWS) product. Authenticated requests must include a signature value that authenticates the request sender. The signature value is, in part, generated from the requester's AWS access keys (access key ID and secret access key). For more information about getting access keys, see [How Do I Get Security Credentials?](#) in the [AWS General Reference](#).

If you are using the AWS SDK, the libraries compute the signature from the keys you provide. However, if you make direct REST API calls in your application, you must write the code to compute the signature and add it to the request.

## About Access Keys

The following sections review the types of access keys that you can use to make authenticated requests.

### AWS Account Access Keys

The account access keys provide full access to the AWS resources owned by the account. The following are examples of access keys:

- Access key ID (a 20-character, alphanumeric string). For example: AKIAIOSFODNN7EXAMPLE
- Secret access key (a 40-character string). For example: wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY

The access key ID uniquely identifies an AWS account. You can use these access keys to send authenticated requests to Amazon S3.

## IAM User Access Keys

You can create one AWS account for your company; however, there may be several employees in the organization who need access to your organization's AWS resources. Sharing your AWS account access keys reduces security, and creating individual AWS accounts for each employee might not be practical. Also, you cannot easily share resources such as buckets and objects because they are owned by different accounts. To share resources, you must grant permissions, which is additional work.

In such scenarios, you can use AWS Identity and Access Management (IAM) to create users under your AWS account with their own access keys and attach IAM user policies granting appropriate resource access permissions to them. To better manage these users, IAM enables you to create groups of users and grant group-level permissions that apply to all users in that group.

These users are referred as IAM users that you create and manage within AWS. The parent account controls a user's ability to access AWS. Any resources an IAM user creates are under the control of and paid for by the parent AWS account. These IAM users can send authenticated requests to Amazon S3 using their own security credentials. For more information about creating and managing users under your AWS account, go to the [AWS Identity and Access Management product details page](#).

## Temporary Security Credentials

In addition to creating IAM users with their own access keys, IAM also enables you to grant temporary security credentials (temporary access keys and a security token) to any IAM user to enable them to access your AWS services and resources. You can also manage users in your system outside AWS. These are referred as federated users. Additionally, users can be applications that you create to access your AWS resources.

IAM provides the AWS Security Token Service API for you to request temporary security credentials. You can use either the AWS STS API or the AWS SDK to request these credentials. The API returns temporary security credentials (access key ID and secret access key), and a security token. These credentials are valid only for the duration you specify when you request them. You use the access key ID and secret key the same way you use them when sending requests using your AWS account or IAM user access keys. In addition, you must include the token in each request you send to Amazon S3.

An IAM user can request these temporary security credentials for their own use or hand them out to federated users or applications. When requesting temporary security credentials for federated users, you must provide a user name and an IAM policy defining the permissions you want to associate with these temporary security credentials. The federated user cannot get more permissions than the parent IAM user who requested the temporary credentials.

You can use these temporary security credentials in making requests to Amazon S3. The API libraries compute the necessary signature value using those credentials to authenticate your request. If you send requests using expired credentials, Amazon S3 denies the request.

For information on signing requests using temporary security credentials in your REST API requests, see [Signing and Authenticating REST Requests \(p. 625\)](#). For information about sending requests using AWS SDKs, see [Making Requests Using the AWS SDKs \(p. 19\)](#).

For more information about IAM support for temporary security credentials, see [Temporary Security Credentials](#) in the *IAM User Guide*.

For added security, you can require multifactor authentication (MFA) when accessing your Amazon S3 resources by configuring a bucket policy. For information, see [Adding a Bucket Policy to Require MFA \(p. 367\)](#). After you require MFA to access your Amazon S3 resources, the only way you can access these resources is by providing temporary credentials that are created with an MFA key. For more

information, see the [AWS Multi-Factor Authentication](#) detail page and [Configuring MFA-Protected API Access](#) in the *IAM User Guide*.

## Request Endpoints

You send REST requests to the service's predefined endpoint. For a list of all AWS services and their corresponding endpoints, go to [Regions and Endpoints](#) in the *AWS General Reference*.

## Making Requests to Amazon S3 over IPv6

Amazon Simple Storage Service (Amazon S3) supports the ability to access S3 buckets using the Internet Protocol version 6 (IPv6), in addition to the IPv4 protocol. Amazon S3 dual-stack endpoints support requests to S3 buckets over IPv6 and IPv4. There are no additional charges for accessing Amazon S3 over IPv6. For more information about pricing, see [Amazon S3 Pricing](#).

### Topics

- [Getting Started Making Requests over IPv6 \(p. 13\)](#)
- [Using IPv6 Addresses in IAM Policies \(p. 14\)](#)
- [Testing IP Address Compatibility \(p. 15\)](#)
- [Using Amazon S3 Dual-Stack Endpoints \(p. 15\)](#)

## Getting Started Making Requests over IPv6

To make a request to an S3 bucket over IPv6, you need to use a dual-stack endpoint. The next section describes how to make requests over IPv6 by using dual-stack endpoints.

The following are some things you should know before trying to access a bucket over IPv6:

- The client and the network accessing the bucket must be enabled to use IPv6.
- Both virtual hosted-style and path style requests are supported for IPv6 access. For more information, see [Amazon S3 Dual-Stack Endpoints \(p. 15\)](#).
- If you use source IP address filtering in your AWS Identity and Access Management (IAM) user or bucket policies, you need to update the policies to include IPv6 address ranges. For more information, see [Using IPv6 Addresses in IAM Policies \(p. 14\)](#).
- When using IPv6, server access log files output IP addresses in an IPv6 format. You need to update existing tools, scripts, and software that you use to parse Amazon S3 log files so that they can parse the IPv6 formatted Remote IP addresses. For more information, see [Server Access Log Format \(p. 601\)](#) and [Server Access Logging \(p. 596\)](#).

### Note

If you experience issues related to the presence of IPv6 addresses in log files, contact [AWS Support](#).

## Making Requests over IPv6 by Using Dual-Stack Endpoints

You make requests with Amazon S3 API calls over IPv6 by using dual-stack endpoints. The Amazon S3 API operations work the same way whether you're accessing Amazon S3 over IPv6 or over IPv4. Performance should be the same too.

When using the REST API, you access a dual-stack endpoint directly. For more information, see [Dual-Stack Endpoints \(p. 15\)](#).

When using the AWS Command Line Interface (AWS CLI) and AWS SDKs, you can use a parameter or flag to change to a dual-stack endpoint. You can also specify the dual-stack endpoint directly as an override of the Amazon S3 endpoint in the config file.

You can use a dual-stack endpoint to access a bucket over IPv6 from any of the following:

- The AWS CLI, see [Using Dual-Stack Endpoints from the AWS CLI \(p. 16\)](#).
- The AWS SDKs, see [Using Dual-Stack Endpoints from the AWS SDKs \(p. 17\)](#).
- The REST API, see [Making Requests to Dual-Stack Endpoints by Using the REST API \(p. 51\)](#).

## Features Not Available over IPv6

The following features are not currently supported when accessing an S3 bucket over IPv6:

- Static website hosting from an S3 bucket
- BitTorrent

## Using IPv6 Addresses in IAM Policies

Before trying to access a bucket using IPv6, you must ensure that any IAM user or S3 bucket policies that are used for IP address filtering are updated to include IPv6 address ranges. IP address filtering policies that are not updated to handle IPv6 addresses may result in clients incorrectly losing or gaining access to the bucket when they start using IPv6. For more information about managing access permissions with IAM, see [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

IAM policies that filter IP addresses use [IP Address Condition Operators](#). The following bucket policy identifies the 54.240.143.\* range of allowed IPv4 addresses by using IP address condition operators. Any IP addresses outside of this range will be denied access to the bucket (`examplebucket`). Since all IPv6 addresses are outside of the allowed range, this policy prevents IPv6 addresses from being able to access `examplebucket`.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "IPAllow",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": "s3:*",  
            "Resource": "arn:aws:s3:::examplebucket/*",  
            "Condition": {  
                "IpAddress": {"aws:SourceIp": "54.240.143.0/24"}  
            }  
        }  
    ]  
}
```

You can modify the bucket policy's `Condition` element to allow both IPv4 (54.240.143.0/24) and IPv6 (2001:DB8:1234:5678::/64) address ranges as shown in the following example. You can use the same type of `Condition` block shown in the example to update both your IAM user and bucket policies.

```
"Condition": {  
    "IpAddress": {  
        "aws:SourceIp": [  
            "54.240.143.0/24",  
            "2001:DB8:1234:5678::/64"  
        ]  
    }  
}
```

```
}
```

Before using IPv6 you must update all relevant IAM user and bucket policies that use IP address filtering to allow IPv6 address ranges. We recommend that you update your IAM policies with your organization's IPv6 address ranges in addition to your existing IPv4 address ranges. For an example of a bucket policy that allows access over both IPv6 and IPv4, see [Restricting Access to Specific IP Addresses \(p. 365\)](#).

You can review your IAM user policies using the IAM console at <https://console.aws.amazon.com/iam/>. For more information about IAM, see the [IAM User Guide](#). For information about editing S3 bucket policies, see [How Do I Add an S3 Bucket Policy?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Testing IP Address Compatibility

If you are using Linux/Unix or Mac OS X, you can test whether you can access a dual-stack endpoint over IPv6 by using the `curl` command as shown in the following example:

### Example

```
curl -v http://s3.dualstack.us-west-2.amazonaws.com/
```

You get back information similar to the following example. If you are connected over IPv6 the connected IP address will be an IPv6 address.

```
* About to connect() to s3-us-west-2.amazonaws.com port 80 (#0)
*   Trying IPv6 address... connected
* Connected to s3.dualstack.us-west-2.amazonaws.com (IPv6 address) port 80 (#0)
> GET / HTTP/1.1
> User-Agent: curl/7.18.1 (x86_64-unknown-linux-gnu) libcurl/7.18.1 OpenSSL/1.0.1t
zlib/1.2.3
> Host: s3.dualstack.us-west-2.amazonaws.com
```

If you are using Microsoft Windows 7, you can test whether you can access a dual-stack endpoint over IPv6 or IPv4 by using the `ping` command as shown in the following example.

```
ping ipv6.s3.dualstack.us-west-2.amazonaws.com
```

## Using Amazon S3 Dual-Stack Endpoints

Amazon S3 dual-stack endpoints support requests to S3 buckets over IPv6 and IPv4. This section describes how to use dual-stack endpoints.

### Topics

- [Amazon S3 Dual-Stack Endpoints \(p. 15\)](#)
- [Using Dual-Stack Endpoints from the AWS CLI \(p. 16\)](#)
- [Using Dual-Stack Endpoints from the AWS SDKs \(p. 17\)](#)
- [Using Dual-Stack Endpoints from the REST API \(p. 18\)](#)

## Amazon S3 Dual-Stack Endpoints

When you make a request to a dual-stack endpoint, the bucket URL resolves to an IPv6 or an IPv4 address. For more information about accessing a bucket over IPv6, see [Making Requests to Amazon S3 over IPv6 \(p. 13\)](#).

When using the REST API, you directly access an Amazon S3 endpoint by using the endpoint name (URI). You can access an S3 bucket through a dual-stack endpoint by using a virtual hosted-style or a path-style endpoint name. Amazon S3 supports only regional dual-stack endpoint names, which means that you must specify the region as part of the name.

Use the following naming conventions for the dual-stack virtual hosted-style and path-style endpoint names:

- Virtual hosted-style dual-stack endpoint:

`bucketname.s3.dualstack.aws-region.amazonaws.com`

- Path-style dual-stack endpoint:

`s3.dualstack.aws-region.amazonaws.com/bucketname`

For more information about endpoint name style, see [Accessing a Bucket \(p. 60\)](#). For a list of Amazon S3 endpoints, see [Regions and Endpoints](#) in the [AWS General Reference](#).

**Important**

You can use transfer acceleration with dual-stack endpoints. For more information, see [Getting Started with Amazon S3 Transfer Acceleration \(p. 82\)](#).

When using the AWS Command Line Interface (AWS CLI) and AWS SDKs, you can use a parameter or flag to change to a dual-stack endpoint. You can also specify the dual-stack endpoint directly as an override of the Amazon S3 endpoint in the config file. The following sections describe how to use dual-stack endpoints from the AWS CLI and the AWS SDKs.

## Using Dual-Stack Endpoints from the AWS CLI

This section provides examples of AWS CLI commands used to make requests to a dual-stack endpoint. For instructions on setting up the AWS CLI, see [Set Up the AWS CLI \(p. 611\)](#).

You set the configuration value `use_dualstack_endpoint` to `true` in a profile in your AWS Config file to direct all Amazon S3 requests made by the `s3` and `s3api` AWS CLI commands to the dual-stack endpoint for the specified region. You specify the region in the config file or in a command using the `--region` option.

When using dual-stack endpoints with the AWS CLI, both path and virtual addressing styles are supported. The addressing style, set in the config file, controls if the bucket name is in the hostname or part of the URL. By default, the CLI will attempt to use virtual style where possible, but will fall back to path style if necessary. For more information, see [AWS CLI Amazon S3 Configuration](#).

You can also make configuration changes by using a command, as shown in the following example, which sets `use_dualstack_endpoint` to `true` and `addressing_style` to `virtual` in the default profile.

```
$ aws configure set default.s3.use_dualstack_endpoint true
$ aws configure set default.s3.addressing_style virtual
```

If you want to use a dual-stack endpoint for specified AWS CLI commands only (not all commands), you can use either of the following methods:

- You can use the dual-stack endpoint per command by setting the `--endpoint-url` parameter to `https://s3.dualstack.aws-region.amazonaws.com` or `http://s3.dualstack.aws-region.amazonaws.com` for any `s3` or `s3api` command.

```
$ aws s3api list-objects --bucket bucketname --endpoint-url https://s3.dualstack.aws-region.amazonaws.com
```

- You can set up separate profiles in your AWS Config file. For example, create one profile that sets `use_dualstack_endpoint` to `true` and a profile that does not set `use_dualstack_endpoint`. When you run a command, specify which profile you want to use, depending upon whether or not you want to use the dual-stack endpoint.

**Note**

When using the AWS CLI you currently cannot use transfer acceleration with dual-stack endpoints. However, support for the AWS CLI is coming soon. For more information, see [Using Transfer Acceleration from the AWS Command Line Interface \(AWS CLI\) \(p. 84\)](#).

## Using Dual-Stack Endpoints from the AWS SDKs

This section provides examples of how to access a dual-stack endpoint by using the AWS SDKs.

### AWS Java SDK Dual-Stack Endpoint Example

You use the `setS3ClientOptions` method in the AWS Java SDK to enable the use of a dual-stack endpoint when creating an instance of `AmazonS3Client`, as shown in the following example.

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
s3Client.setRegion(Region.getRegion(Regions.US_WEST_2));
s3Client.setS3ClientOptions(S3ClientOptions.builder().enableDualstack().build());
```

If you are using the AWS Java SDK on Microsoft Windows, you might have to set the following Java virtual machine (JVM) property.

```
java.net.preferIPv6Addresses=true
```

For information about how to create and test a working Java sample, see [Testing the Java Code Examples \(p. 613\)](#).

### AWS .NET SDK Dual-Stack Endpoint Example

When using the AWS SDK for .NET you use the `AmazonS3Config` class to enable the use of a dual-stack endpoint as shown in the following example.

```
var config = new AmazonS3Config
{
    UseDualstackEndpoint = true,
    RegionEndpoint = RegionEndpoint.USWest2
};

using (var s3Client = new AmazonS3Client(config))
{
    var request = new ListObjectsRequest
    {
        BucketName = "myBucket"
    };

    var response = s3Client.ListObjects(request);
}
```

For a full .NET sample for listing objects, see [Listing Keys Using the AWS SDK for .NET \(p. 245\)](#).

**Note**

You currently cannot use transfer acceleration with dual-stack endpoints. The .NET SDK will throw an exception if you configure both `UseAccelerateEndpoint` and `UseDualstackEndpoint` on the config object. For more information, see [Using Transfer Acceleration from the AWS SDK for .NET \(p. 88\)](#).

For information about how to create and test a working .NET sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

## Using Dual-Stack Endpoints from the REST API

For information about making requests to dual-stack endpoints by using the REST API, see [Making Requests to Dual-Stack Endpoints by Using the REST API \(p. 51\)](#).

# Making Requests Using the AWS SDKs

## Topics

- [Making Requests Using AWS Account or IAM User Credentials \(p. 19\)](#)
- [Making Requests Using IAM User Temporary Credentials \(p. 26\)](#)
- [Making Requests Using Federated User Temporary Credentials \(p. 37\)](#)

You can send authenticated requests to Amazon S3 using either the AWS SDK or by making the REST API calls directly in your application. The AWS SDK API uses the credentials that you provide to compute the signature for authentication. If you use the REST API directly in your applications, you must write the necessary code to compute the signature for authenticating your request. For a list of available AWS SDKs go to, [Sample Code and Libraries](#).

## Making Requests Using AWS Account or IAM User Credentials

You can use your AWS account or IAM user security credentials to send authenticated requests to Amazon S3. This section provides examples of how you can send authenticated requests using the AWS SDK for Java, AWS SDK for .NET, and AWS SDK for PHP. For a list of available AWS SDKs, go to [Sample Code and Libraries](#).

## Topics

- [Making Requests Using AWS Account or IAM User Credentials - AWS SDK for Java \(p. 20\)](#)
- [Making Requests Using AWS Account or IAM User Credentials - AWS SDK for .NET \(p. 21\)](#)
- [Making Requests Using AWS Account or IAM User Credentials - AWS SDK for PHP \(p. 22\)](#)
- [Making Requests Using AWS Account or IAM User Credentials - AWS SDK for Ruby \(p. 23\)](#)

Each of these AWS SDKs uses an SDK-specific credentials provider chain to find and use credentials and perform actions on behalf of the credentials owner. What all these credentials provider chains have in common is that they all look for your local AWS credentials file.

The easiest way to configure credentials for your AWS SDKs is to use an AWS credentials file. If you use the AWS Command Line Interface (AWS CLI), you may already have a local AWS credentials file configured. Otherwise, use the following procedure to set up a credentials file:

### To create a local AWS credentials file

1. Sign in to the AWS Management Console and open the IAM console at <https://console.aws.amazon.com/iam/>.
2. Create a new user with permissions limited to the services and actions that you want your code to have access to. For more information about creating a new IAM user, see [Creating IAM Users \(Console\)](#), and follow the instructions through step 8.
3. Choose **Download .csv** to save a local copy of your AWS credentials.
4. On your computer, navigate to your home directory, and create an `.aws` directory. On Unix-based systems, such as Linux or OS X, this is in the following location:

```
~/ .aws
```

On Windows, this is in the following location:

```
%HOMEPATH%\ .aws
```

5. In the .aws directory, create a new file named `credentials`.
6. Open the `credentials.csv` file that you downloaded from the IAM console, and copy its contents into the `credentials` file using the following format:

```
[default]
aws_access_key_id = your_access_key_id
aws_secret_access_key = your_secret_access_key
```

7. Save the `credentials` file, and delete the `.csv` file that you downloaded in step 3.

Your shared credentials file is now configured on your local computer, and it's ready to be used with the AWK SDKs.

## Making Requests Using AWS Account or IAM User Credentials - AWS SDK for Java

The following tasks guide you through using the Java classes to send authenticated requests using your AWS account credentials or IAM user credentials.

### Making Requests Using Your AWS account or IAM user credentials

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Execute one of the <code>AmazonS3Client</code> methods to send requests to Amazon S3. The client generates the necessary signature value from your credentials and includes it in the request it sends to Amazon S3.

The following Java code sample demonstrates the preceding tasks.

### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());

// Send sample request (list objects in a given bucket).
ObjectListing objectListing = s3client.listObjects(new
    ListObjectsRequest().withBucketName(bucketName));
```

### Note

You can create the `AmazonS3Client` class without providing your security credentials. Requests sent using this client are anonymous requests, without a signature. Amazon S3 returns an error if you send anonymous requests for a resource that is not publicly available.

To see how to make requests using your AWS credentials within the context of an example of listing all the object keys in your bucket, see [Listing Keys Using the AWS SDK for Java \(p. 244\)](#). For more examples, see [Working with Amazon S3 Objects \(p. 106\)](#) and [Working with Amazon S3 Buckets \(p. 58\)](#). You can test these examples using your AWS Account or IAM user credentials.

### Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Making Requests Using AWS Account or IAM User Credentials - AWS SDK for .NET

The following tasks guide you through using the .NET classes to send authenticated requests using your AWS account or IAM user credentials.

### Making Requests Using Your AWS Account or IAM User Credentials

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Execute one of the <code>AmazonS3Client</code> methods to send requests to Amazon S3. The client generates the necessary signature from your credentials and includes it in the request it sends to Amazon S3.

The following C# code sample demonstrates the preceding tasks.

For information on running the .NET examples in this guide and for instructions on how to store your credentials in a configuration file, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

### Example

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class MakeS3Request
    {
        static string bucketName      = "*** Provide bucket name ***";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                Console.WriteLine("Listing objects stored in a bucket");
                ListingObjects();
            }

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static void ListingObjects()
        {
            try
            {
                ListObjectsRequest request = new ListObjectsRequest
                {
                    BucketName = bucketName,
                    MaxKeys = 2
                };

                do
                {
                    ListObjectsResponse response = client.ListObjects(request);

                    // Process response.
                    foreach (S3Object entry in response.S3Objects)
                    {

```

```
        Console.WriteLine("key = {0} size = {1}",
                           entry.Key, entry.Size);
    }

    // If response is truncated, set the marker to get the next
    // set of keys.
    if (response.IsTruncated)
    {
        request.Marker = response.NextMarker;
    }
    else
    {
        request = null;
    }
} while (request != null);
}
catch (AmazonS3Exception amazonS3Exception)
{
    if (amazonS3Exception.ErrorCode != null &&
        (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
        ||
        amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
    {
        Console.WriteLine("Check the provided AWS Credentials.");
        Console.WriteLine(
            "To sign up for service, go to http://aws.amazon.com/s3");
    }
    else
    {
        Console.WriteLine(
            "Error occurred. Message:{0}' when listing objects",
            amazonS3Exception.Message);
    }
}
}
}
```

#### Note

You can create the `AmazonS3Client` client without providing your security credentials. Requests sent using this client are anonymous requests, without a signature. Amazon S3 returns an error if you send anonymous requests for a resource that is not publicly available.

For working examples, see [Working with Amazon S3 Objects \(p. 106\)](#) and [Working with Amazon S3 Buckets \(p. 58\)](#). You can test these examples using your AWS Account or an IAM user credentials.

For example, to list all the object keys in your bucket, see [Listing Keys Using the AWS SDK for .NET \(p. 245\)](#).

#### Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Making Requests Using AWS Account or IAM User Credentials - AWS SDK for PHP

This topic guides you through using a class from the AWS SDK for PHP to send authenticated requests using your AWS account or IAM user credentials.

#### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

## Making Requests Using Your AWS Account or IAM user Credentials

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	Execute one of the <a href="#">Aws\S3\S3Client</a> methods to send requests to Amazon S3. For example, you can use the <a href="#">Aws\S3\S3Client::listBuckets()</a> method to send a request to list all the buckets for your account. The client API generates the necessary signature using your credentials and includes it in the request it sends to Amazon S3.

The following PHP code sample demonstrates the preceding tasks and illustrates how the client makes a request using your security credentials to list all the buckets for your account.

### Example

```
use Aws\S3\S3Client;

// Instantiate the S3 client with your AWS credentials
$s3 = S3Client::factory();

$result = $s3->listBuckets();
```

For working examples, see [Working with Amazon S3 Objects \(p. 106\)](#) and [Working with Amazon S3 Buckets \(p. 58\)](#). You can test these examples using your AWS account or IAM user credentials.

For an example of listing object keys in a bucket, see [Listing Keys Using the AWS SDK for PHP \(p. 246\)](#).

### Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::listBuckets\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Making Requests Using AWS Account or IAM User Credentials - AWS SDK for Ruby

Before you can use version 3 of the AWS SDK for Ruby to make calls to Amazon S3, you must set the AWS access credentials that the SDK uses to verify your access to your buckets and objects. If you have shared credentials set up in the AWS credentials profile on your local system, version 3 of the SDK for Ruby can use those credentials without your having to declare them in your code. For more information about setting up your shared credentials, see [Making Requests Using AWS Account or IAM User Credentials \(p. 19\)](#).

The following Ruby code snippet uses the credentials in a shared AWS credentials file on a local computer to authenticate a request to get all the object key names in a specific bucket and do the following:

1. Create an instance of the `Aws::S3::Resource` class.
2. Make a request to Amazon S3 by enumerating objects in a bucket using the `bucket` method of `Aws::S3::Resource`. The client generates the necessary signature value from the credentials in the AWS credentials file on your computer and includes it in the request it sends to Amazon S3.
3. Print the array of object key names to the terminal.

## Example

```
# Use the Amazon S3 modularized gem for version 3 of the AWS Ruby SDK
require 'aws-sdk-s3'

# Get an Amazon S3 resource
s3 = Aws::S3::Resource.new(region: 'us-west-2')

# Create an array of the object keynames in the bucket, up to the first 100
bucket = s3.bucket('example_bucket').objects.collect(&:key)

# Print the array to the terminal
puts bucket
```

If you don't have a local AWS credentials file, you can still create the `Aws::S3::Resource` resource and execute code against Amazon S3 buckets and objects. Requests that are sent using version 3 of the SDK for Ruby are anonymous requests, with no signature by default. Amazon S3 returns an error if you send anonymous requests for a resource that's not publicly available.

You can use and expand the previous code snippet for SDK for Ruby applications, as in the following more robust example. The credentials that are used for this example come from a local AWS credentials file on the computer that is running this application. The credentials are for an IAM user who can list objects in the bucket that the user specifies when they run the application.

```
# Use the Amazon S3 modularized gem for version 3 of the AWS Ruby SDK
require 'aws-sdk-s3'

# Set the name of the bucket on which the operations are performed
# This argument is required
bucket_name = nil

# The operation to perform on the bucket
operation = 'list' # default
operation = ARGV[0] if (ARGV.length > 0)

if ARGV.length > 1
  bucket_name = ARGV[1]
else
  exit 1
end

# Get an Amazon S3 resource
s3 = Aws::S3::Resource.new(region: 'us-west-2')

# Get the bucket by name
bucket = s3.bucket(bucket_name)

case operation

when 'list'
  if bucket.exists?
    # Enumerate the bucket contents and object etags
    puts "Contents of '%s':\n" % bucket_name
    puts '  Name => GUID'

    bucket.objects.limit(50).each do |obj|
      puts "    #{obj.key} => #{obj.etag}"
    end
  else
    puts "'The bucket '%s' does not exist!' % bucket_name"
  end
else
  puts "Unknown operation: %s" % operation
end
```

```
    puts "Unknown operation: '%s'! Only list is supported." % operation
end
```

# Making Requests Using IAM User Temporary Credentials

## Topics

- [Making Requests Using IAM User Temporary Credentials - AWS SDK for Java \(p. 26\)](#)
- [Making Requests Using IAM User Temporary Credentials - AWS SDK for .NET \(p. 28\)](#)
- [Making Requests Using AWS Account or IAM User Temporary Credentials - AWS SDK for PHP \(p. 31\)](#)
- [Making Requests Using IAM User Temporary Credentials - AWS SDK for Ruby \(p. 33\)](#)

An AWS Account or an IAM user can request temporary security credentials and use them to send authenticated requests to Amazon S3. This section provides examples of how to use the AWS SDK for Java, .NET, and PHP to obtain temporary security credentials and use them to authenticate your requests to Amazon S3.

## Making Requests Using IAM User Temporary Credentials - AWS SDK for Java

An IAM user or an AWS Account can request temporary security credentials (see [Making Requests \(p. 11\)](#)) using AWS SDK for Java and use them to access Amazon S3. These credentials expire after the session duration. By default, the session duration is one hour. If you use IAM user credentials, you can specify duration, between 1 and 36 hours, when requesting the temporary security credentials.

### Making Requests Using IAM User Temporary Security Credentials

1	Create an instance of the AWS Security Token Service client <code>AWSecurityTokenServiceClient</code> .
2	Start a session by calling the <code>GetSessionToken</code> method of the STS client you created in the preceding step. You provide session information to this method using a <code>GetSessionTokenRequest</code> object.  The method returns your temporary security credentials.
3	Package the temporary security credentials in an instance of the <code>BasicSessionCredentials</code> object so you can provide the credentials to your Amazon S3 client.
4	Create an instance of the <code>AmazonS3Client</code> class by passing in the temporary security credentials.  You send the requests to Amazon S3 using this client. If you send requests using expired credentials, Amazon S3 returns an error.

The following Java code sample demonstrates the preceding tasks.

### Example

```
// In real applications, the following code is part of your trusted code. It has
// your security credentials you use to obtain temporary security credentials.
AWSecurityTokenServiceClient stsClient =
    new AWSecurityTokenServiceClient(new
ProfileCredentialsProvider());
```

```
//  
// Manually start a session.  
GetSessionTokenRequest getSessionTokenRequest = new GetSessionTokenRequest();  
// Following duration can be set only if temporary credentials are requested by an IAM  
// user.  
getSessionTokenRequest.setDurationSeconds(7200);  
  
GetSessionTokenResult sessionTokenResult =  
    stsClient.getSessionToken(getSessionTokenRequest);  
Credentials sessionCredentials = sessionTokenResult.getCredentials();  
  
// Package the temporary security credentials as  
// a BasicSessionCredentials object, for an Amazon S3 client object to use.  
BasicSessionCredentials basicSessionCredentials =  
    new BasicSessionCredentials(sessionCredentials.getAccessKeyId(),  
        sessionCredentials.getSecretAccessKey(),  
        sessionCredentials.getSessionToken());  
  
// The following will be part of your less trusted code. You provide temporary security  
// credentials so it can send authenticated requests to Amazon S3.  
// Create Amazon S3 client by passing in the basicSessionCredentials object.  
AmazonS3Client s3 = new AmazonS3Client(basicSessionCredentials);  
  
// Test. For example, get object keys in a bucket.  
ObjectListing objects = s3.listObjects(bucketName);
```

#### Note

If you obtain temporary security credentials using your AWS account credentials, the temporary security credentials are valid for only one hour. You can specify session duration only if you use IAM user credentials to request a session.

The following Java code example lists the object keys in the specified bucket. For illustration, the code example obtains temporary security credentials for a default one hour session and uses them to send an authenticated request to Amazon S3.

If you want to test the sample using IAM user credentials, you will need to create an IAM user under your AWS Account. For more information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

```
import java.io.IOException;  
import com.amazonaws.auth.BasicSessionCredentials;  
import com.amazonaws.auth.PropertiesCredentials;  
import com.amazonaws.services.s3.AmazonS3Client;  
import com.amazonaws.services.securitytoken.AWSSecurityTokenServiceClient;  
import com.amazonaws.services.securitytoken.model.Credentials;  
import com.amazonaws.services.securitytoken.model.GetSessionTokenRequest;  
import com.amazonaws.services.securitytoken.model.GetSessionTokenResult;  
import com.amazonaws.services.s3.model.ObjectListing;  
  
public class S3Sample {  
    private static String bucketName = "*** Provide bucket name ***";  
  
    public static void main(String[] args) throws IOException {  
        AWSSecurityTokenServiceClient stsClient =  
            new AWSSecurityTokenServiceClient(new  
        ProfileCredentialsProvider());  
        //  
        // Start a session.  
        GetSessionTokenRequest getSessionTokenRequest =  
            new GetSessionTokenRequest();  
  
        GetSessionTokenResult sessionTokenResult =  
            stsClient.getSessionToken(getSessionTokenRequest);  
        Credentials sessionCredentials = sessionTokenResult.getCredentials();
```

```
System.out.println("Session Credentials: "
    + sessionCredentials.toString());

// Package the session credentials as a BasicSessionCredentials
// object for an S3 client object to use.
BasicSessionCredentials basicSessionCredentials =
    new BasicSessionCredentials(sessionCredentials.getAccessKeyId(),
        sessionCredentials.getSecretAccessKey(),
        sessionCredentials.getSessionToken());
AmazonS3Client s3 = new AmazonS3Client(basicSessionCredentials);

// Test. For example, get object keys for a given bucket.
ObjectListing objects = s3.listObjects(bucketName);
System.out.println("No. of Objects = " +
    objects.getObjectSummaries().size());
}
}
```

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Making Requests Using IAM User Temporary Credentials - AWS SDK for .NET

An IAM user or an AWS Account can request temporary security credentials (see [Making Requests \(p. 11\)](#)) using the AWS SDK for .NET and use them to access Amazon S3. These credentials expire after the session duration. By default, the session duration is one hour. If you use IAM user credentials, you can specify duration, between 1 and 36 hours, when requesting the temporary security credentials.

### Making Requests Using IAM User Temporary Security Credentials

1	Create an instance of the AWS Security Token Service client, <code>AmazonSecurityTokenServiceClient</code> . For information about providing credentials, see <a href="#">Using the AWS SDKs, CLI, and Explorers (p. 609)</a> .
2	Start a session by calling the <code>GetSessionToken</code> method of the STS client you created in the preceding step. You provide session information to this method using a <code>GetSessionTokenRequest</code> object.  The method returns you temporary security credentials.
3	Package up the temporary security credentials in an instance of the <code>SessionAWSCredentials</code> object. You use this object to provide the temporary security credentials to your Amazon S3 client.
4	Create an instance of the <code>AmazonS3Client</code> class by passing in the temporary security credentials.  You send requests to Amazon S3 using this client. If you send requests using expired credentials, Amazon S3 returns an error.

The following C# code sample demonstrates the preceding tasks.

### Example

```
// In real applications, the following code is part of your trusted code. It has
```

```
// your security credentials you use to obtain temporary security credentials.
AmazonSecurityTokenServiceConfig config = new AmazonSecurityTokenServiceConfig();
AmazonSecurityTokenServiceClient stsClient =
    new AmazonSecurityTokenServiceClient(config);

GetSessionTokenRequest getSessionTokenRequest = new GetSessionTokenRequest();
// Following duration can be set only if temporary credentials are requested by an IAM
// user.
getSessionTokenRequest.DurationSeconds = 7200; // seconds.
Credentials credentials =
    stsClient.GetSessionToken(getSessionTokenRequest).GetSessionTokenResult.Credentials;

SessionAWSCredentials sessionCredentials =
    new SessionAWSCredentials(credentials.AccessKeyId,
                               credentials.SecretAccessKey,
                               credentials.SessionToken);

// The following will be part of your less trusted code. You provide temporary security
// credentials so it can send authenticated requests to Amazon S3.
// Create Amazon S3 client by passing in the basicSessionCredentials object.
AmazonS3Client s3Client = new AmazonS3Client(sessionCredentials);

// Test. For example, send request to list object key in a bucket.
var response = s3Client.ListObjects(bucketName);
```

**Note**

If you obtain temporary security credentials using your AWS account security credentials, the temporary security credentials are valid for only one hour. You can specify session duration only if you use IAM user credentials to request a session.

The following C# code example lists object keys in the specified bucket. For illustration, the code example obtains temporary security credentials for a default one hour session and uses them to send authenticated request to Amazon S3.

If you want to test the sample using IAM user credentials, you will need to create an IAM user under your AWS Account. For more information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

For instructions on how to create and test a working example, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Configuration;
using System.Collections.Specialized;
using Amazon.S3;
using Amazon.SecurityToken;
using Amazon.SecurityToken.Model;
using Amazon.Runtime;
using Amazon.S3.Model;
using System.Collections.Generic;

namespace s3.amazon.com.docsamples
{
    class TempCredExplicitSessionStart
    {
        static string bucketName = "*** Provide bucket name ***";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            NameValueCollection appConfig = ConfigurationManager.AppSettings;
            string accessKeyID = appConfig["AWSAccessKey"];
            string secretAccessKeyID = appConfig["AWSSecretKey"];
```

```
try
{
    Console.WriteLine("Listing objects stored in a bucket");
    SessionAWSCredentials tempCredentials =
        GetTemporaryCredentials(accessKeyId, secretAccessKeyId);

    // Create client by providing temporary security credentials.
    using (client = new AmazonS3Client(tempCredentials,
Amazon.RegionEndpoint.USEast1))
    {
        ListObjectsRequest listObjectRequest =
            new ListObjectsRequest();
        listObjectRequest.BucketName = bucketName;

        // Send request to Amazon S3.
        ListObjectsResponse response = client.ListObjects(listObjectRequest);
        List<S3Object> objects = response.S3Objects;
        Console.WriteLine("Object count = {0}", objects.Count);

        Console.WriteLine("Press any key to continue...");
        Console.ReadKey();
    }
}
catch (AmazonS3Exception s3Exception)
{
    Console.WriteLine(s3Exception.Message,
                      s3Exception.InnerException);
}
catch (AmazonSecurityTokenServiceException stsException)
{
    Console.WriteLine(stsException.Message,
                      stsException.InnerException);
}
}

private static SessionAWSCredentials GetTemporaryCredentials(
    string accessKeyId, string secretAccessKeyId)
{
    AmazonSecurityTokenServiceClient stsClient =
        new AmazonSecurityTokenServiceClient(accessKeyId,
                                             secretAccessKeyId);

    GetSessionTokenRequest getSessionTokenRequest =
        new GetSessionTokenRequest();
    getSessionTokenRequest.DurationSeconds = 7200; // seconds

    GetSessionTokenResponse sessionTokenResponse =
        stsClient.GetSessionToken(getSessionTokenRequest);
    Credentials credentials = sessionTokenResponse.Credentials;

    SessionAWSCredentials sessionCredentials =
        new SessionAWSCredentials(credentials.AccessKeyId,
                                 credentials.SecretAccessKey,
                                 credentials.SessionToken);

    return sessionCredentials;
}
}
```

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Making Requests Using AWS Account or IAM User Temporary Credentials - AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to request temporary security credentials and use them to access Amazon S3.

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

An IAM user or an AWS Account can request temporary security credentials (see [Making Requests \(p. 11\)](#)) using the AWS SDK for PHP and use them to access Amazon S3. These credentials expire when the session duration expires. By default, the session duration is one hour. If you use IAM user credentials, you can specify the duration, between 1 and 36 hours, when requesting the temporary security credentials. For more information about temporary security credentials, see [Temporary Security Credentials](#) in the [IAM User Guide](#).

### Making Requests Using AWS Account or IAM User Temporary Security Credentials

1	Create an instance of an AWS Security Token Service (AWS STS) client by using the <a href="#">Aws\Sts\StsClient</a> class <code>factory()</code> method.
2	Execute the <a href="#">Aws\Sts\StsClient::getSessionToken()</a> method to start a session.  The method returns you temporary security credentials.
3	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client</a> class <code>factory()</code> method with the temporary security credentials you obtained in the preceding step.  Any methods in the <code>S3Client</code> class that you call use the temporary security credentials to send authenticated requests to Amazon S3.

The following PHP code sample demonstrates how to request temporary security credentials and use them to access Amazon S3.

### Example

```
use Aws\Sts\StsClient;
use Aws\S3\S3Client;

// In real applications, the following code is part of your trusted code.
// It has your security credentials that you use to obtain temporary
// security credentials.
$sts = StsClient::factory();

$result = $sts->getSessionToken();

// The following will be part of your less trusted code. You provide temporary
// security credentials so it can send authenticated requests to Amazon S3.
// Create an Amazon S3 client using temporary security credentials.
$credentials = $result->get('Credentials');
$s3 = S3Client::factory(array(
    'key'    => $credentials['AccessKeyId'],
    'secret' => $credentials['SecretAccessKey'],
    'token'  => $credentials['SessionToken']
));
$result = $s3->listBuckets();
```

**Note**

If you obtain temporary security credentials using your AWS account security credentials, the temporary security credentials are valid for only one hour. You can specify the session duration only if you use IAM user credentials to request a session.

### Example of Making an Amazon S3 Request Using Temporary Security Credentials

The following PHP code example lists object keys in the specified bucket using temporary security credentials. The code example obtains temporary security credentials for a default one hour session and uses them to send authenticated request to Amazon S3. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

If you want to test the example using IAM user credentials, you will need to create an IAM user under your AWS Account. For information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*. For an example of setting session duration when using IAM user credentials to request a session, see [Making Requests Using Federated User Temporary Credentials - AWS SDK for PHP \(p. 44\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\Sts\StsClient;
use Aws\S3\S3Client;
use Aws\S3\Exception\S3Exception;

$bucket = '*** Your Bucket Name ***';

$sts = StsClient::factory();

$credentials = $sts->getSessionToken()->get('Credentials');
$s3 = S3Client::factory(array(
    'key'      => $credentials['AccessKeyId'],
    'secret'   => $credentials['SecretAccessKey'],
    'token'    => $credentials['SessionToken']
));

try {
    $objects = $s3->getIterator('ListObjects', array(
        'Bucket' => $bucket
    ));

    echo "Keys retrieved!\n";
    foreach ($objects as $object) {
        echo $object['Key'] . "\n";
    }
} catch (S3Exception $e) {
    echo $e->getMessage() . "\n";
}
```

### Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\Sts\StsClient Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\Sts\StsClient::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\Sts\StsClient::getSessionToken\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)

- [AWS SDK for PHP Documentation](#)

## Making Requests Using IAM User Temporary Credentials - AWS SDK for Ruby

An IAM user or an AWS account can request temporary security credentials (see [Making Requests \(p. 11\)](#)) using AWS SDK for Ruby and use them to access Amazon S3. These credentials expire after the session duration. By default, the session duration is one hour. If you use IAM user credentials, you can specify the duration, between 1 and 36 hours, when requesting the temporary security credentials.

### Making Requests Using IAM User Temporary Security Credentials

1	Create a new AWS Security Token Service (AWS STS) client and get temporary credentials with <code>Aws::STS::Client.new</code> .
2	Create a new IAM user policy for the new user, granting temporary permissions to list the contents in a bucket.
3	Create an Amazon S3 client with the temporary credentials, and use the temporary credentials to list the contents of a specified bucket. If you send requests using expired credentials, Amazon S3 returns an error.

The following Ruby code example demonstrates the preceding tasks.

#### Example

```
require 'aws-sdk-s3'

# Create new STS client and get temporary credentials
sts = Aws::STS::Client.new(region: region)

temp_creds = sts.get_federation_token({
    duration_seconds: 3600,
    name: user_name,
    policy: "{\"Version\":\"2012-10-17\", \"Statement\":[{\"Sid\":\"Stmt1\", \"Effect\":\"Allow\", \"Action\":\"s3>ListBucket\", \"Resource\":\"arn:aws:s3::#{bucket_name}\"]}]",
})

credentials = temp_creds.credentials

begin
    access_key_id      = credentials.access_key_id      # String
    expiration        = credentials.expiration        # Time
    secret_access_key = credentials.secret_access_key # String
    session_token     = credentials.session_token     # String
end

# Create S3 client with temporary credentials
s3 = Aws::S3::Client.new(region: region, credentials: credentials)

# Get an Amazon S3 resource
s3 = Aws::S3::Resource.new(region: region)

# Create an array of the object keynames in the bucket, up to the first 100
bucket = s3.bucket('example_bucket').objects.collect(&:key)

# Print the array to the terminal
puts bucket
```

**Note**

If you obtain temporary security credentials using your AWS account security credentials, the temporary security credentials are valid for only one hour. You can specify session duration only if you use IAM user credentials to request a session.

The following Ruby code example creates a federated policy for a temporary user to list the items in a specified bucket for one hour. To use this code example, your AWS credentials must have the necessary permission to create new AWS STS clients, and list Amazon S3 buckets.

```
require 'aws-sdk-s3'

USAGE = <<<DOC
Usage: sts_create_bucket_policy.rb -b BUCKET -u USER [-r REGION] [-d] [-h]

Creates a federated policy for USER to list items in BUCKET for one hour

BUCKET is required and must not already exist

USER is required and if not found, is created

If REGION is not supplied, defaults to us-west-2.

-d gives you extra (debugging) information.

-h displays this message and quits

DOC

$debug = false

def print_debug(s)
  if $debug
    puts s
  end
end

def get_user(region, user_name, create)
  user = nil

  iam = Aws::IAM::Resource.new(region: region)

  if create
    print_debug("Trying to create new user #{user_name} in region #{region}")
  else
    print_debug("Getting user #{user_name} in region #{region}")
  end

  # First see if user exists
  user = iam.user(user_name)

  if user == nil && create
    user = iam.create_user(user_name: user_name)
    iam.wait_until(:user_exists, user_name: user_name)

    print_debug("Created new user #{user_name}")
  else
    print_debug("Found user #{user_name}")
  end

  user
end
```

```
# main
region = 'us-west-2'
user_name = ''
bucket_name = ''

i = 0

while i < ARGV.length
  case ARGV[i]

    when '-b'
      i += 1
      bucket_name = ARGV[i]

    when '-u'
      i += 1
      user_name = ARGV[i]

    when '-r'
      i += 1

      region = ARGV[i]

    when '-d'
      puts 'Debugging enabled'
      $debug = true

    when '-h'
      puts USAGE
      exit 0

    else
      puts 'Unrecognized option: ' + ARGV[i]
      puts USAGE
      exit 1
  end

  i += 1
end

if bucket_name == ''
  puts 'You must supply a bucket name'
  puts USAGE
  exit 1
end

if user_name == ''
  puts 'You must supply a user name'
  puts USAGE
  exit 1
end

# IAM user we allow to list S3 bucket items for an hour
user = get_user(region, user_name, true)

# Create new STS client and get temporary credentials
sts = Aws::STS::Client.new(region: region)

temp_creds = sts.get_federation_token({
  duration_seconds: 3600,
  name: user_name,
  policy: "{\"Version\":\"2012-10-17\",\"Statement\":[{\"Sid\":\"Stmt1\",\"Effect\":\"Allow\",\"Action\":\"s3>ListBucket\",\"Resource\":\"arn:aws:s3:::#{{bucket_name}}\"}]}"
})
```

```
credentials = temp_creds.credentials

=begin
access_key_id      = credentials.access_key_id      # String
expiration        = credentials.expiration        # Time
secret_access_key = credentials.secret_access_key # String
session_token     = credentials.session_token     # String
=end

# Create S3 client with temporary credentials
s3 = Aws::S3::Client.new(region: region, credentials: credentials)

# List the items for the specified S3 bucket
s3 = Aws::S3::Resource.new(region: region)
begin
  bucket = s3.bucket(bucket_name)

  count = bucket.objects.count

  puts "Items (#{count}):"
  puts

  # List the object key
  bucket.objects.each do |obj|
    puts "  Name: #{obj.key}"
  end
rescue Aws::S3::Errors::PermanentRedirect
  puts
  puts 'The bucket is not in the ' + region + ' region'
  exit 1
end
```

# Making Requests Using Federated User Temporary Credentials

## Topics

- [Making Requests Using Federated User Temporary Credentials - AWS SDK for Java \(p. 37\)](#)
- [Making Requests Using Federated User Temporary Credentials - AWS SDK for .NET \(p. 40\)](#)
- [Making Requests Using Federated User Temporary Credentials - AWS SDK for PHP \(p. 44\)](#)
- [Making Requests Using Federated User Temporary Credentials - AWS SDK for Ruby \(p. 48\)](#)

You can request temporary security credentials and provide them to your federated users or applications who need to access your AWS resources. This section provides examples of how you can use the AWS SDK to obtain temporary security credentials for your federated users or applications and send authenticated requests to Amazon S3 using those credentials. For a list of available AWS SDKs go to, [Sample Code and Libraries](#).

### Note

Both the AWS account and an IAM user can request temporary security credentials for federated users. However, for added security, only an IAM user with the necessary permissions should request these temporary credentials to ensure that the federated user gets at most the permissions of the requesting IAM user. In some applications, you might find suitable to create an IAM user with specific permissions for the sole purpose of granting temporary security credentials to your federated users and applications.

## Making Requests Using Federated User Temporary Credentials - AWS SDK for Java

You can provide temporary security credentials for your federated users and applications (see [Making Requests \(p. 11\)](#)) so they can send authenticated requests to access your AWS resources. When requesting these temporary credentials from the IAM service, you must provide a user name and an IAM policy describing the resource permissions you want to grant. By default, the session duration is one hour. However, if you are requesting temporary credentials using IAM user credentials, you can explicitly set a different duration value when requesting the temporary security credentials for federated users and applications.

### Note

To request temporary security credentials for federated users and applications, for added security, you might want to use a dedicated IAM user with only the necessary access permissions. The temporary user you create can never get more permissions than the IAM user who requested the temporary security credentials. For more information, go to [AWS Identity and Access Management FAQs](#).

### Making Requests Using Federated User Temporary Security Credentials

1	Create an instance of the AWS Security Token Service client <code>AWSecurityTokenServiceClient</code> .
2	<p>Start a session by calling the <code>getFederationToken</code> method of the STS client you created in the preceding step.</p> <p>You will need to provide session information including the user name and an IAM policy that you want to attach to the temporary credentials.</p> <p>This method returns your temporary security credentials.</p>

3	Package the temporary security credentials in an instance of the <code>BasicSessionCredentials</code> object. You use this object to provide the temporary security credentials to your Amazon S3 client.
4	Create an instance of the <code>AmazonS3Client</code> class by passing the temporary security credentials.  You send requests to Amazon S3 using this client. If you send requests using expired credentials, Amazon S3 returns an error.

The following Java code sample demonstrates the preceding tasks.

### Example

```
// In real applications, the following code is part of your trusted code. It has
// your security credentials you use to obtain temporary security credentials.
AWSecurityTokenServiceClient stsClient =
    new AWSecurityTokenServiceClient(new
ProfileCredentialsProvider());

GetFederationTokenRequest getFederationTokenRequest =
    new GetFederationTokenRequest();
getFederationTokenRequest.setDurationSeconds(7200);
getFederationTokenRequest.setName("User1");

// Define the policy and add to the request.
Policy policy = new Policy();
// Define the policy here.
// Add the policy to the request.
getFederationTokenRequest.setPolicy(policy.toJson());

GetFederationTokenResult federationTokenResult =
    stsClient.getFederationToken(getFederationTokenRequest);
Credentials sessionCredentials = federationTokenResult.getCredentials();

// Package the session credentials as a BasicSessionCredentials object
// for an S3 client object to use.
BasicSessionCredentials basicSessionCredentials = new BasicSessionCredentials(
    sessionCredentials.getAccessKeyId(),
    sessionCredentials.getSecretAccessKey(),
    sessionCredentials.getSessionToken());

// The following will be part of your less trusted code. You provide temporary security
// credentials so it can send authenticated requests to Amazon S3.
// Create an Amazon S3 client by passing in the basicSessionCredentials object.
AmazonS3Client s3 = new AmazonS3Client(basicSessionCredentials);

// Test. For example, send list object keys in a bucket.
ObjectListing objects = s3.listObjects(bucketName);
```

To set a condition in the policy, create a `Condition` object and associate it with the policy. The following code sample shows a condition that allows users from a specified IP range to list objects.

```
Policy policy = new Policy();

// Allow only a specified IP range.
Condition condition = new StringCondition(StringCondition.StringComparisonType.StringLike,
    ConditionFactory.SOURCE_IP_CONDITION_KEY , "192.168.143.*");

policy.withStatements(new Statement(Effect.Allow)
    .withActions(S3Actions.ListObjects)
```

```
.withConditions(condition)
.withResources(new Resource("arn:aws:s3:::"+ bucketName)));

getFederationTokenRequest.setPolicy(policy.toJson());
```

## Example

The following Java code example lists keys in the specified bucket. In the code example, you first obtain temporary security credentials for a two-hour session for your federated user (User1) and use them to send authenticated requests to Amazon S3.

When requesting temporary credentials for others, for added security, you use the security credentials of an IAM user who has permissions to request temporary security credentials. You can also limit the access permissions of this IAM user to ensure that the IAM user grants only the minimum application-specific permissions when requesting temporary security credentials. This sample only lists objects in a specific bucket. Therefore, first create an IAM user with the following policy attached.

```
{
    "Statement": [
        {
            "Action": ["s3>ListBucket",
                      "sts:GetFederationToken*"
                ],
            "Effect": "Allow",
            "Resource": "*"
        }
    ]
}
```

The policy allows the IAM user to request temporary security credentials and access permission only to list your AWS resources. For information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

You can now use the IAM user security credentials to test the following example. The example sends authenticated request to Amazon S3 using temporary security credentials. The example specifies the following policy when requesting temporary security credentials for the federated user (User1) which restricts access to list objects in a specific bucket (YourBucketName). You must update the policy and provide your own existing bucket name.

```
{
    "Statement": [
        {
            "Sid": "1",
            "Action": ["s3>ListBucket"],
            "Effect": "Allow",
            "Resource": "arn:aws:s3:::YourBucketName"
        }
    ]
}
```

You must update the following sample and provide the bucket name that you specified in the preceding federated user access policy.

```
import java.io.IOException;
import com.amazonaws.auth.BasicSessionCredentials;
import com.amazonaws.auth.PropertiesCredentials;
import com.amazonaws.auth.policy.Policy;
import com.amazonaws.auth.policy.Resource;
import com.amazonaws.auth.policy.Statement;
import com.amazonaws.auth.policy.Statement.Effect;
import com.amazonaws.auth.policy.actions.S3Actions;
```

```
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.securitytoken.AWSSecurityTokenServiceClient;
import com.amazonaws.services.securitytoken.model.Credentials;
import com.amazonaws.services.securitytoken.model.GetFederationTokenRequest;
import com.amazonaws.services.securitytoken.model.GetFederationTokenResult;
import com.amazonaws.services.s3.model.ObjectListing;

public class S3Sample {
    private static String bucketName = "*** Specify bucket name ***";
    public static void main(String[] args) throws IOException {
        AWSSecurityTokenServiceClient stsClient =
            new AWSSecurityTokenServiceClient(new
ProfileCredentialsProvider());

        GetFederationTokenRequest getFederationTokenRequest =
            new GetFederationTokenRequest();
        getFederationTokenRequest.setDurationSeconds(7200);
        getFederationTokenRequest.setName("User1");

        // Define the policy and add to the request.
        Policy policy = new Policy();
        policy.withStatements(new Statement(Effect.Allow)
            .withActions(S3Actions.ListObjects)
            .withResources(new Resource("arn:aws:s3:::ExampleBucket")));

        getFederationTokenRequest.setPolicy(policy.toJson());

        // Get the temporary security credentials.
        GetFederationTokenResult federationTokenResult =
            stsClient.getFederationToken(getFederationTokenRequest);
        Credentials sessionCredentials = federationTokenResult.getCredentials();

        // Package the session credentials as a BasicSessionCredentials
        // object for an S3 client object to use.
        BasicSessionCredentials basicSessionCredentials =
            new BasicSessionCredentials(sessionCredentials.getAccessKeyId(),
                sessionCredentials.getSecretAccessKey(),
                sessionCredentials.getSessionToken());
        AmazonS3Client s3 = new AmazonS3Client(basicSessionCredentials);

        // Test. For example, send ListBucket request using the temporary security
        credentials.
        ObjectListing objects = s3.listObjects(bucketName);
        System.out.println("No. of Objects = " + objects.getObjectSummaries().size());
    }
}
```

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Making Requests Using Federated User Temporary Credentials - AWS SDK for .NET

You can provide temporary security credentials for your federated users and applications (see [Making Requests \(p. 11\)](#)) so they can send authenticated requests to access your AWS resources. When requesting these temporary credentials, you must provide a user name and an IAM policy describing the resource permissions you want to grant. By default, the session duration is one hour. You can explicitly set a different duration value when requesting the temporary security credentials for federated users and applications.

**Note**

To request temporary security credentials for federated users and applications, for added security, you might want to use a dedicated IAM user with only the necessary access permissions. The temporary user you create can never get more permissions than the IAM user who requested the temporary security credentials. For more information, go to [AWS Identity and Access Management FAQs](#).

## Making Requests Using Federated User Temporary Credentials

1	Create an instance of the AWS Security Token Service client, <code>AmazonSecurityTokenServiceClient</code> class. For information about providing credentials, see <a href="#">Using the AWS SDK for .NET (p. 614)</a> .
2	<p>Start a session by calling the <code>GetFederationToken</code> method of the STS client.</p> <p>You will need to provide session information including the user name and an IAM policy that you want to attach to the temporary credentials. You can provide an optional session duration.</p> <p>This method returns your temporary security credentials.</p>
3	Package the temporary security credentials in an instance of the <code>SessionAWSCredentials</code> object. You use this object to provide the temporary security credentials to your Amazon S3 client.
4	<p>Create an instance of the <code>AmazonS3Client</code> class by passing the temporary security credentials.</p> <p>You send requests to Amazon S3 using this client. If you send requests using expired credentials, Amazon S3 returns an error.</p>

The following C# code sample demonstrates the preceding tasks.

### Example

```
// In real applications, the following code is part of your trusted code. It has
// your security credentials you use to obtain temporary security credentials.
AmazonSecurityTokenServiceConfig config = new AmazonSecurityTokenServiceConfig();
AmazonSecurityTokenServiceClient stsClient =
    new AmazonSecurityTokenServiceClient(config);

GetFederationTokenRequest federationTokenRequest =
    new GetFederationTokenRequest();
federationTokenRequest.Name          = "User1";
federationTokenRequest.Policy       = "*** Specify policy ***";
federationTokenRequest.DurationSeconds = 7200;

GetFederationTokenResponse federationTokenResponse =
    stsClient.GetFederationToken(federationTokenRequest);
GetFederationTokenResult federationTokenResult =
    federationTokenResponse.GetFederationTokenResult;
Credentials credentials = federationTokenResult.Credentials;

SessionAWSCredentials sessionCredentials =
    new SessionAWSCredentials(credentials.AccessKeyId,
                           credentials.SecretAccessKey,
                           credentials.SessionToken);

// The following will be part of your less trusted code. You provide temporary security
```

```
// credentials so it can send authenticated requests to Amazon S3.  
// Create Amazon S3 client by passing in the basicSessionCredentials object.  
AmazonS3Client s3Client = new AmazonS3Client(sessionCredentials);  
// Test. For example, send list object keys in a bucket.  
ListObjectsRequest listObjectRequest = new ListObjectsRequest();  
listObjectRequest.BucketName = bucketName;  
ListObjectsResponse response = s3Client.ListObjects(listObjectRequest);
```

## Example

The following C# code example lists keys in the specified bucket. In the code example, you first obtain temporary security credentials for a two-hour session for your federated user (User1) and use them to send authenticated requests to Amazon S3.

When requesting temporary credentials for others, for added security, you use the security credentials of an IAM user who has permissions to request temporary security credentials. You can also limit the access permissions of this IAM user to ensure that the IAM user grants only the minimum application-specific permissions to the federated user. This sample only lists objects in a specific bucket. Therefore, first create an IAM user with the following policy attached.

```
{
  "Statement": [
    {
      "Action": ["s3>ListBucket",
                 "sts:GetFederationToken*"
                ],
      "Effect": "Allow",
      "Resource": "*"
    }
  ]
}
```

The policy allows the IAM user to request temporary security credentials and access permission only to list your AWS resources. For more information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

You can now use the IAM user security credentials to test the following example. The example sends authenticated request to Amazon S3 using temporary security credentials. The example specifies the following policy when requesting temporary security credentials for the federated user (User1) which restricts access to list objects in a specific bucket (YourBucketName). You must update the policy and provide your own existing bucket name.

```
{
  "Statement": [
    {
      "Sid": "1",
      "Action": ["s3>ListBucket"],
      "Effect": "Allow",
      "Resource": "arn:aws:s3:::YourBucketName"
    }
  ]
}
```

You must update the following sample and provide the bucket name that you specified in the preceding federated user access policy. For instructions on how to create and test a working example, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;  
using System.Configuration;
```

```
using System.Collections.Specialized;
using Amazon.S3;
using Amazon.SecurityToken;
using Amazon.SecurityToken.Model;
using Amazon.Runtime;
using Amazon.S3.Model;
using System.Collections.Generic;

namespace s3.amazonaws.com.docsamples
{
    class TempFederatedCredentials
    {
        static string bucketName = "*** Provide bucket name ***";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            NameValueCollection appConfig = ConfigurationManager.AppSettings;
            string accessKeyID = appConfig["AWSAccessKey"];
            string secretAccessKeyID = appConfig["AWSSecretKey"];

            try
            {
                Console.WriteLine("Listing objects stored in a bucket");
                SessionAWSCredentials tempCredentials =
                    GetTemporaryFederatedCredentials(accessKeyID, secretAccessKeyID);

                // Create client by providing temporary security credentials.
                using (client = new AmazonS3Client(tempCredentials,
                    Amazon.RegionEndpoint.USEast1))
                {

                    ListObjectsRequest listObjectRequest = new ListObjectsRequest();
                    listObjectRequest.BucketName = bucketName;

                    ListObjectsResponse response = client.ListObjects(listObjectRequest);
                    List<S3Object> objects = response.S3Objects;
                    Console.WriteLine("Object count = {0}", objects.Count);

                    Console.WriteLine("Press any key to continue...");
                    Console.ReadKey();
                }
            }
            catch (AmazonS3Exception s3Exception)
            {
                Console.WriteLine(s3Exception.Message,
                    s3Exception.InnerException);
            }
            catch (AmazonSecurityTokenServiceException stsException)
            {
                Console.WriteLine(stsException.Message,
                    stsException.InnerException);
            }
        }

        private static SessionAWSCredentials GetTemporaryFederatedCredentials(
            string accessKeyId, string secretAccessKeyId)
        {
            AmazonSecurityTokenServiceConfig config = new
            AmazonSecurityTokenServiceConfig();
            AmazonSecurityTokenServiceClient stsClient =
                new AmazonSecurityTokenServiceClient(
                    accessKeyId, secretAccessKeyId, config);

            GetFederationTokenRequest federationTokenRequest =
                new GetFederationTokenRequest();
```

```
federationTokenRequest.DurationSeconds = 7200;
federationTokenRequest.Name    = "User1";
federationTokenRequest.Policy = @"
    ""Statement"":
    [
        {
            ""Sid"":""Stmt1311212314284"",
            ""Action"":[""s3>ListBucket""],
            ""Effect"":""Allow"",
            ""Resource"":""arn:aws:s3:::YourBucketName"""
        }
    ]
";
GetFederationTokenResponse federationTokenResponse =
    stsClient.GetFederationToken(federationTokenRequest);
Credentials credentials = federationTokenResponse.Credentials;

SessionAWSCredentials sessionCredentials =
    new SessionAWSCredentials(credentials.AccessKeyId,
                               credentials.SecretAccessKey,
                               credentials.SessionToken);
return sessionCredentials;
}
}
```

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Making Requests Using Federated User Temporary Credentials - AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to request temporary security credentials for federated users and applications and use them to access Amazon S3.

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

You can provide temporary security credentials to your federated users and applications (see [Making Requests \(p. 11\)](#)) so they can send authenticated requests to access your AWS resources. When requesting these temporary credentials, you must provide a user name and an IAM policy describing the resource permissions you want to grant. These credentials expire when the session duration expires. By default, the session duration is one hour. You can explicitly set a different duration value when requesting the temporary security credentials for federated users and applications. For more information about temporary security credentials, see [Temporary Security Credentials](#) in the *IAM User Guide*.

To request temporary security credentials for federated users and applications, for added security, you might want to use a dedicated IAM user with only the necessary access permissions. The temporary user you create can never get more permissions than the IAM user who requested the temporary security credentials. For information about identity federation, go to [AWS Identity and Access Management FAQs](#).

### Making Requests Using Federated User Temporary Credentials

1	Create an instance of an AWS Security Token Service (AWS STS) client by using the <a href="#">Aws\Sts\StsClient</a> class <a href="#">factory()</a> method.
---	---

2	<p>Execute the <a href="#">Aws\Sts\StsClient::getFederationToken()</a> method by providing the name of the federated user in the array parameter's required Name key. You can also add the optional array parameter's Policy and DurationSeconds keys.</p> <p>The method returns temporary security credentials that you can provide to your federated users.</p>
3	<p>Any federated user who has the temporary security credentials can send requests to Amazon S3 by creating an instance of an Amazon S3 client by using <a href="#">Aws\S3\S3Client</a> class <a href="#">factory</a> method with the temporary security credentials.</p> <p>Any methods in the <a href="#">S3Client</a> class that you call use the temporary security credentials to send authenticated requests to Amazon S3.</p>

The following PHP code sample demonstrates obtaining temporary security credentials for a federated user and using the credentials to access Amazon S3.

### Example

```

use Aws\Sts\StsClient;
use Aws\S3\S3Client;

// In real applications, the following code is part of your trusted code. It has
// your security credentials that you use to obtain temporary security credentials.
$sts = StsClient::factory();

// Fetch the federated credentials.
$result = $sts->getFederationToken(array(
    'Name'          => 'User1',
    'DurationSeconds' => 3600,
    'Policy'        => json_encode(array(
        'Statement' => array(
            array(
                'Sid'      => 'randomstatementid' . time(),
                'Action'   => array('s3>ListBucket'),
                'Effect'   => 'Allow',
                'Resource' => 'arn:aws:s3:::YourBucketName'
            )
        )
    )));
));

// The following will be part of your less trusted code. You provide temporary
// security credentials so it can send authenticated requests to Amazon S3.
$credentials = $result->get('Credentials');
$s3 = new S3Client::factory(array(
    'key'    => $credentials['AccessKeyId'],
    'secret' => $credentials['SecretAccessKey'],
    'token'  => $credentials['SessionToken']
));
$result = $s3->listObjects();

```

### Example of a Federated User Making an Amazon S3 Request Using Temporary Security Credentials

The following PHP code example lists keys in the specified bucket. In the code example, you first obtain temporary security credentials for an hour session for your federated user (User1) and use them to send authenticated requests to Amazon S3. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

When requesting temporary credentials for others, for added security, you use the security credentials of an IAM user who has permissions to request temporary security credentials. You can also limit the access permissions of this IAM user to ensure that the IAM user grants only the minimum application-specific permissions to the federated user. This example only lists objects in a specific bucket. Therefore, first create an IAM user with the following policy attached.

```
{  
    "Statement": [  
        {  
            "Action": ["s3>ListBucket",  
                      "sts:GetFederationToken*"  
                ],  
            "Effect": "Allow",  
            "Resource": "*"  
        }  
    ]  
}
```

The policy allows the IAM user to request temporary security credentials and access permission only to list your AWS resources. For more information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

You can now use the IAM user security credentials to test the following example. The example sends an authenticated request to Amazon S3 using temporary security credentials. The example specifies the following policy when requesting temporary security credentials for the federated user (User1) which restricts access to list objects in a specific bucket. You must update the policy with your own existing bucket name.

```
{  
    "Statement": [  
        {  
            "Sid": "1",  
            "Action": ["s3>ListBucket"],  
            "Effect": "Allow",  
            "Resource": "arn:aws:s3:::YourBucketName"  
        }  
    ]  
}
```

In the following example you must replace **YourBucketName** with your own existing bucket name when specifying the policy resource.

```
<?php  
  
// Include the AWS SDK using the Composer autoloader.  
require 'vendor/autoload.php';  
  
$bucket = '*** Your Bucket Name ***';  
  
use Aws\Sts\StsClient;  
use Aws\S3\S3Client;  
use Aws\S3\Exception\S3Exception;  
  
// Instantiate the client.  
$sts = StsClient::factory();  
  
$result = $sts->getFederationToken(array(  
    'Name'          => 'User1',  
    'DurationSeconds' => 3600,  
    'Policy'         => json_encode(array(  
        'Statement' => array(  
            array(  
                'Action': "s3>ListBucket",  
                "Effect": "Allow",  
                "Resource": "arn:aws:s3:::$bucket"  
            )  
        )  
    ))
```

```
        'Sid'      => 'randomstatementid' . time(),
        'Action'   => array('s3>ListBucket'),
        'Effect'   => 'Allow',
        'Resource' => 'arn:aws:s3:::YourBucketName'
    )
)
));
$credentials = $result->get('Credentials');
$s3 = S3Client::factory(array(
    'key'      => $credentials['AccessKeyId'],
    'secret'   => $credentials['SecretAccessKey'],
    'token'    => $credentials['SessionToken']
));
try {
    $objects = $s3->getIterator('ListObjects', array(
        'Bucket' => $bucket
));
echo "Keys retrieved!\n";
foreach ($objects as $object) {
    echo $object['Key'] . "\n";
}
} catch (S3Exception $e) {
    echo $e->getMessage() . "\n";
}
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\Sts\StsClient Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\Sts\StsClient::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\Sts\StsClient::getSessionToken\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Making Requests Using Federated User Temporary Credentials - AWS SDK for Ruby

You can provide temporary security credentials for your federated users and applications (see [Making Requests \(p. 11\)](#)) so that they can send authenticated requests to access your AWS resources. When requesting these temporary credentials from the IAM service, you must provide a user name and an IAM policy describing the resource permissions you want to grant. By default, the session duration is one hour. However, if you are requesting temporary credentials using IAM user credentials, you can explicitly set a different duration value when requesting the temporary security credentials for federated users and applications.

### Note

To request temporary security credentials for federated users and applications, for added security, you might want to use a dedicated IAM user with only the necessary access permissions. The temporary user you create can never get more permissions than the IAM user who requested the temporary security credentials. For more information, go to [AWS Identity and Access Management FAQs](#).

### Making Requests Using Federated User Temporary Security Credentials

1	Create an instance of the AWS Security Token Service (AWS STS) client <code>AWS::STS::Session</code> .
2	<p>Start a session by calling the <code>new_federated_session</code> method of the STS client you created in the preceding step.</p> <p>You need to provide session information, including the user name and an IAM policy that you want to attach to the temporary credentials.</p> <p>This method returns your temporary security credentials.</p>
3	<p>Create an instance of the <code>AWS::S3</code> class by passing the temporary security credentials.</p> <p>You send requests to Amazon S3 using this client. If you send requests using expired credentials, Amazon S3 returns an error.</p>

The following Ruby code example demonstrates the preceding tasks.

### Example

```
# Start a session with restricted permissions.
sts = AWS::STS.new()
policy = AWS::STS::Policy.new
policy.allow(
  :actions => ["s3>ListBucket"],
  :resources => "arn:aws:s3:::{bucket_name}")

session = sts.new_federated_session(
  'User1',
  :policy => policy,
  :duration => 2*60*60)

puts "Policy: #{policy.to_json}"

# Get an instance of the S3 interface using the session credentials.
s3 = AWS::S3.new(session.credentials)

# Get a list of all object keys in a bucket.
bucket = s3.buckets[bucket_name].objects.collect(&:key)
```

## Example

The following Ruby code example lists keys in the specified bucket. In the code example, you first obtain temporary security credentials for a two-hour session for your federated user (User1) and use them to send authenticated requests to Amazon S3.

When requesting temporary credentials for others, for added security, you use the security credentials of an IAM user who has permissions to request temporary security credentials. You can also limit the access permissions of this IAM user to ensure that the IAM user grants only the minimum application-specific permissions when requesting temporary security credentials. This example only lists objects in a specific bucket. Therefore, first create an IAM user with the following policy attached:

```
{  
  "Statement": [  
    {  
      "Action": ["s3>ListBucket",  
                "sts:GetFederationToken*"  
              ],  
      "Effect": "Allow",  
      "Resource": "*"  
    }  
  ]  
}
```

The policy allows the IAM user to request temporary security credentials and access permission only to list your AWS resources. For more information about how to create an IAM user, see [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

You can now use the IAM user security credentials to test the following example. The example sends an authenticated request to Amazon S3 using temporary security credentials. The example specifies the following policy when requesting temporary security credentials for the federated user (User1), which restricts access to listing objects in a specific bucket (`YourBucketName`). To use this example in your code, update the policy and provide your own bucket name.

```
{  
  "Statement": [  
    {  
      "Sid": "1",  
      "Action": ["s3>ListBucket"],  
      "Effect": "Allow",  
      "Resource": "arn:aws:s3:::YourBucketName"  
    }  
  ]  
}
```

To use this example in your code, provide your access key ID and secret key and the bucket name that you specified in the preceding federated user access policy.

```
require 'rubygems'  
require 'aws-sdk'  
  
# In real applications, the following code is part of your trusted code. It has  
# your security credentials that you use to obtain temporary security credentials.  
  
bucket_name = '*** Provide bucket name ***'  
  
# Start a session with restricted permissions.  
sts = AWS::STS.new()  
policy = AWS::STS::Policy.new  
policy.allow(  
  :actions => ["s3>ListBucket"],  
  :resources => "arn:aws:s3:::{bucket_name}")
```

```
session = sts.new_federated_session(
    'User1',
    :policy => policy,
    :duration => 2*60*60)

puts "Policy: #{policy.to_json}"

# Get an instance of the S3 interface using the session credentials.
s3 = AWS::S3.new(session.credentials)

# Get a list of all object keys in a bucket.
bucket = s3.buckets[bucket_name].objects.collect(&:key)
puts "No. of Objects = #{bucket.count.to_s}"
puts bucket
```

## Making Requests Using the REST API

This section contains information on how to make requests to Amazon S3 endpoints by using the REST API. For a list of Amazon S3 endpoints, see [Regions and Endpoints](#) in the *AWS General Reference*.

### Topics

- [Making Requests to Dual-Stack Endpoints by Using the REST API \(p. 51\)](#)
- [Virtual Hosting of Buckets \(p. 51\)](#)
- [Request Redirection and the REST API \(p. 55\)](#)

When making requests by using the REST API, you can use virtual hosted-style or path-style URIs for the Amazon S3 endpoints. For more information, see [Working with Amazon S3 Buckets \(p. 58\)](#).

### Example Virtual Hosted-Style Request

Following is an example of a virtual hosted-style request to delete the `puppy.jpg` file from the bucket named `examplebucket`.

```
DELETE /puppy.jpg HTTP/1.1
Host: examplebucket.s3-us-west-2.amazonaws.com
Date: Mon, 11 Apr 2016 12:00:00 GMT
x-amz-date: Mon, 11 Apr 2016 12:00:00 GMT
Authorization: authorization string
```

### Example Path-Style Request

Following is an example of a path-style version of the same request.

```
DELETE /examplebucket/puppy.jpg HTTP/1.1
Host: s3-us-west-2.amazonaws.com
Date: Mon, 11 Apr 2016 12:00:00 GMT
x-amz-date: Mon, 11 Apr 2016 12:00:00 GMT
Authorization: authorization string
```

Amazon S3 supports virtual hosted-style and path-style access in all regions. The path-style syntax, however, requires that you use the region-specific endpoint when attempting to access a bucket. For example, if you have a bucket called `mybucket` that resides in the EU (Ireland) region, you want to use path-style syntax, and the object is named `puppy.jpg`, the correct URI is `http://s3-eu-west-1.amazonaws.com/mybucket/puppy.jpg`.

You will receive an HTTP response code 307 Temporary Redirect error and a message indicating what the correct URI is for your resource if you try to access a bucket outside the US East (N. Virginia) region with path-style syntax that uses either of the following:

- `http://s3.amazonaws.com`
- An endpoint for a region different from the one where the bucket resides. For example, if you use `http://s3-eu-west-1.amazonaws.com` for a bucket that was created in the US West (N. California) region.

## Making Requests to Dual-Stack Endpoints by Using the REST API

When using the REST API, you can directly access a dual-stack endpoint by using a virtual hosted-style or a path style endpoint name (URI). All Amazon S3 dual-stack endpoint names include the region in the name. Unlike the standard IPv4-only endpoints, both virtual hosted-style and a path-style endpoints use region-specific endpoint names.

### Example Virtual Hosted-Style Dual-Stack Endpoint Request

You can use a virtual hosted-style endpoint in your REST request as shown in the following example that retrieves the `puppy.jpg` object from the bucket named `examplebucket`.

```
GET /puppy.jpg HTTP/1.1
Host: examplebucket.s3.dualstack.us-west-2.amazonaws.com
Date: Mon, 11 Apr 2016 12:00:00 GMT
x-amz-date: Mon, 11 Apr 2016 12:00:00 GMT
Authorization: authorization string
```

### Example Path-Style Dual-Stack Endpoint Request

Or you can use a path-style endpoint in your request as shown in the following example.

```
GET /examplebucket/puppy.jpg HTTP/1.1
Host: s3.dualstack.us-west-2.amazonaws.com
Date: Mon, 11 Apr 2016 12:00:00 GMT
x-amz-date: Mon, 11 Apr 2016 12:00:00 GMT
Authorization: authorization string
```

For more information about dual-stack endpoints, see [Using Amazon S3 Dual-Stack Endpoints \(p. 15\)](#).

## Virtual Hosting of Buckets

### Topics

- [HTTP Host Header Bucket Specification \(p. 52\)](#)
- [Examples \(p. 53\)](#)
- [Customizing Amazon S3 URLs with CNAMEs \(p. 54\)](#)
- [Limitations \(p. 55\)](#)
- [Backward Compatibility \(p. 55\)](#)

In general, virtual hosting is the practice of serving multiple web sites from a single web server. One way to differentiate sites is by using the apparent host name of the request instead of just the path name part of the URI. An ordinary Amazon S3 REST request specifies a bucket by using the first slash-delimited component of the Request-URI path. Alternatively, you can use Amazon S3 virtual hosting to

address a bucket in a REST API call by using the HTTP Host header. In practice, Amazon S3 interprets Host as meaning that most buckets are automatically accessible (for limited types of requests) at `http://bucketname.s3.amazonaws.com`. Furthermore, by naming your bucket after your registered domain name and by making that name a DNS alias for Amazon S3, you can completely customize the URL of your Amazon S3 resources, for example, `http://my.bucketname.com/`.

Besides the attractiveness of customized URLs, a second benefit of virtual hosting is the ability to publish to the "root directory" of your bucket's virtual server. This ability can be important because many existing applications search for files in this standard location. For example, `favicon.ico`, `robots.txt`, `crossdomain.xml` are all expected to be found at the root.

### Important

Amazon S3 supports virtual hosted-style and path-style access in all regions. The path-style syntax, however, requires that you use the region-specific endpoint when attempting to access a bucket. For example, if you have a bucket called `mybucket` that resides in the EU (Ireland) region, you want to use path-style syntax, and the object is named `puppy.jpg`, the correct URI is `http://s3-eu-west-1.amazonaws.com/mybucket/puppy.jpg`.

You will receive an HTTP response code 307 Temporary Redirect error and a message indicating what the correct URI is for your resource if you try to access a bucket outside the US East (N. Virginia) region with path-style syntax that uses either of the following:

- `http://s3.amazonaws.com`
- An endpoint for a region different from the one where the bucket resides. For example, if you use `http://s3-eu-west-1.amazonaws.com` for a bucket that was created in the US West (N. California) region.

### Note

Amazon S3 routes any virtual hosted-style requests to the US East (N. Virginia) region by default if you use the US East (N. Virginia) endpoint (`s3.amazonaws.com`), instead of the region-specific endpoint (for example, `s3-eu-west-1.amazonaws.com`). When you create a bucket, in any region, Amazon S3 updates DNS to reroute the request to the correct location, which might take time. In the meantime, the default rule applies and your virtual hosted-style request goes to the US East (N. Virginia) region, and Amazon S3 redirects it with HTTP 307 redirect to the correct region. For more information, see [Request Redirection and the REST API \(p. 556\)](#).

When using virtual hosted-style buckets with SSL, the SSL wild card certificate only matches buckets that do not contain periods. To work around this, use HTTP or write your own certificate verification logic.

## HTTP Host Header Bucket Specification

As long as your GET request does not use the SSL endpoint, you can specify the bucket for the request by using the HTTP Host header. The Host header in a REST request is interpreted as follows:

- If the Host header is omitted or its value is '`s3.amazonaws.com`', the bucket for the request will be the first slash-delimited component of the Request-URI, and the key for the request will be the rest of the Request-URI. This is the ordinary method, as illustrated by the first and second examples in this section. Omitting the Host header is valid only for HTTP 1.0 requests.
- Otherwise, if the value of the Host header ends in '`s3.amazonaws.com`', the bucket name is the leading component of the Host header's value up to '`s3.amazonaws.com`'. The key for the request is the Request-URI. This interpretation exposes buckets as subdomains of `s3.amazonaws.com`, as illustrated by the third and fourth examples in this section.
- Otherwise, the bucket for the request is the lowercase value of the Host header, and the key for the request is the Request-URI. This interpretation is useful when you have registered the same DNS name as your bucket name and have configured that name to be a CNAME alias for Amazon S3. The procedure for registering domain names and configuring DNS is beyond the scope of this guide, but the result is illustrated by the final example in this section.

## Examples

This section provides example URLs and requests.

### Example Path Style Method

This example uses `johnsmith.net` as the bucket name and `homepage.html` as the key name.

The URL is as follows:

```
http://s3.amazonaws.com/johnsmith.net/homepage.html
```

The request is as follows:

```
GET /johnsmith.net/homepage.html HTTP/1.1
Host: s3.amazonaws.com
```

The request with HTTP 1.0 and omitting the host header is as follows:

```
GET /johnsmith.net/homepage.html HTTP/1.0
```

For information about DNS-compatible names, see [Limitations \(p. 55\)](#). For more information about keys, see [Keys \(p. 4\)](#).

### Example Virtual Hosted-Style Method

This example uses `johnsmith.net` as the bucket name and `homepage.html` as the key name.

The URL is as follows:

```
http://johnsmith.net.s3.amazonaws.com/homepage.html
```

The request is as follows:

```
GET /homepage.html HTTP/1.1
Host: johnsmith.net.s3.amazonaws.com
```

The virtual hosted-style method requires the bucket name to be DNS-compliant.

### Example Virtual Hosted-Style Method for a Bucket in a Region Other Than US East (N. Virginia) region

This example uses `johnsmith.eu` as the name for a bucket in the EU (Ireland) region and `homepage.html` as the key name.

The URL is as follows:

```
http://johnsmith.eu.s3-eu-west-1.amazonaws.com/homepage.html
```

The request is as follows:

```
GET /homepage.html HTTP/1.1
Host: johnsmith.eu.s3-eu-west-1.amazonaws.com
```

Note that, instead of using the region-specific endpoint, you can also use the US East (N. Virginia) region endpoint no matter what region the bucket resides.

```
http://johnsmith.eu.s3.amazonaws.com/homepage.html
```

The request is as follows:

```
GET /homepage.html HTTP/1.1
Host: johnsmith.eu.s3.amazonaws.com
```

### Example CNAME Method

This example uses `www.johnsmith.net` as the bucket name and `homepage.html` as the key name. To use this method, you must configure your DNS name as a CNAME alias for `bucketname.s3.amazonaws.com`.

The URL is as follows:

```
http://www.johnsmith.net/homepage.html
```

The example is as follows:

```
GET /homepage.html HTTP/1.1
Host: www.johnsmith.net
```

## Customizing Amazon S3 URLs with CNAMEs

Depending on your needs, you might not want "s3.amazonaws.com" to appear on your website or service. For example, if you host your website images on Amazon S3, you might prefer `http://images.johnsmith.net/` instead of `http://johnsmith-images.s3.amazonaws.com/`.

The bucket name must be the same as the CNAME. So `http://images.johnsmith.net/filename` would be the same as `http://images.johnsmith.net.s3.amazonaws.com/filename` if a CNAME were created to map `images.johnsmith.net` to `images.johnsmith.net.s3.amazonaws.com`.

Any bucket with a DNS-compatible name can be referenced as follows: `http://[BucketName].s3.amazonaws.com/[Filename]`, for example, `http://images.johnsmith.net.s3.amazonaws.com/mydog.jpg`. By using CNAME, you can map `images.johnsmith.net` to an Amazon S3 host name so that the previous URL could become `http://images.johnsmith.net/mydog.jpg`.

The CNAME DNS record should alias your domain name to the appropriate virtual hosted-style host name. For example, if your bucket name and domain name are `images.johnsmith.net`, the CNAME record should alias to `images.johnsmith.net.s3.amazonaws.com`.

```
images.johnsmith.net CNAME      images.johnsmith.net.s3.amazonaws.com.
```

Setting the alias target to `s3.amazonaws.com` also works, but it may result in extra HTTP redirects.

Amazon S3 uses the host name to determine the bucket name. For example, suppose that you have configured `www.example.com` as a CNAME for `www.example.com.s3.amazonaws.com`. When you access `http://www.example.com`, Amazon S3 receives a request similar to the following:

### Example

```
GET / HTTP/1.1
```

```
Host: www.example.com
Date: date
Authorization: signatureValue
```

Because Amazon S3 sees only the original host name `www.example.com` and is unaware of the CNAME mapping used to resolve the request, the CNAME and the bucket name must be the same.

Any Amazon S3 endpoint can be used in a CNAME. For example, `s3-ap-southeast-1.amazonaws.com` can be used in CNAMEs. For more information about endpoints, see [Request Endpoints \(p. 13\)](#).

### To associate a host name with an Amazon S3 bucket using CNAMEs

1. Select a host name that belongs to a domain you control. This example uses the `images` subdomain of the `johnsmith.net` domain.
2. Create a bucket that matches the host name. In this example, the host and bucket names are `images.johnsmith.net`.

**Note**

The bucket name must exactly match the host name.

3. Create a CNAME record that defines the host name as an alias for the Amazon S3 bucket. For example:

```
images.johnsmith.net CNAME images.johnsmith.net.s3.amazonaws.com
```

**Important**

For request routing reasons, the CNAME record must be defined exactly as shown in the preceding example. Otherwise, it might appear to operate correctly, but will eventually result in unpredictable behavior.

**Note**

The procedure for configuring DNS depends on your DNS server or DNS provider. For specific information, see your server documentation or contact your provider.

## Limitations

Specifying the bucket for the request by using the HTTP `Host` header is supported for non-SSL requests and when using the REST API. You cannot specify the bucket in SOAP by using a different endpoint.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

## Backward Compatibility

Early versions of Amazon S3 incorrectly ignored the HTTP `Host` header. Applications that depend on this undocumented behavior must be updated to set the `Host` header correctly. Because Amazon S3 determines the bucket name from `Host` when it is present, the most likely symptom of this problem is to receive an unexpected `NoSuchBucket` error result code.

## Request Redirection and the REST API

### Topics

- [Redirects and HTTP User-Agents \(p. 56\)](#)
- [Redirects and 100-Continue \(p. 56\)](#)
- [Redirect Example \(p. 56\)](#)

This section describes how to handle HTTP redirects by using the Amazon S3 REST API. For general information about Amazon S3 redirects, see [Request Redirection and the REST API \(p. 556\)](#) in the Amazon Simple Storage Service API Reference.

## Redirects and HTTP User-Agents

Programs that use the Amazon S3 REST API should handle redirects either at the application layer or the HTTP layer. Many HTTP client libraries and user agents can be configured to correctly handle redirects automatically; however, many others have incorrect or incomplete redirect implementations.

Before you rely on a library to fulfill the redirect requirement, test the following cases:

- Verify all HTTP request headers are correctly included in the redirected request (the second request after receiving a redirect) including HTTP standards such as Authorization and Date.
- Verify non-GET redirects, such as PUT and DELETE, work correctly.
- Verify large PUT requests follow redirects correctly.
- Verify PUT requests follow redirects correctly if the 100-continue response takes a long time to arrive.

HTTP user-agents that strictly conform to RFC 2616 might require explicit confirmation before following a redirect when the HTTP request method is not GET or HEAD. It is generally safe to follow redirects generated by Amazon S3 automatically, as the system will issue redirects only to hosts within the amazonaws.com domain and the effect of the redirected request will be the same as that of the original request.

## Redirects and 100-Continue

To simplify redirect handling, improve efficiencies, and avoid the costs associated with sending a redirected request body twice, configure your application to use 100-continues for PUT operations. When your application uses 100-continue, it does not send the request body until it receives an acknowledgement. If the message is rejected based on the headers, the body of the message is not sent. For more information about 100-continue, go to [RFC 2616 Section 8.2.3](#).

### Note

According to RFC 2616, when using `Expect: Continue` with an unknown HTTP server, you should not wait an indefinite period before sending the request body. This is because some HTTP servers do not recognize 100-continue. However, Amazon S3 does recognize if your request contains an `Expect: Continue` and will respond with a provisional 100-continue status or a final status code. Additionally, no redirect error will occur after receiving the provisional 100 continue go-ahead. This will help you avoid receiving a redirect response while you are still writing the request body.

## Redirect Example

This section provides an example of client-server interaction using HTTP redirects and 100-continue.

Following is a sample PUT to the quotes.s3.amazonaws.com bucket.

```
PUT /nelson.txt HTTP/1.1
Host: quotes.s3.amazonaws.com
Date: Mon, 15 Oct 2007 22:18:46 +0000

Content-Length: 6
Expect: 100-continue
```

Amazon S3 returns the following:

```
HTTP/1.1 307 Temporary Redirect
Location: http://quotes.s3-4c25d83b.amazonaws.com/nelson.txt?rk=8d47490b
Content-Type: application/xml
Transfer-Encoding: chunked
Date: Mon, 15 Oct 2007 22:18:46 GMT

Server: AmazonS3

<?xml version="1.0" encoding="UTF-8"?>
<Error>
<Code>TemporaryRedirect</Code>
<Message>Please re-send this request to the
specified temporary endpoint. Continue to use the
original request endpoint for future requests.
</Message>
<Endpoint>quotes.s3-4c25d83b.amazonaws.com</Endpoint>
<Bucket>quotes</Bucket>
</Error>
```

The client follows the redirect response and issues a new request to the quotes.s3-4c25d83b.amazonaws.com temporary endpoint.

```
PUT /nelson.txt?rk=8d47490b HTTP/1.1
Host: quotes.s3-4c25d83b.amazonaws.com
Date: Mon, 15 Oct 2007 22:18:46 +0000

Content-Length: 6
Expect: 100-continue
```

Amazon S3 returns a 100-continue indicating the client should proceed with sending the request body.

```
HTTP/1.1 100 Continue
```

The client sends the request body.

```
ha ha\n
```

Amazon S3 returns the final response.

```
HTTP/1.1 200 OK
Date: Mon, 15 Oct 2007 22:18:48 GMT

ETag: "a2c8d6b872054293af41061e93bc289"
Content-Length: 0
Server: AmazonS3
```

# Working with Amazon S3 Buckets

Amazon S3 is cloud storage for the Internet. To upload your data (photos, videos, documents etc.), you first create a bucket in one of the AWS Regions. You can then upload any number of objects to the bucket.

In terms of implementation, buckets and objects are resources, and Amazon S3 provides APIs for you to manage them. For example, you can create a bucket and upload objects using the Amazon S3 API. You can also use the Amazon S3 console to perform these operations. The console internally uses the Amazon S3 APIs to send requests to Amazon S3.

In this section, we explain working with buckets. For information about working with objects, see [Working with Amazon S3 Objects \(p. 106\)](#).

Amazon S3 bucket names are globally unique, regardless of the AWS Region in which you create the bucket. You specify the name at the time you create the bucket. For bucket naming guidelines, see [Bucket Restrictions and Limitations \(p. 62\)](#).

Amazon S3 creates buckets in a region you specify. You can choose any AWS Region that is geographically close to you to optimize latency, minimize costs, or address regulatory requirements. For example, if you reside in Europe, you might find it advantageous to create buckets in the EU (Ireland) or EU (Frankfurt) regions. For a list of Amazon S3 regions, see [Regions and Endpoints in the AWS General Reference](#).

**Note**

Objects belonging to a bucket that you create in a specific AWS Region never leave that region, unless you explicitly transfer them to another region. For example, objects stored in the EU (Ireland) region never leave it.

Topics

- [Creating a Bucket \(p. 59\)](#)
- [Accessing a Bucket \(p. 60\)](#)
- [Bucket Configuration Options \(p. 61\)](#)
- [Bucket Restrictions and Limitations \(p. 62\)](#)
- [Examples of Creating a Bucket \(p. 64\)](#)
- [Deleting or Emptying a Bucket \(p. 67\)](#)
- [Amazon S3 Default Encryption for S3 Buckets \(p. 71\)](#)
- [Managing Bucket Website Configuration \(p. 74\)](#)
- [Amazon S3 Transfer Acceleration \(p. 81\)](#)
- [Requester Pays Buckets \(p. 92\)](#)
- [Buckets and Access Control \(p. 96\)](#)

- [Billing and Usage Reporting for S3 Buckets \(p. 96\)](#)

## Creating a Bucket

Amazon S3 provides APIs for you to create and manage buckets. By default, you can create up to 100 buckets in each of your AWS accounts. If you need additional buckets, you can increase your bucket limit by submitting a service limit increase. To learn more about submitting a bucket limit increase, see [AWS Service Limits](#) in the *AWS General Reference*.

When you create a bucket, you provide a name and AWS Region where you want the bucket created. For information about naming buckets, see [Rules for Bucket Naming \(p. 63\)](#).

Within each bucket, you can store any number of objects. You can create a bucket using any of the following methods:

- Create the bucket using the console.
- Create the bucket programmatically using the AWS SDKs.

**Note**

If you need to, you can also make the Amazon S3 REST API calls directly from your code. However, this can be cumbersome because it requires you to write code to authenticate your requests. For more information, see [PUT Bucket](#) in the *Amazon Simple Storage Service API Reference*.

When using AWS SDKs you first create a client and then send a request to create a bucket using the client. You can specify an AWS Region when you create the client. US East (N. Virginia) is the default Region. You can also specify a Region in your create bucket request. Note the following:

- If you create a client by specifying the US East (N. Virginia) Region, it uses the following endpoint to communicate with Amazon S3.

```
s3.amazonaws.com
```

You can use this client to create a bucket in any AWS Region. In your create bucket request:

- If you don't specify a Region, Amazon S3 creates the bucket in the US East (N. Virginia) Region.
- If you specify an AWS Region, Amazon S3 creates the bucket in the specified Region.
- If you create a client by specifying any other AWS Region, each of these Regions maps to the Region-specific endpoint:

```
s3-<region>.amazonaws.com
```

For example, if you create a client by specifying the eu-west-1 Region, it maps to the following region-specific endpoint:

```
s3-eu-west-1.amazonaws.com
```

In this case, you can use the client to create a bucket only in the eu-west-1 Region. Amazon S3 returns an error if you specify any other Region in your create bucket request.

- If you create a client to access a dual-stack endpoint, you must specify an AWS Region. For more information, see [Dual-Stack Endpoints \(p. 15\)](#).

For a list of available AWS Regions, see [Regions and Endpoints](#) in the *AWS General Reference*.

For examples, see [Examples of Creating a Bucket \(p. 64\)](#).

## About Permissions

You can use your AWS account root credentials to create a bucket and perform any other Amazon S3 operation. However, AWS recommends not using the root credentials of your AWS account to make requests such as create a bucket. Instead, create an IAM user, and grant that user full access (users by default have no permissions). We refer to these users as administrator users. You can use the administrator user credentials, instead of the root credentials of your account, to interact with AWS and perform tasks, such as create a bucket, create users, and grant them permissions.

For more information, see [Root Account Credentials vs. IAM User Credentials](#) in the *AWS General Reference* and [IAM Best Practices](#) in the *IAM User Guide*.

The AWS account that creates a resource owns that resource. For example, if you create an IAM user in your AWS account and grant the user permission to create a bucket, the user can create a bucket. But the user does not own the bucket; the AWS account to which the user belongs owns the bucket. The user will need additional permission from the resource owner to perform any other bucket operations. For more information about managing permissions for your Amazon S3 resources, see [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

## Accessing a Bucket

You can access your bucket using the Amazon S3 console. Using the console UI, you can perform almost all bucket operations without having to write any code.

If you access a bucket programmatically, note that Amazon S3 supports RESTful architecture in which your buckets and objects are resources, each with a resource URI that uniquely identifies the resource.

Amazon S3 supports both virtual-hosted-style and path-style URLs to access a bucket.

- In a virtual-hosted-style URL, the bucket name is part of the domain name in the URL. For example:
  - `http://bucket.s3.amazonaws.com`
  - `http://bucket.s3-aws-region.amazonaws.com`

In a virtual-hosted-style URL, you can use either of these endpoints. If you make a request to the `http://bucket.s3.amazonaws.com` endpoint, the DNS has sufficient information to route your request directly to the Region where your bucket resides.

For more information, see [Virtual Hosting of Buckets \(p. 51\)](#).

- In a path-style URL, the bucket name is not part of the domain (unless you use a Region-specific endpoint). For example:
  - US East (N. Virginia) Region endpoint, `http://s3.amazonaws.com/bucket`
  - Region-specific endpoint, `http://s3-aws-region.amazonaws.com/bucket`

In a path-style URL, the endpoint you use must match the Region in which the bucket resides. For example, if your bucket is in the South America (São Paulo) Region, you must use the `http://s3-sa-east-1.amazonaws.com/bucket` endpoint. If your bucket is in the US East (N. Virginia) Region, you must use the `http://s3.amazonaws.com/bucket` endpoint.

### Important

Because buckets can be accessed using path-style and virtual-hosted-style URLs, we recommend you create buckets with DNS-compliant bucket names. For more information, see [Bucket Restrictions and Limitations \(p. 62\)](#).

### Accessing an S3 Bucket over IPv6

Amazon S3 has a set of dual-stack endpoints, which support requests to S3 buckets over both Internet Protocol version 6 (IPv6) and IPv4. For more information, see [Making Requests over IPv6 \(p. 13\)](#).

## Bucket Configuration Options

Amazon S3 supports various options for you to configure your bucket. For example, you can configure your bucket for website hosting, add configuration to manage lifecycle of objects in the bucket, and configure the bucket to log all access to the bucket. Amazon S3 supports subresources for you to store, and manage the bucket configuration information. That is, using the Amazon S3 API, you can create and manage these subresources. You can also use the console or the AWS SDKs.

#### Note

There are also object-level configurations. For example, you can configure object-level permissions by configuring an access control list (ACL) specific to that object.

These are referred to as subresources because they exist in the context of a specific bucket or object. The following table lists subresources that enable you to manage bucket-specific configurations.

Subresource	Description
<i>location</i>	When you create a bucket, you specify the AWS Region where you want Amazon S3 to create the bucket. Amazon S3 stores this information in the <i>location</i> subresource and provides an API for you to retrieve this information.
<i>policy</i> and <i>ACL</i> (Access Control List)	All your resources (such as buckets and objects) are private by default. Amazon S3 supports both bucket policy and access control list (ACL) options for you to grant and manage bucket-level permissions. Amazon S3 stores the permission information in the <i>policy</i> and <i>acl</i> subresources.  For more information, see <a href="#">Managing Access Permissions to Your Amazon S3 Resources (p. 295)</a> .
<i>cors</i> (cross-origin resource sharing)	You can configure your bucket to allow cross-origin requests.  For more information, see <a href="#">Enabling Cross-Origin Resource Sharing</a> .
<i>website</i>	You can configure your bucket for static website hosting. Amazon S3 stores this configuration by creating a <i>website</i> subresource.  For more information, see <a href="#">Hosting a Static Website on Amazon S3</a> .
<i>logging</i>	Logging enables you to track requests for access to your bucket. Each access log record provides details about a single access request, such as the requester, bucket name, request time, request action, response status, and error code, if any. Access log information can be useful in security and access audits. It can also help you learn about your customer base and understand your Amazon S3 bill.  For more information, see <a href="#">Server Access Logging (p. 596)</a> .
<i>event notification</i>	You can enable your bucket to send you notifications of specified bucket events.  For more information, see <a href="#">Configuring Amazon S3 Event Notifications (p. 500)</a> .
<i>versioning</i>	Versioning helps you recover accidental overwrites and deletes.  We recommend versioning as a best practice to recover objects from being deleted or overwritten by mistake.

Subresource	Description
	For more information, see <a href="#">Using Versioning (p. 448)</a> .
<i>lifecycle</i>	You can define lifecycle rules for objects in your bucket that have a well-defined lifecycle. For example, you can define a rule to archive objects one year after creation, or delete an object 10 years after creation.  For more information, see <a href="#">Object Lifecycle Management</a> .
<i>cross-region replication</i>	Cross-region replication is the automatic, asynchronous copying of objects across buckets in different AWS Regions. For more information, see <a href="#">Cross-Region Replication (CRR) (p. 519)</a> .
<i>tagging</i>	You can add cost allocation tags to your bucket to categorize and track your AWS costs. Amazon S3 provides the <i>tagging</i> subresource to store and manage tags on a bucket. Using tags you apply to your bucket, AWS generates a cost allocation report with usage and costs aggregated by your tags.  For more information, see <a href="#">Billing and Usage Reporting for S3 Buckets (p. 96)</a> .
<i>requestPayment</i>	By default, the AWS account that creates the bucket (the bucket owner) pays for downloads from the bucket. Using this subresource, the bucket owner can specify that the person requesting the download will be charged for the download. Amazon S3 provides an API for you to manage this subresource.  For more information, see <a href="#">Requester Pays Buckets (p. 92)</a> .
<i>transfer acceleration</i>	Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your client and an S3 bucket. Transfer Acceleration takes advantage of Amazon CloudFront's globally distributed edge locations.  For more information, see <a href="#">Amazon S3 Transfer Acceleration (p. 81)</a> .

## Bucket Restrictions and Limitations

A bucket is owned by the AWS account that created it. By default, you can create up to 100 buckets in each of your AWS accounts. If you need additional buckets, you can increase your bucket limit by submitting a service limit increase. For information about how to increase your bucket limit, see [AWS Service Limits](#) in the [AWS General Reference](#).

Bucket ownership is not transferable; however, if a bucket is empty, you can delete it. After a bucket is deleted, the name becomes available to reuse, but the name might not be available for you to reuse for various reasons. For example, some other account could create a bucket with that name. Note, too, that it might take some time before the name can be reused. So if you want to use the same bucket name, don't delete the bucket.

There is no limit to the number of objects that can be stored in a bucket and no difference in performance whether you use many buckets or just a few. You can store all of your objects in a single bucket, or you can organize them across several buckets.

You cannot create a bucket within another bucket.

The high-availability engineering of Amazon S3 is focused on get, put, list, and delete operations. Because bucket operations work against a centralized, global resource space, it is not appropriate to create or delete buckets on the high-availability code path of your application. It is better to create or delete buckets in a separate initialization or setup routine that you run less often.

**Note**

If your application automatically creates buckets, choose a bucket naming scheme that is unlikely to cause naming conflicts. Ensure that your application logic will choose a different bucket name if a bucket name is already taken.

## Rules for Bucket Naming

We recommend that all bucket names comply with DNS naming conventions. These conventions are enforced in all Regions except for the US East (N. Virginia) Region.

**Note**

If you use the AWS Management Console, bucket names must be DNS-compliant in all Regions.

DNS-compliant bucket names allow customers to benefit from new features and operational improvements, as well as providing support for virtual-host style access to buckets. While the US East (N. Virginia) Region currently allows non-compliant DNS bucket naming, we are moving to the same DNS-compliant bucket naming convention for the US East (N. Virginia) Region in the coming months. This ensures a single, consistent naming approach for Amazon S3 buckets. The rules for DNS-compliant bucket names are:

- Bucket names must be at least 3 and no more than 63 characters long.
- Bucket names must be a series of one or more labels. Adjacent labels are separated by a single period (.). Bucket names can contain lowercase letters, numbers, and hyphens. Each label must start and end with a lowercase letter or a number.
- Bucket names must not be formatted as an IP address (e.g., 192.168.5.4).
- When using virtual hosted-style buckets with SSL, the SSL wildcard certificate only matches buckets that do not contain periods. To work around this, use HTTP or write your own certificate verification logic. We recommend that you do not use periods (".") in bucket names.

The following examples are invalid bucket names:

Invalid Bucket Name	Comment
.myawsbucket	Bucket name cannot start with a period (.).
myawsbucket.	Bucket name cannot end with a period (.).
my..examplebucket	There can be only one period between labels.

## Challenges with Non-DNS-Compliant Bucket Names

The US East (N. Virginia) Region currently allows more relaxed standards for bucket naming, which can result in a bucket name that is not DNS-compliant. For example, `MyAWSBucket` is a valid bucket name, even though it contains uppercase letters. If you try to access this bucket by using a virtual-hosted-style request (`http://MyAWSBucket.s3.amazonaws.com/yourobject`), the URL resolves to the bucket `myawsbucket` and not the bucket `MyAWSBucket`. In response, Amazon S3 will return a "bucket not found" error.

To avoid this problem, we recommend as a best practice that you always use DNS-compliant bucket names regardless of the Region in which you create the bucket. For more information about virtual-hosted-style access to your buckets, see [Virtual Hosting of Buckets \(p. 51\)](#).

The name of the bucket used for Amazon S3 Transfer Acceleration must be DNS-compliant and must not contain periods ("."). For more information about transfer acceleration, see [Amazon S3 Transfer Acceleration \(p. 81\)](#).

The rules for bucket names in the US East (N. Virginia) Region allow bucket names to be as long as 255 characters, and bucket names can contain any combination of uppercase letters, lowercase letters, numbers, periods (.), hyphens (-), and underscores (\_).

## Examples of Creating a Bucket

### Topics

- [Using the Amazon S3 Console \(p. 64\)](#)
- [Using the AWS SDK for Java \(p. 64\)](#)
- [Using the AWS SDK for .NET \(p. 65\)](#)
- [Using the AWS SDK for Ruby Version 3 \(p. 67\)](#)
- [Using Other AWS SDKs \(p. 67\)](#)

This section provides code examples of creating a bucket programmatically using the AWS SDKs for Java, .NET, and Ruby. The code examples perform the following tasks:

- Create a bucket if it does not exist — The examples create a bucket as follows:
  - Create a client by explicitly specifying an AWS Region (example uses the `s3-eu-west-1` Region). Accordingly, the client communicates with Amazon S3 using the `s3-eu-west-1.amazonaws.com` endpoint. You can specify any other AWS Region. For a list of available AWS Regions, see [Regions and Endpoints](#) in the [AWS General Reference](#).
  - Send a create bucket request by specifying only a bucket name. The create bucket request does not specify another AWS Region; therefore, the client sends a request to Amazon S3 to create the bucket in the Region you specified when creating the client.

#### Note

If you specify a Region in your create bucket request that conflicts with the Region you specify when you create the client, you might get an error. For more information, see [Creating a Bucket \(p. 59\)](#).

The SDK libraries send the PUT bucket request to Amazon S3 (see [PUT Bucket](#)) to create the bucket.

- Retrieve bucket location information — Amazon S3 stores bucket location information in the `location` subresource associated with the bucket. The SDK libraries send the GET Bucket location request (see [GET Bucket location](#)) to retrieve this information.

## Using the Amazon S3 Console

For creating a bucket using Amazon S3 console, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Using the AWS SDK for Java

### Example

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;  
  
import com.amazonaws.AmazonClientException;
```

```

import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Region;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.CreateBucketRequest;
import com.amazonaws.services.s3.model.GetBucketLocationRequest;

public class CreateBucket {
    private static String bucketName      = "*** bucket name ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        s3client.setRegion(Region.getRegion(Regions.US_WEST_1));

        try {
            if(!s3client.doesBucketExist(bucketName))
            {
                // Note that CreateBucketRequest does not specify region. So bucket is
                // created in the region specified in the client.
                s3client.createBucket(new CreateBucketRequest(
                    bucketName));
            }
            // Get location.
            String bucketLocation = s3client.getBucketLocation(new
GetBucketLocationRequest(bucketName));
            System.out.println("bucket location = " + bucketLocation);

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, which " +
                "means your request made it " +
                "to Amazon S3, but was rejected with an error response" +
                " for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException, which " +
                "means the client encountered " +
                "an internal error while trying to " +
                "communicate with S3, " +
                "such as not being able to access the network.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}

```

## Using the AWS SDK for .NET

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

### Example

```

using System;
using Amazon.S3;
using Amazon.S3.Model;
using Amazon.S3.Util;

namespace s3.amazonaws.com.docsamples

```

```
{  
    class CreateBucket  
    {  
        static string bucketName = "**** bucket name ****";  
  
        public static void Main(string[] args)  
        {  
            using (var client = new AmazonS3Client(Amazon.RegionEndpoint.EUWest1))  
            {  
  
                if (!(AmazonS3Util.DoesS3BucketExist(client, bucketName)))  
                {  
                    CreateABucket(client);  
                }  
                // Retrieve bucket location.  
                string bucketLocation = FindBucketLocation(client);  
            }  
  
            Console.WriteLine("Press any key to continue...");  
            Console.ReadKey();  
        }  
  
        static string FindBucketLocation(IAmazonS3 client)  
        {  
            string bucketLocation;  
            GetBucketLocationRequest request = new GetBucketLocationRequest()  
            {  
                BucketName = bucketName  
            };  
            GetBucketLocationResponse response = client.GetBucketLocation(request);  
            bucketLocation = response.Location.ToString();  
            return bucketLocation;  
        }  
  
        static void CreateABucket(IAmazonS3 client)  
        {  
            try  
            {  
                PutBucketRequest putRequest1 = new PutBucketRequest()  
                {  
                    BucketName = bucketName,  
                    UseClientRegion = true  
                };  
  
                PutBucketResponse response1 = client.PutBucket(putRequest1);  
            }  
            catch (AmazonS3Exception amazonS3Exception)  
            {  
                if (amazonS3Exception.ErrorCode != null &&  
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")  
                     ||  
                     amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))  
                {  
                    Console.WriteLine("Check the provided AWS Credentials.");  
                    Console.WriteLine(  
                        "For service sign up go to http://aws.amazon.com/s3");  
                }  
                else  
                {  
                    Console.WriteLine(  
                        "Error occurred. Message:{0}' when writing an object"  
                        , amazonS3Exception.Message);  
                }  
            }  
        }  
    }  
}
```

}

## Using the AWS SDK for Ruby Version 3

For information about how to create and test a working sample, see [Using the AWS SDK for Ruby - Version 3 \(p. 617\)](#).

### Example

```
require 'aws-sdk'

s3 = Aws::S3::Client.new(region: 'us-west-1')
s3.create_bucket(bucket: 'bucket-name')
```

## Using Other AWS SDKs

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

## Deleting or Emptying a Bucket

It is easy to delete an empty bucket, however in some situations you may need to delete or empty a bucket that contains objects. In this section, we'll explain how to delete objects in an unversioned bucket (the default), and how to delete object versions and delete markers in a bucket that has versioning enabled. For more information about versioning, see [Using Versioning \(p. 448\)](#). In some situations, you may choose to empty a bucket instead of deleting it. This section explains various options you can use to delete or empty a bucket that contains objects.

### Topics

- [Delete a Bucket \(p. 67\)](#)
- [Empty a Bucket \(p. 70\)](#)

## Delete a Bucket

You can delete a bucket and its content programmatically using AWS SDK. You can also use lifecycle configuration on a bucket to empty its content and then delete the bucket. There are additional options, such as using Amazon S3 console and AWS CLI, but there are limitations on this method based on the number of objects in your bucket and the bucket's versioning status.

### Topics

- [Delete a Bucket: Using the Amazon S3 Console \(p. 67\)](#)
- [Delete a Bucket: Using the AWS CLI \(p. 68\)](#)
- [Delete a Bucket: Using Lifecycle Configuration \(p. 68\)](#)
- [Delete a Bucket: Using the AWS SDKs \(p. 68\)](#)

## Delete a Bucket: Using the Amazon S3 Console

The Amazon S3 console supports deleting a bucket that may or may not be empty. For information about using the Amazon S3 console to delete a bucket, see [How Do I Delete an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Delete a Bucket: Using the AWS CLI

You can delete a bucket that contains objects using the AWS CLI only if the bucket does not have versioning enabled. If your bucket does not have versioning enabled, you can use the `rb` (remove bucket) AWS CLI command with `--force` parameter to remove a non-empty bucket. This command deletes all objects first and then deletes the bucket.

```
$ aws s3 rb s3://bucket-name --force
```

For more information, see [Using High-Level S3 Commands with the AWS Command Line Interface](#) in the AWS Command Line Interface User Guide.

To delete a non-empty bucket that does not have versioning enabled, you have the following options:

- Delete the bucket programmatically using the AWS SDK.
- First, delete all of the objects using the bucket's lifecycle configuration and then delete the empty bucket using the Amazon S3 console.

## Delete a Bucket: Using Lifecycle Configuration

You can configure lifecycle on your bucket to expire objects, Amazon S3 then deletes expired objects. You can add lifecycle configuration rules to expire all or a subset of objects with a specific key name prefix. For example, to remove all objects in a bucket, you can set a lifecycle rule to expire objects one day after creation.

If your bucket has versioning enabled, you can also configure the rule to expire noncurrent objects.

After Amazon S3 deletes all of the objects in your bucket, you can delete the bucket or keep it.

**Important**

If you just want to empty the bucket and not delete it, make sure you remove the lifecycle configuration rule you added to empty the bucket so that any new objects you create in the bucket will remain in the bucket.

For more information, see [Object Lifecycle Management \(p. 125\)](#) and [Expiring Objects: General Considerations \(p. 130\)](#).

## Delete a Bucket: Using the AWS SDKs

You can use the AWS SDKs to delete a bucket. The following sections provide examples of how to delete a bucket using the AWS SDK for .NET and Java. First, the code deletes objects in the bucket and then it deletes the bucket. For information about other AWS SDKs, see [Tools for Amazon Web Services](#).

### Delete a Bucket Using the AWS SDK for Java

The following Java example deletes a non-empty bucket. First, the code deletes all objects and then it deletes the bucket. The code example also works for buckets with versioning enabled.

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import com.amazonaws.AmazonServiceException;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.ListVersionsRequest;
import com.amazonaws.services.s3.model.ObjectListing;
import com.amazonaws.services.s3.model.S3ObjectSummary;
import com.amazonaws.services.s3.model.S3VersionSummary;
import com.amazonaws.services.s3.model.VersionListing;
```

```
import java.util.Iterator;

/**
 * Delete an Amazon S3 bucket.
 *
 * This code expects that you have AWS credentials set up per:
 * http://docs.aws.amazon.com/java-sdk/latest/developer-guide/setup-credentials.html
 *
 * ++ Warning ++ This code will actually delete the bucket that you specify, as
 *               well as any objects within it!
 */
public class DeleteBucket
{
    public static void main(String[] args)
    {
        final String USAGE = "\n" +
            "To run this example, supply the name of an S3 bucket\n" +
            "\n" +
            "Ex: DeleteBucket <bucketname>\n";

        if (args.length < 1) {
            System.out.println(USAGE);
            System.exit(1);
        }

        String bucket_name = args[0];

        System.out.println("Deleting S3 bucket: " + bucket_name);
        final AmazonS3 s3 = new AmazonS3Client();

        try {
            System.out.println(" - removing objects from bucket");
            ObjectListing object_listing = s3.listObjects(bucket_name);
            while (true) {
                for (Iterator<?> iterator =
                    object_listing.getObjectSummaries().iterator();
                    iterator.hasNext();) {
                    S3ObjectSummary summary = (S3ObjectSummary)iterator.next();
                    s3.deleteObject(bucket_name, summary.getKey());
                }

                // more object_listing to retrieve?
                if (object_listing.isTruncated()) {
                    object_listing = s3.listNextBatchOfObjects(object_listing);
                } else {
                    break;
                }
            };
        }

        System.out.println(" - removing versions from bucket");
        VersionListing version_listing = s3.listVersions(
            new ListVersionsRequest().withBucketName(bucket_name));
        while (true) {
            for (Iterator<?> iterator =
                version_listing.getVersionSummaries().iterator();
                iterator.hasNext();) {
                S3VersionSummary vs = (S3VersionSummary)iterator.next();
                s3.deleteVersion(
                    bucket_name, vs.getKey(), vs.getVersionId());
            }

            if (version_listing.isTruncated()) {
                version_listing = s3.listNextBatchOfVersions(
                    version_listing);
            } else {
```

```
        break;
    }
}

System.out.println(" OK, bucket ready to delete!");
s3.deleteBucket(bucket_name);
} catch (AmazonServiceException e) {
    System.err.println(e.getErrorMessage());
    System.exit(1);
}
System.out.println("Done!");
}
```

## Empty a Bucket

You can empty a bucket's content (that is, delete all content, but keep the bucket) programmatically using the AWS SDK. You can also specify lifecycle configuration on a bucket to expire objects so that Amazon S3 can delete them. There are additional options, such as using Amazon S3 console and AWS CLI, but there are limitations on this method based on the number of objects in your bucket and the bucket's versioning status.

### Topics

- [Empty a Bucket: Using the Amazon S3 console \(p. 70\)](#)
- [Empty a Bucket: Using the AWS CLI \(p. 70\)](#)
- [Empty a Bucket: Using Lifecycle Configuration \(p. 71\)](#)
- [Empty a Bucket: Using the AWS SDKs \(p. 71\)](#)

## Empty a Bucket: Using the Amazon S3 console

For information about using the Amazon S3 console to empty a bucket, see [How Do I Empty an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*

## Empty a Bucket: Using the AWS CLI

You can empty a bucket using the AWS CLI only if the bucket does not have versioning enabled. If your bucket does not have versioning enabled, you can use the `rm` (remove) AWS CLI command with the `--recursive` parameter to empty a bucket (or remove a subset of objects with a specific key name prefix).

The following `rm` command removes objects with key name prefix `doc`, for example, `doc/doc1` and `doc/doc2`.

```
$ aws s3 rm s3://bucket-name/doc --recursive
```

Use the following command to remove all objects without specifying a prefix.

```
$ aws s3 rm s3://bucket-name --recursive
```

For more information, see [Using High-Level S3 Commands with the AWS Command Line Interface](#) in the AWS Command Line Interface User Guide.

### Note

You cannot remove objects from a bucket with versioning enabled. Amazon S3 adds a delete marker when you delete an object, which is what this command will do. For more information about versioning, see [Using Versioning \(p. 448\)](#).

To empty a bucket with versioning enabled, you have the following options:

- Delete the bucket programmatically using the AWS SDK.
- Use the bucket's lifecycle configuration to request that Amazon S3 delete the objects.
- Use the Amazon S3 console (can only use this option if your bucket contains less than 100,000 items—including both object versions and delete markers).

## Empty a Bucket: Using Lifecycle Configuration

You can configure lifecycle on your bucket to expire objects and request that Amazon S3 delete expired objects. You can add lifecycle configuration rules to expire all or a subset of objects with a specific key name prefix. For example, to remove all objects in a bucket, you can set lifecycle rule to expire objects one day after creation.

If your bucket has versioning enabled, you can also configure the rule to expire noncurrent objects.

**Warning**

After your objects expire, Amazon S3 deletes the expired objects. If you just want to empty the bucket and not delete it, make sure you remove the lifecycle configuration rule you added to empty the bucket so that any new objects you create in the bucket will remain in the bucket.

For more information, see [Object Lifecycle Management \(p. 125\)](#) and [Expiring Objects: General Considerations \(p. 130\)](#).

## Empty a Bucket: Using the AWS SDKs

You can use the AWS SDKs to empty a bucket or remove a subset of objects with a specific key name prefix.

For an example of how to empty a bucket using AWS SDK for Java, see [Delete a Bucket Using the AWS SDK for Java \(p. 68\)](#). The code deletes all objects, regardless of whether the bucket has versioning enabled or not, and then it deletes the bucket. To just empty the bucket, make sure you remove the statement that deletes the bucket.

For more information about using other AWS SDKs, see [Tools for Amazon Web Services](#).

## Amazon S3 Default Encryption for S3 Buckets

Amazon S3 default encryption provides a way to set the default encryption behavior for an S3 bucket. You can set default encryption on a bucket so that all objects are encrypted when they are stored in the bucket. The objects are encrypted using server-side encryption with either Amazon S3-managed keys (SSE-S3) or AWS KMS-managed keys (SSE-KMS).

When you use server-side encryption, Amazon S3 encrypts an object before saving it to disk in its data centers and decrypts it when you download the objects. For more information about protecting data using server-side encryption and encryption key management, see [Protecting Data Using Encryption \(p. 409\)](#).

Default encryption works with all existing and new S3 buckets. Without default encryption, to encrypt all objects stored in a bucket, you must include encryption information with every object storage request. You must also set up an S3 bucket policy to reject storage requests that don't include encryption information.

There are no new charges for using default encryption for S3 buckets. Requests to configure the default encryption feature incur standard Amazon S3 request charges. For information about pricing, see [Amazon S3 Pricing](#). For SSE-KMS encryption key storage, AWS Key Management Service charges apply and are listed at [AWS KMS Pricing](#).

Topics

- [How Do I Set Up Amazon S3 Default Encryption for an S3 Bucket? \(p. 72\)](#)
- [Moving to Default Encryption from Using Bucket Policies for Encryption Enforcement \(p. 72\)](#)
- [Using Default Encryption with Cross-Region Replication \(p. 72\)](#)
- [Monitoring Default Encryption with CloudTrail and CloudWatch \(p. 73\)](#)
- [More Info \(p. 74\)](#)

## How Do I Set Up Amazon S3 Default Encryption for an S3 Bucket?

This section describes how to set up Amazon S3 default encryption. You can use the AWS SDKs, the Amazon S3 REST API, the AWS Command Line Interface (AWS CLI), or the Amazon S3 console to enable the default encryption. The easiest way to set up default encryption for an S3 bucket is by using the AWS Management Console.

You can set up default encryption on a bucket using any of the following ways:

- Use the Amazon S3 console. For more information, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.
- Use the following REST APIs:
  - Use the REST API [PUT Bucket encryption](#) operation to enable default encryption and to set the type of server-side encryption to use—SSE-S3 or SSE-KMS.
  - Use the REST API [DELETE Bucket encryption](#) to disable the default encryption of objects. After you disable default encryption, Amazon S3 encrypts objects only if `PUT` requests include the encryption information. For more information, see [PUT Object](#) and [PUT Object - Copy](#).
  - Use the REST API [GET Bucket encryption](#) to check the current default encryption configuration.
- Use the AWS CLI and AWS SDKs. For more information, see [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#).

After you enable default encryption for a bucket, the following encryption behavior applies:

- There is no change to the encryption of the objects that existed in the bucket before default encryption was enabled.
- When you upload objects after enabling default encryption:
  - If your `PUT` request headers don't include encryption information, Amazon S3 uses the bucket's default encryption settings to encrypt the objects.
  - If your `PUT` request headers include encryption information, Amazon S3 uses the encryption information from the `PUT` request to encrypt objects before storing them in Amazon S3. If the `PUT` succeeds, the response is an `HTTP/1.1 200 OK` with the encryption information in the response headers. For more information, see [PUT Object](#).
- If you use the SSE-KMS option for your default encryption configuration, you are subject to the RPS (requests per second) limits of AWS KMS. For more information about AWS KMS limits and how to request a limit increase, see [AWS KMS limits](#).

## Moving to Default Encryption from Using Bucket Policies for Encryption Enforcement

If you currently enforce object encryption for an S3 bucket by using a bucket policy to reject `PUT` requests without encryption headers, we recommend that you use the following procedure to start using default encryption.

### To change from using a bucket policy to reject `PUT` requests without encryption headers to using default encryption

1. If you plan to specify that default encryption use SSE-KMS, make sure that all `PUT` and `GET` object requests are signed using Signature Version 4 and sent over an SSL connection to Amazon S3. For information about using AWS KMS, see [Protecting Data Using Server-Side Encryption with AWS KMS–Managed Keys \(SSE-KMS\) \(p. 410\)](#).

#### Note

By default, the Amazon S3 console, the AWS CLI version 1.11.108 and later, and all AWS SDKs released after May 2016 use Signature Version 4 signed requests sent to Amazon S3 over an SSL connection.

2. Delete the bucket policy statements that reject `PUT` requests without encryption headers. (We recommend that you save a backup copy of the bucket policy that is being replaced.)
3. To ensure that the encryption behavior is set as you want, test multiple `PUT` requests to closely simulate your actual workload.
4. If you are using default encryption with SSE-KMS, monitor your clients for failing `PUT` and `GET` requests that weren't failing before your changes. Most likely these are the requests that you didn't update according to Step 1. Change the failing `PUT` or `GET` requests to be signed with AWS Signature Version 4 and sent over SSL.

After you enable default encryption for your S3 bucket, objects stored in Amazon S3 through any `PUT` requests without encryption headers are encrypted using the bucket-level default encryption settings.

## Using Default Encryption with Cross-Region Replication

After you enable default encryption for a cross-region replication destination bucket, the following encryption behavior applies:

- If objects in the source bucket are not encrypted, the replica objects in the destination bucket are encrypted using the default encryption settings of the destination bucket. This results in the `ETag` of the source object being different from the `ETag` of the replica object. You must update applications that use the `ETag` to accommodate for this difference.
- If objects in the source bucket are encrypted using SSE-S3 or SSE-KMS, the replica objects in the destination bucket use the same encryption as the source object encryption. The default encryption settings of the destination bucket are not used.

## Monitoring Default Encryption with CloudTrail and CloudWatch

You can track default encryption configuration requests through AWS CloudTrail events. The API event names used in CloudTrail logs are `PutBucketEncryption`, `GetBucketEncryption`, and `DeleteBucketEncryption`. You can also create Amazon CloudWatch Events with S3 bucket-level operations as the event type. For more information about CloudTrail events, see [How Do I Enable Object-Level Logging for an S3 Bucket with CloudWatch Data Events?](#)

You can use CloudTrail logs for object-level Amazon S3 actions to track `PUT` and `POST` requests to Amazon S3 to verify whether default encryption is being used to encrypt objects when incoming `PUT` requests don't have encryption headers.

When Amazon S3 encrypts an object using the default encryption settings, the log includes the following field as the name/value pair: "SSE\_Applied":"Default\_SSE\_S3" or "SSE\_Applied":"Default\_SSE\_KMS".

When Amazon S3 encrypts an object using the PUT encryption headers, the log includes the following field as the name/value pair: "SSEApplied":"SSE\_S3", "SSEApplied":"SSE\_KMS", or "SSEApplied":"SSE\_C". For multipart uploads, this information is included in the InitiateMultipartUpload API requests. For more information about using CloudTrail and CloudWatch, see [Monitoring Amazon S3 \(p. 566\)](#).

## More Info

- [PUT Bucket encryption](#)
- [DELETE Bucket encryption](#)
- [GET Bucket encryption](#)

# Managing Bucket Website Configuration

## Topics

- [Managing Websites with the AWS Management Console \(p. 74\)](#)
- [Managing Websites with the AWS SDK for Java \(p. 74\)](#)
- [Managing Websites with the AWS SDK for .NET \(p. 76\)](#)
- [Managing Websites with the AWS SDK for PHP \(p. 79\)](#)
- [Managing Websites with the REST API \(p. 81\)](#)

You can host static websites in Amazon S3 by configuring your bucket for website hosting. For more information, see [Hosting a Static Website on Amazon S3 \(p. 471\)](#). There are several ways you can manage your bucket's website configuration. You can use the AWS Management Console to manage configuration without writing any code. You can programmatically create, update, and delete the website configuration by using the AWS SDKs. The SDKs provide wrapper classes around the Amazon S3 REST API. If your application requires it, you can send REST API requests directly from your application.

## Managing Websites with the AWS Management Console

For more information, see [Configuring a Bucket for Website Hosting \(p. 473\)](#).

## Managing Websites with the AWS SDK for Java

The following tasks guide you through using the Java classes to manage website configuration to your bucket. For more information about the Amazon S3 website feature, see [Hosting a Static Website on Amazon S3 \(p. 471\)](#).

### Managing Website Configuration

1	Create an instance of the <code>AmazonS3</code> class.
2	To add website configuration to a bucket, execute the <code>AmazonS3.setBucketWebsiteConfiguration</code> method. You need to provide the bucket name and the website configuration information, including the index document

and the error document names. You must provide the index document, but the error document is optional. You provide website configuration information by creating a `BucketWebsiteConfiguration` object.

To retrieve website configuration, execute the `AmazonS3.getBucketWebsiteConfiguration` method by providing the bucket name.

To delete your bucket website configuration, execute the `AmazonS3.deleteBucketWebsiteConfiguration` method by providing the bucket name. After you remove the website configuration, the bucket is no longer available from the website endpoint. For more information, see [Website Endpoints \(p. 472\)](#).

The following Java code sample demonstrates the preceding tasks.

### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
// Add website configuration.
s3Client.setBucketWebsiteConfiguration(bucketName,
    new BucketWebsiteConfiguration(indexDoc , errorDoc));

// Get website configuration.
BucketWebsiteConfiguration bucketWebsiteConfiguration =
    s3Client.getBucketWebsiteConfiguration(bucketName);

// Delete website configuration.
s3Client.deleteBucketWebsiteConfiguration(bucketName);
```

### Example

The following Java code example adds a website configuration to the specified bucket, retrieves it, and deletes the website configuration. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.BucketWebsiteConfiguration;

public class WebsiteConfiguration {
    private static String bucketName = "*** bucket name ***";
    private static String indexDoc   = "*** index document name ***";
    private static String errorDoc   = "*** error document name ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

        try {
            // Get existing website configuration, if any.
            getWebsiteConfig(s3Client);

            // Set new website configuration.
            s3Client.setBucketWebsiteConfiguration(bucketName,
                new BucketWebsiteConfiguration(indexDoc, errorDoc));
        }
    }
}
```

```

// Verify (Get website configuration again).
getWebsiteConfig(s3Client);

// Delete
s3Client.deleteBucketWebsiteConfiguration(bucketName);

// Verify (Get website configuration again)
getWebsiteConfig(s3Client);

}

} catch (AmazonServiceException ase) {
    System.out.println("Caught an AmazonServiceException, which" +
        " means your request made it " +
        "to Amazon S3, but was rejected with an error response" +
        " for some reason.");
    System.out.println("Error Message: " + ase.getMessage());
    System.out.println("HTTP Status Code: " + ase.getStatusCode());
    System.out.println("AWS Error Code: " + ase.getErrorCode());
    System.out.println("Error Type: " + ase.getErrorType());
    System.out.println("Request ID: " + ase.getRequestId());
} catch (AmazonClientException ace) {
    System.out.println("Caught an AmazonClientException, which means" +
        " the client encountered " +
        "a serious internal problem while trying to " +
        "communicate with Amazon S3, " +
        "such as not being able to access the network.");
    System.out.println("Error Message: " + ace.getMessage());
}
}

private static BucketWebsiteConfiguration getWebsiteConfig(
    AmazonS3 s3Client) {
    System.out.println("Get website config");

    // 1. Get website config.
    BucketWebsiteConfiguration bucketWebsiteConfiguration =
        s3Client.getBucketWebsiteConfiguration(bucketName);
    if (bucketWebsiteConfiguration == null)
    {
        System.out.println("No website config.");
    }
    else
    {
        System.out.println("Index doc:" +
            bucketWebsiteConfiguration.getIndexDocumentSuffix());
        System.out.println("Error doc:" +
            bucketWebsiteConfiguration.getErrorDocument());
    }
    return bucketWebsiteConfiguration;
}
}

```

## Managing Websites with the AWS SDK for .NET

The following tasks guide you through using the .NET classes to manage website configuration on your bucket. For more information about the Amazon S3 website feature, see [Hosting a Static Website on Amazon S3 \(p. 471\)](#).

### Managing Bucket Website Configuration

1	Create an instance of the <code>AmazonS3Client</code> class.
---	--

- 2 To add website configuration to a bucket, execute the `PutBucketWebsite` method. You need to provide the bucket name and the website configuration information, including the index document and the error document names. You must provide the index document, but the error document is optional. You provide this information by creating a `PutBucketWebsiteRequest` object.
- To retrieve website configuration, execute the `GetBucketWebsite` method by providing the bucket name.
- To delete your bucket website configuration, execute the `DeleteBucketWebsite` method by providing the bucket name. After you remove the website configuration, the bucket is no longer available from the website endpoint. For more information, see [Website Endpoints \(p. 472\)](#).

The following C# code sample demonstrates the preceding tasks.

### Example

```
static IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USWest2);

// Add website configuration.
PutBucketWebsiteRequest putRequest = new PutBucketWebsiteRequest()
{
    BucketName = bucketName,
    WebsiteConfiguration = new WebsiteConfiguration()
    {
        IndexDocumentSuffix = indexDocumentSuffix,
        ErrorDocument = errorDocument
    }
};
client.PutBucketWebsite(putRequest);

// Get bucket website configuration.
GetBucketWebsiteRequest getRequest = new GetBucketWebsiteRequest()
{
    BucketName = bucketName
};

GetBucketWebsiteResponse getResponse = client.GetBucketWebsite(getRequest);

// Print configuration data.
Console.WriteLine("Index document: {0}",
    getResponse.WebsiteConfiguration.IndexDocumentSuffix);
Console.WriteLine("Error document: {0}", getResponse.WebsiteConfiguration.ErrorDocument);

// Delete website configuration.
DeleteBucketWebsiteRequest deleteRequest = new DeleteBucketWebsiteRequest()
{
    BucketName = bucketName
};
client.DeleteBucketWebsite(deleteRequest);
```

### Example

The following C# code example adds a website configuration to the specified bucket. The configuration specifies both the index document and the error document names. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
```

```
using System.Configuration;
using System.Collections.Specialized;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazon.com.docsamples
{
    class AddWebsiteConfig
    {
        static string bucketName      = "*** Provide existing bucket name ***";
        static string indexDocumentSuffix = "*** Provide index document name ***";
        static string errorDocument     = "*** Provide error document name ***";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USWest2))
            {
                Console.WriteLine("Adding website configuration");
                AddWebsiteConfiguration(bucketName, indexDocumentSuffix, errorDocument);
            }

            // Get bucket website configuration.
            GetBucketWebsiteRequest getRequest = new GetBucketWebsiteRequest()
            {
                BucketName = bucketName
            };

            GetBucketWebsiteResponse getResponse = client.GetBucketWebsite(getRequest);
            // Print configuration data.
            Console.WriteLine("Index document: {0}",
getResponse.WebsiteConfiguration.IndexDocumentSuffix);
            Console.WriteLine("Error document: {0}",
getResponse.WebsiteConfiguration.ErrorDocument);

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static void AddWebsiteConfiguration(string bucketName,
                                            string indexDocumentSuffix,
                                            string errorDocument)
        {
            try
            {
                PutBucketWebsiteRequest putRequest = new PutBucketWebsiteRequest()
                {
                    BucketName = bucketName,
                    WebsiteConfiguration = new WebsiteConfiguration()
                    {
                        IndexDocumentSuffix = indexDocumentSuffix,
                        ErrorDocument = errorDocument
                    }
                };
                client.PutBucketWebsite(putRequest);
            }
            catch (AmazonS3Exception amazonS3Exception)
            {
                if (amazonS3Exception.ErrorCode != null &&
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                     || amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                {
                    Console.WriteLine("Check the provided AWS Credentials.");
                    Console.WriteLine("Sign up for service at http://aws.amazon.com/s3");
                }
            }
        }
    }
}
```

```
        {
            Console.WriteLine(
                "Error:{0}, occurred when adding website configuration.
Message:'{1}'",
                amazonS3Exception.ErrorCode, amazonS3Exception.Message);
        }
    }
}
```

## Managing Websites with the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to configure and manage an Amazon S3 bucket for website hosting. For more information about the Amazon S3 website feature, see [Hosting a Static Website on Amazon S3 \(p. 471\)](#).

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

The following tasks guide you through using the PHP SDK classes to configure and manage an Amazon S3 bucket for website hosting.

### Configuring a Bucket for Website Hosting

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	To configure a bucket as a website, execute the <a href="#">Aws\S3\S3Client::putBucketWebsite()</a> method. You need to provide the bucket name and the website configuration information, including the index document and the error document names. If you don't provide these document names, this method adds the <code>index.html</code> and <code>error.html</code> default names to the website configuration. You must verify that these documents are present in the bucket.
3	To retrieve existing bucket website configuration, execute the <a href="#">Aws\S3\S3Client::getBucketWebsite()</a> method.
4	To delete website configuration from a bucket, execute the <a href="#">Aws\S3\S3Client::deleteBucketWebsite()</a> method, passing the bucket name as a parameter. If you remove the website configuration, the bucket is no longer accessible from the website endpoints.

The following PHP code sample demonstrates the preceding tasks.

### Example

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';

// 1. Instantiate the client.
$s3 = S3Client::factory();

// 2. Add website configuration.
$result = $s3->putBucketWebsite(array(
    'Bucket'      => $bucket,
    'IndexDocument' => array('Suffix' => 'index.html'),
```

```
'ErrorDocument' => array('Key' => 'error.html'),  
));  
  
// 3. Retrieve website configuration.  
$result = $s3->getBucketWebsite(array(  
    'Bucket' => $bucket,  
));  
echo $result->getPath('IndexDocument/Suffix');  
  
// 4.) Delete website configuration.  
$result = $s3->deleteBucketWebsite(array(  
    'Bucket' => $bucket,  
));
```

### Example of Configuring an Bucket Amazon S3 for Website Hosting

The following PHP code example first adds a website configuration to the specified bucket. The `create_website_config` method explicitly provides the index document and error document names. The sample also retrieves the website configuration and prints the response. For more information about the Amazon S3 website feature, see [Hosting a Static Website on Amazon S3 \(p. 471\)](#).

For instructions on how to create and test a working sample, see [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#).

```
<?php  
  
// Include the AWS SDK using the Composer autoloader.  
require 'vendor/autoload.php';  
  
use Aws\S3\S3Client;  
  
$bucket = '*** Your Bucket Name ***';  
  
// Instantiate the client.  
$s3 = S3Client::factory();  
  
// 1.) Add website configuration.  
$result = $s3->putBucketWebsite(array(  
    'Bucket' => $bucket,  
    'IndexDocument' => array('Suffix' => 'index.html'),  
    'ErrorDocument' => array('Key' => 'error.html'),  
));  
  
// 2.) Retrieve website configuration.  
$result = $s3->getBucketWebsite(array(  
    'Bucket' => $bucket,  
));  
echo $result->getPath('IndexDocument/Suffix');  
  
// 3.) Delete website configuration.  
$result = $s3->deleteBucketWebsite(array(  
    'Bucket' => $bucket,  
));
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::deleteBucketWebsite\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::getBucketWebsite\(\) Method](#)

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::putBucketWebsite\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Managing Websites with the REST API

You can use the AWS Management Console or the AWS SDK to configure a bucket as a website. However, if your application requires it, you can send REST requests directly. For more information, see the following sections in the Amazon Simple Storage Service API Reference.

- [PUT Bucket website](#)
- [GET Bucket website](#)
- [DELETE Bucket website](#)

## Amazon S3 Transfer Acceleration

Amazon S3 Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your client and an S3 bucket. Transfer Acceleration takes advantage of Amazon CloudFront's globally distributed edge locations. As the data arrives at an edge location, data is routed to Amazon S3 over an optimized network path.

When using Transfer Acceleration, additional data transfer charges may apply. For more information about pricing, see [Amazon S3 Pricing](#).

### Topics

- [Why Use Amazon S3 Transfer Acceleration? \(p. 81\)](#)
- [Getting Started with Amazon S3 Transfer Acceleration \(p. 82\)](#)
- [Requirements for Using Amazon S3 Transfer Acceleration \(p. 83\)](#)
- [Amazon S3 Transfer Acceleration Examples \(p. 83\)](#)

## Why Use Amazon S3 Transfer Acceleration?

You might want to use Transfer Acceleration on a bucket for various reasons, including the following:

- You have customers that upload to a centralized bucket from all over the world.
- You transfer gigabytes to terabytes of data on a regular basis across continents.
- You underutilize the available bandwidth over the Internet when uploading to Amazon S3.

For more information about when to use Transfer Acceleration, see [Amazon S3 FAQs](#).

## Using the Amazon S3 Transfer Acceleration Speed Comparison Tool

You can use the [Amazon S3 Transfer Acceleration Speed Comparison tool](#) to compare accelerated and non-accelerated upload speeds across Amazon S3 regions. The Speed Comparison tool uses multipart uploads to transfer a file from your browser to various Amazon S3 regions with and without using Transfer Acceleration.

You can access the Speed Comparison tool using either of the following methods:

- Copy the following URL into your browser window, replacing `region` with the region that you are using (for example, us-west-2) and `yourBucketName` with the name of the bucket that you want to evaluate:

`http://s3-accelerate-speedtest.s3-accelerate.amazonaws.com/en/accelerate-speed-comparsion.html?region=region&origBucketName=yourBucketName`

For a list of the regions supported by Amazon S3, see [Regions and Endpoints](#) in the *Amazon Web Services General Reference*.

- Use the Amazon S3 console. For details, see [Enabling Transfer Acceleration](#) in the *Amazon Simple Storage Service Console User Guide*.

## Getting Started with Amazon S3 Transfer Acceleration

To get started using Amazon S3 Transfer Acceleration perform the following steps:

1. **Enable Transfer Acceleration on a bucket** – For your bucket to work with transfer acceleration, the bucket name must conform to DNS naming requirements and must not contain periods (".").

You can enable Transfer Acceleration on a bucket any of the following ways:

- Use the Amazon S3 console. For more information, see [Enabling Transfer Acceleration](#) in the *Amazon Simple Storage Service Console User Guide*.
- Use the REST API [PUT Bucket accelerate](#) operation.
- Use the AWS CLI and AWS SDKs. For more information, see [Using the AWS SDKs, CLI, and Explorers](#) (p. 609).

2. **Transfer data to and from the acceleration-enabled bucket by using one of the following s3-accelerate endpoint domain names:**

- `bucketname.s3-accelerate.amazonaws.com` – to access an acceleration-enabled bucket.
- `bucketname.s3-accelerate.dualstack.amazonaws.com` – to access an acceleration-enabled bucket over IPv6. Amazon S3 dual-stack endpoints support requests to S3 buckets over IPv6 and IPv4. The Transfer Acceleration dual-stack endpoint only uses the virtual hosted-style type of endpoint name. For more information, see [Getting Started Making Requests over IPv6](#) (p. 13) and [Using Amazon S3 Dual-Stack Endpoints](#) (p. 15).

### Important

Currently support for the dual-stack accelerated endpoint is only available from the AWS Java SDK. For an example, see [Creating an Amazon S3 Java Client to Use the Transfer Acceleration Dual-Stack Endpoint](#) (p. 86). Support for the AWS CLI and other AWS SDKs is coming soon.

### Note

You can continue to use the regular endpoint in addition to the accelerate endpoints.

You can point your Amazon S3 PUT object and GET object requests to the s3-accelerate endpoint domain name after you enable Transfer Acceleration. For example, let's say you currently have a REST API application using [PUT Object](#) that uses the host name `mybucket.s3.amazonaws.com` in the PUT request. To accelerate the PUT you simply change the host name in your request to `mybucket.s3-accelerate.amazonaws.com`. To go back to using the standard upload speed, simply change the name back to `mybucket.s3.amazonaws.com`.

After Transfer Acceleration is enabled, it can take up to 20 minutes for you to realize the performance benefit. However, the accelerate endpoint will be available as soon as you enable Transfer Acceleration.

You can use the accelerate endpoint in the AWS CLI, AWS SDKs, and other tools that transfer data to and from Amazon S3. If you are using the AWS SDKs, some of the supported languages use an accelerate endpoint client configuration flag so you don't need to explicitly set the endpoint for Transfer Acceleration to `bucketname.s3-accelerate.amazonaws.com`. For examples of how to use an accelerate endpoint client configuration flag, see [Amazon S3 Transfer Acceleration Examples \(p. 83\)](#).

You can use all of the Amazon S3 operations through the transaction acceleration endpoints, except for the following operations: [GET Service \(list buckets\)](#), [PUT Bucket \(create bucket\)](#), and [DELETE Bucket](#). Also, Amazon S3 Transfer Acceleration does not support cross region copies using [PUT Object - Copy](#).

## Requirements for Using Amazon S3 Transfer Acceleration

The following are the requirements for using Transfer Acceleration on an S3 bucket:

- Transfer Acceleration is only supported on virtual style requests. For more information about virtual style requests, see [Making Requests Using the REST API \(p. 50\)](#).
- The name of the bucket used for Transfer Acceleration must be DNS-compliant and must not contain periods (".").
- Transfer Acceleration must be enabled on the bucket. After enabling Transfer Acceleration on a bucket it might take up to thirty minutes before the data transfer speed to the bucket increases.
- To access the bucket that is enabled for Transfer Acceleration, you must use the endpoint `bucketname.s3-accelerate.amazonaws.com` or the dual-stack endpoint `bucketname.s3-accelerate.dualstack.amazonaws.com` to connect to the enabled bucket over IPv6.
- You must be the bucket owner to set the transfer acceleration state. The bucket owner can assign permissions to other users to allow them to set the acceleration state on a bucket. The `s3:PutAccelerateConfiguration` permission permits users to enable or disable Transfer Acceleration on a bucket. The `s3:GetAccelerateConfiguration` permission permits users to return the Transfer Acceleration state of a bucket, which is either Enabled or Suspended. For more information about these permissions, see [Permissions Related to Bucket Subresource Operations \(p. 341\)](#) and [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

## More Info

- [GET Bucket accelerate](#)
- [PUT Bucket accelerate](#)

## Amazon S3 Transfer Acceleration Examples

This section provides examples of how to enable Amazon S3 Transfer Acceleration on a bucket and use the acceleration endpoint for the enabled bucket. Some of the AWS SDK supported languages (for example, Java and .NET) use an accelerate endpoint client configuration flag so you don't need to explicitly set the endpoint for Transfer Acceleration to `bucketname.s3-accelerate.amazonaws.com`. For more information about Transfer Acceleration, see [Amazon S3 Transfer Acceleration \(p. 81\)](#).

Topics

- [Using the Amazon S3 Console \(p. 84\)](#)
- [Using Transfer Acceleration from the AWS Command Line Interface \(AWS CLI\) \(p. 84\)](#)
- [Using Transfer Acceleration from the AWS SDK for Java \(p. 85\)](#)
- [Using Transfer Acceleration from the AWS SDK for .NET \(p. 88\)](#)
- [Using Transfer Acceleration from the AWS SDK for JavaScript \(p. 92\)](#)
- [Using Transfer Acceleration from the AWS SDK for Python \(Boto\) \(p. 92\)](#)
- [Using Other AWS SDKs \(p. 92\)](#)

## Using the Amazon S3 Console

For information about enabling Transfer Acceleration on a bucket using the Amazon S3 console, see [Enabling Transfer Acceleration](#) in the *Amazon Simple Storage Service Console User Guide*.

## Using Transfer Acceleration from the AWS Command Line Interface (AWS CLI)

This section provides examples of AWS CLI commands used for Transfer Acceleration. For instructions on setting up the AWS CLI, see [Set Up the AWS CLI \(p. 611\)](#).

### Enabling Transfer Acceleration on a Bucket Using the AWS CLI

Use the AWS CLI [put-bucket-accelerate-configuration](#) command to enable or suspend Transfer Acceleration on a bucket. The following example sets Status=Enabled to enable Transfer Acceleration on a bucket. You use Status=Suspended to suspend Transfer Acceleration.

#### Example

```
$ aws s3api put-bucket-accelerate-configuration --bucket bucketname --accelerate-configuration Status=Enabled
```

## Using the Transfer Acceleration from the AWS CLI

Setting the configuration value `use_accelerate_endpoint` to `true` in a profile in your AWS Config File will direct all Amazon S3 requests made by `s3` and `s3api` AWS CLI commands to the accelerate endpoint: `s3-accelerate.amazonaws.com`. Transfer Acceleration must be enabled on your bucket to use the accelerate endpoint.

All request are sent using the virtual style of bucket addressing: `my-bucket.s3-accelerate.amazonaws.com`. Any `ListBuckets`, `CreateBucket`, and `DeleteBucket` requests will not be sent to the accelerate endpoint as the endpoint does not support those operations. For more information about `use_accelerate_endpoint`, see [AWS CLI S3 Configuration](#).

The following example sets `use_accelerate_endpoint` to `true` in the default profile.

#### Example

```
$ aws configure set default.s3.use_accelerate_endpoint true
```

If you want to use the accelerate endpoint for some AWS CLI commands but not others, you can use either one of the following two methods:

- You can use the accelerate endpoint per command by setting the `--endpoint-url` parameter to `https://s3-accelerate.amazonaws.com` or `http://s3-accelerate.amazonaws.com` for any `s3` or `s3api` command.

- You can setup separate profiles in your AWS Config File. For example, create one profile that sets `use_accelerate_endpoint` to `true` and a profile that does not set `use_accelerate_endpoint`. When you execute a command specify which profile you want to use, depending upon whether or not you want to use the accelerate endpoint.

## AWS CLI Examples of Uploading an Object to a Bucket Enabled for Transfer Acceleration

The following example uploads a file to a bucket enabled for Transfer Acceleration by using the default profile that has been configured to use the accelerate endpoint.

### Example

```
$ aws s3 cp file.txt s3://bucketname/KeyName --region region
```

The following example uploads a file to a bucket enabled for Transfer Acceleration by using the `--endpoint-url` parameter to specify the accelerate endpoint.

### Example

```
$ aws configure set s3.addressing_style virtual
$ aws s3 cp file.txt s3://bucketname/KeyName --region region --endpoint-url http://s3-accelerate.amazonaws.com
```

## Using Transfer Acceleration from the AWS SDK for Java

This section provides examples of using the AWS SDK for Java for Transfer Acceleration. For information about how to create and test a working Java sample, see [Testing the Java Code Examples \(p. 613\)](#).

### Enabling Amazon S3 Transfer Acceleration on a Bucket from the AWS SDK for Java

The following Java example shows how to enable Transfer Acceleration on a bucket.

### Example

```
import java.io.IOException;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Region;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.BucketAccelerateConfiguration;
import com.amazonaws.services.s3.model.BucketAccelerateStatus;
import com.amazonaws.services.s3.model.GetBucketAccelerateConfigurationRequest;
import com.amazonaws.services.s3.model.SetBucketAccelerateConfigurationRequest;

public class BucketAccelerationConfiguration {

    public static String bucketName = "*** Provide bucket name ***";
    public static AmazonS3Client s3Client;

    public static void main(String[] args) throws IOException {
        s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        s3Client.setRegion(Region.getRegion(Regions.US_WEST_2));
        SetBucketAccelerateConfigurationRequest request =
            new SetBucketAccelerateConfigurationRequest(bucketName);
        request.setAccelerateStatus(BucketAccelerateStatus.enabled);
        s3Client.setBucketAccelerateConfiguration(request);
    }
}
```

```
// 1. Enable bucket for Amazon S3 Transfer Acceleration.  
    s3Client.setBucketAccelerateConfiguration(new  
SetBucketAccelerateConfigurationRequest(bucketName,  
    new BucketAccelerateConfiguration(BucketAccelerateStatus.Enabled)));  
  
    // 2. Get the acceleration status of the bucket.  
    String accelerateStatus = s3Client.getBucketAccelerateConfiguration(new  
GetBucketAccelerateConfigurationRequest(bucketName)).getStatus();  
  
    System.out.println("Acceleration status = " + accelerateStatus);  
}  
}
```

## Creating an Amazon S3 Client to Use a Amazon S3 Transfer Acceleration Endpoint from the AWS SDK for Java

You use the `setS3ClientOptions` method from the AWS Java SDK to use a transfer acceleration endpoint when creating an instance of `AmazonS3Client`.

### Creating an Amazon S3 Java Client to Use the Transfer Acceleration Endpoint

The following example shows how to use the `setS3ClientOptions` method from the AWS Java SDK to use a transfer acceleration endpoint when creating an instance of `AmazonS3Client`.

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());  
s3Client.setRegion(Region.getRegion(Regions.US_WEST_2));  
s3Client.setS3ClientOptions(S3ClientOptions.builder().setAccelerateModeEnabled(true).build());
```

### Creating an Amazon S3 Java Client to Use the Transfer Acceleration Dual-Stack Endpoint

The following example shows how to use the `setS3ClientOptions` method from the AWS Java SDK to use a Transfer Acceleration dual-stack endpoint when creating an instance of `AmazonS3Client`.

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());  
s3Client.setRegion(Region.getRegion(Regions.US_WEST_2));  
s3Client.setS3ClientOptions(S3ClientOptions.builder().enableDualstack().setAccelerateModeEnabled(true));
```

If you are using the AWS Java SDK on Microsoft Windows to use a Transfer Acceleration dual-stack endpoint, you might have to set the following Java virtual machine (JVM) property.

```
java.net.preferIPv6Addresses=true
```

## Uploading Objects to a Bucket Enabled for Transfer Acceleration Using the AWS SDK for Java

The Java examples in this section show how to use the accelerate endpoint to upload objects. You can use the examples with the Transfer Acceleration dual-stack endpoint by changing the code that creates an instance of `AmazonS3Client` as described in [Creating an Amazon S3 Java Client to Use the Transfer Acceleration Dual-Stack Endpoint \(p. 86\)](#).

For information about how to create and test a working Java sample, see [Testing the Java Code Examples \(p. 613\)](#).

### Java Example: Uploading a Single Object to a Bucket Enabled for Transfer Acceleration

The following Java example shows how to use the accelerate endpoint to upload a single object.

## Example

```
import java.io.File;
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Region;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.S3ClientOptions;
import com.amazonaws.services.s3.model.PutObjectRequest;

public class AcceleratedUploadSingleObject {

    private static String bucketName      = "*** Provide bucket name ***";
    private static String keyName        = "*** Provide key name ***";
    private static String uploadFileName = "*** Provide file name with full path ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        s3Client.setRegion(Region.getRegion(Regions.US_WEST_2));

        // Use Amazon S3 Transfer Acceleration endpoint.

        s3Client.setS3ClientOptions(S3ClientOptions.builder().setAccelerateModeEnabled(true).build());

        try {
            System.out.println("Uploading a new object to S3 from a file\n");
            File file = new File(uploadFileName);
            s3Client.putObject(new PutObjectRequest(
                bucketName, keyName, file));

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, which " +
                "means your request made it " +
                "to Amazon S3, but was rejected with an error response" +
                " for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException, which " +
                "means the client encountered " +
                "an internal error while trying to " +
                "communicate with S3, " +
                "such as not being able to access the network.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}
```

## Java Example: Multipart Upload to a Bucket Enabled for Transfer Acceleration

The following Java example shows how to use the accelerate endpoint for a multipart upload.

## Example

```
import java.io.File;
```

```
import com.amazonaws.AmazonClientException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.S3ClientOptions;

import com.amazonaws.services.s3.transfer.TransferManager;
import com.amazonaws.services.s3.transfer.Upload;

public class AccelerateMultipartUploadUsingHighLevelAPI {

    private static String EXISTING_BUCKET_NAME = "*** Provide bucket name ***";
    private static String KEY_NAME = "*** Provide key name ***";
    private static String FILE_PATH = "*** Provide file name with full path ***";

    public static void main(String[] args) throws Exception {

        AmazonS3Client s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        s3Client.configureRegion(Regions.US_WEST_2);

        // Use Amazon S3 Transfer Acceleration endpoint.

        s3Client.setS3ClientOptions(S3ClientOptions.builder().setAccelerateModeEnabled(true).build());

        TransferManager tm = new TransferManager(s3Client);
        System.out.println("TransferManager");
        // TransferManager processes all transfers asynchronously,
        // so this call will return immediately.
        Upload upload = tm.upload(
            EXISTING_BUCKET_NAME, KEY_NAME, new File(FILE_PATH));
        System.out.println("Upload");

        try {
            // Or you can block and wait for the upload to finish
            upload.waitForCompletion();
            System.out.println("Upload complete");
        } catch (AmazonClientException amazonClientException) {
            System.out.println("Unable to upload file, upload was aborted.");
            amazonClientException.printStackTrace();
        }
    }
}
```

## Using Transfer Acceleration from the AWS SDK for .NET

This section provides examples of using the AWS SDK for .NET for Transfer Acceleration. For information about how to create and test a working .NET sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

### .NET Example 1: Enable Transfer Acceleration on a Bucket

The following .NET example shows how to enable Transfer Acceleration on a bucket.

#### Example

```
using System;
using System.Collections.Generic;
using Amazon.S3;
using Amazon.S3.Model;
using Amazon.S3.Util;

namespace s3.amazonaws.com.docsamples
```

```
{  
  
    class SetTransferAccelerateState  
    {  
        private static string bucketName = "Provide bucket name";  
  
        public static void Main(string[] args)  
        {  
            using (var s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USWest2))  
  
                try  
                {  
                    EnableTransferAccelerationOnBucket(s3Client);  
                    BucketAccelerateStatus bucketAccelerationStatus =  
GetBucketAccelerateState(s3Client);  
  
                    Console.WriteLine("Acceleration state = '{0}' ", bucketAccelerationStatus);  
                }  
                catch (AmazonS3Exception amazonS3Exception)  
                {  
                    if (amazonS3Exception.ErrorCode != null &&  
                        (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")  
                        ||  
                        amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))  
                    {  
                        Console.WriteLine("Check the provided AWS Credentials.");  
                        Console.WriteLine(  
                            "To sign up for the service, go to http://aws.amazon.com/s3");  
                    }  
                    else  
                    {  
                        Console.WriteLine(  
                            "Error occurred. Message:{0}' when setting transfer acceleration",  
                            amazonS3Exception.Message);  
                    }  
                }  
                Console.WriteLine("Press any key to continue...");  
                Console.ReadKey();  
            }  
  
            static void EnableTransferAccelerationOnBucket(IAmazonS3 s3Client)  
            {  
                PutBucketAccelerateConfigurationRequest request = new  
PutBucketAccelerateConfigurationRequest  
                {  
                    BucketName = bucketName,  
                    AccelerateConfiguration = new AccelerateConfiguration  
                    {  
                        Status = BucketAccelerateStatus.Enabled  
                    }  
                };  
  
                PutBucketAccelerateConfigurationResponse response =  
s3Client.PutBucketAccelerateConfiguration(request);  
            }  
  
            static BucketAccelerateStatus GetBucketAccelerateState(IAmazonS3 s3Client)  
            {  
                GetBucketAccelerateConfigurationRequest request = new  
GetBucketAccelerateConfigurationRequest  
                {  
                    BucketName = bucketName  
                };  
  
                GetBucketAccelerateConfigurationResponse response =  
s3Client.GetBucketAccelerateConfiguration(request);  
            }  
    }  
}
```

```
        return response.Status;
    }
}
```

## .NET Example 2: Uploading a Single Object to a Bucket Enabled for Transfer Acceleration

The following .NET example shows how to use the accelerate endpoint to upload a single object.

### Example

```
using System;
using System.Collections.Generic;
using Amazon;
using Amazon.S3;
using Amazon.S3.Model;
using Amazon.S3.Util;

namespace s3.amazonaws.com.docsamples
{

    public class UploadtoAcceleratedBucket
    {
        private static RegionEndpoint TestRegionEndpoint = RegionEndpoint.USWest2;
        private static string bucketName = "Provide bucket name";
        static string keyName = "*** Provide key name ***";
        static string filePath = "*** Provide filename of file to upload with the full path ***";

        public static void Main(string[] args)
        {
            using (var client = new AmazonS3Client(new AmazonS3Config
            {
                RegionEndpoint = TestRegionEndpoint,
                UseAccelerateEndpoint = true
            }))
            {
                WriteObject(client);
                Console.WriteLine("Press any key to continue...");
                Console.ReadKey();
            }
        }

        static void WriteObject(IAmazonS3 client)
        {
            try
            {
                PutObjectRequest putRequest = new PutObjectRequest
                {
                    BucketName = bucketName,
                    Key = keyName,
                    FilePath = filePath,
                };
                client.PutObject(putRequest);
            }
            catch (AmazonS3Exception amazonS3Exception)
            {
                if (amazonS3Exception.ErrorCode != null &&
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId") ||
                     amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))

```

```
        {
            Console.WriteLine("Check the provided AWS Credentials.");
            Console.WriteLine(
                "For service sign up go to http://aws.amazon.com/s3");
        }
        else
        {
            Console.WriteLine(
                "Error occurred. Message:{0}' when writing an object"
                , amazonS3Exception.Message);
        }
    }
}
```

### .NET Example 3: Multipart Upload to a Bucket Enabled for Transfer Acceleration

The following .NET example shows how to use the accelerate endpoint for a multipart upload.

#### Example

```
using System;
using System.IO;
using Amazon;
using Amazon.S3;
using Amazon.S3.Model;
using Amazon.S3.Transfer;

namespace s3.amazonaws.com.docsamples
{
    class AcceleratedUploadFileMPUHAPI
    {
        private static RegionEndpoint TestRegionEndpoint = RegionEndpoint.USWest2;
        private static string existingBucketName = "Provide bucket name";
        private static string keyName      = "*** Provide your object key ***";
        private static string filePath     = "*** Provide file name with full path ***";

        static void Main(string[] args)
        {
            try
            {
                var client = new AmazonS3Client(new AmazonS3Config
                {
                    RegionEndpoint = TestRegionEndpoint,
                    UseAccelerateEndpoint = true
                });
                using (TransferUtility fileTransferUtility = new
                    TransferUtility(client))
                {

                    // 1. Upload a file, file name is used as the object key name.
                    fileTransferUtility.Upload(filePath, existingBucketName);
                    Console.WriteLine("Upload 1 completed");

                    // 2. Specify object key name explicitly.
                    fileTransferUtility.Upload(filePath,
                        existingBucketName, keyName);
                    Console.WriteLine("Upload 2 completed");

                    // 3. Upload data from a type of System.IO.Stream.
                    using (FileStream fileToUpload =
                        new FileStream(filePath, FileMode.Open, FileAccess.Read))
                    {

```

```
        fileTransferUtility.Upload(fileToUpload,
                                    existingBucketName, keyName);
    }
    Console.WriteLine("Upload 3 completed");

    // 4.Specify advanced settings/options.
    TransferUtilityUploadRequest fileTransferUtilityRequest = new
TransferUtilityUploadRequest
    {
        BucketName = existingBucketName,
        FilePath = filePath,
        StorageClass = S3StorageClass.ReducedRedundancy,
        PartSize = 6291456, // 6 MB.
        Key = keyName,
        CannedACL = S3CannedACL.PublicRead
    };
    fileTransferUtilityRequest.Metadata.Add("param1", "Value1");
    fileTransferUtilityRequest.Metadata.Add("param2", "Value2");
    fileTransferUtility.Upload(fileTransferUtilityRequest);
    Console.WriteLine("Upload 4 completed");
}
}
catch (AmazonS3Exception s3Exception)
{
    Console.WriteLine("{0} {1}", s3Exception.Message,
                      s3Exception.InnerException);
}
}
}
}
```

## Using Transfer Acceleration from the AWS SDK for JavaScript

For an example of enabling Transfer Acceleration by using the AWS SDK for JavaScript, see [Calling the putBucketAccelerateConfiguration operation](#) in the [AWS SDK for JavaScript API Reference](#).

## Using Transfer Acceleration from the AWS SDK for Python (Boto)

For an example of enabling Transfer Acceleration by using the SDK for Python, see [put\\_bucket\\_accelerate\\_configuration](#) in the [AWS SDK for Python \(Boto 3\) API Reference](#).

## Using Other AWS SDKs

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

# Requester Pays Buckets

## Topics

- [Configure Requester Pays by Using the Amazon S3 Console \(p. 93\)](#)
- [Configure Requester Pays with the REST API \(p. 94\)](#)
- [DevPay and Requester Pays \(p. 96\)](#)
- [Charge Details \(p. 96\)](#)

In general, bucket owners pay for all Amazon S3 storage and data transfer costs associated with their bucket. A bucket owner, however, can configure a bucket to be a Requester Pays bucket. With Requester

Pays buckets, the requester instead of the bucket owner pays the cost of the request and the data download from the bucket. The bucket owner always pays the cost of storing data.

Typically, you configure buckets to be Requester Pays when you want to share data but not incur charges associated with others accessing the data. You might, for example, use Requester Pays buckets when making available large datasets, such as zip code directories, reference data, geospatial information, or web crawling data.

**Important**

If you enable Requester Pays on a bucket, anonymous access to that bucket is not allowed.

You must authenticate all requests involving Requester Pays buckets. The request authentication enables Amazon S3 to identify and charge the requester for their use of the Requester Pays bucket.

When the requester assumes an AWS Identity and Access Management (IAM) role prior to making their request, the account to which the role belongs is charged for the request. For more information about IAM roles, see [IAM Roles](#) in the *IAM User Guide*.

After you configure a bucket to be a Requester Pays bucket, requesters must include `x-amz-request-payer` in their requests either in the header, for POST, GET and HEAD requests, or as a parameter in a REST request to show that they understand that they will be charged for the request and the data download.

Requester Pays buckets do not support the following.

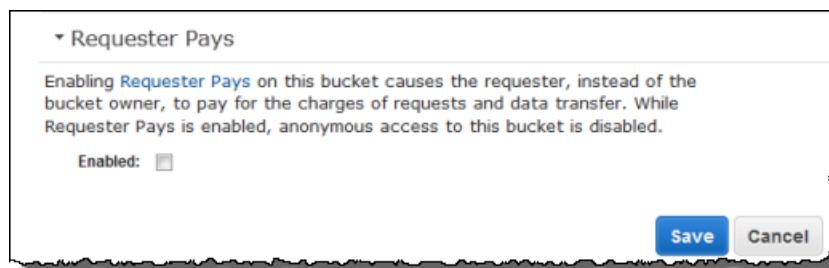
- Anonymous requests
- BitTorrent
- SOAP requests
- You cannot use a Requester Pays bucket as the target bucket for end user logging, or vice versa; however, you can turn on end user logging on a Requester Pays bucket where the target bucket is not a Requester Pays bucket.

## Configure Requester Pays by Using the Amazon S3 Console

You can configure a bucket for Requester Pays by using the Amazon S3 console.

### To configure a bucket for Requester Pays

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. In the **Buckets** list, click the details icon on the left of the bucket name and then click **Properties** to display bucket properties.
3. In the **Properties** pane, click **Requester Pays**.
4. Select the **Enabled** check box.



# Configure Requester Pays with the REST API

## Topics

- [Setting the requestPayment Bucket Configuration \(p. 94\)](#)
- [Retrieving the requestPayment Configuration \(p. 94\)](#)
- [Downloading Objects in Requester Pays Buckets \(p. 95\)](#)

## Setting the requestPayment Bucket Configuration

Only the bucket owner can set the `RequestPaymentConfiguration.payer` configuration value of a bucket to `BucketOwner`, the default, or `Requester`. Setting the `requestPayment` resource is optional. By default, the bucket is not a Requester Pays bucket.

To revert a Requester Pays bucket to a regular bucket, you use the value `BucketOwner`. Typically, you would use `BucketOwner` when uploading data to the Amazon S3 bucket, and then you would set the value to `Requester` before publishing the objects in the bucket.

### To set requestPayment

- Use a `PUT` request to set the `Payer` value to `Requester` on a specified bucket.

```
PUT ?requestPayment HTTP/1.1
Host: [BucketName].s3.amazonaws.com
Content-Length: 173
Date: Wed, 01 Mar 2009 12:00:00 GMT
Authorization: AWS [Signature]

<RequestPaymentConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
<Payer>Requester</Payer>
</RequestPaymentConfiguration>
```

If the request succeeds, Amazon S3 returns a response similar to the following.

```
HTTP/1.1 200 OK
x-amz-id-2: [id]
x-amz-request-id: [request_id]
Date: Wed, 01 Mar 2009 12:00:00 GMT
Content-Length: 0
Connection: close
Server: AmazonS3
x-amz-request-charged:requester
```

You can set Requester Pays only at the bucket level; you cannot set Requester Pays for specific objects within the bucket.

You can configure a bucket to be `BucketOwner` or `Requester` at any time. Realize, however, that there might be a small delay, on the order of minutes, before the new configuration value takes effect.

#### Note

Bucket owners who give out pre-signed URLs should think twice before configuring a bucket to be Requester Pays, especially if the URL has a very long lifetime. The bucket owner is charged each time the requester uses a pre-signed URL that uses the bucket owner's credentials.

## Retrieving the requestPayment Configuration

You can determine the `Payer` value that is set on a bucket by requesting the resource `requestPayment`.

### To return the requestPayment resource

- Use a GET request to obtain the requestPayment resource, as shown in the following request.

```
GET ?requestPayment HTTP/1.1
Host: [BucketName].s3.amazonaws.com
Date: Wed, 01 Mar 2009 12:00:00 GMT
Authorization: AWS [Signature]
```

If the request succeeds, Amazon S3 returns a response similar to the following.

```
HTTP/1.1 200 OK
x-amz-id-2: [id]
x-amz-request-id: [request_id]
Date: Wed, 01 Mar 2009 12:00:00 GMT
Content-Type: [type]
Content-Length: [length]
Connection: close
Server: AmazonS3

<?xml version="1.0" encoding="UTF-8"?>
<RequestPaymentConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
<Payer>Requester</Payer>
</RequestPaymentConfiguration>
```

This response shows that the payer value is set to Requester.

## Downloading Objects in Requester Pays Buckets

Because requesters are charged for downloading data from Requester Pays buckets, the requests must contain a special parameter, `x-amz-request-payer`, which confirms that the requester knows he or she will be charged for the download. To access objects in Requester Pays buckets, requests must include one of the following.

- For GET, HEAD, and POST requests, include `x-amz-request-payer : requester` in the header
- For signed URLs, include `x-amz-request-payer=requester` in the request

If the request succeeds and the requester is charged, the response includes the header `x-amz-request-charged:requester`. If `x-amz-request-payer` is not in the request, Amazon S3 returns a 403 error and charges the bucket owner for the request.

#### Note

Bucket owners do not need to add `x-amz-request-payer` to their requests.

Ensure that you have included `x-amz-request-payer` and its value in your signature calculation. For more information, see [Constructing the CanonicalizedAmzHeaders Element \(p. 628\)](#).

### To download objects from a Requester Pays bucket

- Use a GET request to download an object from a Requester Pays bucket, as shown in the following request.

```
GET / [destinationObject] HTTP/1.1
Host: [BucketName].s3.amazonaws.com
x-amz-request-payer : requester
Date: Wed, 01 Mar 2009 12:00:00 GMT
Authorization: AWS [Signature]
```

If the GET request succeeds and the requester is charged, the response includes `x-amz-request-charged:requester`.

Amazon S3 can return an `Access Denied` error for requests that try to get objects from a Requester Pays bucket. For more information, see [Error Responses](#).

## DevPay and Requester Pays

You can use Amazon DevPay to sell content that is stored in your Requester Pays bucket. For more information, see "Using Amazon S3 Requester Pays with DevPay," in the [Using Amazon S3 Requester Pays with DevPay](#).

## Charge Details

The charge for successful Requester Pays requests is straightforward: the requester pays for the data transfer and the request; the bucket owner pays for the data storage. However, the bucket owner is charged for the request under the following conditions:

- The requester doesn't include the parameter `x-amz-request-payer` in the header (GET, HEAD, or POST) or as a parameter (REST) in the request (HTTP code 403).
- Request authentication fails (HTTP code 403).
- The request is anonymous (HTTP code 403).
- The request is a SOAP request.

## Buckets and Access Control

Each bucket has an associated access control policy. This policy governs the creation, deletion and enumeration of objects within the bucket. For more information, see [Managing Access Permissions to Your Amazon S3 Resources](#) (p. 295).

## Billing and Usage Reporting for S3 Buckets

When using Amazon Simple Storage Service (Amazon S3), you don't have to pay any up-front fees or commit to how much content you'll store. As with the other Amazon Web Services (AWS) services, you pay as you go and pay only for what you use.

AWS provides the following reports for Amazon S3:

- **Billing reports** – Multiple reports that provide high-level views of all of the activity for the AWS services that you're using, including Amazon S3. AWS always bills the owner of the S3 bucket for Amazon S3 fees, unless the bucket was created as a Requester Pays bucket. For more information about Requester Pays, see [Requester Pays Buckets](#) (p. 92). For more information about billing reports, see [AWS Billing Reports for Amazon S3](#) (p. 97).
- **Usage report** – A summary of activity for a specific service, aggregated by hour, day, or month. You can choose which usage type and operation to include. You can also choose how the data is aggregated. For more information, see [AWS Usage Report for Amazon S3](#) (p. 98).

The following topics provide information about billing and usage reporting for Amazon S3.

### Topics

- [AWS Billing Reports for Amazon S3](#) (p. 97)
- [AWS Usage Report for Amazon S3](#) (p. 98)

- [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#)
- [Using Cost Allocation Tags for S3 Buckets \(p. 104\)](#)

## AWS Billing Reports for Amazon S3

Your monthly bill from AWS separates your usage information and cost by AWS service and function. There are several AWS billing reports available, the monthly report, the cost allocation report, and detailed billing reports. For information about how to see your billing reports, see [Viewing Your Bill](#) in the *AWS Billing and Cost Management User Guide*.

You can also download a usage report that gives more detail about your Amazon S3 storage usage than the billing reports. For more information, see [AWS Usage Report for Amazon S3 \(p. 98\)](#).

The following table lists the charges associated with Amazon S3 usage.

### Amazon S3 Usage Charges

Charge	Comments
Storage	You pay for storing objects in your S3 buckets. The rate you're charged depends on your objects' size, how long you stored the objects during the month, and the storage class—STANDARD, STANDARD_IA (IA for infrequent access) GLACIER, or Reduced Redundancy Storage (RRS). For more information about storage classes, see <a href="#">Storage Classes (p. 111)</a> .
Requests	You pay for requests, for example, GET requests, made against your S3 buckets and objects. This includes lifecycle requests. The rates for requests depend on what kind of request you're making. For information about request pricing, see <a href="#">Amazon S3 Pricing</a> .
Retrievals	You pay for retrieving objects that are stored in STANDARD_IA and GLACIER storage.
Early Deletes	If you delete an object stored in STANDARD_IA or GLACIER storage before the minimum storage commitment has passed, you pay an early deletion fee for that object.
Storage Management	You pay for the storage management features (Amazon S3 inventory, analytics, and object tagging) that are enabled on your account's buckets.
Bandwidth	You pay for all bandwidth into and out of Amazon S3, except for the following: <ul style="list-style-type: none"><li>• Data transferred in from the internet</li><li>• Data transferred out to an Amazon Elastic Compute Cloud (Amazon EC2) instance, when the instance is in the same AWS Region as the S3 bucket</li><li>• Data transferred out to Amazon CloudFront (CloudFront)</li></ul>

Charge	Comments
	You also pay a fee for any data transferred using Amazon S3 Transfer Acceleration.

For detailed information on Amazon S3 usage charges for storage, data transfer, and services, see [Amazon S3 Pricing](#) and the [Amazon S3 FAQ](#).

For information on understanding codes and abbreviations used in the billing and usage reports for Amazon S3, see [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#).

## More Info

- [AWS Usage Report for Amazon S3 \(p. 98\)](#)
- [Using Cost Allocation Tags for S3 Buckets \(p. 104\)](#)
- [AWS Billing and Cost Management](#)
- [Amazon S3 Pricing](#)
- [Amazon S3 FAQ](#)
- [Amazon Glacier Pricing](#)

## AWS Usage Report for Amazon S3

For more detail about your Amazon S3 storage usage, download dynamically generated AWS usage reports. You can choose which usage type, operation, and time period to include. You can also choose how the data is aggregated.

When you download a usage report you can choose to aggregate usage data by hour, day, or month. The Amazon S3 usage report lists operations by usage type and AWS Region, for example, the amount of data transferred out of the Asia Pacific (Sydney) Region.

The Amazon S3 usage report includes the following information:

- **Service** –Amazon S3
- **Operation** – The operation performed on your bucket or object. For a detailed explanation of Amazon S3 operations, see [Tracking Operations in Your Usage Reports \(p. 103\)](#).
- **UsageType** – One of the following values:
  - A code that identifies the type of storage
  - A code that identifies the type of request
  - A code that identifies the type of retrieval
  - A code that identifies the type of data transfer
  - A code that identifies early deletions from STANDARD\_IA or GLACIER storage
  - **StorageObjectCount**– The count of objects stored within a given bucket

For a detailed explanation of Amazon S3 usage types, see [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#).

- **Resource** – The name of the bucket associated with the listed usage.
- **StartTime** – Start time of the day that the usage applies to, in Coordinated Universal Time (UTC).
- **EndTime** – End time of the day that the usage applies to, in Coordinated Universal Time (UTC).
- **UsageValue** – One of the following volume values:
  - The number of requests during the specified time period

- The amount of data transferred, in bytes
- The amount of data stored, in byte-hours, which is the number of bytes stored in a given hour
- The amount of data associated with restorations from GLACIER or STANDARD\_IA storage, in bytes

**Tip**

For detailed information about every request that Amazon S3 receives for your objects, turn on server access logging for your buckets. For more information, see [Server Access Logging \(p. 596\)](#).

You can download a usage report as an XML or a comma-separated values (CSV) file. The following is an example CSV usage report opened in a spreadsheet application.

Service	Operation	UsageType	Resource	StartTime	EndTime	UsageValue
AmazonS3	HeadBucket	USW2-C3DataTransfer-Out-Bytes	admin-created3	6/1/2017 0:00	7/1/2017 0:00	15309
AmazonS3	PutObject	USW2-C3DataTransfer-In-Bytes	admin-created3	6/1/2017 0:00	7/1/2017 0:00	19062
AmazonS3	HeadBucket	USW2-Requests-Tier2	admin-created3	6/1/2017 0:00	7/1/2017 0:00	68
AmazonS3	PutObjectForRep1	USW1-Requests-SIA-Tier1	ca-example-bucket	6/1/2017 0:00	7/1/2017 0:00	178294
AmazonS3	PutObjectForRep1	USW1-USW2-AWS-In-Bytes	ca-example-bucket	6/1/2017 0:00	7/1/2017 0:00	387929083
AmazonS3	GetObjectForRep1	USW2-Requests-NoCharge	admin-created3	6/1/2017 0:00	7/1/2017 0:00	108
AmazonS3	GetObjectForRep1	USW2-USW1-AWS-Out-Bytes	my-test-bucket-bash	6/1/2017 0:00	7/1/2017 0:00	387910021

For information on understanding the usage report, see [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#).

## Downloading the AWS Usage Report

You can download a usage report as an .xml or a .csv file.

To download the usage report

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. In the title bar, choose your AWS Identity and Access Management (IAM) user name, and then choose **My Billing Dashboard**.
3. In the navigation pane, choose **Reports**.
4. In the **Other Reports** section, choose **AWS Usage Report**.
5. For **Services**, choose **Amazon Simple Storage Service**.
6. For **Download Usage Report**, choose the following settings
  - **Usage Types** – For a detailed explanation of Amazon S3 usage types, see [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#).
  - **Operation** – For a detailed explanation of Amazon S3 operations, see [Tracking Operations in Your Usage Reports \(p. 103\)](#).
  - **Time Period** – The time period that you want the report to cover.
  - **Report Granularity** – Whether you want the report to include subtotals by the hour, by the day, or by the month.
7. To choose the format for the report, choose the **Download** for that format, and then follow the prompts to see or save the report.

## More Info

- [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#)
- [AWS Billing Reports for Amazon S3 \(p. 97\)](#)

# Understanding Your AWS Billing and Usage Reports for Amazon S3

Amazon S3 billing and usage reports use codes and abbreviations. For example, for usage type, which is defined in the following table, *region* is replaced with one of the following abbreviations:

- **APN1:** Asia Pacific (Tokyo)
- **APN2:** Asia Pacific (Seoul)
- **APS1:** Asia Pacific (Singapore)
- **APS2:** Asia Pacific (Sydney)
- **APS3:** Asia Pacific (Mumbai)
- **CAN1:** Canada (Central)
- **EUC1:** EU (Frankfurt)
- **EU:** EU (Ireland)
- **EUW2:** EU (London)
- **SAE1:** South America (São Paulo)
- **UGW1:** AWS GovCloud (US)
- **USE1 (or no prefix):** US East (N. Virginia)
- **USE2:** US East (Ohio)
- **USW1:** US West (N. California)
- **USW2:** US West (Oregon)

For information about pricing by region, see [Amazon S3 Pricing](#).

The first column in the following table lists usage types that appear in your billing and usage reports.

## Usage Types

Usage Type	Units	Granularity	Description
<i>region1-region2</i> -AWS-In-Bytes	Bytes	Hourly	The amount of data transferred in to AWS Region1 from AWS Region2
<i>region1-region2</i> -AWS-Out-Bytes	Bytes	Hourly	The amount of data transferred from AWS Region1 to AWS Region2
<i>region</i> -C3DataTransfer-Out-Bytes	Bytes	Hourly	The amount of data transferred from Amazon S3 to Amazon EC2 within the same AWS Region
<i>region</i> -C3DataTransfer-In-Bytes	Bytes	Hourly	The amount of data transferred into Amazon S3 from Amazon EC2 within the same AWS Region
<i>region</i> -S3G-DataTransfer-Out-Bytes	Bytes	Hourly	The amount of data transferred from Amazon S3 to transition objects to GLACIER storage

Usage Type	Units	Granularity	Description
<i>region</i> -S3G-DataTransfer-In-Bytes	Bytes	Hourly	The amount of data transferred into Amazon S3 to restore objects from GLACIER storage
<i>region</i> -DataTransfer-Regional-Bytes	Bytes	Hourly	The amount of data transferred from Amazon S3 to AWS resources within the same AWS Region
StorageObjectCount	Count	Daily	The number of objects stored within a given bucket
<i>region</i> -CloudFront-In-Bytes	Bytes	Hourly	The amount of data transferred into an AWS Region from a CloudFront distribution
<i>region</i> -CloudFront-Out-Bytes	Bytes	Hourly	The amount of data transferred from an AWS Region to a CloudFront distribution
<i>region</i> -EarlyDelete-ByteHrs	Byte-Hours <sup>1</sup>	Hourly	Prorated storage usage for objects deleted from GLACIER storage before the 90-day minimum commitment ends <sup>2</sup>
<i>region</i> -EarlyDelete-SIA	Byte-Hours	Hourly	Prorated storage usage for objects deleted from STANDARD_IA before the 30-day minimum commitment ends <sup>3</sup>
<i>region</i> -EarlyDelete-SIA-SmObjects	Byte-Hours	Hourly	Prorated storage usage for small objects (smaller than 128KB) that were deleted from STANDARD_IA before the 30-day minimum commitment ended <sup>4</sup>
<i>region</i> -Inventory-ObjectsListed	Objects	Hourly	The number of objects listed for an object group (objects are grouped by bucket or prefix) with an inventory list
<i>region</i> -Requests-SIA-Tier1	Count	Hourly	The number of PUT, COPY, POST, or LIST requests on STANDARD_IA objects
<i>region</i> -Requests-SIA-Tier2	Count	Hourly	The number of GET and all other non-SIA-Tier1 requests on STANDARD_IA objects

Usage Type	Units	Granularity	Description
<i>region</i> -Requests-Tier1	Count	Hourly	The number of PUT, COPY, POST, or LIST requests for STANDARD, RRS, and tags
<i>region</i> -Requests-Tier2	Count	Hourly	The number of GET and all other non-Tier1 requests
<i>region</i> -Requests-Tier3	Count	Hourly	The number of GLACIER archive requests and standard restore requests
<i>region</i> -Requests-Tier4	Count	Hourly	The number of lifecycle transitions to STANDARD_IA storage
<i>region</i> -Requests-Tier5	Count	Hourly	The number of Bulk GLACIER restore requests
<i>region</i> -Requests-Tier6	Count	Hourly	The number of Expedited GLACIER restore requests
<i>region</i> -Bulk-Retrieval-Bytes	Bytes	Hourly	The number of bytes of data retrieved with Bulk GLACIER requests
<i>region</i> -Expedited-Retrieval-Bytes	Bytes	Hourly	The number of bytes of data retrieved with Expedited GLACIER requests
<i>region</i> -Standard-Retrieval-Bytes	Bytes	Hourly	The number of bytes of data retrieved with standard GLACIER requests
<i>region</i> -Retrieval-SIA	Bytes	Hourly	The number of bytes of data retrieved from STANDARD_IA storage
<i>region</i> -StorageAnalytics-ObjCount	Objects	Hourly	The number of unique objects in each object group (where objects are grouped by bucket or prefix) tracked by storage analytics
<i>region</i> -TagStorage-TagHrs	Tag-Hours	Daily	The total of tags on all objects in the bucket reported by hour
<i>region</i> -TimedStorage-ByteHrs	Byte-Hours	Daily	The number of byte-hours that data was stored in STANDARD storage
<i>region</i> -TimedStorage-GLACIERByteHrs	Byte-Hours	Daily	The number of byte-hours that data was stored in GLACIER storage

Usage Type	Units	Granularity	Description
<i>region</i> -TimedStorage-RRS-ByteHrs	Byte-Hours	Daily	The number of byte-hours that data was stored in Reduced Redundancy Storage (RRS) storage
<i>region</i> -TimedStorage-SIA-ByteHrs	Byte-Hours	Daily	The number of byte-hours that data was stored in STANDARD_IA storage
<i>region</i> -TimedStorage-SIA-SmObjects	Byte-Hours	Daily	The number of byte-hours that small objects (smaller than 128KB) were stored in STANDARD_IA storage

**Notes:**

1. For more information on the byte-hours unit, see [Converting Usage Byte-Hours to Billed GB-Months \(p. 103\)](#).
2. For objects that are archived to the GLACIER storage class, when they are deleted prior to 90 days there is a prorated charge per gigabyte for the remaining days.
3. For objects that are in STANDARD\_IA storage, when they are deleted, overwritten, or transitioned to a different storage class prior to 30 days there is a prorated charge per gigabyte for the remaining days.
4. For small objects that are in STANDARD\_IA storage, when they are deleted, overwritten, or transitioned to a different storage class prior to 30 days there is a prorated charge per gigabyte for the remaining days.

## Tracking Operations in Your Usage Reports

Operations describe the action taken on your AWS object or bucket by the specified usage type. Operations are indicated by self-explanatory codes, such as `PutObject` or `ListBucket`. To see which actions on your bucket generated a specific type of usage, use these codes. When you create a usage report, you can choose to include **All Operations**, or a specific operation, for example, `GetObject`, to report on.

## Converting Usage Byte-Hours to Billed GB-Months

The volume of storage that we bill you for each month is based on the average amount of storage you used throughout the month. You are billed for all of the object data and metadata stored in buckets that you created under your AWS account. For more information about metadata, see [Object Key and Metadata \(p. 107\)](#).

We measure your storage usage in TimedStorage-ByteHrs, which are totaled up at the end of the month to generate your monthly charges. The usage report reports your storage usage in byte-hours and the billing reports report storage usage in GB-months. To correlate your usage report to your billing reports you need to convert byte-hours into GB-months.

For example, if you store 100 GB (107,374,182,400 bytes) of Standard Amazon S3 storage data in your bucket for the first 15 days in March, and 100 TB (109,951,162,777,600 bytes) of Standard Amazon S3 storage data for the final 16 days in March, you will have used 42,259,901,212,262,400 byte-hours.

First, calculate the total byte-hour usage:

[107,374,182,400 bytes x 15 days x (24 hours/day)]

```
+ [109,951,162,777,600 bytes x 16 days x (24 hours/day)]
= 42,259,901,212,262,400 byte-hours
```

Then convert the byte-hours to GB-Months:

```
42,259,901,212,262,400 byte-hours/1,073,741,824 bytes per GB/24 hours per day
/31 days in March
=52,900 GB-Months
```

## More Info

- [AWS Usage Report for Amazon S3 \(p. 98\)](#)
- [AWS Billing Reports for Amazon S3 \(p. 97\)](#)
- [Amazon S3 Pricing](#)
- [Amazon S3 FAQ](#)
- [Amazon Glacier Pricing](#)
- [Amazon Glacier FAQs](#)

## Using Cost Allocation Tags for S3 Buckets

To track the storage cost or other criteria for individual projects or groups of projects, label your Amazon S3 buckets using cost allocation tags. A *cost allocation tag* is a key-value pair that you associate with an S3 bucket. After you activate cost allocation tags, AWS uses the tags to organize your resource costs on your cost allocation report.

The *cost allocation report* lists the AWS usage for your account by product category and AWS Identity and Access Management (IAM) user. The report contains the same line items as the detailed billing report (see [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#)) and additional columns for your tag keys.

AWS provides two types of cost allocation tags, an AWS-generated tag and user-defined tags. AWS defines, creates, and applies the AWS-generated `createdBy` tag for you after an Amazon S3 `CreateBucket` event. You define, create, and apply *user-defined* tags to your S3 bucket.

You must activate both types of tags separately in the Billing and Cost Management console before they can appear in your billing reports. For more information about AWS-generated tags, see [AWS-Generated Cost Allocation Tags](#). For more information about activating tags, see [Using Cost Allocation Tags](#) in the [AWS Billing and Cost Management User Guide](#).

A user-defined cost allocation tag has the following components:

- The tag key. The tag key is the name of the tag. For example, in the tag `project/Trinity`, `project` is the key. The tag key is a case-sensitive string that can contain 1 to 128 Unicode characters.
- The tag value. The tag value is a required string. For example, in the tag `project/Trinity`, `Trinity` is the value. The tag value is a case-sensitive string that can contain from 1 to 256 Unicode characters.

For details on the allowed characters for user-defined tags and other restrictions, see [User-Defined Tag Restrictions](#) in the [AWS Billing and Cost Management User Guide](#).

Each S3 bucket has a tag set. A *tag set* contains all of the tags that are assigned to that bucket. A tag set can contain as many as 10 tags, or it can be empty. Keys must be unique within a tag set, but values in a tag set don't have to be unique. For example, you can have the same value in tag sets named `project/Trinity` and `cost-center/Trinity`.

Within a bucket, if you add a tag that has the same key as an existing tag, the new value overwrites the old value.

AWS doesn't apply any semantic meaning to your tags. We interpret tags strictly as character strings.

To add, list, edit, or delete tags, you can use the Amazon S3 console, the AWS command line interface (AWS CLI), or the Amazon S3 API.

For more information about creating tags, see the appropriate topic:

- To create tags in the console, see [How Do I View the Properties for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.
- To create tags using the Amazon S3 API, see [PUT Bucket tagging](#) in the *Amazon Simple Storage Service API Reference*.
- To create tags using the AWS CLI, see [put-bucket-tagging](#) in the AWS Command Line Interface Reference.

For more information about user-defined tags, see [User-Defined Cost Allocation Tags](#) in the *AWS Billing and Cost Management User Guide*.

## More Info

- [Using Cost Allocation Tags](#) in the *AWS Billing and Cost Management User Guide*
- [Understanding Your AWS Billing and Usage Reports for Amazon S3 \(p. 100\)](#)
- [AWS Billing Reports for Amazon S3 \(p. 97\)](#)

# Working with Amazon S3 Objects

Amazon S3 is a simple key, value store designed to store as many objects as you want. You store these objects in one or more buckets. An object consists of the following:

- **Key** – The name that you assign to an object. You use the object key to retrieve the object.

For more information, see [Object Key and Metadata \(p. 107\)](#)

- **Version ID** – Within a bucket, a key and version ID uniquely identify an object.

The version ID is a string that Amazon S3 generates when you add an object to a bucket. For more information, see [Object Versioning \(p. 114\)](#).

- **Value** – The content that you are storing.

An object value can be any sequence of bytes. Objects can range in size from zero to 5 TB. For more information, see [Uploading Objects \(p. 180\)](#).

- **Metadata** – A set of name-value pairs with which you can store information regarding the object.

You can assign metadata, referred to as user-defined metadata, to your objects in Amazon S3. Amazon S3 also assigns system-metadata to these objects, which it uses for managing objects. For more information, see [Object Key and Metadata \(p. 107\)](#).

- **Subresources** – Amazon S3 uses the subresource mechanism to store object-specific additional information.

Because subresources are subordinates to objects, they are always associated with some other entity such as an object or a bucket. For more information, see [Object Subresources \(p. 114\)](#).

- **Access Control Information** – You can control access to the objects you store in Amazon S3.

Amazon S3 supports both the resource-based access control, such as an Access Control List (ACL) and bucket policies, and user-based access control. For more information, see [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

For more information about working with objects, see the following sections. Note that your Amazon S3 resources (for example buckets and objects) are private by default. You will need to explicitly grant permission for others to access these resources. For example, you might want to share a video or a photo stored in your Amazon S3 bucket on your website. That will work only if you either make the object public or use a presigned URL on your website. For more information about sharing objects, see [Share an Object with Others \(p. 176\)](#).

Topics

- [Object Key and Metadata \(p. 107\)](#)
- [Storage Classes \(p. 111\)](#)
- [Object Subresources \(p. 114\)](#)
- [Object Versioning \(p. 114\)](#)
- [Object Tagging \(p. 116\)](#)
- [Object Lifecycle Management \(p. 125\)](#)
- [Cross-Origin Resource Sharing \(CORS\) \(p. 155\)](#)
- [Operations on Objects \(p. 168\)](#)

## Object Key and Metadata

Topics

- [Object Keys \(p. 107\)](#)
- [Object Metadata \(p. 109\)](#)

Each Amazon S3 object has data, a key, and metadata. Object key (or key name) uniquely identifies the object in a bucket. Object metadata is a set of name-value pairs. You can set object metadata at the time you upload it. After you upload the object, you cannot modify object metadata. The only way to modify object metadata is to make a copy of the object and set the metadata.

## Object Keys

When you create an object, you specify the key name, which uniquely identifies the object in the bucket. For example, in the Amazon S3 console (see [AWS Management Console](#)), when you highlight a bucket, a list of objects in your bucket appears. These names are the object keys. The name for a key is a sequence of Unicode characters whose UTF-8 encoding is at most 1024 bytes long.

**Note**

If you anticipate that your workload against Amazon S3 will exceed 100 requests per second, follow the Amazon S3 key naming guidelines for best performance. For information, see [Request Rate and Performance Considerations \(p. 561\)](#).

## Object Key Naming Guidelines

Although you can use any UTF-8 characters in an object key name, the following key naming best practices help ensure maximum compatibility with other applications. Each application may parse special characters differently. The following guidelines help you maximize compliance with DNS, web safe characters, XML parsers, and other APIs.

### Safe Characters

The following character sets are generally safe for use in key names:

- Alphanumeric characters [0-9a-zA-Z]
- Special characters !, -, \_, ., \*, ', (, and )

The following are examples of valid object key names:

- 4my-organization
- my.great\_photos-2014/jan/myvacation.jpg

- videos/2014/birthday/video1.wmv

Note that the Amazon S3 data model is a flat structure: you create a bucket, and the bucket stores objects. There is no hierarchy of subbuckets or subfolders; however, you can infer logical hierarchy using key name prefixes and delimiters as the Amazon S3 console does. The Amazon S3 console supports a concept of folders. Suppose your bucket (admin-created) has four objects with the following object keys:

Development/Projects1.xls

Finance/statement1.pdf

Private/taxdocument.pdf

s3-dg.pdf

The console uses the key name prefixes (Development/, Finance/, and Private/) and delimiter ('/') to present a folder structure as shown:

The screenshot shows the Amazon S3 console interface. At the top, there are three buttons: 'Upload', '+ Create folder' (which has a red arrow pointing to it), and 'More'. Below these are three folder icons with their names: 'Development', 'Finance', and 'Private'. These three items are highlighted with a red box. At the bottom of the list is a file icon followed by 's3-dg.pdf'.

The s3-dg.pdf key does not have a prefix, so its object appears directly at the root level of the bucket. If you open the Development/ folder, you will see the Projects.xls object in it.

The screenshot shows the contents of the 'Development' folder. At the top, there is a breadcrumb navigation bar: 'Amazon S3 > admin-created2 > Development'. Below this, there are tabs for 'Objects', 'Properties', and 'Permissions', with 'Properties' being the active tab. In the 'Objects' section, there is a search bar with the placeholder 'Type a prefix and press Enter to search. Press ESC to...'. Below the search bar are four buttons: 'Upload', '+ Create folder', 'More', and 'All'. A red box highlights the breadcrumb navigation bar. At the bottom, there is a table with a single row containing a checkmark icon, the name 'Projects.xls', and a file icon.

#### Note

Amazon S3 supports buckets and objects, there is no hierarchy in Amazon S3. However, the prefixes and delimiters in an object key name, enables the Amazon S3 console and the AWS SDKs to infer hierarchy and introduce concept of folders.

## Characters That Might Require Special Handling

The following characters in a key name may require additional code handling and will likely need to be URL encoded or referenced as HEX. Some of these are non-printable characters and your browser may not handle them, which will also require special handling:

Ampersand ("&")	Dollar ("\$")	ASCII character ranges 00–1F hex (0–31 decimal) and 7F (127 decimal.)
'At' symbol ("@")	Equals ("=")	Semicolon (";")
Colon (":")	Plus ("+")	Space – Significant sequences of spaces may be lost in some uses (especially multiple spaces)
Comma (",")	Question mark ("?")	

## Characters to Avoid

You should avoid the following characters in a key name because of significant special handling for consistency across all applications.

Backslash ("\")	Left curly brace ("{")	Non-printable ASCII characters (128–255 decimal characters)
Caret ("^")	Right curly brace ("}")	Percent character ("%")
Grave accent / back tick ("`")	Right square bracket ("]")	Quotation marks
'Greater Than' symbol (">")	Left square bracket ("[")	Tilde ("~")
'Less Than' symbol ("<")	'Pound' character ("#")	Vertical bar / pipe (" ")

## Object Metadata

There are two kinds of metadata: system metadata and user-defined metadata.

### System-Defined Metadata

For each object stored in a bucket, Amazon S3 maintains a set of system metadata. Amazon S3 processes this system metadata as needed. For example, Amazon S3 maintains object creation date and size metadata and uses this information as part of object management.

There are two categories of system metadata:

- Metadata such as object creation date is system controlled where only Amazon S3 can modify the value.
- Other system metadata such as the storage class configured for the object and whether the object has server-side encryption enabled are examples of system metadata whose values you control. If you have your bucket configured as a website, sometimes you might want to redirect a page request to another page or an external URL. In this case, a web page is an object in your bucket. Amazon S3 stores the page redirect value as system metadata whose value you control.

When you create objects, you can configure values of these system metadata items or update the values when you need. For more information about storage class, see [Storage Classes \(p. 111\)](#). For more information about server-side encryption, see [Protecting Data Using Encryption \(p. 409\)](#).

The following table provides a list of system-defined metadata and whether you can update it.

Name	Description	Can User Modify the Value?
Date	Current date and time.	No
Content-Length	Object size in bytes.	No
Last-Modified	Object creation date or the last modified date, whichever is the latest.	No
Content-MD5	The base64-encoded 128-bit MD5 digest of the object.	No
x-amz-server-side-encryption	Indicates whether server-side encryption is enabled for the object, and whether that encryption is from the AWS Key Management Service (SSE-KMS) or from AWS-Managed Encryption (SSE-S3). For more information, see <a href="#">Protecting Data Using Server-Side Encryption (p. 410)</a> .	Yes
x-amz-version-id	Object version. When you enable versioning on a bucket, Amazon S3 assigns a version number to objects added to the bucket. For more information, see <a href="#">Using Versioning (p. 448)</a> .	No
x-amz-delete-marker	In a bucket that has versioning enabled, this Boolean marker indicates whether the object is a delete marker.	No
x-amz-storage-class	Storage class used for storing the object. For more information, see <a href="#">Storage Classes (p. 111)</a> .	Yes
x-amz-website-redirect-location	Redirects requests for the associated object to another object in the same bucket or an external URL. For more information, see <a href="#">(Optional) Configuring a Webpage Redirect (p. 478)</a> .	Yes
x-amz-server-side-encryption-aws-kms-key-id	If the x-amz-server-side-encryption is present and has the value of aws:kms, this indicates the ID of the Key Management Service (KMS) master encryption key that was used for the object.	Yes
x-amz-server-side-encryption-customer-algorithm	Indicates whether server-side encryption with customer-provided encryption keys (SSE-C) is enabled. For more information, see <a href="#">Protecting Data Using Server-Side Encryption with Customer-Provided Encryption Keys (SSE-C) (p. 423)</a> .	Yes

## User-Defined Metadata

When uploading an object, you can also assign metadata to the object. You provide this optional information as a name-value (key-value) pair when you send a PUT or POST request to create the object.

When uploading objects using the REST API the optional user-defined metadata names must begin with "x-amz-meta-" to distinguish them from other HTTP headers. When you retrieve the object using the REST API, this prefix is returned. When uploading objects using the SOAP API, the prefix is not required. When you retrieve the object using the SOAP API, the prefix is removed, regardless of which API you used to upload the object.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

When metadata is retrieved through the REST API, Amazon S3 combines headers that have the same name (ignoring case) into a comma-delimited list. If some metadata contains unprintable characters, it is not returned. Instead, the x-amz-missing-meta header is returned with a value of the number of the unprintable metadata entries.

User-defined metadata is a set of key-value pairs. Amazon S3 stores user-defined metadata keys in lowercase. Each key-value pair must conform to US-ASCII when using REST and UTF-8 when using SOAP or browser-based uploads via POST.

**Note**

The PUT request header is limited to 8 KB in size. Within the PUT request header, the user-defined metadata is limited to 2 KB in size. The size of user-defined metadata is measured by taking the sum of the number of bytes in the UTF-8 encoding of each key and value.

## Storage Classes

Each object in Amazon S3 has a storage class associated with it. For example, if you list all objects in the bucket, the console shows the storage class for all the objects in the list.

Name	Last modified	Size	Storage class
ExampleArchive.pdf	Apr 11, 2017 3:05:34 PM	29.0 B	Standard - IA
ExampleDocument.txt	Apr 11, 2017 3:05:11 PM	29.0 B	Standard
ExampleGuide.pdf	Apr 11, 2017 3:05:11 PM	29.0 B	Standard
ExampleObject.txt	Apr 11, 2017 3:05:49 PM	29.0 B	Reduced redundancy
ExamplePhoto1.jpg	Apr 11, 2017 3:05:49 PM	29.0 B	Reduced redundancy

Amazon S3 offers the following storage classes for the objects that you store. You choose one depending on your use case scenario and performance access requirements. All of these storage classes offer high durability:

- **STANDARD** – This storage class is ideal for performance-sensitive use cases and frequently accessed data.

STANDARD is the default storage class; if you don't specify storage class at the time that you upload an object, Amazon S3 assumes the STANDARD storage class.

- **STANDARD\_IA** – This storage class (IA, for infrequent access) is optimized for long-lived and less frequently accessed data, for example backups and older data where frequency of access has diminished, but the use case still demands high performance.

**Note**

There is a retrieval fee associated with STANDARD\_IA objects which makes it most suitable for infrequently accessed data. For pricing information, see [Amazon S3 Pricing](#).

For example, initially you might upload objects using the STANDARD storage class, and then use a bucket lifecycle configuration rule to transition objects (see [Object Lifecycle Management \(p. 125\)](#)) to the STANDARD\_IA (or GLACIER) storage class at some point in the object's lifetime. For more information about lifecycle management, see [Object Lifecycle Management \(p. 125\)](#).

The STANDARD\_IA objects are available for real-time access. The table at the end of this section highlights some of the differences in these storage classes.

The STANDARD\_IA storage class is suitable for larger objects greater than 128 Kilobytes that you want to keep for at least 30 days. For example, bucket lifecycle configuration has minimum object size limit for Amazon S3 to transition objects. For more information, see [Supported Transitions and Related Constraints \(p. 126\)](#).

- **GLACIER** – The GLACIER storage class is suitable for archiving data where data access is infrequent. Archived objects are not available for real-time access. You must first restore the objects before you can access them. For more information, see [Restoring Archived Objects \(p. 275\)](#).

The GLACIER storage class uses the very low-cost Amazon Glacier storage service, but you still manage objects in this storage class through Amazon S3. Note the following about the GLACIER storage class:

- You cannot specify GLACIER as the storage class at the time that you create an object. You create GLACIER objects by first uploading objects using STANDARD, RRS, or STANDARD\_IA as the storage class. Then, you transition these objects to the GLACIER storage class using lifecycle management. For more information, see [Object Lifecycle Management \(p. 125\)](#).
- You must first restore the GLACIER objects before you can access them (STANDARD, RRS, and STANDARD\_IA objects are available for anytime access). For more information, [Transitioning to the GLACIER Storage Class \(Object Archival\) \(p. 127\)](#).

To learn more about the Amazon Glacier service, see the [Amazon Glacier Developer Guide](#).

All the preceding storage classes are designed to sustain the concurrent loss of data in two facilities (for details, see the following availability and durability table).

In addition to the performance requirements of your application scenario, there is also price/performance considerations. For the Amazon S3 storage classes and pricing, see [Amazon S3 Pricing](#).

Amazon S3 also offers the following storage class that enables you to save costs by maintaining fewer redundant copies of your data.

- **REDUCED\_REDUNDANCY** – The Reduced Redundancy Storage (RRS) storage class is designed for noncritical, reproducible data stored at lower levels of redundancy than the STANDARD storage class, which reduces storage costs. For example, if you upload an image and use STANDARD storage class for it, you might compute a thumbnail and save it as an object of the RRS storage class.

The durability level (see the following table) corresponds to an average annual expected loss of 0.01% of objects. For example, if you store 10,000 objects using the RRS option, you can, on average, expect to incur an annual loss of a single object per year (0.01% of 10,000 objects).

**Note**

This annual loss represents an expected average and does not guarantee the loss of less than 0.01% of objects in a given year.

RRS provides a cost-effective, highly available solution for distributing or sharing content that is durably stored elsewhere, or for storing thumbnails, transcoded media, or other processed data that can be easily reproduced.

If an RRS object is lost, Amazon S3 returns a 405 error on requests made to that object.

Amazon S3 can send an event notification to alert a user or start a workflow when it detects that an RRS object is lost. To receive notifications, you need to add notification configuration to your bucket. For more information, see [Configuring Amazon S3 Event Notifications \(p. 500\)](#).

The following table summarizes the durability and availability offered by each of the storage classes.

Storage Class	Durability (designed for)	Availability (designed for)	Other Considerations		
STANDARD	99.99999999%	99.99%	None		
STANDARD_IA	99.99999999%	99.9%	There is a retrieval fee associated with STANDARD_IA objects which makes it most suitable for infrequently accessed data. For pricing information, see <a href="#">Amazon S3 Pricing</a> .		
GLACIER	99.99999999%	99.99% (after you restore objects)	GLACIER objects are not available for real-time access. You must first restore archived objects before you can access them. For more information, see <a href="#">Restoring Archived Objects (p. 275)</a> .		
RRS	99.99%	99.99%	None		

## Object Subresources

Amazon S3 defines a set of subresources associated with buckets and objects. Subresources are subordinates to objects; that is, subresources do not exist on their own, they are always associated with some other entity, such as an object or a bucket.

The following table lists the subresources associated with Amazon S3 objects.

Subresource	Description
acl	Contains a list of grants identifying the grantees and the permissions granted. When you create an object, the <code>acl</code> identifies the object owner as having full control over the object. You can retrieve an object ACL or replace it with updated list of grants. Any update to an ACL requires you to replace the existing ACL. For more information about ACLs, see <a href="#">Managing Access with ACLs (p. 394)</a>
torrent	Amazon S3 supports the BitTorrent protocol. Amazon S3 uses the <code>torrent</code> subresource to return the torrent file associated with the specific object. To retrieve a torrent file, you specify the <code>torrent</code> subresource in your GET request. Amazon S3 creates a torrent file and returns it. You can only retrieve the <code>torrent</code> subresource, you cannot create, update, or delete the <code>torrent</code> subresource. For more information, see <a href="#">Using BitTorrent with Amazon S3 (p. 581)</a> .

## Object Versioning

Versioning enables you to keep multiple versions of an object in one bucket, for example, `my-image.jpg` (version 111111) and `my-image.jpg` (version 222222). You might want to enable versioning to protect yourself from unintended overwrites and deletions or to archive objects so that you can retrieve previous versions of them.

**Note**

The SOAP API does not support versioning. SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP.

Object versioning can be used in combination with [Object Lifecycle Management \(p. 125\)](#), allowing you to customize your data retention needs while controlling your related storage costs. For information about creating lifecycle policies using the AWS Management Console, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

If you have an object expiration lifecycle policy in your non-versioned bucket and you want to maintain the same permanent delete behavior when you enable versioning, you must add a noncurrent expiration policy. The noncurrent expiration lifecycle policy will manage the deletes of the noncurrent object versions in the version-enabled bucket. (A version-enabled bucket maintains one current and zero or more noncurrent object versions.)

You must explicitly enable versioning on your bucket. By default, versioning is disabled. Regardless of whether you have enabled versioning, each object in your bucket has a version ID. If you have not enabled versioning, then Amazon S3 sets the version ID value to null. If you have enabled versioning, Amazon S3 assigns a unique version ID value for the object. When you enable versioning on a bucket, existing objects, if any, in the bucket are unchanged: the version IDs (null), contents, and permissions remain the same.

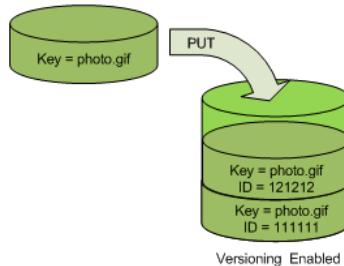
Enabling and suspending versioning is done at the bucket level. When you enable versioning for a bucket, all objects added to it will have a unique version ID. Unique version IDs are randomly generated,

Unicode, UTF-8 encoded, URL-ready, opaque strings that are at most 1024 bytes long. An example version ID is `3/L4kqtJlcpXroDTDmJ+rmSpXd3dIbrHY+MTRCx3vjVBH40Nr8X8gdRQBpUMLUo`. Only Amazon S3 generates version IDs. They cannot be edited.

**Note**

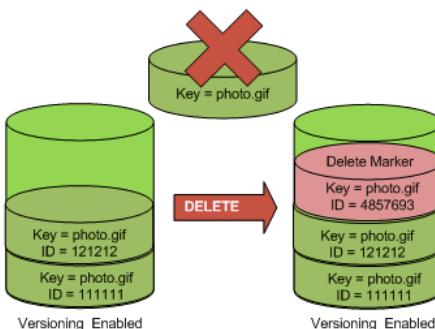
For simplicity, we will use much shorter IDs in all our examples.

When you `PUT` an object in a versioning-enabled bucket, the noncurrent version is not overwritten. The following figure shows that when a new version of `photo.gif` is `PUT` into a bucket that already contains an object with the same name, the original object (ID = 111111) remains in the bucket, Amazon S3 generates a new version ID (121212), and adds the newer version to the bucket.

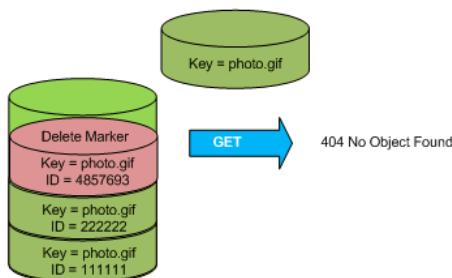


This functionality prevents you from accidentally overwriting or deleting objects and affords you the opportunity to retrieve a previous version of an object.

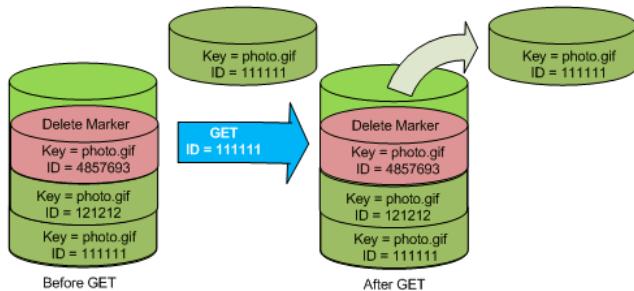
When you `DELETE` an object, all versions remain in the bucket and Amazon S3 inserts a delete marker, as shown in the following figure.



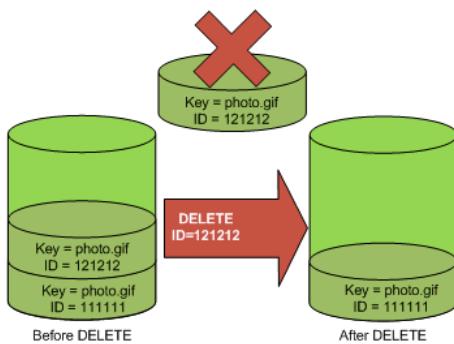
The delete marker becomes the current version of the object. By default, `GET` requests retrieve the most recently stored version. Performing a simple `GET Object` request when the current version is a delete marker returns a `404 Not Found` error, as shown in the following figure.



You can, however, `GET` a noncurrent version of an object by specifying its version ID. In the following figure, we `GET` a specific object version, 111111. Amazon S3 returns that object version even though it's not the current version.



You can permanently delete an object by specifying the version you want to delete. Only the owner of an Amazon S3 bucket can permanently delete a version. The following figure shows how `DELETE versionId` permanently deletes an object from a bucket and that Amazon S3 doesn't insert a delete marker.



You can add additional security by configuring a bucket to enable MFA (Multi-Factor Authentication) Delete. When you do, the bucket owner must include two forms of authentication in any request to delete a version or change the versioning state of the bucket. For more information, see [MFA Delete \(p. 450\)](#).

**Important**

If you notice a significant increase in the number of HTTP 503-slow down responses received for Amazon S3 PUT or DELETE object requests to a bucket that has versioning enabled, you might have one or more objects in the bucket for which there are millions of versions. For more information, see [Troubleshooting Amazon S3 \(p. 592\)](#).

For more information, see [Using Versioning \(p. 448\)](#).

## Object Tagging

Object tagging enables you to categorize storage. Each tag is a key-value pair. Consider the following tagging examples:

- Suppose an object contains protected health information (PHI) data. You might tag the object using the following key-value pair, as shown following:

```
PHI=True
```

or

```
Classification=PHI
```

- Suppose you store project files in your S3 bucket. You might tag these objects with a key called Project and a value, as shown following:

```
Project=Blue
```

- You can add multiple tags to an object, as shown following:

```
Project=x
Classification=confidential
```

You can add tags to new objects when you upload them or you can add them to existing objects. Note the following:

- You can associate up to 10 tags with an object. Tags associated with an object must have unique tag keys.
- A tag key can be up to 128 Unicode characters in length and tag values can be up to 256 Unicode characters in length.
- Key and values are case sensitive.

Object key name prefixes also enable you to categorize storage, however prefix-based categorization is one dimensional. Consider the following object key names:

```
photos/photo1.jpg
project/projectx/document.pdf
project/projecty/document2.pdf
```

These key names have the prefixes photos/, project/projectx/, and project/projecty/. These prefixes enable one-dimensional categorization. That is, everything under a prefix is one category. For example, the prefix project/projectx identifies all documents related to project x.

With tagging, you now have another dimension. If you want photo1 in project x category, you can tag the object accordingly. In addition to data classification, tagging offers other benefits. For example,

- Object tags enable fine-grained access control of permissions. For example, you could grant an IAM user permissions to read only objects with specific tags.
- Object tags enable fine-grained object lifecycle management in which you can specify tag-based filter, in addition to key name prefix, in a lifecycle rule.
- You can also customize Amazon CloudWatch metrics and AWS CloudTrail logs to display information by specific tag filters. The following sections provide details.

**Important**

While it is acceptable to use tags to label objects containing confidential data (such as, personally identifiable information (PII) or protected health information (PHI)), the tags themselves shouldn't contain any confidential information.

## API Operations Related to Object Tagging

Amazon S3 supports the following API operations that are specifically for object tagging:

### Object API Operations

- [PUT Object tagging](#) – Replaces tags on an object. You specify tags in the request body. There are two distinct scenarios of object tag management using this API.

- Object has no tags – Using this API you can add a set of tags to an object (the object has no prior tags).
  - Object has a set of existing tags – To modify the existing tag set, you must first retrieve the existing tag set, modify it on the client side, and then use this API to replace the tag set. If you send this request with empty tag set, S3 deletes existing tag set on the object.
- 
- [GET Object tagging](#) – Returns the tag set associated with an object. Amazon S3 returns object tags in the response body.
  - [DELETE Object tagging](#) – Deletes the tag set associated with an object.

### Other API Operations that Support Tagging

- [PUT Object](#) – You can specify tags when you create objects. You specify tags using the `x-amz-tagging-request` header.
- [GET Object](#) – Instead of returning the tag set, Amazon S3 returns the object tag count in the `x-amz-tag-count` header (only if the requester has permissions to read tags) because the header response size is limited to 8 K bytes. If you want to view the tags, you make another request for the [GET Object tagging](#) API operation.
- [POST Object](#) – You can specify tags in your POST request.

As long as the tags in your request don't exceed the 8 K byte HTTP request header size limit, you can use the [PUT Object](#) API to create objects with tags. If the tags you specify exceed the header size limit, you can use this POST method in which you include the tags in the body.

- [PUT Object - Copy](#) – You can specify the `x-amz-tagging-directive` in your request to direct Amazon S3 to either copy (default behavior) the tags or replace tags by a new set of tags provided in the request.

Note the following:

- Tagging follows the eventual consistency model. That is, soon after adding tags to an object, if you try to retrieve the tags, you might get old tags, if any, on the objects. However, a subsequent call will likely provide the updated tags.

## Object Tagging and Additional Information

This section explains how object tagging relates to other configurations.

### Object Tagging and Lifecycle Management

In bucket lifecycle configuration, you can specify a filter to select a subset of objects to which the rule applies. You can specify a filter based on the key name prefixes, object tags, or both.

Suppose you store photos (raw and the finished format) in your Amazon S3 bucket. You might tag these objects as shown following:

```
phototype=raw
or
phototype=finished
```

You might consider archiving the raw photos to Amazon Glacier sometime after they are created. You can configure a lifecycle rule with a filter that identifies the subset of objects with the key name prefix (photos/) that have a specific tag (phototype=raw).

For more information, see [Object Lifecycle Management \(p. 125\)](#).

## Object Tagging and Cross-Region Replication (CRR)

If you configured cross-region replication (CRR) on your bucket, Amazon S3 replicates tags, provided you grant S3 permission to read the tags. For more information, see [Setting Up Cross-Region Replication \(p. 523\)](#).

## Object Tagging and Multipart Upload

When you create objects using the multipart upload API operation, you can add tags to an object only after you complete the multipart upload (that is, after the object is created). You can then use the PUT Object tagging API operation to add tags to the existing object.

## Object Tagging and Access Control Policies

You can also use permissions policies (bucket and user policies) to manage object tagging related permissions. For policy actions see the following topics:

- [Permissions for Object Operations \(p. 339\)](#)
- [Permissions Related to Bucket Operations \(p. 340\)](#)

Object tags enable fine-grained access control for managing permissions. You can grant conditional permissions based on object tags. Amazon S3 supports the following condition keys that you can use to grant object tag-based conditional permissions.

- s3:ExistingObjectTag/`<tag-key>` – Use this condition key to verify that an existing object tag has the specific tag key and value.

### Note

When granting permissions for the `PUT Object` and `DELETE Object` operations, this condition key is not supported. That is, you cannot create a policy to grant or deny a user permissions to delete or override an existing object based on its existing tags.

- s3:RequestObjectTagKeys – Use this condition key to restrict the tag keys that you want to allow on objects. This is useful when adding tags to objects using the PutObjectTagging and PutObject, and POST object requests.
- s3:RequestObjectTag/`<tag-key>` – Use this condition key to restrict the tag keys and values that you want to allow on objects. This is useful when adding tags to objects using the PutObjectTagging and PutObject, and POST Bucket requests.

For a complete list of Amazon S3 service-specific condition keys, see [Available Condition Keys \(p. 343\)](#). The following permissions policies illustrate how object tagging enables fine grained access permissions management.

### Example 1: Allow a User to Read Only the Objects that Have a Specific Tag

The following permissions policy grants a user permission to read objects, but the condition limits the read permission to only objects that have the following specific tag key and value:

```
security : public
```

Note that the policy uses the Amazon S3 condition key, `s3:ExistingObjectTag/<tag-key>` to specify the key and value.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "s3:GetObject"
      ],
      "Resource": [
        "arn:aws:s3:::examplebucket/*"
      ],
      "Condition": {
        "StringEquals": {
          "s3:ExistingObjectTag/security": "public"
        }
      }
    }
  ]
}
```

### Example 2: Allow a User to Add Object Tags with Restrictions on the Allowed Tag Keys

The following permissions policy grants a user permissions to perform the `s3:PutObjectTagging` action, which allows user to add tags to an existing object. The condition limits the tag keys that the user is allowed to use. The condition uses the `s3:RequestObjectTagKeys` condition key to specify the set of tag keys.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "s3:PutObjectTagging"
      ],
      "Resource": [
        "arn:aws:s3:::examplebucket/*"
      ],
      "Condition": {
        "ForAllValues:StringLike": {
          "s3:RequestObjectTagKeys": [
            "Owner",
            "CreationDate"
          ]
        }
      }
    }
  ]
}
```

```
    ]
}
```

The policy ensures that the tag set, if specified in the request, has the specified keys. A user might send an empty tag set in `PutObjectTagging`, which is allowed by this policy (an empty tag set in the request removes any existing tags on the object). If you want to prevent a user from removing the tag set, you can add another condition to ensure that the user provides at least one value. The `ForAnyValue` in the condition ensures at least one of the specified values must be present in the request.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "s3:PutObjectTagging"
      ],
      "Resource": [
        "arn:aws:s3:::examplebucket/*"
      ],
      "Condition": {
        "ForAllValues:StringLike": {
          "s3:RequestObjectTagKeys": [
            "Owner",
            "CreationDate"
          ]
        },
        "ForAnyValue:StringLike": {
          "s3:RequestObjectTagKeys": [
            "Owner",
            "CreationDate"
          ]
        }
      }
    }
  ]
}
```

For more information, see [Creating a Condition That Tests Multiple Key Values \(Set Operations\)](#) in the *IAM User Guide*.

### Example 3: Allow a User to Add Object Tags that Include a Specific Tag Key and Value

The following user policy grants a user permissions to perform the `s3:PutObjectTagging` action, which allows user to add tags on an existing object. The condition requires the user to include a specific tag (`Project`) with value set to `X`.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "s3:PutObjectTagging"
      ],
      "Resource": [
        "arn:aws:s3:::examplebucket/*"
      ],
      "Condition": {
        "StringEquals": {
          "s3:RequestObjectTag/Project": "X"
        }
      }
    }
  ]
}
```

```
        }
    ]
}
```

#### Related Topics

[Managing Object Tags \(p. 122\)](#)

## Managing Object Tags

This section explains how you can add object tags programmatically using AWS SDK for Java, or by using the Amazon S3 console.

#### Topics

- [Managing Object Tags Using the Console \(p. 122\)](#)
- [Managing Tags Using SDK \(AWS SDK for Java\) \(p. 122\)](#)
- [Managing Tags Using SDK \(AWS SDK for .NET\) \(p. 123\)](#)

## Managing Object Tags Using the Console

You can use the Amazon S3 console to add tags to new objects when you upload them or you can add them to existing objects. For instructions on how to add tags to objects using the Amazon S3 console, see [Adding Object Tags](#) in the Amazon Simple Storage Service Console User Guide.

## Managing Tags Using SDK (AWS SDK for Java)

The following Java code example does the following:

- Create an object with tags.
- Retrieve tag set.
- Update the tag set (replace the existing tag set).

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
package s3.amazonaws.docsamples;

import java.io.File;
import java.util.ArrayList;
import java.util.List;

import com.amazonaws.auth.BasicAWSCredentials;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.*;

public class ObjectTaggingTest {

    static String bucketName = "***bucket***";
    static String keyName = "***object key name***";
    static String filePath = "***filepath***";

    public static void main(String[] args) {

        AmazonS3Client s3client = new AmazonS3Client(new BasicAWSCredentials("<AccessKey>",
        "<SecretKey>"));
    }
}
```

```
// 1. Put object with tags.  
PutObjectRequest putRequest = new PutObjectRequest(bucketName, keyName, new  
File(filePath));  
List<Tag> tags = new ArrayList<Tag>();  
tags.add(new Tag("Key1", "Value1"));  
tags.add(new Tag("Key2", "Value2"));  
putRequest.setTagging(new ObjectTagging(tags));  
PutObjectResult putResult = s3client.putObject(putRequest);  
  
// 2. Retrieve object tags.  
GetObjectTaggingRequest getTaggingRequest = new GetObjectTaggingRequest(bucketName,  
keyName);  
GetObjectTaggingResult getTagsResult =  
s3client.getObjectTagging(getTaggingRequest);  
  
// 3. Replace the tagset.  
List<Tag> newTags = new ArrayList<Tag>();  
newTags.add(new Tag("Key3", "Value3"));  
newTags.add(new Tag("Key4", "Value4"));  
s3client.setObjectTagging(new SetObjectTaggingRequest(bucketName, keyName, new  
ObjectTagging(newTags)));  
  
// 4. Retrieve object tags.  
GetObjectTaggingRequest getTaggingRequest2 = new  
GetObjectTaggingRequest(bucketName, keyName);  
GetObjectTaggingResult getTagsResult2 =  
s3client.getObjectTagging(getTaggingRequest);  
}  
}
```

## Managing Tags Using SDK (AWS SDK for .NET)

The following C# code example does the following:

- Create an object with tags.
- Retrieve tag set.
- Update the tag set (replace the existing tag set).

For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;  
using Amazon.S3;  
using Amazon.S3.Model;  
using System.Collections.Generic;  
  
namespace s3.amazon.com.docsamples  
{  
    class ObjectTaggingTest  
    {  
        static string bucketName = "*** bucket ***";  
        static string keyName = "*** object key name ***";  
        static string filePath = "***file to upload ***";  
  
        static IAmazonS3 client;  
  
        public static void Main(string[] args)  
        {  
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))  
            {
```

```
        Console.WriteLine("Uploading an object");
        PutObjectWithTagsTest();
    }

    Console.WriteLine("Press any key to continue...");
    Console.ReadKey();
}

static void PutObjectWithTagsTest()
{
    try
    {
        // 1. Put object with tags.
        PutObjectRequest putRequest = new PutObjectRequest
        {
            BucketName = bucketName,
            Key = keyName,
            FilePath = filePath,
            TagSet = new List<Tag>{
                new Tag { Key = "Key1", Value = "Value1" },
                new Tag { Key = "Key2", Value = "Value2" }
            }
        };

        PutObjectResponse response = client.PutObject(putRequest);
        // 2. Retrieve object tags.
        GetObjectTaggingRequest getTagsRequest = new GetObjectTaggingRequest();
        getTagsRequest.BucketName = bucketName;
        getTagsRequest.Key = keyName;

        GetObjectTaggingResponse objectTags =
        client.GetObjectTagging(getTagsRequest);

        // 3. Replace the tagset.

        Tagging newTagSet = new Tagging();
        newTagSet.TagSet = new List<Tag>{
            new Tag { Key = "Key3", Value = "Value3" },
            new Tag { Key = "Key4", Value = "Value4" }
        };

        PutObjectTaggingRequest putObjTagsRequest = new PutObjectTaggingRequest();
        putObjTagsRequest.BucketName = bucketName;
        putObjTagsRequest.Key = keyName;
        putObjTagsRequest.Tagging = newTagSet;

        PutObjectTaggingResponse response2 =
        client.PutObjectTagging(putObjTagsRequest);

        // 4. Retrieve object tags.
        GetObjectTaggingRequest getTagsRequest2 = new GetObjectTaggingRequest();
        getTagsRequest2.BucketName = bucketName;
        getTagsRequest2.Key = keyName;
        GetObjectTaggingResponse objectTags2 =
        client.GetObjectTagging(getTagsRequest2);

    }
    catch (AmazonS3Exception amazonS3Exception)
    {
        if (amazonS3Exception.ErrorCode != null &&
            (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
            ||
            amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
        {
            Console.WriteLine("Check the provided AWS Credentials.");
        }
    }
}
```

```
        Console.WriteLine(
            "For service sign up go to http://aws.amazon.com/s3");
    }
    else
    {
        Console.WriteLine(
            "Error occurred. Message:{0} when writing an object"
            , amazonS3Exception.Message);
    }
}
}
```

## Object Lifecycle Management

Lifecycle configuration enables you to specify the lifecycle management of objects in a bucket. The configuration is a set of one or more rules, where each rule defines an action for Amazon S3 to apply to a group of objects. These actions can be classified as follows:

- **Transition actions** – In which you define when objects transition to another [storage class](#). For example, you may choose to transition objects to the STANDARD\_IA (IA, for infrequent access) storage class 30 days after creation, or archive objects to the GLACIER storage class one year after creation.
- **Expiration actions** – In which you specify when the objects expire. Then Amazon S3 deletes the expired objects on your behalf.

For more information about lifecycle rules, see [Lifecycle Configuration Elements \(p. 131\)](#).

## When Should I Use Lifecycle Configuration for Objects?

You can define lifecycle configuration rules for objects that have a well-defined lifecycle. For example:

- If you are uploading periodic logs to your bucket, your application might need these logs for a week or a month after creation, and after that you might want to delete them.
- Some documents are frequently accessed for a limited period of time. After that, these documents are less frequently accessed. Over time, you might not need real-time access to these objects, but your organization or regulations might require you to archive them for a longer period and then optionally delete them later.
- You might also upload some types of data to Amazon S3 primarily for archival purposes, for example digital media archives, financial and healthcare records, raw genomics sequence data, long-term database backups, and data that must be retained for regulatory compliance.

Using lifecycle configuration rules, you can direct S3 to tier down the storage classes, archive, or delete the objects during their lifecycle.

## How Do I Configure a Lifecycle?

A lifecycle configuration, an XML file, comprises a set of rules with predefined actions that you want Amazon S3 to perform on objects during their lifetime.

Amazon S3 provides a set of API operations that you use to manage lifecycle configuration on a bucket. Amazon S3 stores the configuration as a *lifecycle subresource* that is attached to your bucket.

[PUT Bucket lifecycle](#)

[GET Bucket lifecycle](#)

[DELETE Bucket lifecycle](#)

You can also configure the lifecycle by using the Amazon S3 console or programmatically by using the AWS SDK wrapper libraries, and if you need to you can also make the REST API calls directly. For more information, see [Setting Lifecycle Configuration On a Bucket \(p. 146\)](#).

For more information, see the following topics:

- [Lifecycle Configuration: Additional Considerations \(p. 126\)](#)
- [Lifecycle Configuration Elements \(p. 131\)](#)
- [Examples of Lifecycle Configuration \(p. 137\)](#)
- [Setting Lifecycle Configuration On a Bucket \(p. 146\)](#)

## Lifecycle Configuration: Additional Considerations

The following sections describe additional considerations relevant to lifecycle configuration.

### Topics

- [Transitioning Objects: General Considerations \(p. 126\)](#)
- [Expiring Objects: General Considerations \(p. 130\)](#)
- [Lifecycle and Other Bucket Configurations \(p. 130\)](#)

## Transitioning Objects: General Considerations

You can add rules in a lifecycle configuration to direct Amazon S3 to transition objects to another Amazon S3 [storage class](#). For example:

- You might transition objects to the STANDARD\_IA storage class when you know those objects are infrequently accessed.
- You might want to archive objects that don't need real-time access to the GLACIER storage class.

The following sections describe supported transitions, related constraints, and transitioning to the GLACIER storage class.

### Supported Transitions and Related Constraints

In a lifecycle configuration you can define rules to transition objects from one storage class to another. The following are supported transitions:

- From the STANDARD or REDUCED\_REDUNDANCY storage classes to STANDARD\_IA. The following constraints apply:
  - Cost benefits of transitioning to STANDARD\_IA can be realized for larger objects. Amazon S3 does not transition objects less than 128 Kilobytes in size to the STANDARD\_IA storage class. For smaller objects it is not cost effective and Amazon S3 will not transition them.

- Objects must be stored at least 30 days in the current storage class before you can transition them to STANDARD\_IA. For example, you cannot create a lifecycle rule to transition objects to the STANDARD\_IA storage class one day after creation.

Transitions before the first 30 days are not supported because often newer objects are accessed more frequently or deleted sooner than is suitable for STANDARD\_IA.

- If you are transitioning noncurrent objects (versioned bucket scenario), you can transition to STANDARD\_IA only objects that are at least 30 days noncurrent.
- From any storage class to GLACIER.

You can combine these lifecycle rules to manage an object's complete lifecycle, including a first transition to STANDARD\_IA, a second transition to GLACIER for archival, and an expiration.

For example, suppose the objects you create have a well-defined lifecycle. Initially the objects are frequently accessed for a period of 30 days. After the initial period, the frequency of access diminishes where objects are infrequently accessed for up to 90 days. After that, the objects are no longer needed. You may choose to archive or delete them. You can use a lifecycle configuration to define the transition and expiration of objects that matches this example scenario (transition to STANDARD\_IA 30 days after creation and transition to GLACIER 90 days after creation, and perhaps expire them after a certain number of days). As you tier down the object's storage class in the transition, you can benefit from the storage cost savings. For more information about cost considerations, see [Amazon S3 Pricing](#).

**Note**

When configuring lifecycle, the API doesn't allow you to create a lifecycle policy in which you specify both the STANDARD\_IA and GLACIER transitions where the GLACIER transition occurs less than 30 days after the STANDARD\_IA transition. This kind of lifecycle policy may increase costs because of the minimum 30 day storage charge associated with the STANDARD\_IA storage class. For more information about cost considerations, see [Amazon S3 Pricing](#).

You can think of lifecycle transitions as supporting [storage class tiers](#), which offer different costs and benefits. You may choose to transition an object to another storage class in the object's lifetime for cost saving considerations—lifecycle configuration enables you to do that. For example, to manage storage costs, you might configure lifecycle to change an object's storage class from the STANDARD, which is the most available and durable storage class, to the STANDARD\_IA (IA, for infrequent access), and then to the GLACIER storage class (where the objects are archived and only available after you restore them). These transitions can lower your storage costs.

The following transitions are not supported:

- You can't transition from STANDARD\_IA storage class to the STANDARD or REDUCED\_REDUNDANCY classes.
- You can't transition from GLACIER to any other storage class.
- You can't transition from any storage class to REDUCED\_REDUNDANCY.

## Transitioning to the GLACIER Storage Class (Object Archival)

Using lifecycle configuration, you can transition objects to the GLACIER storage class—that is, archive data to Amazon Glacier, a lower-cost storage solution. Before you archive objects, review the following sections for relevant considerations.

## General Considerations

The following are the general considerations for you to consider before you archive objects:

- Objects in the GLACIER storage class are not available in real time.

Archived objects are Amazon S3 objects, but before you can access an archived object, you must first restore a temporary copy of it. The restored object copy is available only for the duration you specify in the restore request. After that, Amazon S3 deletes the temporary copy, and the object remains archived in Amazon Glacier.

Note that object restoration from an archive can take up to five hours.

You can restore an object by using the Amazon S3 console or programmatically by using the AWS SDKs wrapper libraries or the Amazon S3 REST API in your code. For more information, see [POST Object restore](#).

- The transition of objects to the GLACIER storage class is one-way.

You cannot use a lifecycle configuration rule to convert the storage class of an object from GLACIER to STANDARD or REDUCED\_REDUNDANCY. If you want to change the storage class of an already archived object to either STANDARD or REDUCED\_REDUNDANCY, you must use the restore operation to make a temporary copy first. Then use the copy operation to overwrite the object as a STANDARD, STANDARD\_IA, or REDUCED\_REDUNDANCY object.

- The GLACIER storage class objects are visible and available only through Amazon S3, not through Amazon Glacier.

Amazon S3 stores the archived objects in Amazon Glacier. However, these are Amazon S3 objects, and you can access them only by using the Amazon S3 console or the Amazon S3 API. You cannot access the archived objects through the Amazon Glacier console or the Amazon Glacier API.

## Cost Considerations

If you are planning to archive infrequently accessed data for a period of months or years, the GLACIER storage class will usually reduce your storage costs. You should, however, consider the following in order to ensure that the GLACIER storage class is appropriate for you:

- **Storage overhead charges** – When you transition objects to the GLACIER storage class, a fixed amount of storage is added to each object to accommodate metadata for managing the object.
  - For each object archived to Amazon Glacier, Amazon S3 uses 8 KB of storage for the name of the object and other metadata. Amazon S3 stores this metadata so that you can get a real-time list of your archived objects by using the Amazon S3 API. For more information, see [Get Bucket \(List Objects\)](#). You are charged standard Amazon S3 rates for this additional storage.

- For each archived object, Amazon Glacier adds 32 KB of storage for index and related metadata. This extra data is necessary to identify and restore your object. You are charged Amazon Glacier rates for this additional storage.

If you are archiving small objects, consider these storage charges. Also consider aggregating a large number of small objects into a smaller number of large objects in order to reduce overhead costs.

- **Number of days you plan to keep objects archived** – Amazon Glacier is a long-term archival solution. Deleting data that is archived to Amazon Glacier is free if the objects you delete are archived for three months or longer. If you delete or overwrite an object within three months of archiving it, Amazon S3 charges a prorated early deletion fee.
- **Glacier archive request charges** – Each object that you transition to the GLACIER storage class constitutes one archive request. There is a cost for each such request. If you plan to transition a large number of objects, consider the request costs.
- **Glacier data restore charges** – Amazon Glacier is designed for long-term archival of data that you will access infrequently. For information on data restoration charges, see [How much does it cost to retrieve data from Glacier?](#) in the Amazon S3 FAQ. For information on how to restore data from Glacier, see [Restoring Archived Objects \(p. 275\)](#).

When you archive objects to Amazon Glacier by using object lifecycle management, Amazon S3 transitions these objects asynchronously. There may be a delay between the transition date in the lifecycle configuration rule and the date of the physical transition. You are charged Amazon Glacier prices based on the transition date specified in the rule.

The Amazon S3 product detail page provides pricing information and example calculations for archiving Amazon S3 objects. For more information, see the following topics:

- [How is my storage charge calculated for Amazon S3 objects archived to Amazon Glacier?](#)
- [How am I charged for deleting objects from Amazon Glacier that are less than 3 months old?](#)
- [How much does it cost to retrieve data from Glacier?](#)
- [Amazon S3 Pricing](#) for storage costs for the Standard and GLACIER storage classes. This page also provides Glacier Archive Request costs.

## Restoring Archived Objects

Archived objects are not accessible in real time. You must first initiate a restore request and then wait until a temporary copy of the object is available for the duration that you specify in the request. Restore jobs are typically completed in three to five hours, so it is important that you archive only objects that you will not need to access in real time.

After you receive a temporary copy of the restored object, the object's storage class remains GLACIER (a GET or HEAD request will return GLACIER as the storage class).

### Note

Note that when you restore an archive you are paying for both the archive (GLACIER rate) and a copy you restored temporarily (REDUCED\_REDUNDANCY storage rate). For information about pricing, see [Amazon S3 Pricing](#).

You can restore an object copy programmatically or by using the Amazon S3 console. Amazon S3 processes only one restore request at a time per object. For more information, see [Restoring Archived Objects \(p. 275\)](#).

## [Expiring Objects: General Considerations](#)

When an object reaches the end of its lifetime, Amazon S3 queues it for removal and removes it asynchronously. There may be a delay between the expiration date and the date at which Amazon S3 removes an object. You are not charged for storage time associated with an object that has expired.

To find when an object is scheduled to expire, you can use the [HEAD Object](#) or the [GET Object](#) API operations. These API operations return response headers that provide object expiration information.

There are additional cost considerations if you put a lifecycle policy to expire objects that have been in STANDARD\_IA for less than 30 days, or GLACIER for less than 90 days. For more information about cost considerations, see [Amazon S3 Pricing](#).

## [Lifecycle and Other Bucket Configurations](#)

In addition to lifecycle configurations, you can associate other configurations with your bucket. This section explains how lifecycle configuration relates to other bucket configurations.

### [Lifecycle and Versioning](#)

You can add lifecycle configurations to nonversioned buckets and versioning-enabled buckets. For more information, see [Object Versioning \(p. 114\)](#). A versioning-enabled bucket maintains one current object version, and zero or more noncurrent object versions. You can define separate lifecycle rules for current and noncurrent object versions.

For more information, see [Lifecycle Configuration Elements \(p. 131\)](#). For information about versioning, see [Object Versioning \(p. 114\)](#).

### [Lifecycle and MFA Enabled Buckets](#)

Lifecycle configuration on MFA-enabled buckets is not supported.

### [Lifecycle and Logging](#)

If you have logging enabled on your bucket, Amazon S3 reports the results of expiration action as follows:

- If the lifecycle expiration action results in Amazon S3 permanently removing the object, Amazon S3 reports it as an `S3.EXPIRE.OBJECT` operation in the log record.
- For a versioning-enabled bucket, if the lifecycle expiration action results in a logical deletion of current version, in which Amazon S3 adds a delete marker, Amazon S3 reports the logical deletion as an `S3.CREATE.DELETEMARKER` operation in the log record. For more information, see [Object Versioning \(p. 114\)](#).
- When Amazon S3 transitions object to the GLACIER storage class it reports it as operation `S3.TRANSITION.OBJECT` in the log record to indicate it has initiated the operation. When it is transitioned to the STANDARD\_IA storage class, it is reported as `S3.TRANSITION_SIA.OBJECT`.

### [Related Topics](#)

- [Lifecycle Configuration Elements \(p. 131\)](#)

- [Transitioning to the GLACIER Storage Class \(Object Archival\) \(p. 127\)](#)
- [Setting Lifecycle Configuration On a Bucket \(p. 146\)](#)

## Lifecycle Configuration Elements

### Topics

- [ID Element \(p. 131\)](#)
- [Status Element \(p. 131\)](#)
- [Filter Element \(p. 131\)](#)
- [Elements to Describe Lifecycle Actions \(p. 134\)](#)

You specify a lifecycle configuration as XML, consisting of one or more lifecycle rules.

```
<LifecycleConfiguration>
  <Rule>
    ...
  </Rule>
  <Rule>
    ...
  </Rule>
</LifecycleConfiguration>
```

Each rule consists of the following:

- Rule metadata that include a rule ID, and status indicating whether the rule is enabled or disabled. If a rule is disabled, Amazon S3 won't perform any actions specified in the rule.
- Filter identifying objects to which the rule applies. You can specify a filter by using an object key prefix, one or more object tags, or both.
- One or more transition or expiration actions with a date or a time period in the object's lifetime when you want Amazon S3 to perform the specified action.

The following sections describe the XML elements in a lifecycle configuration. For example lifecycle configurations, see [Examples of Lifecycle Configuration \(p. 137\)](#).

### ID Element

A lifecycle configuration can have up to 1,000 rules. The `<ID>` element uniquely identifies a rule. ID length is limited to 255 characters.

### Status Element

The `<Status>` element value can be either Enabled or Disabled. If a rule is disabled, Amazon S3 won't perform any of the actions defined in the rule.

### Filter Element

A lifecycle rule can apply to all or a subset of objects in a bucket based on the `<Filter>` element that you specify in the lifecycle rule.

You can filter objects by key prefix, object tags, or combination of both (in which case Amazon S3 uses a logical AND to combine the filters). Consider the following examples:

- **Specifying a filter using key prefixes** – This example shows a lifecycle rule that applies to a subset of objects based on the key name prefix (`logs/`). For example, the lifecycle rule applies to objects `logs/mylog.txt`, `logs/temp1.txt`, and `logs/test.txt`. The rule does not apply to the object `example.jpg`.

```
<LifecycleConfiguration>
  <Rule>
    <Filter>
      <Prefix>logs/</Prefix>
    </Filter>
    transition/expiration actions.
    ...
  </Rule>
  ...
</LifecycleConfiguration>
```

If you want to apply a lifecycle action to a subset of objects based on different key name prefixes, specify separate rules. In each rule, specify a prefix-based filter. For example, to describe a lifecycle action for objects with key prefixes `projectA/` and `projectB/`, you specify two rules as shown following:

```
<LifecycleConfiguration>
  <Rule>
    <Filter>
      <Prefix>projectA/</Prefix>
    </Filter>
    transition/expiration actions.
    ...
  </Rule>

  <Rule>
    <Filter>
      <Prefix>projectB/</Prefix>
    </Filter>
    transition/expiration actions.
    ...
  </Rule>
</LifecycleConfiguration>
```

For more information about object keys, see [Object Keys \(p. 107\)](#).

- **Specifying a filter based on object tags** – In the following example, the lifecycle rule specifies a filter based on a tag (`key`) and value (`value`). The rule then applies only to a subset of objects with the specific tag.

```
<LifecycleConfiguration>
  <Rule>
    <Filter>
      <Tag>
        <Key>key</Key>
        <Value>value</Value>
      </Tag>
    </Filter>
    transition/expiration actions.
    ...
  </Rule>
</LifecycleConfiguration>
```

You can specify a filter based on multiple tags. You must wrap the tags in the `<AND>` element shown in the following example. The rule directs Amazon S3 to perform lifecycle actions on objects with two tags (with the specific tag key and value).

```
<LifecycleConfiguration>
  <Rule>
    <Filter>
      <And>
        <Tag>
          <Key>key1</Key>
          <Value>value1</Value>
        </Tag>
        <Tag>
          <Key>key2</Key>
          <Value>value2</Value>
        </Tag>
        ...
      </And>
    </Filter>
    transition/expiration actions.
  </Rule>
</Lifecycle>
```

The lifecycle rule applies to objects that have both of the tags specified. Amazon S3 performs a logical AND. Note the following:

- Tag must match both the key and value exactly.
- The rule applies to subset of objects that have one or more tags specified in the rule. An object might have additional tags, that does not matter.

**Note**

When you specify multiple tags in a filter, each tag key must be unique.

- **Specifying a filter based on both prefix and one or more tags** – In a lifecycle rule, you can specify a filter based on both the key prefix and one or more tags. Again, you must wrap all of these in the <And> element as shown following:

```
<LifecycleConfiguration>
  <Rule>
    <Filter>
      <And>
        <Prefix>key-prefix</Prefix>
        <Tag>
          <Key>key1</Key>
          <Value>value1</Value>
        </Tag>
        <Tag>
          <Key>key2</Key>
          <Value>value2</Value>
        </Tag>
        ...
      </And>
    </Filter>
    <Status>Enabled</Status>
    transition/expiration actions.
  </Rule>
</LifecycleConfiguration>
```

Amazon S3 combines these filters using a logical AND. That is, the rule applies to subset of objects with a specific key prefix and specific tags. Note that, a filter can have at most one prefix, and zero or more tags.

- You can specify an empty filter, in which case the rule applies to all objects in the bucket.

```
<LifecycleConfiguration>
  <Rule>
```

```
<Filter>
</Filter>
<Status>Enabled</Status>
    transition/expiration actions.
</Rule>
</LifecycleConfiguration>
```

## Elements to Describe Lifecycle Actions

You can direct Amazon S3 to perform specific actions in an object's lifetime by specifying one or more of the following predefined actions in a lifecycle rule. The effect of these actions depend on the versioning state of your bucket.

- **Transition action element** – You specify the `Transition` action to transition objects from one storage class to another. For more information about transitioning objects, see [Supported Transitions and Related Constraints \(p. 126\)](#). When a specified date or time period in the object's lifetime is reached, Amazon S3 performs the transition.

For a versioned bucket (versioning-enabled or versioning-suspended bucket), the `Transition` action applies to the current object version. To manage noncurrent versions, Amazon S3 defines the `NoncurrentVersionTransition` action (described below).

- **Expiration action element** – The `Expiration` action expires objects identified in the rule. Amazon S3 makes all expired objects unavailable. Whether the objects are permanently removed depends on the versioning state of the bucket.

**Important**

Object expiration lifecycle policies do not remove incomplete multipart uploads. To remove incomplete multipart uploads you must use the `AbortIncompleteMultipartUpload` lifecycle configuration action that is described later in this section.

- **Non-versioned bucket** – The `Expiration` action results in Amazon S3 permanently removing the object.
- **Versioned bucket** – For a versioned bucket (that is, versioning-enabled or versioning-suspended), there are several considerations that guide how Amazon S3 handles the `expiration` action. For more information, see [Using Versioning \(p. 448\)](#). Regardless of the versioning state, the following applies:
  - The `Expiration` action applies only to the current version (it has no impact on noncurrent object versions).
  - Amazon S3 won't take any action if there are one or more object versions and the delete marker is the current version.
  - If the current object version is the only object version and it is also a delete marker (also referred as an *expired object delete marker*, where all object versions are deleted and you only have a delete marker remaining), Amazon S3 removes the expired object delete marker. You can also use the expiration action to direct Amazon S3 to remove any expired object delete markers. For an example, see [Example 7: Removing Expired Object Delete Markers \(p. 144\)](#).

**Important**

Amazon S3 removes an expired object delete marker no sooner than 48 hours after the object expired.

The additional considerations for Amazon S3 to manage expiration are as follows:

- **Versioning-enabled bucket**

If the current object version is not a delete marker, Amazon S3 adds a delete marker with a unique version ID, making the current version noncurrent, and the delete marker the current version.

- **Versioning-suspended bucket**

In a versioning-suspended bucket the expiration action causes Amazon S3 to create a delete marker with null as the version ID. This delete marker replaces any object version with a null version ID in the version hierarchy, which effectively deletes the object.

In addition, Amazon S3 provides the following actions that you can use to manage noncurrent object versions in a versioned bucket (that is, versioning-enabled and versioning-suspended buckets).

- **NoncurrentVersionTransition** action element – Use this action to specify how long (from the time the objects became noncurrent) you want the objects to remain in the current storage class before Amazon S3 transitions them to the specified storage class. For more information about transitioning objects, see [Supported Transitions and Related Constraints \(p. 126\)](#).
- **NoncurrentVersionExpiration** action element – Use this action to specify how long (from the time the objects became noncurrent) you want to retain noncurrent object versions before Amazon S3 permanently removes them. The deleted object can't be recovered.

This delayed removal of noncurrent objects can be helpful when you need to correct any accidental deletes or overwrites. For example, you can configure an expiration rule to delete noncurrent versions five days after they become noncurrent. For example, suppose on 1/1/2014 10:30 AM UTC, you create an object called `photo.gif` (version ID 111111). On 1/2/2014 11:30 AM UTC, you accidentally delete `photo.gif` (version ID 111111), which creates a delete marker with a new version ID (such as version ID 4857693). You now have five days to recover the original version of `photo.gif` (version ID 111111) before the deletion is permanent. On 1/8/2014 00:00 UTC, the lifecycle rule for expiration executes and permanently deletes `photo.gif` (version ID 111111), five days after it became a noncurrent version.

**Important**

Object expiration policies do not remove incomplete multipart uploads. To remove incomplete multipart uploads you must use the **AbortIncompleteMultipartUpload** lifecycle configuration action that is described later in this section.

In addition to the transition and expiration actions, you can use the following lifecycle configuration action to direct Amazon S3 to abort incomplete multipart uploads.

- **AbortIncompleteMultipartUpload** action element – Use this element to set a maximum time (in days) that you want to allow multipart uploads to remain in progress. If the applicable multipart uploads (determined by the key name `prefix` specified in the lifecycle rule) are not successfully completed within the predefined time period, Amazon S3 will abort the incomplete multipart uploads. For more information, see [Aborting Incomplete Multipart Uploads Using a Bucket Lifecycle Policy \(p. 189\)](#).

**Note**

You cannot specify this lifecycle action in a rule that specifies a filter based on object tags.

- **ExpiredObjectDeleteMarker** action element – In a versioning-enabled bucket, a delete marker with zero noncurrent versions is referred to as the expired object delete marker. You can use this lifecycle action to direct S3 to remove the expired object delete markers. For an example, see [Example 7: Removing Expired Object Delete Markers \(p. 144\)](#).

**Note**

You cannot specify this lifecycle action in a rule that specifies a filter based on object tags.

### How Amazon S3 Calculates How Long an Object Has Been Noncurrent

In a versioning-enabled bucket, you can have multiple versions of an object, there is always one current version, and zero or more noncurrent versions. Each time you upload an object, the current version is retained as the noncurrent version and the newly added version, the successor, becomes the current version. To determine the number of days an object is noncurrent, Amazon S3 looks at when its

successor was created. Amazon S3 uses the number of days since its successor was created as the number of days an object is noncurrent.

### Restoring Previous Versions of an Object When Using Lifecycle Configurations

As explained in detail in the topic [Restoring Previous Versions \(p. 466\)](#), you can use either of the following two methods to retrieve previous versions of an object:

1. By copying a noncurrent version of the object into the same bucket. The copied object becomes the current version of that object, and all object versions are preserved.
2. By permanently deleting the current version of the object. When you delete the current object version, you, in effect, turn the noncurrent version into the current version of that object.

When using lifecycle configuration rules with versioning-enabled buckets, we recommend as a best practice that you use the first method.

Because of Amazon S3's eventual consistency semantics, a current version that you permanently deleted may not disappear until the changes propagate (Amazon S3 may be unaware of this deletion). In the meantime, the lifecycle rule that you configured to expire noncurrent objects may permanently remove noncurrent objects, including the one you want to restore. So, copying the old version, as recommended in the first method, is the safer alternative.

## Lifecycle Rules: Based on an Object's Age

You can specify a time period in number of days from the creation (or modification) of the objects when Amazon S3 can take the action.

When you specify the number of days in the `Transition` and `Expiration` actions in a lifecycle configuration, note the following:

- It is the number of days since object creation when the action will occur.
- Amazon S3 calculates the time by adding the number of days specified in the rule to the object creation time and rounding the resulting time to the next day midnight UTC. For example, if an object was created at 1/15/2014 10:30 AM UTC and you specify 3 days in a transition rule, then the transition date of the object would be calculated as 1/19/2014 00:00 UTC.

### Note

Amazon S3 maintains only the last modified date for each object. For example, the Amazon S3 console shows the **Last Modified** date in the object **Properties** pane. When you initially create a new object, this date reflects the date the object is created. If you replace the object, the date will change accordingly. So when we use the term *creation date*, it is synonymous with the term *last modified date*.

When specifying the number of days in the `NoncurrentVersionTransition` and `NoncurrentVersionExpiration` actions in a lifecycle configuration, note the following:

- It is the number of days from when the version of the object becomes noncurrent (that is, since the object was overwritten or deleted), as the time when Amazon S3 will perform the action on the specified object or objects.
- Amazon S3 calculates the time by adding the number of days specified in the rule to the time when the new successor version of the object is created and rounding the resulting time to the next day midnight UTC. For example, in your bucket, you have a current version of an object that was created at 1/1/2014 10:30 AM UTC, if the new successor version of the object that replaces the current version is created at 1/15/2014 10:30 AM UTC and you specify 3 days in a transition rule, then the transition date of the object would be calculated as 1/19/2014 00:00 UTC.

## Lifecycle Rules: Based on a Specific Date

When specifying an action in a lifecycle rule, you can specify a date when you want S3 to take the action. When the specific date arrives, S3 applies the action to all qualified objects (based on the filter criteria).

If you specify a lifecycle action with a date that is in the past, all qualified objects become immediately eligible for that lifecycle action.

### Important

The date-based action is not a one-time action. S3 continues to apply the date-based action even after the date has passed, as long as the rule status is Enabled.

For example, suppose you specify a date-based Expiration action to delete all objects (assume no filter specified in the rule). On the specified date, S3 expires all the objects in the bucket. S3 also continues to expire any new objects you create in the bucket. To stop the lifecycle action, you must remove the action from the lifecycle configuration, disable the rule, or delete the rule from the lifecycle configuration.

The date value must conform to the ISO 8601 format. The time is always midnight UTC.

### Note

You can't create the date-based lifecycle rules using the Amazon S3 console, but you can view, disable, or delete such rules.

## Examples of Lifecycle Configuration

This section provides examples of lifecycle configuration. Each example shows how you can specify the XML in each of the example scenarios.

### Topics

- [Example 1: Specifying a Filter \(p. 137\)](#)
- [Example 2: Disabling a Lifecycle Rule \(p. 139\)](#)
- [Example 3: Tiering Down Storage Class Over an Object's Lifetime \(p. 140\)](#)
- [Example 4: Specifying Multiple Rules \(p. 140\)](#)
- [Example 5: Overlapping Filters, Conflicting Lifecycle Actions, and What Amazon S3 Does \(p. 141\)](#)
- [Example 6: Specifying a Lifecycle Rule for a Versioning-Enabled Bucket \(p. 144\)](#)
- [Example 7: Removing Expired Object Delete Markers \(p. 144\)](#)
- [Example 8: Lifecycle Configuration to Abort Multipart Uploads \(p. 146\)](#)

## Example 1: Specifying a Filter

Each lifecycle rule includes a filter that you can use to identify a subset of objects in your bucket to which the lifecycle rule applies. The following lifecycle configurations show examples of how you can specify a filter.

- In this lifecycle configuration rule, the filter specifies a key prefix (tax/). Therefore, the rule applies to objects with key name prefix tax/, such as tax/doc1.txt and tax/doc2.txt

The rule specifies two actions that request Amazon S3 to do the following:

- Transition objects to the GLACIER storage class 365 days (one year) after creation.
- Delete objects (the `Expiration` action) 3650 days (10 years) after creation.

```
<LifecycleConfiguration>
  <Rule>
    <ID>Transition and Expiration Rule</ID>
    <Filter>
```

```

<Prefix>tax/</Prefix>
</Filter>
<Status>Enabled</Status>
<Transition>
  <Days>365</Days>
  <StorageClass>GLACIER</StorageClass>
</Transition>
<Expiration>
  <Days>3650</Days>
</Expiration>
</Rule>
</LifecycleConfiguration>

```

Instead of specifying object age in terms of days after creation, you can specify a date for each action. However, you can't use both Date and Days in the same rule.

- If you want the lifecycle rule to apply to all objects in the bucket, specify an empty prefix. In the following configuration, the rule specifies a Transition action directing Amazon S3 to transition objects to the GLACIER storage class 0 days after creation in which case objects are eligible for archival to Amazon Glacier at midnight UTC following creation.

```

<LifecycleConfiguration>
  <Rule>
    <ID>Archive all object same-day upon creation</ID>
    <Filter>
      <Prefix></Prefix>
    </Filter>
    <Status>Enabled</Status>
    <Transition>
      <Days>0</Days>
      <StorageClass>GLACIER</StorageClass>
    </Transition>
  </Rule>
</LifecycleConfiguration>

```

- You can specify zero or one key name prefix and zero or more object tags in a filter. The following example code applies the lifecycle rule to a subset of objects with the tax/ key prefix and to objects that have two tags with specific key and value. Note that when you specify more than one filter, you must include the AND as shown (Amazon S3 applies a logical AND to combine the specified filter conditions).

```

...
<Filter>
  <And>
    <Prefix>tax/</Prefix>
    <Tag>
      <Key>key1</Key>
      <Value>value1</Value>
    </Tag>
    <Tag>
      <Key>key2</Key>
      <Value>value2</Value>
    </Tag>
  </And>
</Filter>
...

```

- You can filter objects based only on tags. For example, the following lifecycle rule applies to objects that have the two specified tags (it does not specify any prefix):

```

...
<Filter>

```

```
<And>
  <Tag>
    <Key>key1</Key>
    <Value>value1</Value>
  </Tag>
  <Tag>
    <Key>key2</Key>
    <Value>value2</Value>
  </Tag>
</And>
</Filter>
...

```

**Important**

When you have multiple rules in a lifecycle configuration, an object can become eligible for multiple lifecycle actions. The general rules that Amazon S3 follows in such cases are:

- Permanent deletion takes precedence over transition.
- Transition takes precedence over creation of delete markers.
- When an object is eligible for both a GLACIER and STANDARD\_IA transition, Amazon S3 chooses the GLACIER transition.

For examples, see [Example 5: Overlapping Filters, Conflicting Lifecycle Actions, and What Amazon S3 Does](#) (p. 141)

## Example 2: Disabling a Lifecycle Rule

You can temporarily disable a lifecycle rule. The following lifecycle configuration specifies two rules:

- Rule 1 directs Amazon S3 to transition objects with the logs / prefix to the GLACIER storage class soon after creation.
- Rule 2 directs Amazon S3 to transition objects with the documents / prefix to the GLACIER storage class soon after creation.

In the policy Rule 1 is enabled and Rule 2 is disabled. Amazon S3 will not take any action on disabled rules.

```
<LifecycleConfiguration>
  <Rule>
    <ID>Rule1</ID>
    <Filter>
      <Prefix>logs/</Prefix>
    </Filter>
    <Status>Enabled</Status>
    <Transition>
      <Days>0</Days>
      <StorageClass>GLACIER</StorageClass>
    </Transition>
  </Rule>
  <Rule>
    <ID>Rule2</ID>
    <Prefix>documents/</Prefix>
    <Status>Disabled</Status>
    <Transition>
      <Days>0</Days>
      <StorageClass>GLACIER</StorageClass>
    </Transition>
  </Rule>

```

```
</LifecycleConfiguration>
```

## Example 3: Tiering Down Storage Class Over an Object's Lifetime

In this example, you leverage lifecycle configuration to tier down the storage class of objects over their lifetime. This tiering down can help reduce storage costs. For more information about pricing, see [Amazon S3 Pricing](#).

The following lifecycle configuration specifies a rule that applies to objects with key name prefix logs/. The rule specifies the following actions:

- Two transition actions:
  - Transition objects to the STANDARD\_IA storage class 30 days after creation.
  - Transition objects to the GLACIER storage class 90 days after creation.
- One expiration action that directs Amazon S3 to delete objects a year after creation.

```
<LifecycleConfiguration>
<Rule>
  <ID>example-id</ID>
  <Filter>
    <Prefix>logs/</Prefix>
  </Filter>
  <Status>Enabled</Status>
  <Transition>
    <Days>30</Days>
    <StorageClass>STANDARD_IA</StorageClass>
  </Transition>
  <Transition>
    <Days>90</Days>
    <StorageClass>GLACIER</StorageClass>
  </Transition>
  <Expiration>
    <Days>365</Days>
  </Expiration>
</Rule>
</LifecycleConfiguration>
```

### Note

You can use one rule to describe all lifecycle actions if all actions apply to the same set of objects (identified by the filter). Otherwise, you can add multiple rules with each specifying a different filter.

## Example 4: Specifying Multiple Rules

You can specify multiple rules if you want different lifecycle actions of different objects. The following lifecycle configuration has two rules:

- Rule 1 applies to objects with the key name prefix classA/. It directs Amazon S3 to transition objects to the GLACIER storage class one year after creation and expire these objects 10 years after creation.
- Rule 2 applies to objects with key name prefix classB/. It directs Amazon S3 to transition objects to the STANDARD\_IA storage class 90 days after creation and delete them one year after creation.

```
<LifecycleConfiguration>
  <Rule>
```

```
<ID>ClassADocRule</ID>
<Filter>
    <Prefix>classA/</Prefix>
</Filter>
<Status>Enabled</Status>
<Transition>
    <Days>365</Days>
    <StorageClass>GLACIER</StorageClass>
</Transition>
<Expiration>
    <Days>3650</Days>
</Expiration>
</Rule>
<Rule>
    <ID>ClassBDocRule</ID>
    <Filter>
        <Prefix>classB/</Prefix>
    </Filter>
    <Status>Enabled</Status>
    <Transition>
        <Days>90</Days>
        <StorageClass>STANDARD_IA</StorageClass>
    </Transition>
    <Expiration>
        <Days>365</Days>
    </Expiration>
</Rule>
</LifecycleConfiguration>
```

## Example 5: Overlapping Filters, Conflicting Lifecycle Actions, and What Amazon S3 Does

You might specify a lifecycle configuration in which you specify overlapping prefixes, or actions. The following examples show how Amazon S3 chooses to resolve potential conflicts.

### Example 1: Overlapping Prefixes (No Conflict)

The following example configuration has two rules that specify overlapping prefixes as follows:

- First rule specifies an empty filter, indicating all objects in the bucket.
- Second rule specifies a key name prefix logs/, indicating only a subset of objects.

Rule 1 requests Amazon S3 to delete all objects one year after creation, and Rule 2 requests Amazon S3 to transition a subset of objects to the STANDARD\_IA storage class 30 days after creation.

```
<LifecycleConfiguration>
    <Rule>
        <ID>Rule 1</ID>
        <Filter>
        </Filter>
        <Status>Enabled</Status>
        <Expiration>
            <Days>365</Days>
        </Expiration>
    </Rule>
    <Rule>
        <ID>Rule 2</ID>
        <Filter>
            <Prefix>logs/</Prefix>
        </Filter>
```

```
<Status>Enabled</Status>
<Transition>
  <StorageClass>STANDARD_IA<StorageClass>
  <Days>30</Days>
</Transition>
</Rule>
</LifecycleConfiguration>
```

### Example 2: Conflicting Lifecycle Actions

In this example configuration, there are two rules that direct Amazon S3 to perform two different actions on the same set of objects at the same time in object's lifetime:

- Both rules specify the same key name prefix, so both rules apply to the same set of objects.
- Both rules specify the same 365 days after object creation when the rules apply.
- One rule directs Amazon S3 to transition objects to the STANDARD\_IA storage class and another rule wants Amazon S3 to expire the objects at the same time.

```
<LifecycleConfiguration>
<Rule>
  <ID>Rule 1</ID>
  <Filter>
    <Prefix>logs/</Prefix>
  </Filter>
  <Status>Enabled</Status>
  <Expiration>
    <Days>365</Days>
  </Expiration>
</Rule>
<Rule>
  <ID>Rule 2</ID>
  <Filter>
    <Prefix>logs/</Prefix>
  </Filter>
  <Status>Enabled</Status>
  <Transition>
    <StorageClass>STANDARD_IA<StorageClass>
    <Days>365</Days>
  </Transition>
</Rule>
</LifecycleConfiguration>
```

In this case, because you want objects to expire (removed), there is no point in changing the storage class, and Amazon S3 simply chooses the expiration action on these objects.

### Example 3: Overlapping Prefixes Resulting in Conflicting Lifecycle Actions

In this example, the configuration has two rules which specify overlapping prefixes as follows:

- Rule 1 specifies an empty prefix (indicating all objects).
- Rule 2 specifies a key name prefix (`logs/`) that identifies a subset of all objects.

For the subset of objects with the `logs/` key name prefix, lifecycle actions in both rules apply. One rule directing Amazon S3 to transition objects 10 days after creation and another rule directing Amazon S3 to transition objects 365 days after creation.

```
<LifecycleConfiguration>
<Rule>
```

```
<ID>Rule 1</ID>
<Filter>
  <Prefix></Prefix>
</Filter>
<Status>Enabled</Status>
<Transition>
  <StorageClass>STANDARD_IA<StorageClass>
  <Days>10</Days>
</Transition>
</Rule>
<Rule>
  <ID>Rule 2</ID>
  <Filter>
    <Prefix>logs/</Prefix>
  </Filter>
  <Status>Enabled</Status>
  <Transition>
    <StorageClass>STANDARD_IA<StorageClass>
    <Days>365</Days>
  </Transition>
</Rule>
</LifecycleConfiguration>
```

In this case, Amazon S3 chooses to transition them 10 days after creation.

#### Example 4: Tag-based Filtering and Resulting Conflicting Lifecycle Actions

Suppose you have the following lifecycle policy that has two rules, each specifying a tag filter:

- Rule 1 specifies a tag-based filter (`tag1/value1`). This rule directs Amazon S3 to transition objects to the GLACIER storage class 365 days after creation.
- Rule 2 specifies a tag-based filter (`tag2/value2`). This rule directs Amazon S3 to expire objects 14 days after creation.

The lifecycle configuration is shown following:

```
<LifecycleConfiguration>
<Rule>
  <ID>Rule 1</ID>
  <Filter>
    <Tag>
      <Key>tag1</Key>
      <Value>value1</Value>
    </Tag>
  </Filter>
  <Status>Enabled</Status>
  <Transition>
    <StorageClass>GLACIER<StorageClass>
    <Days>365</Days>
  </Transition>
</Rule>
<Rule>
  <ID>Rule 2</ID>
  <Filter>
    <Tag>
      <Key>tag2</Key>
      <Value>value1</Value>
    </Tag>
  </Filter>
  <Status>Enabled</Status>
  <Expiration>
    <Days>14</Days>
```

```
</Expiration>
</Rule>
</LifecycleConfiguration>
```

The policy is fine, but if there is an object with both tags, then S3 has to decide what to do. That is, both rules apply to an object and in effect you are directing Amazon S3 to perform conflicting actions. In this case, Amazon S3 expires the object 14 days after creation. The object is removed, and therefore the transition action does not come into play.

## Example 6: Specifying a Lifecycle Rule for a Versioning-Enabled Bucket

Suppose you have a versioning-enabled bucket, which means that for each object you have a current version and zero or more noncurrent versions. You want to maintain one year's worth of history and then delete the noncurrent versions. For more information about versioning, see [Object Versioning \(p. 114\)](#).

Also, you want to save storage costs by moving noncurrent versions to GLACIER 30 days after they become noncurrent (assuming cold data for which you don't need real-time access). In addition, you also expect frequency of access of the current versions to diminish 90 days after creation so you might choose to move these objects to the STANDARD\_IA storage class.

```
<LifecycleConfiguration>
  <Rule>
    <ID>sample-rule</ID>
    <Filter>
      <Prefix></Prefix>
    </Filter>
    <Status>Enabled</Status>
    <Transition>
      <Days>90</Days>
      <StorageClass>STANDARD_IA</StorageClass>
    </Transition>
    <NoncurrentVersionTransition>
      <NoncurrentDays>30</NoncurrentDays>
      <StorageClass>GLACIER</StorageClass>
    </NoncurrentVersionTransition>
    <NoncurrentVersionExpiration>
      <NoncurrentDays>365</NoncurrentDays>
    </NoncurrentVersionExpiration>
  </Rule>
</LifecycleConfiguration>
```

## Example 7: Removing Expired Object Delete Markers

A versioning-enabled bucket has one current version and one or more noncurrent versions for each object. When you delete an object, note the following:

- If you don't specify a version ID in your delete request, Amazon S3 adds a delete marker instead of deleting the object. The current object version becomes noncurrent, and then the delete marker becomes the current version.
- If you specify a version ID in your delete request, Amazon S3 deletes the object version permanently (a delete marker is not created).
- A delete marker with zero noncurrent versions is referred to as the *expired object delete marker*.

This example shows a scenario that can create expired object delete markers in your bucket, and how you can use lifecycle configuration to direct Amazon S3 to remove the expired object delete markers.

Suppose you write a lifecycle policy that specifies the `NoncurrentVersionExpiration` action to remove the noncurrent versions 30 days after they become noncurrent as shown following:

```
<LifecycleConfiguration>
  <Rule>
    ...
    <NoncurrentVersionExpiration>
      <NoncurrentDays>30</NoncurrentDays>
    </NoncurrentVersionExpiration>
  </Rule>
</LifecycleConfiguration>
```

Note that the `NoncurrentVersionExpiration` action does not apply to the current object versions, it only removes noncurrent versions.

For current object versions, you have the following options to manage their lifetime depending on whether or not the current object versions follow a well-defined lifecycle:

- **Current object versions follow a well-defined lifecycle.**

In this case you can use lifecycle policy with the `Expiration` action to direct Amazon S3 to remove current versions as shown in the following example:

```
<LifecycleConfiguration>
  <Rule>
    ...
    <Expiration>
      <Days>60</Days>
    </Expiration>
    <NoncurrentVersionExpiration>
      <NoncurrentDays>30</NoncurrentDays>
    </NoncurrentVersionExpiration>
  </Rule>
</LifecycleConfiguration>
```

Amazon S3 removes current versions 60 days after they are created by adding a delete marker for each of the current object versions. This makes the current version noncurrent and the delete marker becomes the current version. For more information, see [Using Versioning \(p. 448\)](#).

The `NoncurrentVersionExpiration` action in the same lifecycle configuration removes noncurrent objects 30 days after they become noncurrent. Thus, all object versions are removed and you have expired object delete markers, but Amazon S3 detects and removes the expired object delete markers for you.

- **Current object versions don't have a well-defined lifecycle.**

In this case you might remove the objects manually when you don't need them, creating a delete marker with one or more noncurrent versions. If lifecycle configuration with `NoncurrentVersionExpiration` action removes all the noncurrent versions, you now have expired object delete markers.

Specifically for this scenario, Amazon S3 lifecycle configuration provides an `Expiration` action where you can request Amazon S3 to remove the expired object delete markers:

```
<LifecycleConfiguration>
  <Rule>
    <ID>Rule 1</ID>
    <Filter>
      <Prefix>logs/</Prefix>
    </Filter>
```

```
<Status>Enabled</Status>
<Expiration>
    <ExpiredObjectDeleteMarker>true</ExpiredObjectDeleteMarker>
</Expiration>
<NoncurrentVersionExpiration>
    <NoncurrentDays>30</NoncurrentDays>
</NoncurrentVersionExpiration>
</Rule>
</LifecycleConfiguration>
```

By setting the `ExpiredObjectDeleteMarker` element to true in the `Expiration` action, you direct Amazon S3 to remove expired object delete markers. Amazon S3 removes an expired object delete marker no sooner than 48 hours after the object expired.

**Note**

When specifying the `ExpiredObjectDeleteMarker` lifecycle action, the rule cannot specify a tag-based filter.

## Example 8: Lifecycle Configuration to Abort Multipart Uploads

You can use the multipart upload API to upload large objects in parts. For more information about multipart uploads, see [Multipart Upload Overview \(p. 187\)](#). Using lifecycle configuration, you can direct Amazon S3 to abort incomplete multipart uploads (identified by the key name prefix specified in the rule) if they don't complete within a specified number of days after initiation. When Amazon S3 aborts a multipart upload, it deletes all parts associated with the multipart upload. This ensures that you don't have incomplete multipart uploads with parts that are stored in Amazon S3 and, therefore, you don't have to pay any storage costs for these parts. The following is an example lifecycle configuration that specifies a rule with the `AbortIncompleteMultipartUpload` action. This action requests Amazon S3 to abort incomplete multipart uploads seven days after initiation.

```
<LifecycleConfiguration>
    <Rule>
        <ID>sample-rule</ID>
        <Filter>
            <Prefix>SomeKeyPrefix</Prefix>
        </Filter>
        <Status>rule-status</Status>
        <AbortIncompleteMultipartUpload>
            <DaysAfterInitiation>7</DaysAfterInitiation>
        </AbortIncompleteMultipartUpload>
    </Rule>
</LifecycleConfiguration>
```

**Note**

When specifying the `AbortIncompleteMultipartUpload` lifecycle action, the rule cannot specify a tag-based filter.

## Setting Lifecycle Configuration On a Bucket

### Topics

- [Manage an Object's Lifecycle Using the Amazon S3 Console \(p. 147\)](#)
- [Set Lifecycle Configuration Using the AWS CLI \(p. 147\)](#)
- [Manage Object Lifecycle Using the AWS SDK for Java \(p. 149\)](#)
- [Manage Object Lifecycle Using the AWS SDK for .NET \(p. 152\)](#)
- [Manage an Object's Lifecycle Using the AWS SDK for Ruby \(p. 155\)](#)

- [Manage Object Lifecycle Using the REST API \(p. 155\)](#)

This section explains how you can set lifecycle configuration on a bucket programmatically using AWS SDKs, or by using the Amazon S3 console, or the AWS CLI. Note the following:

- When you add a lifecycle configuration to a bucket, there is usually some lag before a new or updated lifecycle configuration is fully propagated to all the Amazon S3 systems. Expect a delay of a few minutes before the lifecycle configuration fully takes effect. This delay can also occur when you delete a lifecycle configuration.
- When you disable or delete a lifecycle rule, after a small delay Amazon S3 stops scheduling new objects for deletion or transition. Any objects that were already scheduled will be unscheduled and they won't be deleted or transitioned.
- When you add a lifecycle configuration to a bucket, the configuration rules apply to both existing objects and objects that you add later. For example, if you add a lifecycle configuration rule today with an expiration action that causes objects with a specific prefix to expire 30 days after creation, Amazon S3 will queue for removal any existing objects that are more than 30 days old.
- There may be a lag between when the lifecycle configuration rules are satisfied and when the action triggered by satisfying the rule is taken. However, changes in billing happen as soon as the lifecycle configuration rule is satisfied even if the action is not yet taken. One example is you are not charged for storage after the object expiration time even if the object is not deleted immediately. Another example is you are charged Amazon Glacier storage rates as soon as the object transition time elapses even if the object is not transitioned to Amazon Glacier immediately.

For information about lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

## Manage an Object's Lifecycle Using the Amazon S3 Console

You can specify lifecycle rules on a bucket using the Amazon S3 console.

For instructions on how to setup lifecycle rules using the AWS Management Console, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Set Lifecycle Configuration Using the AWS CLI

You can use the following AWS CLI commands to manage lifecycle configurations:

- `put-bucket-lifecycle-configuration`
- `get-bucket-lifecycle-configuration`
- `delete-bucket-lifecycle`

For instructions to set up the AWS CLI, see [Set Up the AWS CLI \(p. 611\)](#).

Note that the Amazon S3 lifecycle configuration is an XML file. But when using CLI, you cannot specify the XML, you must specify JSON instead. The following are examples XML lifecycle configurations and equivalent JSON that you can specify in AWS CLI command:

- Consider the following example lifecycle configuration:

```
<LifecycleConfiguration>
    <Rule>
        <ID>ExampleRule</ID>
        <Filter>
            <Prefix>documents/</Prefix>
        </Filter>
        <Status>Enabled</Status>
```

```
<Transition>
  <Days>365</Days>
  <StorageClass>GLACIER</StorageClass>
</Transition>
<Expiration>
  <Days>3650</Days>
</Expiration>
</Rule>
</LifecycleConfiguration>
```

The equivalent JSON is shown:

```
{
  "Rules": [
    {
      "Filter": {
        "Prefix": "documents/"
      },
      "Status": "Enabled",
      "Transitions": [
        {
          "Days": 365,
          "StorageClass": "GLACIER"
        }
      ],
      "Expiration": {
        "Days": 3650
      },
      "ID": "TestOnly"
    }
  ]
}
```

- Consider the following example lifecycle configuration:

```
<LifecycleConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Rule>
    <ID>id-1</ID>
    <Expiration>
      <Days>1</Days>
    </Expiration>
    <Filter>
      <And>
        <Prefix>myprefix</Prefix>
        <Tag>
          <Key>mytagkey1</Key>
          <Value>mytagvalue1</Value>
        </Tag>
        <Tag>
          <Key>mytagkey2</Key>
          <Value>mytagvalue2</Value>
        </Tag>
      </And>
    </Filter>
    <Status>Enabled</Status>
    <Transition>
      <Days>365</Days>
      <StorageClass>GLACIER</StorageClass>
    </Transition>
  </Rule>
</LifecycleConfiguration>
```

The equivalent JSON is shown:

```
{  
    "Rules": [  
        {  
            "ID": "id-1",  
            "Filter": {  
                "And": [  
                    {"Prefix": "myprefix",  
                     "Tags": [  
                        {  
                            "Value": "mytagvalue1",  
                            "Key": "mytagkey1"  
                        },  
                        {  
                            "Value": "mytagvalue2",  
                            "Key": "mytagkey2"  
                        }  
                    ]  
                ]  
            },  
            "Status": "Enabled",  
            "Expiration": {  
                "Days": 1  
            }  
        }  
    ]  
}
```

You can test the `put-bucket-lifecycle-configuration` as follows:

1. Save the JSON lifecycle configuration in a file (`lifecycle.json`).
2. Run the following AWS CLI command to set the lifecycle configuration on your bucket:

```
$ aws s3api put-bucket-lifecycle-configuration \  
--bucket bucketname \  
--lifecycle-configuration file://lifecycle.json
```

3. To verify, retrieve the lifecycle configuration using the `get-bucket-lifecycle-configuration` AWS CLI command as follows:

```
$ aws s3api get-bucket-lifecycle-configuration \  
--bucket bucketname
```

4. To delete the lifecycle configuration use the `delete-bucket-lifecycle` AWS CLI command as follows:

```
aws s3api delete-bucket-lifecycle \  
--bucket bucketname
```

## Manage Object Lifecycle Using the AWS SDK for Java

You can use the AWS SDK for Java to manage lifecycle configuration on a bucket. For more information about managing lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

The example code in this topic does the following:

- Add lifecycle configuration with the following two rules:

- A rule that applies to objects with the `glacierobjects/` key name prefix. The rule specifies a transition action that directs Amazon S3 to transition these objects to the GLACIER storage class. Because the number of days specified is 0, the objects become eligible for archival immediately.
- A rule that applies to objects having tags with tag key `archive` and value `true`. The rule specifies two transition actions, directing Amazon S3 to first transition objects to the STANDARD\_IA (IA, for infrequent access) storage class 30 days after creation, and then transition to the GLACIER storage class 365 days after creation. The rule also specifies expiration action directing Amazon S3 to delete these objects 3650 days after creation.
- Retrieves the lifecycle configuration.
- Updates the configuration by adding another rule that applies to objects with the `YearlyDocuments/` key name prefix. The expiration action in this rule directs Amazon S3 to delete these objects 3650 days after creation.

**Note**

When you add a lifecycle configuration to a bucket, any existing lifecycle configuration is replaced. To update existing lifecycle configuration, you must first retrieve the existing lifecycle configuration, make changes and then add the revised lifecycle configuration to the bucket.

### Example Java Code Example

The following Java code example provides a complete code listing that adds, updates, and deletes a lifecycle configuration to a bucket. You need to update the code and provide your bucket name to which the code can add the example lifecycle configuration.

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;
import java.util.Arrays;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.AmazonS3Exception;
import com.amazonaws.services.s3.model.BucketLifecycleConfiguration;
import com.amazonaws.services.s3.model.BucketLifecycleConfiguration.Transition;
import com.amazonaws.services.s3.model.StorageClass;
import com.amazonaws.services.s3.model.Tag;
import com.amazonaws.services.s3.model.lifecycle.LifecycleAndOperator;
import com.amazonaws.services.s3.model.lifecycle.LifecycleFilter;
import com.amazonaws.services.s3.model.lifecycle.LifecyclePrefixPredicate;
import com.amazonaws.services.s3.model.lifecycle.LifecycleTagPredicate;

public class LifecycleConfiguration {
    public static String bucketName = "*** Provide bucket name ***";
    public static AmazonS3Client s3Client;

    public static void main(String[] args) throws IOException {
        s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {

            BucketLifecycleConfiguration.Rule rule1 =
                new BucketLifecycleConfiguration.Rule()
                    .withId("Archive immediately rule")
                    .withFilter(new LifecycleFilter(
                        new LifecyclePrefixPredicate("glacierobjects/")))
                    .addTransition(new Transition()
                        .withDays(0)
                        .withStorageClass(StorageClass.Glacier))
                    .withStatus(BucketLifecycleConfiguration.ENABLED.toString()));


        }
    }
}
```

```

BucketLifecycleConfiguration.Rule rule2 =
    new BucketLifecycleConfiguration.Rule()
    .withId("Archive and then delete rule")
    .withFilter(new LifecycleFilter(
        new LifecycleTagPredicate(new Tag("archive", "true"))))
    .addTransition(new Transition()
        .withDays(30)
        .withStorageClass(StorageClass.StandardInfrequentAccess))
    .addTransition(new Transition()
        .withDays(365)
        .withStorageClass(StorageClass.Glacier))
    .withExpirationInDays(3650)
    .withStatus(BucketLifecycleConfiguration.ENABLED.toString()));

BucketLifecycleConfiguration configuration =
new BucketLifecycleConfiguration()
    .withRules(Arrays.asList(rule1, rule2));

// Save configuration.
s3Client.setBucketLifecycleConfiguration(bucketName, configuration);

// Retrieve configuration.
configuration = s3Client.getBucketLifecycleConfiguration(bucketName);

// Add a new rule.
configuration.getRules().add(
    new BucketLifecycleConfiguration.Rule()
        .withId("NewRule")
        .withFilter(new LifecycleFilter(
            new LifecycleAndOperator(Arrays.asList(
                new LifecyclePrefixPredicate("YearlyDocuments/"),
                new LifecycleTagPredicate(new Tag("expire_after",
                    "ten_years"))))))
        .withExpirationInDays(3650)
        .withStatus(BucketLifecycleConfiguration.
            ENABLED.toString()))
);

// Save configuration.
s3Client.setBucketLifecycleConfiguration(bucketName, configuration);

// Retrieve configuration.
configuration = s3Client.getBucketLifecycleConfiguration(bucketName);

// Verify there are now three rules.
configuration = s3Client.getBucketLifecycleConfiguration(bucketName);
System.out.format("Expected # of rules = 3; found: %s\n",
    configuration.getRules().size());

System.out.println("Deleting lifecycle configuration. Next, we verify
deletion.");
// Delete configuration.
s3Client.deleteBucketLifecycleConfiguration(bucketName);

// Retrieve nonexistent configuration.
configuration = s3Client.getBucketLifecycleConfiguration(bucketName);
String s = (configuration == null) ? "No configuration found." : "Configuration
found.";
System.out.println(s);

} catch (AmazonS3Exception amazonS3Exception) {
    System.out.format("An Amazon S3 error occurred. Exception: %s",
amazonS3Exception.toString());
} catch (Exception ex) {
    System.out.format("Exception: %s", ex.toString());
}

```

```
        }  
    }  
}
```

## Manage Object Lifecycle Using the AWS SDK for .NET

You can use the AWS SDK for .NET to manage lifecycle configuration on a bucket. For more information about managing lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

### Example .NET Code Example

The following C# code example adds lifecycle configuration to a bucket. The example shows two lifecycle configurations:

- Lifecycle configuration that uses only prefix to select a subset of objects to which the rule applies.
- Lifecycle configuration that uses a prefix and object tags to select a subset of objects to which the rule applies.

The lifecycle rule transitions objects to the GLACIER storage class soon after the objects are created.

The following code works with the latest version of the .NET SDK.

For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;  
using System.Collections.Generic;  
using System.Diagnostics;  
using Amazon.S3;  
using Amazon.S3.Model;  
  
namespace aws.amazon.com.s3.documentation  
{  
    class LifeCycleTest  
    {  
        static string bucketName = "*** bucket name ***";  
  
        public static void Main(string[] args)  
        {  
            try  
            {  
                using (var client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))  
                {  
                    // 1. Add lifecycle config with prefix only.  
                    var lifeCycleConfigurationA = LifecycleConfig1();  
  
                    // Add the configuration to the bucket  
                    PutLifeCycleConfiguration(client, lifeCycleConfigurationA);  
  
                    // Retrieve an existing configuration  
                    var lifeCycleConfiguration = GetLifeCycleConfiguration(client);  
  
                    // 2. Add lifecycle config with prefix and tags.  
                    var lifeCycleConfigurationB = LifecycleConfig2();  
  
                    // Add the configuration to the bucket  
                    PutLifeCycleConfiguration(client, lifeCycleConfigurationB);  
  
                    // Retrieve an existing configuration  
                    lifeCycleConfiguration = GetLifeCycleConfiguration(client);  
                }  
            }  
        }  
    }  
}
```

```

        // 3. Delete lifecycle config.
        DeleteLifecycleConfiguration(client);

        // 4. Retrieve a nonexistent configuration
        lifeCycleConfiguration = GetLifeCycleConfiguration(client);
        Debug.Assert(lifeCycleConfiguration == null);
    }

    Console.WriteLine("Example complete. To continue, click Enter...");
    Console.ReadKey();
}
catch (AmazonS3Exception amazonS3Exception)
{
    Console.WriteLine("S3 error occurred. Exception: " +
amazonS3Exception.ToString());
}
catch (Exception e)
{
    Console.WriteLine("Exception: " + e.ToString());
}
}

private static LifecycleConfiguration LifecycleConfig1()
{
    var lifeCycleConfiguration = new LifecycleConfiguration()
    {
        Rules = new List<LifecycleRule>
        {
            new LifecycleRule
            {
                Id = "Rule-1",
                Filter = new LifecycleFilter()
                {
                    LifecycleFilterPredicate = new LifecyclePrefixPredicate
                    {
                        Prefix = "glacier/"
                    }
                },
                Status = LifecycleRuleStatus.Enabled,
                Transitions = new List<LifecycleTransition>
                {
                    new LifecycleTransition
                    {
                        Days = 0,
                        StorageClass = S3StorageClass.Glacier
                    }
                },
            }
        }
    };
    return lifeCycleConfiguration;
}

private static LifecycleConfiguration LifecycleConfig2()
{
    var lifeCycleConfiguration = new LifecycleConfiguration()
    {
        Rules = new List<LifecycleRule>
        {
            new LifecycleRule
            {
                Id = "Rule-1",
                Filter = new LifecycleFilter()
                {
                    LifecycleFilterPredicate = new LifecycleAndOperator

```

```

        {
            Operands = new List<LifecycleFilterPredicate>
            {
                new LifecyclePrefixPredicate
                {
                    Prefix = "glacierobjects/"
                },
                new LifecycleTagPredicate
                {
                    Tag = new Tag()
                    {
                        Key = "tagKey1",
                        Value = "tagValue1"
                    }
                },
                new LifecycleTagPredicate
                {
                    Tag = new Tag()
                    {
                        Key = "tagKey2",
                        Value = "tagValue2"
                    }
                }
            }
        },
        Status = LifecycleRuleStatus.Enabled,
        Transitions = new List<LifecycleTransition>
        {
            new LifecycleTransition
            {
                Days = 0,
                StorageClass =
S3StorageClass.Glacier
            }
        }
    );
    return lifeCycleConfiguration;
}

static void PutLifeCycleConfiguration(IAmazonS3 client, LifecycleConfiguration
configuration)
{
    PutLifecycleConfigurationRequest request = new PutLifecycleConfigurationRequest
    {
        BucketName = bucketName,
        Configuration = configuration
    };

    var response = client.PutLifecycleConfiguration(request);
}

static LifecycleConfiguration GetLifeCycleConfiguration(IAmazonS3 client)
{
    GetLifecycleConfigurationRequest request = new GetLifecycleConfigurationRequest
    {
        BucketName = bucketName

    };
    var response = client.GetLifecycleConfiguration(request);
    var configuration = response.Configuration;
    return configuration;
}

```

```
        static void DeleteLifecycleConfiguration(IAmazonS3 client)
    {
        DeleteLifecycleConfigurationRequest request = new
DeleteLifecycleConfigurationRequest
{
    BucketName = bucketName
};
client.DeleteLifecycleConfiguration(request);
}
}
```

## Manage an Object's Lifecycle Using the AWS SDK for Ruby

You can use the AWS SDK for Ruby to manage lifecycle configuration on a bucket by using the class [AWS::S3::BucketLifecycleConfiguration](#). For more information about using the AWS SDK for Ruby with Amazon S3, see [Using the AWS SDK for Ruby - Version 3 \(p. 617\)](#). For more information about managing lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

## Manage Object Lifecycle Using the REST API

You can use the AWS Management Console to set the lifecycle configuration on your bucket. If your application requires it, you can also send REST requests directly. The following sections in the *Amazon Simple Storage Service API Reference* describe the REST API related to the lifecycle configuration.

- [PUT Bucket lifecycle](#)
- [GET Bucket lifecycle](#)
- [DELETE Bucket lifecycle](#)

## Cross-Origin Resource Sharing (CORS)

Cross-origin resource sharing (CORS) defines a way for client web applications that are loaded in one domain to interact with resources in a different domain. With CORS support in Amazon S3, you can build rich client-side web applications with Amazon S3 and selectively allow cross-origin access to your Amazon S3 resources.

This section provides an overview of CORS. The subtopics describe how you can enable CORS using the Amazon S3 console, or programmatically using the Amazon S3 REST API and the AWS SDKs.

### Topics

- [Cross-Origin Resource Sharing: Use-case Scenarios \(p. 155\)](#)
- [How Do I Configure CORS on My Bucket? \(p. 156\)](#)
- [How Does Amazon S3 Evaluate the CORS Configuration On a Bucket? \(p. 158\)](#)
- [Enabling Cross-Origin Resource Sharing \(CORS\) \(p. 158\)](#)
- [Troubleshooting CORS Issues \(p. 167\)](#)

## Cross-Origin Resource Sharing: Use-case Scenarios

The following are example scenarios for using CORS:

- Scenario 1: Suppose you are hosting a website in an Amazon S3 bucket named [website](#) as described in [Hosting a Static Website on Amazon S3 \(p. 471\)](#). Your users load the website

endpoint `http://website.s3-website-us-east-1.amazonaws.com`. Now you want to use JavaScript on the web pages that are stored in this bucket to be able to make authenticated GET and PUT requests against the same bucket by using the Amazon S3's API endpoint for the bucket, `website.s3.amazonaws.com`. A browser would normally block JavaScript from allowing those requests, but with CORS, you can configure your bucket to explicitly enable cross-origin requests from `website.s3-website-us-east-1.amazonaws.com`.

- Scenario 2: Suppose you want to host a web font from your S3 bucket. Again, browsers require a CORS check (also referred as a preflight check) for loading web fonts, so you would configure the bucket that is hosting the web font to allow any origin to make these requests.

## How Do I Configure CORS on My Bucket?

To configure your bucket to allow cross-origin requests, you create a CORS configuration, an XML document with rules that identify the origins that you will allow to access your bucket, the operations (HTTP methods) will support for each origin, and other operation-specific information.

You can add up to 100 rules to the configuration. You add the XML document as the `cors` subresource to the bucket either programmatically or by using the Amazon S3 console. For more information, see [Enabling Cross-Origin Resource Sharing \(CORS\) \(p. 158\)](#).

Instead of accessing a website by using an Amazon S3 website endpoint, you can use your own domain, such as `example1.com` to serve your content. For information about using your own domain, see [Example: Setting up a Static Website Using a Custom Domain \(p. 487\)](#). The following example `cors` configuration has three rules, which are specified as `CORSRule` elements:

- The first rule allows cross-origin PUT, POST, and DELETE requests from the `https://www.example1.com` origin. The rule also allows all headers in a preflight OPTIONS request through the `Access-Control-Request-Headers` header. In response to any preflight OPTIONS request, Amazon S3 will return any requested headers.
- The second rule allows same cross-origin requests as the first rule but the rule applies to another origin, `https://www.example2.com`.
- The third rule allows cross-origin GET requests from all origins. The '\*' wildcard character refers to all origins.

```
<corsConfiguration>
  <corsRule>
    <allowedOrigin>http://www.example1.com</allowedOrigin>

    <allowedMethod>PUT</allowedMethod>
    <allowedMethod>POST</allowedMethod>
    <allowedMethod>DELETE</allowedMethod>

    <allowedHeader>*</allowedHeader>
  </corsRule>
  <corsRule>
    <allowedOrigin>http://www.example2.com</allowedOrigin>

    <allowedMethod>PUT</allowedMethod>
    <allowedMethod>POST</allowedMethod>
    <allowedMethod>DELETE</allowedMethod>

    <allowedHeader>*</allowedHeader>
  </corsRule>
  <corsRule>
    <allowedOrigin>*</allowedOrigin>
    <allowedMethod>GET</allowedMethod>
  </corsRule>
```

```
</CORSConfiguration>
```

The CORS configuration also allows optional configuration parameters, as shown in the following CORS configuration. In this example, the following CORS configuration allows cross-origin PUT, POST and DELETE requests from the `http://www.example.com` origin.

```
<CORSConfiguration>
  <CORSRule>
    <AllowedOrigin>http://www.example.com</AllowedOrigin>
    <AllowedMethod>PUT</AllowedMethod>
    <AllowedMethod>POST</AllowedMethod>
    <AllowedMethod>DELETE</AllowedMethod>
    <AllowedHeader>*</AllowedHeader>
    <MaxAgeSeconds>3000</MaxAgeSeconds>
    <ExposeHeader>x-amz-server-side-encryption</
    ExposeHeader>
    <ExposeHeader>x-amz-request-id</
    ExposeHeader>
    <ExposeHeader>x-amz-id-2</ExposeHeader>
  </CORSRule>
</CORSConfiguration>
```

The `CORSRule` element in the preceding configuration includes the following optional elements:

- `MaxAgeSeconds`—Specifies the amount of time in seconds (in this example, 3000) that the browser will cache an Amazon S3 response to a preflight OPTIONS request for the specified resource. By caching the response, the browser does not have to send preflight requests to Amazon S3 if the original request is to be repeated.
- `ExposeHeader`—Identifies the response headers (in this example, `x-amz-server-side-encryption`, `x-amz-request-id`, and `x-amz-id-2`) that customers will be able to access from their applications (for example, from a JavaScript `XMLHttpRequest` object).

## AllowedMethod Element

In the CORS configuration, you can specify the following values for the `AllowedMethod` element.

- GET
- PUT
- POST
- DELETE
- HEAD

## AllowedOrigin Element

In the `AllowedOrigin` element you specify the origins that you want to allow cross-domain requests from, for example, `http://www.example.com`. The origin string can contain at most one \* wildcard character, such as `http://*.example.com`. You can optionally specify \* as the origin to enable all the origins to send cross-origin requests. You can also specify `https` to enable only secure origins.

## AllowedHeader Element

The `AllowedHeader` element specifies which headers are allowed in a preflight request through the `Access-Control-Request-Headers` header. Each header name in the `Access-Control-Request-Headers` header must match a corresponding entry in the rule. Amazon S3 will send only the allowed

headers in a response that were requested. For a sample list of headers that can be used in requests to Amazon S3, go to [Common Request Headers](#) in the *Amazon Simple Storage Service API Reference* guide.

Each AllowedHeader string in the rule can contain at most one \* wildcard character. For example, <AllowedHeader>x-amz-\*</AllowedHeader> will enable all Amazon-specific headers.

## ExposeHeader Element

Each ExposeHeader element identifies a header in the response that you want customers to be able to access from their applications (for example, from a JavaScript XMLHttpRequest object). For a list of common Amazon S3 response headers, go to [Common Response Headers](#) in the *Amazon Simple Storage Service API Reference* guide.

## MaxAgeSeconds Element

The MaxAgeSeconds element specifies the time in seconds that your browser can cache the response for a preflight request as identified by the resource, the HTTP method, and the origin.

## How Does Amazon S3 Evaluate the CORS Configuration On a Bucket?

When Amazon S3 receives a preflight request from a browser, it evaluates the CORS configuration for the bucket and uses the first CORSRule rule that matches the incoming browser request to enable a cross-origin request. For a rule to match, the following conditions must be met:

- The request's Origin header must match an AllowedOrigin element.
- The request method (for example, GET or PUT) or the Access-Control-Request-Method header in case of a preflight OPTIONS request must be one of the AllowedMethod elements.
- Every header listed in the request's Access-Control-Request-Headers header on the preflight request must match an AllowedHeader element.

### Note

The ACLs and policies continue to apply when you enable CORS on the bucket.

## Enabling Cross-Origin Resource Sharing (CORS)

Enable cross-origin resource sharing by setting a CORS configuration on your bucket using the AWS Management Console, the REST API, or the AWS SDKs.

### Topics

- [Enabling Cross-Origin Resource Sharing \(CORS\) Using the AWS Management Console \(p. 158\)](#)
- [Enabling Cross-Origin Resource Sharing \(CORS\) Using the AWS SDK for Java \(p. 159\)](#)
- [Enabling Cross-Origin Resource Sharing \(CORS\) Using the AWS SDK for .NET \(p. 162\)](#)
- [Enabling Cross-Origin Resource Sharing \(CORS\) Using the REST API \(p. 167\)](#)

## Enabling Cross-Origin Resource Sharing (CORS) Using the AWS Management Console

You can use the AWS Management Console to set a CORS configuration on your bucket. For instructions, see [How Do I Allow Cross-Domain Resource Sharing with CORS?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Enabling Cross-Origin Resource Sharing (CORS) Using the AWS SDK for Java

You can use the AWS SDK for Java to manage cross-origin resource sharing (CORS) for a bucket. For more information about CORS, see [Cross-Origin Resource Sharing \(CORS\) \(p. 155\)](#).

This section provides sample code snippets for following tasks, followed by a complete example program demonstrating all tasks.

- Creating an instance of the Amazon S3 client class
- Creating and adding a CORS configuration to a bucket
- Updating an existing CORS configuration

### Cross-Origin Resource Sharing Methods

<a href="#">AmazonS3Client()</a>	Constructs an <code>AmazonS3Client</code> object.
<a href="#">setBucketCrossOriginConfiguration</a>	<small>Sets the</small> the CORS configuration that to be applied to the bucket. If a configuration already exists for the specified bucket, the new configuration will replace the existing one.
<a href="#">getBucketCrossOriginConfiguration</a>	<small>Retrieves</small> the CORS configuration for the specified bucket. If no configuration has been set for the bucket, the Configuration header in the response will be null.
<a href="#">deleteBucketCrossOriginConfiguration</a>	<small>Deletes</small> the CORS configuration for the specified bucket.

For more information about the AWS SDK for Java API, go to [AWS SDK for Java API Reference](#).

### Creating an Instance of the Amazon S3 Client Class

The following snippet creates a new `AmazonS3Client` instance for a class called `CORS_JavaSDK`. This example retrieves the values for `accessKey` and `secretKey` from the `AwsCredentials.properties` file.

#### Example

```
AmazonS3Client client;
client = new AmazonS3Client(new ProfileCredentialsProvider());
```

### Creating and Adding a CORS Configuration to a Bucket

To add a CORS configuration to a bucket:

1. Create a `CORSRule` object that describes the rule.
2. Create a `BucketCrossOriginConfiguration` object, and then add the rule to the configuration object.
3. Add the CORS configuration to the bucket by calling the `client.setBucketCrossOriginConfiguration` method.

The following snippet creates two rules, `CORSRule1` and `CORSRule2`, and then adds each rule to the `rules` array. By using the `rules` array, it then adds the rules to the bucket `bucketName`.

#### Example

```
// Add a sample configuration
```

```
BucketCrossOriginConfiguration configuration = new BucketCrossOriginConfiguration();

List<CORSRule> rules = new ArrayList<CORSRule>();

CORSRule rule1 = new CORSRule()
    .withId("CORSRule1")
    .withAllowedMethods(NSArray.asList(new CORSRule.AllowedMethods[] {
        CORSRule.AllowedMethods.PUT, CORSRule.AllowedMethods.POST,
        CORSRule.AllowedMethods.DELETE}))
    .withAllowedOrigins(NSArray.asList(new String[] {"http://*.example.com"}));

CORSRule rule2 = new CORSRule()
    .withId("CORSRule2")
    .withAllowedMethods(NSArray.asList(new CORSRule.AllowedMethods[] {
        CORSRule.AllowedMethods.GET}))
    .withAllowedOrigins(NSArray.asList(new String[] {"*"}))
    .withMaxAgeSeconds(3000)
    .withExposedHeaders(NSArray.asList(new String[] {"x-amz-server-side-encryption"}));

configuration.setRules(NSArray.asList(new CORSRule[] {rule1, rule2}));

// Save the configuration
client.setBucketCrossOriginConfiguration(bucketName, configuration);
```

### Updating an Existing CORS Configuration

To update an existing CORS configuration

1. Get a CORS configuration by calling the `client.getBucketCrossOriginConfiguration` method.
2. Update the configuration information by adding or deleting rules to the list of rules.
3. Add the configuration to a bucket by calling the `client.getBucketCrossOriginConfiguration` method.

The following snippet gets an existing configuration and then adds a new rule with the ID `NewRule`.

### Example

```
// Get configuration.
BucketCrossOriginConfiguration configuration =
    client.getBucketCrossOriginConfiguration(bucketName);

// Add new rule.
CORSRule rule3 = new CORSRule()
    .withId("CORSRule3")
    .withAllowedMethods(NSArray.asList(new CORSRule.AllowedMethods[] {
        CORSRule.AllowedMethods.HEAD}))
    .withAllowedOrigins(NSArray.asList(new String[] {"http://www.example.com"}));

List<CORSRule> rules = configuration.getRules();
rules.add(rule3);
configuration.setRules(rules);

// Save configuration.
client.setBucketCrossOriginConfiguration(bucketName, configuration);
```

### Example Program Listing

The following Java program incorporates the preceding tasks.

For information about creating and testing a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.List;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.BucketCrossOriginConfiguration;
import com.amazonaws.services.s3.model.CORSRule;

public class Cors {

    /**
     * @param args
     * @throws IOException
     */
    public static AmazonS3Client client;
    public static String bucketName = "***provide bucket name***";

    public static void main(String[] args) throws IOException {
        client = new AmazonS3Client(new ProfileCredentialsProvider());

        // Create a new configuration request and add two rules
        BucketCrossOriginConfiguration configuration = new
        BucketCrossOriginConfiguration();

        List<CORSRule> rules = new ArrayList<CORSRule>();

        CORSRule rule1 = new CORSRule()
            .withId("CORSRule1")
            .withAllowedMethods(Arrays.asList(new CORSRule.AllowedMethods[] {
                CORSRule.AllowedMethods.PUT, CORSRule.AllowedMethods.POST,
                CORSRule.AllowedMethods.DELETE}))
            .withAllowedOrigins(Arrays.asList(new String[] {"http://*.example.com"}));

        CORSRule rule2 = new CORSRule()
            .withId("CORSRule2")
            .withAllowedMethods(Arrays.asList(new CORSRule.AllowedMethods[] {
                CORSRule.AllowedMethods.GET}))
            .withAllowedOrigins(Arrays.asList(new String[] {"*"]))
            .withMaxAgeSeconds(3000)
            .withExposedHeaders(Arrays.asList(new String[] {"x-amz-server-side-encryption"}));

        configuration.setRules(Arrays.asList(new CORSRule[] {rule1, rule2}));

        // Add the configuration to the bucket.
        client.setBucketCrossOriginConfiguration(bucketName, configuration);

        // Retrieve an existing configuration.
        configuration = client.getBucketCrossOriginConfiguration(bucketName);
        printCORSConfiguration(configuration);

        // Add a new rule.
        CORSRule rule3 = new CORSRule()
            .withId("CORSRule3")
            .withAllowedMethods(Arrays.asList(new CORSRule.AllowedMethods[] {
                CORSRule.AllowedMethods.HEAD}))
            .withAllowedOrigins(Arrays.asList(new String[] {"http://www.example.com"}));

        rules = configuration.getRules();
        rules.add(rule3);
        configuration.setRules(rules);
        client.setBucketCrossOriginConfiguration(bucketName, configuration);
        System.out.format("Added another rule: %s\n", rule3.getId());
    }
}
```

```

// Verify that the new rule was added.
configuration = client.getBucketCrossOriginConfiguration(bucketName);
System.out.format("Expected # of rules = 3, found %s",
configuration.getRules().size());

// Delete the configuration.
client.deleteBucketCrossOriginConfiguration(bucketName);

// Try to retrieve configuration.
configuration = client.getBucketCrossOriginConfiguration(bucketName);
System.out.println("\nRemoved CORS configuration.");
printCORSConfiguration(configuration);
}

static void printCORSConfiguration(BucketCrossOriginConfiguration configuration)
{
    if (configuration == null)
    {
        System.out.println("\nConfiguration is null.");
        return;
    }

    System.out.format("\nConfiguration has %s rules:\n",
configuration.getRules().size());
    for (CORSRule rule : configuration.getRules())
    {
        System.out.format("Rule ID: %s\n", rule.getId());
        System.out.format("MaxAgeSeconds: %s\n", rule.getMaxAgeSeconds());
        System.out.format("AllowedMethod: %s\n", rule.getAllowedMethods().toArray());
        System.out.format("AllowedOrigins: %s\n", rule.getAllowedOrigins());
        System.out.format("AllowedHeaders: %s\n", rule.getAllowedHeaders());
        System.out.format("ExposeHeader: %s\n", rule.getExposedHeaders());
    }
}
}

```

## Enabling Cross-Origin Resource Sharing (CORS) Using the AWS SDK for .NET

You can use the AWS SDK for .NET to manage cross-origin resource sharing (CORS) for a bucket. For more information about CORS, see [Cross-Origin Resource Sharing \(CORS\) \(p. 155\)](#).

This section provides sample code for the tasks in the following table, followed by a complete example program listing.

### Managing Cross-Origin Resource Sharing

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Create a new CORS configuration.
3	Retrieve and modify an existing CORS configuration.
4	Add the configuration to the bucket.

### Cross-Origin Resource Sharing Methods

<a href="#">AmazonS3Client()</a>	Constructs <code>AmazonS3Client</code> with the credentials defined in the <code>App.config</code> file.
----------------------------------	--

<a href="#">PutCORSConfiguration()</a>	Sets the CORS configuration that should be applied to the bucket. If a configuration already exists for the specified bucket, the new configuration will replace the existing one.
<a href="#">GetCORSConfiguration()</a>	Retrieves the CORS configuration for the specified bucket. If no configuration has been set for the bucket, the Configuration header in the response will be null.
<a href="#">DeleteCORSConfiguration()</a>	Deletes the CORS configuration for the specified bucket.

For more information about the AWS SDK for .NET API, go to [Using the AWS SDK for .NET \(p. 614\)](#).

### Creating an Instance of the AmazonS3 Class

The following sample creates an instance of the `AmazonS3Client` class.

#### Example

```
static IAmazonS3 client;
using (client = new AmazonS3Client(Amazon.RegionEndpoint.USWest2))
```

### Adding a CORS Configuration to a Bucket

To add a CORS configuration to a bucket:

1. Create a `CORSConfiguration` object describing the rule.
2. Create a `PutCORSConfigurationRequest` object that provides the bucket name and the CORS configuration.
3. Add the CORS configuration to the bucket by calling `client.PutCORSConfiguration`.

The following sample creates two rules, `CORSRule1` and `CORSRule2`, and then adds each rule to the `rules` array. By using the `rules` array, it then adds the rules to the bucket `bucketName`.

#### Example

```
// Add a sample configuration
CORSConfiguration configuration = new CORSConfiguration
{
    Rules = new System.Collections.Generic.List<CORSRule>
    {
        new CORSRule
        {
            Id = "CORSRule1",
            AllowedMethods = new List<string> {"PUT", "POST", "DELETE"},
            AllowedOrigins = new List<string> {"http://*.example.com"}
        },
        new CORSRule
        {
            Id = "CORSRule2",
            AllowedMethods = new List<string> {"GET"},
            AllowedOrigins = new List<string> {"*"},
            MaxAgeSeconds = 3000,
            ExposeHeaders = new List<string> {"x-amz-server-side-encryption"}
        }
    };
};

// Save the configuration
```

```
PutCORSConfiguration(configuration);

static void PutCORSConfiguration(CORSConfiguration configuration)
{
    PutCORSConfigurationRequest request = new PutCORSConfigurationRequest
    {
        BucketName = bucketName,
        Configuration = configuration
    };

    var response = client.PutCORSConfiguration(request);
}
```

### Updating an Existing CORS Configuration

To update an existing CORS configuration

1. Get a CORS configuration by calling the `client.GetCORSConfiguration` method.
2. Update the configuration information by adding or deleting rules.
3. Add the configuration to a bucket by calling the `client.PutCORSConfiguration` method.

The following snippet gets an existing configuration and then adds a new rule with the ID `NewRule`.

### Example

```
// Get configuration.
configuration = GetCORSConfiguration();
// Add new rule.
configuration.Rules.Add(new CORSRule
{
    Id = "NewRule",
    AllowedMethods = new List<string> { "HEAD" },
    AllowedOrigins = new List<string> { "http://www.example.com" }
});

// Save configuration.
PutCORSConfiguration(configuration);
```

### Example Program Listing

The following C# program incorporates the preceding tasks.

For information about creating and testing a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Configuration;
using System.Collections.Specialized;
using System.Net;
using Amazon.S3;
using Amazon.S3.Model;
using Amazon.S3.Util;
using System.Diagnostics;
using System.Collections.Generic;

namespace s3.amazonaws.com.docsamples
{
    class CORS
    {
```

```
static string bucketName = "**** Provide bucket name ***";  
  
static IAmazonS3 client;  
  
public static void Main(string[] args)  
{  
    try  
    {  
        using (client = new AmazonS3Client(Amazon.RegionEndpoint.USWest2))  
        {  
            // Create a new configuration request and add two rules  
            CORSConfiguration configuration = new CORSConfiguration  
            {  
                Rules = new System.Collections.Generic.List<CORSRule>  
                {  
                    new CORSRule  
                    {  
                        Id = "CORSRule1",  
                        AllowedMethods = new List<string> {"PUT", "POST", "DELETE"},  
                        AllowedOrigins = new List<string> {"http://*.example.com"}  
                    },  
                    new CORSRule  
                    {  
                        Id = "CORSRule2",  
                        AllowedMethods = new List<string> {"GET"},  
                        AllowedOrigins = new List<string> {"*"},  
                        MaxAgeSeconds = 3000,  
                        ExposeHeaders = new List<string> {"x-amz-server-side-  
encryption"}  
                    }  
                };  
            // Add the configuration to the bucket  
            PutCORSConfiguration(configuration);  
  
            // Retrieve an existing configuration  
            configuration = GetCORSConfiguration();  
  
            // Add a new rule.  
            configuration.Rules.Add(new CORSRule  
            {  
                Id = "CORSRule3",  
                AllowedMethods = new List<string> { "HEAD" },  
                AllowedOrigins = new List<string> { "http://www.example.com" }  
            });  
  
            // Add the configuration to the bucket  
            PutCORSConfiguration(configuration);  
  
            // Verify that there are now three rules  
            configuration = GetCORSConfiguration();  
            Console.WriteLine();  
            Console.WriteLine("Expected # of rules=3; found:{0}",  
                configuration.Rules.Count);  
            Console.WriteLine();  
            Console.WriteLine("Pause before configuration delete. To continue,"  
                click Enter...");  
            Console.ReadKey();  
  
            // Delete the configuration  
            DeleteCORSConfiguration();  
  
            // Retrieve a nonexistent configuration  
            configuration = GetCORSConfiguration();  
            Debug.Assert(configuration == null);  
        }  
    }  
}
```

```
        }

        Console.WriteLine("Example complete.");
    }
    catch (AmazonS3Exception amazonS3Exception)
    {
        Console.WriteLine("S3 error occurred. Exception: " +
amazonS3Exception.ToString());
        Console.ReadKey();
    }
    catch (Exception e)
    {
        Console.WriteLine("Exception: " + e.ToString());
        Console.ReadKey();
    }

    Console.WriteLine("Press any key to continue...");
    Console.ReadKey();
}

static void PutCORSConfiguration(CORSConfiguration configuration)
{

    PutCORSConfigurationRequest request = new PutCORSConfigurationRequest
    {
        BucketName = bucketName,
        Configuration = configuration
    };

    var response = client.PutCORSConfiguration(request);
}

static CORSConfiguration GetCORSConfiguration()
{
    GetCORSConfigurationRequest request = new GetCORSConfigurationRequest
    {
        BucketName = bucketName

    };
    var response = client.GetCORSConfiguration(request);
    var configuration = response.Configuration;
    PrintCORSRules(configuration);
    return configuration;
}

static void DeleteCORSConfiguration()
{
    DeleteCORSConfigurationRequest request = new DeleteCORSConfigurationRequest
    {
        BucketName = bucketName
    };
    client.DeleteCORSConfiguration(request);
}

static void PrintCORSRules(CORSConfiguration configuration)
{
    Console.WriteLine();

    if (configuration == null)
    {
        Console.WriteLine("\nConfiguration is null");
        return;
    }

    Console.WriteLine("Configuration has {0} rules:", configuration.Rules.Count);
    foreach (CORSRule rule in configuration.Rules)
```

```
        {
            Console.WriteLine("Rule ID: {0}", rule.Id);
            Console.WriteLine("MaxAgeSeconds: {0}", rule.MaxAgeSeconds);
            Console.WriteLine("AllowedMethod: {0}", string.Join(", ",
rule.AllowedMethods.ToArray()));
            Console.WriteLine("AllowedOrigins: {0}", string.Join(", ",
rule.AllowedOrigins.ToArray()));
            Console.WriteLine("AllowedHeaders: {0}", string.Join(", ",
rule.AllowedHeaders.ToArray()));
            Console.WriteLine("ExposeHeader: {0}", string.Join(", ",
rule.ExposeHeaders.ToArray()));
        }
    }
}
```

## Enabling Cross-Origin Resource Sharing (CORS) Using the REST API

You can use the AWS Management Console to set CORS configuration on your bucket. If your application requires it, you can also send REST requests directly. The following sections in the *Amazon Simple Storage Service API Reference* describe the REST API actions related to the CORS configuration:

- [PUT Bucket cors](#)
- [GET Bucket cors](#)
- [DELETE Bucket cors](#)
- [OPTIONS object](#)

## Troubleshooting CORS Issues

When you are accessing buckets set with the CORS configuration, if you encounter unexpected behavior the following are some troubleshooting actions you can take:

1. Verify that the CORS configuration is set on the bucket.

For instructions, go to [Editing Bucket Permissions](#) in the *Amazon Simple Storage Service Console User Guide*. If you have the CORS configuration set, the console displays an **Edit CORS Configuration** link in the **Properties** section of the **Permissions** bucket.

2. Capture the complete request and response using a tool of your choice. For each request Amazon S3 receives, there must exist one CORS rule matching the data in your request, as follows:

- a. Verify the request has the Origin header.

If the header is missing, Amazon S3 does not treat the request as a cross-origin request and does not send CORS response headers back in the response.

- b. Verify that the Origin header in your request matches at least one of the AllowedOrigin elements in the specific CORSRule.

The scheme, the host, and the port values in the Origin request header must match the AllowedOrigin in the CORSRule. For example, if you set the CORSRule to allow the origin `http://www.example.com`, then both `https://www.example.com` and `http://www.example.com:80` origins in your request do not match the allowed origin in your configuration.

- c. Verify that the Method in your request (or the method specified in the Access-Control-Request-Method in case of a preflight request) is one of the AllowedMethod elements in the same CORSRule.

- d. For a preflight request, if the request includes an `Access-Control-Request-Headers` header, verify that the `CORSRule` includes the `AllowedHeader` entries for each value in the `Access-Control-Request-Headers` header.

## Operations on Objects

Amazon S3 enables you to store, retrieve, and delete objects. You can retrieve an entire object or a portion of an object. If you have enabled versioning on your bucket, you can retrieve a specific version of the object. You can also retrieve a subresource associated with your object and update it where applicable. You can make a copy of your existing object. Depending on the object size, the following upload and copy related considerations apply:

- **Uploading objects**—You can upload objects of up to 5 GB in size in a single operation. For objects greater than 5 GB you must use the multipart upload API.

Using the multipart upload API you can upload objects up to 5 TB each. For more information, see [Uploading Objects Using Multipart Upload API \(p. 187\)](#).

- **Copying objects**—The copy operation creates a copy of an object that is already stored in Amazon S3.

You can create a copy of your object up to 5 GB in size in a single atomic operation. However, for copying an object greater than 5 GB, you must use the multipart upload API. For more information, see [Copying Objects \(p. 227\)](#).

You can use the REST API (see [Making Requests Using the REST API \(p. 50\)](#)) to work with objects or use one of the following AWS SDK libraries:

- [AWS SDK for Java](#)
- [AWS SDK for .NET](#)
- [AWS SDK for PHP](#)

These libraries provide a high-level abstraction that makes working with objects easy. However, if your application requires, you can use the REST API directly.

## Getting Objects

### Topics

- [Related Resources \(p. 169\)](#)
- [Get an Object Using the AWS SDK for Java \(p. 169\)](#)
- [Get an Object Using the AWS SDK for .NET \(p. 171\)](#)
- [Get an Object Using the AWS SDK for PHP \(p. 173\)](#)
- [Get an Object Using the REST API \(p. 176\)](#)
- [Share an Object with Others \(p. 176\)](#)

You can retrieve objects directly from Amazon S3. You have the following options when retrieving an object:

- **Retrieve an entire object**—A single GET operation can return you the entire object stored in Amazon S3.
- **Retrieve object in parts**—Using the `Range` HTTP header in a GET request, you can retrieve a specific range of bytes in an object stored in Amazon S3.

You resume fetching other parts of the object whenever your application is ready. This resumable download is useful when you need only portions of your object data. It is also useful where network connectivity is poor and you need to react to failures.

**Note**

Amazon S3 doesn't support retrieving multiple ranges of data per GET request.

When you retrieve an object, its metadata is returned in the response headers. There are times when you want to override certain response header values returned in a GET response. For example, you might override the Content-Disposition response header value in your GET request. The REST GET Object API (see [GET Object](#)) allows you to specify query string parameters in your GET request to override these values.

The AWS SDK for Java, .NET and PHP also provide necessary objects you can use to specify values for these response headers in your GET request.

When retrieving objects that are stored encrypted using server-side encryption you will need to provide appropriate request headers. For more information, see [Protecting Data Using Encryption \(p. 409\)](#).

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Get an Object Using the AWS SDK for Java

When you download an object, you get all of object's metadata and a stream from which to read the contents. You should read the content of the stream as quickly as possible because the data is streamed directly from Amazon S3 and your network connection will remain open until you read all the data or close the input stream.

### Downloading Objects

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Execute one of the <code>AmazonS3Client.getObject()</code> method. You need to provide the request information, such as bucket name, and key name. You provide this information by creating an instance of the <code>GetObjectRequest</code> class.
3	Execute one of the <code>getObjectContent()</code> methods on the object returned to get a stream on the object data and process the response.

The following Java code example demonstrates the preceding tasks.

### Example

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
S3Object object = s3Client.getObject(
    new GetObjectRequest(bucketName, key));
InputStream objectData = object.getObjectContent();
// Process the objectData stream.
objectData.close();
```

The `GetObjectRequest` object provides several options, including conditional downloading of objects based on modification times, ETags, and selectively downloading a range of an object. The following Java code example demonstrates how you can specify a range of data bytes to retrieve from an object.

### Example

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

GetObjectRequest rangeObjectRequest = new GetObjectRequest(
    bucketName, key);
rangeObjectRequest.setRange(0, 10); // retrieve 1st 11 bytes.
S3Object objectPortion = s3Client.getObject(rangeObjectRequest);

InputStream objectData = objectPortion.getObjectContent();
// Process the objectData stream.
objectData.close();
```

When retrieving an object, you can optionally override the response header values (see [Getting Objects \(p. 168\)](#)) by using the `ResponseHeaderOverrides` object and setting the corresponding request property, as shown in the following Java code example.

### Example

```
GetObjectRequest request = new GetObjectRequest(bucketName, key);

ResponseHeaderOverrides responseHeaders = new ResponseHeaderOverrides();
responseHeaders.setCacheControl("No-cache");
responseHeaders.setContentDisposition("attachment; filename=testing.txt");

// Add the ResponseHeaderOverrides to the request.
request.setResponseHeaders(responseHeaders);
```

### Example

The following Java code example retrieves an object from a specified Amazon S3 bucket. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStream;
import java.io.InputStreamReader;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.GetObjectRequest;
import com.amazonaws.services.s3.model.S3Object;

public class GetObject {
    private static String bucketName = "*** provide bucket name ***";
    private static String key      = "*** provide object key ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            System.out.println("Downloading an object");
            S3Object s3object = s3Client.getObject(new GetObjectRequest(
                bucketName, key));
            System.out.println("Content-Type: " +
                s3object.getObjectMetadata().getContentType());
            displayTextInputStream(s3object.getObjectContent());

            // Get a range of bytes from an object.
        }
    }

    private static void displayTextInputStream(InputStream objectContent) {
        BufferedReader reader = new BufferedReader(new InputStreamReader(objectContent));
        String line;
        while ((line = reader.readLine()) != null) {
            System.out.println(line);
        }
    }
}
```

```

GetObjectRequest rangeObjectRequest = new GetObjectRequest(
    bucketName, key);
rangeObjectRequest.setRange(0, 10);
S3Object objectPortion = s3Client.getObject(rangeObjectRequest);

System.out.println("Printing bytes retrieved.");
displayTextInputStream(objectPortion.getObjectContent());

} catch (AmazonServiceException ase) {
    System.out.println("Caught an AmazonServiceException, which" +
        " means your request made it " +
        "to Amazon S3, but was rejected with an error response" +
        " for some reason.");
    System.out.println("Error Message:      " + ase.getMessage());
    System.out.println("HTTP Status Code: " + ase.getStatusCode());
    System.out.println("AWS Error Code:   " + ase.getErrorCode());
    System.out.println("Error Type:       " + ase.getErrorType());
    System.out.println("Request ID:      " + ase.getRequestId());
} catch (AmazonClientException ace) {
    System.out.println("Caught an AmazonClientException, which means" +
        " the client encountered " +
        "an internal error while trying to " +
        "communicate with S3, " +
        "such as not being able to access the network.");
    System.out.println("Error Message: " + ace.getMessage());
}
}

private static void displayTextInputStream(InputStream input)
throws IOException {
// Read one text line at a time and display.
BufferedReader reader = new BufferedReader(new
    InputStreamReader(input));
while (true) {
    String line = reader.readLine();
    if (line == null) break;

    System.out.println("      " + line);
}
System.out.println();
}
}

```

## Get an Object Using the AWS SDK for .NET

The following tasks guide you through using the .NET classes to retrieve an object or a portion of the object, and save it locally to a file.

## Downloading Objects

- 1 Create an instance of the `AmazonS3` class.
- 2 Execute one of the `AmazonS3.GetObject` methods. You need to provide information such as bucket name, file path, or a stream. You provide this information by creating an instance of the `GetObjectRequest` class.
- 3 Execute one of the `GetObjectResponse.WriteResponseStreamToFile` methods to save the stream to a file.

The following C# code example demonstrates the preceding tasks. The examples saves the object to a file on your desktop.

### Example

```
static IAmazonS3 client;
using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
{
    GetObjectRequest request = new GetObjectRequest
    {
        BucketName = bucketName,
        Key = keyName
    };

    using (GetObjectResponse response = client.GetObject(request))
    {
        string dest =
Path.Combine(Environment.GetFolderPath(Environment.SpecialFolder.Desktop), keyName);
        if (!File.Exists(dest))
        {
            response.WriteResponseStreamToFile(dest);
        }
    }
}
```

Instead of reading the entire object you can read only the portion of the object data by specifying the byte range in the request, as shown in the following C# code example.

### Example

```
GetObjectRequest request = new GetObjectRequest
{
    BucketName = bucketName,
    Key = keyName,
    ByteRange = new ByteRange(0, 10)
};
```

When retrieving an object, you can optionally override the response header values (see [Getting Objects \(p. 168\)](#)) by using the `ResponseHeaderOverrides` object and setting the corresponding request property, as shown in the following C# code example. You can use this feature to indicate the object should be downloaded into a different filename than the object key name.

### Example

```
GetObjectRequest request = new GetObjectRequest
{
    BucketName = bucketName,
    Key = keyName
};

ResponseHeaderOverrides responseHeaders = new ResponseHeaderOverrides();
responseHeaders.CacheControl = "No-cache";
responseHeaders.ContentDisposition = "attachment; filename=testing.txt";

request.ResponseHeaderOverrides = responseHeaders;
```

### Example

The following C# code example retrieves an object from an Amazon S3 bucket. From the response, the example reads the object data using the `GetObjectResponse.ResponseStream` property. The example also shows how you can use the `GetObjectResponse.Metadata` collection to read object metadata. If the object you retrieve has the `x-amz-meta-title` metadata, the code will print the metadata value.

For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.IO;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class GetObject
    {
        static string bucketName = "**** bucket name ****";
        static string keyName     = "**** object key ****";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            try
            {
                Console.WriteLine("Retrieving (GET) an object");
                string data = ReadObjectData();
            }
            catch (AmazonS3Exception s3Exception)
            {
                Console.WriteLine(s3Exception.Message,
                                  s3Exception.InnerException);
            }
            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static string ReadObjectData()
        {
            string responseBody = "";

            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                GetObjectRequest request = new GetObjectRequest
                {
                    BucketName = bucketName,
                    Key = keyName
                };

                using (GetObjectResponse response = client.GetObject(request))
                using (Stream responseStream = response.ResponseStream)
                using (StreamReader reader = new StreamReader(responseStream))
                {
                    string title = response.Metadata["x-amz-meta-title"];
                    Console.WriteLine("The object's title is {0}", title);

                    responseBody = reader.ReadToEnd();
                }
            }
            return responseBody;
        }
    }
}
```

## Get an Object Using the AWS SDK for PHP

This topic guides you through using a class from the AWS SDK for PHP to retrieve an object. You can retrieve an entire object or specify a byte range to retrieve from the object.

**Note**

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

## Downloading an Object

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	<p>Execute the <a href="#">Aws\S3\S3Client::getObject()</a> method. You must provide a bucket name and a key name in the array parameter's required keys, Bucket and Key.</p> <p>Instead of retrieving the entire object you can retrieve a specific byte range from the object data. You provide the range value by specifying the array parameter's Range key in addition to the required keys.</p> <p>You can save the object you retrieved from Amazon S3 to a file in your local file system by specifying a file path to where to save the file in the array parameter's SaveAs key, in addition to the required keys, Bucket and Key.</p>

The following PHP code example demonstrates the preceding tasks for downloading an object.

### Example

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';
$filepath = '*** Your File Path ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Get an object.
$result = $s3->getObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname
));

// Get a range of bytes from an object.
$result = $s3->getObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname,
    'Range'   => 'bytes=0-99'
));

// Save object to a file.
$result = $s3->getObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname,
    'SaveAs'  => $filepath
));
```

When retrieving an object, you can optionally override the response header values (see [Getting Objects \(p. 168\)](#)) by adding the array parameter's response keys, ResponseContentType, ResponseContentLanguage, ResponseContentDisposition, ResponseCacheControl, and ResponseExpires, to the getObject() method, as shown in the following PHP code example.

## Example

```
$result = $s3->getObject(array(
    'Bucket'                  => $bucket,
    'Key'                     => $keyname,
    'ResponseContentType'     => 'text/plain',
    'ResponseContentLanguage' => 'en-US',
    'ResponseContentDisposition' => 'attachment; filename=testing.txt',
    'ResponseCacheControl'    => 'No-cache',
    'ResponseExpires'         => gmdate(DATE_RFC2822, time() + 3600),
));
```

## Example of Downloading an Object Using PHP

The following PHP example retrieves an object and displays object content in the browser. The example illustrates the use of the `getObject()` method. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;
use Aws\S3\Exception\S3Exception;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

try {
    // Get the object
    $result = $s3->getObject(array(
        'Bucket' => $bucket,
        'Key'      => $keyname
    ));

    // Display the object in the browser
    header("Content-Type: {$result['ContentType']}");
    echo $result['Body'];
} catch (S3Exception $e) {
    echo $e->getMessage() . "\n";
}
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::getObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 - Downloading Objects](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Get an Object Using the REST API

You can use the AWS SDK to retrieve object keys from a bucket. However, if your application requires it, you can send REST requests directly. You can send a GET request to retrieve object keys. For more information about the request and response format, go to [Get Object](#).

## Share an Object with Others

### Topics

- [Generate a Pre-signed Object URL using AWS Explorer for Visual Studio \(p. 176\)](#)
- [Generate a Pre-signed Object URL using AWS SDK for Java \(p. 176\)](#)
- [Generate a Pre-signed Object URL using AWS SDK for .NET \(p. 178\)](#)

All objects by default are private. Only the object owner has permission to access these objects. However, the object owner can optionally share objects with others by creating a pre-signed URL, using their own security credentials, to grant time-limited permission to download the objects.

When you create a pre-signed URL for your object, you must provide your security credentials, specify a bucket name, an object key, specify the HTTP method (GET to download the object) and expiration date and time. The pre-signed URLs are valid only for the specified duration.

Anyone who receives the pre-signed URL can then access the object. For example, if you have a video in your bucket and both the bucket and the object are private, you can share the video with others by generating a pre-signed URL.

### Note

Anyone with valid security credentials can create a pre-signed URL. However, in order to successfully access an object, the pre-signed URL must be created by someone who has permission to perform the operation that the pre-signed URL is based upon.

You can generate pre-signed URL programmatically using the AWS SDK for Java and .NET.

### Generate a Pre-signed Object URL using AWS Explorer for Visual Studio

If you are using Visual Studio, you can generate a pre-signed URL for an object without writing any code by using AWS Explorer for Visual Studio. Anyone with this URL can download the object. For more information, go to [Using Amazon S3 from AWS Explorer](#).

For instructions about how to install the AWS Explorer, see [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#).

### Generate a Pre-signed Object URL using AWS SDK for Java

The following tasks guide you through using the Java classes to generate a pre-signed URL.

#### Downloading Objects

1	Create an instance of the <code>AmazonS3</code> class. For information about providing credentials, see <a href="#">Using the AWS SDK for Java (p. 612)</a> . These credentials are used in creating a signature for authentication when you generate a pre-signed URL.
2	Execute the <code>AmazonS3.generatePresignedUrl</code> method to generate a pre-signed URL.  You provide information including a bucket name, an object key, and an expiration date by creating an instance of the <code>GeneratePresignedUrlRequest</code> class. The request by

default sets the verb to GET. To use the pre-signed URL for other operations, for example PUT, you must explicitly set the verb when you create the request.

The following Java code sample demonstrates the preceding tasks.

### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());

java.util.Date expiration = new java.util.Date();
long msec = expiration.getTime();
msec += 1000 * 60 * 60; // 1 hour.
expiration.setTime(msec);

GeneratePresignedUrlRequest generatePresignedUrlRequest =
    new GeneratePresignedUrlRequest(bucketName, objectKey);
generatePresignedUrlRequest.setMethod(HttpMethod.GET); // Default.
generatePresignedUrlRequest.setExpiration(expiration);

URL s = s3client.generatePresignedUrl(generatePresignedUrlRequest);
```

### Example

The following Java code example generates a pre-signed URL that you can give to others so that they can retrieve the object. You can use the generated pre-signed URL to retrieve the object. To use the pre-signed URL for other operations, such as put an object, you must explicitly set the verb in the GetPreSignedUrlRequest. For instructions about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;
import java.net.URL;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.HttpMethod;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.GeneratePresignedUrlRequest;

public class GeneratePreSignedUrl {
    private static String bucketName = "*** Provide a bucket name ***";
    private static String objectKey = "*** Provide an object key ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());

        try {
            System.out.println("Generating pre-signed URL.");
            java.util.Date expiration = new java.util.Date();
            long milliSeconds = expiration.getTime();
            milliSeconds += 1000 * 60 * 60; // Add 1 hour.
            expiration.setTime(milliSeconds);

            GeneratePresignedUrlRequest generatePresignedUrlRequest =
                new GeneratePresignedUrlRequest(bucketName, objectKey);
            generatePresignedUrlRequest.setMethod(HttpMethod.GET);
            generatePresignedUrlRequest.setExpiration(expiration);

            URL url = s3client.generatePresignedUrl(generatePresignedUrlRequest);
```

```
        System.out.println("Pre-Signed URL = " + url.toString());
    } catch (AmazonServiceException exception) {
        System.out.println("Caught an AmazonServiceException, " +
            "which means your request made it " +
            "to Amazon S3, but was rejected with an error response " +
            "for some reason.");
        System.out.println("Error Message: " + exception.getMessage());
        System.out.println("HTTP Code: " + exception.getStatusCode());
        System.out.println("AWS Error Code: " + exception.getErrorCode());
        System.out.println("Error Type: " + exception.getErrorType());
        System.out.println("Request ID: " + exception.getRequestId());
    } catch (AmazonClientException ace) {
        System.out.println("Caught an AmazonClientException, " +
            "which means the client encountered " +
            "an internal error while trying to communicate" +
            " with S3, " +
            "such as not being able to access the network.");
        System.out.println("Error Message: " + ace.getMessage());
    }
}
```

## Generate a Pre-signed Object URL using AWS SDK for .NET

The following tasks guide you through using the .NET classes to generate a pre-signed URL.

### Downloading Objects

1	Create an instance of the <code>AmazonS3</code> class. For information about providing your credentials see <a href="#">Using the AWS SDK for .NET (p. 614)</a> . These credentials are used in creating a signature for authentication when you generate a pre-signed URL.
2	Execute the <code>AmazonS3.GetPreSignedURL</code> method to generate a pre-signed URL.  You provide information including a bucket name, an object key, and an expiration date by creating an instance of the <code>GetPreSignedUrlRequest</code> class.

The following C# code sample demonstrates the preceding tasks.

### Example

```
static IAmazonS3 s3Client;
s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1)

GetPreSignedUrlRequest request1 = new GetPreSignedUrlRequest()
{
    BucketName = bucketName,
    Key = objectKey,
    Expires = DateTime.Now.AddMinutes(5)
};

string url = s3Client.GetPreSignedURL(request1);
```

### Example

The following C# code example generates a pre-signed URL for a specific object. For instructions about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
```

```
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class GeneratePresignedURL
    {
        static string bucketName = "*** Provide a bucket name ***";
        static string objectKey = "*** Provide an object name ***";
        static IAmazonS3 s3Client;

        public static void Main(string[] args)
        {

            using (s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                string urlString = GeneratePreSignedURL();
            }

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static string GeneratePreSignedURL()
        {
            string urlString = "";
            GetPreSignedUrlRequest request1 = new GetPreSignedUrlRequest
            {
                BucketName = bucketName,
                Key = objectKey,
                Expires = DateTime.Now.AddMinutes(5)

            };
            try
            {
                urlString = s3Client.GetPreSignedURL(request1);
                //string url = s3Client.GetPreSignedURL(request1);
            }
            catch (AmazonS3Exception amazonS3Exception)
            {
                if (amazonS3Exception.ErrorCode != null &&
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                     ||
                     amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                {
                    Console.WriteLine("Check the provided AWS Credentials.");
                    Console.WriteLine(
                        "To sign up for service, go to http://aws.amazon.com/s3");
                }
                else
                {
                    Console.WriteLine(
                        "Error occurred. Message:{0}' when listing objects",
                        amazonS3Exception.Message);
                }
            }
            catch (Exception e)
            {
                Console.WriteLine(e.Message);
            }

            return urlString;
        }
    }
}
```

```
}
```

## Uploading Objects

Depending on the size of the data you are uploading, Amazon S3 offers the following options:

- **Upload objects in a single operation**—With a single PUT operation, you can upload objects up to 5 GB in size.

For more information, see [Uploading Objects in a Single Operation \(p. 180\)](#).

- **Upload objects in parts**—Using the multipart upload API, you can upload large objects, up to 5 TB.

The multipart upload API is designed to improve the upload experience for larger objects. You can upload objects in parts. These object parts can be uploaded independently, in any order, and in parallel. You can use a multipart upload for objects from 5 MB to 5 TB in size. For more information, see [Uploading Objects Using Multipart Upload API \(p. 187\)](#).

We recommend that you use multipart uploading in the following ways:

- If you're uploading large objects over a stable high-bandwidth network, use multipart uploading to maximize the use of your available bandwidth by uploading object parts in parallel for multi-threaded performance.
- If you're uploading over a spotty network, use multipart uploading to increase resiliency to network errors by avoiding upload restarts. When using multipart uploading, you need to retry uploading only parts that are interrupted during the upload. You don't need to restart uploading your object from the beginning.

For more information about multipart uploads, see [Multipart Upload Overview \(p. 187\)](#).

### Topics

- [Uploading Objects in a Single Operation \(p. 180\)](#)
- [Uploading Objects Using Multipart Upload API \(p. 187\)](#)
- [Uploading Objects Using Pre-Signed URLs \(p. 221\)](#)

When uploading an object, you can optionally request that Amazon S3 encrypt it before saving it on disks in its data centers and decrypt it when you download it. For more information, see [Protecting Data Using Encryption \(p. 409\)](#).

### Related Topics

[Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Uploading Objects in a Single Operation

### Topics

- [Upload an Object Using the AWS SDK for Java \(p. 181\)](#)
- [Upload an Object Using the AWS SDK for .NET \(p. 182\)](#)
- [Upload an Object Using the AWS SDK for PHP \(p. 184\)](#)
- [Upload an Object Using the AWS SDK for Ruby \(p. 186\)](#)
- [Upload an Object Using the REST API \(p. 186\)](#)

You can use the AWS SDK to upload objects. The SDK provides wrapper libraries for you to upload data easily. However, if your application requires it, you can use the REST API directly in your application.

## Upload an Object Using the AWS SDK for Java

The following tasks guide you through using the Java classes to upload a file. The API provides several variations, called *overloads*, of the `putObject` method to easily upload your data.

### Uploading Objects

1	Create an instance of the <code>AmazonS3Client</code> .
2	Execute one of the <code>AmazonS3Client.putObject</code> overloads depending on whether you are uploading data from a file, or a stream.

The following Java code example demonstrates the preceding tasks.

### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
s3client.putObject(new PutObjectRequest(bucketName, keyName, file));
```

### Example

The following Java code example uploads a file to an Amazon S3 bucket. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.File;
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.PutObjectRequest;

public class UploadObjectSingleOperation {
    private static String bucketName      = "**** Provide bucket name ***";
    private static String keyName        = "**** Provide key ***";
    private static String uploadFileName = "**** Provide file name ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            System.out.println("Uploading a new object to S3 from a file\n");
            File file = new File(uploadFileName);
            s3client.putObject(new PutObjectRequest(
                bucketName, keyName, file));

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, which " +
                "means your request made it " +
                "to Amazon S3, but was rejected with an error response" +
                " for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
        }
    }
}
```

```
        System.out.println("Request ID:      " + ase.getRequestId());
    } catch (AmazonClientException ace) {
        System.out.println("Caught an AmazonClientException, which " +
            "means the client encountered " +
            "an internal error while trying to " +
            "communicate with S3, " +
            "such as not being able to access the network.");
        System.out.println("Error Message: " + ace.getMessage());
    }
}
```

## Upload an Object Using the AWS SDK for .NET

The tasks in the following process guide you through using the .NET classes to upload an object. The API provides several variations, overloads, of the `PutObject` method to easily upload your data.

### Uploading Objects

1	Create an instance of the <code>AmazonS3</code> class.
2	Execute one of the <code>AmazonS3.PutObject</code> . You need to provide information such as a bucket name, file path, or a stream. You provide this information by creating an instance of the <code>PutObjectRequest</code> class.

The following C# code example demonstrates the preceding tasks.

### Example

```
static IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);
PutObjectRequest request = new PutObjectRequest()
{
    BucketName = bucketName,
    Key = keyName,
    FilePath = filePath
};
PutObjectResponse response2 = client.PutObject(request);
```

### Example

The following C# code example uploads an object. The object data is provided as a text string in the code. The example uploads the object twice.

- The first `PutObjectRequest` specifies only the bucket name, key name, and a text string embedded in the code as sample object data.
- The second `PutObjectRequest` provides additional information including the optional object metadata and a `ContentType` header. The request specifies a file name to upload.

Each successive call to `AmazonS3.PutObject` replaces the previous upload. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Model;
```

```
namespace s3.amazonaws.docsamples
{
    class UploadObject
    {
        static string bucketName = "**** bucket name ****";
        static string keyName     = "**** key name when object is created ****";
        static string filePath     = "**** absolute path to a sample file to upload ****";

        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                Console.WriteLine("Uploading an object");
                WritingAnObject();
            }

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static void WritingAnObject()
        {
            try
            {
                PutObjectRequest putRequest1 = new PutObjectRequest
                {
                    BucketName = bucketName,
                    Key = keyName,
                    ContentBody = "sample text"
                };

                PutObjectResponse response1 = client.PutObject(putRequest1);

                // 2. Put object-set ContentType and add metadata.
                PutObjectRequest putRequest2 = new PutObjectRequest
                {
                    BucketName = bucketName,
                    Key = keyName,
                    FilePath = filePath,
                    ContentType = "text/plain"
                };
                putRequest2.Metadata.Add("x-amz-meta-title", "someTitle");

                PutObjectResponse response2 = client.PutObject(putRequest2);

            }
            catch (AmazonS3Exception amazonS3Exception)
            {
                if (amazonS3Exception.ErrorCode != null &&
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                     ||
                     amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                {
                    Console.WriteLine("Check the provided AWS Credentials.");
                    Console.WriteLine(
                        "For service sign up go to http://aws.amazon.com/s3");
                }
                else
                {
                    Console.WriteLine(
                        "Error occurred. Message:{0}' when writing an object"
                        , amazonS3Exception.Message);
                }
            }
        }
    }
}
```

```
    }
}
```

## Upload an Object Using the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to upload an object of up to 5 GB in size. For larger files you must use multipart upload API. For more information, see [Uploading Objects Using Multipart Upload API \(p. 187\)](#).

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

## Uploading Objects

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	Execute the <a href="#">Aws\S3\S3Client::putObject()</a> method. You must provide a bucket name and a key name in the array parameter's required keys, Bucket and Key.  If you are uploading a file, you specify the file name by adding the array parameter with the SourceFile key. You can also provide the optional object metadata using the array parameter.

The following PHP code example demonstrates how to create an object by uploading a file specified in the SourceFile key in the putObject method's array parameter.

### Example

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';
// $filepath should be absolute path to a file on disk
$filepath = '*** Your File Path ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Upload a file.
$result = $s3->putObject(array(
    'Bucket'      => $bucket,
    'Key'         => $keyname,
    'SourceFile'  => $filepath,
    'ContentType' => 'text/plain',
    'ACL'         => 'public-read',
    'StorageClass' => 'REDUCED_REDUNDANCY',
    'Metadata'    => array(
        'param1' => 'value 1',
        'param2' => 'value 2'
    )
));
echo $result['ObjectURL'];
```

Instead of specifying a file name, you can provide object data inline by specifying the array parameter with the Body key, as shown in the following PHP code example.

## Example

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Upload data.
$result = $s3->putObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname,
    'Body'    => 'Hello, world!'
));

echo $result['ObjectURL'];
```

### Example of Creating an Object in an Amazon S3 bucket by Uploading Data

The following PHP example creates an object in a specified bucket by uploading data using the `putObject()` method. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;
use Aws\S3\Exception\S3Exception;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

try {
    // Upload data.
    $result = $s3->putObject(array(
        'Bucket' => $bucket,
        'Key'     => $keyname,
        'Body'    => 'Hello, world!',
        'ACL'    => 'public-read'
    ));

    // Print the URL to the object.
    echo $result['ObjectURL'] . "\n";
} catch (S3Exception $e) {
    echo $e->getMessage() . "\n";
}
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 `Aws\S3\S3Client` Class](#)
- [AWS SDK for PHP for Amazon S3 `Aws\S3\S3Client::factory\(\)` Method](#)
- [AWS SDK for PHP for Amazon S3 `Aws\S3\S3Client::putObject\(\)` Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Upload an Object Using the AWS SDK for Ruby

The AWS SDK for Ruby - Version 3 has two ways of uploading an object to Amazon S3. The first is a managed file uploader, which makes it easy to upload files of any size from disk.

### Uploading a File

1	Create an instance of the <code>Aws::S3::Resource</code> class.
2	Reference the target object by bucket name and key. Objects live in a bucket and have unique keys that identify the object.
2	Call <code>#upload_file</code> on the object.

### Example

```
require 'aws-sdk-s3'

s3 = Aws::S3::Resource.new(region:'us-west-2')
obj = s3.bucket('bucket-name').object('key')
obj.upload_file('/path/to/source/file')
```

The second way that AWS SDK for Ruby - Version 3 can upload an object is to use the `#put` method of `Aws::S3::Object`. This is useful if the object is a string or an IO object that is not a file on disk.

### Put Object

1	Create an instance of the <code>Aws::S3::Resource</code> class.
2	Reference the target object by bucket name and key.
2	Call <code>#put</code> passing in the string or IO object.

### Example

```
require 'aws-sdk-s3'

s3 = Aws::S3::Resource.new(region:'us-west-2')
obj = s3.bucket('bucket-name').object('key')

# string data
obj.put(body: 'Hello World!')

# IO object
File.open('source', 'rb') do |file|
  obj.put(body: file)
end
```

## Upload an Object Using the REST API

You can use AWS SDK to upload an object. However, if your application requires it, you can send REST requests directly. You can send a PUT request to upload data in a single operation. For more information, see [PUT Object](#).

## Uploading Objects Using Multipart Upload API

### Topics

- [Multipart Upload Overview \(p. 187\)](#)
- [Using the AWS Java SDK for Multipart Upload \(High-Level API\) \(p. 193\)](#)
- [Using the AWS Java SDK for Multipart Upload \(Low-Level API\) \(p. 197\)](#)
- [Using the AWS .NET SDK for Multipart Upload \(High-Level API\) \(p. 201\)](#)
- [Using the AWS .NET SDK for Multipart Upload \(Low-Level API\) \(p. 208\)](#)
- [Using the AWS PHP SDK for Multipart Upload \(High-Level API\) \(p. 213\)](#)
- [Using the AWS PHP SDK for Multipart Upload \(Low-Level API\) \(p. 216\)](#)
- [Using the AWS SDK for Ruby for Multipart Upload \(p. 220\)](#)
- [Using the REST API for Multipart Upload \(p. 221\)](#)

Multipart upload allows you to upload a single object as a set of parts. Each part is a contiguous portion of the object's data. You can upload these object parts independently and in any order. If transmission of any part fails, you can retransmit that part without affecting other parts. After all parts of your object are uploaded, Amazon S3 assembles these parts and creates the object. In general, when your object size reaches 100 MB, you should consider using multipart uploads instead of uploading the object in a single operation.

Using multipart upload provides the following advantages:

- Improved throughput - You can upload parts in parallel to improve throughput.
- Quick recovery from any network issues - Smaller part size minimizes the impact of restarting a failed upload due to a network error.
- Pause and resume object uploads - You can upload object parts over time. Once you initiate a multipart upload there is no expiry; you must explicitly complete or abort the multipart upload.
- Begin an upload before you know the final object size - You can upload an object as you are creating it.

For more information, see [Multipart Upload Overview \(p. 187\)](#).

## Multipart Upload Overview

### Topics

- [Concurrent Multipart Upload Operations \(p. 188\)](#)
- [Multipart Upload and Pricing \(p. 189\)](#)
- [Aborting Incomplete Multipart Uploads Using a Bucket Lifecycle Policy \(p. 189\)](#)
- [Quick Facts \(p. 190\)](#)
- [API Support for Multipart Upload \(p. 191\)](#)
- [Multipart Upload API and Permissions \(p. 191\)](#)

The Multipart upload API enables you to upload large objects in parts. You can use this API to upload new large objects or make a copy of an existing object (see [Operations on Objects \(p. 168\)](#)).

Multipart uploading is a three-step process: You initiate the upload, you upload the object parts, and after you have uploaded all the parts, you complete the multipart upload. Upon receiving the complete multipart upload request, Amazon S3 constructs the object from the uploaded parts, and you can then access the object just as you would any other object in your bucket.

You can list of all your in-progress multipart uploads or get a list of the parts that you have uploaded for a specific multipart upload. Each of these operations is explained in this section.

### Multipart Upload Initiation

When you send a request to initiate a multipart upload, Amazon S3 returns a response with an upload ID, which is a unique identifier for your multipart upload. You must include this upload ID whenever you upload parts, list the parts, complete an upload, or abort an upload. If you want to provide any metadata describing the object being uploaded, you must provide it in the request to initiate multipart upload.

### Parts Upload

When uploading a part, in addition to the upload ID, you must specify a part number. You can choose any part number between 1 and 10,000. A part number uniquely identifies a part and its position in the object you are uploading. Part number you choose need not be a consecutive sequence (for example, it can be 1, 5, and 14). If you upload a new part using the same part number as a previously uploaded part, the previously uploaded part is overwritten. Whenever you upload a part, Amazon S3 returns an *ETag* header in its response. For each part upload, you must record the part number and the ETag value. You need to include these values in the subsequent request to complete the multipart upload.

#### Note

After you initiate a multipart upload and upload one or more parts, you must either complete or abort the multipart upload in order to stop getting charged for storage of the uploaded parts. Only *after* you either complete or abort a multipart upload will Amazon S3 free up the parts storage and stop charging you for the parts storage.

### Multipart Upload Completion (or Abort)

When you complete a multipart upload, Amazon S3 creates an object by concatenating the parts in ascending order based on the part number. If any object metadata was provided in the *initiate multipart upload* request, Amazon S3 associates that metadata with the object. After a successful *complete* request, the parts no longer exist. Your *complete multipart upload* request must include the upload ID and a list of both part numbers and corresponding ETag values. Amazon S3 response includes an ETag that uniquely identifies the combined object data. This ETag will not necessarily be an MD5 hash of the object data. You can optionally abort the multipart upload. After aborting a multipart upload, you cannot upload any part using that upload ID again. All storage that any parts from the aborted multipart upload consumed is then freed. If any part uploads were in-progress, they can still succeed or fail even after you aborted. To free all storage consumed by all parts, you must abort a multipart upload only after all part uploads have completed.

### Multipart Upload Listings

You can list the parts of a specific multipart upload or all in-progress multipart uploads. The list parts operation returns the parts information that you have uploaded for a specific multipart upload. For each list parts request, Amazon S3 returns the parts information for the specified multipart upload, up to a maximum of 1,000 parts. If there are more than 1,000 parts in the multipart upload, you must send a series of list part requests to retrieve all the parts. Note that the returned list of parts doesn't include parts that haven't completed uploading. Using the *list multipart uploads* operation, you can obtain a list of multipart uploads in progress. An in-progress multipart upload is an upload that you have initiated, but have not yet completed or aborted. Each request returns at most 1000 multipart uploads. If there are more than 1,000 multipart uploads in progress, you need to send additional requests to retrieve the remaining multipart uploads. Only use the returned listing for verification. You should not use the result of this listing when sending a *complete multipart upload* request. Instead, maintain your own list of the part numbers you specified when uploading parts and the corresponding ETag values that Amazon S3 returns.

### Concurrent Multipart Upload Operations

In a distributed development environment, it is possible for your application to initiate several updates on the same object at the same time. Your application might initiate several multipart uploads using

the same object key. For each of these uploads, your application can then upload parts and send a complete upload request to Amazon S3 to create the object. When the buckets have versioning enabled, completing a multipart upload always creates a new version. For buckets that do not have versioning enabled, it is possible that some other request received between the time when a multipart upload is initiated and when it is completed might take precedence.

**Note**

It is possible for some other request received between the time you initiated a multipart upload and completed it to take precedence. For example, if another operation deletes a key after you initiate a multipart upload with that key, but before you complete it, the complete multipart upload response might indicate a successful object creation without you ever seeing the object.

## Multipart Upload and Pricing

Once you initiate a multipart upload, Amazon S3 retains all the parts until you either complete or abort the upload. Throughout its lifetime, you are billed for all storage, bandwidth, and requests for this multipart upload and its associated parts. If you abort the multipart upload, Amazon S3 deletes upload artifacts and any parts that you have uploaded, and you are no longer billed for them. For more information about pricing, see [Amazon S3 Pricing](#).

## Aborting Incomplete Multipart Uploads Using a Bucket Lifecycle Policy

After you initiate a multipart upload, you begin uploading parts. Amazon S3 stores these parts, but it creates the object from the parts only after you upload all of them and send a successful request to complete the multipart upload (you should verify that your request to complete multipart upload is successful). Upon receiving the complete multipart upload request, Amazon S3 assembles the parts and creates an object.

If you don't send the complete multipart upload request successfully, Amazon S3 will not assemble the parts and will not create any object. Therefore, the parts remain in Amazon S3 and you pay for the parts that are stored in Amazon S3. As a best practice, we recommend you configure a lifecycle rule (using the `AbortIncompleteMultipartUpload` action) to minimize your storage costs.

Amazon S3 supports a bucket lifecycle rule that you can use to direct Amazon S3 to abort multipart uploads that don't complete within a specified number of days after being initiated. When a multipart upload is not completed within the time frame, it becomes eligible for an abort operation and Amazon S3 aborts the multipart upload (and deletes the parts associated with the multipart upload).

The following is an example lifecycle configuration that specifies a rule with the `AbortIncompleteMultipartUpload` action.

```
<LifecycleConfiguration>
  <Rule>
    <ID>sample-rule</ID>
    <Prefix></Prefix>
    <Status>Enabled</Status>
    <AbortIncompleteMultipartUpload>
      <DaysAfterInitiation>7</DaysAfterInitiation>
    </AbortIncompleteMultipartUpload>
  </Rule>
</LifecycleConfiguration>
```

In the example, the rule does not specify a value for the `Prefix` element (object key name prefix) and therefore it applies to all objects in the bucket for which you initiated multipart uploads. Any multipart uploads that were initiated and did not complete within seven days become eligible for an abort operation (the action has no effect on completed multipart uploads).

For more information about the bucket lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

**Note**

If the multipart upload is completed within the number of days specified in the rule, the `AbortIncompleteMultipartUpload` lifecycle action does not apply (that is, Amazon S3 will not take any action). Also, this action does not apply to objects, no objects are deleted by this lifecycle action.

The following `put-bucket-lifecycle` CLI command adds the lifecycle configuration for the specified bucket.

```
$ aws s3api put-bucket-lifecycle \
    --bucket bucketname \
    --lifecycle-configuration filename-containing-lifecycle-configuration
```

To test the CLI command, do the following:

1. Set up the AWS CLI. For instructions, see [Set Up the AWS CLI \(p. 611\)](#).
2. Save the following example lifecycle configuration in a file (`lifecycle.json`). The example configuration specifies empty prefix and therefore it applies to all objects in the bucket. You can specify a prefix to restrict the policy to a subset of objects.

```
{
    "Rules": [
        {
            "ID": "Test Rule",
            "Status": "Enabled",
            "Prefix": "",
            "AbortIncompleteMultipartUpload": {
                "DaysAfterInitiation": 7
            }
        }
    ]
}
```

3. Run the following CLI command to set lifecycle configuration on your bucket.

```
aws s3api put-bucket-lifecycle \
--bucket bucketname \
--lifecycle-configuration file://lifecycle.json
```

4. To verify, retrieve the lifecycle configuration using the `get-bucket-lifecycle` CLI command.

```
aws s3api get-bucket-lifecycle \
--bucket bucketname
```

5. To delete the lifecycle configuration use the `delete-bucket-lifecycle` CLI command.

```
aws s3api delete-bucket-lifecycle \
--bucket bucketname
```

## Quick Facts

The following table provides multipart upload core specifications. For more information, see [Multipart Upload Overview \(p. 187\)](#).

Item	Specification
Maximum object size	5 TB

Item	Specification
Maximum number of parts per upload	10,000
Part numbers	1 to 10,000 (inclusive)
Part size	5 MB to 5 GB, last part can be < 5 MB
Maximum number of parts returned for a list parts request	1000
Maximum number of multipart uploads returned in a list multipart uploads request	1000

### API Support for Multipart Upload

You can use an AWS SDK to upload an object in parts. The following AWS SDK libraries support multipart upload:

- [AWS SDK for Java](#)
- [AWS SDK for .NET](#)
- [AWS SDK for PHP](#)

These libraries provide a high-level abstraction that makes uploading multipart objects easy. However, if your application requires, you can use the REST API directly. The following sections in the Amazon Simple Storage Service API Reference describe the REST API for multipart upload.

- [Initiate Multipart Upload](#)
- [Upload Part](#)
- [Upload Part \(Copy\)](#)
- [Complete Multipart Upload](#)
- [Abort Multipart Upload](#)
- [List Parts](#)
- [List Multipart Uploads](#)

### Multipart Upload API and Permissions

An individual must have the necessary permissions to use the multipart upload operations. You can use ACLs, the bucket policy, or the user policy to grant individuals permissions to perform these operations. The following table lists the required permissions for various multipart upload operations when using ACLs, bucket policy, or the user policy.

Action	Required Permissions
Initiate Multipart Upload	You must be allowed to perform the <code>s3:PutObject</code> action on an object to initiate multipart upload.  The bucket owner can allow other principals to perform the <code>s3:PutObject</code> action.
Initiator	Container element that identifies who initiated the multipart upload. If the initiator is an AWS account, this element provides the same information as the Owner element. If the initiator is an IAM User, this element provides the user ARN and display name.

Action	Required Permissions
Upload Part	<p>You must be allowed to perform the <code>s3:PutObject</code> action on an object to upload a part.</p> <p>Only the initiator of a multipart upload can upload parts. The bucket owner must allow the initiator to perform the <code>s3:PutObject</code> action on an object in order for the initiator to upload a part for that object.</p>
Upload Part (Copy)	<p>You must be allowed to perform the <code>s3:PutObject</code> action on an object to upload a part. Because you are uploading a part from an existing object, you must be allowed <code>s3:GetObject</code> on the source object.</p> <p>Only the initiator of a multipart upload can upload parts. The bucket owner must allow the initiator to perform the <code>s3:PutObject</code> action on an object in order for the initiator to upload a part for that object.</p>
Complete Multipart Upload	<p>You must be allowed to perform the <code>s3:PutObject</code> action on an object to complete a multipart upload.</p> <p>Only the initiator of a multipart upload can complete that multipart upload. The bucket owner must allow the initiator to perform the <code>s3:PutObject</code> action on an object in order for the initiator to complete a multipart upload for that object.</p>
Abort Multipart Upload	<p>You must be allowed to perform the <code>s3:AbortMultipartUpload</code> action to abort a multipart upload.</p> <p>By default, the bucket owner and the initiator of the multipart upload are allowed to perform this action. If the initiator is an IAM user, that user's AWS account is also allowed to abort that multipart upload.</p> <p>In addition to these defaults, the bucket owner can allow other principals to perform the <code>s3:AbortMultipartUpload</code> action on an object. The bucket owner can deny any principal the ability to perform the <code>s3:AbortMultipartUpload</code> action.</p>
List Parts	<p>You must be allowed to perform the <code>s3&gt;ListMultipartUploadParts</code> action to list parts in a multipart upload.</p> <p>By default, the bucket owner has permission to list parts for any multipart upload to the bucket. The initiator of the multipart upload has the permission to list parts of the specific multipart upload. If the multipart upload initiator is an IAM user, the AWS account controlling that IAM user also has permission to list parts of that upload.</p> <p>In addition to these defaults, the bucket owner can allow other principals to perform the <code>s3&gt;ListMultipartUploadParts</code> action on an object. The bucket owner can also deny any principal the ability to perform the <code>s3&gt;ListMultipartUploadParts</code> action.</p>
List Multipart Uploads	<p>You must be allowed to perform the <code>s3&gt;ListBucketMultipartUploads</code> action on a bucket to list multipart uploads in progress to that bucket.</p> <p>In addition to the default, the bucket owner can allow other principals to perform the <code>s3&gt;ListBucketMultipartUploads</code> action on the bucket.</p>

For information on the relationship between ACL permissions and permissions in access policies, see [Mapping of ACL Permissions and Access Policy Permissions \(p. 396\)](#). For information on IAM users, go to [Working with Users and Groups](#).

## Using the AWS Java SDK for Multipart Upload (High-Level API)

### Topics

- [Upload a File \(p. 193\)](#)
- [Abort Multipart Uploads \(p. 194\)](#)
- [Track Multipart Upload Progress \(p. 195\)](#)

The AWS SDK for Java exposes a high-level API that simplifies multipart upload (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). You can upload data from a file or a stream. You can also set advanced options, such as the part size you want to use for the multipart upload, or the number of threads you want to use when uploading the parts concurrently. You can also set optional object properties, the storage class, or ACL. You use the `PutObjectRequest` and the `TransferManagerConfiguration` classes to set these advanced options. The `TransferManager` class of the Java API provides the high-level API for you to upload data.

When possible, `TransferManager` attempts to use multiple threads to upload multiple parts of a single upload at once. When dealing with large content sizes and high bandwidth, this can have a significant increase on throughput.

In addition to file upload functionality, the `TransferManager` class provides a method for you to abort multipart upload in progress. You must provide a `Date` value, and then the API aborts all the multipart uploads that were initiated before the specified date.

### Upload a File

The following tasks guide you through using the high-level Java classes to upload a file. The API provides several variations, called *overloads*, of the `upload` method to easily upload your data.

### High-Level API File Uploading Process

1	Create an instance of the <code>TransferManager</code> class.
2	Execute one of the <code>TransferManager.upload</code> overloads depending on whether you are uploading data from a file, or a stream.

The following Java code example demonstrates the preceding tasks.

### Example

The following Java code example uploads a file to an Amazon S3 bucket. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.File;

import com.amazonaws.AmazonClientException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.transfer.TransferManager;
import com.amazonaws.services.s3.transfer.Upload;

public class UploadObjectMultipartUploadUsingHighLevelAPI {

    public static void main(String[] args) throws Exception {
        String existingBucketName = "*** Provide existing bucket name ***";
        String keyName           = "*** Provide object key ***";
        String filePath          = "*** Path to and name of the file to upload ***";

        TransferManager tm = new TransferManager(new ProfileCredentialsProvider());
    }
}
```

```
System.out.println("Hello");
// TransferManager processes all transfers asynchronously,
// so this call will return immediately.
Upload upload = tm.upload(
    existingBucketName, keyName, new File(filePath));
System.out.println("Hello2");

try {
    // Or you can block and wait for the upload to finish
    upload.waitForCompletion();
    System.out.println("Upload complete.");
} catch (AmazonClientException amazonClientException) {
    System.out.println("Unable to upload file, upload was aborted.");
    amazonClientException.printStackTrace();
}
}
```

## Abort Multipart Uploads

The `TransferManager` class provides a method, `abortMultipartUploads`, to abort multipart uploads in progress. An upload is considered to be in progress once you initiate it and until you complete it or abort it. You provide a `Date` value and this API aborts all the multipart uploads, on that bucket, that were initiated before the specified `Date` and are still in progress.

Because you are billed for all storage associated with uploaded parts (see [Multipart Upload and Pricing \(p. 189\)](#)), it is important that you either complete the multipart upload to have the object created or abort the multipart upload to remove any uploaded parts.

The following tasks guide you through using the high-level Java classes to abort multipart uploads.

### High-Level API Multipart Uploads Aborting Process

1	Create an instance of the <code>TransferManager</code> class.
2	Execute the <code>TransferManager.abortMultipartUploads</code> method by passing the bucket name and a <code>Date</code> value.

The following Java code example demonstrates the preceding tasks.

### Example

The following Java code aborts all multipart uploads in progress that were initiated on a specific bucket over a week ago. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.util.Date;

import com.amazonaws.AmazonClientException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.transfer.TransferManager;

public class AbortMPUUsingHighLevelAPI {

    public static void main(String[] args) throws Exception {
        String existingBucketName = "*** Provide existing bucket name ***";

        TransferManager tm = new TransferManager(new ProfileCredentialsProvider());

        int sevenDays = 1000 * 60 * 60 * 24 * 7;
        Date oneWeekAgo = new Date(System.currentTimeMillis() - sevenDays);
```

```
        try {
            tm.abortMultipartUploads(existingBucketName, oneWeekAgo);
        } catch (AmazonClientException amazonClientException) {
            System.out.println("Unable to upload file, upload was aborted.");
            amazonClientException.printStackTrace();
        }
    }
}
```

#### Note

You can also abort a specific multipart upload. For more information, see [Abort a Multipart Upload \(p. 200\)](#).

### Track Multipart Upload Progress

The high-level multipart upload API provides a listen interface, `ProgressListener`, to track the upload progress when uploading data using the `TransferManager` class. To use the event in your code, you must import the `com.amazonaws.services.s3.model.ProgressEvent` and `com.amazonaws.services.s3.model.ProgressListener` types.

Progress events occurs periodically and notify the listener that bytes have been transferred.

The following Java code sample demonstrates how you can subscribe to the `ProgressEvent` event and write a handler.

#### Example

```
TransferManager tm = new TransferManager(new ProfileCredentialsProvider());

PutObjectRequest request = new PutObjectRequest(
    existingBucketName, keyName, new File(filePath));

// Subscribe to the event and provide event handler.
request.setProgressListener(new ProgressListener() {
    public void progressChanged(ProgressEvent event) {
        System.out.println("Transferred bytes: " +
            event.getBytesTransferred());
    }
});
```

#### Example

The following Java code uploads a file and uses the `ProgressListener` to track the upload progress. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.File;

import com.amazonaws.AmazonClientException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.event.ProgressEvent;
import com.amazonaws.event.ProgressListener;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.transfer.TransferManager;
import com.amazonaws.services.s3.transfer.Upload;

public class TrackMPUProgressUsingHighLevelAPI {

    public static void main(String[] args) throws Exception {
        String existingBucketName = "*** Provide bucket name ***";
```

```
String keyName           = "*** Provide object key ***";
String filePath          = "*** file to upload ***;

TransferManager tm = new TransferManager(new ProfileCredentialsProvider());

// For more advanced uploads, you can create a request object
// and supply additional request parameters (ex: progress listeners,
// canned ACLs, etc.)
PutObjectRequest request = new PutObjectRequest(
    existingBucketName, keyName, new File(filePath));

// You can ask the upload for its progress, or you can
// add a ProgressListener to your request to receive notifications
// when bytes are transferred.
request.setGeneralProgressListener(new ProgressListener() {
@Override
public void progressChanged(ProgressEvent progressEvent) {
    System.out.println("Transferred bytes: " +
        progressEvent.getBytesTransferred());
}
});

// TransferManager processes all transfers asynchronously,
// so this call will return immediately.
Upload upload = tm.upload(request);

try {
    // You can block and wait for the upload to finish
    upload.waitForCompletion();
} catch (AmazonClientException amazonClientException) {
    System.out.println("Unable to upload file, upload aborted.");
    amazonClientException.printStackTrace();
}
}
```

## Using the AWS Java SDK for Multipart Upload (Low-Level API)

### Topics

- [Upload a File \(p. 197\)](#)
- [List Multipart Uploads \(p. 199\)](#)
- [Abort a Multipart Upload \(p. 200\)](#)

The AWS SDK for Java exposes a low-level API that closely resembles the Amazon S3 REST API for multipart upload (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). Use the low-level API when you need to pause and resume multipart uploads, vary part sizes during the upload, or do not know the size of the data in advance. Use the high-level API (see [Using the AWS Java SDK for Multipart Upload \(High-Level API\) \(p. 193\)](#)) whenever you don't have these requirements.

### Upload a File

The following tasks guide you through using the low-level Java classes to upload a file.

#### Low-Level API File Uploading Process

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Initiate multipart upload by executing the <code>AmazonS3Client.initiateMultipartUpload</code> method. You will need to provide the required information, i.e., bucket name and key name, to initiate the multipart upload by creating an instance of the <code>InitiateMultipartUploadRequest</code> class.
3	Save the upload ID that the <code>AmazonS3Client.initiateMultipartUpload</code> method returns. You will need to provide this upload ID for each subsequent multipart upload operation.
4	Upload parts. For each part upload, execute the <code>AmazonS3Client.uploadPart</code> method. You need to provide part upload information, such as upload ID, bucket name, and the part number. You provide this information by creating an instance of the <code>UploadPartRequest</code> class.
5	Save the response of the <code>AmazonS3Client.uploadPart</code> method in a list. This response includes the ETag value and the part number you will need to complete the multipart upload.
6	Repeat tasks 4 and 5 for each part.
7	Execute the <code>AmazonS3Client.completeMultipartUpload</code> method to complete the multipart upload.

The following Java code sample demonstrates the preceding tasks.

#### Example

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

// Create a list of UploadPartResponse objects. You get one of these for
// each part upload.
List<PartETag> partETags = new ArrayList<PartETag>();

// Step 1: Initialize.
InitiateMultipartUploadRequest initRequest = new InitiateMultipartUploadRequest(
    existingBucketName, keyName);

InitiateMultipartUploadResult initResponse =
```

```
s3Client.initiateMultipartUpload(initRequest);

File file = new File(filePath);
long contentLength = file.length();
long partSize = 5 * 1024 * 1024; // Set part size to 5 MB.

try {
    // Step 2: Upload parts.
    long filePosition = 0;
    for (int i = 1; filePosition < contentLength; i++) {
        // Last part can be less than 5 MB. Adjust part size.
        partSize = Math.min(partSize, (contentLength - filePosition));

        // Create request to upload a part.
        UploadPartRequest uploadRequest = new UploadPartRequest()
            .withBucketName(existingBucketName).withKey(keyName)
            .withUploadId(initResponse.getUploadId()).withPartNumber(i)
            .withFileOffset(filePosition)
            .withFile(file)
            .withPartSize(partSize);

        // Upload part and add response to our list.
        partETags.add(s3Client.uploadPart(uploadRequest).getPartETag());

        filePosition += partSize;
    }

    // Step 3: Complete.
    CompleteMultipartUploadRequest compRequest = new
        CompleteMultipartUploadRequest(existingBucketName,
            keyName,
            initResponse.getUploadId(),
            partETags);

    s3Client.completeMultipartUpload(compRequest);
} catch (Exception e) {
    s3Client.abortMultipartUpload(new AbortMultipartUploadRequest(
        existingBucketName, keyName, initResponse.getUploadId()));
}
```

## Example

The following Java code example uploads a file to an Amazon S3 bucket. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.File;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.AbortMultipartUploadRequest;
import com.amazonaws.services.s3.model.CompleteMultipartUploadRequest;
import com.amazonaws.services.s3.model.InitiateMultipartUploadRequest;
import com.amazonaws.services.s3.model.InitiateMultipartUploadResult;
import com.amazonaws.services.s3.model.PartETag;
import com.amazonaws.services.s3.model.UploadPartRequest;

public class UploadObjectMPULowLevelAPI {

    public static void main(String[] args) throws IOException {
        String existingBucketName = "*** Provide-Your-Existing-BucketName ***";
```

```
String keyName          = "*** Provide-Key-Name ***";
String filePath         = "*** Provide-File-Path ***";

AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

// Create a list of UploadPartResponse objects. You get one of these
// for each part upload.
List<PartETag> partETags = new ArrayList<PartETag>();

// Step 1: Initialize.
InitiateMultipartUploadRequest initRequest = new
    InitiateMultipartUploadRequest(existingBucketName, keyName);
InitiateMultipartUploadResult initResponse =
    s3Client.initiateMultipartUpload(initRequest);

File file = new File(filePath);
long contentLength = file.length();
long partSize = 5242880; // Set part size to 5 MB.

try {
    // Step 2: Upload parts.
    long filePosition = 0;
    for (int i = 1; filePosition < contentLength; i++) {
        // Last part can be less than 5 MB. Adjust part size.
        partSize = Math.min(partSize, (contentLength - filePosition));

        // Create request to upload a part.
        UploadPartRequest uploadRequest = new UploadPartRequest()
            .withBucketName(existingBucketName).withKey(keyName)
            .withUploadId(initResponse.getUploadId()).withPartNumber(i)
            .withFileOffset(filePosition)
            .withFile(file)
            .withPartSize(partSize);

        // Upload part and add response to our list.
        partETags.add(
            s3Client.uploadPart(uploadRequest).getPartETag());

        filePosition += partSize;
    }

    // Step 3: Complete.
    CompleteMultipartUploadRequest compRequest = new
        CompleteMultipartUploadRequest(
            existingBucketName,
            keyName,
            initResponse.getUploadId(),
            partETags);

    s3Client.completeMultipartUpload(compRequest);
} catch (Exception e) {
    s3Client.abortMultipartUpload(new AbortMultipartUploadRequest(
        existingBucketName, keyName, initResponse.getUploadId()));
}
}
```

## List Multipart Uploads

The following tasks guide you through using the low-level Java classes to list all in-progress multipart uploads on a bucket.

## Low-Level API Multipart Uploads Listing Process

- |   |  |
|---|--|
| 1 | Create an instance of the <code>ListMultipartUploadsRequest</code> class and provide the bucket name.  |
| 2 | Execute the <code>AmazonS3Client.listMultipartUploads</code> method. The method returns an instance of the <code>MultipartUploadListing</code> class that gives you information about the multipart uploads in progress. |

The following Java code sample demonstrates the preceding tasks.

### Example

```
ListMultipartUploadsRequest allMultipartUploadsRequest =
    new ListMultipartUploadsRequest(existingBucketName);
MultipartUploadListing multipartUploadListing =
    s3Client.listMultipartUploads(allMultipartUploadsRequest);
```

## Abort a Multipart Upload

You can abort an in-progress multipart upload by calling the `AmazonS3.abortMultipartUpload` method. This method deletes any parts that were uploaded to Amazon S3 and frees up the resources. You must provide the upload ID, bucket name, and key name. The following Java code sample demonstrates how to abort an in-progress multipart upload.

### Example

```
InitiateMultipartUploadRequest initRequest =
    new InitiateMultipartUploadRequest(existingBucketName, keyName);
InitiateMultipartUploadResult initResponse =
    s3Client.initiateMultipartUpload(initRequest);

AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
s3Client.abortMultipartUpload(new AbortMultipartUploadRequest(
    existingBucketName, keyName, initResponse.getUploadId()));
```

### Note

Instead of a specific multipart upload, you can abort all your multipart uploads initiated before a specific time that are still in progress. This clean-up operation is useful to abort old multipart uploads that you initiated but neither completed nor aborted. For more information, see [Abort Multipart Uploads \(p. 194\)](#).

## Using the AWS .NET SDK for Multipart Upload (High-Level API)

### Topics

- [Upload a File \(p. 201\)](#)
- [Upload a Directory \(p. 203\)](#)
- [Abort Multipart Uploads \(p. 204\)](#)
- [Track Multipart Upload Progress \(p. 205\)](#)

The AWS SDK for .NET exposes a high-level API that simplifies multipart upload (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). You can upload data from a file, directory, or a stream. When uploading data from a file, if you don't provide the object's key name, the API uses the file name for the object's key name. You must provide the object's key name if you are uploading data from a stream. You can optionally set advanced options such as the part size you want to use for the multipart upload, number of threads you want to use when uploading the parts concurrently, optional file metadata, the storage class (STANDARD or REDUCED\_REDUNDANCY), or ACL. The high-level API provides the `TransferUtilityUploadRequest` class to set these advanced options.

The `TransferUtility` class provides a method for you to abort multipart uploads in progress. You must provide a `DateTime` value, and then the API aborts all the multipart uploads that were initiated before the specified date and time.

### Upload a File

The following tasks guide you through using the high-level .NET classes to upload a file. The API provides several variations, *overloads*, of the `Upload` method to easily upload your data.

### High-Level API File Uploading Process

1	Create an instance of the <code>TransferUtility</code> class by providing your AWS credentials.
2	Execute one of the <code>TransferUtility.Upload</code> overloads depending on whether you are uploading data from a file, a stream, or a directory.

The following C# code sample demonstrates the preceding tasks.

### Example

```
TransferUtility utility = new TransferUtility();
utility.Upload(filePath, existingBucketName);
```

When uploading large files using the .NET API, timeout might occur even while data is being written to the request stream. You can set explicit timeout using the `TransferUtilityConfig.DefaultTimeout` as demonstrated in the following C# code sample.

### Example

```
TransferUtilityConfig config = new TransferUtilityConfig();
config.DefaultTimeout = 11111;
TransferUtility utility = new TransferUtility(config);
```

### Example

The following C# code example uploads a file to an Amazon S3 bucket. The example illustrates the use of various `TransferUtility.Upload` overloads to upload a file; each successive call to upload

replaces the previous upload. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#)

```
using System;
using System.IO;
using Amazon.S3;
using Amazon.S3.Transfer;

namespace s3.amazonaws.com.docsamples
{
    class UploadFileMPUHighLevelAPI
    {
        static string existingBucketName = "*** Provide bucket name ***";
        static string keyName          = "*** Provide your object key ***";
        static string filePath         = "*** Provide file name ***";

        static void Main(string[] args)
        {
            try
            {
                TransferUtility fileTransferUtility = new
                    TransferUtility(new AmazonS3Client(Amazon.RegionEndpoint.USEast1));

                // 1. Upload a file, file name is used as the object key name.
                fileTransferUtility.Upload(filePath, existingBucketName);
                Console.WriteLine("Upload 1 completed");

                // 2. Specify object key name explicitly.
                fileTransferUtility.Upload(filePath,
                    existingBucketName, keyName);
                Console.WriteLine("Upload 2 completed");

                // 3. Upload data from a type of System.IO.Stream.
                using (FileStream fileToUpload =
                    new FileStream(filePath, FileMode.Open, FileAccess.Read))
                {
                    fileTransferUtility.Upload(fileToUpload,
                        existingBucketName, keyName);
                }
                Console.WriteLine("Upload 3 completed");

                // 4.Specify advanced settings/options.
                TransferUtilityUploadRequest fileTransferUtilityRequest = new
                    TransferUtilityUploadRequest
                {
                    BucketName = existingBucketName,
                    FilePath = filePath,
                    StorageClass = S3StorageClass.ReducedRedundancy,
                    PartSize = 6291456, // 6 MB.
                    Key = keyName,
                    CannedACL = S3CannedACL.PublicRead
                };
                fileTransferUtilityRequest.Metadata.Add("param1", "Value1");
                fileTransferUtilityRequest.Metadata.Add("param2", "Value2");
                fileTransferUtility.Upload(fileTransferUtilityRequest);
                Console.WriteLine("Upload 4 completed");
            }
            catch (AmazonS3Exception s3Exception)
            {
                Console.WriteLine(s3Exception.Message,
                    s3Exception.InnerException);
            }
        }
    }
}
```

```
}
```

## Upload a Directory

Using the `TransferUtility` class you can also upload an entire directory. By default, Amazon S3 only uploads the files at the root of the specified directory. You can, however, specify to recursively upload files in all the subdirectories.

You can also specify filtering expressions to select files, in the specified directory, based on some filtering criteria. For example, to upload only the .pdf files from a directory you specify a "`*.pdf`" filter expression.

When uploading files from a directory you cannot specify the object's key name. It is constructed from the file's location in the directory as well as its name. For example, assume you have a directory, `c:\myfolder`, with the following structure:

### Example

```
C:\myfolder
  \a.txt
  \b.pdf
  \media\
    An.mp3
```

When you upload this directory, Amazon S3 uses the following key names:

### Example

```
a.txt
b.pdf
media/An.mp3
```

The following tasks guide you through using the high-level .NET classes to upload a directory.

### High-Level API Directory Uploading Process

1	Create an instance of the <code>TransferUtility</code> class by providing your AWS credentials.
2	Execute one of the <code>TransferUtility.UploadDirectory</code> overloads.

The following C# code sample demonstrates the preceding tasks.

### Example

```
TransferUtility utility = new TransferUtility();
utility.UploadDirectory(directoryPath, existingBucketName);
```

### Example

The following C# code example uploads a directory to an Amazon S3 bucket. The example illustrates the use of various `TransferUtility.UploadDirectory` overloads to upload a directory, each successive call to upload replaces the previous upload. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.IO;
```

```
using Amazon.S3;
using Amazon.S3.Transfer;

namespace s3.amazonaws.com.docsamples
{
    class UploadDirectoryMPUHighLevelAPI
    {
        static string existingBucketName = "*** Provide bucket name ***";
        static string directoryPath      = "*** Provide directory name ***";

        static void Main(string[] args)
        {
            try
            {
                TransferUtility directoryTransferUtility =
                    new TransferUtility(new AmazonS3Client(Amazon.RegionEndpoint.USEast1));

                // 1. Upload a directory.
                directoryTransferUtility.UploadDirectory(directoryPath,
                                                existingBucketName);
                Console.WriteLine("Upload statement 1 completed");

                // 2. Upload only the .txt files from a directory.
                // Also, search recursively.
                directoryTransferUtility.UploadDirectory(
                    directoryPath,
                    existingBucketName,
                    "*.txt",
                    SearchOption.AllDirectories);
                Console.WriteLine("Upload statement 2 completed");

                // 3. Same as 2 and some optional configuration
                // Search recursively for .txt files to upload).
                TransferUtilityUploadDirectoryRequest request =
                    new TransferUtilityUploadDirectoryRequest
                    {
                        BucketName = existingBucketName,
                        Directory = directoryPath,
                        SearchOption = SearchOption.AllDirectories,
                        SearchPattern = "*.txt"
                    };

                directoryTransferUtility.UploadDirectory(request);
                Console.WriteLine("Upload statement 3 completed");
            }

            catch (AmazonS3Exception e)
            {
                Console.WriteLine(e.Message, e.InnerException);
            }
        }
    }
}
```

## Abort Multipart Uploads

The `TransferUtility` class provides a method, `AbortMultipartUploads`, to abort multipart uploads in progress. An upload is considered to be in-progress once you initiate it and until you complete it or abort it. You provide a `DateTime` value and this API aborts all the multipart uploads, on that bucket, that were initiated before the specified `DateTime` and in progress.

Because you are billed for all storage associated with uploaded parts (see [Multipart Upload and Pricing \(p. 189\)](#)), it is important that you either complete the multipart upload to have the object created or abort the multipart upload to remove any uploaded parts.

The following tasks guide you through using the high-level .NET classes to abort multipart uploads.

### High-Level API Multipart Uploads Aborting Process

1	Create an instance of the <code>TransferUtility</code> class by providing your AWS credentials.
2	Execute the <code>TransferUtility.AbortMultipartUploads</code> method by passing the bucket name and a <code>DateTime</code> value.

The following C# code sample demonstrates the preceding tasks.

#### Example

```
TransferUtility utility = new TransferUtility();
utility.AbortMultipartUploads(existingBucketName, DateTime.Now.AddDays(-7));
```

#### Example

The following C# code aborts all multipart uploads in progress that were initiated on a specific bucket over a week ago. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Transfer;

namespace s3.amazonaws.com.docsamples
{
    class AbortMPUUsingHighLevelAPI
    {
        static string existingBucketName = "***Provide bucket name***";

        static void Main(string[] args)
        {
            try
            {
                TransferUtility transferUtility =
                    new TransferUtility(new AmazonS3Client(Amazon.RegionEndpoint.USEast1));
                // Aborting uploads that were initiated over a week ago.
                transferUtility.AbortMultipartUploads(
                    existingBucketName, DateTime.Now.AddDays(-7));
            }

            catch (AmazonS3Exception e)
            {
                Console.WriteLine(e.Message, e.InnerException);
            }
        }
    }
}
```

#### Note

You can also abort a specific multipart upload. For more information, see [List Multipart Uploads \(p. 211\)](#).

### Track Multipart Upload Progress

The high-level multipart upload API provides an event, `TransferUtilityUploadRequest.UploadProgressEvent`, to track the upload progress when uploading data using the `TransferUtility` class.

The event occurs periodically and returns multipart upload progress information such as the total number of bytes to transfer, and the number of bytes transferred at the time event occurred.

The following C# code sample demonstrates how you can subscribe to the `UploadProgressEvent` event and write a handler.

### Example

```
TransferUtility fileTransferUtility =
    new TransferUtility(new AmazonS3Client(Amazon.RegionEndpoint.USEast1));

// Use TransferUtilityUploadRequest to configure options.
// In this example we subscribe to an event.
TransferUtilityUploadRequest uploadRequest =
    new TransferUtilityUploadRequest
    {
        BucketName = existingBucketName,
        FilePath = filePath,
        Key = keyName
    };

uploadRequest.UploadProgressEvent +=
    new EventHandler<UploadProgressArgs>
    (uploadRequest_UploadPartProgressEvent);

fileTransferUtility.Upload(uploadRequest);

static void uploadRequest_UploadPartProgressEvent(object sender, UploadProgressArgs e)
{
    // Process event.
    Console.WriteLine("{0}/{1}", e.TransferredBytes, e.TotalBytes);
}
```

### Example

The following C# code example uploads a file to an Amazon S3 bucket and tracks the progress by subscribing to the `TransferUtilityUploadRequest.UploadProgressEvent` event. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Specialized;
using System.Configuration;
using Amazon.S3;
using Amazon.S3.Transfer;

namespace s3.amazon.com.docsamples
{
    class TrackMPUUsingHighLevelAPI
    {
        static string existingBucketName = "*** Provide bucket name ***";
        static string keyName           = "*** Provide key name ***";
        static string filePath          = "*** Provide file to upload ***";

        static void Main(string[] args)
        {
            try
            {
                TransferUtility fileTransferUtility =
                    new TransferUtility(new AmazonS3Client(Amazon.RegionEndpoint.USEast1));

                // Use TransferUtilityUploadRequest to configure options.
                // In this example we subscribe to an event.
            }
        }
    }
}
```

```
TransferUtilityUploadRequest uploadRequest =
    new TransferUtilityUploadRequest
    {
        BucketName = existingBucketName,
        FilePath = filePath,
        Key = keyName
    };

uploadRequest.UploadProgressEvent +=
    new EventHandler<UploadProgressArgs>
    (uploadRequest_UploadPartProgressEvent);

fileTransferUtility.Upload(uploadRequest);
Console.WriteLine("Upload completed");
}

catch (AmazonS3Exception e)
{
    Console.WriteLine(e.Message, e.InnerException);
}
}

static void uploadRequest_UploadPartProgressEvent(
    object sender, UploadProgressArgs e)
{
    // Process event.
    Console.WriteLine("{0}/{1}", e.TransferredBytes, e.TotalBytes);
}
}
```

## Using the AWS .NET SDK for Multipart Upload (Low-Level API)

### Topics

- [Upload a File \(p. 208\)](#)
- [List Multipart Uploads \(p. 211\)](#)
- [Track Multipart Upload Progress \(p. 211\)](#)
- [Abort a Multipart Upload \(p. 212\)](#)

The AWS SDK for .NET exposes a low-level API that closely resembles the Amazon S3 REST API for multipart upload (see [Using the REST API for Multipart Upload \(p. 221\)](#)). Use the low-level API when you need to pause and resume multipart uploads, vary part sizes during the upload, or do not know the size of the data in advance. Use the high-level API (see [Using the AWS .NET SDK for Multipart Upload \(High-Level API\) \(p. 201\)](#)), whenever you don't have these requirements.

### Upload a File

The following tasks guide you through using the low-level .NET classes to upload a file.

#### Low-Level API File Uploading Process

1	Create an instance of the <code>AmazonS3Client</code> class, by providing your AWS credentials.
2	Initiate multipart upload by executing the <code>AmazonS3Client.InitiateMultipartUpload</code> method. You will need to provide information required to initiate the multipart upload by creating an instance of the <code>InitiateMultipartUploadRequest</code> class.
3	Save the Upload ID that the <code>AmazonS3Client.InitiateMultipartUpload</code> method returns. You will need to provide this upload ID for each subsequent multipart upload operation.
4	Upload the parts. For each part upload, execute the <code>AmazonS3Client.UploadPart</code> method. You will need to provide part upload information such as upload ID, bucket name, and the part number. You provide this information by creating an instance of the <code>UploadPartRequest</code> class.
5	Save the response of the <code>AmazonS3Client.UploadPart</code> method in a list. This response includes the ETag value and the part number you will later need to complete the multipart upload.
6	Repeat tasks 4 and 5 for each part.
7	Execute the <code>AmazonS3Client.CompleteMultipartUpload</code> method to complete the multipart upload.

The following C# code sample demonstrates the preceding tasks.

### Example

```
IAmazonS3 s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

// List to store upload part responses.
List<UploadPartResponse> uploadResponses = new List<UploadPartResponse>();

// 1. Initialize.
InitiateMultipartUploadRequest initiateRequest = new InitiateMultipartUploadRequest
```

```
{  
    BucketName = existingBucketName,  
    Key = keyName  
};  
  
InitiateMultipartUploadResponse initResponse =  
    s3Client.InitiateMultipartUpload(initRequest);  
  
// 2. Upload Parts.  
long contentLength = new FileInfo(filePath).Length;  
long partSize = 5242880; // 5 MB  
  
try  
{  
    long filePosition = 0;  
    for (int i = 1; filePosition < contentLength; i++)  
    {  
  
        // Create request to upload a part.  
        UploadPartRequest uploadRequest = new UploadPartRequest  
        {  
            BucketName = existingBucketName,  
            Key = keyName,  
            UploadId = initResponse.UploadId,  
            PartNumber = i,  
            PartSize = partSize,  
            FilePosition = filePosition,  
            FilePath = filePath  
        };  
  
        // Upload part and add response to our list.  
        uploadResponses.Add(s3Client.UploadPart(uploadRequest));  
  
        filePosition += partSize;  
    }  
  
    // Step 3: complete.  
    CompleteMultipartUploadRequest completeRequest = new CompleteMultipartUploadRequest  
    {  
        BucketName = existingBucketName,  
        Key = keyName,  
        UploadId = initResponse.UploadId,  
    };  
  
    CompleteMultipartUploadResponse completeUploadResponse =  
        s3Client.CompleteMultipartUpload(completeRequest);  
}  
catch (Exception exception)  
{  
    Console.WriteLine("Exception occurred: {0}", exception.Message);  
    AbortMultipartUploadRequest abortMPURequest = new AbortMultipartUploadRequest  
    {  
        BucketName = existingBucketName,  
        Key = keyName,  
        UploadId = initResponse.UploadId  
    };  
    s3Client.AbortMultipartUpload(abortMPURequest);  
}
```

### Note

When uploading large objects using the .NET API, timeout might occur even while data is being written to the request stream. You can set explicit timeout using the `UploadPartRequest`.

## Example

The following C# code example uploads a file to an Amazon S3 bucket. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Generic;
using System.IO;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class UploadFileMPULowLevelAPI
    {
        static string existingBucketName = "*** bucket name ***";
        static string keyName           = "*** key name ***";
        static string filePath          = "*** file path ***";

        static void Main(string[] args)
        {
            IAmazonS3 s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

            // List to store upload part responses.
            List<UploadPartResponse> uploadResponses = new List<UploadPartResponse>();

            // 1. Initialize.
            InitiateMultipartUploadRequest initiateRequest = new
InitiateMultipartUploadRequest
            {
                BucketName = existingBucketName,
                Key = keyName
            };

            InitiateMultipartUploadResponse initResponse =
                s3Client.InitiateMultipartUpload(initiateRequest);

            // 2. Upload Parts.
            long contentLength = new FileInfo(filePath).Length;
            long partSize = 5 * (long)Math.Pow(2, 20); // 5 MB

            try
            {
                long filePosition = 0;
                for (int i = 1; filePosition < contentLength; i++)
                {
                    UploadPartRequest uploadRequest = new UploadPartRequest
                    {
                        BucketName = existingBucketName,
                        Key = keyName,
                        UploadId = initResponse.UploadId,
                        PartNumber = i,
                        PartSize = partSize,
                        FilePosition = filePosition,
                        FilePath = filePath
                    };

                    // Upload part and add response to our list.
                    uploadResponses.Add(s3Client.UploadPart(uploadRequest));

                    filePosition += partSize;
                }
            }

            // Step 3: complete.
```

```
        CompleteMultipartUploadRequest completeRequest = new
CompleteMultipartUploadRequest
{
    BucketName = existingBucketName,
    Key = keyName,
    UploadId = initResponse.UploadId,
    //PartETags = new List<PartETag>(uploadResponses)

};

completeRequest.AddPartETags(uploadResponses);

CompleteMultipartUploadResponse completeUploadResponse =
    s3Client.CompleteMultipartUpload(completeRequest);

}
catch (Exception exception)
{
    Console.WriteLine("Exception occurred: {0}", exception.Message);
    AbortMultipartUploadRequest abortMPURequest = new
AbortMultipartUploadRequest
{
    BucketName = existingBucketName,
    Key = keyName,
    UploadId = initResponse.UploadId
};
s3Client.AbortMultipartUpload(abortMPURequest);
}
}
}
```

## List Multipart Uploads

The following tasks guide you through using the low-level .NET classes to list all in-progress multipart uploads on a bucket.

### Low-Level API Multipart Uploads Listing Process

1	Create an instance of the <code>ListMultipartUploadsRequest</code> class and provide the bucket name.
2	Execute the <code>AmazonS3Client.ListMultipartUploads</code> method. The method returns an instance of the <code>ListMultipartUploadsResponse</code> class, providing you the information about the in-progress multipart uploads.

The following C# code sample demonstrates the preceding tasks.

#### Example

```
ListMultipartUploadsRequest request = new ListMultipartUploadsRequest
{
    BucketName = existingBucketName
};
```

## Track Multipart Upload Progress

The low-level multipart upload API provides an event, `UploadPartRequest.StreamTransferProgress`, to track the upload progress.

The event occurs periodically and returns multipart upload progress information such as the total number of bytes to transfer, and the number of bytes transferred at the time event occurred.

The following C# code sample demonstrates how you can subscribe to the `StreamTransferProgress` event and write a handler.

### Example

```
UploadPartRequest uploadRequest = new UploadPartRequest
{
    // provide request data.
};

uploadRequest.StreamTransferProgress += 
    new EventHandler<StreamTransferProgressArgs>(UploadPartProgressEventCallback);

...
public static void UploadPartProgressEventCallback(object sender,
    StreamTransferProgressArgs e)
{
    // Process event.
    Console.WriteLine("{0}/{1}", e.TransferredBytes, e.TotalBytes);
}
```

### Abort a Multipart Upload

You can abort an in-progress multipart upload by calling the `AmazonS3Client.AbortMultipartUpload` method. This method deletes any parts that were uploaded to S3 and free up the resources. You must provide the upload ID, bucket name and the key name. The following C# code sample demonstrates how you can abort a multipart upload in progress.

### Example

```
s3Client.AbortMultipartUpload(new AbortMultipartUploadRequest
{
    BucketName = existingBucketName,
    Key = keyName,
    UploadId = uploadID
});
```

#### Note

Instead of a specific multipart upload, you can abort all your in-progress multipart uploads initiated prior to a specific time. This clean up operation is useful to abort old multipart uploads that you initiated but neither completed or aborted. For more information, see [Abort Multipart Uploads \(p. 204\)](#).

## Using the AWS PHP SDK for Multipart Upload (High-Level API)

Amazon S3 allows you to upload large files in multiple parts. You must use a multipart upload for files larger than 5 GB. The AWS SDK for PHP exposes the high-level [Aws\S3\Model\MultipartUpload\UploadBuilder](#) class that simplifies multipart uploads.

The [Aws\S3\Model\MultipartUpload\UploadBuilder](#) class is best used for a simple multipart upload. If you need to pause and resume multipart uploads, vary part sizes during the upload, or do not know the size of the data in advance, you should use the low-level PHP API. For more information, see [Using the AWS PHP SDK for Multipart Upload \(Low-Level API\) \(p. 216\)](#).

For more information about multipart uploads, see [Uploading Objects Using Multipart Upload API \(p. 187\)](#). For information on uploading files that are less than 5GB in size, see [Upload an Object Using the AWS SDK for PHP \(p. 184\)](#).

### Upload a File Using the High-Level Multipart Upload

This topic guides you through using the high-level [Aws\S3\Model\MultipartUpload\UploadBuilder](#) class from the AWS SDK for PHP for multipart file uploads.

#### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

### High-Level Multipart File Upload Process

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client</a> class <code>factory()</code> method.
2	Create an instance of the <code>UploadBuilder</code> using the Amazon S3 <a href="#">Aws\S3\Model\MultipartUpload\UploadBuilder</a> class <code>newInstance()</code> method, which is inherited from the <a href="#">Aws\Common\Model\MultipartUpload\AbstractUploadBuilder</a> class. For the <code>UploadBuilder</code> object set the client, the bucket name, and the key name using the <code>setClient()</code> , <code>setBucket()</code> , and <code>setKey()</code> methods. Set the path and name of the file you want to upload with the <code>setSource()</code> method.
3	Execute the <code>UploadBuilder</code> object's <code>build()</code> method to build the appropriate uploader transfer object based on the builder options you set. (The transfer object is of a subclass of the <a href="#">Aws\S3\Model\MultipartUpload\AbstractTransfer</a> class.)
4	Execute the <code>upload()</code> method of the built transfer object to perform the upload.

The following PHP code sample demonstrates how to upload a file using the high-level `UploadBuilder` object.

#### Example

```
use Aws\Common\Exception\MultipartUploadException;
use Aws\S3\Model\MultipartUpload\UploadBuilder;
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Prepare the upload parameters.
$uploader = UploadBuilder::newInstance()
```

```
->setClient($s3)
->setSource('/path/to/large/file.mov')
->setBucket($bucket)
->setKey($keyname)
->build();

// Perform the upload. Abort the upload if something goes wrong.
try {
    $uploader->upload();
    echo "Upload complete.\n";
} catch (MultipartUploadException $e) {
    $uploader->abort();
    echo "Upload failed.\n";
    echo $e->getMessage() . "\n";
}
```

### Example of a Multipart Upload of a File to an Amazon S3 Bucket Using the High-level UploadBuilder

The following PHP example uploads a file to an Amazon S3 bucket. The example demonstrates how to set advanced options for the UploadBuilder object. For example, you can use the [setMinPartSize\(\)](#) method to set the part size you want to use for the multipart upload and the [setOption\(\)](#) method to set optional file metadata or an access control list (ACL).

The example also demonstrates how to upload file parts in parallel by setting the concurrency option using the [setConcurrency\(\)](#) method for the UploadBuilder object. The example creates a transfer object that will attempt to upload three parts in parallel until the entire file has been uploaded. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\Common\Exception\MultipartUploadException;
use Aws\S3\Model\MultipartUpload\UploadBuilder;
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Prepare the upload parameters.
uploader = UploadBuilder::newInstance()
    ->setClient($s3)
    ->setSource('/path/to/large/file.mov')
    ->setBucket($bucket)
    ->setKey($keyname)
    ->setMinPartSize(25 * 1024 * 1024)
    ->setOption('Metadata', array(
        'param1' => 'value1',
        'param2' => 'value2'
    ))
    ->setOption('ACL', 'public-read')
    ->setConcurrency(3)
    ->build();

// Perform the upload. Abort the upload if something goes wrong.
try {
    $uploader->upload();
    echo "Upload complete.\n";
```

```
    } catch (MultipartUploadException $e) {
        $uploader->abort();
        echo "Upload failed.\n";
        echo $e->getMessage() . "\n";
    }
```

## Related Resources

- [AWS SDK for PHP Aws\Common\Model\MultipartUpload\AbstractUploadBuilder Class](#)
- [AWS SDK for PHP Aws\Common\Model\MultipartUpload\AbstractUploadBuilder::newInstance\(\) Method](#)
- [AWS SDK for PHP Aws\Common\Model\MultipartUpload\AbstractUploadBuilder::SetSource\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\Model\MultipartUpload\UploadBuilder Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\Model\MultipartUpload\UploadBuilder::build\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\Model\MultipartUpload\UploadBuilder::setMinPartSize\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\Model\MultipartUpload\UploadBuilder::setOption\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\Model\MultipartUpload\UploadBuilder::setConcurrency\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 - Uploading Large Files Using Multipart Uploads](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Using the AWS PHP SDK for Multipart Upload (Low-Level API)

### Topics

- [Upload a File in Multiple Parts Using the PHP SDK Low-Level API \(p. 216\)](#)
- [List Multipart Uploads Using the Low-Level AWS SDK for PHP API \(p. 219\)](#)
- [Abort a Multipart Upload \(p. 219\)](#)

The AWS SDK for PHP exposes a low-level API that closely resembles the Amazon S3 REST API for multipart upload (see [Using the REST API for Multipart Upload \(p. 221\)](#)). Use the low-level API when you need to pause and resume multipart uploads, vary part sizes during the upload, or do not know the size of the data in advance. Use the AWS SDK for PHP high-level abstractions (see [Using the AWS PHP SDK for Multipart Upload \(High-Level API\) \(p. 213\)](#)) whenever you don't have these requirements.

### Upload a File in Multiple Parts Using the PHP SDK Low-Level API

This topic guides you through using low-level multipart upload classes from the AWS SDK for PHP to upload a file in multiple parts.

#### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

### PHP SDK Low-Level API Multipart File Upload Process

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	Initiate multipart upload by executing the <a href="#">Aws\S3\S3Client::createMultipartUpload()</a> method. You must provide a bucket name and a key name in the array parameter's required keys, Bucket and Key.  Retrieve and save the UploadID from the response body. The UploadID is used in each subsequent multipart upload operation.
3	Upload the file in parts by executing the <a href="#">Aws\S3\S3Client::uploadPart()</a> method for each file part until the end of the file is reached. The required array parameter keys for <code>upload_part()</code> are Bucket, Key, UploadID, and PartNumber. You must increment the value passed as the argument for the PartNumber key for each subsequent call to <code>upload_part()</code> to upload each successive file part.  Save the response of each of the <code>upload_part()</code> methods calls in an array. Each response includes the ETag value you will later need to complete the multipart upload.
4	Execute the <a href="#">Aws\S3\S3Client::completeMultipartUpload()</a> method to complete the multipart upload. The required array parameters for <code>completeMultipartUpload()</code> are Bucket, Key, and UploadId.

The following PHP code example demonstrates uploading a file in multiple parts using the PHP SDK low-level API.

#### Example

```
use Aws\S3\S3Client;  
  
$bucket = '*** Your Bucket Name ***';  
$keyname = '*** Your Object Key ***';  
$filename = '*** Path to and Name of the File to Upload ***';
```

```
// 1. Instantiate the client.  
$s3 = S3Client::factory();  
  
// 2. Create a new multipart upload and get the upload ID.  
$response = $s3->createMultipartUpload(array(  
    'Bucket' => $bucket,  
    'Key'     => $keyname  
));  
$uploadId = $response['UploadId'];  
  
// 3. Upload the file in parts.  
$file = fopen($filename, 'r');  
$parts = array();  
$partNumber = 1;  
while (!feof($file)) {  
    $result = $s3->uploadPart(array(  
        'Bucket'      => $bucket,  
        'Key'         => $key,  
        'UploadId'   => $uploadId,  
        'PartNumber'  => $partNumber,  
        'Body'        => fread($file, 5 * 1024 * 1024),  
    ));  
    $parts[] = array(  
        'PartNumber' => $partNumber++,  
        'ETag'        => $result['ETag'],  
    );  
}  
  
// 4. Complete multipart upload.  
$result = $s3->completeMultipartUpload(array(  
    'Bucket'      => $bucket,  
    'Key'         => $key,  
    'UploadId'   => $uploadId,  
    'Parts'       => $parts,  
));  
$url = $result['Location'];  
  
fclose($file);
```

### Example of Uploading a File to an Amazon S3 Bucket Using the Low-level Multipart Upload PHP SDK API

The following PHP code example uploads a file to an Amazon S3 bucket using the low-level PHP API multipart upload. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php  
  
// Include the AWS SDK using the Composer autoloader  
require 'vendor/autoload.php';  
  
use Aws\S3\S3Client;  
  
$bucket = '*** Your Bucket Name ***';  
$keyname = '*** Your Object Key ***';  
$filename = '*** Path to and Name of the File to Upload ***';  
  
// 1. Instantiate the client.  
$s3 = S3Client::factory();  
  
// 2. Create a new multipart upload and get the upload ID.  
$result = $s3->createMultipartUpload(array(  
    'Bucket'      => $bucket,
```

```
'Key'          => $keyname,
'StorageClass' => 'REDUCED_REDUNDANCY',
'ACL'          => 'public-read',
'Metadata'     => array(
    'param1' => 'value 1',
    'param2' => 'value 2',
    'param3' => 'value 3'
)
));
$uploadId = $result['UploadId'];

// 3. Upload the file in parts.
try {
    $file = fopen($filename, 'r');
    $parts = array();
    $partNumber = 1;
    while (!feof($file)) {
        $result = $s3->uploadPart(array(
            'Bucket'      => $bucket,
            'Key'         => $keyname,
            'UploadId'   => $uploadId,
            'PartNumber'  => $partNumber,
            'Body'        => fread($file, 5 * 1024 * 1024),
        )));
        $parts[] = array(
            'PartNumber' => $partNumber++,
            'ETag'        => $result['ETag'],
        );
        echo "Uploading part {$partNumber} of {$filename}.\n";
    }
    fclose($file);
} catch (S3Exception $e) {
    $result = $s3->abortMultipartUpload(array(
        'Bucket'      => $bucket,
        'Key'         => $keyname,
        'UploadId'   => $uploadId
    ));
    echo "Upload of {$filename} failed.\n";
}

// 4. Complete multipart upload.
$result = $s3->completeMultipartUpload(array(
    'Bucket'      => $bucket,
    'Key'         => $keyname,
    'UploadId'   => $uploadId,
    'Parts'       => $parts,
));
$url = $result['Location'];

echo "Uploaded {$filename} to {$url}.\n";
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::createMultipartUpload\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::uploadPart\(\)Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::completeMultipartUpload\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## List Multipart Uploads Using the Low-Level AWS SDK for PHP API

This topic guides you through using the low-level API classes from the AWS SDK for PHP to list all in-progress multipart uploads on a bucket.

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

### PHP SDK Low-Level API Multipart Uploads Listing Process

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	Execute the <a href="#">Aws\S3\S3Client::listMultipartUploads()</a> method by providing a bucket name. The method returns all of the in-progress multipart uploads on the specified bucket.

The following PHP code sample demonstrates listing all in-progress multipart uploads on a bucket.

### Example

```
use Aws\S3\S3Client;

$s3 = S3Client::factory();

$bucket = '*** Your Bucket Name ***';

$result = $s3->listMultipartUploads(array('Bucket' => $bucket));

print_r($result->toArray());
```

### Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::listMultipartUploads\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Abort a Multipart Upload

This topic describes how to use a class from the AWS SDK for PHP to abort a multipart upload that is in progress.

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

### Aborting a Multipart Upload

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	Execute the <a href="#">Aws\S3\S3Client::abortMultipartUpload()</a> method. You must provide a bucket name, a key name, and the upload ID, in the array parameter's required keys, Bucket, Key, and UploadId.

The `abortMultipartUpload()` method deletes any parts that were uploaded to Amazon S3 and frees up the resources.

### Example of Aborting a Multipart Upload

The following PHP code example demonstrates how you can abort a multipart upload in progress. The example illustrates the use of the `abortMultipartUpload()` method. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Abort the multipart upload.
$s3->abortMultipartUpload(array(
    'Bucket'      => $bucket,
    'Key'         => $keyname,
    'UploadId'   => 'VXBsb2FkIElExampleB1bHZpbmcncyBtExamplepZS5tMnRzIHVwbG9hZ',
));
```

### Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::abortMultipartUpload\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Using the AWS SDK for Ruby for Multipart Upload

The AWS SDK for Ruby version 3 supports Amazon S3 multipart uploads in two ways. For the first option, you can use a managed file upload helper. This is the recommended method for uploading files to a bucket and it provides the following benefits:

- Manages multipart uploads for objects larger than 15MB.
- Correctly opens files in binary mode to avoid encoding issues.
- Uses multiple threads for uploading parts of large objects in parallel.

For more information, see [Uploading Files to Amazon S3](#) in the AWS Developer Blog.

Alternatively, you can use the following multipart upload client operations directly:

- `create_multipart_upload` – Initiates a multipart upload and returns an upload ID.
- `upload_part` – Uploads a part in a multipart upload.
- `upload_part_copy` – Uploads a part by copying data from an existing object as data source.
- `complete_multipart_upload` – Completes a multipart upload by assembling previously uploaded parts.

- [abort\\_multipart\\_upload](#) – Aborts a multipart upload.

For more information, see [Using the AWS SDK for Ruby - Version 3 \(p. 617\)](#).

## Using the REST API for Multipart Upload

The following sections in the Amazon Simple Storage Service API Reference describe the REST API for multipart upload.

- [Initiate Multipart Upload](#)
- [Upload Part](#)
- [Complete Multipart Upload](#)
- [Abort Multipart Upload](#)
- [List Parts](#)
- [List Multipart Uploads](#)

You can use these APIs to make your own REST requests, or you can use one of the SDKs we provide. For more information about the SDKs, see [API Support for Multipart Upload \(p. 191\)](#).

## Uploading Objects Using Pre-Signed URLs

### Topics

- [Upload an Object Using a Pre-Signed URL \(AWS SDK for Java\) \(p. 221\)](#)
- [Upload an Object Using a Pre-Signed URL \(AWS SDK for .NET\) \(p. 223\)](#)
- [Upload an Object Using a Pre-Signed URL \(AWS SDK for Ruby\) \(p. 226\)](#)

A pre-signed URL gives you access to the object identified in the URL, provided that the creator of the pre-signed URL has permissions to access that object. That is, if you receive a pre-signed URL to upload an object, you can upload the object only if the creator of the pre-signed URL has the necessary permissions to upload that object.

All objects and buckets by default are private. The pre-signed URLs are useful if you want your user/customer to be able to upload a specific object to your bucket, but you don't require them to have AWS security credentials or permissions. When you create a pre-signed URL, you must provide your security credentials and then specify a bucket name, an object key, an HTTP method (PUT for uploading objects), and an expiration date and time. The pre-signed URLs are valid only for the specified duration.

You can generate a pre-signed URL programmatically using the AWS SDK for Java or the AWS SDK for .NET. If you are using Microsoft Visual Studio, you can also use AWS Explorer to generate a pre-signed object URL without writing any code. Anyone who receives a valid pre-signed URL can then programmatically upload an object.

For more information, go to [Using Amazon S3 from AWS Explorer](#).

For instructions about how to install AWS Explorer, see [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#).

### Note

Anyone with valid security credentials can create a pre-signed URL. However, in order for you to successfully upload an object, the pre-signed URL must be created by someone who has permission to perform the operation that the pre-signed URL is based upon.

## Upload an Object Using a Pre-Signed URL (AWS SDK for Java)

The following tasks guide you through using the Java classes to upload an object using a pre-signed URL.

## Uploading Objects

1	Create an instance of the <code>AmazonS3</code> class.
2	Generate a pre-signed URL by executing the <code>AmazonS3.generatePresignedUrl</code> method.  You provide a bucket name, an object key, and an expiration date by creating an instance of the <code>GeneratePresignedUrlRequest</code> class. You must specify the HTTP verb PUT when creating this URL if you want to use it to upload an object.
3	Anyone with the pre-signed URL can upload an object.  The upload creates an object or replaces any existing object with the same key that is specified in the pre-signed URL.

The following Java code example demonstrates the preceding tasks.

### Example

```
AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

java.util.Date expiration = new java.util.Date();
long msec = expiration.getTime();
msec += 1000 * 60 * 60; // Add 1 hour.
expiration.setTime(msec);

GeneratePresignedUrlRequest generatePresignedUrlRequest = new
    GeneratePresignedUrlRequest(bucketName, objectKey);
generatePresignedUrlRequest.setMethod(HttpMethod.PUT);
generatePresignedUrlRequest.setExpiration(expiration);

URL s = s3client.generatePresignedUrl(generatePresignedUrlRequest);

// Use the pre-signed URL to upload an object.
```

### Example

The following Java code example generates a pre-signed URL. The example code then uses the pre-signed URL to upload sample data as an object. For instructions about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;
import java.io.OutputStreamWriter;
import java.net.HttpURLConnection;
import java.net.URL;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.HttpMethod;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.GeneratePresignedUrlRequest;

public class GeneratePresignedUrlAndUploadObject {
    private static String bucketName = "*** bucket name ***";
    private static String objectKey = "*** object key ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
```

```
try {
    System.out.println("Generating pre-signed URL.");
    java.util.Date expiration = new java.util.Date();
    long milliSeconds = expiration.getTime();
    milliSeconds += 1000 * 60 * 60; // Add 1 hour.
    expiration.setTime(milliSeconds);

    GeneratePresignedUrlRequest generatePresignedUrlRequest =
        new GeneratePresignedUrlRequest(bucketName, objectKey);
    generatePresignedUrlRequest.setMethod(HttpMethod.PUT);
    generatePresignedUrlRequest.setExpiration(expiration);

    URL url = s3client.generatePresignedUrl(generatePresignedUrlRequest);

    UploadObject(url);

    System.out.println("Pre-Signed URL = " + url.toString());
} catch (AmazonServiceException exception) {
    System.out.println("Caught an AmazonServiceException, " +
        "which means your request made it " +
        "to Amazon S3, but was rejected with an error response " +
        "for some reason.");
    System.out.println("Error Message: " + exception.getMessage());
    System.out.println("HTTP Code: " + exception.getStatusCode());
    System.out.println("AWS Error Code: " + exception.getErrorCode());
    System.out.println("Error Type: " + exception.getErrorType());
    System.out.println("Request ID: " + exception.getRequestId());
} catch (AmazonClientException ace) {
    System.out.println("Caught an AmazonClientException, " +
        "which means the client encountered " +
        "an internal error while trying to communicate" +
        " with S3, " +
        "such as not being able to access the network.");
    System.out.println("Error Message: " + ace.getMessage());
}
}

public static void UploadObject(URL url) throws IOException
{
    HttpURLConnection connection=(HttpURLConnection) url.openConnection();
    connection.setDoOutput(true);
    connection.setRequestMethod("PUT");
    OutputStreamWriter out = new OutputStreamWriter(
        connection.getOutputStream());
    out.write("This text uploaded as object.");
    out.close();
    int responseCode = connection.getResponseCode();
    System.out.println("Service returned response code " + responseCode);
}
```

## Upload an Object Using a Pre-Signed URL (AWS SDK for .NET)

The following tasks guide you through using the .NET classes to upload an object using a pre-signed URL.

### Uploading Objects

1

Create an instance of the `AmazonS3` class.

These credentials are used in creating a signature for authentication when you generate a pre-signed URL.

2	Generate a pre-signed URL by executing the <code>AmazonS3.GetPreSignedURL</code> method. You provide a bucket name, an object key, and an expiration date by creating an instance of the <code>GetPreSignedUrlRequest</code> class. You must specify the HTTP verb PUT when creating this URL if you plan to use it to upload an object.
3	Anyone with the pre-signed URL can upload an object. You can create an instance of the <code>HttpWebRequest</code> class by providing the pre-signed URL and uploading the object.

The following C# code example demonstrates the preceding tasks.

### Example

```
IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);
// Generate a pre-signed URL.
GetPreSignedUrlRequest request = new GetPreSignedUrlRequest
{
    BucketName = bucketName,
    Key        = objectKey,
    Verb       = HttpVerb.PUT,
    Expires    = DateTime.Now.AddMinutes(5)
};
string url = null;
url = s3Client.GetPreSignedURL(request);

// Upload a file using the pre-signed URL.
HttpWebRequest httpRequest = WebRequest.Create(url) as HttpWebRequest;
httpRequest.Method = "PUT";
using (Stream dataStream = httpRequest.GetRequestStream())
{
    // Upload object.
}

HttpWebResponse response = httpRequest.GetResponse() as HttpWebResponse;
```

### Example

The following C# code example generates a pre-signed URL for a specific object and uses it to upload a file. For instructions about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.IO;
using System.Net;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazon.com.docsamples
{
    class UploadObjectUsingPresignedURL
    {
        static IAmazonS3 s3Client;
        // File to upload.
        static string filePath    = "*** Specify file to upload ***";
        // Information to generate pre-signed object URL.
        static string bucketName = "*** Provide bucket name ***";
        static string objectKey   = "*** Provide object key for the new object ***";

        public static void Main(string[] args)
```

```
{  
    try  
    {  
        using (s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))  
        {  
            string url = GeneratePreSignedURL();  
            UploadObject(url);  
  
        }  
    }  
    catch (AmazonS3Exception amazonS3Exception)  
    {  
        if (amazonS3Exception.ErrorCode != null &&  
            (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")  
            ||  
            amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))  
        {  
            Console.WriteLine("Check the provided AWS Credentials.");  
            Console.WriteLine(  
                "To sign up for service, go to http://aws.amazon.com/s3");  
        }  
        else  
        {  
            Console.WriteLine(  
                "Error occurred. Message:{0} when listing objects",  
                amazonS3Exception.Message);  
        }  
    }  
    catch (Exception e)  
    {  
        Console.WriteLine(e.Message);  
    }  
    Console.WriteLine("Press any key to continue...");  
    Console.ReadKey();  
}  
  
static void UploadObject(string url)  
{  
    HttpWebRequest httpRequest = WebRequest.Create(url) as HttpWebRequest;  
    httpRequest.Method = "PUT";  
    using (Stream dataStream = httpRequest.GetRequestStream())  
    {  
        byte[] buffer = new byte[8000];  
        using (FileStream fileStream = new FileStream(filePath, FileMode.Open,  
FileAccess.Read))  
        {  
            int bytesRead = 0;  
            while ((bytesRead = fileStream.Read(buffer, 0, buffer.Length)) > 0)  
            {  
                dataStream.Write(buffer, 0, bytesRead);  
            }  
        }  
    }  
    HttpWebResponse response = httpRequest.GetResponse() as HttpWebResponse;  
}  
  
static string GeneratePreSignedURL()  
{  
    GetPreSignedUrlRequest request = new GetPreSignedUrlRequest  
    {  
        BucketName = bucketName,  
        Key = objectKey,  
        Verb = HttpVerb.PUT,  
        Expires = DateTime.Now.AddMinutes(5)  
    }
```

```
        };

        string url = null;
        url = s3Client.GetPreSignedURL(request);
        return url;
    }
}
```

## Upload an Object Using a Pre-Signed URL (AWS SDK for Ruby)

The following tasks guide you through using a Ruby script to upload an object using a pre-signed URL for SDK for Ruby - Version 3.

### Uploading Objects - SDK for Ruby - Version 3

1	Create an instance of the <code>Aws::S3::Resource</code> class.
2	Provide a bucket name and an object key by calling the <code>#bucket[ ]</code> and the <code>#object[ ]</code> methods of your <code>Aws::S3::Resource</code> class instance.  Generate a pre-signed URL by creating an instance of the <code>URI</code> class, and use it to parse the <code>.presigned_url</code> method of your <code>Aws::S3::Resource</code> class instance. You must specify <code>:put</code> as an argument to <code>.presigned_url</code> , and you must specify <code>PUT</code> to <code>Net::HTTP::Session#send_request</code> if you want to upload an object.
3	Anyone with the pre-signed URL can upload an object.  The upload creates an object or replaces any existing object with the same key that is specified in the pre-signed URL.

The following Ruby code example demonstrates the preceding tasks for SDK for Ruby - Version 3.

### Example

```
#Uploading an object using a pre-signed URL for SDK for Ruby - Version 3.

require 'aws-sdk-s3'
require 'net/http'

s3 = Aws::S3::Resource.new(region:'us-west-2')

obj = s3.bucket('BucketName').object('KeyName')
# Replace BucketName with the name of your bucket.
# Replace KeyName with the name of the object you are creating or replacing.

url = URI.parse(obj.presigned_url(:put))

body = "Hello World!"
# This is the contents of your object. In this case, it's a simple string.

Net::HTTP.start(url.host) do |http|
  http.send_request("PUT", url.request_uri, body, {
    # This is required, or Net::HTTP will add a default unsigned content-type.
    "content-type" => "",
  })
end

puts obj.get.body.read
# This will print out the contents of your object to the terminal window.
```

# Copying Objects

## Topics

- [Related Resources \(p. 228\)](#)
- [Copying Objects in a Single Operation \(p. 228\)](#)
- [Copying Objects Using the Multipart Upload API \(p. 235\)](#)

The copy operation creates a copy of an object that is already stored in Amazon S3. You can create a copy of your object up to 5 GB in a single atomic operation. However, for copying an object that is greater than 5 GB, you must use the multipart upload API. Using the copy operation, you can:

- Create additional copies of objects
- Rename objects by copying them and deleting the original ones
- Move objects across Amazon S3 locations (e.g., us-west-1 and EU)
- Change object metadata

Each Amazon S3 object has metadata. It is a set of name-value pairs. You can set object metadata at the time you upload it. After you upload the object, you cannot modify object metadata. The only way to modify object metadata is to make copy of the object and set the metadata. In the copy operation you set the same object as the source and target.

Each object has metadata. Some of it is system metadata and other user-defined. Users control some of the system metadata such as storage class configuration to use for the object, and configure server-side encryption. When you copy an object, user-controlled system metadata and user-defined metadata are also copied. Amazon S3 resets the system controlled metadata. For example, when you copy an object, Amazon S3 resets creation date of copied object. You don't need to set any of these values in your copy request.

When copying an object, you might decide to update some of the metadata values. For example, if your source object is configured to use standard storage, you might choose to use reduced redundancy storage for the object copy. You might also decide to alter some of the user-defined metadata values present on the source object. Note that if you choose to update any of the object's user configurable metadata (system or user-defined) during the copy, then you must explicitly specify all the user configurable metadata, even if you are only changing only one of the metadata values, present on the source object in your request.

For more information about the object metadata, see [Object Key and Metadata \(p. 107\)](#).

### Note

Copying objects across locations incurs bandwidth charges.

### Note

If the source object is archived in Amazon Glacier (the storage class of the object is `GLACIER`), you must first restore a temporary copy before you can copy the object to another bucket. For information about archiving objects, see [Transitioning to the GLACIER Storage Class \(Object Archival\) \(p. 127\)](#).

When copying objects you can request Amazon S3 to save the target object encrypted using an AWS Key Management Service (KMS) encryption key, an Amazon S3-managed encryption key, or a customer-provided encryption key. Accordingly you must specify encryption information in your request. If the copy source is an object that stored in Amazon S3 using server-side encryption with customer provided key, you will need to provide encryption information in your request so Amazon S3 can decrypt the object for copying. For more information, see [Protecting Data Using Encryption \(p. 409\)](#).

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Copying Objects in a Single Operation

### Topics

- [Copy an Object Using the AWS SDK for Java \(p. 228\)](#)
- [Copy an Object Using the AWS SDK for .NET \(p. 229\)](#)
- [Copy an Object Using the AWS SDK for PHP \(p. 230\)](#)
- [Copy an Object Using the AWS SDK for Ruby \(p. 233\)](#)
- [Copy an Object Using the REST API \(p. 234\)](#)

The examples in this section show how to copy objects up to 5 GB in a single operation. For copying objects greater than 5 GB, you must use multipart upload API. For more information, see [Copying Objects Using the Multipart Upload API \(p. 235\)](#).

### Copy an Object Using the AWS SDK for Java

The following tasks guide you through using the Java classes to copy an object in Amazon S3.

#### Copying Objects

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Execute one of the <code>AmazonS3Client.copyObject</code> methods. You need to provide the request information, such as source bucket name, source key name, destination bucket name, and destination key. You provide this information by creating an instance of the <code>CopyObjectRequest</code> class or optionally providing this information directly with the <code>AmazonS3Client.copyObject</code> method.

The following Java code example demonstrates the preceding tasks.

#### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
s3client.copyObject(sourceBucketName, sourceKey,
                     destinationBucketName, destinationKey);
```

#### Example

The following Java code example makes a copy of an object. The copied object with a different key is saved in the same source bucket. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.CopyObjectRequest;
```

```

public class CopyObjectSingleOperation {
    private static String bucketName      = "**** Provide bucket name ***";
    private static String key             = "**** Provide key *** ";
    private static String destinationKey = "**** Provide dest. key ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            // Copying object
            CopyObjectRequest copyObjRequest = new CopyObjectRequest(
                bucketName, key, bucketName, destinationKey);
            System.out.println("Copying object.");
            s3client.copyObject(copyObjRequest);

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, " +
                "which means your request made it " +
                "to Amazon S3, but was rejected with an error " +
                "response for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException, " +
                "which means the client encountered " +
                "an internal error while trying to " +
                "communicate with S3, " +
                "such as not being able to access the network.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}

```

## Copy an Object Using the AWS SDK for .NET

The following tasks guide you through using the high-level .NET classes to upload a file. The API provides several variations, *overloads*, of the `Upload` method to easily upload your data.

### Copying Objects

1	Create an instance of the <code>AmazonS3</code> class.
2	Execute one of the <code>AmazonS3.CopyObject</code> . You need to provide information such as source bucket, source key name, target bucket, and target key name. You provide this information by creating an instance of the <code>CopyObjectRequest</code> class.

The following C# code example demonstrates the preceding tasks.

### Example

```

static IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

CopyObjectRequest request = new CopyObjectRequest()
{
    SourceBucket      = bucketName,
    SourceKey         = objectKey,
    DestinationBucket = bucketName,
    DestinationKey   = destObjectKey
};

```

```
CopyObjectResponse response = client.CopyObject(request);
```

### Example

The following C# code example makes a copy of an object. You will need to update code and provide your bucket names, and object keys. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class CopyObject
    {
        static string sourceBucket      = "**** Bucket on which to enable logging ***";
        static string destinationBucket = "**** Bucket where you want logs stored ***";
        static string objectKey         = "**** Provide key name ***";
        static string destObjectKey     = "**** Provide destination key name ***";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                Console.WriteLine("Copying an object");
                CopyingObject();
            }
            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static void CopyingObject()
        {
            try
            {
                CopyObjectRequest request = new CopyObjectRequest
                {
                    SourceBucket      = sourceBucket,
                    SourceKey         = objectKey,
                    DestinationBucket = destinationBucket,
                    DestinationKey   = destObjectKey
                };
                CopyObjectResponse response = client.CopyObject(request);
            }
            catch (AmazonS3Exception s3Exception)
            {
                Console.WriteLine(s3Exception.Message,
                                  s3Exception.InnerException);
            }
        }
    }
}
```

### Copy an Object Using the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to copy a single object and multiple objects within Amazon S3, from one bucket to another or within the same bucket.

#### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

The following tasks guide you through using PHP SDK classes to copy an object that is already stored in Amazon S3.

### Copying an Object

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	To copy an object, execute the <a href="#">Aws\S3\S3Client::copyObject()</a> method. You need to provide information such as source bucket, source key name, target bucket, and target key name.

The following PHP code example demonstrates using the `copyObject()` method to copy an object that is already stored in Amazon S3.

### Example

```
use Aws\S3\S3Client;

$sourceBucket = '*** Your Source Bucket Name ***';
$sourceKeyname = '*** Your Source Object Key ***';
$targetBucket = '*** Your Target Bucket Name ***';
$targetKeyname = '*** Your Target Key Name ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Copy an object.
$s3->copyObject(array(
    'Bucket'      => $targetBucket,
    'Key'         => $targetKeyname,
    'CopySource'  => "{$sourceBucket}/{$sourceKeyname}",
));

```

The following tasks guide you through using PHP classes to make multiple copies of an object within Amazon S3.

### Copying Objects

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client class factory()</a> method.
2	To make multiple copies of an object, you execute a batch of calls to the Amazon S3 client <a href="#">getCommand()</a> method, which is inherited from the <a href="#">Guzzle\Service\Client</a> class. You provide the <code>CopyObject</code> command as the first argument and an array containing the source bucket, source key name, target bucket, and target key name as the second argument.

The following PHP code example demonstrates making multiple copies of an object that is stored in Amazon S3.

### Example

```
use Aws\S3\S3Client;

$sourceBucket = '*** Your Source Bucket Name ***';
$sourceKeyname = '*** Your Source Object Key ***';
$targetBucket = '*** Your Target Bucket Name ***';

```

```

$targetKeyname = '*** Your Target Key Name ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Perform a batch of CopyObject operations.
$batch = array();
for ($i = 1; $i <= 3; $i++) {
    $batch[] = $s3->getCommand('CopyObject', array(
        'Bucket'      => $targetBucket,
        'Key'         => "{$targetKeyname}-{$i}",
        'CopySource'  => "{$sourceBucket}/{$sourceKeyname}",
    ));
}
try {
    $successful = $s3->execute($batch);
    $failed = array();
} catch (\Guzzle\Service\Exception\CommandTransferException $e) {
    $successful = $e->getSuccessfulCommands();
    $failed = $e->getFailedCommands();
}

```

### Example of Copying Objects within Amazon S3

The following PHP example illustrates the use of the `copyObject()` method to copy a single object within Amazon S3 and using a batch of calls to `CopyObject` using the `getcommand()` method to make multiple copies of an object.

```

<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;

$sourceBucket = '*** Your Source Bucket Name ***';
$sourceKeyname = '*** Your Source Object Key ***';
$targetBucket = '*** Your Target Bucket Name ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Copy an object.
$s3->copyObject(array(
    'Bucket'      => $targetBucket,
    'Key'         => "{$sourceKeyname}-copy",
    'CopySource'  => "{$sourceBucket}/{$sourceKeyname}",
));

// Perform a batch of CopyObject operations.
$batch = array();
for ($i = 1; $i <= 3; $i++) {
    $batch[] = $s3->getCommand('CopyObject', array(
        'Bucket'      => $targetBucket,
        'Key'         => "{$sourceKeyname}-copy-{$i}",
        'CopySource'  => "{$sourceBucket}/{$sourceKeyname}",
    ));
}
try {
    $successful = $s3->execute($batch);
    $failed = array();
} catch (\Guzzle\Service\Exception\CommandTransferException $e) {
    $successful = $e->getSuccessfulCommands();
    $failed = $e->getFailedCommands();
}

```

```
}
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::copyObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Guzzle\Service\Client Class](#)
- [AWS SDK for PHP for Amazon S3 Guzzle\Service\Client::getCommand\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Copy an Object Using the AWS SDK for Ruby

The following tasks guide you through using the Ruby classes to copy an object in Amazon S3, from one bucket to another or to copy an object within the same bucket.

### Copying Objects

1	Use the Amazon S3 modularized gem for version 3 of the AWS SDK for Ruby, require 'aws-sdk-s3', and provide your AWS credentials. For more information about how to provide your credentials, see <a href="#">Making Requests Using AWS Account or IAM User Credentials (p. 19)</a> .
2	Provide the request information, such as source bucket name, source key name, destination bucket name, and destination key.

The following Ruby code example demonstrates the preceding tasks using the `#copy_to` method to copy an object from one bucket to another.

### Example

```
require 'aws-sdk-s3'

source_bucket_name = '*** Provide bucket name ***'
target_bucket_name = '*** Provide bucket name ***'
source_key = '*** Provide source key ***'
target_key = '*** Provide target key ***'

s3 = Aws::S3::Client.new(region: 'us-west-2')
s3.copy_object({bucket: source_bucket_name, copy_source: target_bucket_name + '/' + source_key, key: target_key})

puts "Copying file #{source_key} to #{target_key}."
```

### Example

The following Ruby script example makes a copy of an object using the `#copy_from` method. The copied object with a different key is saved in the same source bucket. For instructions about how to create and test a working sample, see [Using the AWS SDK for Ruby - Version 3 \(p. 617\)](#).

```
require 'aws-sdk-s3'

bucket_name = '*** Provide bucket name ***'
source_key = '*** Provide source key ***'
target_key = '*** Provide target key ***'
```

```
s3 = Aws::S3::Client.new(region: 'us-west-2')
s3.copy_object({bucket: bucket_name, copy_source: bucket_name + '/' + source_key, key: target_key})

puts "Copying file #{source_key} to #{target_key}."
```

## Copy an Object Using the REST API

This example describes how to copy an object using REST. For more information about the REST API, go to [PUT Object \(Copy\)](#).

This example copies the `flotsam` object from the `pacific` bucket to the `jetsam` object of the `atlantic` bucket, preserving its metadata.

```
PUT /jetsam HTTP/1.1
Host: atlantic.s3.amazonaws.com
x-amz-copy-source: /pacific/flotsam
Authorization: AWS AKIAIOSFODNN7EXAMPLE:ENoSbxYByFA0UGLZUqJN5EUnLDg=
Date: Wed, 20 Feb 2008 22:12:21 +0000
```

The signature was generated from the following information.

```
PUT\r\n
\r\n
\r\n
Wed, 20 Feb 2008 22:12:21 +0000\r\n

x-amz-copy-source:/pacific/flotsam\r\n
/atlantic/jetsam
```

Amazon S3 returns the following response that specifies the ETag of the object and when it was last modified.

```
HTTP/1.1 200 OK
x-amz-id-2: Vyaxt7qEbzv34BnSu5hctyyNSlHTYZFMWK4FtzO+iX8JQNyadTshL0KxatbaOzt
x-amz-request-id: 6B13C3C5B34AF333
Date: Wed, 20 Feb 2008 22:13:01 +0000

Content-Type: application/xml
Transfer-Encoding: chunked
Connection: close
Server: AmazonS3
<?xml version="1.0" encoding="UTF-8"?>

<CopyObjectResult>
    <LastModified>2008-02-20T22:13:01</LastModified>
    <ETag>"7e9c608af58950deeb370c98608ed097"</ETag>
</CopyObjectResult>
```

## Copying Objects Using the Multipart Upload API

### Topics

- [Copy an Object Using the AWS SDK for Java Multipart Upload API \(p. 235\)](#)
- [Copy an Object Using the AWS SDK for .NET Multipart Upload API \(p. 238\)](#)
- [Copy Object Using the REST Multipart Upload API \(p. 241\)](#)

The examples in this section show you how to copy objects greater than 5 GB using the multipart upload API. You can copy objects less than 5 GB in a single operation. For more information, see [Copying Objects in a Single Operation \(p. 228\)](#).

### Copy an Object Using the AWS SDK for Java Multipart Upload API

The following task guides you through using the Java SDK to copy an Amazon S3 object from one source location to another, such as from one bucket to another. You can use the code demonstrated here to copy objects greater than 5 GB. For objects less than 5 GB, use the single operation copy described in [Copy an Object Using the AWS SDK for Java \(p. 228\)](#).

### Copying Objects

1	Create an instance of the <code>AmazonS3Client</code> class by providing your AWS credentials.
2	Initiate a multipart copy by executing the <code>AmazonS3Client.initiateMultipartUpload</code> method. Create an instance of <code>InitiateMultipartUploadRequest</code> . You will need to provide a bucket name and a key name.
3	Save the upload ID from the response object that the <code>AmazonS3Client.initiateMultipartUpload</code> method returns. You will need to provide this upload ID for each subsequent multipart upload operation.
4	Copy all the parts. For each part copy, create a new instance of the <code>CopyPartRequest</code> class and provide part information including source bucket, destination bucket, object key, uploadID, first byte of the part, last byte of the part, and the part number.
5	Save the response of the <code>CopyPartRequest</code> method in a list. The response includes the ETag value and the part number. You will need the part number to complete the multipart upload.
6	Repeat tasks 4 and 5 for each part.
7	Execute the <code>AmazonS3Client.completeMultipartUpload</code> method to complete the copy.

The following Java code sample demonstrates the preceding tasks.

### Example

```
// Step 1: Create instance and provide credentials.  
AmazonS3Client s3Client = new AmazonS3Client(new  
    PropertiesCredentials(  
        LowLevel_LargeObjectCopy.class.getResourceAsStream(  
            "AwsCredentials.properties")));  
  
// Create lists to hold copy responses  
List<CopyPartResult> copyResponses =
```

```

        new ArrayList<CopyPartResult>();

// Step 2: Initialize
InitiateMultipartUploadRequest initiateRequest =
    new InitiateMultipartUploadRequest(targetBucketName, targetObjectKey);

InitiateMultipartUploadResult initResult =
    s3Client.initiateMultipartUpload(initiateRequest);

// Step 3: Save upload Id.
String uploadId = initResult.getUploadId();

try {

    // Get object size.
    GetObjectMetadataRequest metadataRequest =
        new GetObjectMetadataRequest(sourceBucketName, sourceObjectKey);

    ObjectMetadata metadataResult = s3Client.getObjectMetadata(metadataRequest);
    long objectSize = metadataResult.getContentLength(); // in bytes

    // Step 4. Copy parts.
    long partSize = 5 * (long) Math.pow(2.0, 20.0); // 5 MB
    long bytePosition = 0;
    for (int i = 1; bytePosition < objectSize; i++) {
        // Step 5. Save copy response.
        CopyPartRequest copyRequest = new CopyPartRequest()
            .withDestinationBucketName(targetBucketName)
            .withDestinationKey(targetObjectKey)
            .withSourceBucketName(sourceBucketName)
            .withSourceKey(sourceObjectKey)
            .withUploadId(initResult.getUploadId())
            .withFirstByte(bytePosition)
            .withLastByte(bytePosition + partSize - 1 >= objectSize ? objectSize - 1 :
bytePosition + partSize - 1)
            .withPartNumber(i);

        copyResponses.add(s3Client.copyPart(copyRequest));
        bytePosition += partSize;
    }
    // Step 7. Complete copy operation.
    CompleteMultipartUploadResult completeUploadResponse =
        s3Client.completeMultipartUpload(completeRequest);
} catch (Exception e) {
    System.out.println(e.getMessage());
}
}

```

### Example

The following Java code example copies an object from one Amazon S3 bucket to another. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```

import java.io.IOException;
import java.util.ArrayList;
import java.util.List;

import com.amazonaws.auth.PropertiesCredentials;
import com.amazonaws.services.s3.*;
import com.amazonaws.services.s3.model.*;

public class LowLevel_LargeObjectCopy {

    public static void main(String[] args) throws IOException {

```

```

String sourceBucketName = "*** Source-Bucket-Name ***";
String targetBucketName = "*** Target-Bucket-Name ***";
String sourceObjectKey = "*** Source-Object-Key ***";
String targetObjectKey = "*** Target-Object-Key ***";
AmazonS3Client s3Client = new AmazonS3Client(new
    PropertiesCredentials(
        LowLevel_LargeObjectCopy.class.getResourceAsStream(
            "AwsCredentials.properties")));

// List to store copy part responses.

List<CopyPartResult> copyResponses =
    new ArrayList<CopyPartResult>();

InitiateMultipartUploadRequest initiateRequest =
    new InitiateMultipartUploadRequest(targetBucketName, targetObjectKey);

InitiateMultipartUploadResult initResult =
    s3Client.initiateMultipartUpload(initiateRequest);

try {
    // Get object size.
    GetObjectMetadataRequest metadataRequest =
        new GetObjectMetadataRequest(sourceBucketName, sourceObjectKey);

    ObjectMetadata metadataResult = s3Client.getObjectMetadata(metadataRequest);
    long objectSize = metadataResult.getContentLength(); // in bytes

    // Copy parts.
    long partSize = 5 * (long) Math.pow(2.0, 20.0); // 5 MB

    long bytePosition = 0;
    for (int i = 1; bytePosition < objectSize; i++)
    {
        CopyPartRequest copyRequest = new CopyPartRequest()
            .withDestinationBucketName(targetBucketName)
            .withDestinationKey(targetObjectKey)
            .withSourceBucketName(sourceBucketName)
            .withSourceKey(sourceObjectKey)
            .withUploadId(initResult.getUploadId())
            .withFirstByte(bytePosition)
            .withLastByte(bytePosition + partSize - 1 >= objectSize ? objectSize -
1 : bytePosition + partSize - 1)
            .withPartNumber(i);

        copyResponses.add(s3Client.copyPart(copyRequest));
        bytePosition += partSize;
    }
    CompleteMultipartUploadRequest completeRequest = new
        CompleteMultipartUploadRequest(
            targetBucketName,
            targetObjectKey,
            initResult.getUploadId(),
            GetETags(copyResponses));

    CompleteMultipartUploadResult completeUploadResponse =
        s3Client.completeMultipartUpload(completeRequest);
} catch (Exception e) {
    System.out.println(e.getMessage());
}
}

// Helper function that constructs ETags.
static List<PartETag> GetETags(List<CopyPartResult> responses)
{

```

```

List<PartETag> etags = new ArrayList<PartETag>();
for (CopyPartResult response : responses)
{
    etags.add(new PartETag(response.getPartNumber(), response.getETag()));
}
return etags;
}
}

```

## Copy an Object Using the AWS SDK for .NET Multipart Upload API

The following task guides you through using the .NET SDK to copy an Amazon S3 object from one source location to another, such as from one bucket to another. You can use the code demonstrated here to copy objects that are greater than 5 GB. For objects less than 5 GB, use the single operation copy described in [Copy an Object Using the AWS SDK for .NET \(p. 229\)](#).

### Copying Objects

1	Create an instance of the <code>AmazonS3Client</code> class by providing your AWS credentials.
2	Initiate a multipart copy by executing the <code>AmazonS3Client.InitiateMultipartUpload</code> method. Create an instance of the <code>InitiateMultipartUploadRequest</code> . You will need to provide a bucket name and key name.
3	Save the upload ID from the response object that the <code>AmazonS3Client.InitiateMultipartUpload</code> method returns. You will need to provide this upload ID for each subsequent multipart upload operation.
4	Copy all the parts. For each part copy, create a new instance of the <code>CopyPartRequest</code> class and provide part information including source bucket, destination bucket, object key, uploadID, first byte of the part, last byte of the part, and the part number.
5	Save the response of the <code>CopyPartRequest</code> method in a list. The response includes the ETag value and the part number you will need to complete the multipart upload.
6	Repeat tasks 4 and 5 for each part.
7	Execute the <code>AmazonS3Client.CompleteMultipartUpload</code> method to complete the copy.

The following C# code sample demonstrates the preceding tasks.

### Example

```

// Step 1. Create instance and provide credentials.
IAmazonS3 s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

// List to store upload part responses.
List<UploadPartResponse> uploadResponses = new List<UploadPartResponse>();
List<CopyPartResponse> copyResponses = new List<CopyPartResponse>();
InitiateMultipartUploadRequest initiateRequest =
    new InitiateMultipartUploadRequest
    {
        BucketName = targetBucket,
        Key = targetObjectKey
    };

// Step 2. Initialize.

```

```

InitiateMultipartUploadResponse initResponse =
    s3Client.InitiateMultipartUpload(initiateRequest);

// Step 3. Save Upload Id.
String uploadId = initResponse.UploadId;

try
{
    // Get object size.
    GetObjectMetadataRequest metadataRequest = new GetObjectMetadataRequest
    {
        BucketName = sourceBucket,
        Key        = sourceObjectKey
    };

    GetObjectMetadataResponse metadataResponse =
        s3Client.GetObjectMetadata(metadataRequest);
    long objectSize = metadataResponse.ContentLength; // in bytes

    // Copy parts.
    long partSize = 5 * (long)Math.Pow(2, 20); // 5 MB

    long bytePosition = 0;
    for (int i = 1; bytePosition < objectSize; i++)
    {

        CopyPartRequest copyRequest = new CopyPartRequest
        {
            DestinationBucket = targetBucket,
            DestinationKey = targetObjectKey,
            SourceBucket = sourceBucket,
            SourceKey = sourceObjectKey,
            UploadId = uploadId,
            FirstByte = bytePosition,
            LastByte = bytePosition + partSize - 1 >= objectSize ? objectSize - 1 :
bytePosition + partSize - 1,
            PartNumber = i
        };

        copyResponses.Add(s3Client.CopyPart(copyRequest));

        bytePosition += partSize;
    }

    CompleteMultipartUploadRequest completeRequest =
    new CompleteMultipartUploadRequest
    {
        BucketName = targetBucket,
        Key = targetObjectKey,
        UploadId = initResponse.UploadId
    };

    completeRequest.AddPartETags(copyResponses);
    CompleteMultipartUploadResponse completeUploadResponse =
    s3Client.CompleteMultipartUpload(completeRequest);

}
catch (Exception e) {
    Console.WriteLine(e.Message);
}

```

### Example

The following C# code example copies an object from one Amazon S3 bucket to another. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Generic;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class CopyObjectUsingMPUapi
    {

        static string sourceBucket      = "**** Source bucket name ****";
        static string targetBucket     = "**** Target bucket name ****";
        static string sourceObjectKey  = "**** Source object key ****";
        static string targetObjectKey = "**** Target object key ****";

        static void Main(string[] args)
        {
            IAmazonS3 s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

            // List to store upload part responses.
            List<UploadPartResponse> uploadResponses = new List<UploadPartResponse>();

            List<CopyPartResponse> copyResponses = new List<CopyPartResponse>();
            InitiateMultipartUploadRequest initiateRequest =
                new InitiateMultipartUploadRequest
                {
                    BucketName = targetBucket,
                    Key = targetObjectKey
                };

            InitiateMultipartUploadResponse initResponse =
                s3Client.InitiateMultipartUpload(initiateRequest);
            String uploadId = initResponse.UploadId;

            try
            {
                // Get object size.
                GetObjectMetadataRequest metadataRequest = new GetObjectMetadataRequest
                {
                    BucketName = sourceBucket,
                    Key        = sourceObjectKey
                };

                GetObjectMetadataResponse metadataResponse =
                    s3Client.GetObjectMetadata(metadataRequest);
                long objectSize = metadataResponse.ContentLength; // in bytes

                // Copy parts.
                long partSize = 5 * (long) Math.Pow(2, 20); // 5 MB

                long bytePosition = 0;
                for (int i = 1; bytePosition < objectSize; i++)
                {

                    CopyPartRequest copyRequest = new CopyPartRequest
                    {
                        DestinationBucket = targetBucket,
                        DestinationKey = targetObjectKey,
                        SourceBucket = sourceBucket,
                        SourceKey = sourceObjectKey,
                        UploadId = uploadId,
                        FirstByte = bytePosition,
                        LastByte = bytePosition + partSize - 1 >= objectSize ?
                        objectSize - 1 : bytePosition + partSize - 1,
                        PartNumber = i
                    };

```

```
        };

        copyResponses.Add(s3Client.CopyPart(copyRequest));

        bytePosition += partSize;
    }
    CompleteMultipartUploadRequest completeRequest =
        new CompleteMultipartUploadRequest
    {
        BucketName = targetBucket,
        Key = targetObjectKey,
        UploadId = initResponse.UploadId
    };

    completeRequest.AddPartETags(copyResponses);
    CompleteMultipartUploadResponse completeUploadResponse =
s3Client.CompleteMultipartUpload(completeRequest);

}
catch (Exception e)
{
    Console.WriteLine(e.Message);
}
}

// Helper function that constructs ETags.
static List<PartETag> GetETags(List<CopyPartResponse> responses)
{
    List<PartETag> etags = new List<PartETag>();
    foreach (CopyPartResponse response in responses)
    {
        etags.Add(new PartETag(response.PartNumber, response.ETag));
    }
    return etags;
}
}
```

## Copy Object Using the REST Multipart Upload API

The following sections in the *Amazon Simple Storage Service API Reference* describe the REST API for multipart upload. For copying an existing object you use the Upload Part (Copy) API and specify the source object by adding the `x-amz-copy-source` request header in your request.

- [Initiate Multipart Upload](#)
- [Upload Part](#)
- [Upload Part \(Copy\)](#)
- [Complete Multipart Upload](#)
- [Abort Multipart Upload](#)
- [List Parts](#)
- [List Multipart Uploads](#)

You can use these APIs to make your own REST requests, or you can use one of the SDKs we provide. For more information about the SDKs, see [API Support for Multipart Upload \(p. 191\)](#).

## Listing Object Keys

Keys can be listed by prefix. By choosing a common prefix for the names of related keys and marking these keys with a special character that delimits hierarchy, you can use the list operation to select and browse keys hierarchically. This is similar to how files are stored in directories within a file system.

Amazon S3 exposes a list operation that lets you enumerate the keys contained in a bucket. Keys are selected for listing by bucket and prefix. For example, consider a bucket named "dictionary" that contains a key for every English word. You might make a call to list all the keys in that bucket that start with the letter "q". List results are always returned in UTF-8 binary order.

Both the SOAP and REST list operations return an XML document that contains the names of matching keys and information about the object identified by each key.

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

Groups of keys that share a prefix terminated by a special delimiter can be rolled up by that common prefix for the purposes of listing. This enables applications to organize and browse their keys hierarchically, much like how you would organize your files into directories in a file system. For example, to extend the dictionary bucket to contain more than just English words, you might form keys by prefixing each word with its language and a delimiter, such as "French/logical". Using this naming scheme and the hierarchical listing feature, you could retrieve a list of only French words. You could also browse the top-level list of available languages without having to iterate through all the lexicographically intervening keys.

For more information on this aspect of listing, see [Listing Keys Hierarchically Using a Prefix and Delimiter \(p. 243\)](#).

### List Implementation Efficiency

List performance is not substantially affected by the total number of keys in your bucket, nor by the presence or absence of the prefix, marker, maxkeys, or delimiter arguments. For information on improving overall bucket performance, including the list operation, see [Request Rate and Performance Considerations \(p. 561\)](#).

## Iterating Through Multi-Page Results

As buckets can contain a virtually unlimited number of keys, the complete results of a list query can be extremely large. To manage large result sets, Amazon S3 API support pagination to split them into multiple responses. Each list keys response returns a page of up to 1,000 keys with an indicator indicating if the response is truncated. You send a series of list keys requests until you have received all the keys. AWS SDK wrapper libraries provide the same pagination.

The following Java and .NET SDK examples show how to use pagination when listing keys in a bucket:

- [Listing Keys Using the AWS SDK for Java \(p. 244\)](#)
- [Listing Keys Using the AWS SDK for .NET \(p. 245\)](#)

### Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Listing Keys Hierarchically Using a Prefix and Delimiter

The prefix and delimiter parameters limit the kind of results returned by a list operation. Prefix limits results to only those keys that begin with the specified prefix, and delimiter causes list to roll up all keys that share a common prefix into a single summary list result.

The purpose of the prefix and delimiter parameters is to help you organize and then browse your keys hierarchically. To do this, first pick a delimiter for your bucket, such as slash (/), that doesn't occur in any of your anticipated key names. Next, construct your key names by concatenating all containing levels of the hierarchy, separating each level with the delimiter.

For example, if you were storing information about cities, you might naturally organize them by continent, then by country, then by province or state. Because these names don't usually contain punctuation, you might select slash (/) as the delimiter. The following examples use a slash (/) delimiter.

- Europe/France/Aquitaine/Bordeaux
- North America/Canada/Quebec/Montreal
- North America/USA/Washington/Bellevue
- North America/USA/Washington/Seattle

If you stored data for every city in the world in this manner, it would become awkward to manage a flat key namespace. By using `Prefix` and `Delimiter` with the list operation, you can use the hierarchy you've created to list your data. For example, to list all the states in USA, set `Delimiter='/'` and `Prefix='North America/USA/'`. To list all the provinces in Canada for which you have data, set `Delimiter='/'` and `Prefix='North America/Canada/'`.

A list request with a delimiter lets you browse your hierarchy at just one level, skipping over and summarizing the (possibly millions of) keys nested at deeper levels. For example, assume you have a bucket (`ExampleBucket`) the following keys.

```
sample.jpg
photos/2006/January/sample.jpg
photos/2006/February/sample2.jpg
photos/2006/February/sample3.jpg
photos/2006/February/sample4.jpg
```

The sample bucket has only the `sample.jpg` object at the root level. To list only the root level objects in the bucket you send a GET request on the bucket with "/" delimiter character. In response, Amazon S3 returns the `sample.jpg` object key because it does not contain the "/" delimiter character. All other keys contain the delimiter character. Amazon S3 groups these keys and return a single `CommonPrefixes` element with prefix value `photos/` that is a substring from the beginning of these keys to the first occurrence of the specified delimiter.

### Example

```
<ListBucketResult xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
<Name>ExampleBucket</Name>
<Prefix></Prefix>
<Marker></Marker>
<MaxKeys>1000</MaxKeys>
<Delimiter></Delimiter>
<IsTruncated>false</IsTruncated>
```

```
<Contents>
<Key>sample.jpg</Key>
<LastModified>2011-07-24T19:39:30.000Z</LastModified>
<ETag>&quot;d1a7fb5eab1c16cb4f7cf341cf188c3d&quot;</ETag>
<Size>6</Size>
<Owner>
<ID>75cc57f09aa0c8caeab4f8c24e99d10f8e7faebf76c078efc7c6caea54ba06a</ID>
<DisplayName>displayname</DisplayName>
</Owner>
<StorageClass>STANDARD</StorageClass>
</Contents>
<CommonPrefixes>
<Prefix>photos/</Prefix>
</CommonPrefixes>
</ListBucketResult>
```

## Listing Keys Using the AWS SDK for Java

The following Java code example lists object keys in a bucket. If the response is truncated (`<IsTruncated>` is true in the response), the code loop continues. Each subsequent request specifies the `continuation-token` in the request and sets its value to the `<NextContinuationToken>` returned by Amazon S3 in the previous response.

### Example

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.ListObjectsRequest;
import com.amazonaws.services.s3.model.ListObjectsV2Request;
import com.amazonaws.services.s3.model.ListObjectsV2Result;
import com.amazonaws.services.s3.model.ObjectListing;
import com.amazonaws.services.s3.model.S3ObjectSummary;

public class ListKeys {
    private static String bucketName = "***bucket name***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            System.out.println("Listing objects");
            final ListObjectsV2Request req = new
ListObjectsV2Request().withBucketName(bucketName).withMaxKeys(2);
            ListObjectsV2Result result;
            do {
                result = s3client.listObjectsV2(req);

                for (S3ObjectSummary objectSummary :
result.getObjectSummaries()) {
                    System.out.println(" - " + objectSummary.getKey() + " " +
"(size = " + objectSummary.getSize() +
")");
                }
                System.out.println("Next Continuation Token : " +
result.getNextContinuationToken());
            }
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException, which "
+ "means your request was well-formed but "
+ "for some reason was unsuccessful. "
+ "Error Message: " + ace.getMessage());
        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, "
+ "which means we could not understand the response from "
+ "Amazon S3. "
+ "Error Message: " + ase.getMessage());
        }
    }
}
```

```
        req.setContinuationToken(result.getNextContinuationToken());
    } while(result.isTruncated() == true );

} catch (AmazonServiceException ase) {
    System.out.println("Caught an AmazonServiceException, " +
        "which means your request made it " +
        "to Amazon S3, but was rejected with an error response " +
        "for some reason.");
    System.out.println("Error Message:      " + ase.getMessage());
    System.out.println("HTTP Status Code: " + ase.getStatusCode());
    System.out.println("AWS Error Code:   " + ase.getErrorCode());
    System.out.println("Error Type:       " + ase.getErrorType());
    System.out.println("Request ID:      " + ase.getRequestId());
}

} catch (AmazonClientException ace) {
    System.out.println("Caught an AmazonClientException, " +
        "which means the client encountered " +
        "an internal error while trying to communicate" +
        " with S3, " +
        "such as not being able to access the network.");
    System.out.println("Error Message: " + ace.getMessage());
}

}
```

## Listing Keys Using the AWS SDK for .NET

The following C# code example lists object keys in a bucket. If the response is truncated (`<IsTruncated>` is true in the response), the code loop continues. Each subsequent request specifies the `continuation-token` in the request and sets its value to the `<NextContinuationToken>` returned by Amazon S3 in the previous response.

## Example

For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class ListObjects
    {
        static string bucketName = "****bucket name****";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                Console.WriteLine("Listing objects stored in a bucket");
                ListingObjects();
            }

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static void ListingObjects()
        {
            try
```

```
{  
    ListObjectsV2Request request = new ListObjectsV2Request  
    {  
        BucketName = bucketName,  
        MaxKeys = 10  
    };  
    ListObjectsV2Response response;  
    do  
    {  
        response = client.ListObjectsV2(request);  
  
        // Process response.  
        foreach (S3Object entry in response.S3Objects)  
        {  
            Console.WriteLine("key = {0} size = {1}",  
                entry.Key, entry.Size);  
        }  
        Console.WriteLine("Next Continuation Token: {0}",  
            response.NextContinuationToken);  
        request.ContinuationToken = response.NextContinuationToken;  
    } while (response.IsTruncated == true);  
}  
catch (AmazonS3Exception amazonS3Exception)  
{  
    if (amazonS3Exception.ErrorCode != null &&  
        (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")  
        ||  
        amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))  
    {  
        Console.WriteLine("Check the provided AWS Credentials.");  
        Console.WriteLine(  
            "To sign up for service, go to http://aws.amazon.com/s3");  
    }  
    else  
    {  
        Console.WriteLine(  
            "Error occurred. Message:{0}' when listing objects",  
            amazonS3Exception.Message);  
    }  
}  
}  
}  
}
```

## Listing Keys Using the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to list the object keys contained in an Amazon S3 bucket.

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

To list the object keys contained in a bucket using the AWS SDK for PHP you first must list the objects contained in the bucket and then extract the key from each of the listed objects. When listing objects in a bucket you have the option of using the low-level [Aws\S3\S3Client::listObjects\(\)](#) method or the high-level [Aws\S3\Iterator\ListObjects](#) iterator.

The low-level `listObjects()` method maps to the underlying Amazon S3 REST API. Each `listObjects()` request returns a page of up to 1,000 objects. If you have more than 1,000 objects in the bucket, your response will be truncated and you will need to send another `listObjects()` request to retrieve the next set of 1,000 objects.

You can use the high-level `ListObjects` iterator to make your task of listing the objects contained in a bucket a bit easier. To use the `ListObjects` iterator to create a list of objects you execute the Amazon S3 client `getIterator()` method that is inherited from `Guzzle\Service\Client` class with the `ListObjects` command as the first argument and an array to contain the returned objects from the specified bucket as the second argument. When used as a `ListObjects` iterator the `getIterator()` method returns all the objects contained in the specified bucket. There is no 1,000 object limit, so you don't need to worry if the response is truncated or not.

The following tasks guide you through using the PHP Amazon S3 client methods to list the objects contained in a bucket from which you can list the object keys.

### **Listing Object Keys**

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client</a> class factory method.
2	Execute the high-level Amazon S3 client <code>getIterator()</code> method with the <code>ListObjects</code> command as the first argument and an array to contain the returned objects from the specified bucket as the second argument.  Or you can execute the low-level Amazon S3 client <code>listObjects()</code> method with an array to contain the returned objects from the specified bucket as the argument.
3	Extract the object key from each object in the list of returned objects.

The following PHP code sample demonstrates how to list the objects contained in a bucket from which you can list the object keys.

### **Example**

```
use Aws\S3\S3Client;

// Instantiate the client.
$s3 = S3Client::factory();

$bucket = '*** Bucket Name ***';

// Use the high-level iterators (returns ALL of your objects).
$objects = $s3->getIterator('ListObjects', array('Bucket' => $bucket));

echo "Keys retrieved!\n";
foreach ($objects as $object) {
    echo $object['Key'] . "\n";
}

// Use the plain API (returns ONLY up to 1000 of your objects).
$result = $s3->listObjects(array('Bucket' => $bucket));

echo "Keys retrieved!\n";
foreach ($result['Contents'] as $object) {
    echo $object['Key'] . "\n";
}
```

### **Example of Listing Object Keys**

The following PHP example demonstrates how to list the keys from a specified bucket. It shows how to use the high-level `getIterator()` method to list the objects in a bucket and then how to extract the key from each of the objects in the list. It also shows how to use the low-level `listObjects()` method to list the objects in a bucket and then how to extract the key from each of the objects in

the list returned. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;
use Aws\S3\Exception\S3Exception;

$bucket = '*** Your Bucket Name ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Use the high-level iterators (returns ALL of your objects).
try {
    $objects = $s3->getIterator('ListObjects', array(
        'Bucket' => $bucket
    ));

    echo "Keys retrieved!\n";
    foreach ($objects as $object) {
        echo $object['Key'] . "\n";
    }
} catch (S3Exception $e) {
    echo $e->getMessage() . "\n";
}

// Use the plain API (returns ONLY up to 1000 of your objects).
try {
    $result = $s3->listObjects(array('Bucket' => $bucket));

    echo "Keys retrieved!\n";
    foreach ($result['Contents'] as $object) {
        echo $object['Key'] . "\n";
    }
} catch (S3Exception $e) {
    echo $e->getMessage() . "\n";
}
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\Iterator\ListObjects](#)
- [AWS SDK for PHP for Amazon S3 Guzzle\Service\Client Class](#)
- [AWS SDK for PHP for Amazon S3 Guzzle\Service\Client::getIterator\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::listObjects\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Listing Keys Using the REST API

You can use the AWS SDK to list the object keys in a bucket. However, if your application requires it, you can send REST requests directly. You can send a GET request to return some or all of the objects

in a bucket or you can use selection criteria to return a subset of the objects in a bucket. For more information, go to [GET Bucket \(List Objects\) Version 2](#).

## Deleting Objects

### Topics

- [Deleting Objects from a Version-Enabled Bucket \(p. 249\)](#)
- [Deleting Objects from an MFA-Enabled Bucket \(p. 249\)](#)
- [Related Resources \(p. 250\)](#)
- [Deleting One Object Per Request \(p. 250\)](#)
- [Deleting Multiple Objects Per Request \(p. 258\)](#)

You can delete one or more objects directly from Amazon S3. You have the following options when deleting an object:

- **Delete a single object**—Amazon S3 provides the DELETE API that you can use to delete one object in a single HTTP request.
- **Delete multiple objects**—Amazon S3 also provides the Multi-Object Delete API that you can use to delete up to 1000 objects in a single HTTP request.

When deleting objects from a bucket that is not version-enabled, you provide only the object key name; however, when deleting objects from a version-enabled bucket, you can optionally provide version ID of the object to delete a specific version of the object.

### Deleting Objects from a Version-Enabled Bucket

If your bucket is version-enabled, then multiple versions of the same object can exist in the bucket. When working with version-enabled buckets, the delete API enables the following options:

- **Specify a non-versioned delete request**—That is, you specify only the object's key, and not the version ID. In this case, Amazon S3 creates a delete marker and returns its version ID in the response. This makes your object disappear from the bucket. For information about object versioning and the delete marker concept, see [Object Versioning \(p. 114\)](#).
- **Specify a versioned delete request**—That is, you specify both the key and also a version ID. In this case the following two outcomes are possible:
  - If the version ID maps to a specific object version, then Amazon S3 deletes the specific version of the object.
  - If the version ID maps to the delete marker of that object, Amazon S3 deletes the delete marker. This makes the object reappear in your bucket.

### Deleting Objects from an MFA-Enabled Bucket

When deleting objects from an Multi Factor Authentication (MFA) enabled bucket, note the following:

- If you provide an invalid MFA token, the request always fails.
- If you have MFA-enabled bucket, and you make a versioned delete request (you provide an object key and version ID), the request will fail if you don't provide a valid MFA token. In addition, when using the Multi-Object Delete API on an MFA-enabled bucket, if any of the deletes is a versioned delete request (that is, you specify object key and version ID), the entire request will fail if you don't provide MFA token.

On the other hand, in the following cases the request succeeds:

- If you have an MFA enabled bucket, and you make a non-versioned delete request (you are not deleting a versioned object), and you don't provide MFA token, the delete succeeds.
- If you have a Multi-Object Delete request specifying only non-versioned objects to delete from an MFA-enabled bucket, and you don't provide an MFA token, the deletions succeed.

For information on MFA delete, see [MFA Delete \(p. 450\)](#).

## Related Resources

- [Using the AWS SDKs, CLI, and Explorers \(p. 609\)](#)

## Deleting One Object Per Request

### Topics

- [Deleting an Object Using the AWS SDK for Java \(p. 250\)](#)
- [Deleting an Object Using the AWS SDK for .NET \(p. 253\)](#)
- [Deleting an Object Using the AWS SDK for PHP \(p. 256\)](#)
- [Deleting an Object Using the REST API \(p. 257\)](#)

Amazon S3 provides the DELETE API (see [DELETE Object](#)) for you to delete one object per request. To learn more about object deletion, see [Deleting Objects \(p. 249\)](#).

You can use the REST API directly or use the wrapper libraries provided by the AWS SDKs that can simplify your application development.

### Deleting an Object Using the AWS SDK for Java

The following tasks guide you through using the AWS SDK for Java classes to delete an object.

#### Deleting an Object (Non-Versioned Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class.
2	<p>Execute one of the <code>AmazonS3Client.deleteObject</code> methods.</p> <p>You can provide a bucket name and an object name as parameters or provide the same information in a <code>DeleteObjectRequest</code> object and pass the object as a parameter.</p> <p>If you have not enabled versioning on the bucket, the operation deletes the object. If you have enabled versioning, the operation adds a delete marker. For more information, see <a href="#">Deleting One Object Per Request (p. 250)</a>.</p>

The following Java sample demonstrates the preceding steps. The sample uses the `DeleteObjectRequest` class to provide a bucket name and an object key.

#### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
s3client.deleteObject(new DeleteObjectRequest(bucketName, keyName));
```

#### Deleting a Specific Version of an Object (Version-Enabled Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class.
---	--

2

Execute one of the `AmazonS3Client.deleteVersion` methods.

You can provide a bucket name and an object key directly as parameters or use the `DeleteVersionRequest` to provide the same information.

The following Java sample demonstrates the preceding steps. The sample uses the `DeleteVersionRequest` class to provide a bucket name, an object key, and a version Id.

### Example

```
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
s3client.deleteObject(new DeleteVersionRequest(bucketName, keyName, versionId));
```

#### Example 1: Deleting an Object (Non-Versioned Bucket)

The following Java example deletes an object from a bucket. If you have not enabled versioning on the bucket, Amazon S3 deletes the object. If you have enabled versioning, Amazon S3 adds a delete marker and the object is not deleted. For information about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.DeleteObjectRequest;

public class DeleteAnObjectNonVersionedBucket {

    private static String bucketName = "**** Provide a Bucket Name ****";
    private static String keyName     = "**** Provide a Key Name ****";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            s3Client.deleteObject(new DeleteObjectRequest(bucketName, keyName));
        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}
```

#### Example 2: Deleting an Object (Versioned Bucket)

The following Java example deletes a specific version of an object from a versioned bucket. The `deleteObject` request removes the specific object version from the bucket.

To test the sample, you must provide a bucket name. The code sample performs the following tasks:

1. Enable versioning on the bucket.
2. Add a sample object to the bucket. In response, Amazon S3 returns the version ID of the newly added object.
3. Delete the sample object using the `deleteVersion` method. The `DeleteVersionRequest` class specifies both an object key name and a version ID.

For information about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.ByteArrayInputStream;
import java.io.IOException;
import java.util.Random;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.BucketVersioningConfiguration;
import com.amazonaws.services.s3.model.CannedAccessControlList;
import com.amazonaws.services.s3.model.DeleteVersionRequest;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.PutObjectResult;
import com.amazonaws.services.s3.model.SetBucketVersioningConfigurationRequest;

public class DeleteAnObjectVersionEnabledBucket {

    static String bucketName = "**** Provide a Bucket Name ****";
    static String keyName     = "**** Provide a Key Name ****";
    static AmazonS3Client s3Client;

    public static void main(String[] args) throws IOException {
        s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            // Make the bucket version-enabled.
            enableVersioningOnBucket(s3Client, bucketName);

            // Add a sample object.
            String versionId = putAnObject(keyName);

            s3Client.deleteVersion(
                new DeleteVersionRequest(
                    bucketName,
                    keyName,
                    versionId));
        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }

    static void enableVersioningOnBucket(AmazonS3Client s3Client,
                                         String bucketName) {
        BucketVersioningConfiguration config = new BucketVersioningConfiguration()
```

```
        .withStatus(BucketVersioningConfiguration.ENABLED);
    SetBucketVersioningConfigurationRequest setBucketVersioningConfigurationRequest =
new SetBucketVersioningConfigurationRequest(
    bucketName, config);
    s3Client.setBucketVersioningConfiguration(setBucketVersioningConfigurationRequest);
}

static String putAnObject(String keyName) {
    String content = "This is the content body!";
    String key = "ObjectToDelete-" + new Random().nextInt();
    ObjectMetadata metadata = new ObjectMetadata();
    metadata.setHeader("Subject", "Content-As-Object");
    metadata.setHeader("Content-Length", content.length());
    PutObjectRequest request = new PutObjectRequest(bucketName, key,
        new ByteArrayInputStream(content.getBytes()), metadata)
        .withCannedAcl(CannedAccessControlList.AuthenticatedRead);
    PutObjectResult response = s3Client.putObject(request);
    return response.getVersionId();
}
}
```

## Deleting an Object Using the AWS SDK for .NET

You can delete an object from a bucket. If you have versioning enabled on the bucket, you can also delete a specific version of an object.

The following tasks guide you through using the .NET classes to delete an object.

### Deleting an Object (Non-Versioned Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class by providing your AWS credentials.
2	Execute the <code>AmazonS3.DeleteObject</code> method by providing a bucket name and an object key in an instance of <code>DeleteObjectRequest</code> .  If you have not enabled versioning on the bucket, the operation deletes the object. If you have enabled versioning, the operation adds a delete marker. For more information, see <a href="#">Deleting One Object Per Request (p. 250)</a> .

The following C# code sample demonstrates the preceding steps.

```
static IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

DeleteObjectRequest deleteObjectRequest =
    new DeleteObjectRequest
    {
        BucketName = bucketName,
        Key = keyName
    };

using (client = Amazon.AWSClientFactory.CreateAmazonS3Client(
    accessKeyID, secretAccessKeyID))
{
    client.DeleteObject(deleteObjectRequest);
}
```

### Deleting a Specific Version of an Object (Version-Enabled Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class by providing your AWS credentials.
---	--

- 2 Execute the `AmazonS3.DeleteObject` method by providing a bucket name, an object key name, and object version Id in an instance of `DeleteObjectRequest`.

The `DeleteObject` method deletes the specific version of the object.

The following C# code sample demonstrates the preceding steps.

### Example

```
IAmazonS3 client
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1)

DeleteObjectRequest deleteObjectRequest = new DeleteObjectRequest
{
    BucketName = bucketName,
    Key = keyName,
    VersionId = versionID
};

using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
{
    client.DeleteObject(deleteObjectRequest);
    Console.WriteLine("Deleting an object");
}
```

### Example 1: Deleting an Object (Non-Versioned Bucket)

The following C# code example deletes an object from a bucket. It does not provide a version Id in the delete request. If you have not enabled versioning on the bucket, Amazon S3 deletes the object. If you have enabled versioning, Amazon S3 adds a delete marker and the object is not deleted. For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class DeleteObjectNonVersionedBucket
    {
        static string bucketName = "**** Provide a bucket name ****";
        static string keyName     = "**** Provide a key name ****";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                DeleteObjectRequest deleteObjectRequest = new DeleteObjectRequest
                {
                    BucketName = bucketName,
                    Key = keyName
                };
                try
                {
                    client.DeleteObject(deleteObjectRequest);
                    Console.WriteLine("Deleting an object");
                }
                catch (AmazonS3Exception s3Exception)
```

```
        {
            Console.WriteLine(s3Exception.Message,
                s3Exception.InnerException);
        }
    }
    Console.WriteLine("Press any key to continue...");
    Console.ReadKey();
}
}
```

### Example 2: Deleting an Object (Versioned Bucket)

The following C# code example deletes an object from a versioned bucket. The `DeleteObjectRequest` instance specifies an object key name and a version ID. The `DeleteObject` method removes the specific object version from the bucket.

To test the sample, you must provide a bucket name. The code sample performs the following tasks:

1. Enable versioning on the bucket.
2. Add a sample object to the bucket. In response, Amazon S3 returns the version ID of the newly added object. You can also obtain version IDs of an object by sending a `ListVersions` request.

```
var listResponse = client.ListVersions(new ListVersionsRequest { BucketName = bucketName,
    Prefix = keyName });
```

3. Delete the sample object using the `DeleteObject` method. The `DeleteObjectRequest` class specifies both an object key name and a version ID.

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class DeleteObjectVersion
    {
        static string bucketName = "**** Provide a Bucket Name ****";
        static string keyName     = "**** Provide a Key Name ****";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                try
                {
                    // Make the bucket version-enabled.
                    EnableVersioningOnBucket(bucketName);

                    // Add a sample object.
                    string versionID = PutAnObject(keyName);

                    // Delete the object by specifying an object key and a version ID.
                    DeleteObjectRequest request = new DeleteObjectRequest
                    {
                        BucketName = bucketName,
                        Key = keyName,
```

## Deleting an Object Using the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to delete an object from a non-versioned bucket. For information on deleting an object from a versioned bucket, see [Deleting an Object Using the REST API \(p. 257\)](#).

## Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP](#) and [Running PHP Examples](#) (p. 615) and have the AWS SDK for PHP properly installed.

## **Deleting One Object (Non-Versioned Bucket)**

- 1 Create an instance of an Amazon S3 client by using the [Aws\S3\S3Client](#) class `factory()` method.
- 2 Execute the [Aws\S3\S3Client::deleteObject\(\)](#) method. You must provide a bucket name and a key name in the array parameter's required keys, Bucket and Key.

If you have not enabled versioning on the bucket, the operation deletes the object. If you have enabled versioning, the operation adds a delete marker. For more information, see [Deleting Objects \(p. 249\)](#).

The following PHP code sample demonstrates how to delete an object from an Amazon S3 bucket using the `deleteObject()` method.

```
use Aws\S3\S3Client;

$s3 = S3Client::factory();

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

$result = $s3->deleteObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname
));
```

### Example Deleting an Object from a Non-Versioned Bucket

The following PHP code example deletes an object from a bucket. It does not provide a version Id in the delete request. If you have not enabled versioning on the bucket, Amazon S3 deletes the object. If you have enabled versioning, Amazon S3 adds a delete marker and the object is not deleted. For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#). For information on deleting an object from a versioned bucket, see [Deleting an Object Using the REST API \(p. 257\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;

$s3 = S3Client::factory();

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

$result = $s3->deleteObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname
));
```

### Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::deleteObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Deleting an Object Using the REST API

You can use the AWS SDKs to delete an object. However, if your application requires it, you can send REST requests directly. For more information, go to [DELETE Object](#) in the *Amazon Simple Storage Service API Reference*.

## Deleting Multiple Objects Per Request

### Topics

- [Deleting Multiple Objects Using the AWS SDK for Java \(p. 258\)](#)
- [Deleting Multiple Objects Using the AWS SDK for .NET \(p. 264\)](#)
- [Deleting Multiple Objects Using the AWS SDK for PHP \(p. 271\)](#)
- [Deleting Multiple Objects Using the REST API \(p. 275\)](#)

Amazon S3 provides the Multi-Object Delete API (see [Delete - Multi-Object Delete](#)) that enables you to delete multiple objects in a single request. The API supports two modes for the response; verbose and quiet. By default, the operation uses verbose mode in which the response includes the result each keys deletion that was encountered in your request. In quiet mode, the response includes only keys where the delete operation encountered an error.

If all keys were successfully deleted when using the quiet mode, Amazon S3 returns empty response.

To learn more about object deletion, see [Deleting Objects \(p. 249\)](#).

You can use the REST API directly or use the AWS SDKs.

### Deleting Multiple Objects Using the AWS SDK for Java

The following tasks guide you through using the AWS SDK for Java classes to delete multiple objects in a single HTTP request.

#### Deleting Multiple Objects (Non-Versioned Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Create an instance of the <code>DeleteObjectsRequest</code> class and provide a list of objects keys you want to delete.
3	Execute the <code>AmazonS3Client.deleteObjects</code> method.

The following Java code sample demonstrates the preceding steps.

#### Example

```
DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest(bucketName);

List<KeyVersion> keys = new ArrayList<KeyVersion>();
keys.add(new KeyVersion(keyName1));
keys.add(new KeyVersion(keyName2));
keys.add(new KeyVersion(keyName3));

multiObjectDeleteRequest.setKeys(keys);

try {
    DeleteObjectsResult delObjRes = s3Client.deleteObjects(multiObjectDeleteRequest);
    System.out.format("Successfully deleted all the %s items.\n",
                      delObjRes.getDeletedObjects().size());
} catch (MultiObjectDeleteException e) {
    // Process exception.
}
```

In the event of an exception, you can review the `MultiObjectDeleteException` to determine which objects failed to delete and why as shown in the following Java example.

```
System.out.format("%s \n", e.getMessage());
System.out.format("No. of objects successfully deleted = %s\n",
    e.getDeletedObjects().size());
System.out.format("No. of objects failed to delete = %s\n", e.getErrors().size());
System.out.format("Printing error data...\n");
for (DeleteError deleteError : e.getErrors()){
    System.out.format("Object Key: %s\t%s\n",
        deleteError.getKey(), deleteError.getCode(), deleteError.getMessage());
}
```

The following tasks guide you through deleting objects from a version-enabled bucket.

### Deleting Multiple Objects (Version-Enabled Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Create an instance of the <code>DeleteObjectsRequest</code> class and provide a list of objects keys and optionally the version IDs of the objects that you want to delete.  If you specify the version ID of the object that you want to delete, Amazon S3 deletes the specific object version. If you don't specify the version ID of the object that you want to delete, Amazon S3 adds a delete marker. For more information, see <a href="#">Deleting One Object Per Request (p. 250)</a> .
3	Execute the <code>AmazonS3Client.deleteObjects</code> method.

The following Java code sample demonstrates the preceding steps.

```
List<KeyVersion> keys = new ArrayList<KeyVersion>();
// Provide a list of object keys and versions.

DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest(bucketName)
    .withKeys(keys);

try {
    DeleteObjectsResult delObjRes = s3Client.deleteObjects(multiObjectDeleteRequest);
    System.out.format("Successfully deleted all the %s items.\n",
        delObjRes.getDeletedObjects().size());
}

} catch (MultiObjectDeleteException e) {
    // Process exception.
}
```

### Example 1: Multi-Object Delete (Non-Versioned Bucket)

The following Java code example uses the Multi-Object Delete API to delete objects from a non-versioned bucket. The example first uploads the sample objects to the bucket and then uses the `deleteObjects` method to delete the objects in a single request.

For information about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.ByteArrayInputStream;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import java.util.Random;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
```

```
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.CannedAccessControlList;
import com.amazonaws.services.s3.model.DeleteObjectsRequest;
import com.amazonaws.services.s3.model.DeleteObjectsRequest.KeyVersion;
import com.amazonaws.services.s3.model.DeleteObjectsResult;
import com.amazonaws.services.s3.model.MultiObjectDeleteException;
import com.amazonaws.services.s3.model.MultiObjectDeleteException.DeleteError;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.PutObjectResult;

public class DeleteMultipleObjectsNonVersionedBucket {

    static String bucketName = "*** Provide a bucket name ***";
    static AmazonS3Client s3Client;

    public static void main(String[] args) throws IOException {

        try {
            s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
            // Upload sample objects. Because the bucket is not version-enabled,
            // the KeyVersions list returned will have null values for version IDs.
            List<KeyVersion> keysAndVersions1 = putObjects(3);

            // Delete specific object versions.
            multiObjectNonVersionedDelete(keysAndVersions1);

            } catch (AmazonServiceException ase) {
                System.out.println("Caught an AmazonServiceException.");
                System.out.println("Error Message: " + ase.getMessage());
                System.out.println("HTTP Status Code: " + ase.getStatusCode());
                System.out.println("AWS Error Code: " + ase.getErrorCode());
                System.out.println("Error Type: " + ase.getErrorType());
                System.out.println("Request ID: " + ase.getRequestId());
            } catch (AmazonClientException ace) {
                System.out.println("Caught an AmazonClientException.");
                System.out.println("Error Message: " + ace.getMessage());
            }
        }

        static List<KeyVersion> putObjects(int number) {
            List<KeyVersion> keys = new ArrayList<KeyVersion>();
            String content = "This is the content body!";
            for (int i = 0; i < number; i++) {
                String key = "ObjectToDelete-" + new Random().nextInt();
                ObjectMetadata metadata = new ObjectMetadata();
                metadata.setHeader("Subject", "Content-As-Object");
                metadata.setHeader("Content-Length", (long)content.length());
                PutObjectRequest request = new PutObjectRequest(bucketName, key,
                    new ByteArrayInputStream(content.getBytes()), metadata)
                    .withCannedAcl(CannedAccessControlList.AuthenticatedRead);
                PutObjectResult response = s3Client.putObject(request);
                KeyVersion keyVersion = new KeyVersion(key, response.getVersionId());
                keys.add(keyVersion);
            }
            return keys;
        }

        static void multiObjectNonVersionedDelete(List<KeyVersion> keys) {

            // Multi-object delete by specifying only keys (no version ID).
            DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest(
                bucketName).withQuiet(false);

            // Create request that include only object key names.
```

```
List<KeyVersion> justKeys = new ArrayList<KeyVersion>();
for (KeyVersion key : keys) {
    justKeys.add(new KeyVersion(key.getKey()));
}
multiObjectDeleteRequest.setKeys(justKeys);
// Execute DeleteObjects - Amazon S3 add delete marker for each object
// deletion. The objects no disappear from your bucket (verify).
DeleteObjectsResult delObjRes = null;
try {
    delObjRes = s3Client.deleteObjects(multiObjectDeleteRequest);
    System.out.format("Successfully deleted all the %s items.\n",
delObjRes.getDeletedObjects().size());
} catch (MultiObjectDeleteException mode) {
    printDeleteResults(mode);
}
}
static void printDeleteResults(MultiObjectDeleteException mode) {
    System.out.format("%s \n", mode.getMessage());
    System.out.format("No. of objects successfully deleted = %s\n",
mode.getDeletedObjects().size());
    System.out.format("No. of objects failed to delete = %s\n",
mode.getErrors().size());
    System.out.format("Printing error data... \n");
    for (DeleteError deleteError : mode.getErrors()){
        System.out.format("Object Key: %s\t%s\t%s\n",
                           deleteError.getKey(), deleteError.getCode(), deleteError.getMessage());
    }
}
}
```

### Example 2: Multi-Object Delete (Version-Enabled Bucket)

The following Java code example uses the Multi-Object Delete API to delete objects from a version-enabled bucket.

Before you can test the sample, you must create a sample bucket and provide the bucket name in the example. You can use the AWS Management Console to create a bucket.

The example performs the following actions:

1. Enable versioning on the bucket.
2. Perform a versioned-delete.

The example first uploads the sample objects. In response, Amazon S3 returns the version IDs for each sample object that you uploaded. The example then deletes these objects using the Multi-Object Delete API. In the request, it specifies both the object keys and the version IDs (that is, versioned delete).

3. Perform a non-versioned delete.

The example uploads the new sample objects. Then, it deletes the objects using the Multi-Object API. However, in the request, it specifies only the object keys. In this case, Amazon S3 adds the delete markers and the objects disappear from your bucket.

4. Delete the delete markers.

To illustrate how the delete markers work, the sample deletes the delete markers. In the Multi-Object Delete request, it specifies the object keys and the version IDs of the delete markers it received in the response in the preceding step. This action makes the objects reappear in your bucket.

For information about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.ByteArrayInputStream;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import java.util.Random;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.BucketVersioningConfiguration;
import com.amazonaws.services.s3.model.CannedAccessControlList;
import com.amazonaws.services.s3.model.DeleteObjectsRequest;
import com.amazonaws.services.s3.model.DeleteObjectsRequest.KeyVersion;
import com.amazonaws.services.s3.model.DeleteObjectsResult;
import com.amazonaws.services.s3.model.DeleteObjectsResult.DeletedObject;
import com.amazonaws.services.s3.model.MultiObjectDeleteException;
import com.amazonaws.services.s3.model.MultiObjectDeleteException.DeleteError;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.PutObjectResult;
import com.amazonaws.services.s3.model.SetBucketVersioningConfigurationRequest;

public class DeleteMultipleObjectsVersionEnabledBucket {

    static String bucketName = "**** Provide a bucket name ****";
    static AmazonS3Client s3Client;

    public static void main(String[] args) throws IOException {

        try {
            s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

            // 1. Enable versioning on the bucket.
            enableVersioningOnBucket(s3Client, bucketName);

            // 2a. Upload sample objects.
            List<KeyVersion> keysAndVersions1 = putObjects(3);
            // 2b. Delete specific object versions.
            multiObjectVersionedDelete(keysAndVersions1);

            // 3a. Upload samples objects.
            List<KeyVersion> keysAndVersions2 = putObjects(3);
            // 3b. Delete objects using only keys. Amazon S3 creates a delete marker and
            // returns its version Id in the response.
            DeleteObjectsResult response = multiObjectNonVersionedDelete(keysAndVersions2);
            // 3c. Additional exercise - using multi-object versioned delete, remove the
            // delete markers received in the preceding response. This results in your
            objects
            // reappear in your bucket
            multiObjectVersionedDeleteRemoveDeleteMarkers(response);

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}
```

```
static void enableVersioningOnBucket(AmazonS3Client s3Client,
    String bucketName) {
    BucketVersioningConfiguration config = new BucketVersioningConfiguration()
        .withStatus(BucketVersioningConfiguration.ENABLED);
    SetBucketVersioningConfigurationRequest setBucketVersioningConfigurationRequest =
new SetBucketVersioningConfigurationRequest(
        bucketName, config);
    s3Client.setBucketVersioningConfiguration(setBucketVersioningConfigurationRequest);
}

static List<KeyVersion> putObjects(int number) {
    List<KeyVersion> keys = new ArrayList<KeyVersion>();
    String content = "This is the content body!";
    for (int i = 0; i < number; i++) {
        String key = "ObjectToDelete-" + new Random().nextInt();
        ObjectMetadata metadata = new ObjectMetadata();
        metadata.setHeader("Subject", "Content-As-Object");
        metadata.setHeader("Content-Length", (long)content.length());
        PutObjectRequest request = new PutObjectRequest(bucketName, key,
            new ByteArrayInputStream(content.getBytes()), metadata)
            .withCannedAcl(CannedAccessControlList.AuthenticatedRead);
        PutObjectResult response = s3Client.putObject(request);
        KeyVersion keyVersion = new KeyVersion(key, response.getVersionId());
        keys.add(keyVersion);
    }
    return keys;
}

static void multiObjectVersionedDelete(List<KeyVersion> keys) {
    DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest(
        bucketName).withKeys(keys);

    DeleteObjectsResult delObjRes = null;
    try {
        delObjRes = s3Client.deleteObjects(multiObjectDeleteRequest);
        System.out.format("Successfully deleted all the %s items.\n",
delObjRes.getDeletedObjects().size());
    } catch(MultiObjectDeleteException mode) {
        printDeleteResults(mode);
    }
}

static DeleteObjectsResult multiObjectNonVersionedDelete(List<KeyVersion> keys) {

    // Multi-object delete by specifying only keys (no version ID).
    DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest(
        bucketName);

    // Create request that include only object key names.
    List<KeyVersion> justKeys = new ArrayList<KeyVersion>();
    for (KeyVersion key : keys) {
        justKeys.add(new KeyVersion(key.getKey()));
    }

    multiObjectDeleteRequest.setKeys(justKeys);
    // Execute DeleteObjects - Amazon S3 add delete marker for each object
    // deletion. The objects no disappear from your bucket (verify).
    DeleteObjectsResult delObjRes = null;
    try {
        delObjRes = s3Client.deleteObjects(multiObjectDeleteRequest);
        System.out.format("Successfully deleted all the %s items.\n",
delObjRes.getDeletedObjects().size());
    } catch (MultiObjectDeleteException mode) {
        printDeleteResults(mode);
    }
    return delObjRes;
}
```

```

    }
    static void multiObjectVersionedDeleteRemoveDeleteMarkers(
        DeleteObjectsResult response) {

        List<KeyVersion> keyVersionList = new ArrayList<KeyVersion>();
        for (DeletedObject deletedObject : response.getDeletedObjects()) {
            keyVersionList.add(new KeyVersion(deletedObject.getKey(),
                deletedObject.getDeleteMarkerVersionId()));
        }
        // Create a request to delete the delete markers.
        DeleteObjectsRequest multiObjectDeleteRequest2 = new DeleteObjectsRequest(
            bucketName).withKeys(keyVersionList);

        // Now delete the delete marker bringing your objects back to the bucket.
        DeleteObjectsResult delObjRes = null;
        try {
            delObjRes = s3Client.deleteObjects(multiObjectDeleteRequest2);
            System.out.format("Successfully deleted all the %s items.\n",
            delObjRes.getDeletedObjects().size());
        } catch (MultiObjectDeleteException mode) {
            printDeleteResults(mode);
        }
    }
    static void printDeleteResults(MultiObjectDeleteException mode) {
        System.out.format("%s \n", mode.getMessage());
        System.out.format("No. of objects successfully deleted = %s\n",
        mode.getDeletedObjects().size());
        System.out.format("No. of objects failed to delete = %s\n",
        mode.getErrors().size());
        System.out.format("Printing error data...\n");
        for (DeleteError deleteError : mode.getErrors()){
            System.out.format("Object Key: %s\t%s\t%s\n",
                deleteError.getKey(), deleteError.getCode(), deleteError.getMessage());
        }
    }
}

```

## Deleting Multiple Objects Using the AWS SDK for .NET

The following tasks guide you through using the AWS SDK for .NET classes to delete multiple objects in a single HTTP request.

### Deleting Multiple Objects (Non-Versioned Bucket)

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Create an instance of the <code>DeleteObjectsRequest</code> class and provide list of the object keys you want to delete.
3	Execute the <code>AmazonS3Client.DeleteObjects</code> method.  If one or more objects fail to delete, Amazon S3 throws a <code>DeleteObjectsException</code> .

The following C# code sample demonstrates the preceding steps.

```

DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest();
multiObjectDeleteRequest.BucketName = bucketName;

multiObjectDeleteRequest.AddKey("<object Key>", null); // version ID is null.
multiObjectDeleteRequest.AddKey("<object Key>", null);
multiObjectDeleteRequest.AddKey("<object Key>", null);

```

```

try
{
    DeleteObjectsResponse response = client.DeleteObjects(multiObjectDeleteRequest);
    Console.WriteLine("Successfully deleted all the {0} items",
        response.DeletedObjects.Count);
}
catch (DeleteObjectsException e)
{
    // Process exception.
}

```

The `DeleteObjectsRequest` can also take the list of `KeyVersion` objects as parameter. For bucket without versioning, version ID is null.

```

List<KeyVersion> keys = new List<KeyVersion>();
KeyVersion keyVersion = new KeyVersion
{
    Key = key,
    VersionId = null // For buckets without versioning.
};

keys.Add(keyVersion);
List<KeyVersion> keys = new List<KeyVersion>();
...
DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest
{
    BucketName = bucketName,
    Objects = keys // This includes the object keys and null version IDs.
};

```

In the event of an exception, you can review the `DeleteObjectsException` to determine which objects failed to delete and why as shown in the following C# code example.

```

DeleteObjectsResponse errorResponse = e.Response;
Console.WriteLine("No. of objects successfully deleted = {0}",
    errorResponse.DeletedObjects.Count);
Console.WriteLine("No. of objects failed to delete = {0}",
    errorResponse.DeleteErrors.Count);
Console.WriteLine("Printing error data...");
foreach (DeleteError deleteError in errorResponse.DeleteErrors)
{
    Console.WriteLine("Object Key: {0}\t{1}\t{2}", deleteError.Key, deleteError.Code,
        deleteError.Message);
}

```

The following tasks guide you through deleting objects from a version-enabled bucket.

### **Deleting Multiple Objects (Version-Enabled Bucket)**

1	Create an instance of the <code>AmazonS3Client</code> class.
2	<p>Create an instance of the <code>DeleteObjectsRequest</code> class and provide a list of object keys and optionally the version IDs of the objects that you want to delete.</p> <p>If you specify the version ID of the object you want to delete, Amazon S3 deletes the specific object version. If you don't specify the version ID of the object that you want to delete, Amazon S3 adds a delete marker. For more information, see <a href="#">Deleting One Object Per Request (p. 250)</a>.</p>
3	Execute the <code>AmazonS3Client.DeleteObjects</code> method.

The following C# code sample demonstrates the preceding steps.

```
List<KeyVersion> keysAndVersions = new List<KeyVersion>();
// provide a list of object keys and versions.

DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest
{
    BucketName = bucketName,
    Objects = keysAndVersions
};

try
{
    DeleteObjectsResponse response = client.DeleteObjects(multiObjectDeleteRequest);
    Console.WriteLine("Successfully deleted all the {0} items",
        response.DeletedObjects.Count);
}
catch (DeleteObjectsException e)
{
    // Process exception.
}
```

### Example 1: Multi-Object Delete (Non-Versioned Bucket)

The following C# code example uses the Multi-Object API to delete objects from a bucket that is not version-enabled. The example first uploads the sample objects to the bucket and then uses the `DeleteObjects` method to delete the objects in a single request. In the `DeleteObjectsRequest`, the example specifies only the object key names because the version IDs are null.

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Generic;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class DeleteMultipleObjects
    {
        static string bucketName = "*** Provide a bucket name ***";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                var keysAndVersions = PutObjects(3);
                // Delete the objects.
                MultiObjectDelete(keysAndVersions);
            }

            Console.WriteLine("Click ENTER to continue.....");
            Console.ReadLine();
        }

        static void MultiObjectDelete(List<KeyVersion> keys)
        {
            // a. multi-object delete by specifying the key names and version IDs.
            DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest
            {
                BucketName = bucketName,
```

```
        Objects = keys // This includes the object keys and null version IDs.
    };
    multiObjectDeleteRequest.AddKey("AWSSDKcopy2.dll", null);
    try
    {
        DeleteObjectsResponse response =
client.DeleteObjects(multiObjectDeleteRequest);
        Console.WriteLine("Successfully deleted all the {0} items",
response.DeletedObjects.Count);
    }
    catch (DeleteObjectsException e)
    {
        PrintDeletionReport(e);
    }
}

private static void PrintDeletionReport(DeleteObjectsException e)
{
    // var errorResponse = e.ErrorResponse;
    DeleteObjectsResponse errorResponse = e.Response;
    Console.WriteLine("x {0}", errorResponse.DeletedObjects.Count);

    Console.WriteLine("No. of objects successfully deleted = {0}",
errorResponse.DeletedObjects.Count);
    Console.WriteLine("No. of objects failed to delete = {0}",
errorResponse.DeleteErrors.Count);

    Console.WriteLine("Printing error data...");
    foreach (DeleteError deleteError in errorResponse.DeleteErrors)
    {
        Console.WriteLine("Object Key: {0}\t{1}\t{2}",
deleteError.Key,
deleteError.Code, deleteError.Message);
    }
}

static List<KeyVersion> PutObjects(int number)
{
    List<KeyVersion> keys = new List<KeyVersion>();
    for (int i = 0; i < number; i++)
    {
        string key = "ExampleObject-" + new System.Random().Next();
        PutObjectRequest request = new PutObjectRequest
        {
            BucketName = bucketName,
            Key = key,
            ContentBody = "This is the content body!",
        };

        PutObjectResponse response = client.PutObject(request);
        KeyVersion keyVersion = new KeyVersion
        {
            Key = key,
            // For non-versioned bucket operations, we only need object key.
            // VersionId = response.VersionId
        };
        keys.Add(keyVersion);
    }
    return keys;
}
}
```

### Example 2: Multi-Object Delete (Version-Enabled Bucket)

The following C# code example uses the Multi-Object API to delete objects from a version-enabled bucket. In addition to showing the DeleteObjects Multi-Object Delete API usage, it also illustrates how versioning works in a version-enabled bucket.

Before you can test the sample, you must create a sample bucket and provide the bucket name in the example. You can use the AWS Management Console to create a bucket.

The example performs the following actions:

1. Enable versioning on the bucket.
2. Perform a versioned-delete.

The example first uploads the sample objects. In response, Amazon S3 returns the version IDs for each sample object that you uploaded. The example then deletes these objects using the Multi-Object Delete API. In the request, it specifies both the object keys and the version IDs (that is, versioned delete).

3. Perform a non-versioned delete.

The example uploads the new sample objects. Then, it deletes the objects using the Multi-Object API. However, in the request, it specifies only the object keys. In this case, Amazon S3 adds the delete markers and the objects disappear from your bucket.

4. Delete the delete markers.

To illustrate how the delete markers work, the sample deletes the delete markers. In the Multi-Object Delete request, it specifies the object keys and the version IDs of the delete markers it received in the response in the preceding step. This action makes the objects reappear in your bucket.

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Generic;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class DeleteMultipleObjectsVersionedBucket
    {
        static string bucketName = "**** Provide a bucket name ****";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {

                // 1. Enable versioning on the bucket.
                EnableVersioningOnBucket(bucketName);

                // 2a. Upload the sample objects.
                var keysAndVersions1 = PutObjects(3);
                // 2b. Delete the specific object versions.
                VersionedDelete(keysAndVersions1);

                // 3a. Upload the sample objects.
                var keysAndVersions2 = PutObjects(3);
```

```
        // 3b. Delete objects using only keys. Amazon S3 creates a delete marker
and
        // returns its version Id in the response.
        List<DeletedObject> deletedObjects = NonVersionedDelete(keysAndVersions2);

the
        // 3c. Additional exercise - using a multi-object versioned delete, remove
objects
        // delete markers received in the preceding response. This results in your
        // reappearing in your bucket.
        RemoveMarkers(deletedObjects);
    }

    Console.WriteLine("Click ENTER to continue.....");
    Console.ReadLine();
}

private static void PrintDeletionReport(DeleteObjectsException e)
{
    var errorResponse = e.Response;
    Console.WriteLine("No. of objects successfully deleted = {0}",
errorResponse.DeletedObjects.Count);
    Console.WriteLine("No. of objects failed to delete = {0}",
errorResponse.DeleteErrors.Count);
    Console.WriteLine("Printing error data...");
    foreach (DeleteError deleteError in errorResponse.DeleteErrors)
    {
        Console.WriteLine("Object Key: {0}\t{1}\t{2}", deleteError.Key,
deleteError.Code, deleteError.Message);
    }
}

static void EnableVersioningOnBucket(string bucketName)
{
    PutBucketVersioningRequest setBucketVersioningRequest = new
PutBucketVersioningRequest
    {
        BucketName = bucketName,
        VersioningConfig = new S3BucketVersioningConfig { Status =
VersionStatus.Enabled }
    };
    client.PutBucketVersioning(setBucketVersioningRequest);
}

static void VersionedDelete(List<KeyVersion> keys)
{
    // a. Perform a multi-object delete by specifying the key names and version
IDs.
    DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest
    {
        BucketName = bucketName,
        Objects = keys // This includes the object keys and specific version IDs.
    };
    try
    {
        Console.WriteLine("Executing VersionedDelete...");
        DeleteObjectsResponse response =
client.DeleteObjects(multiObjectDeleteRequest);
        Console.WriteLine("Successfully deleted all the {0} items",
response.DeletedObjects.Count);
    }
    catch (DeleteObjectsException e)
    {
        PrintDeletionReport(e);
    }
}
```

```
static List<DeletedObject> NonVersionedDelete(List<KeyVersion> keys)
{
    // Create a request that includes only the object key names.
    DeleteObjectsRequest multiObjectDeleteRequest = new DeleteObjectsRequest();
    multiObjectDeleteRequest.BucketName = bucketName;

    foreach (var key in keys)
    {
        multiObjectDeleteRequest.AddKey(key.Key);
    }
    // Execute DeleteObjects - Amazon S3 add delete marker for each object
    // deletion. The objects disappear from your bucket.
    // You can verify that using the Amazon S3 console.
    DeleteObjectsResponse response;
    try
    {
        Console.WriteLine("Executing NonVersionedDelete...");
        response = client.DeleteObjects(multiObjectDeleteRequest);
        Console.WriteLine("Successfully deleted all the {0} items",
        response.DeletedObjects.Count);
    }
    catch (DeleteObjectsException e)
    {
        PrintDeletionReport(e);
        throw; // Some deletes failed. Investigate before continuing.
    }
    // This response contains the DeletedObjects list which we use to delete the
    delete markers.
    return response.DeletedObjects;
}

private static void RemoveMarkers(List<DeletedObject> deletedObjects)
{
    List<KeyVersion> keyVersionList = new List<KeyVersion>();

    foreach (var deletedObject in deletedObjects)
    {
        KeyVersion keyVersion = new KeyVersion
        {
            Key = deletedObject.Key,
            VersionId = deletedObject.DeleteMarkerVersionId
        };
        keyVersionList.Add(keyVersion);
    }
    // Create another request to delete the delete markers.
    var multiObjectDeleteRequest = new DeleteObjectsRequest
    {
        BucketName = bucketName,
        Objects = keyVersionList
    };

    // Now, delete the delete marker to bring your objects back to the bucket.
    try
    {
        Console.WriteLine("Removing the delete markers ....");
        var deleteObjectResponse = client.DeleteObjects(multiObjectDeleteRequest);
        Console.WriteLine("Successfully deleted all the {0} delete markers",
                        deleteObjectResponse.DeletedObjects.Count);
    }
    catch (DeleteObjectsException e)
    {
        PrintDeletionReport(e);
    }
}
```

```
static List<KeyVersion> PutObjects(int number)
{
    List<KeyVersion> keys = new List<KeyVersion>();

    for (int i = 0; i < number; i++)
    {
        string key = "ObjectToDelete-" + new System.Random().Next();
        PutObjectRequest request = new PutObjectRequest
        {
            BucketName = bucketName,
            Key = key,
            ContentBody = "This is the content body!",
        };

        PutObjectResponse response = client.PutObject(request);
        KeyVersion keyVersion = new KeyVersion
        {
            Key = key,
            VersionId = response.VersionId
        };

        keys.Add(keyVersion);
    }
    return keys;
}
```

## Deleting Multiple Objects Using the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to delete multiple objects from versioned and non-versioned Amazon S3 buckets. For more information about versioning, see [Using Versioning \(p. 448\)](#).

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

The following tasks guide you through using the PHP SDK classes to delete multiple objects from a non-versioned bucket.

### Deleting Multiple Objects (Non-Versioned Bucket)

1	Create an instance of an Amazon S3 client by using the <a href="#">Aws\S3\S3Client</a> class <code>factory()</code> method.
2	Execute the <a href="#">Aws\S3\S3Client::deleteObjects()</a> method. You need to provide a bucket name and an array of object keys as parameters. You can specify up to 1000 keys.

The following PHP code sample demonstrates deleting multiple objects from an Amazon S3 non-versioned bucket.

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname1 = '*** Your Object Key1 ***';
$keyname2 = '*** Your Object Key2 ***';
$keyname3 = '*** Your Object Key3 ***';

$s3 = S3Client::factory();
```

```
// Delete objects from a bucket
$result = $s3->deleteObjects(array(
    'Bucket' => $bucket,
    'Objects' => array(
        array('Key' => $keyname1),
        array('Key' => $keyname2),
        array('Key' => $keyname3),
    )
));
```

The following tasks guide you through deleting multiple objects from an Amazon S3 version-enabled bucket.

### Deleting Multiple Objects (Version-Enabled Bucket)

1	Create an instance of an Amazon S3 client by using the <code>Aws\S3\S3Client</code> class <code>factory()</code> method.
2	<p>Execute the <code>Aws\S3\S3Client::deleteObjects()</code> method and provide a list of objects keys and optionally the version IDs of the objects that you want to delete.</p> <p>If you specify version ID of the object that you want to delete, Amazon S3 deletes the specific object version. If you don't specify the version ID of the object that you want to delete, Amazon S3 adds a delete marker. For more information, see <a href="#">Deleting One Object Per Request (p. 250)</a>.</p>

The following PHP code sample demonstrates deleting multiple objects from an Amazon S3 version-enabled bucket.

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';
$versionId1 = '*** Your Object Key Version ID1 ***';
$versionId2 = '*** Your Object Key Version ID2 ***';
$versionId3 = '*** Your Object Key Version ID3 ***';

$s3 = S3Client::factory();

// Delete object versions from a versioning-enabled bucket.
$result = $s3->deleteObjects(array(
    'Bucket' => $bucket,
    'Objects' => array(
        array('Key' => $keyname, 'VersionId' => $versionId1),
        array('Key' => $keyname, 'VersionId' => $versionId2),
        array('Key' => $keyname, 'VersionId' => $versionId3),
    )
));
```

Amazon S3 returns a response that shows the objects that were deleted and objects it could not delete because of errors (for example, permission errors).

The following PHP code sample prints the object keys for objects that were deleted. It also prints the object keys that were not deleted and the related error messages.

```
echo "The following objects were deleted successfully:\n";
foreach ($result['Deleted'] as $object) {
    echo "Key: {$object['Key']}, VersionId: {$object['VersionId']}\n";
```

```
}

echo "\nThe following objects could not be deleted:\n";
foreach ($result['Errors'] as $object) {
    echo "Key: {$object['Key']}, VersionId: {$object['VersionId']}\n";
}
```

### Example 1: Multi-Object Delete (Non-Versioned Bucket)

The following PHP code example uses the `deleteObjects()` method to delete multiple objects from a bucket that is not version-enabled.

The example performs the following actions:

1. Creates a few objects by using the [Aws\S3\S3Client::putObject\(\)](#) method.
2. Lists the objects and gets the keys of the created objects using the [Aws\S3\S3Client::listObjects\(\)](#) method.
3. Performs a non-versioned delete by using the [Aws\S3\S3Client::deleteObjects\(\)](#) method.

For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';

// Instantiate the client.
$s3 = S3Client::factory();

// 1. Create a few objects.
for ($i = 1; $i <= 3; $i++) {
    $s3->putObject(array(
        'Bucket' => $bucket,
        'Key'     => "key{$i}",
        'Body'    => "content {$i}",
    ));
}

// 2. List the objects and get the keys.
$keyss = $s3->listObjects(array('Bucket' => $bucket))
    ->getPath('Contents/*/Key');

// 3. Delete the objects.
$result = $s3->deleteObjects(array(
    'Bucket'  => $bucket,
    'Objects' => array_map(function ($key) {
        return array('Key' => $key);
    }, $keyss),
));
```

### Example 2: Multi-Object Delete (Version-Enabled Bucket)

The following PHP code example uses the `deleteObjects()` method to delete multiple objects from a version-enabled bucket.

The example performs the following actions:

1. Enables versioning on the bucket by using the [Aws\S3\S3Client::putBucketVersioning\(\)](#) method.
2. Creates a few versions of an object by using the [Aws\S3\S3Client::putObject\(\)](#) method.
3. Lists the objects versions and gets the keys and version IDs for the created object versions using the [Aws\S3\S3Client::listObjectVersions\(\)](#) method.
4. Performs a versioned-delete by using the [Aws\S3\S3Client::deleteObjects\(\)](#) method with the retrieved keys and versions IDs.
5. Disables versioning on the bucket by using the [Aws\S3\S3Client::putBucketVersioning\(\)](#) method.

For information about running the PHP examples in this guide, go to [Running PHP Examples \(p. 616\)](#).

```
<?php

// Include the AWS SDK using the Composer autoloader.
require 'vendor/autoload.php';

use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// 1. Enable object versioning for the bucket.
$s3->putBucketVersioning(array(
    'Bucket' => $bucket,
    'Status' => 'Enabled',
));

// 2. Create a few versions of an object.
for ($i = 1; $i <= 3; $i++) {
    $s3->putObject(array(
        'Bucket' => $bucket,
        'Key'     => $keyname,
        'Body'    => "content {$i}",
    ));
}

// 3. List the objects versions and get the keys and version IDs.
$versions = $s3->listObjectVersions(array('Bucket' => $bucket))
    ->getPath('Versions');

// 4. Delete the object versions.
$result = $s3->deleteObjects(array(
    'Bucket'  => $bucket,
    'Objects' => array_map(function ($version) {
        return array(
            'Key'      => $version['Key'],
            'VersionId' => $version['VersionId']
        );
    }, $versions),
));

echo "The following objects were deleted successfully:\n";
foreach ($result['Deleted'] as $object) {
    echo "Key: {$object['Key']}, VersionId: {$object['VersionId']}\n";
}

echo "\nThe following objects could not be deleted:\n";
foreach ($result['Errors'] as $object) {
    echo "Key: {$object['Key']}, VersionId: {$object['VersionId']}\n";
```

```
}

// 5. Suspend object versioning for the bucket.
$s3->putBucketVersioning(array(
    'Bucket' => $bucket,
    'Status' => 'Suspended',
));
```

## Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::deleteObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::listObjects\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::listObjectVersions\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::putObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::putBucketVersioning\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Deleting Multiple Objects Using the REST API

You can use the AWS SDKs to delete multiple objects using the Multi-Object Delete API. However, if your application requires it, you can send REST requests directly. For more information, go to [Delete Multiple Objects](#) in the *Amazon Simple Storage Service API Reference*.

## Restoring Archived Objects

Objects archived to Amazon Glacier are not accessible in real-time. You must first initiate a restore request and then wait until a temporary copy of the object is available for the duration (number of days) that you specify in the request. The time it takes restore jobs to complete depends on which retrieval option you specify Standard, Expedited, or Bulk. For more information about archiving objects to Amazon Glacier, see [Transitioning to the GLACIER Storage Class \(Object Archival\) \(p. 127\)](#).

After you receive a temporary copy of the restored object, the object's storage class remains GLACIER (a GET or HEAD request will return GLACIER as the storage class). Note that when you restore an archive you pay for both the archive (GLACIER rate) and a copy you restored temporarily (RRS rate). For information about pricing, see [Amazon S3 Pricing](#).

The following topics provide more information.

### Topics

- [Archive Retrieval Options \(p. 275\)](#)
- [Restore an Archived Object Using the Amazon S3 Console \(p. 276\)](#)
- [Restore an Archived Object Using the AWS SDK for Java \(p. 277\)](#)
- [Restore an Archived Object Using the AWS SDK for .NET \(p. 278\)](#)
- [Restore an Archived Object Using the REST API \(p. 280\)](#)

## Archive Retrieval Options

You can specify one of the following when restoring an archived object:

- **Expedited** - Expedited retrievals allow you to quickly access your data when occasional urgent requests for a subset of archives are required. For all but the largest archived objects (250 MB+), data accessed using Expedited retrievals are typically made available within 1–5 minutes. There are two types of Expedited retrievals: On-Demand and Provisioned. On-Demand requests are similar to EC2 On-Demand instances and are available most of the time. Provisioned requests are guaranteed to be available when you need them. For more information, see [Provisioned Capacity \(p. 276\)](#).
- **Standard** - Standard retrievals allow you to access any of your archived objects within several hours. Standard retrievals typically complete within 3–5 hours. This is the default option for retrieval requests that do not specify the retrieval option.
- **Bulk** - Bulk retrievals are Amazon Glacier's lowest-cost retrieval option, enabling you to retrieve large amounts, even petabytes, of data inexpensively in a day. Bulk retrievals typically complete within 5–12 hours.

To make an Expedited, Standard, or Bulk retrieval, set the `Tier` request element in the [POST Object restore](#) REST API request to the option you want, or the equivalent in the AWS CLI, or AWS SDKs. For Expedited retrievals, there is no need to designate whether an expedited retrieval is On-Demand or Provisioned. If you have purchased provisioned capacity, all Expedited retrievals are automatically served through your provisioned capacity.

You can restore an archived object programmatically or by using the Amazon S3 console. Amazon S3 processes only one restore request at a time per object. You can use both the console and the Amazon S3 API to check the restoration status and to find out when Amazon S3 will delete the restored copy.

## Provisioned Capacity

Provisioned capacity guarantees that your retrieval capacity for expedited retrievals is available when you need it. Each unit of capacity ensures that at least three expedited retrievals can be performed every five minutes and provides up to 150 MB/s of retrieval throughput.

You should purchase provisioned retrieval capacity if your workload requires highly reliable and predictable access to a subset of your data in minutes. Without provisioned capacity Expedited retrievals are accepted, except for rare situations of unusually high demand. However, if you require access to Expedited retrievals under all circumstances, you must purchase provisioned retrieval capacity. You can purchase provisioned capacity using the Amazon S3 console, the Amazon Glacier console, the [Purchase Provisioned Capacity](#) REST API, the AWS SDKs, or the AWS CLI. For provisioned capacity pricing information, see the [Amazon Glacier Pricing](#).

## Restore an Archived Object Using the Amazon S3 Console

You can use the Amazon S3 console to restore a copy of an object that has been archived to Amazon Glacier. For instructions on how to restore an archive using the AWS Management Console, see [How Do I Restore an S3 Object that has been Archived to Amazon Glacier?](#) in the *Amazon Simple Storage Service Console User Guide*.

Note that when you restore an archive you are paying for both the archive and a copy you restored temporarily. For information about pricing, see [Amazon S3 Pricing](#).

Amazon S3 restores a temporary copy of the object only for the specified duration. After that Amazon S3 deletes the restored object copy. You can modify the expiration period of a restored copy, by reissuing a restore, in which case Amazon S3 updates the expiration period, relative to the current time.

Amazon S3 calculates expiration time of the restored object copy by adding the number of days specified in the restoration request to the current time and rounding the resulting time to the next day midnight UTC. For example, if an object was created on 10/15/2012 10:30 am UTC and the restoration period was specified as 3 days, then the restored copy expires on 10/19/2012 00:00 UTC at which time Amazon S3 delete the object copy.

You can restore an object copy for any number of days. However you should restore objects only for the duration you need because of the storage costs associated with the object copy. For pricing information, see [Amazon S3 Pricing](#).

## Restore an Archived Object Using the AWS SDK for Java

The following tasks guide you through use the AWS SDK for Java to initiate a restoration of an archived object.

### Downloading Objects

1	Create an instance of the <code>AmazonS3Client</code> class.
2	Create an instance of <code>RestoreObjectRequest</code> class by providing bucket name, object key to restore and the number of days for which you the object copy restored.
3	Execute one of the <code>AmazonS3.RestoreObject</code> methods to initiate the archive restoration.

The following Java code sample demonstrates the preceding tasks.

### Example

```
String bucketName = "examplebucket";
String objectkey = "examplekey";
AmazonS3Client s3Client = new AmazonS3Client();

RestoreObjectRequest request = new RestoreObjectRequest(bucketName, objectkey, 2);
s3Client.restoreObject(request);
```

Amazon S3 maintains the restoration status in the object metadata. You can retrieve object metadata and check the value of the `RestoreInProgress` property as shown in the following Java code snippet.

```
String bucketName = "examplebucket";
String objectkey = "examplekey";
AmazonS3Client s3Client = new AmazonS3Client();

client = new AmazonS3Client();

GetObjectMetadataRequest request = new GetObjectMetadataRequest(bucketName, objectKey);

ObjectMetadata response = s3Client.getObjectMetadata(request);

Boolean restoreFlag = response.getOngoingRestore();
System.out.format("Restoration status: %s.\n",
    (restoreFlag == true) ? "in progress" : "finished");
```

### Example

The following Java code example initiates a restoration request for the specified archived object. You must update the code and provide a bucket name and an archived object key name. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3Client;
```

```

import com.amazonaws.services.s3.model.AmazonS3Exception;
import com.amazonaws.services.s3.model.GetObjectMetadataRequest;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.RestoreObjectRequest;

public class RestoreArchivedObject {

    public static String bucketName = "*** Provide bucket name ***";
    public static String objectKey = "*** Provide object key name ***";
    public static AmazonS3Client s3Client;

    public static void main(String[] args) throws IOException {
        AmazonS3Client s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

        try {

            RestoreObjectRequest requestRestore = new RestoreObjectRequest(bucketName,
objectKey, 2);
            s3Client.restoreObject(requestRestore);

            GetObjectMetadataRequest requestCheck = new GetObjectMetadataRequest(bucketName,
objectKey);
            ObjectMetadata response = s3Client.getObjectMetadata(requestCheck);

            Boolean restoreFlag = response.getOngoingRestore();
            System.out.format("Restoration status: %s.\n",
                (restoreFlag == true) ? "in progress" : "finished");

        } catch (AmazonS3Exception amazonS3Exception) {
            System.out.format("An Amazon S3 error occurred. Exception: %s",
amazonS3Exception.toString());
        } catch (Exception ex) {
            System.out.format("Exception: %s", ex.toString());
        }
    }
}

```

## Restore an Archived Object Using the AWS SDK for .NET

The following tasks guide you through using the AWS SDK for .NET to initiate a restoration of an archived object.

### Downloading Objects

1	Create an instance of the <code>AmazonS3</code> class.
2	Create an instance of <code>RestoreObjectRequest</code> class by providing bucket name, object key to restore and the number of days for which you the object copy restored.
3	Execute one of the <code>AmazonS3.RestoreObject</code> methods to initiate the archive restoration.

The following C# code sample demonstrates the preceding tasks.

### Example

```

IAmazonS3 client;
string bucketName = "examplebucket";
string objectKey = "examplekey";

client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

```

```
RestoreObjectRequest restoreRequest = new RestoreObjectRequest()
{
    BucketName = bucketName,
    Key = objectKey,
    Days = 2
};

client.RestoreObject(restoreRequest);
```

Amazon S3 maintains the restoration status in the object metadata. You can retrieve object metadata and check the value of the `RestoreInProgress` property as shown in the following C# code snippet.

```
IAmazonS3 client;
string bucketName = "examplebucket";
string objectKey = "examplekey";

client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

GetObjectMetadataRequest metadataRequest = new GetObjectMetadataRequest()
{
    BucketName = bucketName,
    Key = objectKey
};
GetObjectMetadataResponse response = client.GetObjectMetadata(metadataRequest);
Console.WriteLine("Restoration status: {0}", response.RestoreInProgress);
if (response.RestoreInProgress == false)
    Console.WriteLine("Restored object copy expires on: {0}", response.RestoreExpiration);
```

### Example

The following C# code example initiates a restoration request for the specified archived object. You must update the code and provide a bucket name and an archived object key name. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class RestoreArchivedObject
    {
        static string bucketName = "*** provide bucket name ***";
        static string objectKey = "*** archived object keyname ***";

        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            try
            {
                using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
                {
                    RestoreObject(client, bucketName, objectKey);
                    CheckRestorationStatus(client, bucketName, objectKey);
                }

                Console.WriteLine("Example complete. To continue, click Enter...");
                Console.ReadKey();
            }
            catch (AmazonS3Exception amazonS3Exception)
            {
```

```
        Console.WriteLine("S3 error occurred. Exception: " +
amazonS3Exception.ToString());
    }
    catch (Exception e)
    {
        Console.WriteLine("Exception: " + e.ToString());
    }
}

static void RestoreObject(IAmazonS3 client, string bucketName, string objectKey)
{
    RestoreObjectRequest restoreRequest = new RestoreObjectRequest
    {
        BucketName = bucketName,
        Key = objectKey,
        Days = 2
    };
    RestoreObjectResponse response = client.RestoreObject(restoreRequest);
}

static void CheckRestorationStatus(IAmazonS3 client, string bucketName, string
objectKey)
{
    GetObjectMetadataRequest metadataRequest = new GetObjectMetadataRequest
    {
        BucketName = bucketName,
        Key = objectKey
    };
    GetObjectMetadataResponse response = client.GetObjectMetadata(metadataRequest);
    Console.WriteLine("Restoration status: {0}", response.RestoreInProgress);
    if (response.RestoreInProgress == false)
        Console.WriteLine("Restored object copy expires on: {0}",
response.RestoreExpiration);
}
}
```

## Restore an Archived Object Using the REST API

Amazon S3 provides an API for you to initiate an archive restoration. For more information, see [POST Object restore](#) in the *Amazon Simple Storage Service API Reference*.

# Amazon S3 Analytics – Storage Class Analysis

By using Amazon S3 analytics *storage class analysis* you can analyze storage access patterns to help you decide when to transition the right data to the right storage class. This new Amazon S3 analytics feature observes data access patterns to help you determine when to transition less frequently accessed STANDARD storage to the STANDARD\_IA (IA, for infrequent access) storage class. For more information about storage classes, see [Storage Classes \(p. 111\)](#).

After storage class analysis observes the infrequent access patterns of a filtered set of data over a period of time, you can use the analysis results to help you improve your lifecycle policies. You can configure storage class analysis to analyze all the objects in a bucket. Or, you can configure filters to group objects together for analysis by common prefix (that is, objects that have names that begin with a common string), by object tags, or by both prefix and tags. You'll most likely find that filtering by object groups is the best way to benefit from storage class analysis.

You can have multiple storage class analysis filters per bucket, up to 1,000, and will receive a separate analysis for each filter. Multiple filter configurations allow you analyze specific groups of objects to improve your lifecycle policies that transition objects to STANDARD\_IA.

Storage class analysis shows storage usage visualizations in the Amazon S3 console that are updated daily. The storage usage data can also be exported daily to a file in an S3 bucket. You can open the exported usage report file in a spreadsheet application or use it with the business intelligence tools of your choice such as Amazon QuickSight.

## Topics

- [How Do I Set Up Storage Class Analysis? \(p. 281\)](#)
- [How Do I Use Storage Class Analysis? \(p. 282\)](#)
- [How Can I Export Storage Class Analysis Data? \(p. 284\)](#)
- [Amazon S3 Analytics REST APIs \(p. 285\)](#)

## How Do I Set Up Storage Class Analysis?

You set up storage class analysis by configuring what object data you want to analyze. You can configure storage class analysis to do the following:

- **Analyze the entire contents of a bucket.**

You'll receive an analysis for all the objects in the bucket.

- **Analyze objects grouped together by prefix and tags.**

You can configure filters that group objects together for analysis by prefix, or by object tags, or by a combination of prefix and tags. You receive a separate analysis for each filter you configure. You can have multiple filter configurations per bucket, up to 1,000.

- **Export analysis data.**

When you configure storage class analysis for a bucket or filter, you can choose to have the analysis data exported to a file each day. The analysis for the day is added to the file to form a historic analysis log for the configured filter. The file is updated daily at the destination of your choice. When selecting data to export, you specify a destination bucket and optional destination prefix where the file is written.

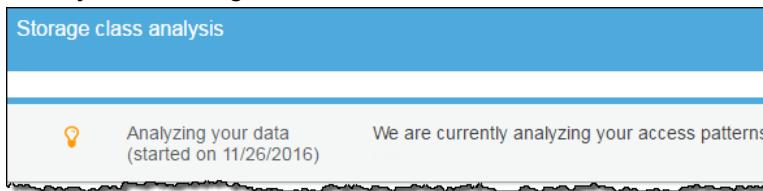
You can use the Amazon S3 console, the REST API, or the AWS CLI or AWS SDKs to configure storage class analysis.

- For information about how to configure storage class analysis in the Amazon S3 console, see [How Do I Configure Storage Class Analysis?](#).
- To use the Amazon S3 API, use the [PutBucketAnalyticsConfiguration](#) REST API, or the equivalent, from the AWS CLI or AWS SDKs.

## How Do I Use Storage Class Analysis?

You use storage class analysis to observe your data access patterns over time to gather information to help you improve the lifecycle management of your STANDARD\_IA storage. After you configure a filter, you'll start seeing data analysis based on the filter in the Amazon S3 console in 24 to 48 hours. However, storage class analysis observes the access patterns of a filtered data set for 30 days or longer to gather information for analysis before giving a result. The analysis continues to run after the initial result and updates the result as the access patterns change.

When you first configure a filter the Amazon S3 console shows a message similar to the following.



Storage class analysis observes the access patterns of a filtered object data set for 30 days or longer to gather enough information for the analysis. After storage class analysis has gathered sufficient information, you'll see a message in the Amazon S3 console similar to the following.

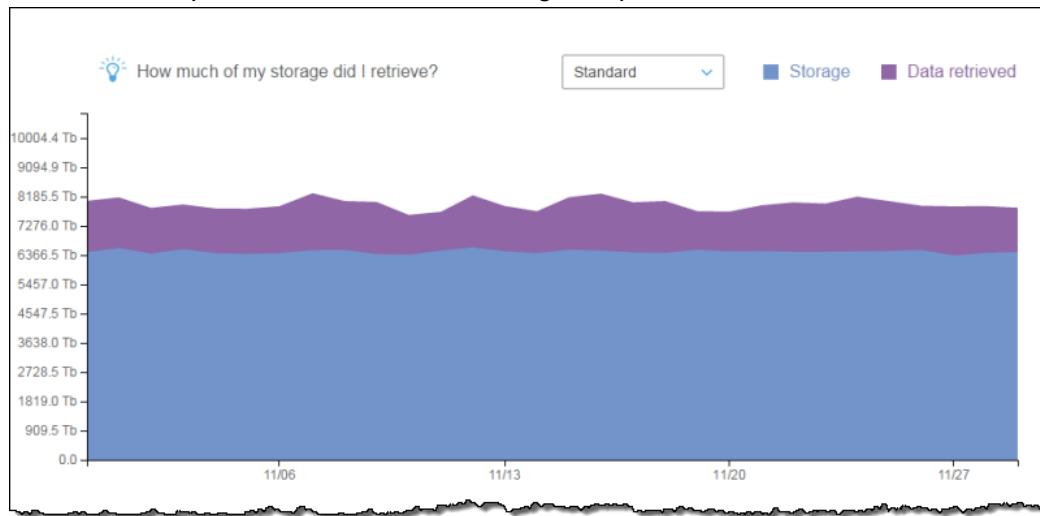


When performing the analysis for infrequently accessed objects storage class analysis looks at the filtered set of objects grouped together based on age since they were uploaded to Amazon S3. Storage class analysis determines if the age group is infrequently accessed by looking at the following factors for the filtered data set:

- Objects in the STANDARD storage class that are larger than 128K.
- How much average total storage you have per age group.
- Average number of bytes transferred out (not frequency) per age group.
- Analytics export data only includes requests with data relevant to storage class analysis. This might cause differences in the number of requests, and the total upload and request bytes compared to what are shown in storage metrics or tracked by your own internal systems.
- Failed GET and PUT requests are not counted for the analysis. However, you will see failed requests in storage metrics.

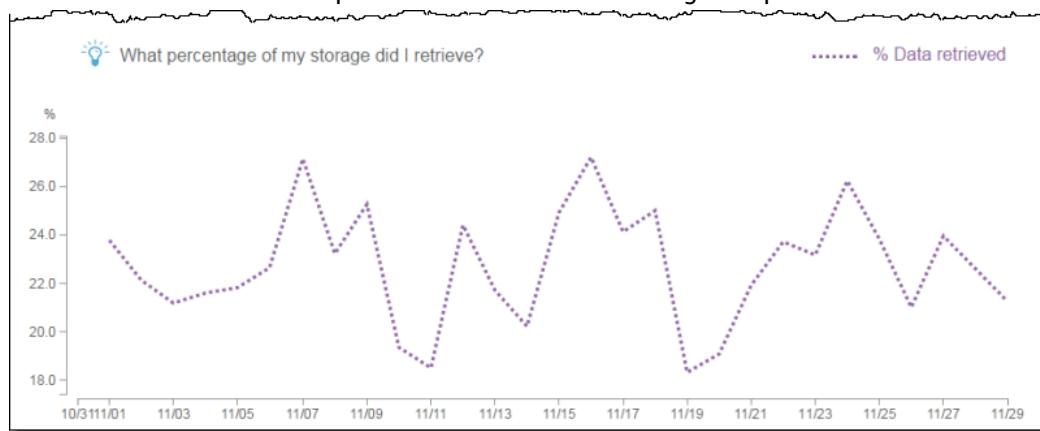
### How Much of My Storage did I Retrieve?

The Amazon S3 console graphs how much of the storage in the filtered data set has been retrieved for the observation period as shown in the following example.



### What Percentage of My Storage did I Retrieve?

The Amazon S3 console also graphs what percentage of the storage in the filtered data set has been retrieved for the observation period as shown in the following example.



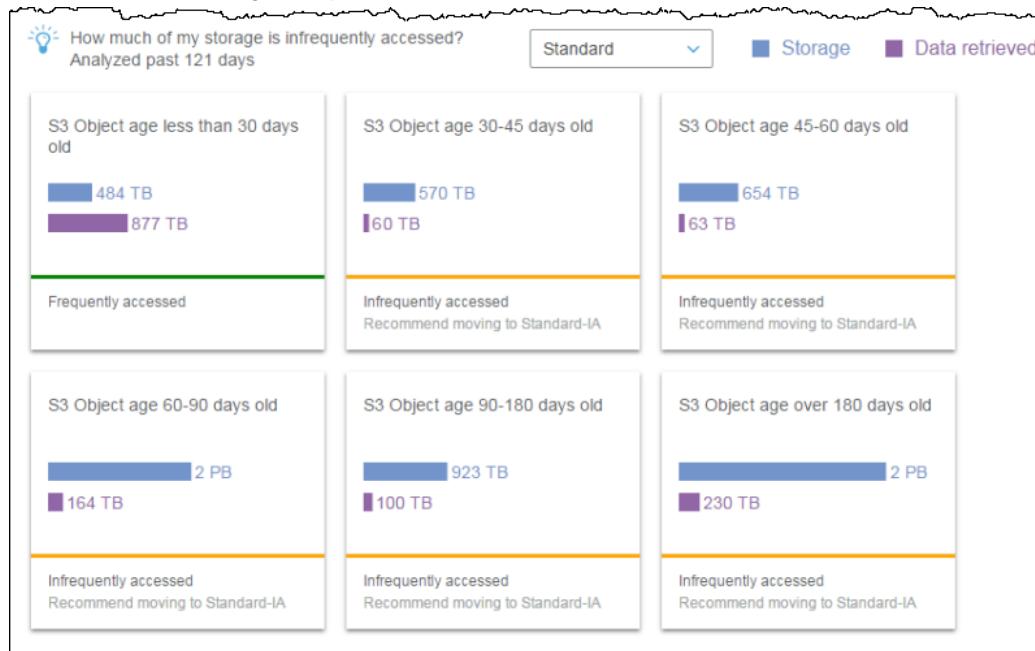
As stated earlier in this topic, when you are performing the analysis for infrequently accessed objects, storage class analysis looks at the filtered set of objects grouped together based on the age since they were uploaded to Amazon S3. The storage class analysis uses the following predefined object age groups:

- Amazon S3 Objects 0-29 days old
- Amazon S3 Objects 30-44 days old
- Amazon S3 Objects 45-59 days old
- Amazon S3 Objects 60-74 days old
- Amazon S3 Objects 75-89 days old
- Amazon S3 Objects 90-179 days old
- Amazon S3 Objects 180-364 days old
- Amazon S3 Objects 365 days and older

Usually it takes about 30 days of observing access patterns to gather enough information for an analysis result. It might take longer than 30 days, depending on the unique access pattern of your data. However, after you configure a filter you'll start seeing data analysis based on the filter in the Amazon S3 console in 24 to 48 hours. You can see analysis on a daily basis of object access broken down by object age group in the Amazon S3 console.

#### How Much of My Storage is Infrequently Accessed?

The Amazon S3 console shows the access patterns grouped by the predefined object age groups as shown in the following example.



The **Frequently accessed** or **Infrequently accessed** text shown at the bottom of each age group is based on the same logic as the lifecycle policy recommendation being prepared. After a recommended age for a lifecycle policy is ready (`RecommendedObjectAge`), all of the age tiers younger than that recommended age are marked as infrequently accessed, regardless of the current cumulative access ratio. This text is meant as a visual aid to help you in the lifecycle creation process.

## How Can I Export Storage Class Analysis Data?

You can choose to have storage class analysis export analysis reports to a comma-separated values (CSV) flat file. Reports are updated daily and are based on the object age group filters you configure. When using the Amazon S3 console you can choose the export report option when you create a filter. When

selecting data export you specify a destination bucket and optional destination prefix where the file is written. You can export the data to a destination bucket in a different account. The destination bucket must be in the same region as the bucket that you configure to be analyzed.

You must create a bucket policy on the destination bucket to grant permissions to Amazon S3 to verify what AWS account owns the bucket and to write objects to the bucket in the defined location. For an example policy, see [Granting Permissions for Amazon S3 Inventory and Amazon S3 Analytics \(p. 369\)](#).

After you configure storage class analysis reports, you start getting the exported report daily after 24 hours. After that, Amazon S3 continues monitoring and providing daily exports.

You can open the CSV file in a spreadsheet application or import the file into other applications like [Amazon QuickSight](#). For information on using Amazon S3 files with Amazon QuickSight, see [Create a Data Set Using Amazon S3 Files in the Amazon QuickSight User Guide](#).

Data in the exported file is sorted by date within object age group as shown in following examples.

Date	ConfigId	Filter	StorageClass	ObjectAge	ObjectCount	DataUploaded_Storage_MB	DataRetrieved_M_GetRequestCount	CumulativeAccessRate	ObjectAgeRange
8/1/2016	SalesMaterial	SalesMaterial	Standard	0-29	99361.08	8612.24	189144342	348604718.1	44310.6
<b>8/2/2016</b>	<b>SalesMaterial</b>	<b>SalesMaterial</b>	<b>Standard</b>	<b>0-29</b>	<b>94761.03</b>	<b>9109.1</b>	<b>183777648.1</b>	<b>349996157.6</b>	<b>46031.4</b>
8/3/2016	SalesMaterial	SalesMaterial	Standard	0-29	92001	8281	191574021	349411856.8	44740.8
8/4/2016	SalesMaterial	SalesMaterial	Standard	0-29	95681.04	8446.62	200980184.1	343109071.5	44740.8
8/5/2016	SalesMaterial	SalesMaterial	Standard	0-29	95681.04	9026.29	185305778.7	352049192.5	46461.6
8/6/2016	SalesMaterial	SalesMaterial	Standard	0-29	94761.03	8860.67	202435642	332460748.9	47322
8/7/2016	SalesMaterial	SalesMaterial	Standard	0-29	92001	9109.1	21245518.6	347074653.8	43450.2
8/8/2016	SalesMaterial	SalesMaterial	Standard	0-29	94761.03	8529.43	199462452.8	365424252.1	46031.4
8/9/2016	SalesMaterial	SalesMaterial	Standard	0-29	99361.08	8529.43	212902176.6	355353073.7	45171
8/10/2016	SalesMaterial	SalesMaterial	Standard	0-29	92001	8529.43	20275517.5	33211272.7	44740.8

8/1/2016	SalesMaterial	SalesMaterial	Standard	30-44	97521.06	9026.29	217832433	442780495.8	44740.8	2.032665913
<b>8/2/2016</b>	<b>SalesMaterial</b>	<b>SalesMaterial</b>	<b>Standard</b>	<b>30-44</b>	<b>101201.1</b>	<b>9109.1</b>	<b>231381076.7</b>	<b>458951258.9</b>	<b>45171</b>	<b>1.983529792</b>
8/3/2016	SalesMaterial	SalesMaterial	Standard	30-44	101201.1	9026.29	241956555.1	434070059.9	43450.2	1.794
8/4/2016	SalesMaterial	SalesMaterial	Standard	30-44	94761.03	8777.86	241281747.4	430936722.5	44310.6	1.786031174
8/5/2016	SalesMaterial	SalesMaterial	Standard	30-44	100281.09	8612.24	213233098	427811450.3	44310.6	2.006308844
8/6/2016	SalesMaterial	SalesMaterial	Standard	30-44	98441.07	8363.81	244330005	429493048.4	46031.4	1.757839969
8/7/2016	SalesMaterial	SalesMaterial	Standard	30-44	93841.02	8446.62	238059172.1	469492499.5	45171	1.972167236
8/8/2016	SalesMaterial	SalesMaterial	Standard	30-44	92001	8943.48	237479011	466310770.8	45601.2	1.963587303
8/9/2016	SalesMaterial	SalesMaterial	Standard	30-44	95681.04	8943.48	225960068.4	444038669.9	43020	1.96512009
8/10/2016	SalesMaterial	SalesMaterial	Standard	30-44	92001	8777.86	233864801.1	455204965	45601.2	1.946444966

At the end of the report the object age group is ALL. The ALL rows contain cumulative totals for all the age groups for that day. If the storage class is STANDARD the ALL row also contains data for the columns ObjectAgeForSIATransition and RecommendedObjectAgeForSIATransition as shown in the following example.

Date	ConfigId	Filter	StorageClass	ObjectAge	ObjectCount	DataUploaded_Storage_MB	DataRetrieved_M_GetRequestCount	CumulativeAccessRate	ObjectAgeForSIATransition	RecommendedObjectAgeForSIATransition
11/23/2016	SalesMaterial	SalesMaterial	Standard	365+	100281.09	8777.86	583506551.9	58923399.9	46461.6	0.100981554
11/24/2016	SalesMaterial	SalesMaterial	Standard	365+	100281.09	8529.43	570691390.3	54882013.97	47322	0.096167587
11/25/2016	SalesMaterial	SalesMaterial	Standard	365+	97521.06	8860.67	595883672	15648244.34	43450.2	0.026260569
11/26/2016	SalesMaterial	SalesMaterial	Standard	365+	101201.1	8777.86	571873528.7	78079566.26	44740.8	0.136532929
11/27/2016	SalesMaterial	SalesMaterial	Standard	365+	95681.04	8777.86	582645345.9	27271268.8	47322	0.04680595
11/28/2016	SalesMaterial	SalesMaterial	Standard	365+	96601.05	8777.86	59707052	34990314.94	44310.6	0.058603364
11/29/2016	SalesMaterial	SalesMaterial	Standard	365+	98441.07	8529.43	583891030	15518920	44740.8	0.02657845
8/1/2016	SalesMaterial	SalesMaterial	Standard	ALL	765448.32	70636.93	257375002	2656337888	363088.8	0.03490-179 90-179
<b>8/2/2016</b>	<b>SalesMaterial</b>	<b>SalesMaterial</b>	<b>Standard</b>	<b>ALL</b>	<b>781088.49</b>	<b>69643.21</b>	<b>2602537079</b>	<b>2686926510</b>	<b>364379.4</b>	<b>0.03490-179 90-179</b>
8/3/2016	SalesMaterial	SalesMaterial	Standard	ALL	761768.28	69229.16	2646435092	2625371539	360507.6	0.03490-179 90-179
8/4/2016	SalesMaterial	SalesMaterial	Standard	ALL	779248.47	69808.83	2633110900	2652027513	365670	0.03490-179 90-179
8/5/2016	SalesMaterial	SalesMaterial	Standard	ALL	766368.33	69974.45	2625417579	2703528043	363949.2	0.03490-179 90-179
8/6/2016	SalesMaterial	SalesMaterial	Standard	ALL	772808.4	69560.4	2644142374	2738429893	371692.8	0.03490-179 90-179
8/7/2016	SalesMaterial	SalesMaterial	Standard	ALL	770986.38	69808.83	2689926676	2664024170	361798.2	0.03490-179 90-179
8/8/2016	SalesMaterial	SalesMaterial	Standard	ALL	771888.39	69808.83	2689926676	2664024170	361798.2	0.03490-179 90-179

The next section describes the columns used in the report.

## Exported File Layout

The following table describe the layout of the exported file.

## Amazon S3 Analytics REST APIs

The following are the REST operations used for storage inventory.

- [DELETE Bucket analytics configuration](#)
- [GET Bucket analytics configuration](#)
- [List Bucket Analytics Configuration](#)
- [PUT Bucket analytics configuration](#)

# Amazon S3 Inventory

Amazon S3 inventory is one of the tools Amazon S3 provides to help manage your storage. You can use it to audit and report on the replication and encryption status of your objects for business, compliance, and regulatory needs. You can also simplify and speed up business workflows and big data jobs using Amazon S3 inventory, which provides a scheduled alternative to the Amazon S3 synchronous `List` API operation.

Amazon S3 inventory provides comma-separated values (CSV) or [Apache optimized row columnar \(ORC\)](#) output files that list your objects and their corresponding metadata on a daily or weekly basis for an S3 bucket or a shared prefix (that is, objects that have names that begin with a common string). For information about Amazon S3 inventory pricing, see [Amazon S3 Pricing](#).

You can configure multiple inventory lists for a bucket. You can configure what object metadata to include in the inventory, whether to list all object versions or only current versions, where to store the inventory list file output, and whether to generate the inventory on a daily or weekly basis. You can also specify that the inventory list file be encrypted.

You can query Amazon S3 inventory using standard SQL by using Amazon Athena, Amazon Redshift Spectrum, and other tools such as [Presto](#), [Apache Hive](#), and [Apache Spark](#). It's easy to use Athena to run queries on your inventory files. You can use Athena for S3 inventory queries in all Regions where Athena is available.

## Topics

- [How Do I Set Up Amazon S3 Inventory? \(p. 287\)](#)
- [What's Included in an Amazon S3 Inventory? \(p. 290\)](#)
- [Where Are Inventory Lists Located? \(p. 291\)](#)
- [How Do I Know When an Inventory Is Complete? \(p. 292\)](#)
- [Querying Inventory with Amazon Athena \(p. 293\)](#)
- [Amazon S3 Inventory REST APIs \(p. 294\)](#)

## How Do I Set Up Amazon S3 Inventory?

This section describes how to set up an inventory, including details about the inventory source and destination buckets.

## Amazon S3 Inventory Source and Destination Buckets

The bucket that the inventory lists the objects for is called the *source bucket*. The bucket where the inventory list file is stored is called the *destination bucket*.

### Source Bucket

The inventory lists the objects that are stored in the source bucket. You can get inventory lists for an entire bucket or filtered by (object key name) prefix.

The source bucket:

- Contains the objects that are listed in the inventory.
- Contains the configuration for the inventory.

### Destination Bucket

Amazon S3 inventory list files are written to the destination bucket. To group all the inventory list files in a common location in the destination bucket, you can specify a destination (object key name) prefix in the inventory configuration.

The destination bucket:

- Contains the inventory file lists.
- Contains the manifest files that list all the file inventory lists that are stored in the destination bucket. For more information, see [What Is an Inventory Manifest? \(p. 291\)](#)
- Must have a bucket policy to give Amazon S3 permission to verify ownership of the bucket and permission to write files to the bucket.
- Must be in the same AWS Region as the source bucket.
- Can be the same as the source bucket.
- Can be owned by a different AWS account than the account that owns the source bucket.

## Setting Up Amazon S3 Inventory

Amazon S3 inventory helps you manage your storage by creating lists of the objects in an S3 bucket on a defined schedule. You can configure multiple inventory lists for a bucket. The inventory lists are published to CSV or ORC files in a destination bucket.

The easiest way to set up an inventory is by using the AWS Management Console, but you can also use the REST API, AWS CLI, or AWS SDKs. The console performs the first step of the following procedure for you: adding a bucket policy to the destination bucket.

### To set up Amazon S3 inventory for an S3 bucket

#### 1. Add a bucket policy for the destination bucket.

You must create a bucket policy on the destination bucket to grant permissions to Amazon S3 to write objects to the bucket in the defined location. For an example policy, see [Granting Permissions for Amazon S3 Inventory and Amazon S3 Analytics \(p. 369\)](#).

#### 2. Configure an inventory to list the objects in a source bucket and publish the list to a destination bucket.

When you configure an inventory list for a source bucket, you specify the destination bucket where you want the list to be stored, and whether you want to generate the list daily or weekly. You can also configure what object metadata to include and whether to list all object versions or only current versions.

You can specify that the inventory list file be encrypted by using Amazon S3-managed keys (SSE-S3) or AWS KMS-managed keys (SSE-KMS). For more information about SSE-S3 and SSE-KMS, see [Protecting Data Using Server-Side Encryption \(p. 410\)](#). If you plan to use SSE-KMS encryption, see Step 3.

- For information about how to use the console to configure an inventory list, see [How Do I Configure Amazon S3 Inventory?](#) in the *Amazon Simple Storage Service Console User Guide*.
  - To use the Amazon S3 API to configure an inventory list, use the [PUT Bucket inventory configuration REST API](#), or the equivalent from the AWS CLI or AWS SDKs.
- 3. To encrypt the inventory list file with SSE-KMS, grant Amazon S3 permission to use the AWS KMS key.**

You can configure encryption for the inventory list file by using the AWS Management Console, REST API, AWS CLI, or AWS SDKs. Whichever way you choose, you must grant Amazon S3 permission to use the AWS KMS customer master key (CMK) to encrypt the inventory file. You grant Amazon S3 permission by modifying the key policy for the AWS KMS CMK that is being used to encrypt the inventory file. For more information, see the next section, [Grant Amazon S3 Permission to Encrypt Using Your AWS KMS Key \(p. 289\)](#).

## Grant Amazon S3 Permission to Encrypt Using Your AWS KMS Key

You must grant Amazon S3 permission to encrypt using your AWS KMS key with a key policy. The following procedure describes how to use the AWS Identity and Access Management (IAM) console to modify the key policy for the AWS KMS CMK that is used to encrypt the inventory file.

### To grant permissions to encrypt using your AWS KMS key

1. Sign in to the AWS Management Console using the AWS account that owns the AWS KMS CMK, and open the IAM console at <https://console.aws.amazon.com/iam/>.
2. In the left navigation pane, choose **Encryption keys**.
3. For **Region**, choose the appropriate AWS Region. Do not use the region selector in the navigation bar (upper-right corner).
4. Choose the alias of the CMK that you want to encrypt inventory with.
5. In the **Key Policy** section of the page, choose **Switch to policy view**.
6. Using the **Key Policy** editor, insert following key policy into the existing policy and then choose **Save Changes**. You might want to copy the policy to the end of the existing policy.

```
{  
    "Sid": "Allow Amazon S3 use of the key",  
    "Effect": "Allow",  
    "Principal": {  
        "Service": "s3.amazonaws.com"  
    },  
    "Action": [  
        "kms:GenerateDataKey*"  
    ],  
    "Resource": "*"  
}
```

You can also use the AWS KMS PUT key policy API [PutKeyPolicy](#) to copy the key policy to the CMK that is being used to encrypt the inventory file. For more information about creating and editing AWS KMS CMKs, see [Getting Started](#) in the *AWS Key Management Service Developer Guide*.

# What's Included in an Amazon S3 Inventory?

An inventory list file contains a list of the objects in the source bucket and metadata for each object. The inventory lists are stored in the destination bucket as a CSV file compressed with GZIP or as an Apache optimized row columnar (ORC) file.

The inventory list contains a list of the objects in an S3 bucket and the following metadata for each listed object:

- **Bucket name** – The name of the bucket that the inventory is for.
- **Key name** – Object key name (or key) that uniquely identifies the object in the bucket.
- **Version ID** – Object version ID. When you enable versioning on a bucket, Amazon S3 assigns a version number to objects that are added to the bucket. For more information, see [Object Versioning \(p. 114\)](#). (This field is not included if the list is only for the current version of objects.)
- **IsLatest** – Set to `True` if the object is the current version of the object. (This field is not included if the list is only for the current version of objects.)
- **Size** – Object size in bytes.
- **Last modified date** – Object creation date or the last modified date, whichever is the latest.
- **ETag** – The entity tag is a hash of the object. The ETag reflects changes only to the contents of an object, not its metadata. The ETag may or may not be an MD5 digest of the object data. Whether it is depends on how the object was created and how it is encrypted.
- **Storage class** – Storage class used for storing the object. For more information, see [Storage Classes \(p. 111\)](#).
- **Multipart upload flag** – Set to `True` if the object was uploaded as a multipart upload. For more information, see [Multipart Upload Overview \(p. 187\)](#).
- **Delete marker** – Set to `True`, if the object is a delete marker. For more information, see [Object Versioning \(p. 114\)](#). (This field is not included if the list is only for the current version of objects.)
- **Replication status** – Set to `PENDING`, `COMPLETED`, `FAILED`, or `REPLICATED`. For more information, see [Finding the Cross-Region Replication Status \(p. 552\)](#).
- **Encryption status** – Set to `SSE-S3`, `SSE-C`, `SSE-KMS`, or `NOT-SSE`. The server-side encryption status for SSE-S3, SSE-KMS, and SSE with customer-provided keys (SSE-C). A status of `NOT-SSE` means that the object is not encrypted with server-side encryption. For more information, see [Protecting Data Using Encryption \(p. 409\)](#).

The following is an example CSV inventory list opened in a spreadsheet application. The heading row is shown only to help clarify the example; it is not included in the actual list.

Bucket	Key	VersionId	IsLatest	IsDeleteMarker	Size	LastModifiedDate	Etag	StorageClass	MultipartUploaded	ReplicationStatus
example-bucket	object1			FALSE	2.4E+08	2016-08-11T01:19:e80d8eda4	STANDARD		TRUE	
example-bucket	object2			FALSE	0	2016-08-10T22:23:d41dbcd98	STANDARD		FALSE	
example-bucket	object3			FALSE	9	2016-08-10T20:18:9090441e4	STANDARD_IA		FALSE	
example-bucket	object4			FALSE	9	2016-08-10T20:36:9090441e4	STANDARD_IA		FALSE	
example-bucket	object1			FALSE	22	2016-08-10T20:35:9090441e4	STANDARD		FALSE	
example-bucket	object1			FALSE		2016-08-10T20:34:9090441e4	REDUCED_RED		FALSE	
example-bucket	object1			FALSE		2016-08-10T21:13:9090441e4	GLACIER		FALSE	

We recommend that you create a lifecycle policy that deletes old inventory lists. For more information, see [Object Lifecycle Management \(p. 125\)](#).

## Inventory Consistency

All of your objects might not appear in each inventory list. The inventory list provides eventual consistency for PUTs of both new objects and overwrites, and DELETEs. Inventory lists are a rolling

snapshot of bucket items, which are eventually consistent (that is, the list might not include recently added or deleted objects).

To validate the state of the object before you take action on the object, we recommend that you perform a `HEAD Object` REST API request to retrieve metadata for the object, or check the object's properties in the Amazon S3 console. You can also check object metadata with the AWS CLI or the AWS SDKs. For more information, see [HEAD Object](#) in the *Amazon Simple Storage Service API Reference*.

## Where Are Inventory Lists Located?

When an inventory list is published, the manifest files are published to the following location in the destination bucket.

```
destination-prefix/source-bucket/config-ID/YYYY-MM-DDTHH-MMZ/manifest.json
destination-prefix/source-bucket/config-ID/YYYY-MM-DDTHH-MMZ/manifest.checksum
destination-prefix/source-bucket/config-ID/hive/dt=YYYY-MM-DD-HH-MM/symlink.txt
```

- `destination-prefix` is the (object key name) prefix set in the inventory configuration, which can be used to group all the inventory list files in a common location within the destination bucket.
- `source-bucket` is the source bucket that the inventory list is for. It is added to prevent collisions when multiple inventory reports from different source buckets are sent to the same destination bucket.
- `config-ID` is added to prevent collisions with multiple inventory reports from the same source bucket that are sent to the same destination bucket.
- `YYYY-MM-DDTHH-MMZ` is the date when the inventory list is generated. For example, 2016-11-06T21-32Z.
- `manifest.json` is the manifest file.
- `manifest.checksum` is the MD5 of the content of the `manifest.json` file.
- `symlink.txt` is the Apache Hive-compatible manifest file.

The inventory lists are published daily or weekly to the following location in the destination bucket.

```
destination-prefix/source-bucket/data/example-file-name.csv.gz
...
destination-prefix/source-bucket/data/example-file-name-1.csv.gz
```

- `destination-prefix` is the (object key name) prefix set in the inventory configuration. It can be used to group all the inventory list files in a common location in the destination bucket.
- `source-bucket` is the source bucket that the inventory list is for. It is added to prevent collisions when multiple inventory reports from different source buckets are sent to the same destination bucket.
- `example-file-name.csv.gz` is one of the CSV inventory files. ORC inventory names end with the file name extension `.orc`.

## What Is an Inventory Manifest?

The manifest files `manifest.json` and `symlink.txt` describe where the inventory files are located. Whenever a new inventory list is delivered, it is accompanied by a new set of manifest files.

Each manifest contained in the `manifest.json` file provides metadata and other basic information about an inventory. This information includes source bucket name, destination bucket name, version of the inventory, format and schema of the inventory files, and the actual list of the inventory files that are in the destination bucket. Whenever a `manifest.json` file is written, it is accompanied by a `manifest.checksum` file that is the MD5 of the content of `manifest.json` file.

The following is an example of a manifest in a `manifest.json` file for a CSV formatted inventory.

```
{  
    "sourceBucket": "example-source-bucket",  
    "destinationBucket": "example-inventory-destination-bucket",  
    "version": "2016-11-30",  
    "fileFormat": "CSV",  
    "fileSchema": "Bucket, Key, VersionId, IsLatest, IsDeleteMarker, Size,  
LastModifiedDate, ETag, StorageClass, MultipartUploaded, ReplicationStatus",  
    "files": [  
        {  
            "key": "Inventory/example-source-bucket/2016-11-06T21-32Z/  
files/939c6d46-85a9-4ba8-87bd-9db705a579ce.csv.gz",  
            "size": 2147483647,  
            "MD5checksum": "f11166069f1990abeb9c97ace9cdfabc",  
            "inventoriedRecord": 58050695  
        }  
    ]  
}
```

The following is an example of a manifest in a `manifest.json` file for a ORC formatted inventory.

```
{  
    "sourceBucket": "example-source-bucket",  
    "destinationBucket": "arn:aws:s3:::example-destination-bucket",  
    "version": "2016-11-30",  
    "fileFormat": "ORC",  
    "fileSchema":  
"struct<bucket:string,key:string,version_id:string,is_latest:boolean,is_delete_marker:boolean,size:bigint>  
    "files": [  
        {  
            "key": "inventory/example-source-bucket/data/  
d794c570-95bb-4271-9128-26023c8b4900.orc",  
            "size": 56291,  
            "MD5checksum": "5925f4e78e1695c2d020b9f6eexample"  
        }  
    ]  
}
```

The `symlink.txt` file is an Apache Hive-compatible manifest file that allows Hive to automatically discover inventory files and their associated data files. The Hive-compatible manifest works with any Hive-compatible service, including Athena, AWS Glue, and Amazon Redshift Spectrum. It also works with Hive-compatible applications, including [Presto](#), [Apache Hive](#), [Apache Spark](#), and many others.

## How Do I Know When an Inventory Is Complete?

You can set up an Amazon S3 event notification to receive notice when the manifest checksum file is created, which indicates that an inventory list has been added to the destination bucket. The manifest is an up-to-date list of all the inventory lists at the destination location.

Amazon S3 can publish events to an Amazon Simple Notification Service (Amazon SNS) topic, an Amazon Simple Queue Service (Amazon SQS) queue, or an AWS Lambda function. For more information, see [Configuring Amazon S3 Event Notifications \(p. 500\)](#).

The following notification configuration defines that all `manifest.checksum` files newly added to the destination bucket are processed by the AWS Lambda `cloud-function-list-write`.

```
<NotificationConfiguration>
  <QueueConfiguration>
    <Id>1</Id>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>prefix</Name>
          <Value>destination-prefix/source-bucket</Value>
        </FilterRule>
        <FilterRule>
          <Name>suffix</Name>
          <Value>checksum</Value>
        </FilterRule>
      </S3Key>
    </Filter>
    <Cloudcode>arn:aws:lambda:us-west-2:222233334444:cloud-function-list-write</Cloudcode>
    <Event>s3:ObjectCreated:*</Event>
  </QueueConfiguration>
</NotificationConfiguration>
```

For more information, see [Using AWS Lambda with Amazon S3](#) in the *AWS Lambda Developer Guide*.

## Querying Inventory with Amazon Athena

You can query Amazon S3 inventory using standard SQL by using Amazon Athena in all Regions where Athena is available. To check for AWS Region availability, see the [AWS Region Table](#).

Athena can query Amazon S3 inventory files in ORC or CSV format. When you use Athena to query inventory, we recommend that you use ORC-formatted inventory files instead of CSV. ORC provides faster query performance and lower query costs. ORC is a self-describing type-aware columnar file format designed for [Apache Hadoop](#). The columnar format lets the reader read, decompress, and process only the columns that are required for the current query. The ORC format for Amazon S3 inventory is available in all AWS Regions.

### To get started using Athena to query Amazon S3 inventory

1. Create an Athena table. For information about creating a table, see [Getting Started](#) in the *Amazon Athena User Guide*.

The following sample query includes all optional fields in the inventory report. Drop any optional field that you did not choose for your inventory so that the query corresponds to the fields chosen for your inventory. Also, you must use your bucket name and the location. The location points to your inventory destination path; for example, `destination-prefix/source-bucket/config-ID/hive`.

```
CREATE EXTERNAL TABLE your-table-name(  
  `destination-bucket-name` string,  
  key string,  
  version_id string,  
  is_latest boolean,  
  is_delete_marker boolean,  
  size bigint,  
  last_modified_date timestamp,  
  e_tag string,  
  storage_class string,  
  is.multipart_uploaded boolean,
```

```
replication_status string,  
encryption_status string  
)  
PARTITIONED BY (dt string)  
ROW FORMAT SERDE 'org.apache.hadoop.hive.ql.io.orc.OrcSerde'  
STORED AS INPUTFORMAT 'org.apache.hadoop.hive.ql.io.SymlinkTextInputFormat'  
OUTPUTFORMAT 'org.apache.hadoop.hive.ql.io.IgnoreKeyTextOutputFormat'  
LOCATION 's3://destination-prefix/source-bucket/config-ID/hive';
```

2. To add new inventory lists to your table, use the following `MSCK REPAIR TABLE` command.

```
MSCK REPAIR TABLE your-table-name;
```

3. After performing the first two steps, you can run ad hoc queries on your inventory, as shown in the following example.

```
SELECT encryption_status, count(*) FROM your-table-name GROUP BY encryption_status;
```

For more information about using Athena, see [Amazon Athena User Guide](#).

## Amazon S3 Inventory REST APIs

The following are the REST operations used for Amazon S3 inventory.

- [DELETE Bucket inventory configuration](#)
- [GET Bucket inventory configuration](#)
- [List Bucket Inventory Configuration](#)
- [PUT Bucket inventory configuration](#)

# Managing Access Permissions to Your Amazon S3 Resources

By default, all Amazon S3 resources—buckets, objects, and related subresources (for example, lifecycle configuration and website configuration)—are private: only the resource owner, an AWS account that created it, can access the resource. The resource owner can optionally grant access permissions to others by writing an access policy.

Amazon S3 offers access policy options broadly categorized as resource-based policies and user policies. Access policies you attach to your resources (buckets and objects) are referred to as resource-based policies. For example, bucket policies and access control lists (ACLs) are resource-based policies. You can also attach access policies to users in your account. These are called user policies. You may choose to use resource-based policies, user policies, or some combination of these to manage permissions to your Amazon S3 resources. The introductory topics provide general guidelines for managing permissions.

We recommend you first review the access control overview topics. For more information, see [Introduction to Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#). Then for more information about specific access policy options, see the following topics:

- [Using Bucket Policies and User Policies \(p. 335\)](#)
- [Managing Access with ACLs \(p. 394\)](#)

## Introduction to Managing Access Permissions to Your Amazon S3 Resources

### Topics

- [Overview of Managing Access \(p. 296\)](#)
- [How Amazon S3 Authorizes a Request \(p. 301\)](#)
- [Guidelines for Using the Available Access Policy Options \(p. 306\)](#)
- [Example Walkthroughs: Managing Access to Your Amazon S3 Resources \(p. 309\)](#)

The topics in this section provide an overview of managing access permissions to your Amazon S3 resources and provides guidelines for when to use which access control method. The topic also provides introductory example walkthroughs. We recommend you review these topics in order.

## Overview of Managing Access

### Topics

- [Amazon S3 Resources \(p. 296\)](#)
- [Resource Operations \(p. 297\)](#)
- [Managing Access to Resources \(Access Policy Options\) \(p. 297\)](#)
- [So Which Access Control Method Should I Use? \(p. 300\)](#)
- [Related Topics \(p. 300\)](#)

When granting permissions, you decide who is getting them, which Amazon S3 resources they are getting permissions for, and specific actions you want to allow on those resources.

## Amazon S3 Resources

Buckets and objects are primary Amazon S3 resources, and both have associated subresources. For example, bucket subresources include the following:

- `lifecycle` – Stores lifecycle configuration information (see [Object Lifecycle Management \(p. 125\)](#)).
- `website` – Stores website configuration information if you configure your bucket for website hosting (see [Hosting a Static Website on Amazon S3 \(p. 471\)](#)).
- `versioning` – Stores versioning configuration (see [PUT Bucket versioning](#)).
- `policy` and `acl` (Access Control List) – Store access permission information for the bucket.
- `cors` (Cross-Origin Resource Sharing) – Supports configuring your bucket to allow cross-origin requests (see [Cross-Origin Resource Sharing \(CORS\) \(p. 155\)](#)).
- `logging` – Enables you to request Amazon S3 to save bucket access logs.

Object subresources include the following:

- `acl` – Stores a list of access permissions on the object. This topic discusses how to use this subresource to manage object permissions (see [Managing Access with ACLs \(p. 394\)](#)).
- `restore` – Supports temporarily restoring an archived object (see [POST Object restore](#)). An object in the Glacier storage class is an archived object. To access the object, you must first initiate a restore request, which restores a copy of the archived object. In the request, you specify the number of days that you want the restored copy to exist. For more information about archiving objects, see [Object Lifecycle Management \(p. 125\)](#).

## About the Resource Owner

By default, all Amazon S3 resources are private. Only a resource owner can access the resource. The resource owner refers to the AWS account that creates the resource. For example:

- The AWS account that you use to create buckets and objects owns those resources.
- If you create an AWS Identity and Access Management (IAM) user in your AWS account, your AWS account is the parent owner. If the IAM user uploads an object, the parent account, to which the user belongs, owns the object.
- A bucket owner can grant cross-account permissions to another AWS account (or users in another account) to upload objects. In this case, the AWS account that uploads objects owns those objects. The bucket owner does not have permissions on the objects that other accounts own, with the following exceptions:
  - The bucket owner pays the bills. The bucket owner can deny access to any objects, or delete any objects in the bucket, regardless of who owns them.

- The bucket owner can archive any objects or restore archived objects regardless of who owns them. Archival refers to the storage class used to store the objects. For more information, see [Object Lifecycle Management \(p. 125\)](#).

**Important**

AWS recommends not using the root credentials of your AWS account to make requests. Instead, create an IAM user, and grant that user full access. We refer to these users as administrator users. You can use the administrator user credentials, instead of root credentials of your account, to interact with AWS and perform tasks, such as create a bucket, create users, and grant them permissions. For more information, go to [Root Account Credentials vs. IAM User Credentials](#) in the *AWS General Reference* and [IAM Best Practices](#) in the *IAM User Guide*.

The following diagram shows an AWS account owning resources, the IAM users, buckets, and objects.



## Resource Operations

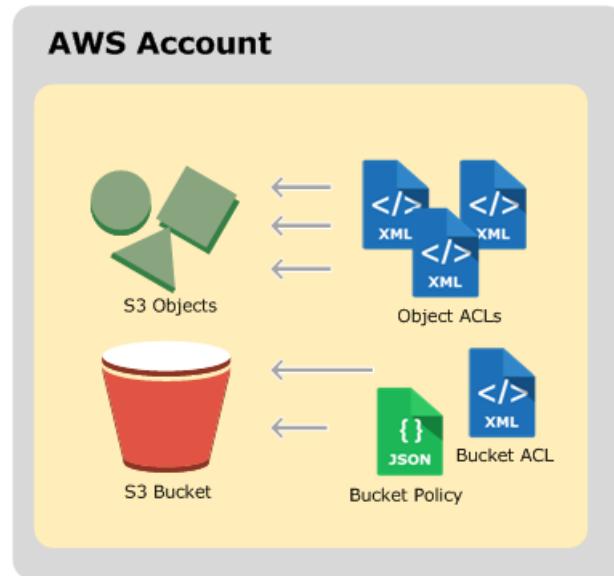
Amazon S3 provides a set of operations to work with the Amazon S3 resources. For a list of available operations, go to [Operations on Buckets](#) and [Operations on Objects](#) in the *Amazon Simple Storage Service API Reference*.

## Managing Access to Resources (Access Policy Options)

Managing access refers to granting others (AWS accounts and users) permission to perform the resource operations by writing an access policy. For example, you can grant `PUT Object` permission to a user in an AWS account so the user can upload objects to your bucket. In addition to granting permissions to individual users and accounts, you can grant permissions to everyone (also referred as anonymous access) or to all authenticated users (users with AWS credentials). For example, if you configure your bucket as a website, you may want to make objects public by granting the `GET Object` permission to everyone.

Access policy describes who has access to what. You can associate an access policy with a resource (bucket and object) or a user. Accordingly, you can categorize the available Amazon S3 access policies as follows:

- **Resource-based policies** – Bucket policies and access control lists (ACLs) are resource-based because you attach them to your Amazon S3 resources.



- **ACL** – Each bucket and object has an ACL associated with it. An ACL is a list of grants identifying grantee and permission granted. You use ACLs to grant basic read/write permissions to other AWS accounts. ACLs use an Amazon S3-specific XML schema.

The following is an example bucket ACL. The grant in the ACL shows a bucket owner as having full control permission.

```
<?xml version="1.0" encoding="UTF-8"?>
<AccessControlPolicy xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Owner>
    <ID>*** Owner-Canonical-User-ID ***</ID>
    <DisplayName>owner-display-name</DisplayName>
  </Owner>
  <AccessControlList>
    <Grant>
      <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                xsi:type="Canonical User">
        <ID>*** Owner-Canonical-User-ID ***</ID>
        <DisplayName>display-name</DisplayName>
      </Grantee>
      <Permission>FULL_CONTROL</Permission>
    </Grant>
  </AccessControlList>
</AccessControlPolicy>
```

Both bucket and object ACLs use the same XML schema.

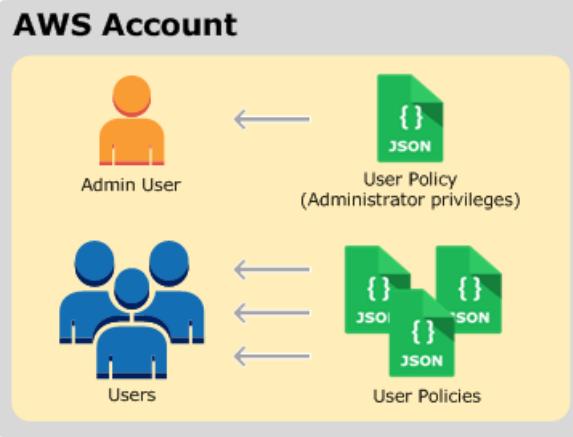
- **Bucket Policy** – For your bucket, you can add a bucket policy to grant other AWS accounts or IAM users permissions for the bucket and the objects in it. Any object permissions apply only to the objects that the bucket owner creates. Bucket policies supplement, and in many cases, replace ACL-based access policies.

The following is an example bucket policy. You express bucket policy (and user policy) using a JSON file. The policy grants anonymous read permission on all objects in a bucket. The bucket policy has one statement, which allows the `s3:GetObject` action (read permission) on objects in a bucket named `examplebucket`. By specifying the `principal` with a wild card (\*), the policy grants anonymous access.

```
{
```

```
"Version": "2012-10-17",
"Statement": [
    {
        "Effect": "Allow",
        "Principal": "*",
        "Action": ["s3:GetObject"],
        "Resource": ["arn:aws:s3:::examplebucket/*"]
    }
]
```

- **User policies** – You can use AWS Identity and Access Management (IAM) to manage access to your Amazon S3 resources. Using IAM, you can create IAM users, groups, and roles in your account and attach access policies to them granting them access to AWS resources including Amazon S3.



For more information about IAM, go to [AWS Identity and Access Management \(IAM\)](#) product detail page.

The following is an example of a user policy. You cannot grant anonymous permissions in an IAM user policy, because the policy is attached to a user. The example policy allows the associated user that it's attached to perform six different Amazon S3 actions on a bucket and the objects in it. You can attach this policy to a specific IAM user, group, or role.

```
{
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:PutObject",
                "s3:GetObject",
                "s3:DeleteObject",
                "s3>ListAllMyBuckets",
                "s3:GetBucketLocation",
                "s3>ListBucket"
            ],
            "Resource": "arn:aws:s3:::examplebucket/*"
        }
    ]
}
```

When Amazon S3 receives a request, it must evaluate all the access policies to determine whether to authorize or deny the request. For more information about how Amazon S3 evaluates these policies, see [How Amazon S3 Authorizes a Request \(p. 301\)](#).

## So Which Access Control Method Should I Use?

With the options available to write an access policy, the following questions arise:

- When should I use which access control method? For example, to grant bucket permissions, should I use bucket policy or bucket ACL? I own a bucket and the objects in the bucket. Should I use a resource-based access policy or an IAM user policy? If I use a resource-based access policy, should I use a bucket policy or an object ACL to manage object permissions?
- I own a bucket, but I don't own all of the objects in it. How are access permissions managed for the objects that somebody else owns?
- If I grant access by using a combination of these access policy options, how does Amazon S3 determine if a user has permission to perform a requested operation?

The following sections explains these access control alternatives, how Amazon S3 evaluates access control mechanisms, when to use which access control method, and also provide example walkthroughs.

[How Amazon S3 Authorizes a Request \(p. 301\)](#)

[Guidelines for Using the Available Access Policy Options \(p. 306\)](#)

[Example Walkthroughs: Managing Access to Your Amazon S3 Resources \(p. 309\)](#)

## Related Topics

We recommend that you first review the introductory topics that explain the options available for you to manage access to your Amazon S3 resources. For more information, see [Introduction to Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#). You can then use the following topics for more information about specific access policy options.

- [Using Bucket Policies and User Policies \(p. 335\)](#)
- [Managing Access with ACLs \(p. 394\)](#)

# How Amazon S3 Authorizes a Request

## Topics

- [Related Topics \(p. 302\)](#)
- [How Amazon S3 Authorizes a Request for a Bucket Operation \(p. 302\)](#)
- [How Amazon S3 Authorizes a Request for an Object Operation \(p. 305\)](#)

When Amazon S3 receives a request—for example, a bucket or an object operation—it first verifies that the requester has the necessary permissions. Amazon S3 evaluates all the relevant access policies, user policies, and resource-based policies (bucket policy, bucket ACL, object ACL) in deciding whether to authorize the request. The following are some of the example scenarios:

- If the requester is an IAM user, Amazon S3 must determine if the parent AWS account to which the user belongs has granted the user necessary permission to perform the operation. In addition, if the request is for a bucket operation, such as a request to list the bucket content, Amazon S3 must verify that the bucket owner has granted permission for the requester to perform the operation.

### Note

To perform a specific operation on a resource, an IAM user needs permission from both the parent AWS account to which it belongs and the AWS account that owns the resource.

- If the request is for an operation on an object that the bucket owner does not own, in addition to making sure the requester has permissions from the object owner, Amazon S3 must also check the bucket policy to ensure the bucket owner has not set explicit deny on the object.

### Note

A bucket owner (who pays the bill) can explicitly deny access to objects in the bucket regardless of who owns it. The bucket owner can also delete any object in the bucket

In order to determine whether the requester has permission to perform the specific operation, Amazon S3 does the following, in order, when it receives a request:

1. Converts all the relevant access policies (user policy, bucket policy, ACLs) at run time into a set of policies for evaluation.
2. Evaluates the resulting set of policies in the following steps. In each step, Amazon S3 evaluates a subset of policies in a specific context, based on the context authority.
  - a. **User context** – In the user context, the parent account to which the user belongs is the context authority.

Amazon S3 evaluates a subset of policies owned by the parent account. This subset includes the user policy that the parent attaches to the user. If the parent also owns the resource in the request (bucket, object), Amazon S3 also evaluates the corresponding resource policies (bucket policy, bucket ACL, and object ACL) at the same time.

A user must have permission from the parent account to perform the operation.

This step applies only if the request is made by a user in an AWS account. If the request is made using root credentials of an AWS account, Amazon S3 skips this step.

- b. **Bucket context** – In the bucket context, Amazon S3 evaluates policies owned by the AWS account that owns the bucket.

If the request is for a bucket operation, the requester must have permission from the bucket owner. If the request is for an object, Amazon S3 evaluates all the policies owned by the bucket owner to check if the bucket owner has not explicitly denied access to the object. If there is an explicit deny set, Amazon S3 does not authorize the request.

- c. **Object context** – If the request is for an object, Amazon S3 evaluates the subset of policies owned by the object owner.

The following sections describe in detail and provide examples:

- [How Amazon S3 Authorizes a Request for a Bucket Operation \(p. 302\)](#)
- [How Amazon S3 Authorizes a Request for an Object Operation \(p. 305\)](#)

## Related Topics

We recommend you first review the introductory topics that explain the options for managing access to your Amazon S3 resources. For more information, see [Introduction to Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#). You can then use the following topics for more information about specific access policy options.

- [Using Bucket Policies and User Policies \(p. 335\)](#)
- [Managing Access with ACLs \(p. 394\)](#)

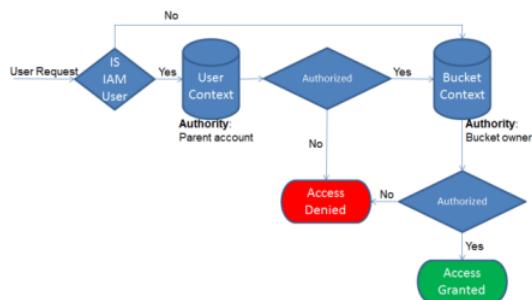
## How Amazon S3 Authorizes a Request for a Bucket Operation

When Amazon S3 receives a request for a bucket operation, Amazon S3 converts all the relevant permissions—resource-based permissions (bucket policy, bucket access control list (ACL)) and IAM user policy if the request is from a user—into a set of policies to evaluate at run time. It then evaluates the resulting set of policies in a series of steps according to a specific context—user context or bucket context.

1. **User context** – If the requester is an IAM user, the user must have permission from the parent AWS account to which it belongs. In this step, Amazon S3 evaluates a subset of policies owned by the parent account (also referred to as the context authority). This subset of policies includes the user policy that the parent account attaches to the user. If the parent also owns the resource in the request (in this case, the bucket), Amazon S3 also evaluates the corresponding resource policies (bucket policy and bucket ACL) at the same time. Whenever a request for a bucket operation is made, the server access logs record the canonical user ID of the requester. For more information, see [Server Access Logging \(p. 596\)](#).
2. **Bucket context** – The requester must have permissions from the bucket owner to perform a specific bucket operation. In this step, Amazon S3 evaluates a subset of policies owned by the AWS account that owns the bucket.

The bucket owner can grant permission by using a bucket policy or bucket ACL. Note that, if the AWS account that owns the bucket is also the parent account of an IAM user, then it can configure bucket permissions in a user policy.

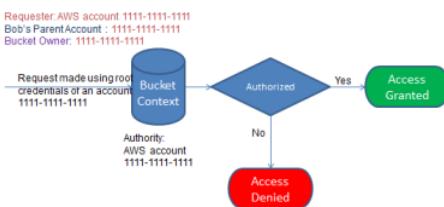
The following is a graphical illustration of the context-based evaluation for bucket operation.



The following examples illustrate the evaluation logic.

### Example 1: Bucket Operation Requested by Bucket Owner

In this example, the bucket owner sends a request for a bucket operation using the root credentials of the AWS account.

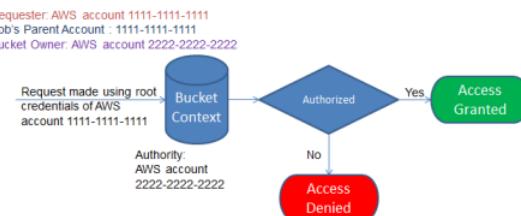


Amazon S3 performs the context evaluation as follows:

1. Because the request is made by using root credentials of an AWS account, the user context is not evaluated .
2. In the bucket context, Amazon S3 reviews the bucket policy to determine if the requester has permission to perform the operation. Amazon S3 authorizes the request.

### Example 2: Bucket Operation Requested by an AWS Account That Is Not the Bucket Owner

In this example, a request is made using root credentials of AWS account 1111-1111-1111 for a bucket operation owned by AWS account 2222-2222-2222. No IAM users are involved in this request.

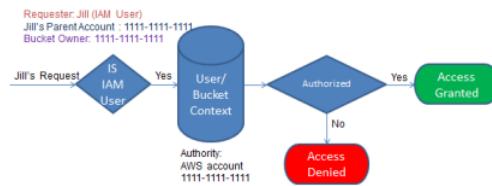


In this case, Amazon S3 evaluates the context as follows:

1. Because the request is made using root credentials of an AWS account, the user context is not evaluated.
2. In the bucket context, Amazon S3 examines the bucket policy. If the bucket owner (AWS account 2222-2222-2222) has not authorized AWS account 1111-1111-1111 to perform the requested operation, Amazon S3 denies the request. Otherwise, Amazon S3 grants the request and performs the operation.

## Example 3: Bucket Operation Requested by an IAM User Whose Parent AWS Account Is Also the Bucket Owner

In the example, the request is sent by Jill, an IAM user in AWS account 1111-1111-1111, which also owns the bucket.



Amazon S3 performs the following context evaluation:

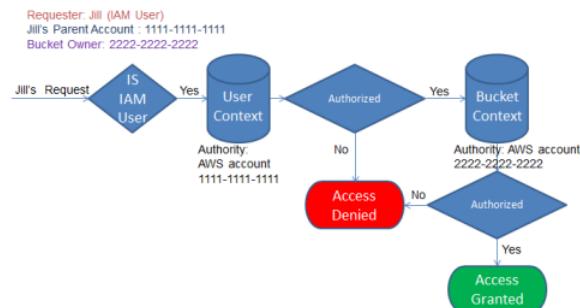
1. Because the request is from an IAM user, in the user context, Amazon S3 evaluates all policies that belong to the parent AWS account to determine if Jill has permission to perform the operation.

In this example, parent AWS account 1111-1111-1111, to which the user belongs, is also the bucket owner. As a result, in addition to the user policy, Amazon S3 also evaluates the bucket policy and bucket ACL in the same context, because they belong to the same account.

2. Because Amazon S3 evaluated the bucket policy and bucket ACL as part of the user context, it does not evaluate the bucket context.

## Example 4: Bucket Operation Requested by an IAM User Whose Parent AWS Account Is Not the Bucket Owner

In this example, the request is sent by Jill, an IAM user whose parent AWS account is 1111-1111-1111, but the bucket is owned by another AWS account, 2222-2222-2222.



Jill will need permissions from both the parent AWS account and the bucket owner. Amazon S3 evaluates the context as follows:

1. Because the request is from an IAM user, Amazon S3 evaluates the user context by reviewing the policies authored by the account to verify that Jill has the necessary permissions. If Jill has permission, then Amazon S3 moves on to evaluate the bucket context; if not, it denies the request.
2. In the bucket context, Amazon S3 verifies that bucket owner 2222-2222-2222 has granted Jill (or her parent AWS account) permission to perform the requested operation. If she has that permission, Amazon S3 grants the request and performs the operation; otherwise, Amazon S3 denies the request.

## How Amazon S3 Authorizes a Request for an Object Operation

When Amazon S3 receives a request for an object operation, it converts all the relevant permissions—resource-based permissions (object access control list (ACL), bucket policy, bucket ACL) and IAM user policies—into a set of policies to be evaluated at run time. It then evaluates the resulting set of policies in a series of steps. In each step, it evaluates a subset of policies in three specific contexts—user context, bucket context, and object context.

1. **User context** – If the requester is an IAM user, the user must have permission from the parent AWS account to which it belongs. In this step, Amazon S3 evaluates a subset of policies owned by the parent account (also referred as the context authority). This subset of policies includes the user policy that the parent attaches to the user. If the parent also owns the resource in the request (bucket, object), Amazon S3 evaluates the corresponding resource policies (bucket policy, bucket ACL, and object ACL) at the same time.

**Note**

If the parent AWS account owns the resource (bucket or object), it can grant resource permissions to its IAM user by using either the user policy or the resource policy.

2. **Bucket context** – In this context, Amazon S3 evaluates policies owned by the AWS account that owns the bucket.

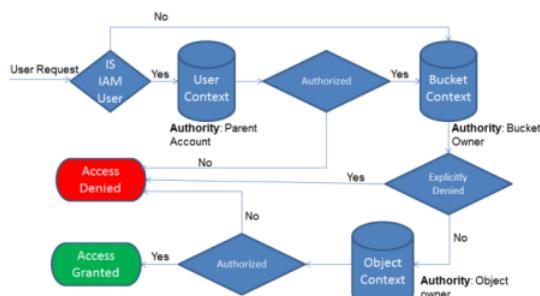
If the AWS account that owns the object in the request is not same as the bucket owner, in the bucket context Amazon S3 checks the policies if the bucket owner has explicitly denied access to the object. If there is an explicit deny set on the object, Amazon S3 does not authorize the request.

3. **Object context** – The requester must have permissions from the object owner to perform a specific object operation. In this step, Amazon S3 evaluates the object ACL.

**Note**

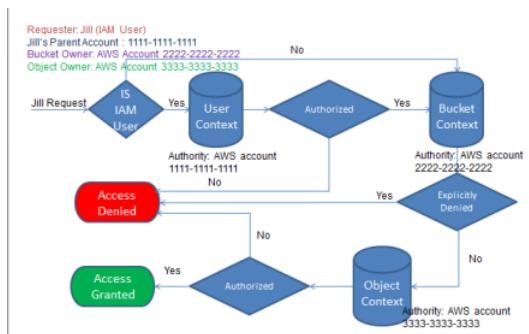
If bucket and object owners are the same, access to the object can be granted in the bucket policy, which is evaluated at the bucket context. If the owners are different, the object owners must use an object ACL to grant permissions. If the AWS account that owns the object is also the parent account to which the IAM user belongs, it can configure object permissions in a user policy, which is evaluated at the user context. For more information about using these access policy alternatives, see [Guidelines for Using the Available Access Policy Options \(p. 306\)](#).

The following is an illustration of the context-based evaluation for an object operation.



### Example 1: Object Operation Request

In this example, IAM user Jill, whose parent AWS account is 1111-1111-1111, sends an object operation request (for example, Get object) for an object owned by AWS account 3333-3333-3333 in a bucket owned by AWS account 2222-2222-2222.



Jill will need permission from the parent AWS account, the bucket owner, and the object owner. Amazon S3 evaluates the context as follows:

1. Because the request is from an IAM user, Amazon S3 evaluates the user context to verify that the parent AWS account 1111-1111-1111 has given Jill permission to perform the requested operation. If she has that permission, Amazon S3 evaluates the bucket context. Otherwise, Amazon S3 denies the request.
2. In the bucket context, the bucket owner, AWS account 2222-2222-2222, is the context authority. Amazon S3 evaluates the bucket policy to determine if the bucket owner has explicitly denied Jill access to the object.
3. In the object context, the context authority is AWS account 3333-3333-3333, the object owner. Amazon S3 evaluates the object ACL to determine if Jill has permission to access the object. If she does, Amazon S3 authorizes the request.

## Guidelines for Using the Available Access Policy Options

Amazon S3 supports resource-based policies and user policies to manage access to your Amazon S3 resources (see [Managing Access to Resources \(Access Policy Options\) \(p. 297\)](#)). Resource-based policies include bucket policies, bucket ACLs, and object ACLs. This section describes specific scenarios for using resource-based access policies to manage access to your Amazon S3 resources.

### When to Use an ACL-based Access Policy (Bucket and Object ACLs)

Both buckets and objects have associated ACLs that you can use to grant permissions. The following sections describe scenarios for using object ACLs and bucket ACLs.

#### When to Use an Object ACL

In addition to an object ACL, there are other ways an object owner can manage object permissions. For example:

- If the AWS account that owns the object also owns the bucket, then it can write a bucket policy to manage the object permissions.
- If the AWS account that owns the object wants to grant permission to a user in its account, it can use a user policy.

So when do you use object ACLs to manage object permissions? The following are the scenarios when you use object ACLs to manage object permissions.

- **An object ACL is the only way to manage access to objects not owned by the bucket owner** – An AWS account that owns the bucket can grant another AWS account permission to upload objects. The bucket owner does not own these objects. The AWS account that created the object must grant permissions using object ACLs.

**Note**

A bucket owner cannot grant permissions on objects it does not own. For example, a bucket policy granting object permissions applies only to objects owned by the bucket owner.

However, the bucket owner, who pays the bills, can write a bucket policy to deny access to any objects in the bucket, regardless of who owns it. The bucket owner can also delete any objects in the bucket.

- **Permissions vary by object and you need to manage permissions at the object level** – You can write a single policy statement granting an AWS account read permission on millions of objects with a specific key name prefix. For example, grant read permission on objects starting with key name prefix "logs". However, if your access permissions vary by object, granting permissions to individual objects using a bucket policy may not be practical. Also the bucket policies are limited to 20 KB in size.

In this case, you may find using object ACLs a suitable alternative. Although, even an object ACL is also limited to a maximum of 100 grants (see [Access Control List \(ACL\) Overview \(p. 394\)](#)).

- **Object ACLs control only object-level permissions** – There is a single bucket policy for the entire bucket, but object ACLs are specified per object.

An AWS account that owns a bucket can grant another AWS account permission to manage access policy. It allows that account to change anything in the policy. To better manage permissions, you may choose not to give such a broad permission, and instead grant only the READ-ACP and WRITE-ACP permissions on a subset of objects. This limits the account to manage permissions only on specific objects by updating individual object ACLs.

## When to Use a Bucket ACL

The only recommended use case for the bucket ACL is to grant write permission to the Amazon S3 Log Delivery group to write access log objects to your bucket (see [Server Access Logging \(p. 596\)](#)). If you want Amazon S3 to deliver access logs to your bucket, you will need to grant write permission on the bucket to the Log Delivery group. The only way you can grant necessary permissions to the Log Delivery group is via a bucket ACL, as shown in the following bucket ACL fragment.

```
<?xml version="1.0" encoding="UTF-8"?>
<AccessControlPolicy xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Owner>
    ...
  </Owner>
  <AccessControlList>
    <Grant>
      ...
    </Grant>
    <Grant>
      <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="Group">
        <URI>http://acs.amazonaws.com/groups/s3/LogDelivery</URI>
      </Grantee>
      <Permission>WRITE</Permission>
    </Grant>
  </AccessControlList>
</AccessControlPolicy>
```

## When to Use a Bucket Policy

If an AWS account that owns a bucket wants to grant permission to users in its account, it can use either a bucket policy or a user policy. But in the following scenarios, you will need to use a bucket policy.

- **You want to manage cross-account permissions for all Amazon S3 permissions** – You can use ACLs to grant cross-account permissions to other accounts, but ACLs support only a finite set of permission ([What Permissions Can I Grant? \(p. 396\)](#)), these don't include all Amazon S3 permissions. For example, you cannot grant permissions on bucket subresources (see [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#)) using an ACL.

Although both bucket and user policies support granting permission for all Amazon S3 operations (see [Specifying Permissions in a Policy \(p. 338\)](#)), the user policies are for managing permissions for users in your account. For cross-account permissions to other AWS accounts or users in another account, you must use a bucket policy.

## When to Use a User Policy

In general, you can use either a user policy or a bucket policy to manage permissions. You may choose to manage permissions by creating users and managing permissions individually by attaching policies to users (or user groups), or you may find that resource-based policies, such as a bucket policy, work better for your scenario.

Note that AWS Identity and Access Management (IAM) enables you to create multiple users within your AWS account and manage their permissions via user policies. An IAM user must have permissions from the parent account to which it belongs, and from the AWS account that owns the resource the user wants to access. The permissions can be granted as follows:

- **Permission from the parent account** – The parent account can grant permissions to its user by attaching a user policy.
- **Permission from the resource owner** – The resource owner can grant permission to either the IAM user (using a bucket policy) or the parent account (using a bucket policy, bucket ACL, or object ACL).

This is akin to a child who wants to play with a toy that belongs to someone else. In this case, the child must get permission from a parent to play with the toy and permission from the toy owner.

## Permission Delegation

If an AWS account owns a resource, it can grant those permissions to another AWS account. That account can then delegate those permissions, or a subset of them, to users in the account. This is referred to as permission delegation. But an account that receives permissions from another account cannot delegate permission cross-account to another AWS account.

## Related Topics

We recommend you first review all introductory topics that explain how you manage access to your Amazon S3 resources and related guidelines. For more information, see [Introduction to Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#). You can then use the following topics for more information about specific access policy options.

- [Using Bucket Policies and User Policies \(p. 335\)](#)
- [Managing Access with ACLs \(p. 394\)](#)

## Example Walkthroughs: Managing Access to Your Amazon S3 Resources

This topic provides the following introductory walkthrough examples for granting access to Amazon S3 resources. These examples use the AWS Management Console to create resources (buckets, objects, users) and grant them permissions. The examples then show you how to verify permissions using the command line tools, so you don't have to write any code. We provide commands using both the AWS Command Line Interface (CLI) and the AWS Tools for Windows PowerShell.

- [Example 1: Bucket Owner Granting Its Users Bucket Permissions \(p. 312\)](#)

The IAM users you create in your account have no permissions by default. In this exercise, you grant a user permission to perform bucket and object operations.

- [Example 2: Bucket Owner Granting Cross-Account Bucket Permissions \(p. 316\)](#)

In this exercise, a bucket owner, Account A, grants cross-account permissions to another AWS account, Account B. Account B then delegates those permissions to users in its account.

- **Managing object permissions when the object and bucket owners are not the same**

The example scenarios in this case are about a bucket owner granting object permissions to others, but not all objects in the bucket are owned by the bucket owner. What permissions does the bucket owner need, and how can it delegate those permissions?

The AWS account that creates a bucket is called the bucket owner. The owner can grant other AWS accounts permission to upload objects, and the AWS accounts that create objects own them. The bucket owner has no permissions on those objects created by other AWS accounts. If the bucket owner writes a bucket policy granting access to objects, the policy does not apply to objects that are owned by other accounts.

In this case, the object owner must first grant permissions to the bucket owner using an object ACL. The bucket owner can then delegate those object permissions to others, to users in its own account, or to another AWS account, as illustrated by the following examples.

- [Example 3: Bucket Owner Granting Its Users Permissions to Objects It Does Not Own \(p. 321\)](#)

In this exercise, the bucket owner first gets permissions from the object owner. The bucket owner then delegates those permissions to users in its own account.

- [Example 4: Bucket Owner Granting Cross-account Permission to Objects It Does Not Own \(p. 326\)](#)

After receiving permissions from the object owner, the bucket owner cannot delegate permission to other AWS accounts because cross-account delegation is not supported (see [Permission Delegation \(p. 308\)](#)). Instead, the bucket owner can create an IAM role with permissions to perform specific operations (such as get object) and allow another AWS account to assume that role. Anyone who assumes the role can then access objects. This example shows how a bucket owner can use an IAM role to enable this cross-account delegation.

## Before You Try the Example Walkthroughs

These examples use the AWS Management Console to create resources and grant permissions. And to test permissions, the examples use the command line tools, AWS Command Line Interface (CLI) and AWS Tools for Windows PowerShell, so you don't need to write any code. To test permissions you will need to set up one of these tools. For more information, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

In addition, when creating resources these examples don't use root credentials of an AWS account. Instead, you create an administrator user in these accounts to perform these tasks.

## About Using an Administrator User to Create Resources and Grant Permissions

AWS Identity and Access Management (IAM) recommends not using the root credentials of your AWS account to make requests. Instead, create an IAM user, grant that user full access, and then use that user's credentials to interact with AWS. We refer to this user as an administrator user. For more information, go to [Root Account Credentials vs. IAM User Credentials](#) in the *AWS General Reference* and [IAM Best Practices](#) in the *IAM User Guide*.

All example walkthroughs in this section use the administrator user credentials. If you have not created an administrator user for your AWS account, the topics show you how.

Note that to sign in to the AWS Management Console using the user credentials, you will need to use the IAM User Sign-In URL. The IAM console provides this URL for your AWS account. The topics show you how to get the URL.

## Setting Up the Tools for the Example Walkthroughs

The introductory examples (see [Example Walkthroughs: Managing Access to Your Amazon S3 Resources \(p. 309\)](#)) use the AWS Management Console to create resources and grant permissions. And to test permissions, the examples use the command line tools, AWS Command Line Interface (CLI) and AWS Tools for Windows PowerShell, so you don't need to write any code. To test permissions, you must set up one of these tools.

### To set up the AWS CLI

1. Download and configure the AWS CLI. For instructions, see the following topics in the *AWS Command Line Interface User Guide*.

[Getting Set Up with the AWS Command Line Interface](#)

[Installing the AWS Command Line Interface](#)

[Configuring the AWS Command Line Interface](#)

2. Set the default profile.

You will store user credentials in the AWS CLI config file. Create a default profile in the config file using your AWS account credentials.

```
[default]
aws_access_key_id = access key ID
aws_secret_access_key = secret access key
region = us-west-2
```

3. Verify the setup by entering the following command at the command prompt. Both these commands don't provide credentials explicitly, so the credentials of the default profile are used.

- Try the help command

```
aws help
```

- Use aws s3 ls to get a list of buckets on the configured account.

```
aws s3 ls
```

As you go through the example walkthroughs, you will create users, and you will save user credentials in the config files by creating profiles, as the following example shows. Note that these profiles have names (AccountAdmin and AccountBadmin):

```
[profile AccountAadmin]
aws_access_key_id = User AccountAadmin access key ID
aws_secret_access_key = User AccountAadmin secret access key
region = us-west-2

[profile AccountBadmin]
aws_access_key_id = Account B access key ID
aws_secret_access_key = Account B secret access key
region = us-east-1
```

To execute a command using these user credentials, you add the `--profile` parameter specifying the profile name. The following AWS CLI command retrieves a listing of objects in `examplebucket` and specifies the `AccountBadmin` profile.

```
aws s3 ls s3://examplebucket --profile AccountBadmin
```

Alternatively, you can configure one set of user credentials as the default profile by changing the `AWS_DEFAULT_PROFILE` environment variable from the command prompt. Once you've done this, whenever you execute AWS CLI commands without the `--profile` parameter, the AWS CLI will use the profile you set in the environment variable as the default profile.

```
$ export AWS_DEFAULT_PROFILE=AccountAadmin
```

## To set up AWS Tools for Windows PowerShell

1. Download and configure the AWS Tools for Windows PowerShell. For instructions, go to [Download and Install the AWS Tools for Windows PowerShell](#) in the *AWS Tools for Windows PowerShell User Guide*.

### Note

In order to load the AWS Tools for Windows PowerShell module, you need to enable PowerShell script execution. For more information, go to [Enable Script Execution](#) in the *AWS Tools for Windows PowerShell User Guide*.

2. For these exercises, you will specify AWS credentials per session using the `Set-AWSCredentials` command. The command saves the credentials to a persistent store (`-StoreAs` parameter).

```
Set-AWSCredentials -AccessKey AccessKeyId -SecretKey SecretAccessKey -storeas string
```

3. Verify the setup.
  - Execute the `Get-Command` to retrieve a list of available commands you can use for Amazon S3 operations.

```
Get-Command -module awspowershell -noun s3* -StoredCredentials string
```

- Execute the `Get-S3Object` command to retrieve a list of objects in a bucket.

```
Get-S3Object -BucketName bucketname -StoredCredentials string
```

For a list of commands, go to [Amazon Simple Storage Service Cmdlets](#).

Now you are ready to try the exercises. Follow the links provided at the beginning of the section.

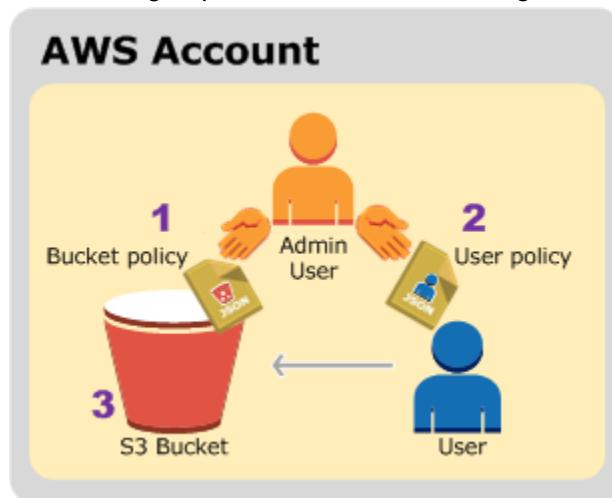
## Example 1: Bucket Owner Granting Its Users Bucket Permissions

### Topics

- [Step 0: Preparing for the Walkthrough \(p. 312\)](#)
- [Step 1: Create Resources \(a Bucket and an IAM User\) in Account A and Grant Permissions \(p. 313\)](#)
- [Step 2: Test Permissions \(p. 315\)](#)

In this exercise, an AWS account owns a bucket, and it has an IAM user in the account. The user by default has no permissions. The parent account must grant permissions to the user to perform any tasks. Both the bucket owner and the parent account to which the user belongs are the same. Therefore, the AWS account can use a bucket policy, a user policy, or both to grant its user permissions on the bucket. You will grant some permissions using a bucket policy and grant other permissions using a user policy.

The following steps summarize the walkthrough:



1. Account administrator creates a bucket policy granting a set of permissions to the user.
2. Account administrator attaches a user policy to the user granting additional permissions.
3. User then tries permissions granted via both the bucket policy and the user policy.

For this example, you will need an AWS account. Instead of using the root credentials of the account, you will create an administrator user (see [About Using an Administrator User to Create Resources and Grant Permissions \(p. 310\)](#)). We refer to the AWS account and the administrator user as follows:

Account ID	Account Referred To As	Administrator User in the Account
1111-1111-1111	Account A	AccountAAdmin

All the tasks of creating users and granting permissions are done in the AWS Management Console. To verify permissions, the walkthrough uses the command line tools, AWS Command Line Interface (CLI) and AWS Tools for Windows PowerShell, to verify the permissions, so you don't need to write any code.

### Step 0: Preparing for the Walkthrough

1. Make sure you have an AWS account and that it has a user with administrator privileges.

- a. Sign up for an account, if needed. We refer to this account as Account A.
  - i. Go to <https://aws.amazon.com/s3> and click **Sign Up**.
  - ii. Follow the on-screen instructions.

AWS will notify you by email when your account is active and available for you to use.
- b. In Account A, create an administrator user AccountAadmin. Using Account A credentials, sign in to the [IAM console](#) and do the following:
  - i. Create user AccountAadmin and note down the user security credentials.  
For instructions, see [Creating an IAM User in Your AWS Account](#) in the *IAM User Guide*.
  - ii. Grant AccountAadmin administrator privileges by attaching a user policy giving full access.  
For instructions, see [Working with Policies](#) in the *IAM User Guide*.
  - iii. Note down the **IAM User Sign-In URL** for AccountAadmin. You will need to use this URL when signing in to the AWS Management Console. For more information about where to find it, see [How Users Sign in to Your Account](#) in *IAM User Guide*. Note down the URL for each of the accounts.
2. Set up either the AWS Command Line Interface (CLI) or the AWS Tools for Windows PowerShell. Make sure you save administrator user credentials as follows:
  - If using the AWS CLI, create two profiles, AccountAadmin and AccountBadmin, in the config file.
  - If using the AWS Tools for Windows PowerShell, make sure you store credentials for the session as AccountAadmin and AccountBadmin.

For instructions, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

## Step 1: Create Resources (a Bucket and an IAM User) in Account A and Grant Permissions

Using the credentials of user AccountAadmin in Account A, and the special IAM user sign-in URL, sign in to the AWS Management Console and do the following:

1. Create Resources (a bucket and an IAM user)
  - a. In the Amazon S3 console create a bucket. Note down the AWS region in which you created it. For instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.
  - b. In the IAM console, do the following:
    - i. Create a user, Dave.  
For instructions, see [Creating IAM Users \(AWS Management Console\)](#) in the *IAM User Guide*.
    - ii. Note down the UserDave credentials.
    - iii. Note down the Amazon Resource Name (ARN) for user Dave. In the IAM console, select the user, and the **Summary** tab provides the user ARN.
2. Grant Permissions.

Because the bucket owner and the parent account to which the user belongs are the same, the AWS account can grant user permissions using a bucket policy, a user policy, or both. In this example, you do both. If the object is also owned by the same account, the bucket owner can grant object permissions in the bucket policy (or an IAM policy).

- a. In the Amazon S3 console, attach the following bucket policy to `examplebucket`.

The policy has two statements.

- The first statement grants Dave the bucket operation permissions `s3:GetBucketLocation` and `s3>ListBucket`.
- The second statement grants the `s3:GetObject` permission. Because Account A also owns the object, the account administrator is able to grant the `s3:GetObject` permission.

In the `Principal` statement, Dave is identified by his user ARN. For more information about policy elements, see [Access Policy Language Overview \(p. 335\)](#).

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "statement1",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"  
            },  
            "Action": [  
                "s3:GetBucketLocation",  
                "s3>ListBucket"  
            ],  
            "Resource": [  
                "arn:aws:s3:::examplebucket"  
            ]  
        },  
        {  
            "Sid": "statement2",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"  
            },  
            "Action": [  
                "s3:GetObject"  
            ],  
            "Resource": [  
                "arn:aws:s3:::examplebucket/*"  
            ]  
        }  
    ]  
}
```

- b. Create an inline policy for the user Dave by using the following policy. The policy grants Dave the `s3:PutObject` permission. You need to update the policy by providing your bucket name.

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

```
    ]  
}
```

For instructions, see [Working with Inline Policies](#) in the *IAM User Guide*. Note you need to sign in to the console using Account B credentials.

## Step 2: Test Permissions

Using Dave's credentials, verify that the permissions work. You can use either of the following two procedures.

### Test Using the AWS CLI

1. Update the AWS CLI config file by adding the following UserDaveAccountA profile. For more information, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
[profile UserDaveAccountA]  
aws_access_key_id = access-key  
aws_secret_access_key = secret-access-key  
region = us-east-1
```

2. Verify that Dave can perform the operations as granted in the user policy. Upload a sample object using the following AWS CLI put-object command.

The --body parameter in the command identifies the source file to upload. For example, if the file is in the root of the C: drive on a Windows machine, you specify c:\HappyFace.jpg. The --key parameter provides the key name for the object.

```
aws s3api put-object --bucket examplebucket --key HappyFace.jpg --body HappyFace.jpg --  
profile UserDaveAccountA
```

Execute the following AWS CLI command to get the object.

```
aws s3api get-object --bucket examplebucket --key HappyFace.jpg OutputFile.jpg --  
profile UserDaveAccountA
```

### Test Using the AWS Tools for Windows PowerShell

1. Store Dave's credentials as AccountADave. You then use these credentials to PUT and GET an object.

```
set-awscredentials -AccessKey AccessKeyID -SecretKey SecretAccessKey -storeas  
AccountADave
```

2. Upload a sample object using the AWS Tools for Windows PowerShell Write-S3Object command using user Dave's stored credentials.

```
Write-S3Object -bucketname examplebucket -key HappyFace.jpg -file HappyFace.jpg -  
StoredCredentials AccountADave
```

Download the previously uploaded object.

```
Read-S3Object -bucketname examplebucket -key HappyFace.jpg -file Output.jpg -  
StoredCredentials AccountADave
```

## Example 2: Bucket Owner Granting Cross-Account Bucket Permissions

### Topics

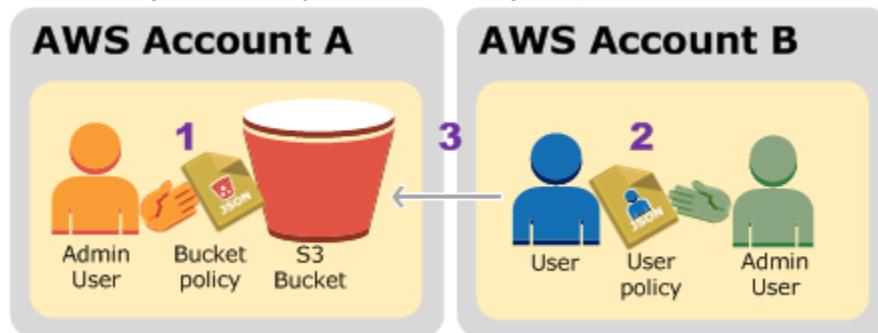
- [Step 0: Preparing for the Walkthrough \(p. 317\)](#)
- [Step 1: Do the Account A Tasks \(p. 318\)](#)
- [Step 2: Do the Account B Tasks \(p. 319\)](#)
- [Step 3: Extra Credit: Try Explicit Deny \(p. 320\)](#)
- [Step 4: Clean Up \(p. 321\)](#)

An AWS account—for example, Account A—can grant another AWS account, Account B, permission to access its resources such as buckets and objects. Account B can then delegate those permissions to users in its account. In this example scenario, a bucket owner grants cross-account permission to another account to perform specific bucket operations.

#### Note

Account A can also directly grant a user in Account B permissions using a bucket policy. But the user will still need permission from the parent account, Account B, to which the user belongs, even if Account B does not have permissions from Account A. As long as the user has permission from both the resource owner and the parent account, the user will be able to access the resource.

The following is a summary of the walkthrough steps:



1. Account A administrator user attaches a bucket policy granting cross-account permissions to Account B to perform specific bucket operations.

Note that administrator user in Account B will automatically inherit the permissions.

2. Account B administrator user attaches user policy to the user delegating the permissions it received from Account A.
3. User in Account B then verifies permissions by accessing an object in the bucket owned by Account A.

For this example, you need two accounts. The following table shows how we refer to these accounts and the administrator users in them. Per IAM guidelines (see [About Using an Administrator User to Create Resources and Grant Permissions \(p. 310\)](#)) we do not use the account root credentials in this walkthrough. Instead, you create an administrator user in each account and use those credentials in creating resources and granting them permissions.

AWS Account ID	Account Referred To As	Administrator User in the Account
1111-1111-1111	Account A	AccountAAdmin

AWS Account ID	Account Referred To As	Administrator User in the Account
2222-2222-2222	Account B	AccountBadmin

All the tasks of creating users and granting permissions are done in the AWS Management Console. To verify permissions, the walkthrough uses the command line tools, AWS Command Line Interface (CLI) and AWS Tools for Windows PowerShell, so you don't need to write any code.

## Step 0: Preparing for the Walkthrough

1. Make sure you have two AWS accounts and that each account has one administrator user as shown in the table in the preceding section.
  - a. Sign up for an AWS account, if needed.
    - i. Go to <https://aws.amazon.com/s3/> and click **Create an AWS Account**.
    - ii. Follow the on-screen instructions.

AWS will notify you by email when your account is active and available for you to use.
  - b. Using Account A credentials, sign in to the [IAM console](#) to create the administrator user:
    - i. Create user AccountAadmin and note down the security credentials. For instructions, see [Creating an IAM User in Your AWS Account](#) in the *IAM User Guide*.
    - ii. Grant AccountAadmin administrator privileges by attaching a user policy giving full access. For instructions, see [Working with Policies](#) in the *IAM User Guide*.
  - c. While you are in the IAM console, note down the **IAM User Sign-In URL** on the **Dashboard**. All users in the account must use this URL when signing in to the AWS Management Console.

For more information, see [How Users Sign in to Your Account](#) in *IAM User Guide*.

  - d. Repeat the preceding step using Account B credentials and create administrator user AccountBadmin.
2. Set up either the AWS Command Line Interface (CLI) or the AWS Tools for Windows PowerShell. Make sure you save administrator user credentials as follows:
  - If using the AWS CLI, create two profiles, AccountAadmin and AccountBadmin, in the config file.
  - If using the AWS Tools for Windows PowerShell, make sure you store credentials for the session as AccountAadmin and AccountBadmin.

For instructions, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

3. Save the administrator user credentials, also referred to as profiles. You can use the profile name instead of specifying credentials for each command you enter. For more information, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).
  - a. Add profiles in the AWS CLI config file for each of the administrator users in the two accounts.

```
[profile AccountAadmin]
aws_access_key_id = access-key-ID
aws_secret_access_key = secret-access-key
region = us-east-1

[profile AccountBadmin]
aws_access_key_id = access-key-ID
aws_secret_access_key = secret-access-key
region = us-east-1
```

- b. If you are using the AWS Tools for Windows PowerShell

```
set-awscredentials -AccessKey AcctA-access-key-ID -SecretKey AcctA-secret-access-
key -storeas AccountAadmin
set-awscredentials -AccessKey AcctB-access-key-ID -SecretKey AcctB-secret-access-
key -storeas AccountBadmin
```

## Step 1: Do the Account A Tasks

### Step 1.1: Sign In to the AWS Management Console

Using the IAM user sign-in URL for Account A first sign in to the AWS Management Console as AccountAadmin user. This user will create a bucket and attach a policy to it.

### Step 1.2: Create a Bucket

1. In the Amazon S3 console, create a bucket. This exercise assumes the bucket is created in the US East (N. Virginia) region and is named examplebucket.

For instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

2. Upload a sample object to the bucket.

For instructions, go to [Add an Object to a Bucket](#) in the *Amazon Simple Storage Service Getting Started Guide*.

### Step 1.3: Attach a Bucket Policy to Grant Cross-Account Permissions to Account B

The bucket policy grants the s3:GetBucketLocation and s3>ListBucket permissions to Account B. It is assumed you are still signed into the console using AccountAadmin user credentials.

1. Attach the following bucket policy to examplebucket. The policy grants Account B permission for the s3:GetBucketLocation and s3>ListBucket actions.

For instructions, see [How Do I Add an S3 Bucket Policy?](#) in the *Amazon Simple Storage Service Console User Guide*.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Example permissions",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountB-ID:root"
            },
            "Action": [
                "s3:GetBucketLocation",
                "s3>ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::examplebucket"
            ]
        }
    ]
}
```

2. Verify Account B (and thus its administrator user) can perform the operations.

- Using the AWS CLI

```
aws s3 ls s3://examplebucket --profile AccountBadmin
aws s3api get-bucket-location --bucket examplebucket --profile AccountBadmin
```

- Using the AWS Tools for Windows PowerShell

```
get-s3object -BucketName example2bucket -StoredCredentials AccountBadmin
get-s3bucketlocation -BucketName example2bucket -StoredCredentials AccountBadmin
```

## Step 2: Do the Account B Tasks

Now the Account B administrator creates a user, Dave, and delegates the Dave permissions received from Account A.

### Step 2.1: Sign In to the AWS Management Console

Using the IAM user sign-in URL for Account B, first sign in to the AWS Management Console as AccountBadmin user.

### Step 2.2: Create User Dave in Account B

1. In the IAM console, create a user, Dave.

For instructions, see [Creating IAM Users \(AWS Management Console\)](#) in the *IAM User Guide*.

2. Note down the UserDave credentials.

### Step 2.3: Delegate Permissions to User Dave

- Create an inline policy for the user Dave by using the following policy. You will need to update the policy by providing your bucket name.

It is assumed you are signed in to the console using AccountBadmin user credentials.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Example",
            "Effect": "Allow",
            "Action": [
                "s3>ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::examplebucket"
            ]
        }
    ]
}
```

For instructions, see [Working with Inline Policies in the IAM User Guide](#).

### Step 2.4: Test Permissions

Now Dave in Account B can list the contents of examplebucket owned by Account A. You can verify the permissions using either of the following procedures.

## Test Using the AWS CLI

1. Add the UserDave profile to the AWS CLI config file. For more information about the config file, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
[profile UserDave]
aws_access_key_id = access-key
aws_secret_access_key = secret-access-key
region = us-east-1
```

2. At the command prompt, enter the following AWS CLI command to verify Dave can now get an object list from the examplebucket owned by Account A. Note the command specifies the UserDave profile.

```
aws s3 ls s3://examplebucket --profile UserDave
```

Dave does not have any other permissions. So if he tries any other operation—for example, the following get bucket location—Amazon S3 returns permission denied.

```
aws s3api get-bucket-location --bucket examplebucket --profile UserDave
```

## Test Using AWS Tools for Windows PowerShell

1. Store Dave's credentials as AccountBDave.

```
set-awscredentials -AccessKey AccessKeyID -SecretKey SecretAccessKey -storeas
AccountBDave
```

2. Try the List Bucket command.

```
get-s3object -BucketName example2bucket -StoredCredentials AccountBDave
```

Dave does not have any other permissions. So if he tries any other operation—for example, the following get bucket location—Amazon S3 returns permission denied.

```
get-s3bucketlocation -BucketName example2bucket -StoredCredentials AccountBDave
```

## Step 3: Extra Credit: Try Explicit Deny

You can have permissions granted via an ACL, a bucket policy, and a user policy. But if there is an explicit deny set via either a bucket policy or a user policy, the explicit deny takes precedence over any other permissions. For testing, let's update the bucket policy and explicitly deny Account B the s3:ListBucket permission. The policy also grants s3>ListBucket permission, but explicit deny takes precedence, and Account B or users in Account B will not be able to list objects in examplebucket.

1. Using credentials of user AccountAdmin in Account A, replace the bucket policy by the following.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Example permissions",
            "Effect": "Allow",
            "Principal": {
```

```
        "AWS": "arn:aws:iam::AccountB-ID:root"
    },
    "Action": [
        "s3:GetBucketLocation",
        "s3>ListBucket"
    ],
    "Resource": [
        "arn:aws:s3:::examplebucket"
    ]
},
{
    "Sid": "Deny permission",
    "Effect": "Deny",
    "Principal": {
        "AWS": "arn:aws:iam::AccountB-ID:root"
    },
    "Action": [
        "s3>ListBucket"
    ],
    "Resource": [
        "arn:aws:s3:::examplebucket"
    ]
}
]
```

- Now if you try to get a bucket list using AccountBadmin credentials, you will get access denied.

- Using the AWS CLI:

```
aws s3 ls s3://examplebucket --profile AccountBadmin
```

- Using the AWS Tools for Windows PowerShell:

```
get-s3object -BucketName example2bucket -StoredCredentials AccountBDave
```

## Step 4: Clean Up

- After you are done testing, you can do the following to clean up.
  - Sign in to the AWS Management Console ([AWS Management Console](#)) using Account A credentials, and do the following:
    - In the Amazon S3 console, remove the bucket policy attached to `examplebucket`. In the bucket **Properties**, delete the policy in the **Permissions** section.
    - If the bucket is created for this exercise, in the Amazon S3 console, delete the objects and then delete the bucket.
    - In the IAM console, remove the AccountAadmin user.
- Sign in to the AWS Management Console ([AWS Management Console](#)) using Account B credentials. In the IAM console, delete user AccountBadmin.

## Example 3: Bucket Owner Granting Its Users Permissions to Objects It Does Not Own

### Topics

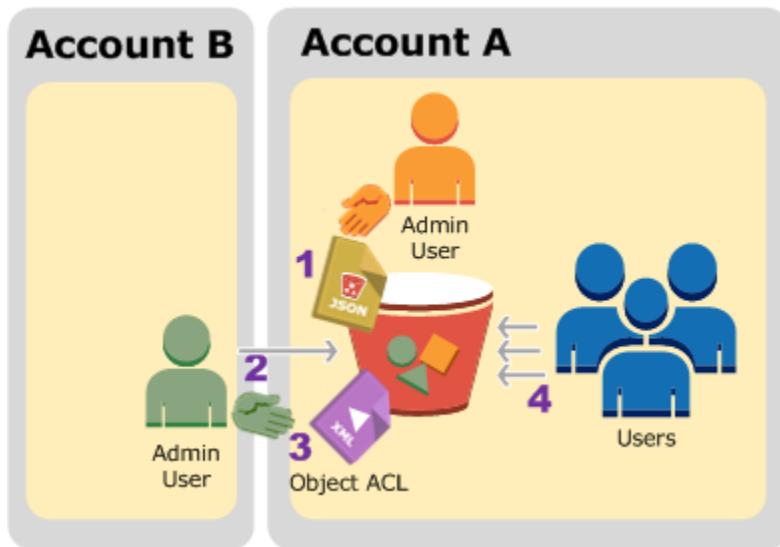
- [Step 0: Preparing for the Walkthrough \(p. 323\)](#)
- [Step 1: Do the Account A Tasks \(p. 323\)](#)

- [Step 2: Do the Account B Tasks \(p. 324\)](#)
- [Step 3: Test Permissions \(p. 325\)](#)
- [Step 4: Clean Up \(p. 326\)](#)

The scenario for this example is that a bucket owner wants to grant permission to access objects, but not all objects in the bucket are owned by the bucket owner. How can a bucket owner grant permission on objects it does not own? For this example, the bucket owner is trying to grant permission to users in its own account.

A bucket owner can enable other AWS accounts to upload objects. These objects are owned by the accounts that created them. The bucket owner does not own objects that were not created by the bucket owner. Therefore, for the bucket owner to grant access to these objects, the object owner must first grant permission to the bucket owner using an object ACL. The bucket owner can then delegate those permissions via a bucket policy. In this example, the bucket owner delegates permission to users in its own account.

The following is a summary of the walkthrough steps:



1. Account A administrator user attaches a bucket policy with two statements.
  - Allow cross-account permission to Account B to upload objects.
  - Allow a user in its own account to access objects in the bucket.
2. Account B administrator user uploads objects to the bucket owned by Account A.
3. Account B administrator updates the object ACL adding grant that gives the bucket owner full-control permission on the object.
4. User in Account A verifies by accessing objects in the bucket, regardless of who owns them.

For this example, you need two accounts. The following table shows how we refer to these accounts and the administrator users in these accounts. Per IAM guidelines (see [About Using an Administrator User to Create Resources and Grant Permissions \(p. 310\)](#)) we do not use the account root credentials in this walkthrough. Instead, you create an administrator user in each account and use those credentials in creating resources and granting them permissions.

AWS Account ID	Account Referred To As	Administrator User in the Account
1111-1111-1111	Account A	AccountAadmin
2222-2222-2222	Account B	AccountBadmin

All the tasks of creating users and granting permissions are done in the AWS Management Console. To verify permissions, the walkthrough uses the command line tools, AWS Command Line Interface (CLI) and AWS Tools for Windows PowerShell, so you don't need to write any code.

## Step 0: Preparing for the Walkthrough

1. Make sure you have two AWS accounts and each account has one administrator user as shown in the table in the preceding section.
  - a. Sign up for an AWS account, if needed.
    - i. Go to <https://aws.amazon.com/s3/> and click **Create an AWS Account**.
    - ii. Follow the on-screen instructions. AWS will notify you by email when your account is active and available for you to use.
  - b. Using Account A credentials, sign in to the [IAM console](#) and do the following to create an administrator user:
    - Create user AccountAadmin and note down security credentials. For more information about adding users, see [Creating an IAM User in Your AWS Account](#) in the *IAM User Guide*.
    - Grant AccountAadmin administrator privileges by attaching a user policy giving full access. For instructions, see [Working with Policies](#) in the *IAM User Guide*.
    - In the IAM console **Dashboard**, note down the **IAM User Sign-In URL**. Users in this account must use this URL when signing in to the AWS Management Console. For more information, see [How Users Sign in to Your Account](#) in *IAM User Guide*.
  - c. Repeat the preceding step using Account B credentials and create administrator user AccountBadmin.
2. Set up either the AWS Command Line Interface (CLI) or the AWS Tools for Windows PowerShell. Make sure you save administrator user credentials as follows:
  - If using the AWS CLI, create two profiles, AccountAadmin and AccountBadmin, in the config file.
  - If using the AWS Tools for Windows PowerShell, make sure you store credentials for the session as AccountAadmin and AccountBadmin.

For instructions, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

## Step 1: Do the Account A Tasks

### Step 1.1: Sign In to the AWS Management Console

Using the IAM user sign-in URL for Account A first sign in to the AWS Management Console as AccountAadmin user. This user will create a bucket and attach a policy to it.

### Step 1.2: Create a Bucket, a User, and Add a Bucket Policy Granting User Permissions

1. In the Amazon S3 console, create a bucket. This exercise assumes the bucket is created in the US East (N. Virginia) region and the name is examplebucket.

For instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

2. In the IAM console, create a user Dave.

For instructions, see [Creating IAM Users \(AWS Management Console\)](#) in the *IAM User Guide*.

3. Note down the Dave credentials.
4. In the Amazon S3 console, attach the following bucket policy to examplebucket bucket. For instructions, see [How Do I Add an S3 Bucket Policy?](#) in the *Amazon Simple Storage Service Console User Guide*. Follow steps to add a bucket policy.

The policy grants Account B the s3:PutObject and s3>ListBucket permissions. The policy also grants user Dave the s3:GetObject permission.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Statement1",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountB-ID:root"
            },
            "Action": [
                "s3:PutObject"
            ],
            "Resource": [
                "arn:aws:s3:::examplebucket/*"
            ]
        },
        {
            "Sid": "Statement3",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"
            },
            "Action": [
                "s3:GetObject"
            ],
            "Resource": [
                "arn:aws:s3:::examplebucket/*"
            ]
        }
    ]
}
```

## Step 2: Do the Account B Tasks

Now that Account B has permissions to perform operations on Account A's bucket, the Account B administrator will do the following;

- Upload an object to Account A's bucket.
- Add a grant in the object ACL to allow Account A, bucket owner, full control.

### Using the AWS CLI

1. Using the put-object AWS CLI command, upload an object. The --body parameter in the command identifies the source file to upload. For example, if the file is on C: drive of a Windows

machine, you would specify c:\HappyFace.jpg. The --key parameter provides the key name for the object.

```
aws s3api put-object --bucket examplebucket --key HappyFace.jpg --body HappyFace.jpg --profile AccountBadmin
```

2. Add a grant to the object ACL to allow the bucket owner full control of the object.

```
aws s3api put-object-acl --bucket examplebucket --key HappyFace.jpg --grant-full-control id="AccountA-CanonicalUserID" --profile AccountBadmin
```

## Using the AWS Tools for Windows PowerShell

1. Using the Write-S3Object AWS Tools for Windows PowerShell command, upload an object.

```
Write-S3Object -BucketName examplebucket -key HappyFace.jpg -file HappyFace.jpg -StoredCredentials AccountBadmin
```

2. Add a grant to the object ACL to allow the bucket owner full control of the object.

```
Set-S3ACL -BucketName examplebucket -Key HappyFace.jpg -CannedACLName "bucket-owner-full-control" -StoredCreden
```

## Step 3: Test Permissions

Now verify user Dave in Account A can access the object owned by Account B.

### Using the AWS CLI

1. Add user Dave credentials to the AWS CLI config file and create a new profile, UserDaveAccountA. For more information, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
[profile UserDaveAccountA]
aws_access_key_id = access-key
aws_secret_access_key = secret-access-key
region = us-east-1
```

2. Execute the get-object AWS CLI command to download HappyFace.jpg and save it locally. You provide user Dave credentials by adding the --profile parameter.

```
aws s3api get-object --bucket examplebucket --key HappyFace.jpg Outputfile.jpg --profile UserDaveAccountA
```

## Using the AWS Tools for Windows PowerShell

1. Store user Dave AWS credentials, as UserDaveAccountA, to persistent store.

```
Set-AWSCredentials -AccessKey UserDave-AccessKey -SecretKey UserDave-SecretAccessKey -storeas UserDaveAccountA
```

2. Execute the Read-S3Object command to download the HappyFace.jpg object and save it locally. You provide user Dave credentials by adding the -StoredCredentials parameter.

```
Read-S3Object -BucketName examplebucket -Key HappyFace.jpg -file HappyFace.jpg -  
StoredCredentials UserDaveAccountA
```

## Step 4: Clean Up

1. After you are done testing, you can do the following to clean up.
  - Sign in to the AWS Management Console ([AWS Management Console](#)) using Account A credentials, and do the following:
    - In the Amazon S3 console, remove the bucket policy attached to `examplebucket`. In the bucket **Properties**, delete the policy in the **Permissions** section.
    - If the bucket is created for this exercise, in the Amazon S3 console, delete the objects and then delete the bucket.
    - In the IAM console, remove the AccountAdmin user.
2. Sign in to the AWS Management Console ([AWS Management Console](#)) using Account B credentials. In the IAM console, delete user AccountBadmin.

## Example 4: Bucket Owner Granting Cross-account Permission to Objects It Does Not Own

### Topics

- [Background: Cross-Account Permissions and Using IAM Roles \(p. 327\)](#)
- [Step 0: Preparing for the Walkthrough \(p. 328\)](#)
- [Step 1: Do the Account A Tasks \(p. 329\)](#)
- [Step 2: Do the Account B Tasks \(p. 331\)](#)
- [Step 3: Do the Account C Tasks \(p. 332\)](#)
- [Step 4: Clean Up \(p. 333\)](#)
- [Related Resources \(p. 334\)](#)

In this example scenario, you own a bucket and you have enabled other AWS accounts to upload objects. That is, your bucket can have objects that other AWS accounts own.

Now, suppose as a bucket owner, you need to grant cross-account permission on objects, regardless of who the owner is, to a user in another account. For example, that user could be a billing application that needs to access object metadata. There are two core issues:

- The bucket owner has no permissions on those objects created by other AWS accounts. So for the bucket owner to grant permissions on objects it does not own, the object owner, the AWS account that created the objects, must first grant permission to the bucket owner. The bucket owner can then delegate those permissions.
- Bucket owner account can delegate permissions to users in its own account (see [Example 3: Bucket Owner Granting Its Users Permissions to Objects It Does Not Own \(p. 321\)](#)), but it cannot delegate permissions to other AWS accounts, because cross-account delegation is not supported.

In this scenario, the bucket owner can create an AWS Identity and Access Management (IAM) role with permission to access objects, and grant another AWS account permission to assume the role temporarily enabling it to access objects in the bucket.

## Background: Cross-Account Permissions and Using IAM Roles

IAM roles enable several scenarios to delegate access to your resources, and cross-account access is one of the key scenarios. In this example, the bucket owner, Account A, uses an IAM role to temporarily delegate object access cross-account to users in another AWS account, Account C. Each IAM role you create has two policies attached to it:

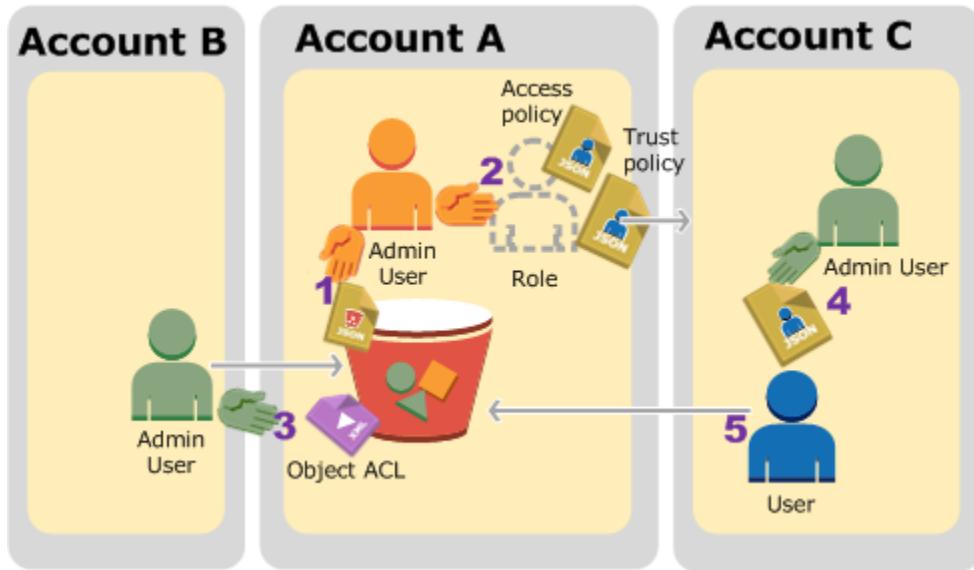
- A trust policy identifying another AWS account that can assume the role.
- An access policy defining what permissions—for example, `s3:GetObject`—are allowed when someone assumes the role. For a list of permissions you can specify in a policy, see [Specifying Permissions in a Policy \(p. 338\)](#).

The AWS account identified in the trust policy then grants its user permission to assume the role. The user can then do the following to access objects:

- Assume the role and, in response, get temporary security credentials.
- Using the temporary security credentials, access the objects in the bucket.

For more information about IAM roles, go to [IAM Roles](#) in *IAM User Guide*.

The following is a summary of the walkthrough steps:



1. Account A administrator user attaches a bucket policy granting Account B conditional permission to upload objects.
2. Account A administrator creates an IAM role, establishing trust with Account C, so users in that account can access Account A. The access policy attached to the role limits what user in Account C can do when the user accesses Account A.
3. Account B administrator uploads an object to the bucket owned by Account A, granting full-control permission to the bucket owner.
4. Account C administrator creates a user and attaches a user policy that allows the user to assume the role.
5. User in Account C first assumes the role, which returns the user temporary security credentials. Using those temporary credentials, the user then accesses objects in the bucket.

For this example, you need three accounts. The following table shows how we refer to these accounts and the administrator users in these accounts. Per IAM guidelines (see [About Using an Administrator User to Create Resources and Grant Permissions \(p. 310\)](#)) we do not use the account root credentials in this walkthrough. Instead, you create an administrator user in each account and use those credentials in creating resources and granting them permissions

AWS Account ID	Account Referred To As	Administrator User in the Account
<a href="#"><b>1111-1111-1111</b></a>	Account A	AccountAadmin
<a href="#"><b>2222-2222-2222</b></a>	Account B	AccountBadmin
<a href="#"><b>3333-3333-3333</b></a>	Account C	AccountCadmin

## Step 0: Preparing for the Walkthrough

### Note

You may want to open a text editor and write down some of the information as you walk through the steps. In particular, you will need account IDs, canonical user IDs, IAM User Sign-in URLs for each account to connect to the console, and Amazon Resource Names (ARNs) of the IAM users, and roles.

1. Make sure you have three AWS accounts and each account has one administrator user as shown in the table in the preceding section.
  - a. Sign up for AWS accounts, as needed. We refer to these accounts as Account A, Account B, and Account C.
    - i. Go to <https://aws.amazon.com/s3/> and click **Create an AWS Account**.
    - ii. Follow the on-screen instructions.

AWS will notify you by email when your account is active and available for you to use.
  - b. Using Account A credentials, sign in to the [IAM console](#) and do the following to create an administrator user:
    - Create user AccountAadmin and note down security credentials. For more information about adding users, see [Creating an IAM User in Your AWS Account](#) in the *IAM User Guide*.
    - Grant AccountAadmin administrator privileges by attaching a user policy giving full access. For instructions, see [Working with Policies](#) in the *IAM User Guide*.
    - In the **IAM Console Dashboard**, note down the **IAM User Sign-In URL**. Users in this account must use this URL when signing in to the AWS Management Console. For more information, go to [How Users Sign In to Your Account](#) in *IAM User Guide*.
  - c. Repeat the preceding step to create administrator users in Account B and Account C.
2. For Account C, note down the account ID.

When you create an IAM role in Account A, the trust policy grants Account C permission to assume the role by specifying the account ID. You can find account information as follows:

- a. Go to <https://aws.amazon.com/> and from the **My Account/Console** drop-down menu, select **Security Credentials**.
- b. Sign in using appropriate account credentials.
- c. Click **Account Identifiers** and note down the **AWS Account ID** and the **Canonical User ID**.
3. When creating a bucket policy, you will need the following information. Note down these values:

- **Canonical user ID of Account A** – When the Account A administrator grants conditional upload object permission to the Account B administrator, the condition specifies the canonical user ID of the Account A user that must get full-control of the objects.

**Note**

The canonical user ID is the Amazon S3-only concept. It is a 64-character obfuscated version of the account ID.

- **User ARN for Account B administrator** – You can find the user ARN in the IAM console. You will need to select the user and find the user's ARN in the **Summary** tab.

In the bucket policy, you grant AccountBadmin permission to upload objects and you specify the user using the ARN. Here's an example ARN value:

```
arn:aws:iam::AccountB-ID:user/AccountBadmin
```

4. Set up either the AWS Command Line Interface (CLI) or the AWS Tools for Windows PowerShell. Make sure you save administrator user credentials as follows:
  - If using the AWS CLI, create profiles, AccountAadmin and AccountBadmin, in the config file.
  - If using the AWS Tools for Windows PowerShell, make sure you store credentials for the session as AccountAadmin and AccountBadmin.

For instructions, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

## Step 1: Do the Account A Tasks

In this example, Account A is the bucket owner. So user AccountAadmin in Account A will create a bucket, attach a bucket policy granting the Account B administrator permission to upload objects, create an IAM role granting Account C permission to assume the role so it can access objects in the bucket.

### Step 1.1: Sign In to the AWS Management Console

Using the IAM User Sign-in URL for Account A, first sign in to the AWS Management Console as AccountAadmin user. This user will create a bucket and attach a policy to it.

### Step 1.2: Create a Bucket and Attach a Bucket Policy

In the Amazon S3 console, do the following:

1. Create a bucket. This exercise assumes the bucket name is `examplebucket`.

For instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

2. Attach the following bucket policy granting conditional permission to the Account B administrator permission to upload objects.

You need to update the policy by providing your own values for `examplebucket`, `AccountB-ID`, and the `CanonicalUserId-of-AWSaccountA-BucketOwner`.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "111",  
            "Effect": "Allow",  
            "Principal": {
```

```

        "AWS": "arn:aws:iam::AccountB-ID:user/AccountBadmin"
    },
    "Action": "s3:PutObject",
    "Resource": "arn:aws:s3:::examplebucket/*"
},
{
    "Sid": "112",
    "Effect": "Deny",
    "Principal": {
        "AWS": "arn:aws:iam::AccountB-ID:user/AccountBadmin"
    },
    "Action": "s3:PutObject",
    "Resource": "arn:aws:s3:::examplebucket/*",
    "Condition": {
        "StringNotEquals": {
            "s3:x-amz-grant-full-control": "id=CanonicalUserId-of-AWSaccountA-
BucketOwner"
        }
    }
}
]
}

```

### Step 1.3: Create an IAM Role to Allow Account C Cross-Account Access in Account A

In the IAM console, create an IAM role ("examplerole") that grants Account C permission to assume the role. Make sure you are still signed in as the Account A administrator because the role must be created in Account A.

1. Before creating the role, prepare the managed policy that defines the permissions that the role requires. You attach this policy to the role in a later step.
  - a. In the navigation pane on the left, click **Policies** and then click **Create Policy**.
  - b. Next to **Create Your Own Policy**, click **Select**.
  - c. Enter **access-accountA-bucket** in the **Policy Name** field.
  - d. Copy the following access policy and paste it into the **Policy Document** field. The access policy grants the role **s3:GetObject** permission so when Account C user assumes the role, it can only perform the **s3:GetObject** operation.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "s3:GetObject",
      "Resource": "arn:aws:s3:::examplebucket/*"
    }
  ]
}
```

- e. Click **Create Policy**.

The new policy appears in the list of managed policies.

2. In the navigation pane on the left, click **Roles** and then click **Create New Role**.
3. Enter **examplerole** for the role name, and then click **Next Step**.
4. Under **Select Role Type**, select **Role for Cross-Account Access**, and then click the **Select** button next to **Provide access between AWS accounts you own**.
5. Enter the Account C account ID.

For this walkthrough you do not need to require users to have multi-factor authentication (MFA) to assume the role, so leave that option unselected.

6. Click **Next Step** to set the permissions that will be associated with the role.
7. Select the box next to the access-accountA-bucket policy that you created and then click **Next Step**.

The Review page appears so you can confirm the settings for the role before it's created. One very important item to note on this page is the link that you can send to your users who need to use this role. Users who click the link go straight to the Switch Role page with the Account ID and Role Name fields already filled in. You can also see this link later on the Role Summary page for any cross-account role.

8. After reviewing the role, click **Create Role**.

The exemplerole role is displayed in the list of roles.

9. Click the role name exemplerole.
10. Select the **Trust Relationships** tab.
11. Click **Show policy document** and verify the trust policy shown matches the following policy.

The following trust policy establishes trust with Account C, by allowing it the sts:AssumeRole action. For more information, go to [AssumeRole](#) in the *AWS Security Token Service API Reference*.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "arn:aws:iam::AccountC-ID:root"  
            },  
            "Action": "sts:AssumeRole"  
        }  
    ]  
}
```

12. Note down the Amazon Resource Name (ARN) of the exemplerole role you created.

Later in the following steps, you attach a user policy to allow an IAM user to assume this role, and you identify the role by the ARN value.

## Step 2: Do the Account B Tasks

The examplebucket owned by Account A needs objects owned by other accounts. In this step, the Account B administrator uploads an object using the command line tools.

- Using the put-object AWS CLI command, upload an object to the examplebucket.

```
aws s3api put-object --bucket examplebucket --key HappyFace.jpg --body HappyFace.jpg --grant-full-control id="canonicalUserId-ofTheBucketOwner" --profile AccountBadmin
```

Note the following:

- The --Profile parameter specifies AccountBadmin profile, so the object is owned by Account B.
- The parameter grant-full-control grants the bucket owner full-control permission on the object as required by the bucket policy.

- The --body parameter identifies the source file to upload. For example, if the file is on the C: drive of a Windows computer, you specify c:\HappyFace.jpg.

## Step 3: Do the Account C Tasks

In the preceding steps, Account A has already created a role, exempleroles, establishing trust with Account C. This allows users in Account C to access Account A. In this step, Account C administrator creates a user (Dave) and delegates him the sts:AssumeRole permission it received from Account A. This will allow Dave to assume the exempleroles and temporarily gain access to Account A. The access policy that Account A attached to the role will limit what Dave can do when he accesses Account A—specifically, get objects in examplebucket.

### Step 3.1: Create a User in Account C and Delegate Permission to Assume exempleroles

1. Using the IAM user sign-in URL for Account C, first sign in to the AWS Management Console as AccountCadmin user.
2. In the IAM console, create a user Dave.

For instructions, see [Creating IAM Users \(AWS Management Console\)](#) in the *IAM User Guide*.

3. Note down the Dave credentials. Dave will need these credentials to assume the exempleroles role.
4. Create an inline policy for the Dave IAM user to delegate the sts:AssumeRole permission to Dave on the exempleroles role in account A.
  - a. In the navigation pane on the left, click **Users**.
  - b. Click the user name Dave.
  - c. On the user details page, select the **Permissions** tab and then expand the **Inline Policies** section.
  - d. Choose **click here (or Create User Policy)**.
  - e. Click **Custom Policy**, and then click **Select**.
  - f. Enter a name for the policy in the **Policy Name** field.
  - g. Copy the following policy into the **Policy Document** field.

You will need to update the policy by providing the Account A ID.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Action": ["sts:AssumeRole"],  
            "Resource": "arn:aws:iam::AccountA-ID:role/exempleroles"  
        }  
    ]  
}
```

#### h. Click **Apply Policy**

5. Save Dave's credentials to the config file of the AWS CLI by adding another profile, AccountCDave.

```
[profile AccountCDave]  
aws_access_key_id = UserDaveAccessKeyId  
aws_secret_access_key = UserDaveSecretAccessKey  
region = us-west-2
```

### Step 3.2: Assume Role (`examplerole`) and Access Objects

Now Dave can access objects in the bucket owned by Account A as follows:

- Dave first assumes the `examplerole` using his own credentials. This will return temporary credentials.
- Using the temporary credentials, Dave will then access objects in Account A's bucket.

1. At the command prompt, execute the following AWS CLI `assume-role` command using the `AccountCDave` profile.

You will need to update the ARN value in the command by providing the Account A ID where `examplerole` is defined.

```
aws sts assume-role --role-arn arn:aws:iam::accountA-ID:role/examplerole --profile AccountCDave --role-session-name test
```

In response, AWS Security Token Service (STS) returns temporary security credentials (access key ID, secret access key, and a security token).

2. Save the temporary security credentials in the AWS CLI config file under the `TempCred` profile.

```
[profile TempCred]
aws_access_key_id = temp-access-key-ID
aws_secret_access_key = temp-secret-access-key
aws_security_token = security-token
region = us-west-2
```

3. At the command prompt, execute the following AWS CLI command to access objects using the temporary credentials. For example, the command specifies the head-object API to retrieve object metadata for the `HappyFace.jpg` object.

```
aws s3api get-object --bucket examplebucket --key HappyFace.jpg SaveFileAs.jpg --profile TempCred
```

Because the access policy attached to `examplerole` allows the actions, Amazon S3 processes the request. You can try any other action on any other object in the bucket.

If you try any other action—for example, `get-object-acl`—you will get permission denied because the role is not allowed that action.

```
aws s3api get-object-acl --bucket examplebucket --key HappyFace.jpg --profile TempCred
```

We used user Dave to assume the role and access the object using temporary credentials. It could also be an application in Account C that accesses objects in `examplebucket`. The application can obtain temporary security credentials, and Account C can delegate the application permission to assume `examplerole`.

### Step 4: Clean Up

1. After you are done testing, you can do the following to clean up.

- Sign in to the AWS Management Console ([AWS Management Console](#)) using account A credentials, and do the following:
  - In the Amazon S3 console, remove the bucket policy attached to `examplebucket`. In the bucket **Properties**, delete the policy in the **Permissions** section.

- If the bucket is created for this exercise, in the Amazon S3 console, delete the objects and then delete the bucket.
  - In the IAM console, remove the `examplerole` you created in Account A.
  - In the IAM console, remove the AccountAdmin user.
2. Sign in to the AWS Management Console ([AWS Management Console](#)) using Account B credentials. In the IAM console, delete user AccountBadmin.
  3. Sign in to the AWS Management Console ([AWS Management Console](#)) using Account C credentials. In the IAM console, delete user AccountCadmin and user Dave.

## Related Resources

- [Creating a Role to Delegate Permissions to an IAM User](#) in the *IAM User Guide*.
- [Tutorial: Delegate Access Across AWS Accounts Using IAM Roles](#) in the *IAM User Guide*.
- [Working with Policies](#) in the *IAM User Guide*.

# Using Bucket Policies and User Policies

## Topics

- [Access Policy Language Overview \(p. 335\)](#)
- [Bucket Policy Examples \(p. 363\)](#)
- [User Policy Examples \(p. 372\)](#)

Bucket policy and user policy are two of the access policy options available for you to grant permission to your Amazon S3 resources. Both use JSON-based access policy language. The topics in this section describe the key policy language elements, with emphasis on Amazon S3-specific details, and provide example bucket and user policies.

### Important

We recommend you first review the introductory topics that explain the basic concepts and options available for you to manage access to your Amazon S3 resources. For more information, see [Introduction to Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

## Access Policy Language Overview

The topics in this section describe the basic elements used in bucket and user policies as used in Amazon S3. For complete policy language information, see the [Overview of IAM Policies](#) and the [AWS IAM Policy Reference](#) topics in the *IAM User Guide*.

### Note

Bucket policies are limited to 20 KB in size.

## Common Elements in an Access Policy

In its most basic sense, a policy contains the following elements:

- **Resources** – Buckets and objects are the Amazon S3 resources for which you can allow or deny permissions. In a policy, you use the Amazon Resource Name (ARN) to identify the resource.
- **Actions** – For each resource, Amazon S3 supports a set of operations. You identify resource operations you will allow (or deny) by using action keywords (see [Specifying Permissions in a Policy \(p. 338\)](#)).

For example, the `s3>ListBucket` permission will allow the user permission to the Amazon S3 [GET Bucket \(List Objects\)](#) operation.

- **Effect** – What the effect will be when the user requests the specific action—this can be either allow or deny.

If you do not explicitly grant access to (allow) a resource, access is implicitly denied. You can also explicitly deny access to a resource, which you might do in order to make sure that a user cannot access it, even if a different policy grants access.

- **Principal** – The account or user who is allowed access to the actions and resources in the statement. You specify a principal only in a bucket policy. It is the user, account, service, or other entity who is the recipient of this permission. In a user policy, the user to which the policy is attached is the implicit principal.

The following example bucket policy shows the preceding common policy elements. The policy allows Dave, a user in account `Account-ID`, `s3:GetBucketLocation`, `s3>ListBucket` and `s3GetObject` Amazon S3 permissions on the `examplebucket` bucket.

```
{
```

```
"Version": "2012-10-17",
"Statement": [
    {
        "Sid": "ExampleStatement1",
        "Effect": "Allow",
        "Principal": {
            "AWS": "arn:aws:iam::Account-ID:user/Dave"
        },
        "Action": [
            "s3:GetBucketLocation",
            "s3>ListBucket",
            "s3:GetObject"
        ],
        "Resource": [
            "arn:aws:s3:::examplebucket"
        ]
    }
]
```

Because this is a bucket policy, it includes the `Principal` element, which specifies who gets the permission.

For more information about the access policy elements, see the following topics:

- [Specifying Resources in a Policy \(p. 336\)](#)
- [Specifying a Principal in a Policy \(p. 337\)](#)
- [Specifying Permissions in a Policy \(p. 338\)](#)
- [Specifying Conditions in a Policy \(p. 343\)](#)

The following topics provide additional policy examples:

- [Bucket Policy Examples \(p. 363\)](#)
- [User Policy Examples \(p. 372\)](#)

## Specifying Resources in a Policy

The following is the common Amazon Resource Name (ARN) format to identify any resources in AWS.

```
arn:partition:service:region:namespace:relative-id
```

For your Amazon S3 resources,

- `aws` is a common partition name. If your resources are in China (Beijing) region, `aws-cn` is the partition name.
- `s3` is the service.
- you don't specify region and namespace.
- For Amazon S3, it can be a bucket-name or a bucket-name/object-key. You can use wild card.

Then the ARN format for Amazon S3 resources reduces to:

```
arn:aws:s3:::bucket_name
arn:aws:s3:::bucket_name/key_name
```

The following are examples of Amazon S3 resource ARNs.

- This ARN identifies the `/developers/design_info.doc` object in the `examplebucket` bucket.

```
arn:aws:s3:::examplebucket/developers/design_info.doc
```

- You can use wildcards as part of the resource ARN. You can use wildcard characters (\*) and (?) within any ARN segment (the parts separated by colons). An asterisk (\*) represents any combination of zero or more characters and a question mark (?) represents any single character. You can have use multiple \* or ? characters in each segment, but a wildcard cannot span segments.

```
arn:aws:s3:::examplebucket/*
```

This ARN uses '\*' to indicate all Amazon S3 resources (all S3 buckets and objects in your account).

```
arn:aws:s3:::*
```

- This ARN uses both wildcards, '\*', and '?', in the relative-ID part. It identifies all objects in buckets such as `example1bucket`, `example2bucket`, `example3bucket` and so on.

```
arn:aws:s3:::example?bucket/*
```

- You can use policy variables in Amazon S3 ARNs. At policy evaluation time, these predefined variables are replaced by their corresponding values. Suppose you organize your bucket as a collection of folders, one folder for each of your users. The folder name is the same as the user name. To grant users permission to their folders, you can specify a policy variable in the resource ARN:

```
arn:aws:s3:::bucket_name/developers/${aws:username}/
```

At run time, when the policy is evaluated, the variable `${aws:username}` in the resource ARN is substituted with the user name making the request.

For more information, see the following resources:

- [Resource in the \*IAM User Guide\*](#)
- [IAM Policy Variables Overview in the \*IAM User Guide\*](#).
- [ARNs in the AWS General Reference](#)

For more information about other access policy language elements, see [Access Policy Language Overview \(p. 335\)](#).

## Specifying a Principal in a Policy

The `Principal` element specifies the user, account, service, or other entity that is allowed or denied access to a resource. The `Principal` element is relevant only in a bucket policy; you don't specify it in a user policy because you attach user policy directly to a specific user. The following are examples of specifying `Principal`. For more information, see [Principal in the \*IAM User Guide\*](#).

- To grant permissions to an AWS account, identify the account using the following format.

```
"AWS" : "account-ARN"
```

For example:

```
"Principal": {"AWS": "arn:aws:iam::AccountNumber-WithoutHyphens:root"}
```

Amazon S3 also supports canonical user ID, which is an obfuscated form of the AWS account ID. You can specify this ID using the following format.

```
"CanonicalUser": "64-digit-alphanumeric-value"
```

For example:

```
"Principal": {"CanonicalUser": "64-digit-alphanumeric-value"}
```

For information about how to find the canonical user ID for your account, see [Finding Your Account Canonical User ID](#).

- To grant permission to an IAM user within your account, you must provide an "AWS" : "user-ARN" name-value pair.

```
"Principal": {"AWS": "arn:aws:iam::account-number-without-hyphens:user/username"}
```

- To grant permission to everyone, also referred as anonymous access, you set the wildcard, "\*", as the Principal value. For example, if you configure your bucket as a website, you want all the objects in the bucket to be publicly accessible. The following are equivalent:

```
"Principal": "*"
```

```
"Principal": {"AWS": "*"}"
```

### Warning

Use caution when granting anonymous access to your S3 bucket. When you grant anonymous access, anyone in the world can access your bucket. We highly recommend that you never grant any kind of anonymous write access to your S3 bucket.

- You can require that your users access your Amazon S3 content by using CloudFront URLs (instead of Amazon S3 URLs). To do this, create a CloudFront origin access identity (OAI), and then change the permissions either on your bucket or on the objects in your bucket. The format for specifying the OAI in a Principal statement is as follows:

```
"Principal": {"CanonicalUser": "Amazon S3 Canonical User ID assigned to origin access identity"}
```

For more information, see [Using an Origin Access Identity to Restrict Access to Your Amazon S3 Content](#) in the *Amazon CloudFront Developer Guide*.

For more information about other access policy language elements, see [Access Policy Language Overview \(p. 335\)](#).

## Specifying Permissions in a Policy

Amazon S3 defines a set of permissions that you can specify in a policy. These are keywords, each of which maps to specific Amazon S3 operations (see [Operations on Buckets](#), and [Operations on Objects](#) in the *Amazon Simple Storage Service API Reference*).

## Topics

- [Permissions for Object Operations \(p. 339\)](#)
- [Permissions Related to Bucket Operations \(p. 340\)](#)
- [Permissions Related to Bucket Subresource Operations \(p. 341\)](#)

## Permissions for Object Operations

This section provides a list of the permissions for object operations that you can specify in a policy.

### Amazon S3 Permissions for Object Operations

Permissions	Amazon S3 Operations
s3:AbortMultipartUpload	<a href="#">Abort Multipart Upload</a>
s3:DeleteObject	<a href="#">DELETE Object</a>
s3:DeleteObjectTagging	<a href="#">DELETE Object tagging</a>
s3:DeleteObjectVersion	<a href="#">DELETE Object (a Specific Version of the Object)</a>
s3:DeleteObjectVersionTagging	<a href="#">DELETE Object tagging (for a Specific Version of the Object)</a>
s3:GetObject	<a href="#">GET Object, HEAD Object, GET Object torrent</a>  When you grant this permission on a version-enabled bucket, you always get the latest version data.
s3:GetObjectAcl	<a href="#">GET Object ACL</a>
s3:GetObjectTagging	<a href="#">GET Object tagging</a>
s3:GetObjectTorrent	<a href="#">GET Object torrent</a>
s3:GetObjectVersion	<a href="#">GET Object, HEAD Object, GET Object torrent</a>  To grant permission for version-specific object data, you must grant this permission. That is, when you specify version number when making any of these requests, you need this Amazon S3 permission.
s3:GetObjectVersionAcl	<a href="#">GET ACL (for a Specific Version of the Object)</a>
s3:GetObjectVersionTagging	<a href="#">GET Object tagging (for a Specific Version of the Object)</a>
s3:GetObjectVersionTorrent	<a href="#">GET Object Torrent versioning</a>
s3>ListMultipartUploadParts	<a href="#">List Multipart Upload Parts</a>
s3:PutObject	<a href="#">PUT Object, POST Object, Initiate Multipart Upload, Upload Part, Complete Multipart Upload, PUT Object - Copy</a>
s3:PutObjectAcl	<a href="#">PUT Object ACL</a>
s3:PutObjectTagging	<a href="#">PUT Object tagging</a>
s3:PutObjectVersionAcl	<a href="#">PUT Object ACL (for a Specific Version of the Object)</a>
s3:PutObjectVersionTagging	<a href="#">PUT Object tagging (for a Specific Version of the Object)</a>
s3:RestoreObject	<a href="#">POST Object restore</a>

The following example bucket policy grants the `s3:PutObject` and the `s3:PutObjectAcl` permissions to a user (Dave). If you remove the `Principal` element, you can attach the policy to a user. These are object operations, and accordingly the relative-id portion of the Resource ARN identifies objects (`examplebucket/*`). For more information, see [Specifying Resources in a Policy \(p. 336\)](#).

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountB-ID:user/Dave"
            },
            "Action": ["s3:PutObject", "s3:PutObjectAcl"],
            "Resource": "arn:aws:s3:::examplebucket/*"
        }
    ]
}
```

You can use a wildcard to grant permission for all Amazon S3 actions.

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

## Permissions Related to Bucket Operations

This section provides a list of the permissions related to bucket operations that you can specify in a policy.

### Amazon S3 Permissions Related to Bucket Operations

Permission Keywords	Amazon S3 Operation(s) Covered
<code>s3:CreateBucket</code>	<a href="#">PUT Bucket</a>
<code>s3:DeleteBucket</code>	<a href="#">DELETE Bucket</a>
<code>s3&gt;ListBucket</code>	<a href="#">GET Bucket (List Objects)</a> , <a href="#">HEAD Bucket</a>
<code>s3&gt;ListBucketVersions</code>	<a href="#">GET Bucket Object versions</a>
<code>s3&gt;ListAllMyBuckets</code>	<a href="#">GET Service</a>
<code>s3&gt;ListBucketMultiPartUploads</code>	<a href="#">Multi-part uploads</a>

The following example user policy grants the `s3:CreateBucket`, `s3>ListAllMyBuckets`, and the `s3:GetBucketLocation` permissions to a user. Note that for all these permissions, you set the relative-id part of the Resource ARN to `"*"`. For all other bucket actions, you must specify a bucket name. For more information, see [Specifying Resources in a Policy \(p. 336\)](#).

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Action": [
                "s3:CreateBucket", "s3>ListAllMyBuckets", "s3:GetBucketLocation"
            ],
            "Resource": "*"
        }
    ]
}
```

```

        ],
        "Resource": [
            "arn:aws:s3::::*"
        ]
    }
}

```

Note that, if your user is going to use the console to view buckets, and see content of any of these buckets, the console will need the user to have the `s3>ListAllMyBuckets` and `s3:GetBucketLocation` permissions. For an example walkthrough, see [An Example Walkthrough: Using user policies to control access to your bucket \(p. 377\)](#).

## Permissions Related to Bucket Subresource Operations

This section provides a list of the permissions related to bucket subresource operations that you can specify in a policy.

### Amazon S3 Permissions Related to Bucket Subresource Operations

Permissions	Amazon S3 Operation(s) Covered
<code>s3&gt;DeleteBucketPolicy</code>	<a href="#">DELETE Bucket policy</a>
<code>s3&gt;DeleteBucketWebsite</code>	<a href="#">DELETE Bucket website</a>
<code>s3&gt;DeleteReplicationConfiguration</code>	<a href="#">DELETE Bucket replication</a>
<code>s3&gt;GetAccelerateConfiguration</code>	<a href="#">GET Bucket accelerate</a>
<code>s3&gt;GetAnalyticsConfiguration</code>	<a href="#">GET Bucket analytics</a> , <a href="#">List Bucket Analytics Configurations</a>
<code>s3&gt;GetBucketAcl</code>	<a href="#">GET Bucket acl</a>
<code>s3&gt;GetBucketCORS</code>	<a href="#">GET Bucket cors</a>
<code>s3&gt;GetBucketLocation</code>	<a href="#">GET Bucket location</a>
<code>s3&gt;GetBucketLogging</code>	<a href="#">GET Bucket logging</a>
<code>s3&gt;GetBucketNotification</code>	<a href="#">GET Bucket notification</a>
<code>s3&gt;GetBucketPolicy</code>	<a href="#">GET Bucket policy</a>
<code>s3&gt;GetBucketRequestPayment</code>	<a href="#">GET Bucket requestPayment</a>
<code>s3&gt;GetBucketTagging</code>	<a href="#">GET Bucket tagging</a>
<code>s3&gt;GetBucketVersioning</code>	<a href="#">GET Bucket versioning</a>
<code>s3&gt;GetBucketWebsite</code>	<a href="#">GET Bucket website</a>
<code>s3&gt;GetEncryptionConfiguration</code>	<a href="#">GET Bucket encryption</a>
<code>s3&gt;GetInventoryConfiguration</code>	<a href="#">GET Bucket inventory</a> , <a href="#">List Bucket Inventory Configurations</a>
<code>s3&gt;GetLifecycleConfiguration</code>	<a href="#">GET Bucket lifecycle</a>
<code>s3&gt;GetMetricsConfiguration</code>	<a href="#">GET Bucket metrics</a> , <a href="#">List Bucket Metrics Configurations</a>
<code>s3&gt;GetReplicationConfiguration</code>	<a href="#">GET Bucket replication</a>
<code>s3&gt;PutAccelerateConfiguration</code>	<a href="#">PUT Bucket accelerate</a>

Permissions	Amazon S3 Operation(s) Covered
s3:PutAnalyticsConfiguration	PUT Bucket analytics, DELETE Bucket analytics
s3:PutBucketAcl	PUT Bucket acl
s3:PutBucketCORS	PUT Bucket cors
s3:PutBucketLogging	PUT Bucket logging
s3:PutBucketNotification	PUT Bucket notification
s3:PutBucketPolicy	PUT Bucket policy
s3:PutBucketRequestPayment	PUT Bucket requestPayment
s3:PutBucketTagging	DELETE Bucket tagging, PUT Bucket tagging
s3:PutBucketVersioning	PUT Bucket versioning
s3:PutBucketWebsite	PUT Bucket website
s3:PutEncryptionConfiguration	PUT Bucket encryption and DELETE Bucket encryption
s3:PutInventoryConfiguration	PUT Bucket inventory, DELETE Bucket inventory
s3:PutLifecycleConfiguration	PUT Bucket lifecycle
s3:PutMetricsConfiguration	PUT Bucket metrics, DELETE Bucket metrics
s3:PutReplicationConfiguration	PUT Bucket replication

The following user policy grants the s3:GetBucketAcl permission on the `examplebucket` bucket to user Dave.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "statement1",
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::Account-ID:user/Dave"
      },
      "Action": [
        "s3:GetObjectVersion",
        "s3:GetBucketAcl"
      ],
      "Resource": "arn:aws:s3:::examplebucket"
    }
  ]
}
```

You can delete objects either by explicitly calling the DELETE Object API or by configuring its lifecycle (see [Object Lifecycle Management \(p. 125\)](#)) so that Amazon S3 can remove the objects when their lifetime expires. To explicitly block users or accounts from deleting objects, you must explicitly deny them s3:DeleteObject, s3:DeleteObjectVersion, and s3:PutLifecycleConfiguration permissions. Note that, by default, users have no permissions. But as you create users, add users to groups, and grant them permissions, it is possible for users to get certain permissions that you did not intend to give. That is where you can use explicit deny, which supersedes all other permissions a user might have and denies the user permissions for specific actions.

## Specifying Conditions in a Policy

The access policy language allows you to specify conditions when granting permissions. The `Condition` element (or Condition block) lets you specify conditions for when a policy is in effect. In the `Condition` element, which is optional, you build expressions in which you use Boolean operators (equal, less than, etc.) to match your condition against values in the request. For example, when granting a user permission to upload an object, the bucket owner can require the object be publicly readable by adding the `StringEquals` condition as shown here:

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "statement1",  
            "Effect": "Allow",  
            "Action": [  
                "s3:PutObject"  
            ],  
            "Resource": [  
                "arn:aws:s3:::examplebucket/*"  
            ],  
            "Condition": {  
                "StringEquals": {  
                    "s3:x-amz-acl": [  
                        "public-read"  
                    ]  
                }  
            }  
        }  
    ]  
}
```

The `Condition` block specifies the `StringEquals` condition that is applied to the specified key-value pair, `"s3:x-amz-acl": ["public-read"]`. There is a set of predefined keys you can use in expressing a condition. The example uses the `s3:x-amz-acl` condition key. This condition requires user to include the `x-amz-acl` header with value `public-read` in every PUT object request.

For more information about specifying conditions in an access policy language, see [Condition in the IAM User Guide](#).

The following topics describe AWS-wide and Amazon S3-specific condition keys and provide example policies.

### Topics

- [Available Condition Keys \(p. 343\)](#)
- [Amazon S3 Condition Keys for Object Operations \(p. 345\)](#)
- [Amazon S3 Condition Keys for Bucket Operations \(p. 357\)](#)

## Available Condition Keys

The predefined keys available for specifying conditions in an Amazon S3 access policy can be classified as follows:

- **AWS-wide keys** – AWS provides a set of common keys that are supported by all AWS services that support policies. These keys that are common to all services are called AWS-wide keys and use the prefix `aws:`. For a list of AWS-wide keys, see [Available Keys for Conditions](#) in the [IAM User Guide](#). There are also keys that are specific to Amazon S3, which use the prefix `s3:`. Amazon S3-specific keys are discussed in the next bulleted item.

The new condition keys `aws:sourceVpce` and `aws:sourceVpc` are used in bucket policies for VPC endpoints. For examples of using these condition keys, see [Example Bucket Policies for VPC Endpoints for Amazon S3 \(p. 370\)](#).

The following example bucket policy allows authenticated users permission to use the `s3:GetObject` action if the request originates from a specific range of IP addresses (192.168.143.\*), unless the IP address is 192.168.143.188. In the condition block, the `IpAddress` and the `NotIpAddress` are conditions, and each condition is provided a key-value pair for evaluation. Both the key-value pairs in this example use the `aws:SourceIp` AWS-wide key.

**Note**

The `IpAddress` and `NotIpAddress` key values specified in the condition uses CIDR notation as described in RFC 4632. For more information, go to <http://www.rfc-editor.org/rfc/rfc4632.txt>.

```
{  
    "Version": "2012-10-17",  
    "Id": "S3PolicyId1",  
    "Statement": [  
        {  
            "Sid": "statement1",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": ["s3:GetObject"],  
            "Resource": "arn:aws:s3:::examplebucket/*",  
            "Condition": {  
                "IpAddress": {  
                    "aws:SourceIp": "192.168.143.0/24"  
                },  
                "NotIpAddress": {  
                    "aws:SourceIp": "192.168.143.188/32"  
                }  
            }  
        }  
    ]  
}
```

- **Amazon S3-specific keys** – In addition to the AWS-wide keys the following are the condition keys that are applicable only in the context of granting Amazon S3 specific permissions. These Amazon S3-specific keys use the prefix `s3:`.

- `s3:x-amz-acl`
- `s3:x-amz-copy-source`
- `s3:x-amz-metadata-directive`
- `s3:x-amz-server-side-encryption`
- `s3:VersionId`
- `s3:LocationConstraint`
- `s3:delimiter`
- `s3:max-keys`
- `s3:prefix`
- `s3:x-amz-server-side-encryption-aws-kms-key-id`
- `s3:ExistingObjectTag/<tag-key>`

For example policies using object tags related condition keys, see [Object Tagging and Access Control Policies \(p. 119\)](#).

- `s3:RequestObjectTagKeys`

- `s3:RequestObjectTag/<tag-key>`

For example, the following bucket policy allows the `s3:PutObject` permission for two AWS accounts if the request includes the `x-amz-acl` header making the object publicly readable.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AddCannedAcl",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": [ "arn:aws:iam::account1-ID:root", "arn:aws:iam::account2-ID:root" ]  
            },  
            "Action": [ "s3:PutObject" ],  
            "Resource": [ "arn:aws:s3:::examplebucket/*" ],  
            "Condition": {  
                "StringEquals": {  
                    "s3:x-amz-acl": ["public-read"]  
                }  
            }  
        }  
    ]  
}
```

The Condition block uses the `StringEquals` condition and it is provided a key-value pair, `"s3:x-amz-acl":["public-read"]`, for evaluation. In the key-value pair, the `s3:x-amz-acl` is an Amazon S3-specific key, as indicated by the prefix `s3:`.

### Important

Not all conditions make sense for all actions. For example, it makes sense to include an `s3:LocationConstraint` condition on a policy that grants the `s3:CreateBucket` Amazon S3 permission, but not for the `s3:GetObject` permission. Amazon S3 can test for semantic errors of this type that involve Amazon S3-specific conditions. However, if you are creating a policy for an IAM user and you include a semantically invalid Amazon S3 condition, no error is reported, because IAM cannot validate Amazon S3 conditions.

The following section describes the condition keys that can be used to grant conditional permission for bucket and object operations. In addition, there are condition keys related to Amazon S3 Signature Version 4 authentication. For more information, go to [Amazon S3 Signature Version 4 Authentication Specific Policy Keys](#) in the *Amazon Simple Storage Service API Reference*.

## Amazon S3 Condition Keys for Object Operations

The following table shows which Amazon S3 conditions you can use with which Amazon S3 actions. Example policies are provided following the table. Note the following about the Amazon S3-specific condition keys described in the following table:

- The condition key names are preceded by the prefix `s3:.`. For example, `s3:x-amz-acl`
- Each condition key maps to the same name request header allowed by the API on which the condition can be set. That is, these condition keys dictate behavior of the same name request headers. For example:
  - The condition key `s3:x-amz-acl` that you can use to grant condition permission for the `s3:PutObject`

permission defines behavior of the `x-amz-acl` request header that the PUT Object API supports.

- The condition key `s3:VersionId` that you can use to grant conditional permission for the `s3:GetObjectVersion` permission defines behavior of the `versionId` query parameter that you set in a GET Object request.

Permission	Applicable Condition Keys (or keywords)	Description
<code>s3:PutObject</code>	<ul style="list-style-type: none"> <li><code>s3:x-amz-acl</code> (for canned ACL permissions)</li> <li><code>s3:x-amz-grant-permission</code> (for explicit permissions), where <code>permission</code> can be: <code>read</code>, <code>write</code>, <code>read-acp</code>, <code>write-acp</code>, <code>full-control</code></li> </ul>	<p>The <a href="#">PUT Object</a> operation allows access control list (ACL)-specific headers that you can use to grant ACL-based permissions. Using these keys, the bucket owner can set a condition to require specific access permissions when the user uploads an object.</p> <p>For an example policy, see <a href="#">Example 1: Granting s3:PutObject permission with a condition requiring the bucket owner to get full control (p. 352)</a>.</p> <p>For more information about ACLs, see <a href="#">Access Control List (ACL) Overview (p. 394)</a>.</p>
<code>s3:x-amz-copy-source</code>		<p>To copy an object you use the PUT Object API (see <a href="#">PUT Object</a>) and specify the source using the <code>x-amz-copy-source</code> header. Using this key, the bucket owner can restrict the copy source to a specific bucket, a specific folder in the bucket, or a specific object in a bucket.</p> <p>For a policy example, see <a href="#">Example 3: Granting s3:PutObject permission to copy objects with a restriction on the copy source (p. 354)</a>.</p>
<code>s3:x-amz-server-side-encryption</code>		<p>When you upload an object, you can use the <code>x-amz-server-side-encryption</code> header to request Amazon S3 to encrypt the object when it is saved, using an envelope encryption key managed either by AWS Key Management Service (KMS) or by Amazon S3 (see <a href="#">Protecting Data Using Server-Side Encryption (p. 410)</a>).</p> <p>When granting the <code>s3:PutObject</code> permission, the bucket owner can add a condition using this key to require the user to specify this header in the request. A bucket owner can grant such conditional permission to ensure</p>

Permission	Applicable Condition Keys (or keywords)	Description
		<p>that objects the user uploads are encrypted when they are saved.</p> <p>For a policy example, see <a href="#">Example 1: Granting s3:PutObject permission with a condition requiring the bucket owner to get full control (p. 352)</a>.</p>
	<p><code>s3:x-amz-server-side-encryption-aws-kms-key-id</code></p>	<p>When you upload an object, you can use the <code>x-amz-server-side-encryption-aws-kms-key-id</code> header to request Amazon S3 to encrypt the object using the specified AWS KMS key when it is saved (see <a href="#">Protecting Data Using Server-Side Encryption with AWS KMS-Managed Keys (SSE-KMS) (p. 410)</a>).</p> <p>When granting the <code>s3:PutObject</code> permission, the bucket owner can add a condition using this key to restrict the AWS KMS key ID used for object encryption to a specific value.</p> <p>A bucket owner can grant such conditional permission to ensure that objects the user uploads are encrypted with a specific key when they are saved.</p> <p>The KMS key you specify in the policy must use the following format:</p> <pre>arn:aws:kms:<i>region</i>:<i>acct-id</i>:key/<i>key-id</i></pre>
	<p><code>s3:x-amz-metadata-directive</code></p>	<p>When you copy an object using the PUT Object API (see <a href="#">PUT Object</a>) you can optionally add the <code>x-amz-metadata-directive</code> header to specify whether you want the object metadata copied from the source object or replaced with metadata provided in the request.</p> <p>Using this key bucket, an owner can add a condition to enforce certain behavior when objects are uploaded.</p> <p>Valid values: COPY   REPLACE. The default is COPY.</p>

Permission	Applicable Condition Keys (or keywords)	Description
	<p><code>s3:x-amz-storage-class</code></p> <p>By default <code>s3:PutObject</code> stores objects using the STANDARD storage class, but you can use the <code>x-amz-storage-class</code> request header to specify a different storage class.</p> <p>When granting the <code>s3:PutObject</code> permission, you can use the <code>s3:x-amz-storage-class</code> condition key to restrict which storage class to use when storing uploaded objects. For more information about storage classes, see <a href="#">Storage Classes</a>.</p> <p>For an example policy, see <a href="#">Example 5: Restrict object uploads to objects with a specific storage class (p. 356)</a>.</p> <p>Valid Values: STANDARD   STANDARD_IA   REDUCED_REDUNDANCY. The default is STANDARD.</p>	
<code>s3:PutObjectAcl</code>	<ul style="list-style-type: none"> <li>• <code>s3:RequestObjectTagKeys</code></li> <li>• <code>s3:RequestObjectTag/&lt;tag-key&gt;</code></li> </ul>	<p>Using this condition key you can limit permission for the <code>s3:PutObject</code> action by restricting the object tags allowed in the request. For examples of using these condition keys, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a>.</p> <p>The <a href="#">PUT Object ACL API</a> sets the access control list (ACL) on the specified object. The operation supports ACL-related headers. When granting this permission, the bucket owner can add conditions using these keys to require certain permissions. For more information about ACLs, see <a href="#">Access Control List (ACL) Overview (p. 394)</a>.</p> <p>For example, the bucket owner may want to retain control of the object regardless of who owns the object. To accomplish this, the bucket owner can add a condition using one of these keys to require the user to include specific permissions to the bucket owner.</p>

<b>Permission</b>	<b>Applicable Condition Keys (or keywords)</b>	<b>Description</b>
	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission for the s3:PutObjectAcl action to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3:PutObjectTagging	<ul style="list-style-type: none"> <li>• s3:RequestObjectTagKeys</li> <li>• s3:RequestObjectTag/ &lt;tag-key&gt;</li> </ul>	Using this condition key you can limit permission for the s3:PutObjectTagging action by restricting the object tags allowed in the request. For examples of using these condition keys, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3:PutObjectVersionTagging	<ul style="list-style-type: none"> <li>• s3:RequestObjectTagKeys</li> <li>• s3:RequestObjectTag/ &lt;tag-key&gt;</li> </ul>	Using this condition key you can limit permission for the s3:PutObjectVersionTagging action by restricting the object tags allowed in the request. For examples of using these condition keys, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
	s3:VersionId	Using this condition key you can limit the permission for the s3:PutObjectVersionTagging action to a specific object version. For an example policy, see <a href="#">Example 4: Granting access to a specific version of an object (p. 356)</a> .
	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .

Permission	Applicable Condition Keys (or keywords)	Description
s3:GetObjectVersion	s3:VersionId	<p>This Amazon S3 permission enables the user to perform a set of Amazon S3 API operations (see <a href="#">Amazon S3 Permissions for Object Operations (p. 339)</a>). For a version-enabled bucket, you can specify the object version to retrieve data for.</p> <p>By adding a condition using this key, the bucket owner can restrict the user to accessing data only for a specific version of the object. For an example policy, see <a href="#">Example 4: Granting access to a specific version of an object (p. 356)</a>.</p>
	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3:GetObject	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3:GetObjectAcl	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3:GetObjectVersionAcl	s3:VersionId	<p>You can retrieve Access Control List (ACL) of a specific object version using the <a href="#">GET Object acl</a> API. User must have permission for the s3:GetObjectVersionAcl action. For a version-enabled bucket, this Amazon S3 permission allows a user to get the ACL for a specific version of the object.</p> <p>The bucket owner can add a condition using the key to restrict the user to a specific version of the object.</p>
	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .

Permission	Applicable Condition Keys (or keywords)	Description
s3:PutObjectVersionAcl	s3:VersionId	For a version-enabled bucket, you can specify the object version in the <a href="#">PUT Object acl</a> request to set ACL on a specific object version. Using this condition, the bucket owner can restrict the user to setting an ACL only on a specific version of an object.
	<ul style="list-style-type: none"> <li>• s3:x-amz-acl (for canned ACL permissions)</li> <li>• s3:x-amz-grant-permission (for explicit permissions), where <i>permission</i> can be: read, write, read-acp, write-acp, grant-full-control</li> </ul>	<p>For a version-enabled bucket, this Amazon S3 permission allows you to set an ACL on a specific version of the object.</p> <p>For a description of these condition keys, see the <a href="#">s3:PutObjectACL</a> permission in this table.</p>
	s3:ExistingObjectTag/<tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3>DeleteObjectVersion	s3:VersionId	<p>For a version-enabled bucket, this Amazon S3 permission allows the user to delete a specific version of the object.</p> <p>The bucket owner can add a condition using this key to limit the user's ability to delete only a specific version of the object.</p> <p>For an example of using this condition key, see <a href="#">Example 4: Granting access to a specific version of an object (p. 356)</a>. The example is about granting the <a href="#">s3:GetObjectVersion</a> action, but the policy shows the use of this condition key.</p>
s3:DeleteObjectTagging	s3:ExistingObjectTag/<tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .

Permission	Applicable Condition Keys (or keywords)	Description
s3:DeleteObjectVersion	TagExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
	s3:VersionId	Using this condition key you can limit the permission for the s3:DeleteObjectVersionTagging action to a specific object version. For an example policy, see <a href="#">Example 4: Granting access to a specific version of an object (p. 356)</a> .
s3:GetObjectTagging	s3:ExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
s3:GetObjectVersionTagging	TagExistingObjectTag/ <tag-key>	Using this condition key you can limit the permission to only on objects that have a specific tag key and value. For examples, see <a href="#">Object Tagging and Access Control Policies (p. 119)</a> .
	s3:VersionId	Using this condition key you can limit the permission for the s3:GetObjectVersionTagging action to a specific object version. For an example policy, see <a href="#">Example 4: Granting access to a specific version of an object (p. 356)</a> .

[Example 1: Granting s3:PutObject permission with a condition requiring the bucket owner to get full control](#)

Suppose Account A owns a bucket and the account administrator wants to grant Dave, a user in Account B, permissions to upload objects. By default, objects that Dave uploads are owned by Account B, and Account A has no permissions on these objects. Because the bucket owner is paying the bills, it wants full permissions on the objects that Dave uploads. The Account A administrator can accomplish this by granting the s3:PutObject permission to Dave, with a condition that the request include ACL-specific headers, that either grants full permission explicitly or uses a canned ACL (see [PUT Object](#)).

- Require the x-amz-full-control header in the request with full control permission to the bucket owner.

The following bucket policy grants the s3:PutObject permission to user Dave with a condition using the s3:x-amz-grant-full-control condition key, which requires the request to include the x-amz-full-control header.

```
{
  "Version": "2012-10-17",
  "Statement": [
```

```
{
    "Sid": "statement1",
    "Effect": "Allow",
    "Principal": {
        "AWS": "arn:aws:iam::AccountB-ID:user/Dave"
    },
    "Action": "s3:PutObject",
    "Resource": "arn:aws:s3:::examplebucket/*",
    "Condition": {
        "StringEquals": {
            "s3:x-amz-grant-full-control": "id=AccountA-CanonicalUserID"
        }
    }
}
]
```

### Note

This example is about cross-account permission. However, if Dave, who is getting the permission, belongs to the AWS account that owns the bucket, then this conditional permission is not necessary, because the parent account to which Dave belongs owns objects the user uploads.

The preceding bucket policy grants conditional permission to user Dave in Account B. While this policy is in effect, it is possible for Dave to get the same permission without any condition via some other policy. For example, Dave can belong to a group and you grant the group s3:PutObject permission without any condition. To avoid such permission loopholes, you can write a stricter access policy by adding explicit deny. In this example, we explicitly deny user Dave upload permission if he does not include the necessary headers in the request granting full permissions to the bucket owner. Explicit deny always supersedes any other permission granted. The following is the revised access policy example.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountB-ID:user/AccountBadmin"
            },
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::examplebucket/*",
            "Condition": {
                "StringEquals": {
                    "s3:x-amz-grant-full-control": "id=AccountA-CanonicalUserID"
                }
            }
        },
        {
            "Sid": "statement2",
            "Effect": "Deny",
            "Principal": {
                "AWS": "arn:aws:iam::AccountB-ID:user/AccountBadmin"
            },
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::examplebucket/*",
            "Condition": {
                "StringNotEquals": {
                    "s3:x-amz-grant-full-control": "id=AccountA-CanonicalUserID"
                }
            }
        }
    ]
}
```

```
        }
    ]
```

If you have two AWS accounts, you can test the policy using the AWS CLI. You attach the policy and, using Dave's credentials, test the permission using the following AWS CLI `put-object` command. You provide Dave's credentials by adding the `--profile` parameter. You grant full control permission to the bucket owner by adding the `--grant-full-control` parameter. For more information about setting up and using the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
aws s3api put-object --bucket examplebucket --key HappyFace.jpg --body c:\HappyFace.jpg
--grant-full-control id="AccountA-CanonicalUserID" --profile AccountBUserProfile
```

- Require the `x-amz-acl` header with a canned ACL granting full control permission to the bucket owner.

To require the `x-amz-acl` header in the request, you can replace the key-value pair in the `Condition` block and specify the `s3:x-amz-acl` condition key as shown below.

```
"Condition": {
  "StringNotEquals": {
    "s3:x-amz-acl": "bucket-owner-full-control"
  }
}
```

To test the permission using the AWS CLI, you specify the `--acl` parameter. The AWS CLI then adds the `x-amz-acl` header when it sends the request.

```
aws s3api put-object --bucket examplebucket --key HappyFace.jpg --body c:\HappyFace.jpg
--acl "bucket-owner-full-control" --profile AccountBadmin
```

### Example 2: Granting `s3:PutObject` permission requiring objects stored using server-side encryption

Suppose Account A owns a bucket and the account administrator wants to grant Jane, a user in Account A, permission to upload objects with a condition that Jane always request server-side encryption so that Amazon S3 saves objects encrypted. The Account A administrator can accomplish using the `s3:x-amz-server-side-encryption` condition key as shown. The key-value pair in the `Condition` block specifies the `s3:x-amz-server-side-encryption` key.

```
"Condition": {
  "StringNotEquals": {
    "s3:x-amz-server-side-encryption": "AES256"
  }
}
```

When testing the permission using AWS CLI, you will need to add the required parameter using the `--server-side-encryption` parameter.

```
aws s3api put-object --bucket example1bucket --key HappyFace.jpg --body c:\HappyFace.jpg --
server-side-encryption "AES256" --profile AccountBadmin
```

### Example 3: Granting `s3:PutObject` permission to copy objects with a restriction on the copy source

In the PUT Object request, when you specify a source object, it is a copy operation (see [PUT Object - Copy](#)). Accordingly, the bucket owner can grant a user permission to copy objects with restrictions on the source. For example:

- allow copying objects only from the sourcebucket bucket.
- allow copying objects from the sourcebucket bucket, and only the objects whose key name prefix start with public/f. For example, sourcebucket/public/\*
- allow copying only a specific object from the sourcebucket. For example, sourcebucket/example.jpg.

The following bucket policy grants user Dave s3:PutObject permission that allows him to copy only objects with a condition that the request include the s3:x-amz-copy-source header and the header value specify the /examplebucket/public/\* key name prefix.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "cross-account permission to user in your own account",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"
            },
            "Action": ["s3:PutObject"],
            "Resource": "arn:aws:s3:::examplebucket/*"
        },
        {
            "Sid": "Deny your user permission to upload object if copy source is not / bucket/folder",
            "Effect": "Deny",
            "Principal": {
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"
            },
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::examplebucket/*",
            "Condition": {
                "StringNotLike": {
                    "s3:x-amz-copy-source": "examplebucket/public/*"
                }
            }
        }
    ]
}
```

You can test the permission using the AWS CLI copy-object command. You specify the source by adding the --copy-source parameter, the key name prefix must match that the prefix allowed in the policy. You will need to provide user Dave credentials using the --profile parameter. For more information about setting up AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
aws s3api copy-object --bucket examplebucket --key HappyFace.jpg
--copy-source examplebucket/public/PublicHappyFace1.jpg --profile AccountADave
```

Note that the preceding policy uses the StringNotLike condition. To grant permission to copy only a specific object you will need to change the condition from StringNotLike to StringNotEquals and then specify the exact object key as shown.

```
"Condition": {
    "StringNotEquals": {
        "s3:x-amz-copy-source": "examplebucket/public/PublicHappyFace1.jpg"
    }
}
```

#### Example 4: Granting access to a specific version of an object

Suppose Account A owns a version-enabled bucket. The bucket has several versions of the HappyFace.jpg object. The account administrator now wants to grant its user (Dave) permission to get only a specific version of the object. The account administrator can accomplish this by granting Dave s3:GetObjectVersion permission conditionally as shown. The key-value pair in the Condition block specifies the s3:VersionId condition key.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"
            },
            "Action": ["s3:GetObjectVersion"],
            "Resource": "arn:aws:s3:::examplebucketversionenabled/HappyFace.jpg"
        },
        {
            "Sid": "statement2",
            "Effect": "Deny",
            "Principal": {
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"
            },
            "Action": ["s3:GetObjectVersion"],
            "Resource": "arn:aws:s3:::examplebucketversionenabled/HappyFace.jpg",
            "Condition": {
                "StringNotEquals": {
                    "s3:VersionId": "AaaHbAQitwiL_h47_44lR02DDfLlB05e"
                }
            }
        }
    ]
}
```

In this case, Dave will need to know the exact object version ID to retrieve the object.

You can test the permissions using the AWS CLI get-object command with the --version-id parameter identifying the specific object version. The command retrieves the object and saves it to the OutputFile.jpg file.

```
aws s3api get-object --bucket examplebucketversionenabled --key HappyFace.jpg
OutputFile.jpg --version-id AaaHbAQitwiL_h47_44lR02DDfLlB05e --profile AccountADave
```

#### Example 5: Restrict object uploads to objects with a specific storage class

Suppose Account A owns a bucket and the account administrator wants to restrict Dave, a user in Account A, to be able to only upload objects to the bucket that will be stored with the STANDARD\_IA storage class. The Account A administrator can accomplish this by using the s3:x-amz-storage-class condition key as shown in the following example bucket policy.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::AccountA-ID:user/Dave"
            },

```

```
        "Action": "s3:PutObject",
        "Resource": [
            "arn:aws:s3:::examplebucket/*"
        ],
        "Condition": {
            "StringEquals": {
                "s3:x-amz-storage-class": [
                    "STANDARD_IA"
                ]
            }
        }
    }
}
```

## Amazon S3 Condition Keys for Bucket Operations

The following table shows list of bucket operation-specific permissions you can grant in policies, and for each of the permissions, the available keys you can use in specifying a condition.

Permission	Applicable Condition Keys	Description
s3:CreateBucket	<ul style="list-style-type: none"><li>s3:x-amz-acl (for canned ACL permissions)</li><li>s3:x-amz-grant-permission (for explicit permissions), where <i>permission</i> can be:  read, write, read-acp, write-acp, full-control</li></ul>	The Create Bucket API (see <a href="#">PUT Bucket</a> ) supports ACL-specific headers. Using these condition keys, you can require a user to set these headers in the request granting specific permissions.
	s3:LocationConstraint	Using this condition key, you can restrict user to create bucket in a specific region. For a policy example, see <a href="#">Example 1: Allow a user to create a bucket but only in a specific region (p. 360)</a> .
s3>ListBucket	s3:prefix	<p>Using this condition key, you can limit the response of the Get Bucket (List Objects) API (see <a href="#">GET Bucket (List Objects)</a>) to key names with specific prefix.</p> <p>The Get Bucket (List Objects) API returns list of object keys in the specified bucket. This API supports the <code>prefix</code> header to retrieve only the object keys with a specific prefix. This condition key relates to the <code>prefix</code> header.</p> <p>For example, the Amazon S3 console supports the folder concept using key name prefixes. So if you have two objects with key names <code>public/object1.jpg</code> and <code>public/</code></p>

Permission	Applicable Condition Keys	Description
		<p>object2.jpg, the console shows the objects under the public folder. If you organize your object keys using such prefixes, you can grant s3&gt;ListBucket permission with the condition that will allow the user to get a list of key names with a specific prefix.</p> <p>For a policy example, see <a href="#">Example 2: Allow a user to get a list of objects in a bucket according to a specific prefix (p. 361)</a>.</p>
	s3:delimiter	<p>If you organize your object key names using prefixes and delimiters, you can use this condition key to require the user to specify the delimiter parameter in the Get Bucket (List Objects) request. In this case, the response Amazon S3 returns is a list of object keys with common prefixes grouped together. For an example of using prefixes and delimiters, go to <a href="#">Get Bucket (List Objects)</a>.</p>
	s3:max-keys	<p>Using this condition, you can limit the number of keys Amazon S3 returns in response to the Get Bucket (List Objects) request by requiring the user to specify the max-keys parameter. By default the API returns up to 1000 key names.</p> <p>For a list of numeric conditions you can use, see <a href="#">Numeric Condition Operators</a> in the <i>IAM User Guide</i>.</p>

Permission	Applicable Condition Keys	Description
s3>ListBucketVersions	s3:prefix	<p>If your bucket is version-enabled, you can use the <a href="#">GET Bucket Object versions API</a> (see <a href="#">GET Bucket Object versions</a>) to retrieve metadata of all of the versions of objects. For this API, the bucket owner must grant the <code>s3&gt;ListBucketVersions</code> permission in the policy.</p> <p>Using this condition key, you can limit the response of the API to key names with a specific prefix by requiring the user to specify the <code>prefix</code> parameter in the request with a specific value.</p> <p>For example, the Amazon S3 console supports the folder concept of using key name prefixes. If you have two objects with key names <code>public/object1.jpg</code> and <code>public/object2.jpg</code>, the console shows the objects under the <code>public</code> folder. If you organize your object keys using such prefixes, you can grant <code>s3&gt;ListBucket</code> permission with the condition that will allow a user to get a list of key names with a specific prefix.</p> <p>For a policy example, see <a href="#">Example 2: Allow a user to get a list of objects in a bucket according to a specific prefix (p. 361)</a>.</p>
	s3:delimiter	<p>If you organize your object key names using prefixes and delimiters, you can use this condition key to require the user to specify the <code>delimiter</code> parameter in the GET Bucket Object versions request. In this case, the response Amazon S3 returns is a list of object keys with common prefixes grouped together.</p>
	s3:max-keys	<p>Using this condition you can limit the number of keys Amazon S3 returns in response to the GET Bucket Object versions request by requiring the user to specify the <code>max-keys</code> parameter. By default, the API returns up to 1000 key names. For a list of numeric conditions you can use, see <a href="#">Numeric Condition Operators</a> in the <a href="#">IAM User Guide</a>.</p>

Permission	Applicable Condition Keys	Description
s3:PutBucketAcl	<ul style="list-style-type: none"> <li>• s3:x-amz-acl (for canned ACL permissions)</li> <li>• s3:x-amz-grant-permission (for explicit permissions), where <b>permission</b> can be: <code>read, write, read-acp, write-acp, full-control</code></li> </ul>	The <b>PUT Bucket acl</b> API (see <a href="#">PUT Bucket</a> ) supports ACL-specific headers. You can use these condition keys to require a user to set these headers in the request.

### Example 1: Allow a user to create a bucket but only in a specific region

Suppose an AWS account administrator wants to grant its user (Dave), permission to create a bucket in the South America (São Paulo) region only. The account administrator can attach the following user policy granting the s3:CreateBucket permission with a condition as shown. The key-value pair in the Condition block specifies the s3:LocationConstraint key and the sa-east-1 region as its value.

#### Note

In this example, the bucket owner is granting permission to one of its users, so either a bucket policy or a user policy can be used. This example shows a user policy.

For a list of Amazon S3 regions, go to [Regions and Endpoints](#) in the *Amazon Web Services General Reference*.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Action": [
                "s3:CreateBucket"
            ],
            "Resource": [
                "arn:aws:s3:::*"
            ],
            "Condition": {
                "StringLike": {
                    "s3:LocationConstraint": "sa-east-1"
                }
            }
        }
    ]
}
```

This policy restricts the user from creating a bucket in any other region except sa-east-1. However, it is possible some other policy will grant this user permission to create buckets in another region. For example, if the user belongs to a group, the group may have a policy attached to it allowing all users in the group permission to create buckets in some other region. To ensure the user does not get permission to create buckets in any other region, you can add an explicit deny statement in this policy.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Deny",
            "Action": [
                "s3:CreateBucket"
            ],
            "Resource": [
                "arn:aws:s3:::*"
            ],
            "Condition": {
                "StringNotLike": {
                    "s3:LocationConstraint": "sa-east-1"
                }
            }
        }
    ]
}
```

```

        "Effect": "Allow",
        "Action": [
            "s3:CreateBucket"
        ],
        "Resource": [
            "arn:aws:s3::::*"
        ],
        "Condition": {
            "StringLike": {
                "s3:LocationConstraint": "sa-east-1"
            }
        }
    },
    {
        "Sid": "statement2",
        "Effect": "Deny",
        "Action": [
            "s3:CreateBucket"
        ],
        "Resource": [
            "arn:aws:s3::::*"
        ],
        "Condition": {
            "StringNotLike": {
                "s3:LocationConstraint": "sa-east-1"
            }
        }
    }
]
}

```

The Deny statement uses the `StringNotLike` condition. That is, a create bucket request will be denied if the location constraint is not "sa-east-1". The explicit deny will not allow the user to create a bucket in any other region, no matter what other permission the user gets.

You can test the policy using the following `create-bucket` AWS CLI command. This example uses the `bucketconfig.txt` file to specify the location constraint. Note the Windows file path. You will need to update the bucket name and path as appropriate. You must provide user credentials using the `--profile` parameter. For more information about setting up and using the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
aws s3api create-bucket --bucket examplebucket --profile AccountADave --create-bucket-configuration file://c:/Users/someUser/bucketconfig.txt
```

The `bucketconfig.txt` file specifies the configuration as follows

```
{"LocationConstraint": "sa-east-1"}
```

### Example 2: Allow a user to get a list of objects in a bucket according to a specific prefix

A bucket owner can restrict a user to list content of a specific folder in the bucket. This is useful if objects in the bucket are organized by key name prefixes, the Amazon S3 console then uses the prefixes to show a folder hierarchy (only the console supports the concept of folders; the Amazon S3 API supports only buckets and objects).

In this example, the bucket owner and the parent account to which the user belongs are the same. So the bucket owner can use either a bucket policy or a user policy. First, we show a user policy.

The following user policy grants the `s3>ListBucket` permission (see [GET Bucket \(List Objects\)](#)) with a condition that requires the user to specify the `prefix` in the request with the value `projects`.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Action": [
                "s3>ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::<examplebucket>"
            ],
            "Condition": {
                "StringEquals": {
                    "s3:prefix": "projects"
                }
            }
        },
        {
            "Sid": "statement2",
            "Effect": "Deny",
            "Action": [
                "s3>ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::<examplebucket>"
            ],
            "Condition": {
                "StringNotEquals": {
                    "s3:prefix": "projects"
                }
            }
        }
    ]
}
```

The condition restricts the user to listing object keys with the `projects` prefix. The added explicit deny will deny user request for listing keys with any other prefix no matter what other permissions the user might have. For example, it is possible that the user gets permission to list object keys without any restriction, for example either by updates to the preceding user policy or via a bucket policy. But because explicit deny always supersedes, the user request to list keys other than the `project` prefix will be denied.

The preceding policy is a user policy. If you add the `Principal` element to the policy, identifying the user, you now have a bucket policy as shown.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "statement1",
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::<BucketOwner-accountID>:user/<user-name>"
            },
            "Action": [
                "s3>ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::<examplebucket>"
            ],
            "Condition": {
                "StringEquals": {

```

```
        "s3:prefix": "examplefolder"
    }
},
{
    "Sid":"statement2",
    "Effect":"Deny",
    "Principal": {
        "AWS": "arn:aws:iam::BucketOwner-AccountID:user/user-name"
    },
    "Action": [
        "s3>ListBucket"
    ],
    "Resource": [
        "arn:aws:s3:::examplebucket"
    ],
    "Condition": {
        "StringNotEquals": {
            "s3:prefix": "examplefolder"
        }
    }
}
]
```

You can test the policy using the following `list-object` AWS CLI command. In the command, you provide user credentials using the `--profile` parameter. For more information about setting up and using the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

```
aws s3api list-objects --bucket examplebucket --prefix examplefolder --profile AccountADave
```

Now if the bucket is version-enabled, to list the objects in the bucket, instead of `s3>ListBucket` permission, you must grant the `s3>ListBucketVersions` permission in the preceding policy. This permission also supports the `s3:prefix` condition key.

## Bucket Policy Examples

This section presents a few examples of typical use cases for bucket policies. The policies use `bucket` and `examplebucket` strings in the resource value. To test these policies, you need to replace these strings with your bucket name. For information about access policy language, see [Access Policy Language Overview \(p. 335\)](#).

### Note

Bucket policies are limited to 20 KB in size.

You can use the [AWS Policy Generator](#) to create a bucket policy for your Amazon S3 bucket. You can then use the generated document to set your bucket policy by using the [Amazon S3 console](#), by a number of third-party tools, or via your application.

### Important

When testing permissions using the Amazon S3 console, you will need to grant additional permissions that the console requires—`s3>ListAllMyBuckets`, `s3:GetBucketLocation`, and `s3>ListBucket` permissions. For an example walkthrough that grants permissions to users and tests them using the console, see [An Example Walkthrough: Using user policies to control access to your bucket \(p. 377\)](#).

### Topics

- [Granting Permissions to Multiple Accounts with Added Conditions \(p. 364\)](#)
- [Granting Read-Only Permission to an Anonymous User \(p. 364\)](#)

- [Restricting Access to Specific IP Addresses \(p. 365\)](#)
- [Restricting Access to a Specific HTTP Referrer \(p. 366\)](#)
- [Granting Permission to an Amazon CloudFront Origin Identity \(p. 367\)](#)
- [Adding a Bucket Policy to Require MFA \(p. 367\)](#)
- [Granting Cross-Account Permissions to Upload Objects While Ensuring the Bucket Owner Has Full Control \(p. 369\)](#)
- [Granting Permissions for Amazon S3 Inventory and Amazon S3 Analytics \(p. 369\)](#)
- [Example Bucket Policies for VPC Endpoints for Amazon S3 \(p. 370\)](#)

## Granting Permissions to Multiple Accounts with Added Conditions

The following example policy grants the `s3:PutObject` and `s3:PutObjectAcl` permissions to multiple AWS accounts and requires that any request for these operations include the `public-read` canned ACL. For more information, see [Specifying Permissions in a Policy \(p. 338\)](#) and [Specifying Conditions in a Policy \(p. 343\)](#).

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AddCannedAcl",  
            "Effect": "Allow",  
            "Principal": {"AWS":  
                ["arn:aws:iam::111122223333:root", "arn:aws:iam::444455556666:root"]},  
            "Action": ["s3:PutObject", "s3:PutObjectAcl"],  
            "Resource": ["arn:aws:s3:::examplebucket/*"],  
            "Condition": {"StringEquals": {"s3:x-amz-acl": ["public-read"]}}  
        }  
    ]  
}
```

## Granting Read-Only Permission to an Anonymous User

The following example policy grants the `s3:GetObject` permission to any public anonymous users. (For a list of permissions and the operations that they allow, see [Specifying Permissions in a Policy \(p. 338\)](#).) This permission allows anyone to read the object data, which is useful for when you configure your bucket as a website and want everyone to be able to read objects in the bucket.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AddPerm",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": ["s3:GetObject"],  
            "Resource": ["arn:aws:s3:::examplebucket/*"]  
        }  
    ]  
}
```

### Warning

Use caution when granting anonymous access to your S3 bucket. When you grant anonymous access, anyone in the world can access your bucket. We highly recommend that you never grant any kind of anonymous write access to your S3 bucket.

## Restricting Access to Specific IP Addresses

The following example grants permissions to any user to perform any Amazon S3 operations on objects in the specified bucket. However, the request must originate from the range of IP addresses specified in the condition.

The condition in this statement identifies the 54.240.143.\* range of allowed Internet Protocol version 4 (IPv4) IP addresses, with one exception: 54.240.143.188.

The Condition block uses the `IpAddress` and `NotIpAddress` conditions and the `aws:SourceIp` condition key, which is an AWS-wide condition key. For more information about these condition keys, see [Specifying Conditions in a Policy \(p. 343\)](#). The `aws:sourceIp` IPv4 values use the standard CIDR notation. For more information, see [IP Address Condition Operators](#) in the *IAM User Guide*.

```
{  
    "Version": "2012-10-17",  
    "Id": "S3PolicyId1",  
    "Statement": [  
        {  
            "Sid": "IPAllow",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": "s3:*",  
            "Resource": "arn:aws:s3:::examplebucket/*",  
            "Condition": {  
                "IpAddress": {"aws:SourceIp": "54.240.143.0/24"},  
                "NotIpAddress": {"aws:SourceIp": "54.240.143.188/32"}  
            }  
        }  
    ]  
}
```

## Allowing IPv4 and IPv6 Addresses

When you start using IPv6 addresses, we recommend that you update all of your organization's policies with your IPv6 address ranges in addition to your existing IPv4 ranges to ensure that the policies continue to work as you make the transition to IPv6.

The following example bucket policy shows how to mix IPv4 and IPv6 address ranges to cover all of your organization's valid IP addresses. The example policy would allow access to the example IP addresses 54.240.143.1 and 2001:DB8:1234:5678::1 and would deny access to the addresses 54.240.143.129 and 2001:DB8:1234:5678:ABCD::1.

The IPv6 values for `aws:sourceIp` must be in standard CIDR format. For IPv6 we support using :: to represent a range of 0s, for example, 2032001:DB8:1234:5678::/64. For more information, see [IP Address Condition Operators](#) in the *IAM User Guide*.

```
{  
    "Id": "PolicyId2",  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AllowIPmix",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": "s3:*",  
            "Resource": "arn:aws:s3:::examplebucket/*",  
            "Condition": {  
                "IpAddress": {  
                    "aws:SourceIp": [  
                        "54.240.143.0/24",  
                        "2001:DB8:1234:5678::/64"  
                    ]  
                }  
            }  
        }  
    ]  
}
```

```

        "2001:DB8:1234:5678::/64"
    ],
},
"NotIpAddress": {
    "aws:SourceIp": [
        "54.240.143.128/30",
        "2001:DB8:1234:5678:ABCD::/80"
    ]
}
}
]
```

## Restricting Access to a Specific HTTP Referrer

Suppose you have a website with domain name (`www.example.com` or `example.com`) with links to photos and videos stored in your S3 bucket, `examplebucket`. By default, all the S3 resources are private, so only the AWS account that created the resources can access them. To allow read access to these objects from your website, you can add a bucket policy that allows `s3:GetObject` permission with a condition, using the `aws:referer` key, that the get request must originate from specific webpages. The following policy specifies the `StringLike` condition with the `aws:Referer` condition key.

```
{
    "Version": "2012-10-17",
    "Id": "http referer policy example",
    "Statement": [
        {
            "Sid": "Allow get requests originating from www.example.com and example.com.",
            "Effect": "Allow",
            "Principal": "*",
            "Action": "s3:GetObject",
            "Resource": "arn:aws:s3:::examplebucket/*",
            "Condition": {
                "StringLike": {"aws:Referer": ["http://www.example.com/*", "http://example.com/*"]}
            }
        }
    ]
}
```

Make sure the browsers you use include the `http referer` header in the request.

You can further secure access to objects in the `examplebucket` bucket by adding explicit deny to the bucket policy as shown in the following example. Explicit deny supersedes any permission you might grant to objects in the `examplebucket` bucket using other means such as ACLs or user policies.

```
{
    "Version": "2012-10-17",
    "Id": "http referer policy example",
    "Statement": [
        {
            "Sid": "Allow get requests referred by www.example.com and example.com.",
            "Effect": "Allow",
            "Principal": "*",
            "Action": "s3:GetObject",
            "Resource": "arn:aws:s3:::examplebucket/*",
            "Condition": {
                "StringLike": {"aws:Referer": ["http://www.example.com/*", "http://example.com/*"]}
            }
        },
        {

```

```
        "Sid": "Explicit deny to ensure requests are allowed only from specific referer.",
        "Effect": "Deny",
        "Principal": "*",
        "Action": "s3:*",
        "Resource": "arn:aws:s3:::examplebucket/*",
        "Condition": {
            "StringNotLike": {"aws:Referer": ["http://www.example.com/*", "http://example.com/*"]}
        }
    }
}
```

## Granting Permission to an Amazon CloudFront Origin Identity

The following example bucket policy grants a CloudFront Origin Identity permission to get (list) all objects in your Amazon S3 bucket. The CloudFront Origin Identity is used to enable the CloudFront private content feature. The policy uses the CanonicalUser prefix, instead of AWS, to specify a Canonical User ID. To learn more about CloudFront support for serving private content, go to the [Serving Private Content](#) topic in the *Amazon CloudFront Developer Guide*. You must specify the canonical user ID for your CloudFront distribution's origin access identity. For instructions about finding the canonical user ID, see [Specifying a Principal in a Policy \(p. 337\)](#).

```
{
    "Version": "2012-10-17",
    "Id": "PolicyForCloudFrontPrivateContent",
    "Statement": [
        {
            "Sid": " Grant a CloudFront Origin Identity access to support private content",
            "Effect": "Allow",
            "Principal": {
                "CanonicalUser": "79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be"
            },
            "Action": "s3:GetObject",
            "Resource": "arn:aws:s3:::example-bucket/*"
        }
    ]
}
```

## Adding a Bucket Policy to Require MFA

Amazon S3 supports MFA-protected API access, a feature that can enforce multi-factor authentication (MFA) for access to your Amazon S3 resources. Multi-factor authentication provides an extra level of security you can apply to your AWS environment. It is a security feature that requires users to prove physical possession of an MFA device by providing a valid MFA code. For more information, go to [AWS Multi-Factor Authentication](#). You can require MFA authentication for any requests to access your Amazon S3 resources.

You can enforce the MFA authentication requirement using the `aws:MultiFactorAuthAge` key in a bucket policy. IAM users can access Amazon S3 resources by using temporary credentials issued by the AWS Security Token Service (STS). You provide the MFA code at the time of the STS request.

When Amazon S3 receives a request with MFA authentication, the `aws:MultiFactorAuthAge` key provides a numeric value indicating how long ago (in seconds) the temporary credential was created. If the temporary credential provided in the request was not created using an MFA device, this key value is null (absent). In a bucket policy, you can add a condition to check this value, as shown in the following example bucket policy. The policy denies any Amazon S3 operation on the `/taxdocuments` folder in the `examplebucket` bucket if the request is not MFA authenticated. To learn more about MFA authentication, see [Using Multi-Factor Authentication \(MFA\) in AWS](#) in the *IAM User Guide*.

```
{
```

```

    "Version": "2012-10-17",
    "Id": "123",
    "Statement": [
        {
            "Sid": "",
            "Effect": "Deny",
            "Principal": "*",
            "Action": "s3:*",
            "Resource": "arn:aws:s3:::examplebucket/taxdocuments/*",
            "Condition": { "Null": { "aws:MultiFactorAuthAge": true } }
        }
    ]
}

```

The Null condition in the Condition block evaluates to true if the `aws:MultiFactorAuthAge` key value is null, indicating that the temporary security credentials in the request were created without the MFA key.

The following bucket policy is an extension of the preceding bucket policy. It includes two policy statements. One statement allows the `s3:GetObject` permission on a bucket (`examplebucket`) to everyone and another statement further restricts access to the `examplebucket/taxdocuments` folder in the bucket by requiring MFA authentication.

```

{
    "Version": "2012-10-17",
    "Id": "123",
    "Statement": [
        {
            "Sid": "",
            "Effect": "Deny",
            "Principal": "*",
            "Action": "s3:*",
            "Resource": "arn:aws:s3:::examplebucket/taxdocuments/*",
            "Condition": { "Null": { "aws:MultiFactorAuthAge": true } }
        },
        {
            "Sid": "",
            "Effect": "Allow",
            "Principal": "*",
            "Action": ["s3:GetObject"],
            "Resource": "arn:aws:s3:::examplebucket/*"
        }
    ]
}

```

You can optionally use a numeric condition to limit the duration for which the `aws:MultiFactorAuthAge` key is valid, independent of the lifetime of the temporary security credential used in authenticating the request. For example, the following bucket policy, in addition to requiring MFA authentication, also checks how long ago the temporary session was created. The policy denies any operation if the `aws:MultiFactorAuthAge` key value indicates that the temporary session was created more than an hour ago (3,600 seconds).

```

{
    "Version": "2012-10-17",
    "Id": "123",
    "Statement": [
        {
            "Sid": "",
            "Effect": "Deny",
            "Principal": "*",
            "Action": "s3:*",
            "Resource": "arn:aws:s3:::examplebucket/taxdocuments/*",
            "Condition": { "LessThan": { "aws:MultiFactorAuthAge": 3600 } }
        }
    ]
}

```

```

        "Condition": {"Null": {"aws:MultiFactorAuthAge": true }},
    },
    {
        "Sid": "",
        "Effect": "Deny",
        "Principal": "*",
        "Action": "s3:*",
        "Resource": "arn:aws:s3:::examplebucket/taxdocuments/*",
        "Condition": {"NumericGreaterThan": {"aws:MultiFactorAuthAge": 3600 }}
    },
    {
        "Sid": "",
        "Effect": "Allow",
        "Principal": "*",
        "Action": ["s3:GetObject"],
        "Resource": "arn:aws:s3:::examplebucket/*"
    }
]
}

```

## Granting Cross-Account Permissions to Upload Objects While Ensuring the Bucket Owner Has Full Control

You can allow another AWS account to upload objects to your bucket. However, you may decide that as a bucket owner you must have full control of the objects uploaded to your bucket. The following policy enforces that a specific AWS account (111111111111) be denied the ability to upload objects unless that account grants full-control access to the bucket owner identified by the email address (xyz@amazon.com). The `StringNotEquals` condition in the policy specifies the `s3:x-amz-grant-full-control` condition key to express the requirement (see [Specifying Conditions in a Policy \(p. 343\)](#)).

```

{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "111",
            "Effect": "Allow",
            "Principal": {"AWS": "111111111111"},
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::examplebucket/*"
        },
        {
            "Sid": "112",
            "Effect": "Deny",
            "Principal": {"AWS": "111111111111" },
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::examplebucket/*",
            "Condition": {
                "StringNotEquals": {"s3:x-amz-grant-full-control": ["emailAddress=xyz@amazon.com"]}
            }
        }
    ]
}

```

## Granting Permissions for Amazon S3 Inventory and Amazon S3 Analytics

Amazon S3 inventory creates lists of the objects in an S3 bucket and Amazon S3 analytics export creates output files of the data used in the analysis. The bucket that the inventory lists the objects for is called the *source bucket*. The bucket where the inventory file is written and the bucket where the

analytics export file is written is called a *destination bucket*. You must create a bucket policy for the destination bucket when setting up inventory for an S3 bucket and when setting up the analytics export. For more information, see [Amazon S3 Inventory \(p. 287\)](#) and [Amazon S3 Analytics – Storage Class Analysis \(p. 281\)](#).

The following example bucket policy grants Amazon S3 permission to write objects (PUTs) from the account for the source bucket to the destination bucket. You use a bucket policy like this on the destination bucket when setting up Amazon S3 inventory and Amazon S3 analytics export.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "InventoryAndAnalyticsExamplePolicy",  
            "Effect": "Allow",  
            "Principal": {"Service": "s3.amazonaws.com"},  
            "Action": ["s3:PutObject"],  
            "Resource": ["arn:aws:s3:::destination-bucket/*"],  
            "Condition": {  
                "ArnLike": {  
                    "aws:SourceArn": "arn:aws:s3:::source-bucket"  
                },  
                "StringEquals": {  
                    "aws:SourceAccount": "1234567890",  
                    "s3:x-amz-acl": "bucket-owner-full-control"  
                }  
            }  
        }  
    ]  
}
```

## Example Bucket Policies for VPC Endpoints for Amazon S3

You can use Amazon S3 bucket policies to control access to buckets from specific Amazon Virtual Private Cloud (Amazon VPC) endpoints, or specific VPCs. This section contains example bucket policies that can be used to control S3 bucket access from VPC endpoints. To learn how to set up VPC endpoints, go to the [VPC Endpoints](#) topic in the *Amazon VPC User Guide*.

Amazon VPC enables you to launch Amazon Web Services (AWS) resources into a virtual network that you define. A VPC endpoint enables you to create a private connection between your VPC and another AWS service without requiring access over the Internet, through a VPN connection, through a NAT instance, or through AWS Direct Connect.

A VPC endpoint for Amazon S3 is a logical entity within a VPC that allows connectivity only to Amazon S3. The VPC endpoint routes requests to Amazon S3 and routes responses back to the VPC. VPC endpoints only change how requests are routed, Amazon S3 public endpoints and DNS names will continue to work with VPC endpoints. For important information about using Amazon VPC endpoints with Amazon S3, go to the [Endpoints for Amazon S3](#) topic in the *Amazon VPC User Guide*.

VPC endpoints for Amazon S3 provides two ways to control access to your Amazon S3 data:

- You can control what requests, users, or groups are allowed through a specific VPC endpoint. For information on this type of access control, go to the [VPC Endpoints - Controlling Access to Services](#) topic in the *Amazon VPC User Guide*.
- You can control which VPCs or VPC endpoints have access to your S3 buckets by using S3 bucket policies. For examples of this type of bucket policy access control, see the following topics on restricting access.

Topics

- [Restricting Access to a Specific VPC Endpoint \(p. 371\)](#)
- [Restricting Access to a Specific VPC \(p. 371\)](#)
- [Related Resources \(p. 372\)](#)

## Restricting Access to a Specific VPC Endpoint

The following is an example of an S3 bucket policy that allows access to a specific bucket, `examplebucket`, only from the VPC endpoint with the ID `vpce-1a2b3c4d`. The policy uses the `aws:sourceVpce` condition key to restrict access to the specified VPC endpoint. The `aws:sourceVpce` condition key does not require an ARN for the VPC endpoint resource, only the VPC endpoint ID. For more information about using conditions in a policy, see [Specifying Conditions in a Policy \(p. 343\)](#).

```
{  
    "Version": "2012-10-17",  
    "Id": "Policy1415115909152",  
    "Statement": [  
        {  
            "Sid": "Access-to-specific-VPCE-only",  
            "Action": "s3:*",  
            "Effect": "Deny",  
            "Resource": ["arn:aws:s3:::examplebucket",  
                        "arn:aws:s3:::examplebucket/*"],  
            "Condition": {  
                "StringNotEquals": {  
                    "aws:sourceVpce": "vpce-1a2b3c4d"  
                }  
            },  
            "Principal": "*"  
        }  
    ]  
}
```

## Restricting Access to a Specific VPC

You can create a bucket policy that restricts access to a specific VPC by using the `aws:sourceVpc` condition key. This is useful if you have multiple VPC endpoints configured in the same VPC, and you want to manage access to your S3 buckets for all of your endpoints. The following is an example of a policy that allows VPC `vpc-111bbb22` to access `examplebucket`. The `vpc-111bbb22` condition key does not require an ARN for the VPC resource, only the VPC ID.

```
{  
    "Version": "2012-10-17",  
    "Id": "Policy1415115909153",  
    "Statement": [  
        {  
            "Sid": "Access-to-specific-VPC-only",  
            "Action": "s3:*",  
            "Effect": "Deny",  
            "Resource": ["arn:aws:s3:::examplebucket",  
                        "arn:aws:s3:::examplebucket/*"],  
            "Condition": {  
                "StringNotEquals": {  
                    "aws:sourceVpc": "vpc-111bbb22"  
                }  
            },  
            "Principal": "*"  
        }  
    ]  
}
```

## Related Resources

- [VPC Endpoints](#) in the *Amazon VPC User Guide*
- [Bucket Policy Examples \(p. 363\)](#)

# User Policy Examples

This section shows several IAM user policies for controlling user access to Amazon S3. For information about access policy language, see [Access Policy Language Overview \(p. 335\)](#).

The following example policies will work if you test them programmatically; however, in order to use them with the Amazon S3 console, you will need to grant additional permissions that are required by the console. For information about using policies such as these with the Amazon S3 console, see [An Example Walkthrough: Using user policies to control access to your bucket \(p. 377\)](#).

### Topics

- [Example: Allow an IAM user access to one of your buckets \(p. 372\)](#)
- [Example: Allow each IAM user access to a folder in a bucket \(p. 373\)](#)
- [Example: Allow a group to have a shared folder in Amazon S3 \(p. 375\)](#)
- [Example: Allow all your users to read objects in a portion of the corporate bucket \(p. 376\)](#)
- [Example: Allow a partner to drop files into a specific portion of the corporate bucket \(p. 376\)](#)
- [An Example Walkthrough: Using user policies to control access to your bucket \(p. 377\)](#)

## Example: Allow an IAM user access to one of your buckets

In this example, you want to grant an IAM user in your AWS account access to one of your buckets, `examplebucket`, and allow the user to add, update, and delete objects.

In addition to granting the `s3:PutObject`, `s3:GetObject`, and `s3:DeleteObject` permissions to the user, the policy also grants the `s3>ListAllMyBuckets`, `s3:GetBucketLocation`, and `s3>ListBucket` permissions. These are the additional permissions required by the console. Also, the `s3:PutObjectAcl` and the `s3:GetObjectAcl` actions are required to be able to copy, cut, and paste objects in the console. For an example walkthrough that grants permissions to users and tests them using the console, see [An Example Walkthrough: Using user policies to control access to your bucket \(p. 377\)](#).

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Action": [  
                "s3>ListAllMyBuckets"  
            ],  
            "Resource": "arn:aws:s3:::*"  
        },  
        {  
            "Effect": "Allow",  
            "Action": [  
                "s3>ListBucket",  
                "s3:GetBucketLocation"  
            ],  
            "Resource": "arn:aws:s3:::examplebucket"  
        },  
        {  
    ]}
```

```
        "Effect": "Allow",
        "Action": [
            "s3:PutObject",
            "s3:PutObjectAcl",
            "s3:GetObject",
            "s3:GetObjectAcl",
            "s3:DeleteObject"
        ],
        "Resource": "arn:aws:s3:::examplebucket/*"
    }
]
```

## Example: Allow each IAM user access to a folder in a bucket

In this example, you want two IAM users, Alice and Bob, to have access to your bucket, `examplebucket`, so they can add, update, and delete objects. However, you want to restrict each user's access to a single folder in the bucket. You might create folders with names that match the user names.

```
examplebucket
Alice/
Bob/
```

To grant each user access only to his or her folder, you can write a policy for each user and attach it individually. For example, you can attach the following policy to user Alice to allow her specific Amazon S3 permissions on the `examplebucket/Alice` folder.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:PutObject",
                "s3:GetObject",
                "s3:GetObjectVersion",
                "s3:DeleteObject",
                "s3:DeleteObjectVersion"
            ],
            "Resource": "arn:aws:s3:::examplebucket/Alice/*"
        }
    ]
}
```

You then attach a similar policy to user Bob, identifying folder Bob in the Resource value.

Instead of attaching policies to individual users, though, you can write a single policy that uses a policy variable and attach the policy to a group. You will first need to create a group and add both Alice and Bob to the group. The following example policy allows a set of Amazon S3 permissions in the `examplebucket/${aws:username}` folder. When the policy is evaluated, the policy variable  `${aws:username}` is replaced by the requester's user name. For example, if Alice sends a request to put an object, the operation is allowed only if Alice is uploading the object to the `examplebucket/Alice` folder.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
```

```
        "Action": [
            "s3:PutObject",
            "s3:GetObject",
            "s3:GetObjectVersion",
            "s3:DeleteObject",
            "s3:DeleteObjectVersion"
        ],
        "Resource": "arn:aws:s3:::examplebucket/${aws:username}/*"
    }
]
```

**Note**

When using policy variables you must explicitly specify version 2012-10-17 in the policy. The default version of the access policy language, 2008-10-17, does not support policy variables.

If you want to test the preceding policy on the Amazon S3 console, the console requires permission for additional Amazon S3 permissions, as shown in the following policy. For information about how the console uses these permissions, see [An Example Walkthrough: Using user policies to control access to your bucket \(p. 377\)](#).

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AllowGroupToSeeBucketListInTheConsole",
            "Action": [ "s3>ListAllMyBuckets", "s3:GetBucketLocation" ],
            "Effect": "Allow",
            "Resource": [ "arn:aws:s3:::*" ]
        },
        {
            "Sid": "AllowRootLevelListingOfTheBucket",
            "Action": [ "s3>ListBucket" ],
            "Effect": "Allow",
            "Resource": [ "arn:aws:s3:::examplebucket" ],
            "Condition": {
                "StringEquals": {
                    "s3:prefix": [ "" ], "s3:delimiter": [ "/" ]
                }
            }
        },
        {
            "Sid": "AllowListBucketOfASpecificUserPrefix",
            "Action": [ "s3>ListBucket" ],
            "Effect": "Allow",
            "Resource": [ "arn:aws:s3:::examplebucket" ],
            "Condition": { "StringLike": { "s3:prefix": [ "${aws:username}/*" ] } }
        },
        {
            "Sid": "AllowUserSpecificActionsOnlyInTheSpecificUserPrefix",
            "Effect": "Allow",
            "Action": [
                "s3:PutObject",
                "s3:GetObject",
                "s3:GetObjectVersion",
                "s3:DeleteObject",
                "s3:DeleteObjectVersion"
            ],
            "Resource": "arn:aws:s3:::examplebucket/${aws:username}/*"
        }
    ]
}
```

**Note**

In the 2012-10-17 version of the policy, policy variables start with \$. This change in syntax can potentially create a conflict if your object key includes a \$. For example, to include an object key my\$file in a policy, you specify the \$ character with \${\$}, my\${\$}file.

Although IAM user names are friendly, human-readable identifiers, they are not required to be globally unique. For example, if user Bob leaves the organization and another Bob joins, then new Bob could access old Bob's information. Instead of using user names, you could create folders based on user IDs. Each user ID is unique. In this case, you will need to modify the preceding policy to use the \${aws:userid} policy variable. For more information about user identifiers, see [IAM Identifiers](#) in the *IAM User Guide*.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Action": [  
                "s3:PutObject",  
                "s3:GetObject",  
                "s3:GetObjectVersion",  
                "s3:DeleteObject",  
                "s3:DeleteObjectVersion"  
            ],  
            "Resource": "arn:aws:s3:::my_corporate_bucket/home/${aws:userid}/*"  
        }  
    ]  
}
```

## Allow non-IAM users (mobile app users) access to folders in a bucket

Suppose you want to develop a mobile app, a game that stores users' data in an S3 bucket. For each app user, you want to create a folder in your bucket. You also want to limit each user's access to his or her own folder. But you cannot create folders before someone downloads your app and starts playing the game, because you don't have a user ID.

In this case, you can require users to sign in to your app by using public identity providers such as Login with Amazon, Facebook, or Google. After users have signed in to your app through one of these providers, they have a user ID that you can use to create user-specific folders at run time.

You can then use web identity federation in AWS Security Token Service to integrate information from the identity provider with your app and to get temporary security credentials for each user. You can then create IAM policies that allow the app to access your bucket and perform such operations as creating user-specific folders and uploading data. For more information about web identity federation, see [About Web Identity Federation](#) in the *IAM User Guide*.

## Example: Allow a group to have a shared folder in Amazon S3

Attaching the following policy to the group grants everybody in the group access to the following folder in Amazon S3: my\_corporate\_bucket/share/marketing. Group members are allowed to access only the specific Amazon S3 permissions shown in the policy and only for objects in the specified folder.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Action": [  
                "s3:PutObject",  
                "s3:GetObject",  
                "s3:GetObjectVersion",  
            ],  
            "Resource": "arn:aws:s3:::my_corporate_bucket/share/marketing/*"  
        }  
    ]  
}
```

```
        "s3:DeleteObject",
        "s3:DeleteObjectVersion"
    ],
    "Resource": "arn:aws:s3:::my_corporate_bucket/share/marketing/*"
}
}
```

## Example: Allow all your users to read objects in a portion of the corporate bucket

In this example, we create a group called `AllUsers`, which contains all the IAM users that are owned by the AWS account. We then attach a policy that gives the group access to `GetObject` and `GetObjectVersion`, but only for objects in the `my_corporate_bucket/readonly` folder.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetObject",
                "s3:GetObjectVersion"
            ],
            "Resource": "arn:aws:s3:::my_corporate_bucket/readonly/*"
        }
    ]
}
```

## Example: Allow a partner to drop files into a specific portion of the corporate bucket

In this example, we create a group called `WidgetCo` that represents a partner company. We create an IAM user for the specific person or application at the partner company that needs access, and then we put the user in the group.

We then attach a policy that gives the group `PutObject` access to the following folder in the corporate bucket: `my_corporate_bucket/uploads/widgetco`.

We want to prevent the `WidgetCo` group from doing anything else with the bucket, so we add a statement that explicitly denies permission to any Amazon S3 permissions except `PutObject` on any Amazon S3 resource in the AWS account. This step is necessary only if there's a broad policy in use elsewhere in your AWS account that gives users wide access to Amazon S3 resources.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::my_corporate_bucket/uploads/widgetco/*"
        },
        {
            "Effect": "Deny",
            "NotAction": "s3:PutObject",
            "Resource": "arn:aws:s3:::my_corporate_bucket/uploads/widgetco/*"
        },
        {
            "Effect": "Deny",
            "Action": "s3:*",
            "Resource": "*"
        }
    ]
}
```

```
        "NotResource": "arn:aws:s3:::my_corporate_bucket/uploads/widgetco/*"  
    }  
}
```

## An Example Walkthrough: Using user policies to control access to your bucket

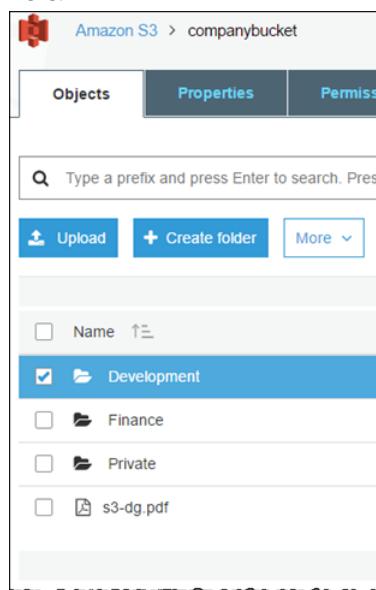
This walkthrough explains how user permissions work with Amazon S3. We will create a bucket with folders, and then we'll create AWS Identity and Access Management users in your AWS account and grant those users incremental permissions on your Amazon S3 bucket and the folders in it.

### Topics

- [Background: Basics of Buckets and Folders \(p. 377\)](#)
- [Walkthrough Example \(p. 379\)](#)
- [Step 0: Preparing for the Walkthrough \(p. 379\)](#)
- [Step 1: Create a Bucket \(p. 380\)](#)
- [Step 2: Create IAM Users and a Group \(p. 381\)](#)
- [Step 3: Verify that IAM Users Have No Permissions \(p. 381\)](#)
- [Step 4: Grant Group-Level Permissions \(p. 381\)](#)
- [Step 5: Grant IAM User Alice Specific Permissions \(p. 387\)](#)
- [Step 6: Grant IAM User Bob Specific Permissions \(p. 391\)](#)
- [Step 7: Secure the Private Folder \(p. 391\)](#)
- [Cleanup \(p. 393\)](#)
- [Related Resources \(p. 393\)](#)

### Background: Basics of Buckets and Folders

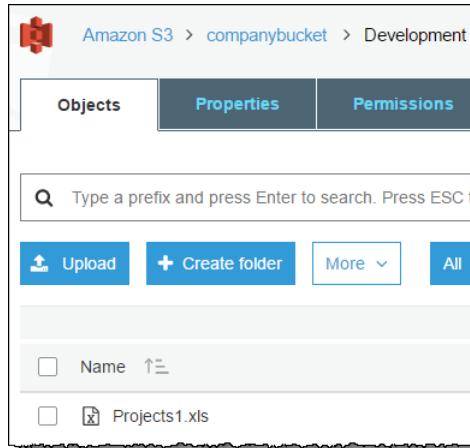
The Amazon S3 data model is a flat structure: you create a bucket, and the bucket stores objects. There is no hierarchy of subbuckets or subfolders; however, you can emulate a folder hierarchy. Tools such as the Amazon S3 Console can present a view of these logical folders and subfolders in your bucket, as shown here:



The console shows that a bucket named **companybucket** has three folders, **Private**, **Development**, and **Finance**, and an object, **s3-dg.pdf**. The console uses the object names (keys) to create a logical hierarchy with folders and subfolders. Consider the following examples:

- When you create the **Development** folder, the console creates an object with the key **Development/**. Note the trailing '/' delimiter.
- When you upload an object named **Projects1.xls** in the **Development** folder, the console uploads the object and gives it the key **Development/Projects1.xls**.

In the key, **Development** is the prefix and '/' is the delimiter. The Amazon S3 API supports prefixes and delimiters in its operations. For example, you can get a list of all objects from a bucket with a specific prefix and delimiter. In the console, when you double-click the **Development** folder, the console lists the objects in that folder. In the following example, the **Development** folder contains one object.



When the console lists the **Development** folder in the **companybucket** bucket, it sends a request to Amazon S3 in which it specifies a prefix of **Development** and a delimiter of '/' in the request. The console's response looks just like a folder list in your computer's file system. The preceding example shows that the bucket **companybucket** has an object with the key **Development/Projects1.xls**.

The console is using object keys to infer a logical hierarchy; Amazon S3 has no physical hierarchy, only buckets that contain objects in a flat file structure. When you create objects by using the Amazon S3 API, you can use object keys that imply a logical hierarchy.

When you create a logical hierarchy of objects, you can manage access to individual folders, as we will do in this walkthrough.

Before going into the walkthrough, you need to familiarize yourself with one more concept, the "root-level" bucket content. Suppose your **companybucket** bucket has the following objects:

Private/privDoc1.txt

Private/privDoc2.zip

Development/project1.xls

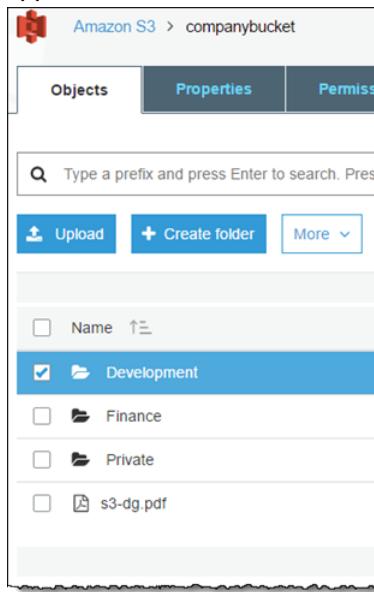
Development/project2.xls

Finance/Tax2011/document1.pdf

Finance/Tax2011/document2.pdf

## s3-dg.pdf

These object keys create a logical hierarchy with `Private`, `Development` and the `Finance` as root-level folders and `s3-dg.pdf` as a root-level object. When you click the bucket name in the Amazon S3 console, the root-level items appear as shown. The console shows the top-level prefixes (`Private/`, `Development/` and `Finance/`) as root-level folders. The object key `s3-dg.pdf` has no prefix, and so it appears as a root-level item.



## Walkthrough Example

The example for this walkthrough is as follows:

- You create a bucket and then add three folders (`Private`, `Development`, and `Finance`) to it.
- You have two users, Alice and Bob. You want Alice to access only the `Development` folder and Bob to access only the `Finance` folder, and you want to keep the `Private` folder content private. In the walkthrough, you manage access by creating AWS Identity and Access Management (IAM) users (we will use the same user names, Alice and Bob) and grant them the necessary permissions.

IAM also supports creating user groups and granting group-level permissions that apply to all users in the group. This helps you better manage permissions. For this exercise, both Alice and Bob will need some common permissions. So you will also create a group named `Consultants` and then add both Alice and Bob to the group. You will first grant permissions by attaching a group policy to the group. Then you will add user-specific permissions by attaching policies to specific users.

### Note

The walkthrough uses `companybucket` as the bucket name, Alice and Bob as the IAM users, and `Consultants` as the group name. Because Amazon S3 requires that bucket names be globally unique, you will need to replace the bucket name with a name that you create.

## Step 0: Preparing for the Walkthrough

In this example, you will use your AWS account credentials to create IAM users. Initially, these users have no permissions. You will incrementally grant these users permissions to perform specific Amazon S3 actions. To test these permissions, you will sign in to the console with each user's credentials. As you incrementally grant permissions as an AWS account owner and test permissions as an IAM user, you need to sign in and out, each time using different credentials. You can do this testing with one browser,

but the process will go faster if you can use two different browsers: use one browser to connect to the AWS Management Console with your AWS account credentials and another to connect with the IAM user credentials.

To sign into the AWS Management Console with your AWS account credentials, go to <https://console.aws.amazon.com/>. An IAM user cannot sign in by using the same link. An IAM user must use an IAM-enabled sign-in page. As the account owner, you can provide this link to your users.

For more information about IAM, go to [The AWS Management Console Sign-in Page](#) in the *IAM User Guide*.

### To Provide a Sign-in Link for IAM Users

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 **IAM Dashboard**.
3. Note the URL under **IAM users sign in link**: You will give this link to IAM users to sign in to the console with their IAM user name and password.

## Step 1: Create a Bucket

In this step, you will sign in to the Amazon S3 console with your AWS account credentials, create a bucket, add folders (Development, Finance, Private) to the bucket, and upload one or two sample documents in each folder.

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. Create a bucket.

For step-by-step instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

3. Upload one document to the bucket.

This exercise assumes you have the `s3-dg.pdf` document at the root level of this bucket. If you upload a different document, substitute its file name for `s3-dg.pdf`.

4. Add three folders named Private, Finance, and Development to the bucket.
5. Upload one or two documents to each folder.

For this exercise, assume you have uploaded a couple of documents in each folder, resulting in the bucket having objects with the following keys:

Private/privDoc1.txt

Private/privDoc2.zip

Development/project1.xls

Development/project2.xls

Finance/Tax2011/document1.pdf

Finance/Tax2011/document2.pdf

s3-dg.pdf

For step-by-step instructions, see [How Do I Upload Files and Folders to an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Step 2: Create IAM Users and a Group

Now use the IAM console to add two IAM users, Alice and Bob, to your AWS account. Also create an administrative group named Consultants, and then add both users to the group.

### Warning

When you add users and a group, do not attach any policies that grant permissions to these users. At first, these users will not have any permissions. In the following sections, you will incrementally grant permissions. You must first ensure that you have assigned passwords to these IAM users. You will use these user credentials to test Amazon S3 actions and verify that the permissions work as expected.

For step-by-step instructions on creating a new IAM user, see [Creating an IAM User in Your AWS Account](#) in the *IAM User Guide*.

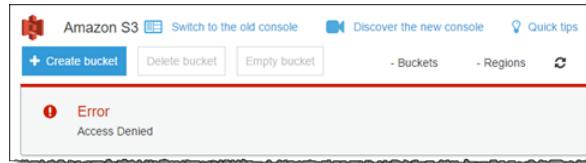
For step-by-step instructions on creating an administrative group, see [Creating Your First IAM User and Administrators Group](#) section in the *IAM User Guide*.

## Step 3: Verify that IAM Users Have No Permissions

If you are using two browsers, you can now use the second browser to sign into the console using one of the IAM user credentials.

1. Using the IAM user sign-in link (see [To Provide a Sign-in Link for IAM Users \(p. 380\)](#)), sign into the AWS console using either of the IAM user credentials.
2. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

Verify the following console message telling you that access is denied.



Now, let's begin granting incremental permissions to the users. First, you will attach a group policy that grants permissions that both users must have.

## Step 4: Grant Group-Level Permissions

We want all our users to be able to do the following:

- List all buckets owned by the parent account

To do so, Bob and Alice must have permission for the `s3>ListAllMyBuckets` action.

- List root-level items, folders, and objects, in the `companybucket` bucket.

To do so, Bob and Alice must have permission for the `s3>ListBucket` action on the `companybucket` bucket.

Now we'll create a policy that grants these permissions and then we'll attach it to the Consultants group.

### Step 4.1: Grant Permission to List All Buckets

In this step you'll create a managed policy that grants the users minimum permissions to enable them to list all buckets owned by the parent account and then you'll attach the policy to the Consultants group.

When you attach the managed policy to a user or a group, you allow the user or group permission to obtain a list of buckets owned by the parent AWS account.

1. Sign in to the AWS Management Console and open the IAM console at <https://console.aws.amazon.com/iam/>.

**Note**

Since you'll be granting user permissions sign in with your AWS account credentials, not as an IAM user.

2. Create the managed policy.

- a. In the navigation pane on the left, click **Policies** and then click **Create Policy**.
- b. Next to **Create Your Own Policy**, click **Select**.
- c. Enter `AllowGroupToSeeBucketListInTheConsole` in the **Policy Name** field.
- d. Copy the following access policy and paste it into the **Policy Document** field.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AllowGroupToSeeBucketListInTheConsole",  
            "Action": ["s3>ListAllMyBuckets"],  
            "Effect": "Allow",  
            "Resource": ["arn:aws:s3:::*"]  
        }  
    ]  
}
```

A policy is a JSON document. In the document, a **Statement** is an array of objects, each describing a permission using a collection of name value pairs. The preceding policy describes one specific permission. The **Action** specifies the type of access. In the policy, the `s3>ListAllMyBuckets` is a predefined Amazon S3 action. This action covers the Amazon S3 GET Service operation, which returns list of all buckets owned by the authenticated sender. The **Effect** element value determine if specific permission is allowed or denied.

3. Attach the `AllowGroupToSeeBucketListInTheConsole` managed policy that you created to the Consultants group.

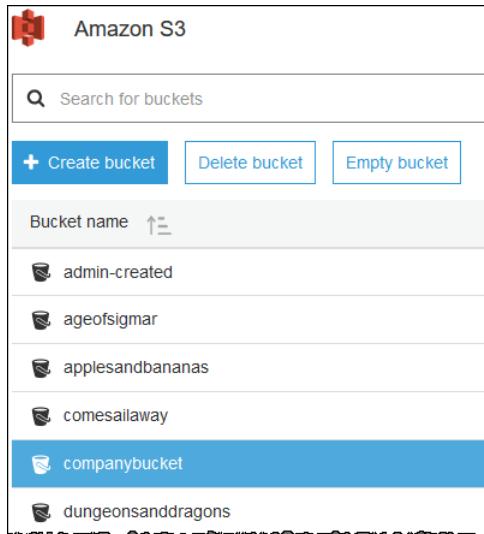
For step-by-step instructions for attaching a managed policy, see [Working with Managed Policies Using the AWS Management Console](#) in the *IAM User Guide*.

You attach policy documents to IAM users and groups in the IAM console. Because we want both our users to be able to list the buckets, we attach the policy to the group.

4. Test the permission.

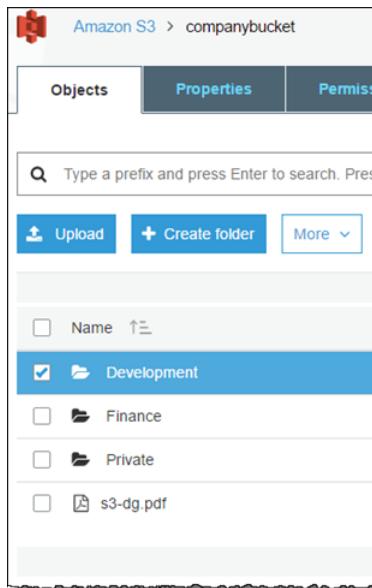
- a. Using the IAM user sign-in link (see [To Provide a Sign-in Link for IAM Users \(p. 380\)](#)), sign into the AWS console using any one of IAM user credentials.
- b. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

The console should now list all the buckets but not the objects in any of the buckets.



#### Step 4.2: Enable Users to List Root-Level Content of a Bucket

Now let's allow all users to list the root-level `companybucket` bucket items. When a user clicks the `companybucket` in the Amazon S3 console, he or she will be able to see the root-level items in the bucket.



Remember, we are using `companybucket` for illustration. You must use the name of the bucket that you created for this exercise.

To understand what request the console sends to Amazon S3 when you click a bucket name, the response Amazon S3 returns, and how the console interprets the response, it is necessary to take a little deep dive.

When you click a bucket name, the console sends the [GET Bucket \(List Objects\)](#) request to Amazon S3. This request includes the following parameters:

- `prefix` parameter with an empty string as its value.

- delimiter parameter with / as its value.

The following is an example request:

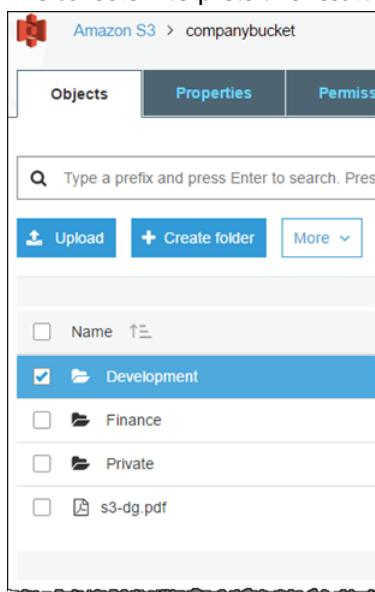
```
GET ?prefix=&delimiter=/ HTTP/1.1
Host: companybucket.s3.amazonaws.com
Date: Wed, 01 Aug 2012 12:00:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:xQE0diMbLRepdf3YB+FIEEXAMPLE=
```

Amazon S3 returns a response that includes the following <ListBucketResult/> element:

```
<ListBucketResult xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
<Name>companybucket</Name>
<Prefix></Prefix>
<Delimiter>/<Delimiter>
...
<Contents>
<Key>s3-dg.pdf</Key>
...
</Contents>
<CommonPrefixes>
<Prefix>Development/</Prefix>
</CommonPrefixes>
<CommonPrefixes>
<Prefix>Finance/</Prefix>
</CommonPrefixes>
<CommonPrefixes>
<Prefix>Private/</Prefix>
</CommonPrefixes>
</ListBucketResult>
```

The key s3-dg.pdf does not contain the '/' delimiter, and Amazon S3 returns the key in the <Contents/> element. However, all other keys in our example bucket contain the '/' delimiter. Amazon S3 groups these keys and returns a <CommonPrefixes/> element for each of the distinct prefix values Development/, Finance/, and Private/ that is a substring from the beginning of these keys to the first occurrence of the specified '/' delimiter.

The console interprets this result and displays the root-level items as three folders and one object key.



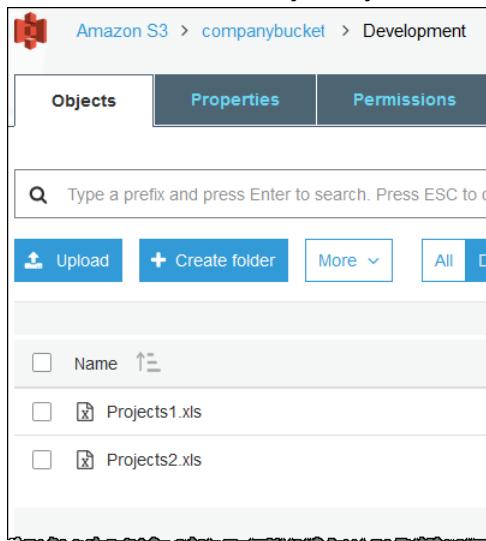
Now, if Bob or Alice double-clicks the **Development** folder, the console sends the [GET Bucket \(List Objects\)](#) request to Amazon S3 with the `prefix` and the `delimiter` parameters set to the following values:

- `prefix` parameter with value `Development/`.
- `delimiter` parameter with `'/'` value.

In response, Amazon S3 returns the object keys that start with the specified prefix.

```
<ListBucketResult xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
<Name>companybucket</Name>
<Prefix>Development</Prefix>
<Delimiter>/<Delimiter>
...
<Contents>
  <Key>Project1.xls</Key>
  ...
</Contents>
<Contents>
  <Key>Project2.xls</Key>
  ...
</Contents>
</ListBucketResult>
```

The console shows the object keys:



Now, let's return to granting users permission to list the root-level bucket items. To list bucket content, users need permission to call the `s3>ListBucket` action, as shown in the following policy statement. To ensure that they see only the root-level content, we add a condition that users must specify an empty `prefix` in the request—that is, they are not allowed to double-click any of our root-level folders. Finally, we will add a condition to require folder-style access by requiring user requests to include the `delimiter` parameter with value `'/'`.

```
{
  "Sid": "AllowRootLevelListingOfCompanyBucket",
  "Action": ["s3>ListBucket"],
  "Effect": "Allow",
  "Resource": ["arn:aws:s3:::companybucket"],
  "Condition":{
```

```
        "StringEquals":{  
            "s3:prefix":[""], "s3:delimiter":["/"]  
        }  
    }  
}
```

When you use the Amazon S3 console, note that when you click a bucket, the console first sends the [GET Bucket location](#) request to find the AWS region where the bucket is deployed. Then the console uses the region-specific endpoint for the bucket to send the [GET Bucket \(List Objects\)](#) request. As a result, if users are going to use the console, you must grant permission for the `s3:GetBucketLocation` action as shown in the following policy statement:

```
{  
    "Sid": "RequiredByS3Console",  
    "Action": ["s3:GetBucketLocation"],  
    "Effect": "Allow",  
    "Resource": ["arn:aws:s3:::*"]  
}
```

### To enable users to list root-level bucket content

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

Use your AWS account credentials, not the credentials of an IAM user, to sign in to the console.

2. Replace the existing `AllowGroupToSeeBucketListInTheConsole` managed policy that is attached to the Consultants group with the following policy, which also allows the `s3>ListBucket` action. Remember to replace `companybucket` in the policy Resource with the name of your bucket.

For step-by-step instructions, see [Editing Customer Managed Policies](#) in the *IAM User Guide*. When following the step-by-step instructions, make sure to follow the directions for applying your changes to all principal entities that the policy is attached to.

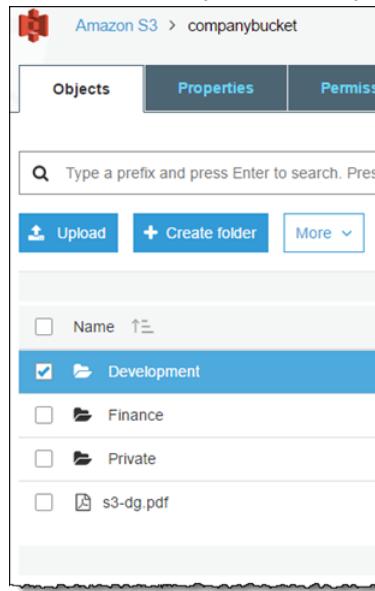
```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid":  
"AllowGroupToSeeBucketListAndAlsoAllowGetBucketLocationRequiredForListBucket",  
            "Action": [ "s3>ListAllMyBuckets", "s3:GetBucketLocation" ],  
            "Effect": "Allow",  
            "Resource": [ "arn:aws:s3:::*" ]  
        },  
        {  
            "Sid": "AllowRootLevelListingOfCompanyBucket",  
            "Action": [ "s3>ListBucket" ],  
            "Effect": "Allow",  
            "Resource": [ "arn:aws:s3:::companybucket" ],  
            "Condition":{  
                "StringEquals":{  
                    "s3:prefix":[""], "s3:delimiter":["/"]  
                }  
            }  
        }  
    ]  
}
```

3. Test the updated permissions.

1. Using the IAM user sign-in link (see [To Provide a Sign-in Link for IAM Users \(p. 380\)](#)), sign in to the AWS Management Console.

Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

2. Click the bucket that you created for this exercise, and the console will now show the root-level bucket items. If you click any folders in the bucket, you will not be able to see the folder content, because you have not yet granted those permissions.



This test succeeds when users use the Amazon S3 console because when you click a bucket in the console, the console implementation sends a request that includes the `prefix` parameter with an empty string as its value and the `delimiter` parameter with '/' as its value.

#### Step 4.3: Summary of the Group Policy

The net effect of the group policy that you added is to grant the IAM users Alice and Bob the following minimum permissions:

- List all buckets owned by the parent account.
- See root-level items in the `companybucket` bucket.

However, the users still cannot do much. Let's grant user-specific permissions, as follows:

- Permit Alice to get and put objects in the `Development` folder.
- Permit Bob to get and put objects in the `Finance` folder.

For user-specific permissions, you attach a policy to the specific user, not to the group. In the following section, you grant Alice permission to work in the `Development` folder. You can repeat the steps to grant similar permission to Bob to work in the `Finance` folder.

#### Step 5: Grant IAM User Alice Specific Permissions

Now we grant additional permissions to Alice so she can see the content of the `Development` folder and get and put objects in that folder.

### Step 5.1: Grant IAM User Alice Permission to List the Development Folder Content

For Alice to list the Development folder content, you must apply a policy to the Alice user that grants permission for the `s3>ListBucket` action on the `companybucket` bucket, provided the request includes the prefix `Development/`. Because we want this policy to be applied only to the user Alice we'll use an inline policy. For more information about inline policies, see [Managed Policies and Inline Policies](#) in the *IAM User Guide*.

1. Sign in to the AWS Management Console and open the IAM console at <https://console.aws.amazon.com/iam/>.

Use your AWS account credentials, not the credentials of an IAM user, to sign in to the console.

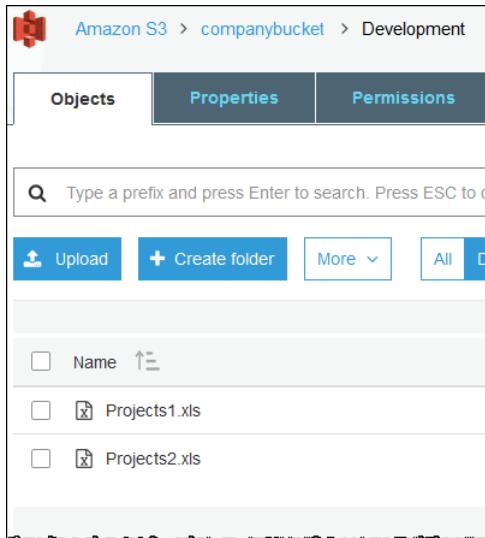
2. Create an inline policy to grant the user Alice permission to list the Development folder content.
  - a. In the navigation pane on the left, click **Users**.
  - b. Click the user name Alice.
  - c. On the user details page, select the **Permissions** tab and then expand the **Inline Policies** section.
  - d. Choose **click here (or Create User Policy)**.
  - e. Click **Custom Policy**, and then click **Select**.
  - f. Enter a name for the policy in the **Policy Name** field.
  - g. Copy the following policy into the **Policy Document** field.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AllowListBucketIfSpecificPrefixIsIncludedInRequest",  
            "Action": ["s3>ListBucket"],  
            "Effect": "Allow",  
            "Resource": ["arn:aws:s3:::companybucket"],  
            "Condition": { "StringLike": {"s3:prefix": ["Development/*"] } }  
        }  
    ]  
}
```

3. Test the change to Alice's permissions:

- a. Using the IAM user sign in link (see [To Provide a Sign-in Link for IAM Users \(p. 380\)](#)), sign in to the AWS Management Console.
- b. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
- c. In the Amazon S3 console, verify that Alice can see the list of objects in the `Development/` folder in the bucket.

When the user clicks the `/Development` folder to see the list of objects in it, the Amazon S3 console sends the `ListObjects` request to Amazon S3 with the prefix `/Development`. Because the user is granted permission to see the object list with the prefix `Development` and delimiter `'/'`, Amazon S3 returns the list of objects with the key prefix `Development/`, and the console displays the list.



### Step 5.2: Grant IAM User Alice Permissions to Get and Put Objects in the Development Folder

For Alice to get and put objects in the Development folder, she needs permission to call the `s3:GetObject` and `s3:PutObject` actions. The following policy statements grant these permissions, provided the request includes the `prefix` parameter with a value of `Development/`.

```
{  
    "Sid": "AllowUserToReadWriteObjectData",  
    "Action": ["s3:GetObject", "s3:PutObject"],  
    "Effect": "Allow",  
    "Resource": ["arn:aws:s3:::companybucket/Development/*"]  
}
```

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

Use your AWS account credentials, not the credentials of an IAM user, to sign in to the console.

2. Edit the inline policy you created in the previous step.
  - a. In the navigation pane on the left, click **Users**.
  - b. Click the user name Alice.
  - c. On the user details page, select the **Permissions** tab and then expand the **Inline Policies** section.
  - d. Click **Edit Policy** next to the name of the policy you created in the previous step.
  - e. Copy the following policy into the **Policy Document** field replacing the existing policy.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "AllowListBucketIfSpecificPrefixIsIncludedInRequest",  
            "Action": ["s3>ListBucket"],  
            "Effect": "Allow",  
            "Resource": ["arn:aws:s3:::companybucket"],  
            "Condition": {  
                "StringLike": {"s3:prefix": ["Development/*"]} }  
        }  
    ]  
}
```

```

        }
    },
    {
        "Sid": "AllowUserToReadWriteObjectDataInDevelopmentFolder",
        "Action": ["s3:GetObject", "s3:PutObject"],
        "Effect": "Allow",
        "Resource": ["arn:aws:s3:::companybucket/Development/*"]
    }
]
}

```

3. Test the updated policy:

1. Using the IAM user sign-in link (see [To Provide a Sign-in Link for IAM Users \(p. 380\)](#)), sign into the AWS Management Console.
2. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
3. In the Amazon S3 console, verify that Alice can now add an object and download an object in the Development folder.

### Step 5.3: Explicitly Deny IAM User Alice Permissions to Any Other Folders in the Bucket

User Alice can now list the root-level content in the companybucket bucket. She can also get and put objects in the Development folder. If you really want to tighten the access permissions, you could explicitly deny Alice access to any other folders in the bucket. If there is any other policy (bucket policy or ACL) that grants Alice access to any other folders in the bucket, this explicit deny overrides those permissions.

You can add the following statement to the user Alice policy that requires all requests that Alice sends to Amazon S3 to include the `prefix` parameter, whose value can be either `Development/*` or an empty string.

```

{
    "Sid": "ExplicitlyDenyAnyRequestsForAllOtherFoldersExceptDevelopment",
    "Action": ["s3>ListBucket"],
    "Effect": "Deny",
    "Resource": ["arn:aws:s3:::companybucket"],
    "Condition": {
        "StringNotLike": {"s3:prefix": ["Development/*"]},
        "Null": {"s3:prefix": false}
    }
}

```

Note that there are two conditional expressions in the `Condition` block. The result of these conditional expressions is combined by using the logical AND. If both conditions are true, the result of the combined condition is true.

- The `Null` conditional expression ensures that requests from Alice include the `prefix` parameter.

The `prefix` parameter requires folder-like access. If you send a request without the `prefix` parameter, Amazon S3 returns all the object keys.

If the request includes the `prefix` parameter with a null value, the expression will evaluate to true, and so the entire Condition will evaluate to true. You must allow an empty string as value of the `prefix` parameter. You recall from the preceding discussion, allowing the null string allows Alice to retrieve root-level bucket items as the console does in the preceding discussion. For more information, see [Step 4.2: Enable Users to List Root-Level Content of a Bucket \(p. 383\)](#).

- The `StringNotLike` conditional expression ensures that if the value of the `prefix` parameter is specified and is not `Development/*`, the request will fail.

Follow the steps in the preceding section and again update the inline policy you created for user Alice.

Copy the following policy into the **Policy Document** field replacing the existing policy.

```
{  
    "Statement": [  
        {  
            "Sid": "AllowListBucketIfSpecificPrefixIsIncludedInRequest",  
            "Action": ["s3>ListBucket"],  
            "Effect": "Allow",  
            "Resource": ["arn:aws:s3:::companybucket"],  
            "Condition": {  
                "StringLike": {"s3:prefix": ["Development/*"]}  
            }  
        },  
        {  
            "Sid": "AllowUserToReadWriteObjectDataInDevelopmentFolder",  
            "Action": ["s3GetObject", "s3PutObject"],  
            "Effect": "Allow",  
            "Resource": ["arn:aws:s3:::companybucket/Development/*"]  
        },  
        {  
            "Sid": "ExplicitlyDenyAnyRequestsForAllOtherFoldersExceptDevelopment",  
            "Action": ["s3>ListBucket"],  
            "Effect": "Deny",  
            "Resource": ["arn:aws:s3:::companybucket"],  
            "Condition": {  
                "StringNotLike": {"s3:prefix": ["Development/*"]},  
                "Null": {"s3:prefix": false}  
            }  
        }  
    ]  
}
```

## Step 6: Grant IAM User Bob Specific Permissions

Now you want to grant Bob permission to the Finance folder. Follow the steps you used earlier to grant permissions to Alice, but replace the Development folder with the Finance folder. For step-by-step instructions, see [Step 5: Grant IAM User Alice Specific Permissions \(p. 387\)](#).

## Step 7: Secure the Private Folder

In this example, you have only two users. You granted all the minimum required permissions at the group level and granted user-level permissions only when you really need them at the individual user level. This approach helps minimize the effort of managing permissions. As the number of users increases, managing permissions can become cumbersome. For example, we don't want any of the users in this example to access the content of the Private folder. How do you ensure you don't accidentally grant a user permission to it? You add a policy that explicitly denies access to the folder. An explicit deny overrides any other permissions. To ensure that the Private folder remains private, you can add the following two deny statements to the group policy:

- Add the following statement to explicitly deny any action on resources in the Private folder (companybucket/Private/\*).

```
{  
    "Sid": "ExplicitDenyAccessToPrivateFolderToEveryoneInTheGroup",  
    "Action": ["s3:*"],  
    "Effect": "Deny",  
    "Resource": ["arn:aws:s3:::companybucket/Private/*"]  
}
```

- You also deny permission for the list objects action when the request specifies the `Private/` prefix. In the console, if Bob or Alice double-clicks the Private folder, this policy causes Amazon S3 to return an error response.

```
{
  "Sid": "DenyListBucketOnPrivateFolder",
  "Action": ["s3>ListBucket"],
  "Effect": "Deny",
  "Resource": ["arn:aws:s3:::*"],
  "Condition":{
    "StringLike": {"s3:prefix": ["Private/"]}
  }
}
```

Replace the Consultants group policy with an updated policy that includes the preceding deny statements. After the updated policy is applied, none of the users in the group will be able to access the Private folder in your bucket.

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

Use your AWS account credentials, not the credentials of an IAM user, to sign in to the console.

2. Replace the existing `AllowGroupToSeeBucketListInTheConsole` managed policy that is attached to the Consultants group with the following policy. Remember to replace `companybucket` in the policy with the name of your bucket.

For instructions, see [Editing Customer Managed Policies](#) in the *IAM User Guide*. When following the instructions, make sure to follow the directions for applying your changes to all principal entities that the policy is attached to.

```
{
  "Statement": [
    {
      "Sid": "AllowGroupToSeeBucketListAndAlsoAllowGetBucketLocationRequiredForListBucket",
      "Action": ["s3>ListAllMyBuckets", "s3>GetBucketLocation"],
      "Effect": "Allow",
      "Resource": ["arn:aws:s3:::*"]
    },
    {
      "Sid": "AllowRootLevelListingOfCompanyBucket",
      "Action": ["s3>ListBucket"],
      "Effect": "Allow",
      "Resource": ["arn:aws:s3:::companybucket"],
      "Condition":{
        "StringEquals": {"s3:prefix": [""]}}
    },
    {
      "Sid": "RequireFolderStyleList",
      "Action": ["s3>ListBucket"],
      "Effect": "Deny",
      "Resource": ["arn:aws:s3:::*"],
      "Condition":{
        "StringNotEquals": {"s3:delimiter": "/"}}
    },
    {
      "Sid": "ExplicitDenyAccessToPrivateFolderToEveryoneInTheGroup",
      "Action": ["s3:*"],
```

```
        "Effect": "Deny",
        "Resource": ["arn:aws:s3:::companybucket/Private/*"]
    },
{
    "Sid": "DenyListBucketOnPrivateFolder",
    "Action": ["s3>ListBucket"],
    "Effect": "Deny",
    "Resource": ["arn:aws:s3::::*"],
    "Condition": {
        "StringLike": {"s3:prefix": ["Private/"]}
    }
}
]
```

## Cleanup

In order to clean up, go to the IAM console and remove the users Alice and Bob. For step-by-step instructions, go to [Deleting an IAM User](#) in the *IAM User Guide*.

To ensure that you aren't charged further for storage, you should also delete the objects and the bucket that you created for this exercise .

## Related Resources

- [Working with Policies](#) in the *IAM User Guide*.

# Managing Access with ACLs

## Topics

- [Access Control List \(ACL\) Overview \(p. 394\)](#)
- [Managing ACLs \(p. 399\)](#)

Access control lists (ACLs) are one of the resource-based access policy options (see [Overview of Managing Access \(p. 296\)](#)) that you can use to manage access to your buckets and objects. You can use ACLs to grant basic read/write permissions to other AWS accounts. There are limits to managing permissions using ACLs. For example, you can grant permissions only to other AWS accounts; you cannot grant permissions to users in your account. You cannot grant conditional permissions, nor can you explicitly deny permissions. ACLs are suitable for specific scenarios. For example, if a bucket owner allows other AWS accounts to upload objects, permissions to these objects can only be managed using object ACL by the AWS account that owns the object.

The following introductory topics explain the basic concepts and options that are available for you to manage access to your Amazon S3 resources, and provide guidelines for when to use which access policy options.

- [Introduction to Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#)
- [Guidelines for Using the Available Access Policy Options \(p. 306\)](#)

## Access Control List (ACL) Overview

## Topics

- [Who Is a Grantee? \(p. 395\)](#)
- [What Permissions Can I Grant? \(p. 396\)](#)
- [Sample ACL \(p. 397\)](#)
- [Canned ACL \(p. 398\)](#)
- [How to Specify an ACL \(p. 399\)](#)

Amazon S3 access control lists (ACLs) enable you to manage access to buckets and objects. Each bucket and object has an ACL attached to it as a subresource. It defines which AWS accounts or groups are granted access and the type of access. When a request is received against a resource, Amazon S3 checks the corresponding ACL to verify that the requester has the necessary access permissions.

When you create a bucket or an object, Amazon S3 creates a default ACL that grants the resource owner full control over the resource. This is shown in the following sample bucket ACL (the default object ACL has the same structure):

### Example

```
<?xml version="1.0" encoding="UTF-8"?>
<AccessControlPolicy xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Owner>
    <ID>*** Owner-Canonical-User-ID ***</ID>
    <DisplayName>owner-display-name</DisplayName>
  </Owner>
  <AccessControlList>
    <Grant>
      <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:type="Canonical User">
        <ID>*** Owner-Canonical-User-ID ***</ID>
```

```
<DisplayName>display-name</DisplayName>
</Grantee>
<Permission>FULL_CONTROL</Permission>
</Grant>
</AccessControlList>
</AccessControlPolicy>
```

The sample ACL includes an `Owner` element that identifies the owner by the AWS account's canonical user ID, which is a long string such as `79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be`. The `Grant` element identifies the grantee (either an AWS account or a predefined group) and the permission granted. This default ACL has one `Grant` element for the owner. You grant permissions by adding `Grant` elements, with each grant identifying the grantee and the permission.

**Note**

An ACL can have up to 100 grants.

## Who Is a Grantee?

A grantee can be an AWS account or one of the predefined Amazon S3 groups. You grant permission to an AWS account using the email address or the canonical user ID. However, if you provide an email address in your grant request, Amazon S3 finds the canonical user ID for that account and adds it to the ACL. The resulting ACLs always contain the canonical user ID for the AWS account, not the AWS account's email address.

**Important**

You cannot use an email address to specify a grantee for any AWS Region that was created after 12/8/2014. The following Regions were created after 12/8/2014: US East (Ohio), Canada (Central), Asia Pacific (Mumbai), Asia Pacific (Seoul), EU (Frankfurt), EU (London), China (Beijing), and AWS GovCloud (US).

**Warning**

When you grant other AWS accounts access to your resources, be aware that the AWS accounts can delegate their permissions to users under their accounts. This is known as *cross-account access*. For information about using cross-account access, see [Creating a Role to Delegate Permissions to an IAM User](#) in the *IAM User Guide*.

## Finding an AWS Account Canonical User ID

The canonical user ID is associated with your AWS account. For information about how to find the canonical user ID for your account, see [Finding Your Account Canonical User ID](#).

You can also look up the canonical user ID of an AWS account by reading the ACL of a bucket or an object to which the AWS account has access permissions. When an individual AWS account is granted permissions by a grant request, a grant entry is added to the ACL with the AWS account's canonical user ID.

## Amazon S3 Predefined Groups

Amazon S3 has a set of predefined groups. When granting account access to a group, you specify one of our URIs instead of a canonical user ID. We provide the following predefined groups:

- **Authenticated Users group** – Represented by `http://acs.amazonaws.com/groups/global/AuthenticatedUsers`.

This group represents all AWS accounts. **Access permission to this group allows any AWS account to access the resource.** However, all requests must be signed (authenticated).

**Warning**

When you grant access to the **Authenticated Users group** any AWS authenticated user in the world can access your resource.

- **All Users group** – Represented by `http://acs.amazonaws.com/groups/global/AllUsers`.

**Access permission to this group allows anyone in the world access to the resource.** The requests can be signed (authenticated) or unsigned (anonymous). Unsigned requests omit the Authentication header in the request.

**Warning**

We highly recommend that you never grant the **All Users group** `WRITE`, `WRITE_ACP`, or `FULL_CONTROL` permissions. For example, `WRITE` permissions allow anyone to store objects in your bucket, for which you are billed. It also allows others to delete objects that you might want to keep. For more details about these permissions, see the following section [What Permissions Can I Grant? \(p. 396\)](#).

- **Log Delivery group** – Represented by `http://acs.amazonaws.com/groups/s3/LogDelivery`.

`WRITE` permission on a bucket enables this group to write server access logs (see [Server Access Logging \(p. 596\)](#)) to the bucket.

**Note**

When using ACLs, a grantee can be an AWS account or one of the predefined Amazon S3 groups. However, the grantee cannot be an IAM user. For more information about AWS users and permissions within IAM, go to [Using AWS Identity and Access Management](#).

## What Permissions Can I Grant?

The following table lists the set of permissions that Amazon S3 supports in an ACL. The set of ACL permissions is the same for an object ACL and a bucket ACL. However, depending on the context (bucket ACL or object ACL), these ACL permissions grant permissions for specific buckets or object operations. The table lists the permissions and describes what they mean in the context of objects and buckets.

Permission	When granted on a bucket	When granted on an object
READ	Allows grantee to list the objects in the bucket	Allows grantee to read the object data and its metadata
WRITE	Allows grantee to create, overwrite, and delete any object in the bucket	Not applicable
READ_ACP	Allows grantee to read the bucket ACL	Allows grantee to read the object ACL
WRITE_ACP	Allows grantee to write the ACL for the applicable bucket	Allows grantee to write the ACL for the applicable object
FULL_CONTROL	Allows grantee the <code>READ</code> , <code>WRITE</code> , <code>READ_ACP</code> , and <code>WRITE_ACP</code> permissions on the bucket	Allows grantee the <code>READ</code> , <code>READ_ACP</code> , and <code>WRITE_ACP</code> permissions on the object

**Warning**

Use caution when granting access permissions to your S3 buckets and objects. For example, granting `WRITE` access to a bucket allows the grantee to create, overwrite, and delete any object in the bucket. We highly recommend that you read through this entire [Access Control List \(ACL\) Overview \(p. 394\)](#) section before granting permissions.

## Mapping of ACL Permissions and Access Policy Permissions

As shown in the preceding table, an ACL allows only a finite set of permissions, compared to the number of permissions you can set in an access policy (see [Specifying Permissions in a Policy \(p. 338\)](#)). Each of these permissions allows one or more Amazon S3 operations.

The following table shows how each ACL permission maps to the corresponding access policy permissions. As you can see, access policy allows more permissions than ACL does. You use ACL primarily to grant basic read/write permissions, similar to file system permissions. For more information about when to use ACL, see [Guidelines for Using the Available Access Policy Options \(p. 306\)](#).

ACL permission	Corresponding access policy permissions when the ACL permission is granted on a bucket	Corresponding access policy permissions when the ACL permission is granted on an object
READ	s3>ListBucket, s3>ListBucketVersions, and s3>ListBucketMultipartUploads	s3GetObject, s3GetObjectVersion, and s3GetObjectTorrent
WRITE	s3PutObject and s3DeleteObject.  In addition, when the grantee is the bucket owner, granting WRITE permission in a bucket ACL allows the s3DeleteObjectVersion action to be performed on any version in that bucket.	Not applicable
READ_ACP	s3GetBucketAcl	s3GetObjectAcl and s3GetObjectVersionAcl
WRITE_ACP	s3PutBucketAcl	s3PutObjectAcl and s3PutObjectVersionAcl
FULL_CONTROL	Equivalent to granting READ, WRITE, READ_ACP, and WRITE_ACP ACL permissions. Accordingly, this ACL permission maps to a combination of corresponding access policy permissions.	Equivalent to granting READ, READ_ACP, and WRITE_ACP ACL permissions. Accordingly, this ACL permission maps to a combination of corresponding access policy permissions.

## Sample ACL

The following sample ACL on a bucket identifies the resource owner and a set of grants. The format is the XML representation of an ACL in the Amazon S3 REST API. The bucket owner has FULL\_CONTROL of the resource. In addition, the ACL shows how permissions are granted on a resource to two AWS accounts, identified by canonical user ID, and two of the predefined Amazon S3 groups discussed in the preceding section.

### Example

```
<?xml version="1.0" encoding="UTF-8"?>
<AccessControlPolicy xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Owner>
    <ID>Owner-canonical-user-ID</ID>
    <DisplayName>display-name</DisplayName>
  </Owner>
  <AccessControlList>
    <Grant>
      <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:type="CanonicalUser">
        <ID>Owner-canonical-user-ID</ID>
        <DisplayName>display-name</DisplayName>
      </Grantee>
```

```

<Permission>FULL_CONTROL</Permission>
</Grant>

<Grant>
  <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:type="CanonicalUser">
    <ID>user1-canonical-user-ID</ID>
    <DisplayName>display-name</DisplayName>
  </Grantee>
  <Permission>WRITE</Permission>
</Grant>

<Grant>
  <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:type="CanonicalUser">
    <ID>user2-canonical-user-ID</ID>
    <DisplayName>display-name</DisplayName>
  </Grantee>
  <Permission>READ</Permission>
</Grant>

<Grant>
  <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="Group">
    <URI>http://acs.amazonaws.com/groups/global/AllUsers</URI>
  </Grantee>
  <Permission>READ</Permission>
</Grant>
<Grant>
  <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="Group">
    <URI>http://acs.amazonaws.com/groups/s3/LogDelivery</URI>
  </Grantee>
  <Permission>WRITE</Permission>
</Grant>

</AccessControlList>
</AccessControlPolicy>

```

## Canned ACL

Amazon S3 supports a set of predefined grants, known as canned ACLs. Each canned ACL has a predefined a set of grantees and permissions. The following table lists the set of canned ACLs and the associated predefined grants.

Canned ACL	Applies to	Permissions added to ACL
private	Bucket and object	Owner gets FULL_CONTROL. No one else has access rights (default).
public-read	Bucket and object	Owner gets FULL_CONTROL. The AllUsers group (see <a href="#">Who Is a Grantee? (p. 395)</a> ) gets READ access.
public-read-write	Bucket and object	Owner gets FULL_CONTROL. The AllUsers group gets READ and WRITE access. Granting this on a bucket is generally not recommended.
aws-exec-read	Bucket and object	Owner gets FULL_CONTROL. Amazon EC2 gets READ access to GET an Amazon Machine Image (AMI) bundle from Amazon S3.
authenticated-read	Bucket and object	Owner gets FULL_CONTROL. The AuthenticatedUsers group gets READ access.

Canned ACL	Applies to	Permissions added to ACL
bucket-owner-read	Object	Object owner gets FULL_CONTROL. Bucket owner gets READ access. If you specify this canned ACL when creating a bucket, Amazon S3 ignores it.
bucket-owner-full-control	Object	Both the object owner and the bucket owner get FULL_CONTROL over the object. If you specify this canned ACL when creating a bucket, Amazon S3 ignores it.
log-delivery-write	Bucket	The LogDelivery group gets WRITE and READ_ACP permissions on the bucket. For more information about logs, see ( <a href="#">Server Access Logging (p. 596)</a> ).

**Note**

You can specify only one of these canned ACLs in your request.

You specify a canned ACL in your request using the `x-amz-acl` request header. When Amazon S3 receives a request with a canned ACL in the request, it adds the predefined grants to the ACL of the resource.

## How to Specify an ACL

Amazon S3 APIs enable you to set an ACL when you create a bucket or an object. Amazon S3 also provides API to set an ACL on an existing bucket or an object. These APIs provide the following methods to set an ACL:

- **Set ACL using request headers**— When you send a request to create a resource (bucket or object), you set an ACL using the request headers. Using these headers, you can either specify a canned ACL or specify grants explicitly (identifying grantee and permissions explicitly).
- **Set ACL using request body**— When you send a request to set an ACL on an existing resource, you can set the ACL either in the request header or in the body.

For more information, see [Managing ACLs \(p. 399\)](#).

## Managing ACLs

### Topics

- [Managing ACLs in the AWS Management Console \(p. 399\)](#)
- [Managing ACLs Using the AWS SDK for Java \(p. 400\)](#)
- [Managing ACLs Using the AWS SDK for .NET \(p. 403\)](#)
- [Managing ACLs Using the REST API \(p. 408\)](#)

There are several ways you can add grants to your resource ACL. You can use the AWS Management Console, which provides a UI to manage permissions without writing any code. You can use the REST API or one of the AWS SDKs. These libraries further simplify your programming tasks.

## Managing ACLs in the AWS Management Console

AWS Management Console provides a UI for you to grant ACL-based access permissions to your buckets and objects. For information on setting ACL-based access permissions in the console, see [How Do I Set ACL Bucket Permissions?](#) and [How Do I Set Permissions on an Object?](#) in the *Amazon Simple Storage Service Console User Guide*.

## Managing ACLs Using the AWS SDK for Java

### Setting an ACL When Creating a Resource

When creating a resource (buckets and objects), you can grant permissions (see [Access Control List \(ACL\) Overview \(p. 394\)](#)) by adding an `AccessControlList` in your request. For each permission, you explicitly specify the grantee and the permission.

For example, the following Java code snippet sends a `PutObject` request to upload an object. In the request, the code snippet specifies permissions to two AWS accounts and the Amazon S3 `AllUsers` group. The `PutObject` call includes the object data in the request body and the ACL grants in the request headers (see [PUT Object](#)).

```
String bucketName      = "bucket-name";
String keyName        = "object-key";
String uploadFileName = "file-name";

AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());

AccessControlList acl = new AccessControlList();
acl.grantPermission(new CanonicalGrantee("d25639fbe9c19cd30a4c0f43fbf00e2d3f96400a9aa8dabfbbebe1906Example"),
    Permission.ReadAcp);
acl.grantPermission(GroupGrantee.AllUsers, Permission.Read);
acl.grantPermission(new EmailAddressGrantee("user@email.com"), Permission.WriteAcp);

File file = new File(uploadFileName);
s3client.putObject(new PutObjectRequest(bucketName, keyName,
    file).withAccessControlList(acl));
```

For more information about uploading objects, see [Working with Amazon S3 Objects \(p. 106\)](#).

In the preceding code snippet, in granting each permission you explicitly identified a grantee and a permission. Alternatively, you can specify a canned (predefined) ACL (see [Canned ACL \(p. 398\)](#)) in your request when creating a resource. The following Java code snippet creates a bucket and specifies a `LogDeliveryWrite` canned ACL in the request to grant write permission to the Amazon S3 `LogDelivery` group.

### Example

```
String bucketName      = "bucket-name";
AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());

s3client.createBucket(new CreateBucketRequest
    (bucketName).withCannedAcl(CannedAccessControlList.LogDeliveryWrite));
```

For information about the underlying REST API, go to [PUT Bucket](#).

### Updating ACL on an Existing Resource

You can set ACL on an existing object or a bucket. You create an instance of the `AccessControlList` class and grant permissions and call the appropriate set ACL method. The following Java code snippet calls the `setObjectAcl` method to set ACL on an existing object.

```
String bucketName      = "bucket-name";
String keyName        = "object-key";

AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
```

```
AccessControlList acl = new AccessControlList();
acl.grantPermission(new CanonicalGrantee("d25639fbe9c19cd30a4c0f43fbf00e2d3f96400a9aa8dabfbbebe1906Example"),
    Permission.ReadAcp);
acl.grantPermission(GroupGrantee.AuthenticatedUsers, Permission.Read);
acl.grantPermission(new EmailAddressGrantee("user@email.com"), Permission.WriteAcp);
Owner owner = new Owner();
owner.setId("852b113e7a2f25102679df27bb0ae12b3f85be6f290b936c4393484beExample");
owner.setDisplayName("display-name");
acl.setOwner(owner);

s3client.setObjectAcl(bucketName, keyName, acl);
```

**Note**

In the preceding code snippet, you can optionally read an existing ACL first, by calling the `getObjectAcl` method, add new grants to it, and then set the revised ACL on the resource.

Instead of granting permissions by explicitly specifying grantees and permissions explicitly, you can also specify a canned ACL in your request. The following Java code snippet sets the ACL on an existing object. In the request, the snippet specifies the canned ACL `AuthenticatedRead` to grant read access to the Amazon S3 Authenticated Users group.

```
String bucketName      = "bucket-name";
String keyName         = "object-key";

AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());

s3client.setObjectAcl(bucketName, keyName, CannedAccessControlList.AuthenticatedRead);
```

## An Example

The following Java code example first creates a bucket. In the create request, it specifies a public-read canned ACL. It then retrieves the ACL in an `AccessControlList` instance, clears grants, and adds new grants to the `AccessControlList`. Finally, it saves the updated `AccessControlList`, that is, it replaces the bucket ACL subresource.

The following Java code example performs the following tasks:

- Create a bucket. In the request, it specifies a log-delivery-write canned ACL, granting write permission to the LogDelivery Amazon S3 group.
- Read the ACL on the bucket.
- Clear existing permissions and add the new permission to the ACL.
- Call `setBucketAcl` to add the new ACL to the bucket.

**Note**

To test the following code example, you must update the code and provide your credentials, and also provide the canonical user ID and email address of the accounts that you want to grant permissions to.

```
import java.io.IOException;
import java.util.ArrayList;
import java.util.Collection;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
```

```
import com.amazonaws.services.s3.model.AccessControlList;
import com.amazonaws.services.s3.model.Bucket;
import com.amazonaws.services.s3.model.CannedAccessControlList;
import com.amazonaws.services.s3.model.CanonicalGrantee;
import com.amazonaws.services.s3.model.CreateBucketRequest;
import com.amazonaws.services.s3.model.Grant;
import com.amazonaws.services.s3.model.GroupGrantee;
import com.amazonaws.services.s3.model.Permission;
import com.amazonaws.services.s3.model.Region;

public class ACLExample {
    private static String bucketName = "*** Provide bucket name ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());

        Collection<Grant> grantCollection = new ArrayList<Grant>();
        try {
            // 1. Create bucket with Canned ACL.
            CreateBucketRequest createBucketRequest =
                new CreateBucketRequest(bucketName,
                    Region.US_Standard).withCannedAcl(CannedAccessControlList.LogDeliveryWrite);

            Bucket resp = s3Client.createBucket(createBucketRequest);

            // 2. Update ACL on the existing bucket.
            AccessControlList bucketAcl = s3Client.getBucketAcl(bucketName);

            // (Optional) delete all grants.
            bucketAcl.getGrants().clear();

            // Add grant - owner.
            Grant grant0 = new Grant(
                new CanonicalGrantee("852b113e7a2f25102679df27bb0ae12b3f85be6f290b936c4393484beExample"),
                Permission.FullControl);
            grantCollection.add(grant0);

            // Add grant using canonical user id.
            Grant grant1 = new Grant(
                new CanonicalGrantee("d25639fbe9c19cd30a4c0f43fbf00e2d3f96400a9aa8dabfbbebe1906Example"),
                Permission.Write);
            grantCollection.add(grant1);

            // Grant LogDelivery group permission to write to the bucket.
            Grant grant3 = new Grant(GroupGrantee.LogDelivery,
                Permission.Write);
            grantCollection.add(grant3);

            bucketAcl.getGrants().addAll(grantCollection);

            // Save (replace) ACL.
            s3Client.setBucketAcl(bucketName, bucketAcl);

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, which" +
                " means your request made it " +
                "to Amazon S3, but was rejected with an error response" +
                " for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
        }
    }
}
```

```
        System.out.println("Request ID:      " + ase.getRequestId());
    } catch (AmazonClientException ace) {
        System.out.println("Caught an AmazonClientException, which means"+
            " the client encountered " +
            "a serious internal problem while trying to " +
            "communicate with S3, " +
            "such as not being able to access the network.");
        System.out.println("Error Message: " + ace.getMessage());
    }
}
```

## Managing ACLs Using the AWS SDK for .NET

### Setting an ACL When Creating a Resource

When creating a resource (buckets and objects), you can grant permissions by specifying a collection of Grants (see [Access Control List \(ACL\) Overview \(p. 394\)](#)) in your request. For each Grant, you create an `S3Grant` object explicitly specifying the grantee and the permission.

For example, the following C# code example sends a [PUT Bucket](#) request to create a bucket and then a `PutObject` request to put a new object in the new bucket. In the request, the code specifies permissions for full control for the owner and WRITE permission for the Amazon S3 **Log Delivery** group. The `PutObject` call includes the object data in the request body and the ACL grants in the request headers (see [PUT Object](#)).

### Example

```
static string bucketName = "**** Provide existing bucket name ****";
static string newBucketName = "**** Provide a name for a new bucket ****";
static string newKeyName = "**** Provide a name for a new key ****";

IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

// Retrieve ACL from one of the owner's buckets
S3AccessControlList acl = client.GetACL(new GetACLRequest
{
    BucketName = bucketName,
}).AccessControlList;

// Describe grant for full control for owner.
S3Grant grant1 = new S3Grant
{
    Grantee = new S3Grantee { CanonicalUser = acl.Owner.Id },
    Permission = S3Permission.FULL_CONTROL
};

// Describe grant for write permission for the LogDelivery group.
S3Grant grant2 = new S3Grant
{
    Grantee = new S3Grantee { URI = "http://acs.amazonaws.com/groups/s3/LogDelivery" },
    Permission = S3Permission.WRITE
};

PutBucketRequest request = new PutBucketRequest()
{
    BucketName = newBucketName,
    BucketRegion = S3Region.US,
    Grants = new List<S3Grant> { grant1, grant2 }
};
PutBucketResponse response = client.PutBucket(request);
```

```
PutObjectRequest objectRequest = new PutObjectRequest()
{
    ContentBody = "Object data for simple put.",
    BucketName = newBucketName,
    Key = newKeyName,
    Grants = new List<S3Grant> { grant1 }
};
PutObjectResponse objectResponse = client.PutObject(objectRequest);
```

For more information about uploading objects, see [Working with Amazon S3 Objects \(p. 106\)](#).

In the preceding code example, for each S3Grant you explicitly identify a grantee and permission. Alternatively, you can specify a canned (predefined) ACL (see [Canned ACL \(p. 398\)](#)) in your request when creating a resource. The following C# code example creates an object and specifies a LogDeliveryWrite canned ACL in the request to grant the **Log Delivery** group WRITE and READ\_ACP permissions on the bucket.

### Example

```
static string newBucketName = "*** Provide existing bucket name ***";
static string keyName = "*** Provide key name ***";

IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

PutBucketRequest request = new PutBucketRequest()
{
    BucketName = newBucketName,
    BucketRegion = S3Region.US,
    // Add canned ACL.
    CannedACL = S3CannedACL.LogDeliveryWrite
};
PutBucketResponse response = client.PutBucket(request);
```

For information about the underlying REST API, go to [PUT Bucket](#).

## Updating ACL on an Existing Resource

You can set an ACL on an existing object or a bucket by calling the `AmazonS3Client.PutACL` method. You create an instance of the `S3AccessControlList` class with a list of ACL grants and include the list in the `PutACL` request.

The following C# code example reads an existing ACL first, using the `AmazonS3Client.GetACL` method, add new grants to it, and then sets the revised ACL on the object.

### Example

```
static string bucketName = "*** Provide existing bucket name ***";
static string keyName = "*** Provide key name ***";

IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

// Retrieve ACL for object
S3AccessControlList acl = client.GetACL(new GetACLRequest
{
    BucketName = bucketName,
    Key = keyName
}).AccessControlList;
```

```

// Retrieve owner
Owner owner = acl.Owner;

// Clear existing grants.
acl.Grants.Clear();

// First, add grant to reset owner's full permission
// (previous clear statement removed all permissions).
S3Grant grant0 = new S3Grant
{
    Grantee = new S3Grantee { CanonicalUser = acl.Owner.Id }
};
acl.AddGrant(grant0.Grantee, S3Permission.FULL_CONTROL);

// Describe grant for permission using email address.
S3Grant grant1 = new S3Grant
{
    Grantee = new S3Grantee { EmailAddress = emailAddress },
    Permission = S3Permission.WRITE_ACP
};

// Describe grant for permission to the LogDelivery group.
S3Grant grant2 = new S3Grant
{
    Grantee = new S3Grantee { URI = "http://acs.amazonaws.com/groups/s3/LogDelivery" },
    Permission = S3Permission.WRITE
};

// Create new ACL.
S3AccessControlList newAcl = new S3AccessControlList
{
    Grants = new List<S3Grant> { grant1, grant2 },
    Owner = owner
};

// Set new ACL.
PutACLResponse response = client.PutACL(new PutACLRequest
{
    BucketName = bucketName,
    Key = keyName,
    AccessControlList = newAcl
});

```

Instead of creating `S3Grant` objects and specifying grantee and permission explicitly, you can also specify a canned ACL in your request. The following C# code example sets a canned ACL on a new bucket. The sample request specifies an `AuthenticatedRead` canned ACL to grant read access to the Amazon S3 Authenticated Users group.

### Example

```

static string newBucketName = "**** Provide new bucket name ****";

IAmazonS3 client;
client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);

PutBucketRequest request = new PutBucketRequest()
{
    BucketName = newBucketName,
    BucketRegion = S3Region.US,
    // Add canned ACL.
    CannedACL = S3CannedACL.AuthenticatedRead
};
PutBucketResponse response = client.PutBucket(request);

```

## An Example

The following C# code example performs the following tasks:

- Create a bucket. In the request, it specifies a log-delivery-write canned ACL, granting write permission to the LogDelivery Amazon S3 group.
- Read the ACL on the bucket.
- Clear existing permissions and add new the permission to the ACL.
- Call PutACL request to add the new ACL to the bucket.

For instructions on how to create and test a working example, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Specialized;
using System.Configuration;
using Amazon.S3;
using Amazon.S3.Model;
using Amazon.S3.Util;
using System.Collections.Generic;

namespace s3.amazon.com.docsamples
{
    class ManageACLs
    {
        static string bucketName      = "*** Provide existing bucket name ***";
        static string newBucketName  = "*** Provide a name for a new bucket ***";
        static string keyName         = "*** Provide key name ***";
        static string newKeyName     = "*** Provide a name for a new key ***";
        static string emailAddress   = "*** Provide email address ***";

        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            try
            {
                using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
                {
                    // Add bucket (specify canned ACL).
                    AddBucketWithCannedACL(newBucketName);

                    // Get ACL on a bucket.
                    GetBucketACL(bucketName);

                    // Add (replace) ACL on an object in a bucket.
                    AddACLToExistingObject(bucketName, keyName);

                    Console.WriteLine("Example complete.");
                }
            }
            catch (AmazonS3Exception amazonS3Exception)
            {
                if (amazonS3Exception.ErrorCode != null &&
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId") ||
                     amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                {
                    Console.WriteLine("Check the provided AWS Credentials.");
                    Console.WriteLine("For service sign up go to http://aws.amazon.com/s3");
                }
            }
        }
    }
}
```

```
{  
    Console.WriteLine(  
        "Error occurred. Message:{0}' when writing an object"  
        , amazonS3Exception.Message);  
}  
}  
catch (Exception e)  
{  
    Console.WriteLine(e.Message);  
}  
  
Console.WriteLine("Press any key to continue...");  
Console.ReadKey();  
}  
  
static void AddBucketWithCannedACL(string bucketName)  
{  
    PutBucketRequest request = new PutBucketRequest()  
    {  
        BucketName = newBucketName,  
        BucketRegion = S3Region.US,  
        // Add canned ACL.  
        CannedACL = S3CannedACL.LogDeliveryWrite  
    };  
    PutBucketResponse response = client.PutBucket(request);  
}  
  
static void GetBucketACL(string bucketName)  
{  
    GetACLResponse response = client.GetACL(new GetACLRequest  
    {  
        BucketName = bucketName  
    });  
  
    // GetACLResponse response = client.GetACL(request);  
    S3AccessControlList accessControlList = response.AccessControlList;  
    //response.Dispose();  
}  
  
static void AddACLToExistingObject(string bucketName, string keyName)  
{  
    // Retrieve ACL for object  
    S3AccessControlList acl = client.GetACL(new GetACLRequest  
    {  
        BucketName = bucketName,  
        Key = keyName  
    }).AccessControlList;  
  
    // Retrieve owner  
    Owner owner = acl.Owner;  
  
    // Clear existing grants.  
    acl.Grants.Clear();  
  
    // First, add grant to reset owner's full permission  
    // (previous clear statement removed all permissions).  
    S3Grant grant0 = new S3Grant  
    {  
        Grantee = new S3Grantee { CanonicalUser = acl.Owner.Id }  
    };  
    acl.AddGrant(grant0.Grantee, S3Permission.FULL_CONTROL);  
  
    // Describe grant for permission using email address.  
    S3Grant grant1 = new S3Grant  
    {  
        Grantee = new S3Grantee { EmailAddress = emailAddress },  
    }
```

```
        Permission = S3Permission.WRITE_ACP
    };

    // Describe grant for permission to the LogDelivery group.
    S3Grant grant2 = new S3Grant
    {
        Grantee = new S3Grantee { URI = "http://acs.amazonaws.com/groups/s3/
LogDelivery" },
        Permission = S3Permission.WRITE
    };

    // Create new ACL.
    S3AccessControlList newAcl = new S3AccessControlList
    {
        Grants = new List<S3Grant> { grant1, grant2 },
        Owner = owner
    };

    // Set new ACL.
    PutACLResponse response = client.PutACL(new PutACLRequest
    {
        BucketName = bucketName,
        Key = keyName,
        AccessControlList = newAcl
    });

    // Get and print response.
    Console.WriteLine(client.GetACL(new GetACLRequest()
    {
        BucketName = bucketName,
        Key = keyName
    })
);
}
}
}
```

## Managing ACLs Using the REST API

For information on the REST API support for managing ACLs, see the following sections in the *Amazon Simple Storage Service API Reference*:

- [GET Bucket acl](#)
- [PUT Bucket acl](#)
- [GET Object acl](#)
- [PUT Object acl](#)
- [PUT Object](#)
- [PUT Bucket](#)
- [PUT Object - Copy](#)
- [Initiate Multipart Upload](#)

# Protecting Data in Amazon S3

## Topics

- [Protecting Data Using Encryption \(p. 409\)](#)
- [Using Reduced Redundancy Storage \(p. 445\)](#)
- [Using Versioning \(p. 448\)](#)

Amazon S3 provides a highly durable storage infrastructure designed for mission-critical and primary data storage. Objects are redundantly stored on multiple devices across multiple facilities in an Amazon S3 region. To help better ensure data durability, Amazon S3 `PUT` and `PUT Object copy` operations synchronously store your data across multiple facilities before returning `SUCCESS`. Once the objects are stored, Amazon S3 maintains their durability by quickly detecting and repairing any lost redundancy.

Amazon S3 also regularly verifies the integrity of data stored using checksums. If Amazon S3 detects data corruption, it is repaired using redundant data. In addition, Amazon S3 calculates checksums on all network traffic to detect corruption of data packets when storing or retrieving data.

Amazon S3's standard storage is:

- Backed with the [Amazon S3 Service Level Agreement](#)
- Designed to provide 99.999999999% durability and 99.99% availability of objects over a given year
- Designed to sustain the concurrent loss of data in two facilities

Amazon S3 further protects your data using versioning. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. By default, requests retrieve the most recently written version. You can retrieve older versions of an object by specifying a version of the object in a request.

## Protecting Data Using Encryption

### Topics

- [Protecting Data Using Server-Side Encryption \(p. 410\)](#)
- [Protecting Data Using Client-Side Encryption \(p. 436\)](#)

Data protection refers to protecting data while in-transit (as it travels to and from Amazon S3) and at rest (while it is stored on disks in Amazon S3 data centers). You can protect data in transit by using SSL or by using client-side encryption. You have the following options of protecting data at rest in Amazon S3.

- **Use Server-Side Encryption** – You request Amazon S3 to encrypt your object before saving it on disks in its data centers and decrypt it when you download the objects.
- **Use Client-Side Encryption** – You can encrypt data client-side and upload the encrypted data to Amazon S3. In this case, you manage the encryption process, the encryption keys, and related tools.

## Protecting Data Using Server-Side Encryption

Server-side encryption is about data encryption at rest—that is, Amazon S3 encrypts your data at the object level as it writes it to disks in its data centers and decrypts it for you when you access it. As long as you authenticate your request and you have access permissions, there is no difference in the way you access encrypted or unencrypted objects. For example, if you share your objects using a presigned URL, that URL works the same way for both encrypted and unencrypted objects.

**Note**

You can't apply different types of server-side encryption to the same object simultaneously.

You have three mutually exclusive options depending on how you choose to manage the encryption keys:

- **Use Server-Side Encryption with Amazon S3-Managed Keys (SSE-S3)** – Each object is encrypted with a unique key employing strong multi-factor encryption. As an additional safeguard, it encrypts the key itself with a master key that it regularly rotates. Amazon S3 server-side encryption uses one of the strongest block ciphers available, 256-bit Advanced Encryption Standard (AES-256), to encrypt your data. For more information, see [Protecting Data Using Server-Side Encryption with Amazon S3-Managed Encryption Keys \(SSE-S3\) \(p. 415\)](#).
- **Use Server-Side Encryption with AWS KMS-Managed Keys (SSE-KMS)** – Similar to SSE-S3, but with some additional benefits along with some additional charges for using this service. There are separate permissions for the use of an envelope key (that is, a key that protects your data's encryption key) that provides added protection against unauthorized access of your objects in S3. SSE-KMS also provides you with an audit trail of when your key was used and by whom. Additionally, you have the option to create and manage encryption keys yourself, or use a default key that is unique to you, the service you're using, and the region you're working in. For more information, see [Protecting Data Using Server-Side Encryption with AWS KMS-Managed Keys \(SSE-KMS\) \(p. 410\)](#).
- **Use Server-Side Encryption with Customer-Provided Keys (SSE-C)** – You manage the encryption keys and Amazon S3 manages the encryption, as it writes to disks, and decryption, when you access your objects. For more information, see [Protecting Data Using Server-Side Encryption with Customer-Provided Encryption Keys \(SSE-C\) \(p. 423\)](#).

**Note**

When you list objects in your bucket, the list API will return a list of all objects, regardless of whether they are encrypted.

## Protecting Data Using Server-Side Encryption with AWS KMS-Managed Keys (SSE-KMS)

Server-side encryption is about protecting data at rest. AWS Key Management Service (AWS KMS) is a service that combines secure, highly available hardware and software to provide a key management system scaled for the cloud. AWS KMS uses customer master keys (CMKs) to encrypt your Amazon S3 objects. You use AWS KMS via the Encryption Keys section in the IAM console or via AWS KMS APIs to centrally create encryption keys, define the policies that control how keys can be used, and audit key

usage to prove they are being used correctly. You can use these keys to protect your data in Amazon S3 buckets.

The first time you add an SSE-KMS–encrypted object to a bucket in a region, a default CMK is created for you automatically. This key is used for SSE-KMS encryption unless you select a CMK that you created separately using AWS Key Management Service. Creating your own CMK gives you more flexibility, including the ability to create, rotate, disable, and define access controls, and to audit the encryption keys used to protect your data.

For more information, see [What is AWS Key Management Service?](#) in the *AWS Key Management Service Developer Guide*. If you use AWS KMS, there are additional charges for using AWS-KMS keys. For more information, see [AWS Key Management Service Pricing](#).

**Note**

If you are uploading or accessing objects encrypted by SSE-KMS, you need to use AWS Signature Version 4 for added security. For more information on how to do this using an AWS SDK, see [Specifying Signature Version in Request Authentication](#).

The highlights of SSE-KMS are:

- You can choose to create and manage encryption keys yourself, or you can choose to use your default service key uniquely generated on a customer by service by region level.
- The ETag in the response is not the MD5 of the object data.
- The data keys used to encrypt your data are also encrypted and stored alongside the data they protect.
- Auditable master keys can be created, rotated, and disabled from the IAM console.
- The security controls in AWS KMS can help you meet encryption-related compliance requirements.

Amazon S3 supports bucket policies that you can use if you require server-side encryption for all objects that are stored in your bucket. For example, the following bucket policy denies upload object (`s3:PutObject`) permission to everyone if the request does not include the `x-amz-server-side-encryption` header requesting server-side encryption with SSE-KMS.

```
{  
    "Version": "2012-10-17",  
    "Id": "PutObjPolicy",  
    "Statement": [  
        {  
            "Sid": "DenyUnEncryptedObjectUploads",  
            "Effect": "Deny",  
            "Principal": "*",  
            "Action": "s3:PutObject",  
            "Resource": "arn:aws:s3:::YourBucket/*",  
            "Condition": {  
                "StringNotEquals": {  
                    "s3:x-amz-server-side-encryption": "aws:kms"  
                }  
            }  
        }  
    ]  
}
```

Amazon S3 also supports the `s3:x-amz-server-side-encryption-aws-kms-key-id` condition key, which you can use to require a specific KMS key for object encryption. The KMS key you specify in the policy must use the `"arn:aws:kms:region:acct-id:key/key-id"` format.

**Note**

When you upload an object, you can specify the KMS key using the `x-amz-server-side-encryption-aws-kms-key-id` header. If the header is not present in the request, Amazon S3 assumes the default KMS key. Regardless, the KMS key ID that Amazon S3 uses for object encryption must match the KMS key ID in the policy, otherwise Amazon S3 denies the request.

**Important**

All GET and PUT requests for an object protected by AWS KMS will fail if they are not made via SSL or by using SigV4.

SSE-KMS encrypts only the object data. Any object metadata is not encrypted.

## Using AWS Key Management Service in the Amazon S3 Management Console

For more information about using KMS-Managed Encryption Keys in the Amazon S3 Management Console, see [Uploading S3 Objects](#) in the *Amazon Simple Storage Service User Guide*.

## API Support for AWS Key Management Service in Amazon S3

The object creation REST APIs (see [Specifying the AWS Key Management Service in Amazon S3 Using the REST API \(p. 415\)](#)) provide a request header, `x-amz-server-side-encryption` that you can use to request SSE-KMS with the value of `aws:kms`. There's also `x-amz-server-side-encryption-aws-kms-key-id`, which specifies the ID of the AWS KMS master encryption key that was used for the object. The Amazon S3 API also supports encryption context, with the `x-amz-server-side-encryption-context` header.

The encryption context can be any value that you want, provided that the header adheres to the Base64-encoded JSON format. However, because the encryption context is not encrypted and because it is logged if AWS CloudTrail logging is turned on, the encryption context should not include sensitive information. We further recommend that your context describe the data being encrypted or decrypted so that you can better understand the CloudTrail events produced by AWS KMS. For more information, see [Encryption Context](#) in the *AWS Key Management Service Developer Guide*.

Also, Amazon S3 may append a predefined key of `aws:s3:arn` with the value equal to the object's ARN for the encryption context that you provide. This only happens if the key `aws:s3:arn` is not already in the encryption context that you provided, in which case this predefined key is appended when Amazon S3 processes your Put requests. If this `aws:s3:arn` key is already present in your encryption context, the key is not appended a second time to your encryption context.

Having this predefined key as a part of your encryption context means that you can track relevant requests in CloudTrail, so you'll always be able to see which S3 object's ARN was used with which encryption key. In addition, this predefined key as a part of your encryption context guarantees that the encryption context is not identical between different S3 objects, which provides additional security for your objects. Your full encryption context will be validated to have the value equal to the object's ARN.

The following Amazon S3 APIs support these request headers.

- **PUT operation** — When uploading data using the PUT API (see [PUT Object](#)), you can specify these request headers.
- **Initiate Multipart Upload** — When uploading large objects using the multipart upload API, you can specify these headers. You specify these headers in the initiate request (see [Initiate Multipart Upload](#)).
- **POST operation** — When using a POST operation to upload an object (see [POST Object](#)), instead of the request headers, you provide the same information in the form fields.
- **COPY operation** — When you copy an object (see [PUT Object - Copy](#)), you have both a source object and a target object. When you pass SSE-KMS headers with the COPY operation, they will be applied only to the target object.

The AWS SDKs also provide wrapper APIs for you to request SSE-KMS with Amazon S3.

## Specifying the AWS Key Management Service in Amazon S3 Using the AWS SDKs

### Topics

- [AWS SDK for Java \(p. 413\)](#)

- [AWS SDK for .NET \(p. 414\)](#)

When using AWS SDKs, you can request Amazon S3 to use AWS Key Management Service (AWS KMS)–managed encryption keys. This section provides examples of using the AWS SDKs for Java and .NET. For information about other SDKs, go to [Sample Code and Libraries](#).

## AWS SDK for Java

This section explains various Amazon S3 operations using the AWS SDK for Java and how you use the AWS KMS–managed encryption keys.

### Put Operation

When uploading an object using the AWS SDK for Java, you can request Amazon S3 to use an AWS KMS–managed encryption key by adding the `SSEAwsKeyManagementParams` property as shown in the following request:

```
PutObjectRequest putRequest = new PutObjectRequest(bucketName,  
    keyName, file).withSSEAwsKeyManagementParams(new SSEAwsKeyManagementParams());
```

In this case, Amazon S3 uses the default master key (see [Protecting Data Using Server-Side Encryption with AWS KMS–Managed Keys \(SSE-KMS\) \(p. 410\)](#)). You can optionally create your own key and specify that in the request.

```
PutObjectRequest putRequest = new PutObjectRequest(bucketName,  
    keyName, file).withSSEAwsKeyManagementParams(new SSEAwsKeyManagementParams(keyID));
```

For more information about creating keys, go to [Programming the AWS KMS API](#) in the *AWS Key Management Service Developer Guide*.

For working code examples of uploading an object, see the following topics. You will need to update those code examples and provide encryption information as shown in the preceding code fragment.

- For uploading an object in a single operation, see [Upload an Object Using the AWS SDK for Java \(p. 181\)](#)
- For a multipart upload, see the following topics:
  - Using high-level multipart upload API, see [Upload a File \(p. 193\)](#)
  - If you are using the low-level multipart upload API, see [Upload a File \(p. 197\)](#)

### Copy Operation

When copying objects, you add the same request properties (`ServerSideEncryptionMethod` and `ServerSideEncryptionKeyManagementServiceKeyId`) to request Amazon S3 to use an AWS KMS–managed encryption key. For more information about copying objects, see [Copying Objects \(p. 227\)](#).

### Pre-signed URLs

When creating a pre-signed URL for an object encrypted using an AWS KMS–managed encryption key, you must explicitly specify Signature Version 4:

```
ClientConfiguration clientConfiguration = new ClientConfiguration();  
clientConfiguration.setSignerOverride("AWSS3V4SignerType");  
AmazonS3Client s3client = new AmazonS3Client(  
    new ProfileCredentialsProvider(), clientConfiguration);  
...
```

For a code example, see [Generate a Pre-signed Object URL using AWS SDK for Java \(p. 176\)](#).

## AWS SDK for .NET

This section explains various Amazon S3 operations using the AWS SDK for .NET and how you use the AWS KMS-managed encryption keys.

### Put Operation

When uploading an object using the AWS SDK for .NET, you can request Amazon S3 to use an AWS KMS-managed encryption key by adding the `ServerSideEncryptionMethod` property as shown in the following request:

```
PutObjectRequest putRequest = new PutObjectRequest
{
    BucketName = bucketName,
    Key = keyName,
    // other properties.
    ServerSideEncryptionMethod = ServerSideEncryptionMethod.AWSKMS
};
```

In this case, Amazon S3 uses the default master key (see [Protecting Data Using Server-Side Encryption with AWS KMS-Managed Keys \(SSE-KMS\) \(p. 410\)](#)). You can optionally create your own key and specify that in the request.

```
PutObjectRequest putRequest1 = new PutObjectRequest
{
    BucketName = bucketName,
    Key = keyName,
    // other properties.
    ServerSideEncryptionMethod = ServerSideEncryptionMethod.AWSKMS,
    ServerSideEncryptionKeyManagementServiceKeyId = keyId
};
```

For more information about creating keys, see [Programming the AWS KMS API](#) in the *AWS Key Management Service Developer Guide*.

For working code examples of uploading an object, see the following topics. You will need to update these code examples and provide encryption information as shown in the preceding code fragment.

- For uploading an object in a single operation, see [Upload an Object Using the AWS SDK for .NET \(p. 182\)](#)
- For multipart upload see the following topics:
  - Using high-level multipart upload API, see [Upload a File \(p. 201\)](#)
  - Using low-level multipart upload API, see [Upload a File \(p. 208\)](#)

### Copy Operation

When copying objects, you add the same request properties (`ServerSideEncryptionMethod` and `ServerSideEncryptionKeyManagementServiceKeyId`) to request Amazon S3 to use an AWS KMS-managed encryption key. For more information about copying objects, see [Copying Objects \(p. 227\)](#).

### Pre-signed URLs

When creating a pre-signed URL for an object encrypted using an AWS KMS-managed encryption key, you must explicitly specify Signature Version 4:

```
AWSConfigs.S3Config.UseSignatureVersion4 = true;
```

For a code example, see [Generate a Pre-signed Object URL using AWS SDK for .NET \(p. 178\)](#).

## Specifying the AWS Key Management Service in Amazon S3 Using the REST API

At the time of object creation—that is, when you are uploading a new object or making a copy of an existing object—you can specify the use of server-side encryption with AWS KMS-managed encryption keys (SSE-KMS) to encrypt your data by adding the `x-amz-server-side-encryption` header to the request. Set the value of the header to the encryption algorithm `aws:kms`. Amazon S3 confirms that your object is stored using SSE-KMS by returning the response header `x-amz-server-side-encryption`.

The following REST upload APIs accept the `x-amz-server-side-encryption` request header.

- [PUT Object](#)
- [PUT Object - Copy](#)
- [POST Object](#)
- [Initiate Multipart Upload](#)

When uploading large objects using the multipart upload API, you can specify SSE-KMS by adding the `x-amz-server-side-encryption` header to the Initiate Multipart Upload request with the value of `aws:kms`. When copying an existing object, regardless of whether the source object is encrypted or not, the destination object is not encrypted unless you explicitly request server-side encryption.

The response headers of the following REST APIs return the `x-amz-server-side-encryption` header when an object is stored using server-side encryption.

- [PUT Object](#)
- [PUT Object - Copy](#)
- [POST Object](#)
- [Initiate Multipart Upload](#)
- [Upload Part](#)
- [Upload Part - Copy](#)
- [Complete Multipart Upload](#)
- [Get Object](#)
- [Head Object](#)

### Note

Encryption request headers should not be sent for `GET` requests and `HEAD` requests if your object uses SSE-KMS or you'll get an HTTP 400 BadRequest error.

## Protecting Data Using Server-Side Encryption with Amazon S3-Managed Encryption Keys (SSE-S3)

Server-side encryption is about protecting data at rest. Server-side encryption with Amazon S3-managed encryption keys (SSE-S3) employs strong multi-factor encryption. Amazon S3 encrypts each object with a unique key. As an additional safeguard, it encrypts the key itself with a master key that it regularly rotates. Amazon S3 server-side encryption uses one of the strongest block ciphers available, 256-bit Advanced Encryption Standard (AES-256), to encrypt your data.

Amazon S3 supports bucket policies that you can use if you require server-side encryption for all objects that are stored in your bucket. For example, the following bucket policy denies upload object (`s3:PutObject`) permission to everyone if the request does not include the `x-amz-server-side-encryption` header requesting server-side encryption.

```
{  
    "Version": "2012-10-17",
```

```

    "Id": "PutObjPolicy",
    "Statement": [
        {
            "Sid": "DenyIncorrectEncryptionHeader",
            "Effect": "Deny",
            "Principal": "*",
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::YourBucket/*",
            "Condition": {
                "StringNotEquals": {
                    "s3:x-amz-server-side-encryption": "AES256"
                }
            }
        },
        {
            "Sid": "DenyUnEncryptedObjectUploads",
            "Effect": "Deny",
            "Principal": "*",
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::YourBucket/*",
            "Condition": {
                "Null": {
                    "s3:x-amz-server-side-encryption": "true"
                }
            }
        }
    ]
}

```

Server-side encryption encrypts only the object data. Any object metadata is not encrypted.

## API Support for Server-Side Encryption

The object creation REST APIs (see [Specifying Server-Side Encryption Using the REST API \(p. 422\)](#)) provide a request header, `x-amz-server-side-encryption`, which you can use to request server-side encryption.

The following Amazon S3 APIs support these headers.

- PUT operation — When uploading data using the PUT API (see [PUT Object](#)), you can specify these request headers.
- Initiate Multipart Upload — When uploading large objects using the multipart upload API, you can specify these headers. You specify these headers in the initiate request (see [Initiate Multipart Upload](#)).
- POST operation — When using a POST operation to upload an object (see [POST Object](#)), instead of the request headers, you provide the same information in the form fields.
- COPY operation — When you copy an object (see [PUT Object - Copy](#)), you have both a source object and a target object.

The AWS SDKs also provide wrapper APIs for you to request server-side encryption. You can also use the AWS Management Console to upload objects and request server-side encryption.

### Note

You can't enforce whether objects are encrypted with SSE-S3 when they are uploaded using presigned URLs. This is because the only way you can specify server-side encryption is through the AWS Management Console or through an HTTP request header. For more information, see [Specifying Conditions in a Policy \(p. 343\)](#).

## Specifying Server-Side Encryption Using the AWS SDK for Java

When using the AWS SDK for Java to upload an object, you can use the `ObjectMetadata` property of the `PutObjectRequest` to set the `x-amz-server-side-encryption` request header (see [Specifying](#)

[Server-Side Encryption Using the REST API \(p. 422\)](#)). When you call the `PutObject` method of the Amazon S3 client as shown in the following Java code example, Amazon S3 encrypts and saves the data.

```
File file = new File(uploadFileName);
PutObjectRequest putRequest = new PutObjectRequest(
    bucketName, keyName, file);

// Request server-side encryption.
ObjectMetadata objectMetadata = new ObjectMetadata();
objectMetadata.setSSEAlgorithm(ObjectMetadata.AES_256_SERVER_SIDE_ENCRYPTION);
putRequest.setMetadata(objectMetadata);

PutObjectResult response = s3client.putObject(putRequest);
System.out.println("Uploaded object encryption status is " +
    response.getSSEAlgorithm());
```

In response, Amazon S3 returns the encryption algorithm used for encrypting your object data, which you can check using the `getSSEAlgorithm` method.

For a working sample that shows how to upload an object, see [Upload an Object Using the AWS SDK for Java \(p. 181\)](#). For server-side encryption, add the `ObjectMetadata` property to your request.

When uploading large objects using multipart upload API, you can request server-side encryption for the object that you are uploading.

- When using the low-level multipart upload API (see [Upload a File \(p. 197\)](#)) to upload a large object, you can specify server-side encryption when you initiate the multipart upload. That is, you add the `ObjectMetadata` property by calling the `InitiateMultipartUploadRequest.setObjectMetadata` method.
- When using the high-level multipart upload API (see [Using the AWS Java SDK for Multipart Upload \(High-Level API\) \(p. 193\)](#)), the `TransferManager` class provides methods to upload objects. You can call any of the upload methods that take `ObjectMetadata` as a parameter.

## Determining the Encryption Algorithm Used

To determine the encryption state of an existing object, you can retrieve the object metadata as shown in the following Java code example.

```
GetObjectMetadataRequest request2 =
    new GetObjectMetadataRequest(bucketName, keyName);

ObjectMetadata metadata = s3client.getObjectMetadata(request2);

System.out.println("Encryption algorithm used: " +
    metadata.getSSEAlgorithm());
```

If server-side encryption is not used for the object that is stored in Amazon S3, the method returns null.

## Changing Server-Side Encryption of an Existing Object (Copy Operation)

To change the encryption state of an existing object, you make a copy of the object and delete the source object. By default, the copy API does not encrypt the target unless you explicitly request server-side encryption. You can request the encryption of the target object by using the `ObjectMetadata` property to specify server-side encryption in the `CopyObjectRequest` as shown in the following Java code example.

```
CopyObjectRequest copyObjRequest = new CopyObjectRequest(
    sourceBucket, sourceKey, targetBucket, targetKey);

// Request server-side encryption.
```

```
ObjectMetadata objectMetadata = new ObjectMetadata();
objectMetadata.setSSEAlgorithm(ObjectMetadata.AES_256_SERVER_SIDE_ENCRYPTION);

copyObjRequest.setNewObjectMetadata(objectMetadata);

CopyObjectResult response = s3client.copyObject(copyObjRequest);
System.out.println("Copied object encryption status is " +
    response.getSSEAlgorithm());
```

For a working sample of how to copy an object, see [Copy an Object Using the AWS SDK for Java \(p. 228\)](#). You can specify server-side encryption in the `CopyObjectRequest` object as shown in the preceding code example.

## Specifying Server-Side Encryption Using the AWS SDK for .NET

When using the AWS SDK for .NET to upload an object, you can use the `WithServerSideEncryptionMethod` property of `PutObjectRequest` to set the `x-amz-server-side-encryption` request header (see [Specifying Server-Side Encryption Using the REST API \(p. 422\)](#)). When you call the `PutObject` method of the `AmazonS3` client as shown in the following C# code example, Amazon S3 encrypts and saves the data.

```
static AmazonS3 client;
client = new AmazonS3Client(accessKeyID, secretAccessKeyID);

PutObjectRequest request = new PutObjectRequest();
request.WithContentBody("Object data for simple put.")
    .WithBucketName(bucketName)
    .WithKey(keyName)
    .WithServerSideEncryptionMethod(ServerSideEncryptionMethod.AES256);

S3Response response = client.PutObject(request);

// Check the response header to determine if the object is encrypted.
ServerSideEncryptionMethod destinationObjectEncryptionStatus =
    response.ServerSideEncryptionMethod;
```

In response, Amazon S3 returns the encryption algorithm that is used to encrypt your object data, which you can check using the `ServerSideEncryptionMethod` property.

For a working sample of how to upload an object, see [Upload an Object Using the AWS SDK for .NET \(p. 182\)](#). For server-side encryption, set the `ServerSideEncryptionMethod` property by calling the `WithServerSideEncryptionMethod` method.

To upload large objects using the multipart upload API, you can specify server-side encryption for the objects that you are uploading.

- When using the low-level multipart upload API (see [Using the AWS .NET SDK for Multipart Upload \(Low-Level API\) \(p. 208\)](#)) to upload a large object, you can specify server-side encryption in your `InitiateMultipartUpload` request. That is, you set the `ServerSideEncryptionMethod` property to your `InitiateMultipartUploadRequest` by calling the `WithServerSideEncryptionMethod` method.
- When using the high-level multipart upload API (see [Using the AWS .NET SDK for Multipart Upload \(High-Level API\) \(p. 201\)](#)), the `TransferUtility` class provides methods (`Upload` and `UploadDirectory`) to upload objects. In this case, you can request server-side encryption using the `TransferUtilityUploadRequest` and `TransferUtilityUploadDirectoryRequest` objects.

## Determining the Encryption Algorithm Used

To determine the encryption state of an existing object, you can retrieve the object metadata as shown in the following C# code example.

```
AmazonS3 client;
client = new AmazonS3Client(accessKeyID, secretAccessKeyID);

ServerSideEncryptionMethod objectEncryption;

GetObjectMetadataRequest metadataRequest = new GetObjectMetadataRequest()
    .WithBucketName(bucketName)
    .WithKey(keyName);

objectEncryption = client.GetObjectMetadata(metadataRequest)
    .ServerSideEncryptionMethod;
```

The encryption algorithm is specified with an enum. If the stored object is not encrypted (default behavior), then the `ServerSideEncryptionMethod` property of the object defaults to `None`.

### Changing Server-Side Encryption of an Existing Object (Copy Operation)

To change the encryption state of an existing object, you can make a copy of the object and delete the source object. By default, the copy API does not encrypt the target unless you explicitly request server-side encryption of the destination object. The following C# code example makes a copy of an object. The request explicitly specifies server-side encryption for the destination object.

```
AmazonS3 client;
client = new AmazonS3Client(accessKeyID, secretAccessKeyID);

CopyObjectResponse response = client.CopyObject(new CopyObjectRequest()
    .WithSourceBucket(sourceBucketName)
    .WithSourceKey(sourceObjectKey)
    .WithDestinationBucket(targetBucketName)
    .WithDestinationKey(targetObjectKey)
    .WithServerSideEncryptionMethod(ServerSideEncryptionMethod.AES256)
);
// Check the response header to determine if the object is encrypted.
ServerSideEncryptionMethod destinationObjectEncryptionStatus =
    response.ServerSideEncryptionMethod;
```

For a working sample of how to copy an object, see [Copy an Object Using the AWS SDK for .NET \(p. 229\)](#). You can specify server-side encryption in the `CopyObjectRequest` object as shown in the preceding code example.

## Specifying Server-Side Encryption Using the AWS SDK for PHP

This topic guides you through using classes from the AWS SDK for PHP to add server-side encryption to objects you are uploading to Amazon S3.

### Note

This topic assumes that you are already following the instructions for [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#) and have the AWS SDK for PHP properly installed.

You can use the `Aws\S3\S3Client::putObject()` method to upload an object to Amazon S3. For a working sample of how to upload an object, see [Upload an Object Using the AWS SDK for PHP \(p. 184\)](#).

To add the `x-amz-server-side-encryption` request header (see [Specifying Server-Side Encryption Using the REST API \(p. 422\)](#)) to your upload request, specify the array parameter's `ServerSideEncryption` key with the value `AES256` as shown in the following PHP code sample.

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';
```

```
// $filepath should be absolute path to a file on disk
$filepath = '*** Your File Path ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Upload a file with server-side encryption.
$result = $s3->putObject(array(
    'Bucket'          => $bucket,
    'Key'             => $keyname,
    'SourceFile'      => $filepath,
    'ServerSideEncryption' => 'AES256',
));

```

In response, Amazon S3 returns the `x-amz-server-side-encryption` header with the value of the encryption algorithm used to encrypt your object data.

To upload large objects using the multipart upload API, you can specify server-side encryption for the objects that you are uploading.

- When using the low-level multipart upload API (see [Using the AWS PHP SDK for Multipart Upload \(Low-Level API\) \(p. 216\)](#)), you can specify server-side encryption when you call the `Aws\S3\S3Client::createMultipartUpload()` method. To add the `x-amz-server-side-encryption` request header to your request, specify the array parameter's `ServerSideEncryption` key with the value `AES256`.
- When using the high-level multipart upload, you can specify server-side encryption using the `Aws\S3\Model\MultipartUpload\UploadBuilder::setOption()` method like `setOption('ServerSideEncryption', 'AES256')`. For an example of using the `setOption()` method with the high-level `UploadBuilder`, see [Using the AWS PHP SDK for Multipart Upload \(High-Level API\) \(p. 213\)](#).

## Determining Encryption Algorithm Used

To determine the encryption state of an existing object, retrieve the object metadata by calling the `Aws\S3\S3Client::headObject()` method as shown in the following PHP code sample.

```
use Aws\S3\S3Client;

$bucket = '*** Your Bucket Name ***';
$keyname = '*** Your Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Check which server-side encryption algorithm is used.
$result = $s3->headObject(array(
    'Bucket' => $bucket,
    'Key'     => $keyname,
));
echo $result['ServerSideEncryption'];

```

## Changing Server-Side Encryption of an Existing Object (Copy Operation)

To change the encryption state of an existing object, make a copy of the object using the `Aws\S3\S3Client::copyObject()` method and delete the source object. Note that by default `copyObject()` will not encrypt the target, unless you explicitly request server-side encryption of the destination object using the array parameter's `ServerSideEncryption` key with the value `AES256`. The following PHP code sample makes a copy of an object and adds server-side encryption to the copied object.

```
use Aws\S3\S3Client;
```

```
$sourceBucket = '*** Your Source Bucket Name ***';
$sourceKeyname = '*** Your Source Object Key ***';

$targetBucket = '*** Your Target Bucket Name ***';
$targetKeyname = '*** Your Target Object Key ***';

// Instantiate the client.
$s3 = S3Client::factory();

// Copy an object and add server-side encryption.
$result = $s3->copyObject(array(
    'Bucket'          => $targetBucket,
    'Key'             => $targetKeyname,
    'CopySource'      => "{$sourceBucket}/{$sourceKeyname}",
    'ServerSideEncryption' => 'AES256',
));
```

For a working sample of how to copy an object, see [Copy an Object Using the AWS SDK for PHP \(p. 230\)](#).

### Related Resources

- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client Class](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::factory\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::copyObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::createMultipartUpload\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::headObject\(\) Method](#)
- [AWS SDK for PHP for Amazon S3 Aws\S3\S3Client::putObject\(\) Method](#)
- [Aws\S3\Model\MultipartUpload\UploadBuilder::setOption\(\) Method](#)
- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

## Specifying Server-Side Encryption Using the AWS SDK for Ruby

When using the AWS SDK for Ruby to upload an object, you can specify that the object be stored encrypted at rest with server-side encryption (SSE). When you read the object back, it is automatically decrypted.

The following AWS SDK for Ruby – Version 3 example demonstrates how to specify that a file uploaded to Amazon S3 be encrypted at rest.

```
require 'aws-sdk-s3'

s3 = Aws::S3::Resource.new(region:'us-west-2')
obj = s3.bucket('my-bucket').object('key')
obj.upload_file('local/path/to/file', :server_side_encryption => 'AES256')
```

For an example that shows how to upload an object without SSE, see [Upload an Object Using the AWS SDK for Ruby \(p. 186\)](#).

### Determining the Encryption Algorithm Used

The following code example demonstrates how to determine the encryption state of an existing object.

```
# Determine server-side encryption of an object.
require 'aws-sdk-s3'
```

```
s3 = Aws::S3::Resource.new(region:'us-west-2')
enc = s3.bucket('bucket-name').object('key').server_side_encryption
enc_state = (enc != nil) ? enc : "not set"
puts "Encryption state is #{enc_state}."
```

If server-side encryption is not used for the object that is stored in Amazon S3, the method returns null.

### Changing Server-Side Encryption of an Existing Object (Copy Operation)

To change the encryption state of an existing object, make a copy of the object and delete the source object. By default, the copy methods do not encrypt the target unless you explicitly request server-side encryption. You can request the encryption of the target object by specifying the `server_side_encryption` value in the options hash argument as shown in the following Ruby code example. The code example demonstrates how to copy an object and encrypt the copy.

```
require 'aws-sdk-s3'

s3 = Aws::S3::Resource.new(region:'us-west-2')
bucket1 = s3.bucket('source-bucket-name')
bucket2 = s3.bucket('target-bucket-name')
obj1 = bucket1.object('key')
obj2 = bucket2.object('key')

obj1.copy_to(obj2, :server_side_encryption => 'AES256')
```

For a sample of how to copy an object without encryption, see [Copy an Object Using the AWS SDK for Ruby \(p. 233\)](#).

### Specifying Server-Side Encryption Using the REST API

At the time of object creation—that is, when you are uploading a new object or making a copy of an existing object—you can specify if you want Amazon S3 to encrypt your data by adding the `x-amz-server-side-encryption` header to the request. Set the value of the header to the encryption algorithm `AES256` that Amazon S3 supports. Amazon S3 confirms that your object is stored using server-side encryption by returning the response header `x-amz-server-side-encryption`.

The following REST upload APIs accept the `x-amz-server-side-encryption` request header.

- [PUT Object](#)
- [PUT Object - Copy](#)
- [POST Object](#)
- [Initiate Multipart Upload](#)

When uploading large objects using the multipart upload API, you can specify server-side encryption by adding the `x-amz-server-side-encryption` header to the Initiate Multipart Upload request. When you are copying an existing object, regardless of whether the source object is encrypted or not, the destination object is not encrypted unless you explicitly request server-side encryption.

The response headers of the following REST APIs return the `x-amz-server-side-encryption` header when an object is stored using server-side encryption.

- [PUT Object](#)
- [PUT Object - Copy](#)
- [POST Object](#)
- [Initiate Multipart Upload](#)
- [Upload Part](#)
- [Upload Part - Copy](#)

- [Complete Multipart Upload](#)
- [Get Object](#)
- [Head Object](#)

**Note**

Encryption request headers should not be sent for `GET` requests and `HEAD` requests if your object uses SSE-S3 or you'll get an HTTP 400 BadRequest error.

## Specifying Server-Side Encryption Using the AWS Management Console

When uploading an object using the AWS Management Console, you can specify server-side encryption. For an example of how to upload an object, see [Uploading S3 Objects](#).

When you copy an object using the AWS Management Console, the console copies the object as is. That is, if the copy source is encrypted, the target object is encrypted. The console also allows you to add encryption to an object. For more information, see [How Do I Add Encryption to an S3 Object?](#).

## Protecting Data Using Server-Side Encryption with Customer-Provided Encryption Keys (SSE-C)

Server-side encryption is about protecting data at rest. Using server-side encryption with customer-provided encryption keys (SSE-C) allows you to set your own encryption keys. With the encryption key you provide as part of your request, Amazon S3 manages both the encryption, as it writes to disks, and decryption, when you access your objects. Therefore, you don't need to maintain any code to perform data encryption and decryption. The only thing you do is manage the encryption keys you provide.

When you upload an object, Amazon S3 uses the encryption key you provide to apply AES-256 encryption to your data and removes the encryption key from memory.

**Important**

Amazon S3 does not store the encryption key you provide. Instead, we store a randomly salted HMAC value of the encryption key in order to validate future requests. The salted HMAC value cannot be used to derive the value of the encryption key or to decrypt the contents of the encrypted object. That means, if you lose the encryption key, you lose the object.

When you retrieve an object, you must provide the same encryption key as part of your request. Amazon S3 first verifies that the encryption key you provided matches, and then decrypts the object before returning the object data to you.

The highlights of SSE-C are:

- You must use https.

**Important**

Amazon S3 will reject any requests made over http when using SSE-C. For security considerations, we recommend you consider any key you send erroneously using http to be compromised. You should discard the key, and rotate as appropriate.

- The ETag in the response is not the MD5 of the object data.
- You manage a mapping of which encryption key was used to encrypt which object. Amazon S3 does not store encryption keys. You are responsible for tracking which encryption key you provided for which object.
  - If your bucket is versioning-enabled, each object version you upload using this feature can have its own encryption key. You are responsible for tracking which encryption key was used for which object version.
  - Because you manage encryption keys on the client side, you manage any additional safeguards, such as key rotation, on the client side.

**Warning**

If you lose the encryption key any GET request for an object without its encryption key will fail, and you lose the object.

## Using SSE-C

When using server-side encryption with customer-provided encryption keys (SSE-C), you must provide encryption key information using the following request headers.

Name	Description
x-amz-server-side-encryption-customer-algorithm	Use this header to specify the encryption algorithm. The header value must be "AES256".
x-amz-server-side-encryption-customer-key	Use this header to provide the 256-bit, base64-encoded encryption key for Amazon S3 to use to encrypt or decrypt your data.
x-amz-server-side-encryption-customer-key-MD5	Use this header to provide the base64-encoded 128-bit MD5 digest of the encryption key according to <a href="#">RFC 1321</a> . Amazon S3 uses this header for a message integrity check to ensure the encryption key was transmitted without error.

You can use AWS SDK wrapper libraries to add these headers to your request. If you need to, you can make the Amazon S3 REST API calls directly in your application.

**Note**

You cannot use the Amazon S3 console to upload an object and request SSE-C. You also cannot use the console to update (for example, change the storage class or add metadata) an existing object stored using SSE-C.

The following Amazon S3 APIs support these headers.

- GET operation — When retrieving objects using the GET API (see [GET Object](#)), you can specify the request headers. Torrents are not supported for objects encrypted using SSE-C.
- HEAD operation — To retrieve object metadata using the HEAD API (see [HEAD Object](#)), you can specify these request headers.
- PUT operation — When uploading data using the PUT API (see [PUT Object](#)), you can specify these request headers.
- Multipart Upload — When uploading large objects using the multipart upload API, you can specify these headers. You specify these headers in the initiate request (see [Initiate Multipart Upload](#)) and each subsequent part upload request ([Upload Part](#)). For each part upload request, the encryption information must be the same as what you provided in the initiate multipart upload request.
- POST operation — When using a POST operation to upload an object (see [POST Object](#)), instead of the request headers, you provide the same information in the form fields.
- Copy operation — When you copy an object (see [PUT Object - Copy](#)), you have both a source object and a target object. Accordingly, you have the following to consider:
  - If you want the target object encrypted using server-side encryption with AWS-managed keys, you must provide the x-amz-server-side-encryption request header.
  - If you want the target object encrypted using SSE-C, you must provide encryption information using the three headers described in the preceding table.
  - If the source object is encrypted using SSE-C, you must provide encryption key information using the following headers so that Amazon S3 can decrypt the object for copying.

Name	Description
x-amz-copy-source-server-side-encryption-customer-algorithm	Include this header to specify the algorithm Amazon S3 should use to decrypt the source object. This value must be AES256.
x-amz-copy-source-server-side-encryption-customer-key	Include this header to provide the base64-encoded encryption key for Amazon S3 to use to decrypt the source object. This encryption key must be the one that you provided Amazon S3 when you created the source object; otherwise, Amazon S3 will not be able to decrypt the object.
x-amz-copy-source-server-side-encryption-customer-key-MD5	Include this header to provide the base64-encoded 128-bit MD5 digest of the encryption key according to <a href="#">RFC 1321</a> .

## Presigned URL and SSE-C

You can generate a presigned URL that can be used for operations such as upload a new object, retrieve an existing object, or object metadata. Presigned URLs support the SSE-C as follows:

- When creating a presigned URL, you must specify the algorithm using the `x-amz-server-side-encryption-customer-algorithm` in the signature calculation.
- When using the presigned URL to upload a new object, retrieve an existing object, or retrieve only object metadata, you must provide all the encryption headers in your client application.

For more information, see the following topics:

- [Specifying Server-Side Encryption with Customer-Provided Encryption Keys Using the AWS Java SDK \(p. 425\)](#)
- [Specifying Server-Side Encryption with Customer-Provided Encryption Keys Using the .NET SDK \(p. 430\)](#)
- [Specifying Server-Side Encryption with Customer-Provided Encryption Keys Using the REST API \(p. 436\)](#)

## Specifying Server-Side Encryption with Customer-Provided Encryption Keys Using the AWS Java SDK

The following Java code example illustrates server-side encryption with customer-provided keys (SSE-C) (see [Protecting Data Using Server-Side Encryption with Customer-Provided Encryption Keys \(SSE-C\) \(p. 423\)](#)). The example performs the following operations; each operation shows how you specify SSE-C related headers in the request:

- **Put object** – upload an object requesting server-side encryption using a customer-provided encryption key.
- **Get object** – download the object that you uploaded in the previous step. The example shows that in the Get request you must provide the same encryption information that you provided at the time you uploaded the object, so that Amazon S3 can decrypt the object before returning it.
- **Get object metadata** – The request shows the same encryption information that you specified when creating the object is required to retrieve the object's metadata.

- **Copy object** – This example makes a copy of the previously uploaded object. Because the source object is stored using SSE-C, you must provide the encryption information in your copy request. By default, the object copy will not be encrypted. But in this example, you request that Amazon S3 store the object copy encrypted by using SSE-C, and therefore you must provide SSE-C encryption information for the target as well.

#### Note

This example shows how to upload an object in a single operation. When using the multipart upload API to upload large objects, you provide the same encryption information that you provide in your request, as shown in the following example. For multipart upload AWS SDK for Java examples, see [Using the AWS Java SDK for Multipart Upload \(High-Level API\) \(p. 193\)](#) and [Using the AWS Java SDK for Multipart Upload \(Low-Level API\) \(p. 197\)](#).

The AWS SDK for Java provides the `SSECustomerKey` class for you to add the required encryption information (see [Using SSE-C \(p. 424\)](#)) in your request. You are required to provide only the encryption key. The Java SDK sets the values for the MD5 digest of the encryption key and the algorithm.

For information about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

#### Example

```
import java.io.BufferedReader;
import java.io.File;
import java.io.IOException;
import java.io.InputStreamReader;
import java.security.NoSuchAlgorithmException;
import java.security.SecureRandom;

import javax.crypto.KeyGenerator;
import javax.crypto.SecretKey;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.CopyObjectRequest;
import com.amazonaws.services.s3.model.GetObjectMetadataRequest;
import com.amazonaws.services.s3.model.GetObjectRequest;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.S3Object;
import com.amazonaws.services.s3.model.S3ObjectInputStream;
import com.amazonaws.services.s3.model.SSECustomerKey;

public class ServerSideEncryptionUsingClientSideEncryptionKey {
    private static String bucketName      = "*** Provide bucket name ***";
    private static String keyName        = "*** Provide key ***";
    private static String uploadFileName = "*** Provide file name ***";
    private static String targetKeyName = "*** provide target key ***";
    private static AmazonS3 s3client;

    public static void main(String[] args) throws IOException, NoSuchAlgorithmException {
        s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            System.out.println("Uploading a new object to S3 from a file\n");
            File file = new File(uploadFileName);
            // Create encryption key.
            SecretKey secretKey = generateSecretKey();
            SSECustomerKey sseKey = new SSECustomerKey(secretKey);
```

```

// 1. Upload object.
uploadObject(file, sseKey);

// 2. Download object.
downloadObject(sseKey);

// 3. Get object metadata (and verify AES256 encryption).
retrieveObjectMetadata(sseKey);

// 4. Copy object (both source and object use SSE-C).
copyObject(sseKey);

} catch (AmazonServiceException ase) {
    System.out.println("Caught an AmazonServiceException, which " +
        "means your request made it " +
        "to Amazon S3, but was rejected with an error response" +
        " for some reason.");
    System.out.println("Error Message: " + ase.getMessage());
    System.out.println("HTTP Status Code: " + ase.getStatusCode());
    System.out.println("AWS Error Code: " + ase.getErrorCode());
    System.out.println("Error Type: " + ase.getErrorType());
    System.out.println("Request ID: " + ase.getRequestId());
} catch (AmazonClientException ace) {
    System.out.println("Caught an AmazonClientException, which " +
        "means the client encountered " +
        "an internal error while trying to " +
        "communicate with S3, " +
        "such as not being able to access the network.");
    System.out.println("Error Message: " + ace.getMessage());
}
}

private static void copyObject(SSECustomerKey sseKey) {
    // Create new encryption key for target so it is saved using sse-c
    SecretKey secretKey2 = generateSecretKey();
    SSECustomerKey newSseKey = new SSECustomerKey(secretKey2);

    CopyObjectRequest copyRequest = new CopyObjectRequest(bucketName, keyName,
    bucketName, targetKeyName)
        .withSourceSSECustomerKey(sseKey)
        .withDestinationSSECustomerKey(newSseKey);

    s3client.copyObject(copyRequest);
    System.out.println("Object copied");
}

private static void retrieveObjectMetadata(SSECustomerKey sseKey) {
    GetObjectMetadataRequest getMetadataRequest = new
    GetObjectMetadataRequest(bucketName, keyName)
        .withSSECustomerKey(sseKey);

    ObjectMetadata objectMetadata = s3client.getObjectMetadata(getMetadataRequest);
    System.out.println("object size " + objectMetadata.getContentLength());
    System.out.println("Metadata retrieved");
}

private static PutObjectRequest uploadObject(File file, SSECustomerKey sseKey) {
    // 1. Upload Object.
    PutObjectRequest putObjectRequest = new PutObjectRequest(bucketName, keyName, file)
        .withSSECustomerKey(sseKey);

    s3client.putObject(putObjectRequest);
    System.out.println("Object uploaded");
    return putObjectRequest;
}

```

```

private static void downloadObject(SSECustomerKey sseKey) throws IOException {
    // Get a range of bytes from an object.
   .GetObjectRequest getObjectRequest = new GetObjectRequest(bucketName, keyName)
        .withSSECustomerKey(sseKey);

    S3Object s3Object = s3client.getObject(getObjectRequest);

    System.out.println("Printing bytes retrieved.");
    displayTextInputStream(s3Object.getObjectContent());
}

private static void displayTextInputStream(S3ObjectInputStream input)
throws IOException {
    // Read one text line at a time and display.
    BufferedReader reader = new BufferedReader(new InputStreamReader(input));
    while (true) {
        String line = reader.readLine();
        if (line == null) break;

        System.out.println("    " + line);
    }
    System.out.println();
}

private static SecretKey generateSecretKey() {
    try {
        KeyGenerator generator = KeyGenerator.getInstance("AES");
        generator.init(256, new SecureRandom());
        return generator.generateKey();
    } catch (Exception e) {
        e.printStackTrace();
        System.exit(-1);
        return null;
    }
}
}

```

## Other Amazon S3 Operations and SSE-C

The example in the preceding section shows how to request server-side encryption with customer-provided keys (SSE-C) in the PUT, GET, Head, and Copy operations. This section describes other APIs that support SSE-C.

To upload large objects, you can use multipart upload API (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). You can use either high-level or low-level APIs to upload large objects. These APIs support encryption-related headers in the request.

- When using the high-level Transfer-Utility API, you provide the encryption-specific headers in the `TransferManager` (see [Using the AWS Java SDK for Multipart Upload \(High-Level API\) \(p. 193\)](#)).
- When using the low-level API, you provide encryption-related information in the initiate multipart upload request, followed by identical encryption information in the subsequent upload part requests. You do not need to provide any encryption-specific headers in your complete multipart upload request. For examples, see [Using the AWS Java SDK for Multipart Upload \(Low-Level API\) \(p. 197\)](#).

The following example uses `TransferManager` to create objects and shows how to provide SSE-C related information. The example does the following:

- Create an object using the `TransferManager.upload` method. In the `PutObjectRequest` instance, you provide encryption key information to request that Amazon S3 store the object encrypted using the customer-provided encryption key.
- Make a copy of the object by calling the `TransferManager.copy` method. In the `CopyObjectRequest`, this example requests Amazon S3 to store the object copy also encrypted

using a customer-provided encryption key. Because the source object is encrypted using SSE-C, the CopyObjectRequest also provides the encryption key of the source object so Amazon S3 can decrypt the object before it can copy.

### Example

```

import java.io.File;
import java.security.SecureRandom;

import javax.crypto.KeyGenerator;
import javax.crypto.SecretKey;

import com.amazonaws.AmazonClientException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.model.CopyObjectRequest;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.SSECustomerKey;
import com.amazonaws.services.s3.transfer.Copy;
import com.amazonaws.services.s3.transfer.TransferManager;
import com.amazonaws.services.s3.transfer.Upload;

public class ServerSideEncryptionCopyObjectUsingHLwithSSEC {

    public static void main(String[] args) throws Exception {
        String existingBucketName = "*** Provide existing bucket name ***";
        String fileToUpload      = "*** file path ***";
        String keyName           = "*** New object key ***";
        String targetKeyName     = "*** Key name for object copy ***";

        TransferManager tm = new TransferManager(new ProfileCredentialsProvider());

        // 1. first create an object from a file.
        PutObjectRequest putObjectRequest = new PutObjectRequest(existingBucketName,
keyName, new File(fileToUpload));

        // we want object stored using SSE-C. So we create encryption key.
        SecretKey secretKey1 = generateSecretKey();
        SSECustomerKey sseCustomerEncryptionKey1 = new SSECustomerKey(secretKey1);

        putObjectRequest.setSSECustomerKey(sseCustomerEncryptionKey1);
        // now create object.
        //Upload upload = tm.upload(existingBucketName, keyName, new File(sourceFile));
        Upload upload = tm.upload(putObjectRequest);
        try {
            // Or you can block and wait for the upload to finish
            upload.waitForCompletion();
            //tm.getAmazonS3Client().putObject(putObjectRequest);
            System.out.println("Object created.");
        } catch (AmazonClientException amazonClientException) {
            System.out.println("Unable to upload file, upload was aborted.");
            amazonClientException.printStackTrace();
        }

        // 2. Now make object copy (in the same bucket). Store target using sse-c.
        CopyObjectRequest copyObjectRequest = new CopyObjectRequest(existingBucketName,
keyName, existingBucketName, targetKeyName);

        SecretKey secretKey2 = generateSecretKey();
        SSECustomerKey sseTargetObjectEncryptionKey = new SSECustomerKey(secretKey2);

        copyObjectRequest.setSourceSSECustomerKey(sseCustomerEncryptionKey1);
        copyObjectRequest.setDestinationSSECustomerKey(sseTargetObjectEncryptionKey);
    }
}

```

```
// TransferManager processes all transfers asynchronously,  
// so this call will return immediately.  
Copy copy = tm.copy(copyObjectRequest);  
try {  
    // Or you can block and wait for the upload to finish  
    copy.waitForCompletion();  
    System.out.println("Copy complete.");  
} catch (AmazonClientException amazonClientException) {  
    System.out.println("Unable to upload file, upload was aborted.");  
    amazonClientException.printStackTrace();  
}  
}  
  
private static SecretKey generateSecretKey() {  
    KeyGenerator generator;  
    try {  
        generator = KeyGenerator.getInstance("AES");  
        generator.init(256, new SecureRandom());  
        return generator.generateKey();  
    } catch (Exception e) {  
        e.printStackTrace();  
        System.exit(-1);  
        return null;  
    }  
}  
}
```

## Specifying Server-Side Encryption with Customer-Provided Encryption Keys Using the .NET SDK

The following C# code example illustrates server-side encryption with customer-provided keys (SSE-C) (see [Protecting Data Using Server-Side Encryption with Customer-Provided Encryption Keys \(SSE-C\) \(p. 423\)](#)). The example performs the following operations, each operation shows how you specify SSE-C-related headers in the request:

- **Put object** – upload an object requesting server-side encryption using customer-provided encryption keys.
- **Get object** – download the object uploaded in the previous step. It shows that the request must provide the same encryption information for Amazon S3 to decrypt the object so that it can return it to you.
- **Get object metadata** – The request shows that the same encryption information you specified when creating the object is required to retrieve the object metadata.
- **Copy object** – This example makes a copy of the previously uploaded object. Because the source object is stored using SSE-C, you must provide encryption information in your copy request. By default, the object copy will not be encrypted. But in this example, you request that Amazon S3 store the object copy encrypted using SSE-C, and therefore you provide encryption-related information for the target as well.

### Note

When using multipart upload API to upload large objects, you provide the same encryption information that you provide in your request as shown in the following example. For multipart upload .NET SDK examples, see [Using the AWS .NET SDK for Multipart Upload \(High-Level API\) \(p. 201\)](#) and [Using the AWS .NET SDK for Multipart Upload \(Low-Level API\) \(p. 208\)](#).

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

## Example

```
using System;
using System.IO;
using System.Security.Cryptography;
using Amazon.S3;
using Amazon.S3.Model;
using Microsoft.VisualStudio.TestTools.UnitTesting;

namespace s3.amazonaws.com.docsamples
{
    class SSEClientEncryptionKeyObjectOperations
    {
        static string bucketName      = "*** bucket name ***";
        static string keyName         = "*** object key name for new object ***";
        static string copyTargetKeyName = "*** copy operation target object key name ***";

        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USWest2))
            {
                try
                {
                    // Create encryption key.
                    Aes aesEncryption = Aes.Create();
                    aesEncryption.KeySize = 256;
                    aesEncryption.GenerateKey();
                    string base64Key = Convert.ToBase64String(aesEncryption.Key);

                    // 1. Upload object.
                    PutObjectRequest putObjectRequest = UploadObject(base64Key);
                    // 2. Download object (and also verify content is same as what you
uploaded).
                    DownloadObject(base64Key, putObjectRequest);
                    // 3. Get object metadata (and also verify AES256 encryption).
                    GetObjectMetadata(base64Key);
                    // 4. Copy object (both source and target objects use server-side
encryption with
                    //      customer-provided encryption key.
                    CopyObject(aesEncryption, base64Key);
                }
                catch (AmazonS3Exception amazonS3Exception)
                {
                    if (amazonS3Exception.ErrorCode != null &&
                        (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                         ||
                         amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                    {
                        Console.WriteLine("Check the provided AWS Credentials.");
                        Console.WriteLine(
                            "For service sign up go to http://aws.amazon.com/s3");
                    }
                    else
                    {
                        Console.WriteLine(
                            "Error occurred. Message:{0}' when writing an object"
                            , amazonS3Exception.Message);
                    }
                }
            }

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }
    }
}
```

```

        }

        private static void CopyObject(Aes aesEncryption, string base64Key)
        {
            aesEncryption.GenerateKey();
            string copyBase64Key = Convert.ToBase64String(aesEncryption.Key);

            CopyObjectRequest copyRequest = new CopyObjectRequest
            {
                SourceBucket = bucketName,
                SourceKey = keyName,
                DestinationBucket = bucketName,
                DestinationKey = copyTargetKeyName,
                // Source object encryption information.
                CopySourceServerSideEncryptionCustomerMethod =
                ServerSideEncryptionCustomerMethod.AES256,
                CopySourceServerSideEncryptionCustomerProvidedKey = base64Key,
                // Target object encryption information.
                ServerSideEncryptionCustomerMethod =
                ServerSideEncryptionCustomerMethod.AES256,
                ServerSideEncryptionCustomerProvidedKey = copyBase64Key
            };
            client.CopyObject(copyRequest);
        }

        private static void DownloadObject(string base64Key, PutObjectRequest
putObjectRequest)
        {
            GetObjectRequest getObjectRequest = new GetObjectRequest
            {
                BucketName = bucketName,
                Key = keyName,
                // Provide encryption information of the object stored in S3.
                ServerSideEncryptionCustomerMethod =
                ServerSideEncryptionCustomerMethod.AES256,
                ServerSideEncryptionCustomerProvidedKey = base64Key
            };

            using (GetObjectResponse getResponse = client.GetObject(getObjectRequest))
            using (StreamReader reader = new StreamReader(getResponse.ResponseStream))
            {
                string content = reader.ReadToEnd();
                Assert.AreEqual(putObjectRequest.ContentBody, content);
                Assert.AreEqual(ServerSideEncryptionCustomerMethod.AES256,
getResponse.ServerSideEncryptionCustomerMethod);
            }
        }

        private static void GetObjectMetadata(string base64Key)
        {
            GetObjectMetadataRequest getObjectMetadataRequest = new
GetObjectMetadataRequest
            {
                BucketName = bucketName,
                Key = keyName,

                // Object stored in S3 is encrypted. So provide necessary encryption
information.
                ServerSideEncryptionCustomerMethod =
                ServerSideEncryptionCustomerMethod.AES256,
                ServerSideEncryptionCustomerProvidedKey = base64Key
            };

            GetObjectMetadataResponse getObjectMetadataResponse =
client.GetObjectMetadata(getObjectMetadataRequest);
        }
    }
}

```

```
        Assert.AreEqual(ServerSideEncryptionCustomerMethod.AES256,
getObjectMetadataResponse.ServerSideEncryptionCustomerMethod);
    }

    private static PutObjectRequest UploadObject(string base64Key)
{
    PutObjectRequest putObjectRequest = new PutObjectRequest
    {
        BucketName = bucketName,
        Key = keyName,
        ContentBody = "sample text",
        ServerSideEncryptionCustomerMethod =
ServerSideEncryptionCustomerMethod.AES256,
        ServerSideEncryptionCustomerProvidedKey = base64Key
    };
    PutObjectResponse putObjectResponse = client.PutObject(putObjectRequest);
    return putObjectRequest;
}
}
```

## Other Amazon S3 Operations and SSE-C

The example in the preceding section shows how to request server-side encryption with customer-provided key (SSE-C) in the PUT, GET, Head, and Copy operations. This section describes other APIs that support SSE-C.

To upload large objects, you can use multipart upload API (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). You can use either high-level or low-level APIs to upload large objects. These APIs support encryption-related headers in the request.

- When using high-level Transfer-Utility API, you provide the encryption-specific headers in the `TransferUtilityUploadRequest` as shown. For code examples, see [Using the AWS .NET SDK for Multipart Upload \(High-Level API\) \(p. 201\)](#).

```
TransferUtilityUploadRequest request = new TransferUtilityUploadRequest()
{
    FilePath = filePath,
    BucketName = existingBucketName,
    Key = keyName,
    // Provide encryption information.
    ServerSideEncryptionCustomerMethod = ServerSideEncryptionCustomerMethod.AES256,
    ServerSideEncryptionCustomerProvidedKey = base64Key,
};
```

- When using the low-level API, you provide encryption-related information in the initiate multipart upload request, followed by identical encryption information in the subsequent upload part requests. You do not need to provide any encryption-specific headers in your complete multipart upload request. For examples, see [Using the AWS .NET SDK for Multipart Upload \(Low-Level API\) \(p. 208\)](#).

The following is a low-level multipart upload example that makes a copy of an existing large object. In the example, the object to be copied is stored in Amazon S3 using SSE-C, and you want to save the target object also using SSE-C. In the example, you do the following:

- Initiate a multipart upload request by providing an encryption key and related information.
- Provide source and target object encryption keys and related information in the `CopyPartRequest`.
- Obtain the size of the source object to be copied by retrieving the object metadata.
- Upload the objects in 5 MB parts.

## Example

```
using System;
using System.Collections.Generic;
using System.Security.Cryptography;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class SSECLowLevelMPUcopyObject
    {
        static string existingBucketName      = "**** bucket name ***";
        static string sourceKeyName          = "*** key name ***";
        static string targetKeyName          = "*** key name ***";

        static void Main(string[] args)
        {
            IAmazonS3 s3Client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1);
            List<CopyPartResponse> uploadResponses = new List<CopyPartResponse>();

            Aes aesEncryption = Aes.Create();
            aesEncryption.KeySize = 256;
            aesEncryption.GenerateKey();
            string base64Key = Convert.ToBase64String(aesEncryption.Key);

            // 1. Initialize.
            InitiateMultipartUploadRequest initiateRequest = new
InitiateMultipartUploadRequest
            {
                BucketName = existingBucketName,
                Key = targetKeyName,
                ServerSideEncryptionCustomerMethod =
ServerSideEncryptionCustomerMethod.AES256,
                ServerSideEncryptionCustomerProvidedKey = base64Key,
            };

            InitiateMultipartUploadResponse initResponse =
                s3Client.InitiateMultipartUpload(initiateRequest);

            // 2. Upload Parts.
            long partSize = 5 * (long)Math.Pow(2, 20); // 5 MB
            long firstByte = 0;
            long lastByte = partSize;

            try
            {
                // First find source object size. Because object is stored encrypted with
                // customer provided key you need to provide encryption information in
                your request.
                GetObjectMetadataRequest getObjectMetadataRequest = new
GetObjectMetadataRequest()
                {
                    BucketName = existingBucketName,
                    Key = sourceKeyName,
                    ServerSideEncryptionCustomerMethod =
ServerSideEncryptionCustomerMethod.AES256,
                    ServerSideEncryptionCustomerProvidedKey = "***source object
encryption key ***"
                };

                GetObjectMetadataResponse getObjectMetadataResponse =
s3Client.GetObjectMetadata(getObjectMetadataRequest);
```

```

        long filePosition = 0;
        for (int i = 1; filePosition < getObjectMetadataResponse.ContentLength; i++)
        {
            CopyPartRequest copyPartRequest = new CopyPartRequest
            {
                UploadId = initResponse.UploadId,
                // Source.
                SourceBucket = existingBucketName,
                SourceKey = sourceKeyName,
                // Source object is stored using SSE-C. Provide encryption
                information.
                CopySourceServerSideEncryptionCustomerMethod =
                ServerSideEncryptionCustomerMethod.AES256,
                CopySourceServerSideEncryptionCustomerProvidedKey = "***source
                object encryption key ***",
                FirstByte = firstByte,
                // If the last part is smaller then our normal part size then use
                the remaining size.
                LastByte = lastByte > getObjectMetadataResponse.ContentLength ?
                getObjectMetadataResponse.ContentLength - 1 : lastByte,
                // Target.
                DestinationBucket = existingBucketName,
                DestinationKey = targetKeyName,
                PartNumber = i,
                // Encryption information for the target object.
                ServerSideEncryptionCustomerMethod =
                ServerSideEncryptionCustomerMethod.AES256,
                ServerSideEncryptionCustomerProvidedKey = base64Key
            };
            uploadResponses.Add(s3Client.CopyPart(copyPartRequest));
            filePosition += partSize;
            firstByte += partSize;
            lastByte += partSize;
        }

        // Step 3: complete.
        CompleteMultipartUploadRequest completeRequest = new
        CompleteMultipartUploadRequest
        {
            BucketName = existingBucketName,
            Key = targetKeyName,
            UploadId = initResponse.UploadId,
        };
        completeRequest.AddPartETags(uploadResponses);

        CompleteMultipartUploadResponse completeUploadResponse =
            s3Client.CompleteMultipartUpload(completeRequest);
    }
    catch (Exception exception)
    {
        Console.WriteLine("Exception occurred: {0}", exception.Message);
        AbortMultipartUploadRequest abortMPURequest = new
        AbortMultipartUploadRequest
        {
            BucketName = existingBucketName,
            Key = targetKeyName,
            UploadId = initResponse.UploadId
        };
        s3Client.AbortMultipartUpload(abortMPURequest);
    }
}

```

}

## Specifying Server-Side Encryption with Customer-Provided Encryption Keys Using the REST API

The following Amazon S3 REST APIs support headers related to server-side encryption with customer-provided encryption keys. For more information about these headers, see [Using SSE-C \(p. 424\)](#).

- [GET Object](#)
- [HEAD Object](#)
- [PUT Object](#)
- [PUT Object - Copy](#)
- [POST Object](#)
- [Initiate Multipart Upload](#)
- [Upload Part](#)
- [Upload Part - Copy](#)

## Protecting Data Using Client-Side Encryption

Client-side encryption refers to encrypting data before sending it to Amazon S3. You have the following two options for using data encryption keys:

- Use an AWS KMS-managed customer master key
- Use a client-side master key

### Option 1: Using an AWS KMS–Managed Customer Master Key (CMK)

When using an AWS KMS-managed customer master key for client-side data encryption, you don't have to worry about providing any encryption keys to the Amazon S3 encryption client (for example, the `AmazonS3EncryptionClient` in the AWS SDK for Java). Instead, you provide only an AWS KMS customer master key ID (CMK ID), and the client does the rest. This is how it works:

- **When uploading an object** – Using the CMK ID, the client first sends a request to AWS KMS for a key that it can use to encrypt your object data. In response, AWS KMS returns a randomly generated data encryption key. In fact, AWS KMS returns two versions of the data encryption key:
  - A plain text version that the client uses to encrypt the object data.
  - A cipher blob of the same data encryption key that the client uploads to Amazon S3 as object metadata.

#### Note

The client obtains a unique data encryption key for each object it uploads.

For a working example, see [Example: Client-Side Encryption \(Option 1: Using an AWS KMS–Managed Customer Master Key \(AWS SDK for Java\)\) \(p. 437\)](#).

- **When downloading an object** – The client first downloads the encrypted object from Amazon S3 along with the cipher blob version of the data encryption key stored as object metadata. The client then sends the cipher blob to AWS KMS to get the plain text version of the same, so that it can decrypt the object data.

For more information about AWS KMS, go to [What is the AWS Key Management Service?](#) in the *AWS Key Management Service Developer Guide*.

## Option 2: Using a Client-Side Master Key

This section shows how to provide your client-side master key in the client-side data encryption process.

**Important**

Your client-side master keys and your unencrypted data are never sent to AWS; therefore, it is important that you safely manage your encryption keys. If you lose them, you won't be able to decrypt your data.

This is how it works:

- **When uploading an object** – You provide a client-side master key to the Amazon S3 encryption client (for example, `AmazonS3EncryptionClient` when using the AWS SDK for Java). The client uses this master key only to encrypt the data encryption key that it generates randomly. The process works like this:

1. The Amazon S3 encryption client locally generates a one-time-use symmetric key (also known as a data encryption key or data key). It uses this data key to encrypt the data of a single S3 object (for each object, the client generates a separate data key).
2. The client encrypts the data encryption key using the master key you provide.

The client uploads the encrypted data key and its material description as part of the object metadata. The material description helps the client later determine which client-side master key to use for decryption (when you download the object, the client decrypts it).

3. The client then uploads the encrypted data to Amazon S3 and also saves the encrypted data key as object metadata (`x-amz-meta-x-amz-key`) in Amazon S3 by default.
- **When downloading an object** – The client first downloads the encrypted object from Amazon S3 along with the metadata. Using the material description in the metadata, the client first determines which master key to use to decrypt the encrypted data key. Using that master key, the client decrypts the data key and uses it to decrypt the object.

The client-side master key you provide can be either a symmetric key or a public/private key pair. For examples, see [Examples: Client-Side Encryption \(Option 2: Using a Client-Side Master Key \(AWS SDK for Java\)\) \(p. 439\)](#).

For more information, see the [Client-Side Data Encryption with the AWS SDK for Java and Amazon S3](#) article.

The following AWS SDKs support client-side encryption:

- [AWS SDK for .NET](#)
- [AWS SDK for Go](#)
- [AWS SDK for Java](#)
- [AWS SDK for PHP](#)
- [AWS SDK for Ruby](#)

## Example: Client-Side Encryption (Option 1: Using an AWS KMS-Managed Customer Master Key (AWS SDK for Java))

The following Java code example uploads an object to Amazon S3. The example uses a KMS-managed customer master key (CMK) to encrypt data on the client-side before uploading to Amazon S3. You will need the CMK ID in the code.

For more information about how client-side encryption using a KMS-managed CMK works, see [Option 1: Using an AWS KMS-Managed Customer Master Key \(CMK\) \(p. 436\)](#).

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#). You will need to update the code by providing your bucket name and a CMK ID.

```
import java.io.ByteArrayInputStream;
import java.util.Arrays;

import junit.framework.Assert;

import org.apache.commons.io.IOUtils;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Region;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3EncryptionClient;
import com.amazonaws.services.s3.model.CryptoConfiguration;
import com.amazonaws.services.s3.model.KMSEncryptionMaterialsProvider;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.S3Object;

public class testKMSkeyUploadObject {

    private static AmazonS3EncryptionClient encryptionClient;

    public static void main(String[] args) throws Exception {
        String bucketName = "***bucket name***";
        String objectKey = "ExampleKMSEncryptedObject";
        String kms_cmk_id = "***AWS KMS customer master key ID***";

        KMSEncryptionMaterialsProvider materialProvider = new
        KMSEncryptionMaterialsProvider(kms_cmk_id);

        encryptionClient = new AmazonS3EncryptionClient(new ProfileCredentialsProvider(),
        materialProvider,
            new CryptoConfiguration().withKmsRegion(Regions.US_EAST_1))
            .withRegion(Region.getRegion(Regions.US_EAST_1));

        // Upload object using the encryption client.
        byte[] plaintext = "Hello World, S3 Client-side Encryption Using Asymmetric Master
        Key!";
        .getBytes();
        System.out.println("plaintext's length: " + plaintext.length);
        encryptionClient.putObject(new PutObjectRequest(bucketName, objectKey,
            new ByteArrayInputStream(plaintext), new ObjectMetadata()));

        // Download the object.
        S3Object downloadedObject = encryptionClient.getObject(bucketName,
            objectKey);
        byte[] decrypted = IOUtils.toByteArray(downloadedObject
            .getObjectContent());

        // Verify same data.
        Assert.assertTrue(Arrays.equals(plaintext, decrypted));
    }
}
```

## Examples: Client-Side Encryption (Option 2: Using a Client-Side Master Key (AWS SDK for Java))

This section provides code examples of client-side encryption. As described in the overview (see [Protecting Data Using Client-Side Encryption \(p. 436\)](#)) the client-side master key you provide can be either a symmetric key or a public/private key pair. This section provides examples of both types of master keys, symmetric master key (256-bit Advanced Encryption Standard (AES) secret key) and asymmetric master key (1024-bit RSA key pair).

### Topics

- [Example 1: Encrypt and Upload a File Using a Client-Side Symmetric Master Key \(p. 439\)](#)
- [Example 2: Encrypt and Upload a File to Amazon S3 Using a Client-Side Asymmetric Master Key \(p. 442\)](#)

### Note

If you get a cipher encryption error message when you use the encryption API for the first time, your version of the JDK may have a Java Cryptography Extension (JCE) jurisdiction policy file that limits the maximum key length for encryption and decryption transformations to 128 bits. The AWS SDK requires a maximum key length of 256 bits. To check your maximum key length, use the `getMaxAllowedKeyLength` method of the `javax.crypto.Cipher` class. To remove the key length restriction, install the Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files at the [Java SE download page](#).

### Example 1: Encrypt and Upload a File Using a Client-Side Symmetric Master Key

This section provides example code using the AWS SDK for Java to do the following:

- First create a 256-bit AES symmetric master key and save it to a file.
- Upload an object to Amazon S3 using an S3 encryption client that first encrypts sample data on the client-side. The example also downloads the object and verifies that the data is the same.

#### Example 1a: Creating a Symmetric Master Key

Run this code to first generate a 256-bit AES symmetric master key for encrypted uploads to Amazon S3. The example saves the master key to a file (`secret.key`) in a temp directory (on Windows, it is the `c:\Users\<username>\AppData\Local\Tmp` folder).

For instructions on how to create and test a working sample, see [Using the AWS SDK for Java \(p. 612\)](#).

```
import java.io.File;
import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;
import java.security.InvalidKeyException;
import java.security.NoSuchAlgorithmException;
import java.security.spec.InvalidKeySpecException;
import java.security.spec.X509EncodedKeySpec;
import java.util.Arrays;

import javax.crypto.KeyGenerator;
import javax.crypto.SecretKey;
import javax.crypto.spec.SecretKeySpec;

import org.junit.Assert;

public class GenerateSymmetricMasterKey {
```

```

private static final String keyDir = System.getProperty("java.io.tmpdir");
private static final String keyName = "secret.key";

public static void main(String[] args) throws Exception {

    //Generate symmetric 256 bit AES key.
    KeyGenerator symKeyGenerator = KeyGenerator.getInstance("AES");
    symKeyGenerator.init(256);
    SecretKey symKey = symKeyGenerator.generateKey();

    //Save key.
    saveSymmetricKey(keyDir, symKey);

    //Load key.
    SecretKey symKeyLoaded = loadSymmetricAESKey(keyDir, "AES");
    Assert.assertTrue(Arrays.equals(symKey.getEncoded(), symKeyLoaded.getEncoded()));
}

public static void saveSymmetricKey(String path, SecretKey secretKey)
    throws IOException {
    X509EncodedKeySpec x509EncodedKeySpec = new X509EncodedKeySpec(
        secretKey.getEncoded());
    FileOutputStream keyfos = new FileOutputStream(path + "/" + keyName);
    keyfos.write(x509EncodedKeySpec.getEncoded());
    keyfos.close();
}

public static SecretKey loadSymmetricAESKey(String path, String algorithm)
    throws IOException, NoSuchAlgorithmException, InvalidKeySpecException,
InvalidKeyException{
    //Read private key from file.
    File keyFile = new File(path + "/" + keyName);
    FileInputStream keyfis = new FileInputStream(keyFile);
    byte[] encodedPrivateKey = new byte[(int)keyFile.length()];
    keyfis.read(encodedPrivateKey);
    keyfis.close();

    //Generate secret key.
    return new SecretKeySpec(encodedPrivateKey, "AES");
}
}
}

```

This code example is for demonstration purposes only. For production use, you should consult your security engineer on how to obtain or generate the client-side master key.

### Example 1b: Uploading a File to Amazon S3 Using a Symmetric Key

Run this code to encrypt sample data using a symmetric master key created by the preceding code example. The example uses an S3 encryption client to encrypt the data on the client-side and then upload it to Amazon S3.

For instructions on how to create and test a working sample, see [Using the AWS SDK for Java \(p. 612\)](#).

```

import java.io.ByteArrayInputStream;
import java.util.Arrays;
import java.util.Iterator;
import java.util.UUID;

import javax.crypto.SecretKey;

import org.apache.commons.io.IOUtils;
import org.joda.time.DateTime;

```

```
import org.joda.time.format.DateTimeFormat;
import org.junit.Assert;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3EncryptionClient;
import com.amazonaws.services.s3.model.EncryptionMaterials;
import com.amazonaws.services.s3.model.ListVersionsRequest;
import com.amazonaws.services.s3.model.ObjectListing;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.S3Object;
import com.amazonaws.services.s3.model.S3ObjectSummary;
import com.amazonaws.services.s3.model.S3VersionSummary;
import com.amazonaws.services.s3.model.StaticEncryptionMaterialsProvider;
import com.amazonaws.services.s3.model.VersionListing;

public class S3ClientSideEncryptionWithSymmetricMasterKey {
    private static final String masterKeyDir = System.getProperty("java.io.tmpdir");
    private static final String bucketName = UUID.randomUUID() + "-"
        + DateTimeFormat.forPattern("yyMMdd-hhmmss").print(new DateTime());
    private static final String objectKey = UUID.randomUUID().toString();

    public static void main(String[] args) throws Exception {
        SecretKey mySymmetricKey = GenerateSymmetricMasterKey
            .loadSymmetricAESKey(masterKeyDir, "AES");

        EncryptionMaterials encryptionMaterials = new EncryptionMaterials(
            mySymmetricKey);

        AmazonS3EncryptionClient encryptionClient = new AmazonS3EncryptionClient(
            new ProfileCredentialsProvider(),
            new StaticEncryptionMaterialsProvider(encryptionMaterials));
        // Create the bucket
        encryptionClient.createBucket(bucketName);

        // Upload object using the encryption client.
        byte[] plaintext = "Hello World, S3 Client-side Encryption Using Asymmetric Master
Key!".
            .getBytes();
        System.out.println("plaintext's length: " + plaintext.length);
        encryptionClient.putObject(new PutObjectRequest(bucketName, objectKey,
            new ByteArrayInputStream(plaintext), new ObjectMetadata()));

        // Download the object.
        S3Object downloadedObject = encryptionClient.getObject(bucketName,
            objectKey);
        byte[] decrypted = IOUtils.toByteArray(downloadedObject
            .getObjectContent());

        // Verify same data.
        Assert.assertTrue(Arrays.equals(plaintext, decrypted));
        deleteBucketAndAllContents(encryptionClient);
    }

    private static void deleteBucketAndAllContents(AmazonS3 client) {
        System.out.println("Deleting S3 bucket: " + bucketName);
        ObjectListing objectListing = client.listObjects(bucketName);

        while (true) {
            for ( Iterator<?> iterator = objectListing.getObjectSummaries().iterator();
            iterator.hasNext(); ) {
                S3ObjectSummary objectSummary = (S3ObjectSummary) iterator.next();
                client.deleteObject(bucketName, objectSummary.getKey());
            }
        }
    }
}
```

```
        if (objectListing.isTruncated()) {
            objectListing = client.listNextBatchOfObjects(objectListing);
        } else {
            break;
        }
    };
    VersionListing list = client.listVersions(new
ListVersionsRequest().withBucketName(bucketName));
    for ( Iterator<?> iterator = list.getVersionSummaries().iterator();
iterator.hasNext(); ) {
        S3VersionSummary s = (S3VersionSummary)iterator.next();
        client.deleteVersion(bucketName, s.getKey(), s.getVersionId());
    }
    client.deleteBucket(bucketName);
}
}
```

## Example 2: Encrypt and Upload a File to Amazon S3 Using a Client-Side Asymmetric Master Key

This section provides example code using the AWS SDK for Java to first create a 1024-bit RSA key pair. The example then uses that key pair as the client-side master key for the purpose of encrypting and upload a file.

This is how it works:

- First create a 1024-bit RSA key pair (asymmetric master key) and save it to a file.
- Upload an object to Amazon S3 using an S3 encryption client that encrypts sample data on the client-side. The example also downloads the object and verifies that the data is the same.

### Example 2a: Creating a 1024-bit RSA Key Pair

Run this code to first generate a 1024-bit key pair (asymmetric master key). The example saves the master key to a file (`secret.key`) in a temp directory (on Windows, it is the `c:\Users\<username>\AppData\Local\Tmp` folder).

For instructions on how to create and test a working sample, see [Using the AWS SDK for Java \(p. 612\)](#).

```
import static org.junit.Assert.assertTrue;

import java.io.File;
import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;
import java.security.KeyFactory;
import java.security.KeyPair;
import java.security.KeyPairGenerator;
import java.security.NoSuchAlgorithmException;
import java.security.PrivateKey;
import java.security.PublicKey;
import java.security.SecureRandom;
import java.security.spec.InvalidKeySpecException;
import java.security.spec.PKCS8EncodedKeySpec;
import java.security.spec.X509EncodedKeySpec;
import java.util.Arrays;

public class GenerateAsymmetricMasterKey {
    private static final String keyDir  = System.getProperty("java.io.tmpdir");
    private static final SecureRandom srand = new SecureRandom();

    // ... (rest of the class definition)
```

```

public static void main(String[] args) throws Exception {
    // Generate RSA key pair of 1024 bits
    KeyPair keypair = genKeyPair("RSA", 1024);
    // Save to file system
    saveKeyPair(keyDir, keypair);
    // Loads from file system
    KeyPair loaded = loadKeyPair(keyDir, "RSA");
    // Sanity check
    assertTrue(Arrays.equals(keypair.getPublic().getEncoded(), loaded
        .getPublic().getEncoded()));
    assertTrue(Arrays.equals(keypair.getPrivate().getEncoded(), loaded
        .getPrivate().getEncoded()));
}

public static KeyPair genKeyPair(String algorithm, int bitLength)
    throws NoSuchAlgorithmException {
    KeyPairGenerator keyGenerator = KeyPairGenerator.getInstance(algorithm);
    keyGenerator.initialize(1024, strand);
    return keyGenerator.generateKeyPair();
}

public static void saveKeyPair(String dir, KeyPair keyPair)
    throws IOException {
    PrivateKey privateKey = keyPair.getPrivate();
    PublicKey publicKey = keyPair.getPublic();

    X509EncodedKeySpec x509EncodedKeySpec = new X509EncodedKeySpec(
        publicKey.getEncoded());
    FileOutputStream fos = new FileOutputStream(dir + "/public.key");
    fos.write(x509EncodedKeySpec.getEncoded());
    fos.close();

    PKCS8EncodedKeySpec pkcs8EncodedKeySpec = new PKCS8EncodedKeySpec(
        privateKey.getEncoded());
    fos = new FileOutputStream(dir + "/private.key");
    fos.write(pkcs8EncodedKeySpec.getEncoded());
    fos.close();
}

public static KeyPair loadKeyPair(String path, String algorithm)
    throws IOException, NoSuchAlgorithmException,
    InvalidKeySpecException {
    // read public key from file
    File filePublicKey = new File(path + "/public.key");
    FileInputStream fis = new FileInputStream(filePublicKey);
    byte[] encodedPublicKey = new byte[(int) filePublicKey.length()];
    fis.read(encodedPublicKey);
    fis.close();

    // read private key from file
    File filePrivateKey = new File(path + "/private.key");
    fis = new FileInputStream(filePrivateKey);
    byte[] encodedPrivateKey = new byte[(int) filePrivateKey.length()];
    fis.read(encodedPrivateKey);
    fis.close();

    // Convert them into KeyPair
    KeyFactory keyFactory = KeyFactory.getInstance(algorithm);
    X509EncodedKeySpec publicKeySpec = new X509EncodedKeySpec(
        encodedPublicKey);
    PublicKey publicKey = keyFactory.generatePublic(publicKeySpec);

    PKCS8EncodedKeySpec privateKeySpec = new PKCS8EncodedKeySpec(
        encodedPrivateKey);
    PrivateKey privateKey = keyFactory.generatePrivate(privateKeySpec);
}

```

```
        return new KeyPair(publicKey, privateKey);
    }
}
```

This code example is for demonstration purposes only. For production use, you should consult your security engineer on how to obtain or generate the client-side master key.

### Example 2b: Uploading a File to Amazon S3 Using a Key Pair

Run this code to encrypt sample data using a symmetric master key created by the preceding code example. The example uses an S3 encryption client to encrypt the data on the client-side and then upload it to Amazon S3.

For instructions on how to create and test a working sample, see [Using the AWS SDK for Java \(p. 612\)](#).

```
import java.io.ByteArrayInputStream;
import java.io.File;
import java.security.KeyFactory;
import java.security.KeyPair;
import java.security.PrivateKey;
import java.security.PublicKey;
import java.security.spec.PKCS8EncodedKeySpec;
import java.security.spec.X509EncodedKeySpec;
import java.util.Arrays;
import java.util.Iterator;
import java.util.UUID;

import org.apache.commons.io.FileUtils;
import org.apache.commons.io.IOUtils;
import org.joda.time.DateTime;
import org.joda.time.format.DateTimeFormat;
import org.junit.Assert;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3EncryptionClient;
import com.amazonaws.services.s3.model.EncryptionMaterials;
import com.amazonaws.services.s3.model.ListVersionsRequest;
import com.amazonaws.services.s3.model.ObjectListing;
import com.amazonaws.services.s3.model.ObjectMetadata;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.S3Object;
import com.amazonaws.services.s3.model.S3ObjectSummary;
import com.amazonaws.services.s3.model.S3VersionSummary;
import com.amazonaws.services.s3.model.StaticEncryptionMaterialsProvider;
import com.amazonaws.services.s3.model.VersionListing;

public class S3ClientSideEncryptionAsymmetricMasterKey {
    private static final String keyDir = System.getProperty("java.io.tmpdir");
    private static final String bucketName = UUID.randomUUID() + "-"
        + DateTimeFormat.forPattern("yyMMdd-hhmmss").print(new DateTime());
    private static final String objectKey = UUID.randomUUID().toString();

    public static void main(String[] args) throws Exception {

        // 1. Load keys from files
        byte[] bytes = FileUtils.readFileToByteArray(new File(
            keyDir + "private.key"));
        KeyFactory kf = KeyFactory.getInstance("RSA");
        PKCS8EncodedKeySpec ks = new PKCS8EncodedKeySpec(bytes);
        PrivateKey pk = kf.generatePrivate(ks);

        bytes = FileUtils.readFileToByteArray(new File(keyDir + "public.key"));

        // 2. Create S3 client
        AmazonS3 s3 = AmazonS3EncryptionClient.builder()
            .withRegion("us-west-2")
            .withStaticEncryptionMaterialsProvider(new StaticEncryptionMaterialsProvider(pk))
            .build();

        // 3. Upload file
        PutObjectRequest request = new PutObjectRequest(bucketName, objectKey, new ByteArrayInputStream(bytes));
        ObjectMetadata metadata = new ObjectMetadata();
        metadata.setContentType("text/plain");
        request.setObjectMetadata(metadata);
        s3.putObject(request);
    }
}
```

```
PublicKey publicKey = KeyFactory.getInstance("RSA").generatePublic(
    new X509EncodedKeySpec(bytes));

KeyPair loadedKeyPair = new KeyPair(publicKey, pk);

// 2. Construct an instance of AmazonS3EncryptionClient.
EncryptionMaterials encryptionMaterials = new EncryptionMaterials(
    loadedKeyPair);
AmazonS3EncryptionClient encryptionClient = new AmazonS3EncryptionClient(
    new ProfileCredentialsProvider(),
    new StaticEncryptionMaterialsProvider(encryptionMaterials));
// Create the bucket
encryptionClient.createBucket(bucketName);
// 3. Upload the object.
byte[] plaintext = "Hello World, S3 Client-side Encryption Using Asymmetric Master
Key!" +
    .getBytes();
System.out.println("plaintext's length: " + plaintext.length);
encryptionClient.putObject(new PutObjectRequest(bucketName, objectKey,
    new ByteArrayInputStream(plaintext), new ObjectMetadata()));

// 4. Download the object.
S3Object downloadedObject = encryptionClient.getObject(bucketName, objectKey);
byte[] decrypted = IOUtils.toByteArray(downloadedObject
    .getObjectContent());
Assert.assertTrue(Arrays.equals(plaintext, decrypted));
deleteBucketAndAllContents(encryptionClient);
}

private static void deleteBucketAndAllContents(AmazonS3 client) {
    System.out.println("Deleting S3 bucket: " + bucketName);
    ObjectListing objectListing = client.listObjects(bucketName);

    while (true) {
        for ( Iterator<?> iterator = objectListing.getObjectSummaries().iterator();
iterator.hasNext(); ) {
            S3ObjectSummary objectSummary = (S3ObjectSummary) iterator.next();
            client.deleteObject(bucketName, objectSummary.getKey());
        }

        if (objectListing.isTruncated()) {
            objectListing = client.listNextBatchOfObjects(objectListing);
        } else {
            break;
        }
    };
    VersionListing list = client.listVersions(new
ListVersionsRequest().withBucketName(bucketName));
    for ( Iterator<?> iterator = list.getVersionSummaries().iterator();
iterator.hasNext(); ) {
        S3VersionSummary s = (S3VersionSummary) iterator.next();
        client.deleteVersion(bucketName, s.getKey(), s.getVersionId());
    }
    client.deleteBucket(bucketName);
}
}
```

## Using Reduced Redundancy Storage

### Topics

- [Setting the Storage Class of an Object You Upload \(p. 446\)](#)

- [Changing the Storage Class of an Object in Amazon S3 \(p. 447\)](#)

Amazon S3 stores objects according to their storage class. It assigns the storage class to an object when it is written to Amazon S3. You can assign objects a specific storage class (standard or reduced redundancy) only when you write the objects to an Amazon S3 bucket or when you copy objects that are already stored in Amazon S3. Standard is the default storage class. For information about storage classes, see [Object Key and Metadata \(p. 107\)](#).

In order to reduce storage costs, you can use reduced redundancy storage for noncritical, reproducible data at lower levels of redundancy than Amazon S3 provides with standard storage. The lower level of redundancy results in less durability and availability, but in many cases, the lower costs can make reduced redundancy storage an acceptable storage solution. For example, it can be a cost-effective solution for sharing media content that is durably stored elsewhere. It can also make sense if you are storing thumbnails and other resized images that can be easily reproduced from an original image.

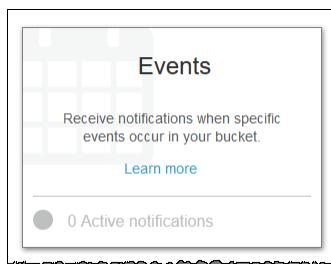
Reduced redundancy storage is designed to provide 99.99% durability of objects over a given year. This durability level corresponds to an average annual expected loss of 0.01% of objects. For example, if you store 10,000 objects using the RRS option, you can, on average, expect to incur an annual loss of a single object per year (0.01% of 10,000 objects).

**Note**

This annual loss represents an expected average and does not guarantee the loss of less than 0.01% of objects in a given year.

Reduced redundancy storage stores objects on multiple devices across multiple facilities, providing 400 times the durability of a typical disk drive, but it does not replicate objects as many times as Amazon S3 standard storage. In addition, reduced redundancy storage is designed to sustain the loss of data in a single facility.

If an object in reduced redundancy storage has been lost, Amazon S3 will return a 405 error on requests made to that object. Amazon S3 also offers notifications for reduced redundancy storage object loss: you can configure your bucket so that when Amazon S3 detects the loss of an RRS object, a notification will be sent through Amazon Simple Notification Service (Amazon SNS). You can then replace the lost object. To enable notifications from the Amazon S3 console, choose the **Properties** tab for your bucket, and then choose **Events**.



Latency and throughput for reduced redundancy storage are the same as for standard storage. For more information about cost considerations, see [Amazon S3 Pricing](#).

## Setting the Storage Class of an Object You Upload

To set the storage class of an object you upload to RRS, you set `x-amz-storage-class` to `REDUCED_REDUNDANCY` in a `PUT` request.

### How to Set the Storage Class of an Object You're Uploading to RRS

- Create a `PUT` Object request setting the `x-amz-storage-class` request header to `REDUCED_REDUNDANCY`.

You must have the correct permissions on the bucket to perform the `PUT` operation. The default value for the storage class is `STANDARD` (for regular Amazon S3 storage).

The following example sets the storage class of `my-image.jpg` to `RRS`.

```
PUT /my-image.jpg HTTP/1.1
Host: myBucket.s3.amazonaws.com
Date: Wed, 12 Oct 2009 17:50:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:xQE0diMbLRepdf3YB+FIEXAMPLE=
Content-Type: image/jpeg
Content-Length: 11434
Expect: 100-continue
x-amz-storage-class: REDUCED_REDUNDANCY
```

## Changing the Storage Class of an Object in Amazon S3

### Topics

- [Return Code for Lost Data \(p. 448\)](#)

You can also change the storage class of an object that is already stored in Amazon S3 by copying it to the same key name in the same bucket. To do that, you use the following request headers in a `PUT` Object copy request:

- `x-amz-metadata-directive` set to `COPY`
- `x-amz-storage-class` set to `STANDARD`, `STANDARD_IA`, or `REDUCED_REDUNDANCY`

### Important

To optimize the execution of the copy request, do not change any of the other metadata in the `PUT` Object copy request. If you need to change metadata other than the storage class, set `x-amz-metadata-directive` to `REPLACE` for better performance.

### How to Rewrite the Storage Class of an Object in Amazon S3

- Create a `PUT` Object copy request and set the `x-amz-storage-class` request header to `REDUCED_REDUNDANCY` (for `RRS`) or `STANDARD` (for regular Amazon S3 storage) or `STANDARD_IA` (for Standard-Infrequent Access), and make the target name the same as the source name.

You must have the correct permissions on the bucket to perform the copy operation.

The following example sets the storage class of `my-image.jpg` to `RRS`.

```
PUT /my-image.jpg HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
x-amz-copy-source: /bucket/my-image.jpg
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
x-amz-storage-class: REDUCED_REDUNDANCY
x-amz-metadata-directive: COPY
```

The following example sets the storage class of `my-image.jpg` to `Standard`.

```
PUT /my-image.jpg HTTP/1.1
```

```
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
x-amz-copy-source: /bucket/my-image.jpg
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
x-amz-storage-class: STANDARD
x-amz-metadata-directive: COPY
```

The following example sets the storage class of `my-image.jpg` to Standard-Infrequent Access.

```
PUT /my-image.jpg HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Sat, 30 Apr 2016 23:29:37 GMT
x-amz-copy-source: /bucket/my-image.jpg
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
x-amz-storage-class: STANDARD_IA
x-amz-metadata-directive: COPY
```

**Note**

If you copy an object and fail to include the `x-amz-storage-class` request header, the storage class of the target object defaults to STANDARD.

It is not possible to change the storage class of a specific version of an object. When you copy it, Amazon S3 gives it a new version ID.

**Note**

When an object is written in a copy request, the entire object is rewritten in order to apply the new storage class.

For more information about versioning, see [Using Versioning \(p. 448\)](#).

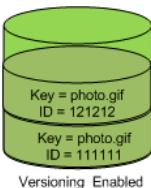
## Return Code for Lost Data

If Amazon S3 detects that an object has been lost, any subsequent GET, or HEAD operations, or PUT Object copy operation that uses the lost object as the source object, will result in a 405 Method Not Allowed error. Once an object is marked lost, Amazon S3 will never be able to recover the object. In this situation, you can either delete the key, or upload a copy of the object.

# Using Versioning

Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures.

In one bucket, for example, you can have two objects with the same key, but different version IDs, such as `photo.gif` (version 111111) and `photo.gif` (version 121212).



Versioning-enabled buckets enable you to recover objects from accidental deletion or overwrite. For example:

- If you delete an object, instead of removing it permanently, Amazon S3 inserts a delete marker, which becomes the current object version. You can always restore the previous version. For more information, see [Deleting Object Versions \(p. 461\)](#).
- If you overwrite an object, it results in a new object version in the bucket. You can always restore the previous version.

**Important**

If you have an object expiration lifecycle policy in your non-versioned bucket and you want to maintain the same permanent delete behavior when you enable versioning, you must add a noncurrent expiration policy. The noncurrent expiration lifecycle policy will manage the deletes of the noncurrent object versions in the version-enabled bucket. (A version-enabled bucket maintains one current and zero or more noncurrent object versions.) For more information, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

Buckets can be in one of three states: unversioned (the default), versioning-enabled, or versioning-suspended.

**Important**

Once you version-enable a bucket, it can never return to an unversioned state. You can, however, suspend versioning on that bucket.

The versioning state applies to all (never some) of the objects in that bucket. The first time you enable a bucket for versioning, objects in it are thereafter always versioned and given a unique version ID. Note the following:

- Objects stored in your bucket before you set the versioning state have a version ID of `null`. When you enable versioning, existing objects in your bucket do not change. What changes is how Amazon S3 handles the objects in future requests. For more information, see [Managing Objects in a Versioning-Enabled Bucket \(p. 453\)](#).
- The bucket owner (or any user with appropriate permissions) can suspend versioning to stop accruing object versions. When you suspend versioning, existing objects in your bucket do not change. What changes is how Amazon S3 handles objects in future requests. For more information, see [Managing Objects in a Versioning-Suspended Bucket \(p. 467\)](#).

## How to Configure Versioning on a Bucket

You can configure bucket versioning using any of the following methods:

- Configure versioning using the Amazon S3 console.
- Configure versioning programmatically using the AWS SDKs

Both the console and the SDKs call the REST API Amazon S3 provides to manage versioning.

**Note**

If you need to, you can also make the Amazon S3 REST API calls directly from your code. However, this can be cumbersome because it requires you to write code to authenticate your requests.

Each bucket you create has a *versioning* subresource (see [Bucket Configuration Options \(p. 61\)](#)) associated with it. By default, your bucket is unversioned, and accordingly the versioning subresource stores empty versioning configuration.

```
<VersioningConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
</VersioningConfiguration>
```

To enable versioning, you send a request to Amazon S3 with a versioning configuration that includes a status.

```
<VersioningConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Status>Enabled</Status>
</VersioningConfiguration>
```

To suspend versioning, you set the status value to Suspended.

The bucket owner, an AWS account that created the bucket (root account), and authorized users can configure the versioning state of a bucket. For more information about permissions, see [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

For an example of configuring versioning, see [Examples of Enabling Bucket Versioning \(p. 451\)](#).

## MFA Delete

You can optionally add another layer of security by configuring a bucket to enable MFA (Multi-Factor Authentication) Delete, which requires additional authentication for either of the following operations.

- Change the versioning state of your bucket
- Permanently delete an object version

MFA Delete requires two forms of authentication together:

- Your security credentials
- The concatenation of a valid serial number, a space, and the six-digit code displayed on an approved authentication device

MFA Delete thus provides added security in the event, for example, your security credentials are compromised.

To enable or disable MFA delete, you use the same API that you use to configure versioning on a bucket. Amazon S3 stores the MFA Delete configuration in the same *versioning* subresource that stores the bucket's versioning status.

```
<VersioningConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Status>VersioningState</Status>
  <MfaDelete>MfaDeleteState</MfaDelete>
</VersioningConfiguration>
```

To use MFA Delete, you can use either a hardware or virtual MFA device to generate an authentication code. The following example shows a generated authentication code displayed on a hardware device.



### Note

MFA Delete and MFA-protected API access are features intended to provide protection for different scenarios. You configure MFA Delete on a bucket to ensure that data in your bucket cannot be accidentally deleted. MFA-protected API access is used to enforce another authentication factor (MFA code) when accessing sensitive Amazon S3 resources. You can require any operations against these Amazon S3 resources be done with temporary credentials created using MFA. For an example, see [Adding a Bucket Policy to Require MFA \(p. 367\)](#).

For more information on how to purchase and activate an authentication device, see <https://aws.amazon.com/iam/details/mfa/>.

**Note**

The bucket owner, the AWS account that created the bucket (root account), and all authorized IAM users can enable versioning, but only the bucket owner (root account) can enable MFA delete.

## Related Topics

For more information, see the following topics:

- Examples of Enabling Bucket Versioning (p. 451)
- Managing Objects in a Versioning-Enabled Bucket (p. 453)
- Managing Objects in a Versioning-Suspended Bucket (p. 467)
- Significant Increases in HTTP 503 Responses to Amazon S3 Requests to Buckets with Versioning Enabled (p. 592)

## Examples of Enabling Bucket Versioning

### Topics

- Using the Amazon S3 Console (p. 451)
- Using the AWS SDK for Java (p. 451)
- Using the AWS SDK for .NET (p. 452)
- Using Other AWS SDKs (p. 453)

This section provides examples of enabling versioning on a bucket. The examples first enable versioning on a bucket and then retrieve versioning status. For an introduction, see [Using Versioning \(p. 448\)](#).

### Using the Amazon S3 Console

For more information about enabling versioning on a bucket using the Amazon S3 console, see [How Do I Enable or Suspend Versioning for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

### Using the AWS SDK for Java

#### Example

For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;

import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Region;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.AmazonS3Exception;
import com.amazonaws.services.s3.model.BucketVersioningConfiguration;
import com.amazonaws.services.s3.model.SetBucketVersioningConfigurationRequest;

public class BucketVersioningConfigurationExample {
    public static String bucketName = "*** bucket name ***";
```

```
public static AmazonS3Client s3Client;

public static void main(String[] args) throws IOException {
    s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
    s3Client.setRegion(Region.getRegion(Regions.US_EAST_1));
    try {

        // 1. Enable versioning on the bucket.
        BucketVersioningConfiguration configuration =
            new BucketVersioningConfiguration().withStatus("Enabled");

        SetBucketVersioningConfigurationRequest setBucketVersioningConfigurationRequest =
            new SetBucketVersioningConfigurationRequest(bucketName, configuration);

        s3Client.setBucketVersioningConfiguration(setBucketVersioningConfigurationRequest);

        // 2. Get bucket versioning configuration information.
        BucketVersioningConfiguration conf =
            s3Client.getBucketVersioningConfiguration(bucketName);
        System.out.println("bucket versioning configuration status: " + conf.getStatus());

        } catch (AmazonS3Exception amazonS3Exception) {
            System.out.format("An Amazon S3 error occurred. Exception: %s",
amazonS3Exception.toString());
        } catch (Exception ex) {
            System.out.format("Exception: %s", ex.toString());
        }
    }
}
```

## Using the AWS SDK for .NET

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

### Example

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class BucketVersioningConfiguration
    {
        static string bucketName = "*** bucket name ***";

        public static void Main(string[] args)
        {
            using (var client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                try
                {
                    EnableVersioningOnBucket(client);
                    string bucketVersioningStatus =
                    RetrieveBucketVersioningConfiguration(client);
                }
                catch (AmazonS3Exception amazonS3Exception)
                {
                    if (amazonS3Exception.ErrorCode != null &&
                        (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                        ||
                        amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                }
            }
        }
    }
}
```

```
        {
            Console.WriteLine("Check the provided AWS Credentials.");
            Console.WriteLine(
                "To sign up for service, go to http://aws.amazon.com/s3");
        }
        else
        {
            Console.WriteLine(
                "Error occurred. Message:{0} when listing objects",
                amazonS3Exception.Message);
        }
    }

    Console.WriteLine("Press any key to continue...");
    Console.ReadKey();
}

static void EnableVersioningOnBucket(IAmazonS3 client)
{
    PutBucketVersioningRequest request = new PutBucketVersioningRequest
    {
        BucketName = bucketName,
        VersioningConfig = new S3BucketVersioningConfig
        {
            Status = VersionStatus.Enabled
        };
    };

    PutBucketVersioningResponse response = client.PutBucketVersioning(request);
}

static string RetrieveBucketVersioningConfiguration(IAmazonS3 client)
{
    GetBucketVersioningRequest request = new GetBucketVersioningRequest
    {
        BucketName = bucketName
    };

    GetBucketVersioningResponse response = client.GetBucketVersioning(request);
    return response.VersioningConfig.Status;
}
}
```

## Using Other AWS SDKs

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

# Managing Objects in a Versioning-Enabled Bucket

## Topics

- [Adding Objects to Versioning-Enabled Buckets \(p. 454\)](#)
- [Listing Objects in a Versioning-Enabled Bucket \(p. 455\)](#)
- [Retrieving Object Versions \(p. 459\)](#)
- [Deleting Object Versions \(p. 461\)](#)
- [Transitioning Object Versions \(p. 466\)](#)
- [Restoring Previous Versions \(p. 466\)](#)

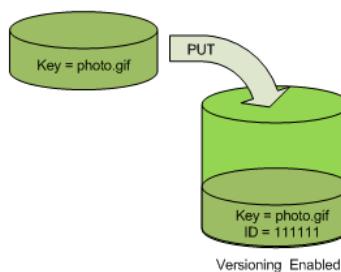
- [Versioned Object Permissions \(p. 467\)](#)

Objects stored in your bucket before you set the versioning state have a version ID of `null`. When you enable versioning, existing objects in your bucket do not change. What changes is how Amazon S3 handles the objects in future requests. The topics in this section explain various object operations in a versioning-enabled bucket.

## Adding Objects to Versioning-Enabled Buckets

Once you enable versioning on a bucket, Amazon S3 automatically adds a unique version ID to every object stored (using `PUT`, `POST`, or `COPY`) in the bucket.

The following figure shows that Amazon S3 adds a unique version ID to an object when it is added to a versioning-enabled bucket.



### Topics

- [Using the Console \(p. 454\)](#)
- [Using the AWS SDKs \(p. 454\)](#)
- [Using the REST API \(p. 454\)](#)

## Using the Console

For instructions, see [How Do I Upload an Object to an S3 Bucket?](#) in the Amazon Simple Storage Service Console User Guide.

## Using the AWS SDKs

For examples of uploading objects using the AWS SDKs for Java, .NET, and PHP, see [Uploading Objects \(p. 180\)](#). The examples for uploading objects in nonversioned and versioning-enabled buckets are the same, although in the case of versioning-enabled buckets, Amazon S3 assigns a version number. Otherwise, the version number is null.

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

## Using the REST API

### Adding Objects to Versioning-Enabled Buckets

1	Enable versioning on a bucket using a <code>PUT Bucket versioning</code> request. For more information, see <a href="#">PUT Bucket versioning</a> .
2	Send a <code>PUT</code> , <code>POST</code> , or <code>COPY</code> request to store an object in the bucket.

When you add an object to a versioning-enabled bucket, Amazon S3 returns the version ID of the object in the `x-amz-versionid` response header, for example:

```
x-amz-version-id: 3/L4kqtJlcpXroDTDmJ+rmSpXd3d1brHY
```

**Note**

Normal Amazon S3 rates apply for every version of an object stored and transferred. Each version of an object is the entire object; it is not just a diff from the previous version. Thus, if you have three versions of an object stored, you are charged for three objects.

**Note**

The version ID values that Amazon S3 assigns are URL safe (can be included as part of a URI).

## Listing Objects in a Versioning-Enabled Bucket

### Topics

- [Using the Console \(p. 455\)](#)
- [Using the AWS SDKs \(p. 455\)](#)
- [Using the REST API \(p. 458\)](#)

This section provides an example of listing object versions from a versioning-enabled bucket. Amazon S3 stores object version information in the *versions* subresource (see [Bucket Configuration Options \(p. 61\)](#)) associated with the bucket.

### Using the Console

For information about listing object versions in the console, see [How Do I See the Versions of an S3 Object?](#) in the Amazon Simple Storage Service Console User Guide.

### Using the AWS SDKs

The code examples in this section retrieve an object listing from a version-enabled bucket. Each request returns up to 1000 versions. If you have more, you will need to send a series of requests to retrieve a list of all versions. To illustrate how pagination works, the code examples limit the response to two object versions. If there are more than two object versions in the bucket, the response returns the `IStuncated` element with the value "true" and also includes the `NextKeyMarker` and `NextVersionIdMarker` elements whose values you can use to retrieve the next set of object keys. The code example includes these values in the subsequent request to retrieve the next set of objects.

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

### Using the AWS SDK for Java

For information about how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

### Example

```
import java.io.IOException;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.ListVersionsRequest;
import com.amazonaws.services.s3.model.S3VersionSummary;
import com.amazonaws.services.s3.model.VersionListing;
```

```

public class ListKeysVersionEnabledBucket {
    private static String bucketName = "*** bucket name ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            System.out.println("Listing objects");

            ListVersionsRequest request = new ListVersionsRequest()
                .withBucketName(bucketName)
                .withMaxResults(2);
            // you can specify .withPrefix to obtain version list for a specific object
            or objects with
            // the specified key prefix.

            VersionListing versionListing;
            do {
                versionListing = s3client.listVersions(request);
                for (S3VersionSummary objectSummary :
                    versionListing.getVersionSummaries()) {
                    System.out.println(" - " + objectSummary.getKey() + "  " +
                        "(size = " + objectSummary.getSize() + ")" +
                        "(versionID= " + objectSummary.getVersionId() + ")");
                }
                request.setKeyMarker(versionListing.getNextKeyMarker());
                request.setVersionIdMarker(versionListing.getNextVersionIdMarker());
            } while (versionListing.isTruncated());
        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, " +
                "which means your request made it " +
                "to Amazon S3, but was rejected with an error response " +
                "for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException, " +
                "which means the client encountered " +
                "an internal error while trying to communicate" +
                " with S3, " +
                "such as not being able to access the network.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}

```

## Using the AWS SDK for .NET

For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

### Example

```

using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class ListObjectsVersioningEnabledBucket
    {

```

```

static string bucketName = "*** bucket name ***";

public static void Main(string[] args)
{
    using (var client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
    {
        Console.WriteLine("Listing objects stored in a bucket");

        GetObjectListWithAllVersions(client);
    }

    Console.WriteLine("Press any key to continue...");
    Console.ReadKey();
}

static void GetObjectListWithAllVersions(IAmazonS3 client)
{
    try
    {
        ListVersionsRequest request = new ListVersionsRequest()
        {
            BucketName = bucketName,
            // You can optionally specify key name prefix in the request
            // if you want list of object versions of a specific object.

            // For this example we limit response to return list of 2 versions.
            MaxKeys = 2
        };
        do
        {
            ListVersionsResponse response = client.ListVersions(request);
            // Process response.
            foreach (S3ObjectVersion entry in response.Versions)
            {
                Console.WriteLine("key = {0} size = {1}",
                    entry.Key, entry.Size);
            }

            // If response is truncated, set the marker to get the next
            // set of keys.
            if (response.IsTruncated)
            {
                request.KeyMarker = response.NextKeyMarker;
                request.VersionIdMarker = response.NextVersionIdMarker;
            }
            else
            {
                request = null;
            }
        } while (request != null);

    }
    catch (AmazonS3Exception amazonS3Exception)
    {
        if (amazonS3Exception.ErrorCode != null &&
            (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
            ||
            amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
        {
            Console.WriteLine("Check the provided AWS Credentials.");
            Console.WriteLine(
                "To sign up for service, go to http://aws.amazon.com/s3");
        }
        else
        {
            Console.WriteLine(

```

```

        "Error occurred. Message:'{0}' when listing objects",
        amazonS3Exception.Message);
    }
}
}
}
```

## Using the REST API

To list all of the versions of all of the objects in a bucket, you use the `versions` subresource in a `GET Bucket` request. Amazon S3 can retrieve only a maximum of 1000 objects, and each object version counts fully as an object. Therefore, if a bucket contains two keys (e.g., `photo.gif` and `picture.jpg`), and the first key has 990 versions and the second key has 400 versions; a single request would retrieve all 990 versions of `photo.gif` and only the most recent 10 versions of `picture.jpg`.

Amazon S3 returns object versions in the order in which they were stored, with the most recently stored returned first.

### To list all object versions in a bucket

- In a `GET Bucket` request, include the `versions` sub-resource.

```

GET /?versions HTTP/1.1
Host: bucketName.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 +0000
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

## Retrieving a Subset of Objects in a Bucket

This section discusses the following two example scenarios:

- You want to retrieve a subset of all object versions in a bucket, for example, retrieve all versions of a specific object.
- The number of object versions in the response exceeds the value for `max-key` (1000 by default), so that you have to submit a second request to retrieve the remaining object versions.

To retrieve a subset of object versions, you use the request parameters for `GET Bucket`. For more information, see [GET Bucket](#).

### Example 1: Retrieving All Versions of Only a Specific Object

You can retrieve all versions of an object using the `versions` subresource and the `prefix` request parameter using the following process. For more information about `prefix`, see [GET Bucket](#).

#### Retrieving All Versions of a Key

1	Set the <code>prefix</code> parameter to the key of the object you want to retrieve.
2	Send a <code>GET Bucket</code> request using the <code>versions</code> subresource and <code>prefix</code> .

```
GET /?versions&prefix=objectName HTTP/1.1
```

### Example Retrieving Objects Using a Prefix

The following example retrieves objects whose key is or begins with `myObject`.

```
GET /?versions&prefix=myObject HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

You can use the other request parameters to retrieve a subset of all versions of the object. For more information, see [GET Bucket](#).

### Example 2: Retrieving a Listing of Additional Objects if the Response Is Truncated

If the number of objects that could be returned in a GET request exceeds the value of `max-keys`, the response contains `<isTruncated>true</isTruncated>`, and includes the first key (in `NextKeyMarker`) and the first version ID (in `NextVersionIdMarker`) that satisfy the request, but were not returned. You use those returned values as the starting position in a subsequent request to retrieve the additional objects that satisfy the GET request.

Use the following process to retrieve additional objects that satisfy the original `GET Bucket versions` request from a bucket. For more information about `key-marker`, `version-id-marker`, `NextKeyMarker`, and `NextVersionIdMarker`, see [GET Bucket](#).

### Retrieving Additional Responses that Satisfy the Original GET Request

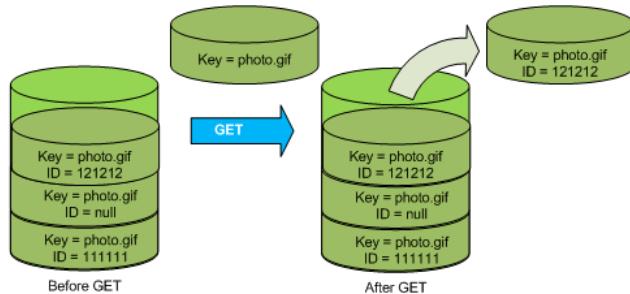
1	Set the value of <code>key-marker</code> to the key returned in <code>NextKeyMarker</code> in the previous response.
2	Set the value of <code>version-id-marker</code> to the version ID returned in <code>NextVersionIdMarker</code> in the previous response.
3	Send a <code>GET Bucket versions</code> request using <code>key-marker</code> and <code>version-id-marker</code> .

### Example Retrieving Objects Starting with a Specified Key and Version ID

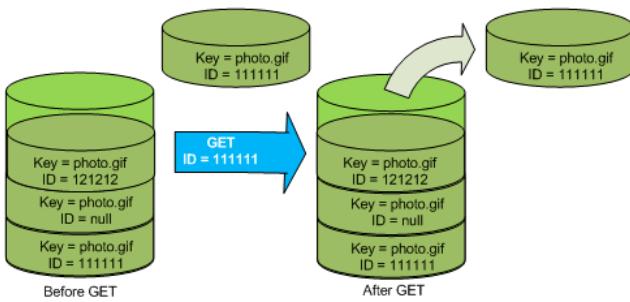
```
GET /?versions&key-marker=myObject&version-id-marker=298459348571 HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

## Retrieving Object Versions

A simple GET request retrieves the current version of an object. The following figure shows how GET returns the current version of the object, `photo.gif`.



To retrieve a specific version, you have to specify its version ID. The following figure shows that a `GET versionId` request retrieves the specified version of the object (not necessarily the current one).



## Using the Console

For instructions see, [How Do I See the Versions of an S3 Object?](#) in the Amazon Simple Storage Service Console User Guide.

## Using the AWS SDKs

For examples of uploading objects using AWS SDKs for Java, .NET, and PHP, see [Getting Objects \(p. 168\)](#). The examples for uploading objects in a nonversioned and versioning-enabled buckets are the same, although in the case of versioning-enabled buckets, Amazon S3 assigns a version number. Otherwise, the version number is null.

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

## Using REST

### To retrieve a specific object version

1. Set `versionId` to the ID of the version of the object you want to retrieve.
2. Send a `GET Object versionId` request.

### Example Retrieving a Versioned Object

The following request retrieves version L4kqtJlcpXroDTDmpUMLUo of `my-image.jpg`.

```
GET /my-image.jpg?versionId=L4kqtJlcpXroDTDmpUMLUo HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

## Related Topics

[Retrieving the Metadata of an Object Version \(p. 460\)](#)

### Retrieving the Metadata of an Object Version

If you only want to retrieve the metadata of an object (and not its content), you use the `HEAD` operation. By default, you get the metadata of the most recent version. To retrieve the metadata of a specific object version, you specify its version ID.

### To retrieve the metadata of an object version

1. Set `versionId` to the ID of the version of the object whose metadata you want to retrieve.
2. Send a `HEAD Object versionId` request.

## Example Retrieving the Metadata of a Versioned Object

The following request retrieves the metadata of version 3HL4kqCxf3vjVBH40Nrjfkd of my-image.jpg.

```
HEAD /my-image.jpg?versionId=3HL4kqCxf3vjVBH40Nrjfkd HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

The following shows a sample response.

```
HTTP/1.1 200 OK
x-amz-id-2: ef8yU9AS1ed4OpIszj7UDNEHGran
x-amz-request-id: 318BC8BC143432E5
x-amz-version-id: 3HL4kqtJlcpXroDTDmjVBH40Nrjfkd
Date: Wed, 28 Oct 2009 22:32:00 GMT
Last-Modified: Sun, 1 Jan 2006 12:00:00 GMT
ETag: "fba9dede5f27731c9771645a39863328"
Content-Length: 434234
Content-Type: text/plain
Connection: close
Server: AmazonS3
```

## Deleting Object Versions

You can delete object versions whenever you want. In addition, you can also define lifecycle configuration rules for objects that have a well-defined lifecycle to request Amazon S3 to expire current object versions or permanently remove noncurrent object versions. When your bucket is version-enabled or versioning is suspended, the lifecycle configuration actions work as follows:

- The `Expiration` action applies to the current object version and instead of deleting the current object version, Amazon S3 retains the current version as a noncurrent version by adding a delete marker, which then becomes the current version.
- The `NoncurrentVersionExpiration` action applies to noncurrent object versions, and Amazon S3 permanently removes these object versions. You cannot recover permanently removed objects.

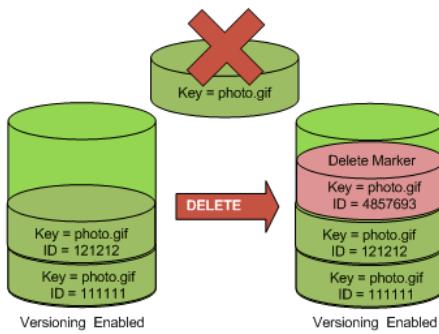
For more information, see [Object Lifecycle Management \(p. 125\)](#).

A `DELETE` request has the following use cases:

- When versioning is enabled, a simple `DELETE` cannot permanently delete an object.

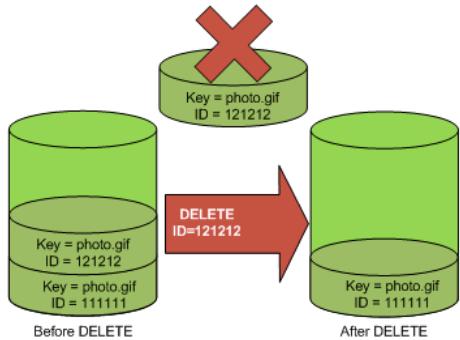
Instead, Amazon S3 inserts a delete marker in the bucket, and that marker becomes the current version of the object with a new ID. When you try to `GET` an object whose current version is a delete marker, Amazon S3 behaves as though the object has been deleted (even though it has not been erased) and returns a 404 error.

The following figure shows that a simple `DELETE` does not actually remove the specified object. Instead, Amazon S3 inserts a delete marker.



- To permanently delete versioned objects, you must use `DELETE Object versionId`.

The following figure shows that deleting a specified object version permanently removes that object.



## Using the Console

For instructions see, [How Do I See the Versions of an S3 Object?](#) in the Amazon Simple Storage Service Console User Guide.

## Using the AWS SDKs

For examples of uploading objects using the AWS SDKs for Java, .NET, and PHP, see [Deleting Objects \(p. 249\)](#). The examples for uploading objects in nonversioned and versioning-enabled buckets are the same, although in the case of versioning-enabled buckets, Amazon S3 assigns a version number. Otherwise, the version number is null.

For information about using other AWS SDKs, see [Sample Code and Libraries](#).

## Using REST

### To delete a specific version of an object

- In a `DELETE`, specify a version ID.

### Example Deleting a Specific Version

The following example shows how to delete version UIORUnfnd89493jJFJ of `photo.gif`.

```
DELETE /photo.gif?versionId=UIORUnfnd89493jJFJ HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 12 Oct 2009 17:50:00 GMT
```

```
Authorization: AWS AKIAIOSFODNN7EXAMPLE:xQE0diMbLRepdf3YB+FIEEXAMPLE=
Content-Type: text/plain
Content-Length: 0
```

## Related Topics

[Using MFA Delete \(p. 463\)](#)

[Working with Delete Markers \(p. 463\)](#)

[Removing Delete Markers \(p. 464\)](#)

[Using Versioning \(p. 448\)](#)

## Using MFA Delete

If a bucket's versioning configuration is MFA Delete–enabled, the bucket owner must include the `x-amz-mfa` request header in requests to permanently delete an object version or change the versioning state of the bucket. Requests that include `x-amz-mfa` must use HTTPS. The header's value is the concatenation of your authentication device's serial number, a space, and the authentication code displayed on it. If you do not include this request header, the request fails.

For more information about authentication devices, see <https://aws.amazon.com/iam/details/mfa/>.

### Example Deleting an Object from an MFA Delete Enabled Bucket

The following example shows how to delete `my-image.jpg` (with the specified version), which is in a bucket configured with MFA Delete enabled. Note the space between `[SerialNumber]` and `[AuthenticationCode]`. For more information, see [DELETE Object](#).

```
DELETE /my-image.jpg?versionId=3HL4kqCxf3vjVBH40Nrjfkd HTTPS/1.1
Host: bucketName.s3.amazonaws.com
x-amz-mfa: 20899872 301749
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

For more information about enabling MFA delete, see [MFA Delete \(p. 450\)](#).

## Working with Delete Markers

A delete marker is a placeholder (marker) for a versioned object that was named in a simple `DELETE` request. Because the object was in a versioning-enabled bucket, the object was not deleted. The delete marker, however, makes Amazon S3 behave as if it had been deleted.

A delete marker has a key name (or key) and version ID like any other object. However, a delete marker differs from other objects in the following ways:

- It does not have data associated with it.
- It is not associated with an access control list (ACL) value.
- It does not retrieve anything from a `GET` request because it has no data; you get a 404 error.
- The only operation you can use on a delete marker is `DELETE`, and only the bucket owner can issue such a request.

Delete markers accrue a nominal charge for storage in Amazon S3. The storage size of a delete marker is equal to the size of the key name of the delete marker. A key name is a sequence of Unicode characters. The UTF-8 encoding adds from 1 to 4 bytes of storage to your bucket for each character in the name. For

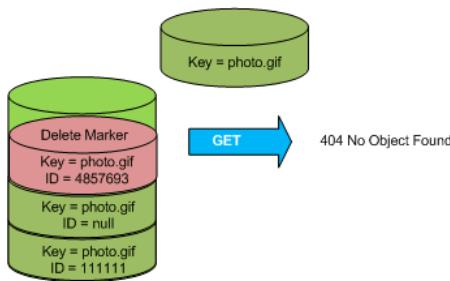
more information about key names, see [Object Keys \(p. 107\)](#). For information about deleting a delete marker, see [Removing Delete Markers \(p. 464\)](#).

Only Amazon S3 can create a delete marker, and it does so whenever you send a `DELETE Object` request on an object in a versioning-enabled or suspended bucket. The object named in the `DELETE` request is not actually deleted. Instead, the delete marker becomes the current version of the object. (The object's key name (or key) becomes the key of the delete marker.) If you try to get an object and its current version is a delete marker, Amazon S3 responds with:

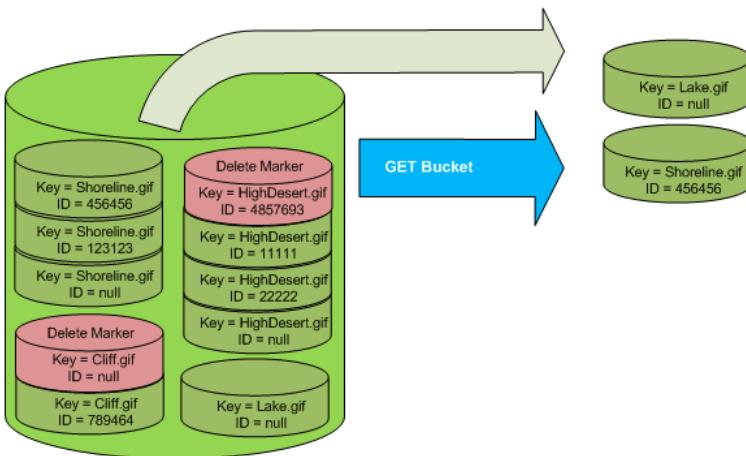
- A 404 (Object not found) error
- A response header, `x-amz-delete-marker: true`

The response header tells you that the object accessed was a delete marker. This response header never returns `false`; if the value is `false`, Amazon S3 does not include this response header in the response.

The following figure shows how a simple `GET` on an object, whose current version is a delete marker, returns a 404 No Object Found error.



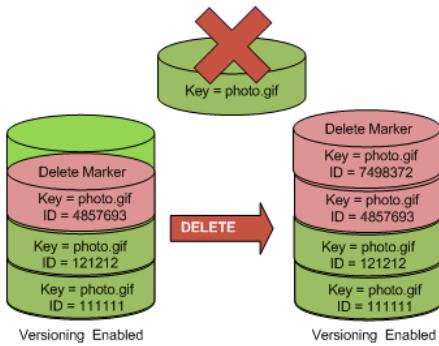
The only way to list delete markers (and other versions of an object) is by using the `versions` subresource in a `GET Bucket versions` request. A simple `GET` does not retrieve delete marker objects. The following figure shows that a `GET Bucket` request does not return objects whose current version is a delete marker.



## Removing Delete Markers

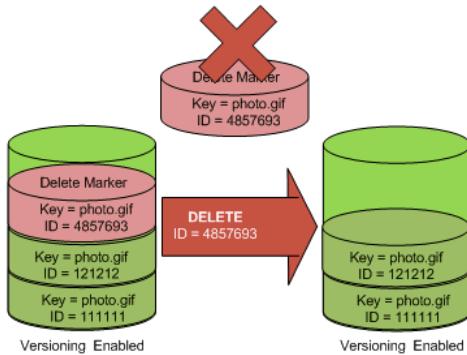
To delete a delete marker, you must specify its version ID in a `DELETE Object` `versionId` request. If you use a `DELETE` request to delete a delete marker (without specifying the version ID of the delete marker), Amazon S3 does not delete the delete marker, but instead, inserts another delete marker.

The following figure shows how a simple `DELETE` on a delete marker removes nothing, but adds a new delete marker to a bucket.



In a versioning-enabled bucket, this new delete marker would have a unique version ID. So, it's possible to have multiple delete markers of the same object in one bucket.

To permanently delete a delete marker, you must include its version ID in a `DELETE Object versionId` request. The following figure shows how a `DELETE Object versionId` request permanently removes a delete marker. Only the owner of a bucket can permanently remove a delete marker.



The effect of removing the delete marker is that a simple `GET` request will now retrieve the current version (121212) of the object.

### To permanently remove a delete marker

1. Set `versionId` to the ID of the version to the delete marker you want to remove.
2. Send a `DELETE Object versionId` request.

### Example Removing a Delete Marker

The following example removes the delete marker for `photo.gif` version 4857693.

```
DELETE /photo.gif?versionId=4857693 HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
```

When you delete a delete marker, Amazon S3 includes in the response:

```
204 NoContent
x-amz-version-id: versionID
x-amz-delete-marker: true
```

## Transitioning Object Versions

You can define lifecycle configuration rules for objects that have a well-defined lifecycle to transition object versions to the GLACIER storage class at a specific time in the object's lifetime. For more information, see [Object Lifecycle Management \(p. 125\)](#).

## Restoring Previous Versions

One of the value propositions of versioning is the ability to retrieve previous versions of an object. There are two approaches to doing so:

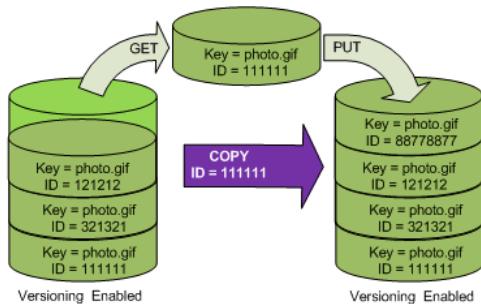
- Copy a previous version of the object into the same bucket

The copied object becomes the current version of that object and all object versions are preserved.

- Permanently delete the current version of the object

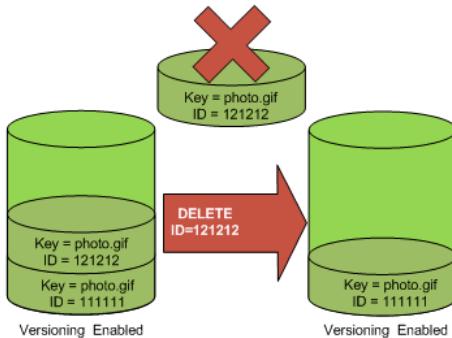
When you delete the current object version, you, in effect, turn the previous version into the current version of that object.

Because all object versions are preserved, you can make any earlier version the current version by copying a specific version of the object into the same bucket. In the following figure, the source object (ID = 111111) is copied into the same bucket. Amazon S3 supplies a new ID (88778877) and it becomes the current version of the object. So, the bucket has both the original object version (111111) and its copy (88778877).



A subsequent `GET` will retrieve version 88778877.

The following figure shows how deleting the current version (121212) of an object, which leaves the previous version (111111) as the current object.



A subsequent `GET` will retrieve version 111111.

## Versioned Object Permissions

Permissions are set at the version level. Each version has its own object owner; an AWS account that creates the object version is the owner. So, you can set different permissions for different versions of the same object. To do so, you must specify the version ID of the object whose permissions you want to set in a `PUT Object versionId acl` request. For a detailed description and instructions on using ACLs, see [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

### Example Setting Permissions for an Object Version

The following request sets the permission of the grantee, `BucketOwner@amazon.com`, to `FULL_CONTROL` on the key, `my-image.jpg`, version ID, `3HL4kqtJvjVBH40Nrjfkd`.

```
PUT /my-image.jpg?acl&versionId=3HL4kqtJvjVBH40Nrjfkd HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU=
Content-Length: 124

<AccessControlPolicy>
  <Owner>
    <ID>75cc57f09aa0c8caeab4f8c24e99d10f8e7faeef76c078efc7c6caea54ba06a</ID>
    <DisplayName>mtd@amazon.com</DisplayName>
  </Owner>
  <AccessControlList>
    <Grant>
      <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:type="CanonicalUser">
        <ID>a9a7b886d6fd24a52fe8ca5bef65f89a64e0193f23000e241bf9b1c61be666e9</ID>
        <DisplayName>BucketOwner@amazon.com</DisplayName>
      </Grantee>
      <Permission>FULL_CONTROL</Permission>
    </Grant>
  </AccessControlList>
</AccessControlPolicy>
```

Likewise, to get the permissions of a specific object version, you must specify its version ID in a `GET Object versionId acl` request. You need to include the version ID because, by default, `GET Object acl` returns the permissions of the current version of the object.

### Example Retrieving the Permissions for a Specified Object Version

In the following example, Amazon S3 returns the permissions for the key, `my-image.jpg`, version ID, `DVBH40Nr8X8gUMLUo`.

```
GET /my-image.jpg?versionId=DVBH40Nr8X8gUMLUo&acl HTTP/1.1
Host: bucket.s3.amazonaws.com
Date: Wed, 28 Oct 2009 22:32:00 GMT
Authorization: AWS AKIAIOSFODNN7EXAMPLE:0RQf4/cRonhpaBX5sCYVf1bNRuU
```

For more information, see [GET Object acl](#).

## Managing Objects in a Versioning-Suspended Bucket

### Topics

- [Adding Objects to Versioning-Suspended Buckets \(p. 468\)](#)
- [Retrieving Objects from Versioning-Suspended Buckets \(p. 469\)](#)
- [Deleting Objects from Versioning-Suspended Buckets \(p. 469\)](#)

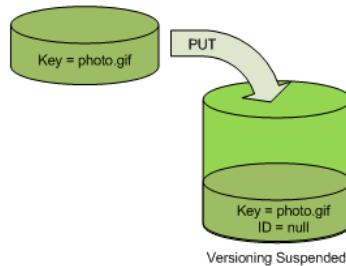
You suspend versioning to stop accruing new versions of the same object in a bucket. You might do this because you only want a single version of an object in a bucket, or you might not want to accrue charges for multiple versions.

When you suspend versioning, existing objects in your bucket do not change. What changes is how Amazon S3 handles objects in future requests. The topics in this section explain various object operations in a versioning-suspended bucket.

## Adding Objects to Versioning-Suspended Buckets

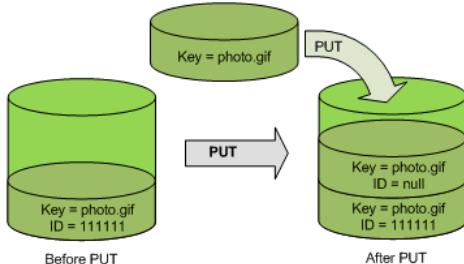
Once you suspend versioning on a bucket, Amazon S3 automatically adds a `null` version ID to every subsequent object stored thereafter (using `PUT`, `POST`, or `COPY`) in that bucket.

The following figure shows how Amazon S3 adds the version ID of `null` to an object when it is added to a version-suspended bucket.

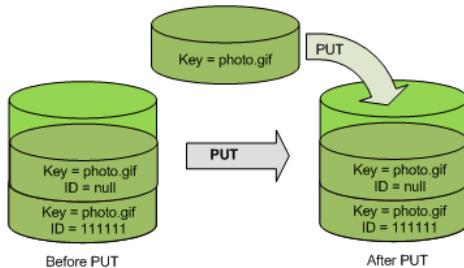


If a `null` version is already in the bucket and you add another object with the same key, the added object overwrites the original `null` version.

If there are versioned objects in the bucket, the version you `PUT` becomes the current version of the object. The following figure shows how adding an object to a bucket that contains versioned objects does not overwrite the object already in the bucket. In this case, version `111111` was already in the bucket. Amazon S3 attaches a version ID of `null` to the object being added and stores it in the bucket. Version `111111` is not overwritten.



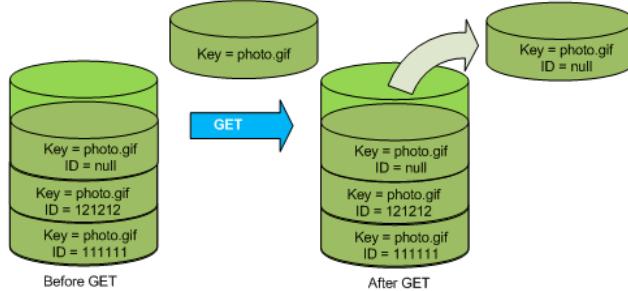
If a `null` version already exists in a bucket, the `null` version is overwritten, as shown in the following figure.



Note that although the key and version ID (`null`) of null version are the same before and after the `PUT`, the contents of the null version originally stored in the bucket is replaced by the contents of the object `PUT` into the bucket.

## Retrieving Objects from Versioning-Suspended Buckets

A `GET` Object request returns the current version of an object whether you've enabled versioning on a bucket or not. The following figure shows how a simple `GET` returns the current version of an object.

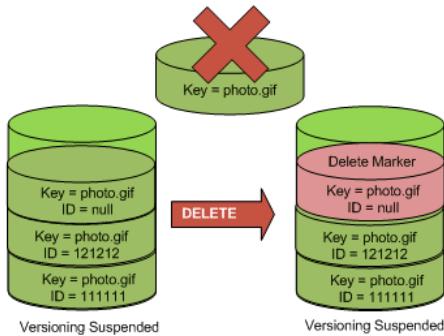


## Deleting Objects from Versioning-Suspended Buckets

If versioning is suspended, a `DELETE` request:

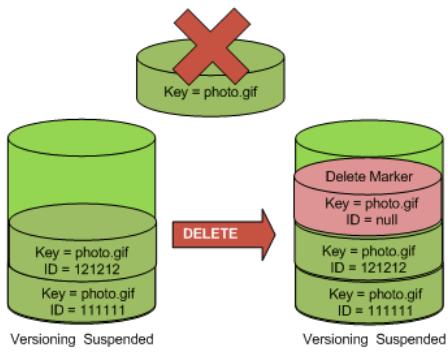
- Can only remove an object whose version ID is `null`  
Doesn't remove anything if there isn't a null version of the object in the bucket.
- Inserts a delete marker into the bucket.

The following figure shows how a simple `DELETE` removes a null version and Amazon S3 inserts a delete marker in its place with a version ID of `null`.

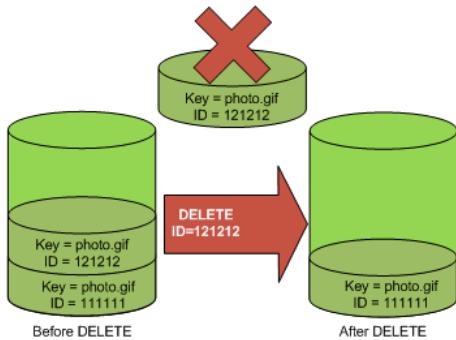


Remember that a delete marker doesn't have content, so you lose the content of the null version when a delete marker replaces it.

The following figure shows a bucket that doesn't have a null version. In this case, the `DELETE` removes nothing; Amazon S3 just inserts a delete marker.



Even in a versioning-suspended bucket, the bucket owner can permanently delete a specified version. The following figure shows that deleting a specified object version permanently removes that object. Only the bucket owner can delete a specified object version.



# Hosting a Static Website on Amazon S3

You can host a static website on Amazon Simple Storage Service (Amazon S3). On a static website, individual webpages include static content. They might also contain client-side scripts. By contrast, a dynamic website relies on server-side processing, including server-side scripts such as PHP, JSP, or ASP.NET. Amazon S3 does not support server-side scripting. Amazon Web Services (AWS) also has resources for hosting dynamic websites. To learn more about website hosting on AWS, go to [Websites and Website Hosting](#).

## Topics

- [Website Endpoints \(p. 472\)](#)
- [Configuring a Bucket for Website Hosting \(p. 473\)](#)
- [Example Walkthroughs - Hosting Websites on Amazon S3 \(p. 485\)](#)

To host a static website, you configure an Amazon S3 bucket for website hosting, and then upload your website content to the bucket. The website is then available at the AWS Region-specific website endpoint of the bucket:

```
<bucket-name>.s3-website-<AWS-region>.amazonaws.com
```

For a list of AWS Region-specific website endpoints for Amazon S3, see [Website Endpoints \(p. 472\)](#). For example, suppose you create a bucket called `examplebucket` in the US West (Oregon) Region, and configure it as a website. The following example URLs provide access to your website content:

- This URL returns a default index document that you configured for the website.

```
http://examplebucket.s3-website-us-west-2.amazonaws.com/
```

- This URL requests the `photo.jpg` object, which is stored at the root level in the bucket.

```
http://examplebucket.s3-website-us-east-1.amazonaws.com/photo.jpg
```

- This URL requests the `docs/doc1.html` object in your bucket.

```
http://examplebucket.s3-website-us-east-1.amazonaws.com/docs/doc1.html
```

### Using Your Own Domain

Instead of accessing the website by using an Amazon S3 website endpoint, you can use your own domain, such as `example.com` to serve your content. Amazon S3, along with Amazon Route 53, supports hosting a website at the root domain. For example, if you have the root domain `example.com` and you host your website on Amazon S3, your website visitors can access the site from their browser by typing either `http://www.example.com` or `http://example.com`. For an example walkthrough, see [Example: Setting up a Static Website Using a Custom Domain \(p. 487\)](#).

To configure a bucket for website hosting, you add website configuration to the bucket. For more information, see [Configuring a Bucket for Website Hosting \(p. 473\)](#).

## Website Endpoints

When you configure a bucket for website hosting, the website is available via the region-specific website endpoint. Website endpoints are different from the endpoints where you send REST API requests. For more information about the differences between the endpoints, see [Key Differences Between the Amazon Website and the REST API Endpoint \(p. 473\)](#).

The two general forms of an Amazon S3 website endpoint are as follows:

```
bucket-name.s3-website-region.amazonaws.com
```

```
bucket-name.s3-website.region.amazonaws.com
```

Which form is used for the endpoint depends on what Region the bucket is in. For example, if your bucket is named `example-bucket` and it resides in the US East (N. Virginia) region, the website is available at the following Amazon S3 website endpoint:

```
http://example-bucket.s3-website-us-east-1.amazonaws.com/
```

Or, if your bucket is named `example-bucket` and it resides in the EU (Frankfurt) region, the website is available at the following Amazon S3 website endpoint:

```
http://example-bucket.s3-website.eu-central-1.amazonaws.com/
```

For a list of the Amazon S3 website endpoints by Region, see [Amazon Simple Storage Service Website Endpoints](#) in the *AWS General Reference*.

In order for your customers to access content at the website endpoint, you must make all your content publicly readable. To do so, you can use a bucket policy or an ACL on an object to grant the necessary permissions.

#### Note

Requester Pays buckets or DevPay buckets do not allow access through the website endpoint. Any request to such a bucket receives a `403 Access Denied` response. For more information, see [Requester Pays Buckets \(p. 92\)](#).

If you have a registered domain, you can add a DNS CNAME entry to point to the Amazon S3 website endpoint. For example, if you have registered domain, `www.example-bucket.com`, you could create a bucket `www.example-bucket.com`, and add a DNS CNAME record that points to `www.example-bucket.com.s3-website-<region>.amazonaws.com`. All requests to `http://www.example-bucket.com` are routed to `www.example-bucket.com.s3-website-<region>.amazonaws.com`. For more information, see [Virtual Hosting of Buckets \(p. 51\)](#).

## Key Differences Between the Amazon Website and the REST API Endpoint

The website endpoint is optimized for access from a web browser. The following table describes the key differences between the Amazon REST API endpoint and the website endpoint.

Key Difference	REST API Endpoint	Website Endpoint
Access control	Supports both public and private content.	Supports only publicly readable content.
Error message handling	Returns an XML-formatted error response.	Returns an HTML document.
Redirection support	Not applicable	Supports both object-level and bucket-level redirects.
Requests supported	Supports all bucket and object operations	Supports only GET and HEAD requests on objects.
Responses to GET and HEAD requests at the root of a bucket	Returns a list of the object keys in the bucket.	Returns the index document that is specified in the website configuration.
Secure Sockets Layer (SSL) support	Supports SSL connections.	Does not support SSL connections.

For a list of the Amazon S3 endpoints, see [Request Endpoints \(p. 13\)](#).

## Configuring a Bucket for Website Hosting

You can host a static website in an Amazon Simple Storage Service (Amazon S3) bucket. However, to do so requires some configuration. Some optional configurations are also available, depending on your website requirements.

### Required configurations:

- [Enabling Website Hosting \(p. 474\)](#)
- [Configuring Index Document Support \(p. 474\)](#)
- [Permissions Required for Website Access \(p. 476\)](#)

### Optional configurations:

- [\(Optional\) Configuring Web Traffic Logging \(p. 476\)](#)

- [\(Optional\) Custom Error Document Support \(p. 477\)](#)
- [\(Optional\) Configuring a Webpage Redirect \(p. 478\)](#)

## Enabling Website Hosting

Follow these steps to enable website hosting for your Amazon S3 buckets using the [Amazon S3 console](#):

### To enable website hosting for an Amazon S3 bucket

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. In the list, choose the bucket that you want to use for your hosted website.
3. Choose the **Properties** tab.
4. Choose **Static website hosting**, and then choose **Use this bucket to host a website**.
5. You are prompted to provide the index document and any optional error documents and redirection rules that are needed.

For information about what an index document is, see [Configuring Index Document Support \(p. 474\)](#).

## Configuring Index Document Support

An *index document* is a webpage that Amazon S3 returns when a request is made to the root of a website or any subfolder. For example, if a user enters `http://www.example.com` in the browser, the user is not requesting any specific page. In that case, Amazon S3 serves up the index document, which is sometimes referred to as the default page.

When you configure your bucket as a website, provide the name of the index document. You then upload an object with this name and configure it to be publicly readable.

The trailing slash at the root-level URL is optional. For example, if you configure your website with `index.html` as the index document, either of the following two URLs return `index.html`.

```
http://example-bucket.s3-website-region.amazonaws.com/  
http://example-bucket.s3-website-region.amazonaws.com
```

For more information about Amazon S3 website endpoints, see [Website Endpoints \(p. 472\)](#).

## Index Documents and Folders

In Amazon S3, a bucket is a flat container of objects; it does not provide any hierarchical organization as the file system on your computer does. You can create a logical hierarchy by using object key names that imply a folder structure. For example, consider a bucket with three objects and the following key names.

- `sample1.jpg`
- `photos/2006/Jan/sample2.jpg`
- `photos/2006/Feb/sample3.jpg`

Although these are stored with no physical hierarchical organization, you can infer the following logical folder structure from the key names.

- `sample1.jpg` object is at the root of the bucket.
- `sample2.jpg` object is in the `photos/2006/Jan` subfolder.
- `sample3.jpg` object is in the `photos/2006/Feb` subfolder.

The folder concept that Amazon S3 console supports is based on object key names. To continue the previous example, the console displays the `examplebucket` with a `photos` folder.

Name	Last modified	Storage class
photos	--	

You can upload objects to the bucket or to the `photos` folder within the bucket. If you add the object `sample.jpg` to the bucket, the key name is `sample.jpg`. If you upload the object to the `photos` folder, the object key name is `photos/sample.jpg`.

Name	Last modified	Size	Storage class
sample.jpg	Apr 4, 2017 3:43:52 PM	37.8 KB	Standard

If you create such a folder structure in your bucket, you must have an index document at each level. When a user specifies a URL that resembles a folder lookup, the presence or absence of a trailing slash determines the behavior of the website. For example, the following URL, with a trailing slash, returns the `photos/index.html` index document.

```
http://example-bucket.s3-website-region.amazonaws.com/photos/
```

However, if you exclude the trailing slash from the preceding URL, Amazon S3 first looks for an object `photos` in the bucket. If the `photos` object is not found, then it searches for an index document,

`photos/index.html`. If that document is found, Amazon S3 returns a 302 Found message and points to the `photos/` key. For subsequent requests to `photos/`, Amazon S3 returns `photos/index.html`. If the index document is not found, Amazon S3 returns an error.

## Permissions Required for Website Access

When you configure a bucket as a website, you must make the objects that you want to serve publicly readable. To do this, you write a bucket policy that grants everyone `s3:GetObject` permission. On the website endpoint, if a user requests an object that doesn't exist, Amazon S3 returns HTTP response code 404 (Not Found). If the object exists but you haven't granted read permission on it, the website endpoint returns HTTP response code 403 (Access Denied). The user can use the response code to infer whether a specific object exists. If you don't want this behavior, you should not enable website support for your bucket.

The following sample bucket policy grants everyone access to the objects in the specified folder. For more information about bucket policies, see [Using Bucket Policies and User Policies \(p. 335\)](#).

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "PublicReadGetObject",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": ["s3:GetObject"],  
            "Resource": ["arn:aws:s3:::example-bucket/*"]  
        }  
    ]  
}
```

### Note

The bucket policy applies only to objects owned by the bucket owner. If your bucket contains objects that aren't owned by the bucket owner, public READ permission on those objects should be granted using the object access control list (ACL).

You can grant public read permission to your objects by using either a bucket policy or an object ACL. To make an object publicly readable using an ACL, grant READ permission to the AllUsers group, as shown in the following grant element. Add this grant element to the object ACL. For information about managing ACLs, see [Managing Access with ACLs \(p. 394\)](#).

```
<Grant>  
    <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
             xsi:type="Group">  
        <URI>http://acs.amazonaws.com/groups/global/AllUsers</URI>  
    </Grantee>  
    <Permission>READ</Permission>  
</Grant>
```

## (Optional) Configuring Web Traffic Logging

If you want to track the number of visitors who access your website, enable logging for the root domain bucket. Enabling logging is optional.

### To enable logging for your root domain bucket

1. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.

2. Create a bucket for logging named `logs.example.com` in the same AWS Region that the `example.com` and `www.example.com` buckets were created in.
3. Create two folders in the `logs.example.com` bucket; one named `root`, and the other named `cdn`. If you configure Amazon CloudFront to speed up your website, you will use the `cdn` folder.
4. In the **Buckets** pane, choose your root domain bucket, choose **Properties**, and then choose **Logging**.
5. In the **Logging** pane, complete the following steps:
  - a. Select the **Enabled** check box.
  - b. For **Target Bucket**, choose the bucket that you created for the log files, `logs.example.com`.
  - c. For **Target Prefix**, type `root/`. This setting groups the log data files in the bucket in a folder named `root` so that they are easy to locate.
  - d. Choose **Save**.

## (Optional) Custom Error Document Support

The following table lists the subset of HTTP response codes that Amazon S3 returns when an error occurs.

HTTP Error Code	Description
<b>301 Moved Permanently</b>	When a user sends a request directly to the Amazon S3 website endpoints ( <code>http://s3-website-&lt;region&gt;.amazonaws.com/</code> ), Amazon S3 returns a <b>301 Moved Permanently</b> response and redirects those requests to <code>https://aws.amazon.com/s3/</code> .
<b>302 Found</b>	When Amazon S3 receives a request for a key <code>x</code> , <code>http://&lt;bucket&gt;.s3-website-&lt;region&gt;.amazonaws.com/x</code> , without a trailing slash, it first looks for the object with the keyname <code>x</code> . If the object is not found, Amazon S3 determines that the request is for subfolder <code>x</code> and redirects the request by adding a slash at the end, and returns <b>302 Found</b> .
<b>304 Not Modified</b>	Amazon S3 users request headers <code>If-Modified-Since</code> , <code>If-Unmodified-Since</code> , <code>If-Match</code> and/or <code>If-None-Match</code> to determine whether the requested object is same as the cached copy held by the client. If the object is the same, the website endpoint returns a <b>304 Not Modified</b> response.
<b>400 Malformed Request</b>	The website endpoint responds with a <b>400 Malformed Request</b> when a user attempts to access a bucket through the incorrect regional endpoint.
<b>403 Forbidden</b>	The website endpoint responds with a <b>403 Forbidden</b> when a user request translates to an object that is not publicly readable. The object owner must make the object publicly readable using a bucket policy or an ACL.
<b>404 Not Found</b>	<p>The website endpoint responds with <b>404 Not Found</b> for the following reasons:</p> <ul style="list-style-type: none"> <li>• Amazon S3 determines that the URL of the website refers to an object key that does not exist.</li> <li>• Amazon infers that the request is for an index document that does not exist.</li> <li>• A bucket specified in the URL does not exist.</li> <li>• A bucket specified in the URL exists, but isn't configured as a website.</li> </ul> <p>You can create a custom document that is returned for <b>404 Not Found</b>. Make sure that the document is uploaded to the bucket configured as a website, and that the website hosting configuration is set to use the document.</p>

HTTP Error Code	Description
	For information on how Amazon S3 interprets the URL as a request for an object or an index document, see <a href="#">Configuring Index Document Support (p. 474)</a> .
<b>500 Service Error</b>	The website endpoint responds with a <b>500 Service Error</b> when an internal server error occurs.
<b>503 Service Unavailable</b>	The website endpoint responds with a <b>503 Service Unavailable</b> when Amazon S3 determines that you need to reduce your request rate.

For each of these errors, Amazon S3 returns a predefined HTML message. The following is an example HTML message that is returned for a **403 Forbidden** response.

## 403 Forbidden

- Code: AccessDenied
- Message: Access Denied
- RequestId: 873CA367A51F7EC7
- HostId: DdQezl9vkuw5luD5HKsFaTDm9KH4PZzCPRkW3igimILbTu1DiYlvXjgyd7pVxq32

### An Error Occurred While Attempting to Retrieve a Custom Error Document

- Code: AccessDenied
- Message: Access Denied

## Custom Error Document

You can optionally provide a custom error document that contains a user-friendly error message and additional help. You provide this custom error document as part of adding website configuration to your bucket. Amazon S3 returns your custom error document for only the HTTP 4XX class of error codes.

## Error Documents and Browser Behavior

When an error occurs, Amazon S3 returns an HTML error document. If you configured your website with a custom error document, Amazon S3 returns that error document. However, some browsers display their own error message when an error occurs, ignoring the error document that Amazon S3 returns. For example, when an HTTP 404 Not Found error occurs, Google Chrome might ignore the error document that Amazon S3 returns and display its own error.

## (Optional) Configuring a Webpage Redirect

If your Amazon S3 bucket is configured for website hosting, you can redirect requests for an object to another object in the same bucket or to an external URL.

### Topics

- [Page Redirect Support in the Amazon S3 Console \(p. 479\)](#)
- [Setting a Page Redirect from the REST API \(p. 480\)](#)
- [Advanced Conditional Redirects \(p. 481\)](#)

You set the redirect by adding the `x-amz-website-redirect-location` property to the object metadata. The website then interprets the object as 301 redirect. To redirect a request to another object, you set the redirect location to the key of the target object. To redirect a request to an external URL, you set the redirect location to the URL that you want. For more information about object metadata, see [System-Defined Metadata \(p. 109\)](#).

A bucket configured for website hosting has both the website endpoint and the REST endpoint. A request for a page that is configured as a 301 redirect has the following possible outcomes, depending on the endpoint of the request:

- **Region-specific website endpoint** – Amazon S3 redirects the page request according to the value of the `x-amz-website-redirect-location` property.
- **REST endpoint** – Amazon S3 doesn't redirect the page request. It returns the requested object.

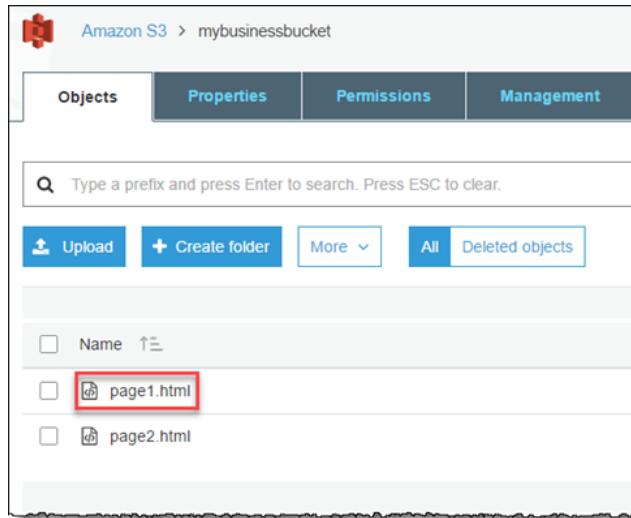
For more information about the endpoints, see [Key Differences Between the Amazon Website and the REST API Endpoint \(p. 473\)](#).

You can set a page redirect from the Amazon S3 console or by using the Amazon S3 REST API.

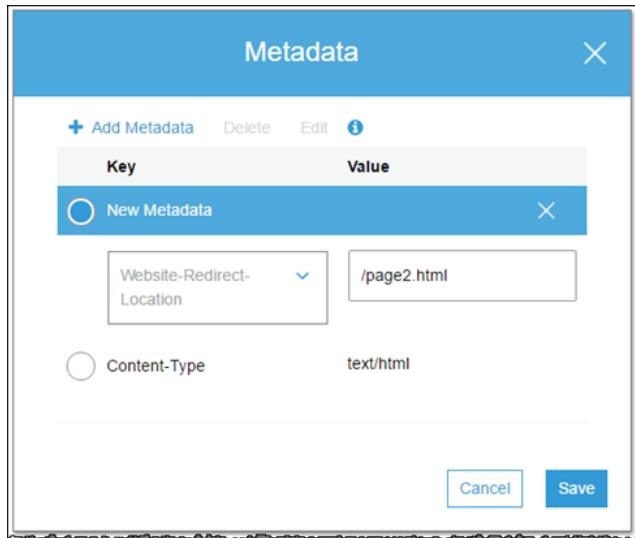
## Page Redirect Support in the Amazon S3 Console

You can use the Amazon S3 console to set the website redirect location in the metadata of the object. When you set a page redirect, you can either keep or delete the source object content. For example, suppose that you have a `page1.html` object in your bucket. To redirect any requests for this page to another object, `page2.html`, you can do one of the following:

- To keep the content of the `page1.html` object and only redirect page requests, choose the `page1.html` object.



Choose the **Properties** tab for `page1.html`, and then choose the **Metadata** box. Add `Website Redirect Location` to the metadata, as shown in the following example, and set its value to `/page2.html`. The `/` prefix in the value is required.



You can also set the value to an external URL, such as `http://www.example.com`. For example, if your root domain is `example.com`, and you want to serve requests for both `http://example.com` and `http://www.example.com`, you can create two buckets named `example.com` and `www.example.com`. Then, maintain the content in one of the buckets (say `example.com`), and configure the other bucket to redirect all requests to the `example.com` bucket.

- To delete the content of the `page1.html` object and redirect requests, you can upload a new zero-byte object with the same key, `page1.html`, to replace the existing object. Then specify Website Redirect Location for `page1.html` in the upload process. For information about uploading an object, see [Uploading S3 Objects](#) in the *Amazon Simple Storage Service Console User Guide*.

## Setting a Page Redirect from the REST API

The following Amazon S3 API actions support the `x-amz-website-redirect-location` header in the request. Amazon S3 stores the header value in the object metadata as `x-amz-website-redirect-location`.

- [PUT Object](#)
- [Initiate Multipart Upload](#)
- [POST Object](#)
- [PUT Object - Copy](#)

When setting a page redirect, you can either keep or delete the object content. For example, suppose you have a `page1.html` object in your bucket.

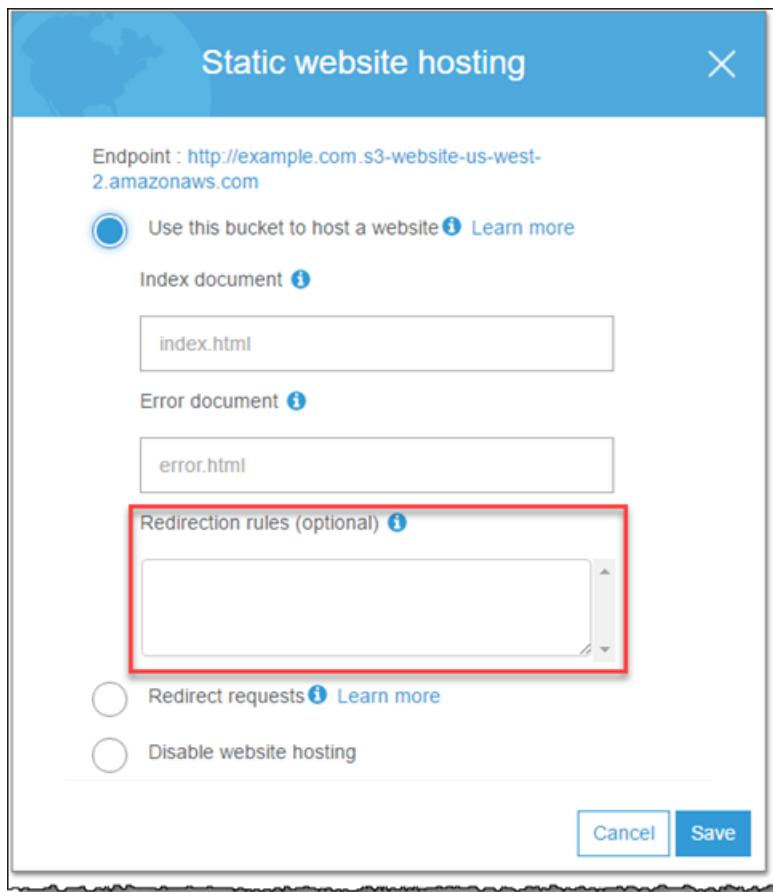
- To keep the content of `page1.html` and only redirect page requests, you can submit a [PUT Object - Copy](#) request to create a new `page1.html` object that uses the existing `page1.html` object as the source. In your request, you set the `x-amz-website-redirect-location` header. When the request is complete, you have the original page with its content unchanged, but Amazon S3 redirects any requests for the page to the redirect location that you specify.
- To delete the content of the `page1.html` object and redirect requests for the page, you can send a PUT Object request to upload a zero-byte object that has the same object key:`page1.html`. In the PUT request, you set `x-amz-website-redirect-location` for `page1.html` to the new object. When the request is complete, `page1.html` has no content, and requests are redirected to the location that is specified by `x-amz-website-redirect-location`.

When you retrieve the object using the [GET Object](#) action, along with other object metadata, Amazon S3 returns the `x-amz-website-redirect-location` header in the response.

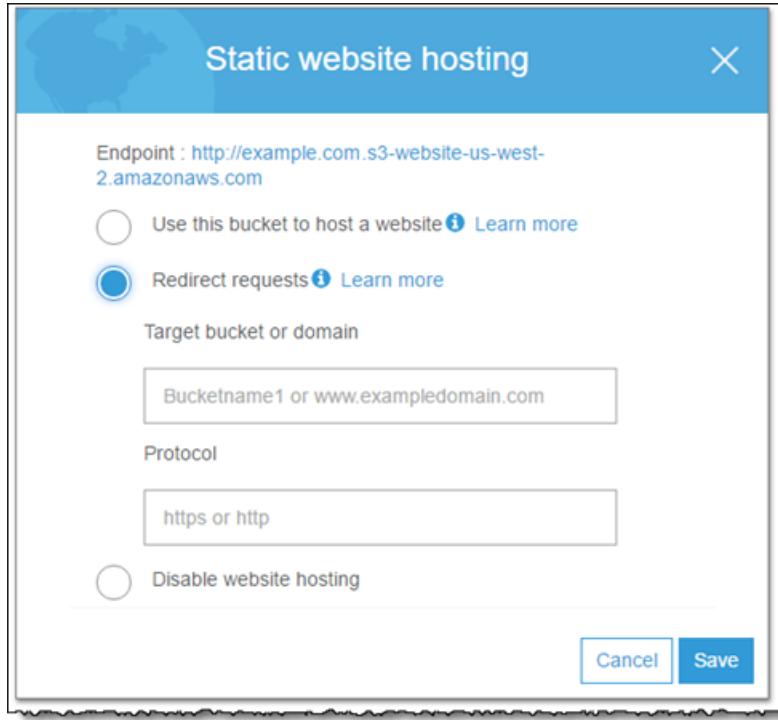
## Advanced Conditional Redirects

Using advanced redirection rules, you can route requests conditionally according to specific object key names, prefixes in the request, or response codes. For example, suppose that you delete or rename an object in your bucket. You can add a routing rule that redirects the request to another object. If you want to make a folder unavailable, you can add a routing rule to redirect the request to another webpage. You can also add a routing rule to handle error conditions by routing requests that return the error to another domain when the error is processed.

When configuring a bucket for website hosting, you have the option of specifying advanced redirection rules.



To redirect all requests to the bucket's website endpoint to another host, you only need to provide the host name.



You describe the rules using XML. The following section provides general syntax and examples of specifying redirection rules.

## Syntax for Specifying Routing Rules

The following is general syntax for defining the routing rules in a website configuration:

```
<RoutingRules> =
  <RoutingRules>
    <RoutingRule>...</RoutingRule>
    [<RoutingRule>...</RoutingRule>
     ...]
  </RoutingRules>

<RoutingRule> =
  <RoutingRule>
    [ <Condition>...</Condition> ]
    <Redirect>...</Redirect>
  </RoutingRule>

<Condition> =
  <Condition>
    [ <KeyPrefixEquals>...</KeyPrefixEquals> ]
    [ <HttpErrorCodeReturnedEquals>...</HttpErrorCodeReturnedEquals> ]
  </Condition>
  Note: <Condition> must have at least one child element.

<Redirect> =
  <Redirect>
    [ <HostName>...</HostName> ]
    [ <Protocol>...</Protocol> ]
    [ <ReplaceKeyPrefixWith>...</ReplaceKeyPrefixWith> ]
    [ <ReplaceKeyWith>...</ReplaceKeyWith> ]
    [ <HttpRedirectCode>...</HttpRedirectCode> ]
  </Redirect>
```

*Note: <Redirect> must have at least one child element.  
 Also, you can have either ReplaceKeyPrefix with or ReplaceKeyWith,  
 but not both.*

The following table describes the elements in the routing rule.

Name	Description
RoutingRules	Container for a collection of RoutingRule elements.
RoutingRule	A rule that identifies a condition and the redirect that is applied when the condition is met.  Condition: A RoutingRules container must contain at least one routing rule.
Condition	Container for describing a condition that must be met for the specified redirect to be applied. If the routing rule does not include a condition, the rule is applied to all requests.
KeyPrefixEquals	The prefix of the object key name from which requests are redirected.  KeyPrefixEquals is required if HttpStatusCodeReturnedEquals is not specified. If both KeyPrefixEquals and HttpStatusCodeReturnedEquals are specified, both must be true for the condition to be met.
HttpStatusCodeReturnedEquals	The HTTP error code that must match for the redirect to apply. If an error occurs, and if the error code meets this value, then the specified redirect applies.  HttpStatusCodeReturnedEquals is required if KeyPrefixEquals is not specified. If both KeyPrefixEquals and HttpStatusCodeReturnedEquals are specified, both must be true for the condition to be met.
Redirect	Container element that provides instructions for redirecting the request. You can redirect requests to another host or another page, or you can specify another protocol to use. A RoutingRule must have a Redirect element. A Redirect element must contain at least one of the following sibling elements: Protocol, HostName, ReplaceKeyPrefixWith, ReplaceKeyWith, or HttpRedirectCode.
Protocol	The protocol, HTTP or HTTPS, to be used in the Location header that is returned in the response.  If one of its siblings is supplied, Protocol is not required.
HostName	The host name to be used in the Location header that is returned in the response.  If one of its siblings is supplied, HostName is not required.
ReplaceKeyPrefixWith	The prefix of the object key name that replaces the value of KeyPrefixEquals in the redirect request.  If one of its siblings is supplied, ReplaceKeyPrefixWith is not required. It can be supplied only if ReplaceKeyWith is not supplied.

Name	Description
ReplaceKeyWith	The object key to be used in the Location header that is returned in the response.  If one of its siblings is supplied, ReplaceKeyWith is not required. It can be supplied only if ReplaceKeyPrefixWith is not supplied.
HttpRedirectCode	The HTTP redirect code to be used in the Location header that is returned in the response.  If one of its siblings is supplied, HttpRedirectCode is not required.

The following examples explain common redirection tasks:

### Example 1: Redirect after renaming a key prefix

Suppose that your bucket contains the following objects:

- index.html
- docs/article1.html
- docs/article2.html

You decide to rename the folder from docs/ to documents/. After you make this change, you need to redirect requests for prefix docs/ to documents/. For example, request for docs/article1.html will be redirected to documents/article1.html.

In this case, you add the following routing rule to the website configuration:

```
<RoutingRules>
  <RoutingRule>
    <Condition>
      <KeyPrefixEquals>docs/</KeyPrefixEquals>
    </Condition>
    <Redirect>
      <ReplaceKeyPrefixWith>documents/</ReplaceKeyPrefixWith>
    </Redirect>
  </RoutingRule>
</RoutingRules>
```

### Example 2: Redirect requests for a deleted folder to a page

Suppose that you delete the images/ folder (that is, you delete all objects with the key prefix images/). You can add a routing rule that redirects requests for any object with the key prefix images/ to a page named folderdeleted.html.

```
<RoutingRules>
  <RoutingRule>
    <Condition>
      <KeyPrefixEquals>images/</KeyPrefixEquals>
    </Condition>
    <Redirect>
      <ReplaceKeyWith>folderdeleted.html</ReplaceKeyWith>
    </Redirect>
  </RoutingRule>
</RoutingRules>
```

### Example 3: Redirect for an HTTP error

Suppose that when a requested object is not found, you want to redirect requests to an Amazon Elastic Compute Cloud (Amazon EC2) instance. Add a redirection rule so that when an HTTP status code 404 (Not Found) is returned, the site visitor is redirected to an Amazon EC2 instance that handles the request. The following example also inserts the object key prefix `report-404/` in the redirect. For example, if you request a page `ExamplePage.html` and it results in an HTTP 404 error, the request is redirected to a page `report-404/ExamplePage.html` on the specified Amazon EC2 instance. If there is no routing rule and the HTTP error 404 occurs, the error document that is specified in the configuration is returned.

```
<RoutingRules>
  <RoutingRule>
    <Condition>
      <HttpErrorCodeReturnedEquals>404</HttpErrorCodeReturnedEquals >
    </Condition>
    <Redirect>
      <HostName>ec2-11-22-33-44.compute-1.amazonaws.com</HostName>
      <ReplaceKeyPrefixWith>report-404/</ReplaceKeyPrefixWith>
    </Redirect>
  </RoutingRule>
</RoutingRules>
```

## Example Walkthroughs - Hosting Websites on Amazon S3

### Topics

- [Example: Setting up a Static Website \(p. 485\)](#)
- [Example: Setting up a Static Website Using a Custom Domain \(p. 487\)](#)
- [Example: Speed Up Your Website with Amazon CloudFront \(p. 496\)](#)
- [Clean Up Your Example Resources \(p. 498\)](#)

This section provides two examples. In the first example, you configure a bucket for website hosting, upload a sample index document, and test the website using the Amazon S3 website endpoint for the bucket. The second example shows how you can use your own domain, such as `example.com`, instead of the S3 bucket website endpoint, and serve content from an Amazon S3 bucket configured as a website. The example also shows how Amazon S3 offers the root domain support.

## Example: Setting up a Static Website

You can configure an Amazon S3 bucket to function like a website. This example walks you through the steps of hosting a website on Amazon S3.

### Topics

- [Step 1: Creating a Bucket and Configuring It as a Website \(p. 486\)](#)
- [Step 2: Adding a Bucket Policy That Makes Your Bucket Content Publicly Available \(p. 486\)](#)
- [Step 3: Uploading an Index Document \(p. 486\)](#)
- [Step 4: Testing Your Website \(p. 487\)](#)

## Step 1: Creating a Bucket and Configuring It as a Website

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. Create a bucket.

For step-by-step instructions, see [How Do I Create an S3 Bucket?](#) in *Amazon Simple Storage Service Console User Guide*.

For bucket naming guidelines, see [Bucket Restrictions and Limitations \(p. 62\)](#). If you have a registered domain name, for additional information about bucket naming, see [Customizing Amazon S3 URLs with CNAMEs \(p. 54\)](#).

3. Open the bucket **Properties** pane, choose **Static Website Hosting**, and do the following:
  1. Choose **Enable website hosting**.
  2. In the **Index Document** box, type the name of your index document. The name is typically `index.html`.
  3. Choose **Save** to save the website configuration.
  4. Write down the **Endpoint**.

This is the Amazon S3-provided website endpoint for your bucket. You use this endpoint in the following steps to test your website.

## Step 2: Adding a Bucket Policy That Makes Your Bucket Content Publicly Available

1. In the **Properties** pane for the bucket, choose **Permissions**.
2. Choose **Add Bucket Policy**.
3. Copy the following bucket policy, and then paste it in the Bucket Policy Editor.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Sid": "PublicReadForGetBucketObjects",  
            "Effect": "Allow",  
            "Principal": "*",  
            "Action": ["s3:GetObject"],  
            "Resource": ["arn:aws:s3:::example-bucket/*"]  
        }  
    ]  
}
```

4. In the policy, replace `example-bucket` with the name of your bucket.
5. Choose **Save**.

## Step 3: Uploading an Index Document

1. Create a document. Give it the same name that you gave the index document earlier.
2. Using the console, upload the index document to your bucket.

For instructions, see [Uploading S3 Objects](#) in the *Amazon Simple Storage Service Console User Guide*.

## Step 4: Testing Your Website

Type the following URL in the browser, replacing `example-bucket` with the name of your bucket and `website-region` with the name of the AWS Region where you deployed your bucket. For information about AWS Region names, see [Website Endpoints \(p. 472\)](#).

```
http://example-bucket.s3-website-region.amazonaws.com
```

If your browser displays your `index.html` page, the website was successfully deployed.

**Note**

HTTPS access to the website is not supported.

You now have a website hosted on Amazon S3. This website is available at the Amazon S3 website endpoint. However, you might have a domain, such as `example.com`, that you want to use to serve the content from the website you created. You might also want to use Amazon S3 root domain support to serve requests for both `http://www.example.com` and `http://example.com`. This requires additional steps. For an example, see [Example: Setting up a Static Website Using a Custom Domain \(p. 487\)](#).

## Example: Setting up a Static Website Using a Custom Domain

Suppose that you want to host your static website on Amazon S3. You registered a domain (for example, `example.com`), and you want requests for `http://www.example.com` and `http://example.com` to be served from your Amazon S3 content. Whether you have an existing static website that you want to host on Amazon S3, or you are starting from scratch, use this example to learn how to host websites on Amazon S3.

Topics

- [Before You Begin \(p. 487\)](#)
- [Step 1: Register a Domain \(p. 488\)](#)
- [Step 2: Create and Configure Buckets and Upload Data \(p. 488\)](#)
- [Step 3: Create and Configure Amazon Route 53 Hosted Zone \(p. 491\)](#)
- [Step 4: Switch to Amazon Route 53 as Your DNS Provider \(p. 494\)](#)
- [Step 5: Testing \(p. 495\)](#)

## Before You Begin

As you walk through the steps in this example, you work with the following services:

**Domain registrar of your choice** – If you don't already have a registered domain name, such as `example.com`, create and register one with a registrar of your choice. You can typically register a domain for a small yearly fee. For procedural information about registering a domain name, see the registrar's website.

**Amazon S3** – You use Amazon S3 to create buckets, upload a sample website page, configure permissions so that everyone can see the content, and then configure the buckets for website hosting. In this example, because you want to allow requests for both `http://www.example.com` and `http://example.com`, you create two buckets; however, you host content in only one bucket. You configure the other Amazon S3 bucket to redirect requests to the bucket that hosts the content.

**Amazon Route 53** – You configure Amazon Route 53 as your Domain Name System (DNS) provider. You create a hosted zone in Amazon Route 53 for your domain and configure applicable DNS records. If you

are switching from an existing DNS provider, you need to ensure that you have transferred all of the DNS records for your domain.

We recommend that you have basic familiarity with domains, DNS, CNAME records, and A records. A detailed explanation of these concepts is beyond the scope of this guide. Your domain registrar should provide any basic information that you need.

In this example, we use Amazon Route 53. However, you can use most registrars to define a CNAME record that points to an Amazon S3 bucket.

**Note**

All the steps in this example use `example.com` as a domain name. Replace this domain name with the one that you registered.

## Step 1: Register a Domain

If you already have a registered domain, you can skip this step. If you are new to hosting a website, your first step is to register a domain, such as `example.com`, with a registrar of your choice.

After you choose a registrar, register your domain name according to the instructions at the registrar's website. For a list of registrar websites that you can use to register your domain name, see [Information for Registrars and Registrants](#) at the ICANN.org website.

When you have a registered domain name, your next task is to create and configure Amazon S3 buckets for website hosting and to upload your website content.

## Step 2: Create and Configure Buckets and Upload Data

To support requests from both the root domain such as `example.com` and subdomain such as `www.example.com`, you create two buckets. One bucket contains the content. You configure the other bucket to redirect requests.

### Step 2.1: Create Two Buckets

The bucket names must match the names of the website that you are hosting. For example, to host your `example.com` website on Amazon S3, you would create a bucket named `example.com`. To host a website under `www.example.com`, you would name the bucket `www.example.com`. In this example, your website supports requests from both `example.com` and `www.example.com`.

In this step, you sign in to the Amazon S3 console with your AWS account credentials and create the following two buckets.

- `example.com`
- `www.example.com`

**Note**

Like domains, subdomains must have their own S3 buckets, and the buckets must share the exact names as the subdomains. In this example, we are creating the `www.example.com` subdomain, so we also need an S3 bucket named `www.example.com`.

### To create your buckets and upload your website content for hosting

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. Create two buckets that match your domain name and subdomain. For instance, `example.com` and `www.example.com`.

For step-by-step instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

3. Upload your website data to the `example.com` bucket.

You will host your content out of the root domain bucket (`example.com`), and you will redirect requests for `www.example.com` to the root domain bucket. You can store content in either bucket. For this example, you host content in the `example.com` bucket. The content can be text files, family photos, videos—whatever you want. If you have not yet created a website, then you only need one file for this example. You can upload any file. For example, you can create a file using the following HTML and upload it to the bucket. The file name of the home page of a website is typically `index.html`, but you can give it any name. In a later step, you provide this file name as the index document name for your website.

```
<html xmlns="http://www.w3.org/1999/xhtml" >
<head>
    <title>My Website Home Page</title>
</head>
<body>
    <h1>Welcome to my website</h1>
    <p>Now hosted on Amazon S3!</p>
</body>
</html>
```

For step-by-step instructions, see [How Do I Upload an Object to an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

4. Configure permissions for your objects to make them publicly accessible.

Attach the following bucket policy to the `example.com` bucket, substituting the name of your bucket for `example.com`. For step-by-step instructions to attach a bucket policy, see [How Do I Add an S3 Bucket Policy?](#) in the *Amazon Simple Storage Service Console User Guide*.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "PublicReadGetObject",
            "Effect": "Allow",
            "Principal": "*",
            "Action": ["s3:GetObject"],
            "Resource": ["arn:aws:s3:::example.com/*"]
        }
    ]
}
```

You now have two buckets, `example.com` and `www.example.com`, and you have uploaded your website content to the `example.com` bucket. In the next step, you configure `www.example.com` to redirect requests to your `example.com` bucket. By redirecting requests, you can maintain only one copy of your website content. Visitors who type `www` in their browsers and those who specify only the root domain are routed to the same website content in your `example.com` bucket.

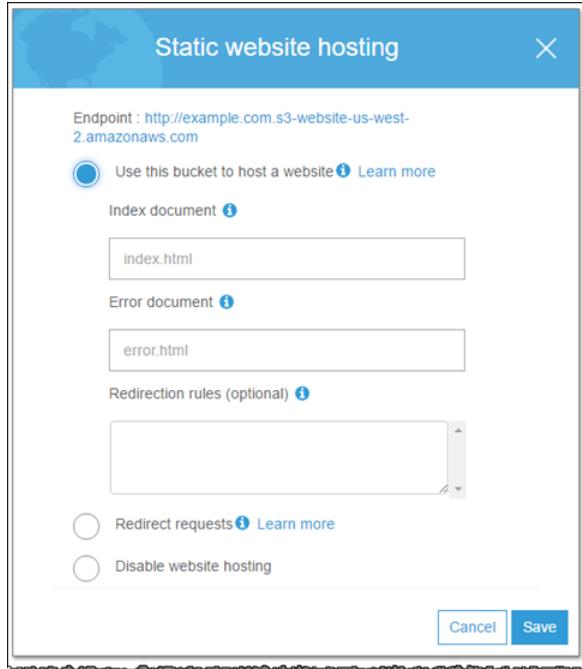
## Step 2.2: Configure Buckets for Website Hosting

When you configure a bucket for website hosting, you can access the website using the Amazon S3 assigned bucket website endpoint.

In this step, you configure both buckets for website hosting. First, you configure `example.com` as a website and then you configure `www.example.com` to redirect all requests to the `example.com` bucket.

### To configure your buckets for website hosting

1. Sign in to the AWS Management Console and open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. In the **Bucket name** list, choose the name of the bucket that you want to enable static website hosting for.
3. Choose **Properties**.
4. Choose **Static website hosting**.
5. Configure the *example.com* bucket for website hosting. In the **Index Document** box, type the name that you gave your index page.



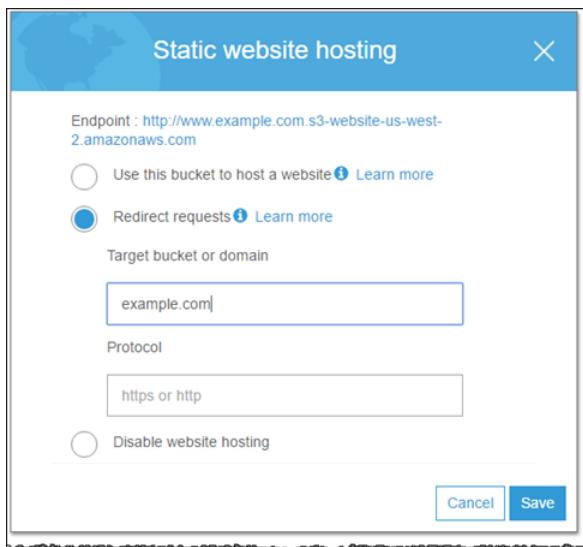
6. Choose **Save**.

### Step 2.3: Configure Your Website Redirect

Now that you have configured your bucket for website hosting, configure the *www.example.com* bucket to redirect all requests for *www.example.com* to *example.com*.

#### To redirect requests from *www.example.com* to *example.com*

1. In the Amazon S3 console, in the **Buckets** list, choose your bucket (*www.example.com*, in this example).
2. Choose **Properties**.
3. Choose **Static website hosting**.
4. Choose **Redirect requests**. In the **Target bucket or domain** box, type *example.com*.



## Step 2.4: Configure Logging for Website Traffic

Optionally, you can configure logging to track the number of visitors accessing your website. To do that, you enable logging for the root domain bucket. For more information, see [\(Optional\) Configuring Web Traffic Logging \(p. 476\)](#).

## Step 2.5: Test Your Endpoint and Redirect

To test the website, type the URL of the endpoint in your browser. Your request is redirected, and the browser displays the index document for `example.com`.

You have now successfully redirected requests from one bucket to another, and the following Amazon S3 bucket website endpoints are accessible to any internet user:

- `example.com.s3-website-us-east-1.amazonaws.com`
- `http://www.example.com.s3-website-us-east-1.amazonaws.com`

In the next step, you use Amazon Route 53 to enable customers to use all of the URLs to navigate to your site.

## Step 3: Create and Configure Amazon Route 53 Hosted Zone

Configure Amazon Route 53 as your Domain Name System (DNS) provider. If you want to serve content from your root domain, such as `example.com`, you must use Amazon Route 53. You create a hosted zone, which holds the DNS records associated with your domain:

- An alias record that maps the domain `example.com` to the `example.com` bucket. This is the bucket that you configured as a website endpoint in step 2.2.
- Another alias record that maps the subdomain `www.example.com` to the `www.example.com` bucket. You configured this bucket to redirect requests to the `example.com` bucket in step 2.2.

## Step 3.1: Create a Hosted Zone for Your Domain

Go to the Amazon Route 53 console at <https://console.aws.amazon.com/route53> and then create a hosted zone for your domain. For instructions, go to [Creating a Hosted Zone](#) in the <http://docs.aws.amazon.com/Route53/latest/DeveloperGuide/>.

The following example shows the hosted zone created for the `example.com` domain. Write down the Amazon Route 53 name servers (NS) for this domain. You will need them later.

The screenshot shows the AWS Route 53 console interface. On the left, there's a navigation sidebar with options like Dashboard, Hosted zones (which is selected and highlighted in orange), Health checks, Traffic flow, Traffic policies, Policy records, Domains, Registered domains, and Pending requests. The main content area has three buttons at the top: 'Create Hosted Zone' (blue), 'Go to Record Sets' (grey), and 'Delete Hosted Zone' (grey). Below these are search and filter fields. A table lists the hosted zones, with one entry for 'example.com' which is marked as 'Public' with a count of '2' record sets and a Hosted Zone ID of 'ZB18PHADT6H9A'. To the right, there's a 'Hosted Zone Details' panel. It shows the 'Domain Name' as 'example.com', 'Type' as 'Hosted Zone', and 'Hosted Zone ID' as 'ZB18PHADT6H9A'. The 'Record Set Count' is listed as '2'. There's a 'Comment' field and a 'Name Servers' field, which is currently empty and highlighted with a red box. A note below says: '\* Before the DNS queries for this hosted zone can resolve, you must update the current DNS servers for the domain above.' At the bottom right of the details panel, there's a 'Tags' section.

## Step 3.2: Add Alias Records for `example.com` and `www.example.com`

The alias records that you add to the hosted zone for your domain maps `example.com` and `www.example.com` to the corresponding S3 buckets. Instead of using IP addresses, the alias records use the Amazon S3 website endpoints. Amazon Route 53 maintains a mapping between the alias records and the IP addresses where the S3 buckets reside.

For step-by-step instructions, see [Creating Resource Record Sets by Using the Amazon Route 53 Console](#) in the [Amazon Route 53 Developer Guide](#).

The following screenshot shows the alias record for `example.com` as an illustration. You also need to create an alias record for `www.example.com`.

	Name	Type	Value
	example.com.	NS	ns-165.awsdns-20.com. ns-1897.awsdns-45.co.uk. ns-1026.awsdns-00.org. ns-783.awsdns-33.net.
	example.com.	SOA	ns-165.awsdns-20.com. awsdns-hostmaster.amazon. ns-165.awsdns-20.com. awsdns-22.com. awsdns-22.com. awsdns-22.com.

To enable this hosted zone, you must use Amazon Route 53 as the DNS server for your domain [example.com](#). If you are moving an existing website to Amazon S3, first you must transfer DNS records associated with your domain [example.com](#) to the hosted zone that you created in Amazon Route 53 for your domain. If you are creating a new website, you can go directly to step 4.

#### Note

Creating, changing, and deleting resource record sets take time to propagate to the Amazon Route 53 DNS servers. Changes generally propagate to all Amazon Route 53 name servers in a couple of minutes. In rare circumstances, propagation can take up to 30 minutes.

### Step 3.3: Transfer Other DNS Records from Your Current DNS Provider to Amazon Route 53

Before you switch to Amazon Route 53 as your DNS provider, you must transfer the remaining DNS records—including MX records, CNAME records, and A records—from your DNS provider to Amazon Route 53. You don't need to transfer the following records:

- NS records—Instead of transferring these, replace their values with the name server values that are provided by Amazon Route 53.
- SOA record—Amazon Route 53 provides this record in the hosted zone with a default value.

Migrating required DNS records is a critical step to ensure the continued availability of all the existing services hosted under the domain name.

### Step 3.4: Create A Type DNS Records

If you're not transferring your website from another existing website, you need to create new A type DNS records.

**Note**

If you've already transferred A type records for this website from a different DNS provider, you can skip the rest of this step.

**To create A type DNS records in the Amazon Route 53 console**

1. Open the Amazon Route 53 console in your web browser.
2. On the **Dashboard**, choose **Hosted zones**.
3. Choose your domain name in the table of hosted zones.
4. Choose **Create Record Set**.
5. In the **Create Record Set** form that appears on the right, choose **Yes** for **Alias**.
6. In **Alias Target**, provide the Amazon S3 website endpoint—for example, `s3-website-us-west-2.amazonaws.com`.
7. Choose **Save Record Set**.

Now that you've added an A type DNS record to your record set, it appears in the table as in the following example.

The screenshot shows a table of DNS records for a specific domain. The columns are labeled 'Name', 'Type', and 'Value'. There are three records listed:

Name	Type	Value
example.com.	A	ALIAS s3-website-us-west-2.amazonaws.com. (z3bj) No
example.com.	NS	ns-165.awsdns-20.com. ns-1897.awsdns-45.co.uk. ns-1026.awsdns-00.org. ns-783.awsdns-33.net.
example.com.	SOA	ns-165.awsdns-20.com. awsdns-hostmaster.amazon -

## Step 4: Switch to Amazon Route 53 as Your DNS Provider

To switch to Amazon Route 53 as your DNS provider, contact your DNS provider and update the name server (NS) record to use the name servers in the delegation that you set in Amazon Route 53.

On your DNS provider's site, update the NS record with the delegation set values of the hosted zone as shown in the following Amazon Route 53 console screenshot. For more information, see [Updating Your DNS Service's Name Server Records](#) in *Amazon Route 53 Developer Guide*.

The screenshot shows the AWS Route 53 console. On the left, a navigation pane lists options like Dashboard, Hosted zones, Health checks, Traffic flow, Traffic policies, Policy records, Domains, Registered domains, and Pending requests. The 'Hosted zones' option is selected. The main area displays a table for the 'example.com' hosted zone. The table has columns for Domain Name, Type, Record Set Count, Comment, and Hosted Zone ID. One record is listed: 'example.com' (Type: Public, Record Set Count: 2, Hosted Zone ID: ZB18PHADT6H9A). To the right, there's a 'Hosted Zone Details' panel with fields for Domain Name (example.com), Type (Public), Hosted Zone ID (ZB18PHADT6H9A), Record Set Count (2), and a Comment field which is currently empty. A red box highlights the 'Name Servers' field, which contains four entries: ns-9999.awsdns-99.com., ns-9999.awsdns-99.org., ns-9999.awsdns-99.co.uk., and ns-9999.awsdns-99.net.. Below this field is a note: '\* Before the domain name changes, you must update the current DNS servers as applicable. For more information, see the note above.' At the bottom of the details panel, there's a 'Tags' section.

When the transfer to Amazon Route 53 is complete, verify that the name server for your domain has indeed changed. On a Linux computer, use the `dig` DNS lookup utility. For example, use this `dig` command:

```
dig +recurse +trace www.example.com any
```

It returns the following output (only partial output is shown). The output shows the same name servers on the Amazon Route 53 hosted zone that you created for the `example.com` domain.

```
...
example.com.    172800  IN      NS      ns-9999.awsdns-99.com.
example.com.    172800  IN      NS      ns-9999.awsdns-99.org.
example.com.    172800  IN      NS      ns-9999.awsdns-99.co.uk.
example.com.    172800  IN      NS      ns-9999.awsdns-99.net.

www.example.com. 300      IN      CNAME   www.example.com.s3-website-us-
east-1.amazonaws.com.
...
```

## Step 5: Testing

To verify that the website is working correctly, in your browser, try the following URLs:

- `http://example.com` - Displays the index document in the `example.com` bucket.
- `http://www.example.com` - Redirects your request to `http://example.com`.

In some cases, you might need to clear the cache of your web browser to see the expected behavior.

## Example: Speed Up Your Website with Amazon CloudFront

You can use [Amazon CloudFront](#) to improve the performance of your website. CloudFront makes your website's files (such as HTML, images, and video) available from data centers around the world (called *edge locations*). When a visitor requests a file from your website, CloudFront automatically redirects the request to a copy of the file at the nearest edge location. This results in faster download times than if the visitor had requested the content from a data center that is located farther away.

CloudFront caches content at edge locations for a period of time that you specify. If a visitor requests content that has been cached for longer than the expiration date, CloudFront checks the origin server to see if a newer version of the content is available. If a newer version is available, CloudFront copies the new version to the edge location. Changes that you make to the original content are replicated to edge locations as visitors request the content.

To speed up your website, use CloudFront to complete the following tasks.

### Tasks

- [Create a CloudFront Distribution \(p. 496\)](#)
- [Update the Record Sets for Your Domain and Subdomain \(p. 497\)](#)
- [\(Optional\) Check the Log Files \(p. 498\)](#)

## Create a CloudFront Distribution

First, you create a CloudFront distribution. This makes your website available from data centers around the world.

### To create a distribution with an Amazon S3 origin

1. Open the CloudFront console at <https://console.aws.amazon.com/cloudfront/>.
2. Choose **Create Distribution**.
3. On the **Select a delivery method for your content** page, for **Web**, choose **Get Started**.
4. On the **Create Distribution** page, in the **Origin Settings** section, for **Origin Domain Name**, type the Amazon S3 static website hosting endpoint for your bucket. For example, `example.com.s3-website-us-east-1.amazonaws.com`.

#### Note

Be sure to specify the static website hosting endpoint, not the name of the bucket. For more information, see [Amazon Simple Storage Service Website Endpoints](#).

CloudFront fills in the **Origin ID** for you.

5. For **Default Cache Behavior Settings**, leave the values set to the defaults. For more information about these configuration options, see [Values that You Specify When You Create or Update a Web Distribution](#) in the [Amazon CloudFront Developer Guide](#).
6. For **Distribution Settings**, do the following:
  - a. Leave **Price Class** set to **Use All Edge Locations (Best Performance)**.
  - b. Set **Alternate Domain Names (CNAMEs)** to the root domain and www subdomain; in this tutorial, these are `example.com` and `www.example.com`. These values must be set before you create aliases for the A records that connect the specified domain names to the CloudFront distribution.
  - c. Set **Default Root Object** to `index.html`. This is the default page that the CloudFront distribution returns if the URL used to access the distribution doesn't contain a file name. This

value should match the index document value that you set in [Configuring a Bucket for Website Hosting \(p. 473\)](#).

- d. Set **Logging to On**.
  - e. For **Bucket for Logs**, choose the logging bucket that you created.
  - f. To store the logs generated by traffic to the CloudFront distribution in a folder, named `cdn`, in the log bucket, type `cdn/` for **Log Prefix**.
  - g. Leave the other settings at their default values.
7. Choose **Create Distribution**.

To see the status of the distribution, find the distribution in the console and check the **Status** column. A status of **InProgress** indicates that the distribution is not yet fully deployed.

After your distribution is deployed, you can reference your content with the new CloudFront domain name. Record the value of **Domain Name** shown in the CloudFront console. You'll need it in the next step. In this example, the value is `dj4p1rv6mvubz.cloudfront.net`.

To verify that your CloudFront distribution is working, type the domain name of the distribution in a web browser. If it is working, your website is visible.

## Update the Record Sets for Your Domain and Subdomain

Now that you have successfully created a CloudFront distribution, update the A records in Amazon Route 53 to point to the new CloudFront distribution.

### To update A records to point to a CloudFront distribution

1. Open the Amazon Route 53 console at <https://console.aws.amazon.com/route53/>.
2. On the **Hosted Zones** page, choose the hosted zone that you created for your domain.
3. Choose **Go to Record Sets**.
4. Choose the A record that you created for the `www` subdomain.
5. For **Alias Target**, choose the CloudFront distribution.
6. Choose **Save Record Set**.
7. To redirect the A record for the root domain to the CloudFront distribution, repeat this procedure.

The update to the record sets takes effect within 2 to 48 hours. To see if the new A records have taken effect, in a web browser, type `http://www.example.com`. If the browser no longer redirects you to `http://example.com`, the new A records are in place.

This change in behavior occurs because traffic routed by the *old* A record to the `www` subdomain S3 bucket is redirected by the settings in Amazon S3 to the root domain. When the new A record has taken effect, traffic routed by the new A record to the CloudFront distribution is not redirected to the root domain.

### Tip

Browsers can cache redirect settings. If you think the new A record settings should have taken effect, but your browser still redirects `http://www.example.com` to `http://example.com`, try clearing your browser history and cache, closing and reopening your browser application, or using a different web browser.

When the new A records are in effect, any visitors who reference the site by using `http://example.com` or `http://www.example.com` are redirected to the nearest CloudFront edge location, where they benefit from faster download times.

If you created your site as a learning exercise only, you can delete the resources that you allocated so that you no longer accrue charges. To do so, continue on to [Clean Up Your Example Resources \(p. 498\)](#). After you delete your AWS resources, your website is no longer available.

## (Optional) Check the Log Files

The access logs tell you how many people are visiting the website. They also contain valuable business data that you can analyze with other services, such as [Amazon EMR](#).

In your bucket, older Amazon S3 log files are located in the `root` folder. All new log files, which should be CloudFront logs, are located in the `cdn` folder. Amazon S3 writes website access logs to your log bucket every two hours. CloudFront writes logs to your log bucket within 24 hours from when the corresponding requests are made.

### To see the log files for your website

1. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. Choose the logging bucket for your website.
3. To see the log files that are stored in the `cdn` or `root` folder, choose `cdn` or `root`.
4. Open Amazon S3 log files, which are text files, in a browser. Download the `.gzip` files written by CloudFront before opening them.

## Clean Up Your Example Resources

If you created your static website as a learning exercise only, be sure to delete the AWS resources that you allocated so that you no longer accrue charges. After you delete your AWS resources, your website is no longer available.

### Tasks

- [Delete the Amazon CloudFront Distribution \(p. 498\)](#)
- [Delete the Amazon Route 53 Hosted Zone \(p. 498\)](#)
- [Delete the S3 Bucket \(p. 499\)](#)

## Delete the Amazon CloudFront Distribution

Before you delete an Amazon CloudFront distribution, you must disable it. A disabled distribution is no longer functional and does not accrue charges. You can enable a disabled distribution at any time. After you delete a disabled distribution, it is no longer available.

### To disable and delete a CloudFront distribution

1. Open the CloudFront console at <https://console.aws.amazon.com/cloudfront/>.
2. Select the distribution that you want to disable, and then choose **Disable**.
3. When prompted for confirmation, choose **Yes, Disable**.
4. Select the disabled distribution, and then choose **Delete**.
5. When prompted for confirmation, choose **Yes, Delete**.

## Delete the Amazon Route 53 Hosted Zone

Before you delete the hosted zone, you must delete the record sets that you created. You don't need to delete the NS and SOA records; these are automatically deleted when you delete the hosted zone.

### To delete the record sets

1. Open the Amazon Route 53 console at <https://console.aws.amazon.com/route53/>.
2. In the list of domain names, select your domain name, and then choose **Go to Record Sets**.
3. In the list of record sets, select the A records that you created. The type of each record set is listed in the **Type** column.
4. Choose **Delete Record Set**.
5. When prompted for confirmation, choose **Confirm**.

### To delete an Amazon Route 53 hosted zone

1. Continuing from the previous procedure, choose **Back to Hosted Zones**.
2. Select your domain name, and then choose **Delete Hosted Zone**.
3. When prompted for confirmation, choose **Confirm**.

## Delete the S3 Bucket

Before you delete your S3 bucket, make sure that logging is disabled for the bucket. Otherwise, AWS continues to write logs to your bucket as you delete it.

### To disable logging for a bucket

1. Open the Amazon S3 console at <https://console.aws.amazon.com/s3/>.
2. Select your bucket, and then choose **Properties**.
3. From **Properties**, choose **Logging**.
4. Clear the **Enabled** check box.
5. Choose **Save**.

Now, you can delete your bucket. For more information, see [How Do I Delete an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

# Configuring Amazon S3 Event Notifications

The Amazon S3 notification feature enables you to receive notifications when certain events happen in your bucket. To enable notifications, you must first add a notification configuration identifying the events you want Amazon S3 to publish, and the destinations where you want Amazon S3 to send the event notifications. You store this configuration in the *notification* subresource (see [Bucket Configuration Options \(p. 61\)](#)) associated with a bucket. Amazon S3 provides an API for you to manage this subresource.

## Topics

- [Overview \(p. 500\)](#)
- [How to Enable Event Notifications \(p. 501\)](#)
- [Event Notification Types and Destinations \(p. 503\)](#)
- [Configuring Notifications with Object Key Name Filtering \(p. 504\)](#)
- [Granting Permissions to Publish Event Notification Messages to a Destination \(p. 509\)](#)
- [Example Walkthrough 1: Configure a Bucket for Notifications \(Message Destination: SNS Topic and SQS Queue\) \(p. 510\)](#)
- [Example Walkthrough 2: Configure a Bucket for Notifications \(Message Destination: AWS Lambda\) \(p. 516\)](#)
- [Event Message Structure \(p. 516\)](#)

## Overview

Currently, Amazon S3 can publish the following events:

- A new object created event—Amazon S3 supports multiple APIs to create objects. You can request notification when only a specific API is used (e.g., `s3:ObjectCreated:Put`) or you can use a wildcard (e.g., `s3:ObjectCreated:*`) to request notification when an object is created regardless of the API used.
- An object removal event—Amazon S3 supports deletes of versioned and unversioned objects. For information about object versioning, see [Object Versioning \(p. 114\)](#) and [Using Versioning \(p. 448\)](#).

You can request notification when an object is deleted or a versioned object is permanently deleted by using the `s3:ObjectRemoved:Delete` event type. Or you can request notification when a delete

marker is created for a versioned object by using `s3:ObjectRemoved:DeleteMarkerCreated`. You can also use a wildcard `s3:ObjectRemoved:*` to request notification anytime an object is deleted. For information about deleting versioned objects, see [Deleting Object Versions \(p. 461\)](#).

- A Reduced Redundancy Storage (RRS) object lost event—Amazon S3 sends a notification message when it detects that an object of the RRS storage class has been lost.

For a list of supported event types, see [Supported Event Types \(p. 503\)](#).

Amazon S3 supports the following destinations where it can publish events:

- Amazon Simple Notification Service (Amazon SNS) topic

Amazon SNS is a flexible, fully managed push messaging service. Using this service, you can push messages to mobile devices or distributed services. With SNS you can publish a message once, and deliver it one or more times. An SNS topic is an access point that recipients can dynamically subscribe to in order to receive event notifications. For more information about SNS, see the [Amazon SNS product detail page](#).

- Amazon Simple Queue Service (Amazon SQS) queue

Amazon SQS is a scalable and fully managed message queuing service. You can use SQS to transmit any volume of data without requiring other services to be always available. In your notification configuration you can request that Amazon S3 publish events to an SQS queue. For more information about SQS, see [Amazon SQS product detail page](#).

- AWS Lambda

AWS Lambda is a compute service that makes it easy for you to build applications that respond quickly to new information. AWS Lambda runs your code in response to events such as image uploads, in-app activity, website clicks, or outputs from connected devices. You can use AWS Lambda to extend other AWS services with custom logic, or create your own back-end that operates at AWS scale, performance, and security. With AWS Lambda, you can easily create discrete, event-driven applications that execute only when needed and scale automatically from a few requests per day to thousands per second.

AWS Lambda can run custom code in response to Amazon S3 bucket events. You upload your custom code to AWS Lambda and create what is called a Lambda function. When Amazon S3 detects an event of a specific type (for example, an object created event), it can publish the event to AWS Lambda and invoke your function in Lambda. In response, AWS Lambda executes your function. For more information, see [AWS Lambda product detail page](#).

The following sections offer more detail about how to enable event notifications on a bucket. The subtopics also provide example walkthroughs to help you explore the notification feature.

- [Example Walkthrough 1: Configure a Bucket for Notifications \(Message Destination: SNS Topic and SQS Queue\) \(p. 510\)](#)
- [Example Walkthrough 2: Configure a Bucket for Notifications \(Message Destination: AWS Lambda\) \(p. 516\)](#)

## How to Enable Event Notifications

Enabling notifications is a bucket-level operation; that is, you store notification configuration information in the *notification* subresource associated with a bucket. You can use any of the following methods to manage notification configuration:

- Using the Amazon S3 console

The console UI enables you to set a notification configuration on a bucket without having to write any code. For instruction, see [How Do I Enable and Configure Event Notifications for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

- Programmatically using the AWS SDKs

**Note**

If you need to, you can also make the Amazon S3 REST API calls directly from your code. However, this can be cumbersome because it requires you to write code to authenticate your requests.

Internally, both the console and the SDKs call the Amazon S3 REST API to manage *notification* subresources associated with the bucket. For notification configuration using AWS SDK examples, see the walkthrough link provided in the preceding section.

Regardless of the method you use, Amazon S3 stores the notification configuration as XML in the *notification* subresource associated with a bucket. For information about bucket subresources, see [Bucket Configuration Options \(p. 61\)](#)). By default, notifications are not enabled for any type of event. Therefore, initially the *notification* subresource stores an empty configuration.

```
<NotificationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
</NotificationConfiguration>
```

To enable notifications for events of specific types, you replace the XML with the appropriate configuration that identifies the event types you want Amazon S3 to publish and the destination where you want the events published. For each destination, you add a corresponding XML configuration. For example:

- Publish event messages to an SQS queue—To set an SQS queue as the notification destination for one or more event types, you add the `QueueConfiguration`.

```
<NotificationConfiguration>
  <QueueConfiguration>
    <Id>optional-id-string</Id>
    <Queue>sqs-queue-arn</Queue>
    <Event>event-type</Event>
    <Event>event-type</Event>
    ...
  </QueueConfiguration>
  ...
</NotificationConfiguration>
```

- Publish event messages to an SNS topic—To set an SNS topic as the notification destination for specific event types, you add the `TopicConfiguration`.

```
<NotificationConfiguration>
  <TopicConfiguration>
    <Id>optional-id-string</Id>
    <Topic>sns-topic-arn</Topic>
    <Event>event-type</Event>
    <Event>event-type</Event>
    ...
  </TopicConfiguration>
  ...
</NotificationConfiguration>
```

- Invoke the AWS Lambda function and provide an event message as an argument—To set a Lambda function as the notification destination for specific event types, you add the `CloudFunctionConfiguration`.

```
<NotificationConfiguration>
  <CloudFunctionConfiguration>
    <Id>optional-id-string</Id>
    <Cloudcode>cloud-function-arn</Cloudcode>
    <Event>event-type</Event>
    <Event>event-type</Event>
    ...
  </CloudFunctionConfiguration>
  ...
</NotificationConfiguration>
```

To remove all notifications configured on a bucket, you save an empty `<NotificationConfiguration/>` element in the *notification* subresource.

When Amazon S3 detects an event of the specific type, it publishes a message with the event information. For more information, see [Event Message Structure \(p. 516\)](#).

## Event Notification Types and Destinations

This section describes the event notification types that are supported by Amazon S3 and the type of destinations where the notifications can be published.

### Supported Event Types

Amazon S3 can publish events of the following types. You specify these event types in the notification configuration.

Event types	Description
<code>s3:ObjectCreated:*</code>	Amazon S3 APIs such as PUT, POST, and COPY can create an object. Using these event types, you can enable notification when an object is created using a specific API, or you can use the <code>s3:ObjectCreated:*</code> event type to request notification regardless of the API that was used to create an object.
<code>s3:ObjectCreated:Put</code>	
<code>s3:ObjectCreated:Post</code>	
<code>s3:ObjectCreated:Copy</code>	You will not receive event notifications from failed operations.
<code>s3:ObjectCreated:CompleteMultipartUpload</code>	
<code>s3:ObjectRemoved:*</code>	By using the <i>ObjectRemoved</i> event types, you can enable notification when an object or a batch of objects is removed from a bucket.
<code>s3:ObjectRemoved:Delete</code>	
<code>s3:ObjectRemoved:DeleteMarkerCreated</code>	You can request notification when an object is deleted or a versioned object is permanently deleted by using the <code>s3:ObjectRemoved:Delete</code> event type. Or you can request notification when a delete marker is created for a versioned object by using <code>s3:ObjectRemoved:DeleteMarkerCreated</code> . For information about deleting versioned objects, see <a href="#">Deleting Object Versions (p. 461)</a> . You can also use a wildcard <code>s3:ObjectRemoved:*</code> to request notification anytime an object is deleted.  You will not receive event notifications from automatic deletes from lifecycle policies or from failed operations.

Event types	Description
<code>s3:ReducedRedundancyLostObject</code>	You can use this event type to request Amazon S3 to send a notification message when Amazon S3 detects that an object of the RRS storage class is lost.

## Supported Destinations

Amazon S3 can send event notification messages to the following destinations. You specify the ARN value of these destinations in the notification configuration.

- Publish event messages to an Amazon Simple Notification Service (Amazon SNS) topic
- Publish event messages to an Amazon Simple Queue Service (Amazon SQS) queue

**Note**

At this time S3 supports only standard SQS queues that are not server-side encryption (SSE) enabled.

- Publish event messages to AWS Lambda by invoking a Lambda function and providing the event message as an argument

You must grant Amazon S3 permissions to post messages to an Amazon SNS topic or an Amazon SQS queue. You must also grant Amazon S3 permission to invoke an AWS Lambda function on your behalf. For information about granting these permissions, see [Granting Permissions to Publish Event Notification Messages to a Destination \(p. 509\)](#).

## Configuring Notifications with Object Key Name Filtering

You can configure notifications to be filtered by the prefix and suffix of the key name of objects. For example, you can set up a configuration so that you are sent a notification only when image files with a ".jpg" extension are added to a bucket. Or you can have a configuration that delivers a notification to an Amazon SNS topic when an object with the prefix "images/" is added to the bucket, while having notifications for objects with a "logs/" prefix in the same bucket delivered to an AWS Lambda function.

You can setup notification configurations that use object key name filtering in the Amazon S3 console and by using Amazon S3 APIs through the AWS SDKs or the REST APIs directly. For information about using the console UI to set a notification configuration on a bucket, see [How Do I Enable and Configure Event Notifications for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

Amazon S3 stores the notification configuration as XML in the *notification* subresource associated with a bucket as described in [How to Enable Event Notifications \(p. 501\)](#). You use the `Filter` XML structure to define the rules for notifications to be filtered by the prefix and/or suffix of an object key name. For information about the details of the `Filter` XML structure, see [PUT Bucket notification](#) in the *Amazon Simple Storage Service API Reference*.

Notification configurations that use `Filter` cannot define filtering rules with overlapping prefixes, overlapping suffixes, or prefix and suffix overlapping. The following sections have examples of valid notification configurations with object key name filtering and examples of notification configurations that are invalid because of prefix/suffix overlapping.

## Examples of Valid Notification Configurations with Object Key Name Filtering

The following notification configuration contains a queue configuration identifying an Amazon SQS queue for Amazon S3 to publish events to of the s3:ObjectCreated:Put type. The events will be published whenever an object that has a prefix of `images/` and a `.jpg` suffix is PUT to a bucket.

```
<NotificationConfiguration>
  <QueueConfiguration>
    <Id>1</Id>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>prefix</Name>
          <Value>images/</Value>
        </FilterRule>
        <FilterRule>
          <Name>suffix</Name>
          <Value>.jpg</Value>
        </FilterRule>
      </S3Key>
    </Filter>
    <Queue>arn:aws:sqs:us-west-2:444455556666:s3notificationqueue</Queue>
    <Event>s3:ObjectCreated:Put</Event>
  </QueueConfiguration>
</NotificationConfiguration>
```

The following notification configuration has multiple non-overlapping prefixes. The configuration defines that notifications for PUT requests in the `images/` folder will go to queue-A while notifications for PUT requests in the `logs/` folder will go to queue-B.

```
<NotificationConfiguration>
  <QueueConfiguration>
    <Id>1</Id>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>prefix</Name>
          <Value>images/</Value>
        </FilterRule>
      </S3Key>
    </Filter>
    <Queue>arn:aws:sqs:us-west-2:444455556666:sqs-queue-A</Queue>
    <Event>s3:ObjectCreated:Put</Event>
  </QueueConfiguration>
  <QueueConfiguration>
    <Id>2</Id>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>prefix</Name>
          <Value>logs/</Value>
        </FilterRule>
      </S3Key>
    </Filter>
    <Queue>arn:aws:sqs:us-west-2:444455556666:sqs-queue-B</Queue>
    <Event>s3:ObjectCreated:Put</Event>
  </QueueConfiguration>
</NotificationConfiguration>
```

The following notification configuration has multiple non-overlapping suffixes. The configuration defines that all .jpg images newly added to the bucket will be processed by Lambda cloud-function-A and all newly added .png images will be processed by cloud-function-B. The suffixes .png and .jpg are not overlapping even though they have the same last letter. Two suffixes are considered overlapping if a given string can end with both suffixes. A string cannot end with both .png and .jpg so the suffixes in the example configuration are not overlapping suffixes.

```
<NotificationConfiguration>
<CloudFunctionConfiguration>
  <Id>1</Id>
  <Filter>
    <S3Key>
      <FilterRule>
        <Name>suffix</Name>
        <Value>.jpg</Value>
      </FilterRule>
    </S3Key>
  </Filter>
  <Cloudcode>arn:aws:lambda:us-west-2:444455556666:cloud-function-A</Cloudcode>
  <Event>s3:ObjectCreated:Put</Event>
</CloudFunctionConfiguration>
<CloudFunctionConfiguration>
  <Id>2</Id>
  <Filter>
    <S3Key>
      <FilterRule>
        <Name>suffix</Name>
        <Value>.png</Value>
      </FilterRule>
    </S3Key>
  </Filter>
  <Cloudcode>arn:aws:lambda:us-west-2:444455556666:cloud-function-B</Cloudcode>
  <Event>s3:ObjectCreated:Put</Event>
</CloudFunctionConfiguration>
</NotificationConfiguration>
```

Your notification configurations that use `Filter` cannot define filtering rules with overlapping prefixes for the same event types, unless the overlapping prefixes are used with suffixes that do not overlap. The following example configuration shows how objects created with a common prefix but non-overlapping suffixes can be delivered to different destinations.

```
<NotificationConfiguration>
<CloudFunctionConfiguration>
  <Id>1</Id>
  <Filter>
    <S3Key>
      <FilterRule>
        <Name>prefix</Name>
        <Value>images</Value>
      </FilterRule>
      <FilterRule>
        <Name>suffix</Name>
        <Value>.jpg</Value>
      </FilterRule>
    </S3Key>
  </Filter>
  <Cloudcode>arn:aws:lambda:us-west-2:444455556666:cloud-function-A</Cloudcode>
  <Event>s3:ObjectCreated:Put</Event>
</CloudFunctionConfiguration>
<CloudFunctionConfiguration>
  <Id>2</Id>
  <Filter>
    <S3Key>
```

```
<FilterRule>
    <Name>prefix</Name>
    <Value>images</Value>
</FilterRule>
<FilterRule>
    <Name>suffix</Name>
    <Value>.png</Value>
</FilterRule>
</S3Key>
</Filter>
<Cloudcode>arn:aws:lambda:us-west-2:444455556666:cloud-function-B</Cloudcode>
<Event>s3:ObjectCreated:Put</Event>
</CloudFunctionConfiguration>
</NotificationConfiguration>
```

## Examples of Notification Configurations with Invalid Prefix/Suffix Overlapping

Your notification configurations that use `Filter`, for the most part, cannot define filtering rules with overlapping prefixes, overlapping suffixes, or overlapping combinations of prefixes and suffixes for the same event types. (You can have overlapping prefixes as long as the suffixes do not overlap. For an example, see [Configuring Notifications with Object Key Name Filtering \(p. 504\)](#).)

You can use overlapping object key name filters with different event types. For example, you could create a notification configuration that uses the prefix `image/` for the `ObjectCreated:Put` event type and the prefix `image/` for the `ObjectDeleted:*` event type.

You will get an error if you try to save a notification configuration that has invalid overlapping name filters for the same event types, when using the AWS Amazon S3 console or when using the Amazon S3 API. This section shows examples of notification configurations that are invalid because of overlapping name filters.

Any existing notification configuration rule is assumed to have a default prefix and suffix that match any other prefix and suffix respectively. The following notification configuration is invalid because it has overlapping prefixes, where the root prefix overlaps with any other prefix. (The same thing would be true if we were using suffix instead of prefix in this example. The root suffix overlaps with any other suffix.)

```
<NotificationConfiguration>
    <TopicConfiguration>
        <Topic>arn:aws:sns:us-west-2:444455556666:sns-notification-one</Topic>
        <Event>s3:ObjectCreated:*</Event>
    </TopicConfiguration>
    <TopicConfiguration>
        <Topic>arn:aws:sns:us-west-2:444455556666:sns-notification-two</Topic>
        <Event>s3:ObjectCreated:*</Event>
        <Filter>
            <S3Key>
                <FilterRule>
                    <Name>prefix</Name>
                    <Value>images</Value>
                </FilterRule>
            </S3Key>
        </Filter>
    </TopicConfiguration>
</NotificationConfiguration>
```

The following notification configuration is invalid because it has overlapping suffixes. Two suffixes are considered overlapping if a given string can end with both suffixes. A string can end with `jpg` and `pg` so the suffixes are overlapping. (The same is true for prefixes, two prefixes are considered overlapping if a given string can begin with both prefixes.)

```
<NotificationConfiguration>
  <TopicConfiguration>
    <Topic>arn:aws:sns:us-west-2:444455556666:sns-topic-one</Topic>
    <Event>s3:ObjectCreated:*</Event>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>suffix</Name>
          <Value>jpg</Value>
        </FilterRule>
      </S3Key>
    </Filter>
  </TopicConfiguration>
  <TopicConfiguration>
    <Topic>arn:aws:sns:us-west-2:444455556666:sns-topic-two</Topic>
    <Event>s3:ObjectCreated:Put</Event>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>suffix</Name>
          <Value>pg</Value>
        </FilterRule>
      </S3Key>
    </Filter>
  </TopicConfiguration>
</NotificationConfiguration>
```

The following notification configuration is invalid because it has overlapping prefixes and suffixes.

```
<NotificationConfiguration>
  <TopicConfiguration>
    <Topic>arn:aws:sns:us-west-2:444455556666:sns-topic-one</Topic>
    <Event>s3:ObjectCreated:*</Event>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>prefix</Name>
          <Value>images</Value>
        </FilterRule>
        <FilterRule>
          <Name>suffix</Name>
          <Value>jpg</Value>
        </FilterRule>
      </S3Key>
    </Filter>
  </TopicConfiguration>
  <TopicConfiguration>
    <Topic>arn:aws:sns:us-west-2:444455556666:sns-topic-two</Topic>
    <Event>s3:ObjectCreated:Put</Event>
    <Filter>
      <S3Key>
        <FilterRule>
          <Name>suffix</Name>
          <Value>jpg</Value>
        </FilterRule>
      </S3Key>
    </Filter>
  </TopicConfiguration>
</NotificationConfiguration>
```

# Granting Permissions to Publish Event Notification Messages to a Destination

Before Amazon S3 can publish messages to a destination, you must grant the Amazon S3 principal the necessary permissions to call the relevant API to publish messages to an SNS topic, an SQS queue, or a Lambda function.

## Granting Permissions to Invoke an AWS Lambda Function

Amazon S3 publishes event messages to AWS Lambda by invoking a Lambda function and providing the event message as an argument.

When you use the Amazon S3 console to configure event notifications on an Amazon S3 bucket for a Lambda function, the Amazon S3 console will set up the necessary permissions on the Lambda function so that Amazon S3 has permissions to invoke the function from the bucket. For more information, see [How Do I Enable and Configure Event Notifications for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

You can also grant Amazon S3 permissions from AWS Lambda to invoke your Lambda function. For more information, see [Tutorial: Using AWS Lambda with Amazon S3](#) in the *AWS Lambda Developer Guide*.

## Granting Permissions to Publish Messages to an SNS Topic or an SQS Queue

You attach an IAM policy to the destination SNS topic or SQS queue to grant Amazon S3 permissions to publish messages to the SNS topic or SQS queue.

Example of an IAM policy that you attach to the destination SNS topic.

```
{
  "Version": "2008-10-17",
  "Id": "example-ID",
  "Statement": [
    {
      "Sid": "example-statement-ID",
      "Effect": "Allow",
      "Principal": {
        "Service": "s3.amazonaws.com"
      },
      "Action": [
        "SNS:Publish"
      ],
      "Resource": "SNS-ARN",
      "Condition": {
        "ArnLike": {
          "aws:SourceArn": "arn:aws:s3:::*::bucket-name"
        }
      }
    ]
  }
}
```

Example of an IAM policy that you attach to the destination SQS queue.

```
{  
    "Version": "2008-10-17",  
    "Id": "example-ID",  
    "Statement": [  
        {  
            "Sid": "example-statement-ID",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "*"  
            },  
            "Action": [  
                "SQS:SendMessage"  
            ],  
            "Resource": "SQS-ARN",  
            "Condition": {  
                "ArnLike": {  
                    "aws:SourceArn": "arn:aws:s3:::*::bucket-name"  
                }  
            }  
        }  
    ]  
}
```

Note that for both the Amazon SNS and Amazon SQS IAM policies, you can specify the `StringLike` condition in the policy, instead of the `ArnLike` condition.

```
"Condition": {  
    "StringLike": {  
        "aws:SourceArn": "arn:aws:s3:::*::bucket-name"  
    }  
}
```

For an example of how to attach a policy to a SNS topic or an SQS queue, see [Example Walkthrough 1: Configure a Bucket for Notifications \(Message Destination: SNS Topic and SQS Queue\) \(p. 510\)](#).

For more information about permissions, see the following topics:

- [Example Cases for Amazon SNS Access Control](#) in the *Amazon Simple Notification Service Developer Guide*
- [Access Control Using AWS Identity and Access Management \(IAM\)](#) in the *Amazon Simple Queue Service Developer Guide*

## Example Walkthrough 1: Configure a Bucket for Notifications (Message Destination: SNS Topic and SQS Queue)

### Topics

- [Walkthrough Summary \(p. 511\)](#)
- [Step 1: Create an Amazon SNS Topic \(p. 511\)](#)
- [Step 2: Create an Amazon SQS Queue \(p. 512\)](#)
- [Step 3: Add a Notification Configuration to Your Bucket \(p. 513\)](#)
- [Step 4: Test the Setup \(p. 516\)](#)

## Walkthrough Summary

In this walkthrough you add notification configuration on a bucket requesting Amazon S3 to:

- Publish events of the `s3:ObjectCreated:*` type to an Amazon SQS queue.
- Publish events of the `s3:ReducedRedundancyLostObject` type to an Amazon SNS topic.

For information about notification configuration, see [Configuring Amazon S3 Event Notifications \(p. 500\)](#).

You can do all these steps using the console, without writing any code. In addition, code examples, using AWS SDKs for Java and .NET are also provided so you can add notification configuration programmatically.

You will do the following in this walkthrough:

1. Create an Amazon SNS topic.

Using the Amazon SNS console, you create an SNS topic and subscribe to the topic so that any events posted to it are delivered to you. You will specify email as the communications protocol. After you create a topic, Amazon SNS will send an email. You must click a link in the email to confirm the topic subscription.

You will attach an access policy to the topic to grant Amazon S3 permission to post messages.

2. Create an Amazon SQS queue.

Using the Amazon SQS console, you create an SQS queue. You can access any messages Amazon S3 sends to the queue programmatically. But for this walkthrough, you will verify notification messages in the console.

You will attach an access policy to the topic to grant Amazon S3 permission to post messages.

3. Add notification configuration to a bucket.

## Step 1: Create an Amazon SNS Topic

Follow the steps to create and subscribe to an Amazon Simple Notification Service (Amazon SNS) topic.

1. Using Amazon SNS console create a topic. For instructions, see [Create a Topic](#) in the *Amazon Simple Notification Service Developer Guide*.
2. Subscribe to the topic. For this exercise, use email as the communications protocol. For instructions, see [Subscribe to a Topic](#) in the *Amazon Simple Notification Service Developer Guide*.

You will get email requesting you to confirm your subscription to the topic. Confirm the subscription.

3. Replace the access policy attached to the topic by the following policy. You must update the policy by providing the your SNS topic ARN and bucket name.:

```
{  
  "Version": "2008-10-17",  
  "Id": "example-ID",  
  "Statement": [  
    {  
      "Sid": "example-statement-ID",  
      "Effect": "Allow",  
      "Principal": {  
        "AWS": "*"  
      }  
    }  
  ]  
}
```

```
        },
        "Action": [
            "SNS:Publish"
        ],
        "Resource": "SNS-topic-ARN",
        "Condition": {
            "ArnLike": {
                "aws:SourceArn": "arn:aws:s3:::bucket-name"
            }
        }
    ]
}
```

4. Note the topic ARN.

The SNS topic you created is another resource in your AWS account, and it has a unique Amazon Resource Name (ARN). You will need this ARN in the next step. The ARN will be of the following format:

```
arn:aws:sns:aws-region:account-id:topic-name
```

## Step 2: Create an Amazon SQS Queue

Follow the steps to create and subscribe to an Amazon Simple Queue Service (Amazon SQS) queue.

1. Using the Amazon SQS console, create a queue. For instructions, see [Getting Started with Amazon SQS](#) in the *Amazon Simple Queue Service Developer Guide*.
2. Replace the access policy attached to the queue with the following policy (in the SQS console, you select the queue, and in the **Permissions** tab, click **Edit Policy Document (Advanced)**).

```
{
    "Version": "2008-10-17",
    "Id": "example-ID",
    "Statement": [
        {
            "Sid": "example-statement-ID",
            "Effect": "Allow",
            "Principal": {
                "AWS": "*"
            },
            "Action": [
                "SQS:SendMessage"
            ],
            "Resource": "SQS-queue-ARN",
            "Condition": {
                "ArnLike": {
                    "aws:SourceArn": "arn:aws:s3:::bucket-name"
                }
            }
        ]
    }
}
```

3. Note the queue ARN

The SQS queue you created is another resource in your AWS account, and it has a unique Amazon Resource Name (ARN). You will need this ARN in the next step. The ARN will be of the following format:

```
arn:aws:sqs:aws-region:account-id:queue-name
```

## Step 3: Add a Notification Configuration to Your Bucket

You can enable bucket notifications either by using the Amazon S3 console or programmatically by using AWS SDKs. Choose any one of the options to configure notifications on your bucket. This section provides code examples using the AWS SDKs for Java and .NET.

### Step 3 (option a): Enable Notifications on a Bucket Using the Console

Using the Amazon S3 console, add a notification configuration requesting Amazon S3 to:

- Publish events of the `s3:ObjectCreated:*` type to your Amazon SQS queue.
- Publish events of the `s3:ReducedRedundancyLostObject` type to your Amazon SNS topic.

After you save the notification configuration, Amazon S3 will post a test message, which you will get via email.

For instructions, see [How Do I Enable and Configure Event Notifications for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

### Step 3 (option b): Enable Notifications on a Bucket Using the AWS SDK for .NET

The following C# code example provides a complete code listing that adds a notification configuration to a bucket. You will need to update the code and provide your bucket name and SNS topic ARN. For information about how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

#### Example

```
using System;
using System.Collections.Generic;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazon.com.docsamples
{
    class EnableNotifications
    {
        static string bucketName = "***bucket name***";
        static string snsTopic = "***SNS topic ARN***";
        static string sqsQueue = "***SQS queue ARN***";

        static string putEventType = "s3:ObjectCreated:Put";
        static string rrsObjectLostType = "s3:ObjectCreated:Copy";

        public static void Main(string[] args)
        {
            using (var client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                Console.WriteLine("Enabling Notification on a bucket");
                var config = new NotificationConfiguration();
                config.AddQueue(queueName: sqsQueue, eventTypes: putEventType);
                config.AddTopic(topicName: snsTopic, eventTypes: rrsObjectLostType);
                client.PutBucketNotificationConfiguration(bucketName, config);
            }
        }
    }
}
```

```
        EnableNotification(client);
    }

    Console.WriteLine("Press any key to continue...");
    Console.ReadKey();
}

static void EnableNotification(IAmazonS3 client)
{
    try
    {
        List<Amazon.S3.Model.TopicConfiguration> topicConfigurations = new
List<TopicConfiguration>();

        topicConfigurations.Add(new TopicConfiguration()
        {
            Event = rrsObjectLostType,
            Topic = snsTopic
        });

        List<Amazon.S3.Model.QueueConfiguration> queueConfigurations = new
List<QueueConfiguration>();
        queueConfigurations.Add(new QueueConfiguration()
        {
            Events = new List<string> { putEventType },
            Queue = sqsQueue
        });

        PutBucketNotificationRequest request = new PutBucketNotificationRequest
        {
            BucketName = bucketName,
            TopicConfigurations = topicConfigurations,
            QueueConfigurations = queueConfigurations
        };

        PutBucketNotificationResponse response =
client.PutBucketNotification(request);
    }
    catch (AmazonS3Exception amazonS3Exception)
    {
        if (amazonS3Exception.ErrorCode != null &&
            (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
            ||
            amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
        {
            Console.WriteLine("Check the provided AWS Credentials.");
            Console.WriteLine(
                "To sign up for service, go to http://aws.amazon.com/s3");
        }
        else
        {
            Console.WriteLine(
                "Error occurred. Message:{0} when enabling notifications.",
                amazonS3Exception.Message);
        }
    }
}
}
```

## Step 3 (option c): Enable Notifications on a Bucket Using the AWS SDK for Java

The following Java code example provides a complete code listing that adds a notification configuration to a bucket. You will need to update the code and provide your bucket name and SNS topic ARN. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

### Example

```
import java.io.IOException;
import java.util.Collection;
import java.util.EnumSet;
import java.util.LinkedList;

import com.amazonaws.AmazonClientException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.AmazonS3Exception;
import com.amazonaws.services.s3.model.BucketNotificationConfiguration;
import com.amazonaws.services.s3.model.TopicConfiguration;
import com.amazonaws.services.s3.model.QueueConfiguration;
import com.amazonaws.services.s3.model.S3Event;
import com.amazonaws.services.s3.model.SetBucketNotificationConfigurationRequest;

public class NotificationConfigurationOnABucket {
    private static String bucketName = "*** bucket name ***";
    private static String snsTopicARN = "*** SNS Topic ARN ***";
    private static String sqsQueueARN = "*** SQS Queue ARN ***";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            System.out.println("Setting notification configuration on a bucket.\n");

            BucketNotificationConfiguration notificationConfiguration = new
BucketNotificationConfiguration();
            notificationConfiguration.addConfiguration(
                "snsTopicConfig",
                new TopicConfiguration(snsTopicARN, EnumSet
                    .of(S3Event.ReducedRedundancyLostObject)));

            notificationConfiguration.addConfiguration(
                "sqsQueueConfig",
                new QueueConfiguration(sqsQueueARN, EnumSet
                    .of(S3Event.ObjectCreated)));

            SetBucketNotificationConfigurationRequest request =
                new SetBucketNotificationConfigurationRequest(bucketName,
notificationConfiguration);

            s3client.setBucketNotificationConfiguration(request);

        } catch (AmazonS3Exception ase) {
            System.out.println("Caught an AmazonServiceException, which "
                + "means your request made it "
                + "to Amazon S3, but was rejected with an error response"
                + " for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorResponse());
            System.out.println("Request ID: " + ase.getRequestId());
        }
    }
}
```

```
        System.out.println("Error XML" + ase.getErrorResponseXml());
    } catch (AmazonClientException ace) {
        System.out.println("Caught an AmazonClientException, which "
            + "means the client encountered "
            + "an internal error while trying to "
            + "communicate with S3, "
            + "such as not being able to access the network.");
        System.out.println("Error Message: " + ace.getMessage());
    }
}
```

## Step 4: Test the Setup

Now you can test the setup by uploading an object to your bucket and verify the event notification in the Amazon SQS console. For instructions, see [Receiving a Message](#) in the *Amazon Simple Queue Service Developer Guide "Getting Started"* section.

# Example Walkthrough 2: Configure a Bucket for Notifications (Message Destination: AWS Lambda)

For an example of using Amazon S3 notifications with AWS Lambda, see [Using AWS Lambda with Amazon S3](#) in the *AWS Lambda Developer Guide*.

## Event Message Structure

The notification message Amazon S3 sends to publish an event is a JSON message with the following structure. Note the following:

- The `responseElements` key value is useful if you want to trace the request by following up with Amazon S3 support. Both `x-amz-request-id` and `x-amz-id-2` help Amazon S3 to trace the individual request. These values are the same as those that Amazon S3 returned in the response to your original PUT request, which initiated the event.
- The `s3` key provides information about the bucket and object involved in the event. Note that the `object keyname` value is URL encoded. For example "red flower.jpg" becomes "red+flower.jpg".
- The `sequencer` key provides a way to determine the sequence of events. Event notifications are not guaranteed to arrive in the order that the events occurred. However, notifications from events that create objects (PUTs) and delete objects contain a `sequencer`, which can be used to determine the order of events for a given object key.

If you compare the `sequencer` strings from two event notifications on the same object key, the event notification with the greater `sequencer` hexadecimal value is the event that occurred later. If you are using event notifications to maintain a separate database or index of your Amazon S3 objects, you will probably want to compare and store the `sequencer` values as you process each event notification.

Note that:

- `sequencer` cannot be used to determine order for events on different object keys.
- The sequencers can be of different lengths. So to compare these values, you first right pad the shorter value with zeros and then do lexicographical comparison.

```
{
  "Records": [
```

```
{
    "eventVersion": "2.0",
    "eventSource": "aws:s3",
    "awsRegion": "us-east-1",
    "eventTime": The time, in ISO-8601 format, for example, 1970-01-01T00:00:00.000Z, when S3 finished processing the request,
    "eventName": "event-type",
    "userIdentity": {
        "principalId": "Amazon-customer-ID-of-the-user-who-caused-the-event"
    },
    "requestParameters": {
        "sourceIPAddress": "ip-address-where-request-came-from"
    },
    "responseElements": {
        "x-amz-request-id": "Amazon S3 generated request ID",
        "x-amz-id-2": "Amazon S3 host that processed the request"
    },
    "s3": {
        "s3SchemaVersion": "1.0",
        "configurationId": "ID found in the bucket notification configuration",
        "bucket": {
            "name": "bucket-name",
            "ownerIdentity": {
                "principalId": "Amazon-customer-ID-of-the-bucket-owner"
            },
            "arn": "bucket-ARN"
        },
        "object": {
            "key": "object-key",
            "size": object-size,
            "eTag": "object eTag",
            "versionId": "object version if bucket is versioning-enabled, otherwise null",
            "sequencer": "a string representation of a hexadecimal value used to determine event sequence, only used with PUTs and DELETES"
        }
    }
},
{
    // Additional events
}
]
```

The following are example messages:

- Test message—When you configure an event notification on a bucket, Amazon S3 sends the following test message:

```
{
    "Service": "Amazon S3",
    "Event": "s3:TestEvent",
    "Time": "2014-10-13T15:57:02.089Z",
    "Bucket": "bucketname",
    "RequestId": "5582815E1AEA5ADF",
    "HostId": "8cLeGAmw098X5cv4Zkwcmo8vvZa3eH3eKxsPzbB9wr+YstdA6Knx4Ip8EXAMPLE"
}
```

- Example message when an object is created using the PUT request—The following message is an example of a message Amazon S3 sends to publish an s3:ObjectCreated:Put event:

```
{
```

```
"Records": [
    {
        "eventVersion": "2.0",
        "eventSource": "aws:s3",
        "awsRegion": "us-east-1",
        "eventTime": "1970-01-01T00:00:00.000Z",
        "eventName": "ObjectCreated:Put",
        "userIdentity": {
            "principalId": "AIDAJDPLRKLG7UEXAMPLE"
        },
        "requestParameters": {
            "sourceIPAddress": "127.0.0.1"
        },
        "responseElements": {
            "x-amz-request-id": "C3D13FE58DE4C810",
            "x-amz-id-2": "FMyUVURIY8/IgAtTv8xRjskZOpCIZ9KG4V5Wp6S7S/JRWeUWerMUE5JgHvANOjpD"
        },
        "s3": {
            "s3SchemaVersion": "1.0",
            "configurationId": "testConfigRule",
            "bucket": {
                "name": "mybucket",
                "ownerIdentity": {
                    "principalId": "A3NL1KOZZKExample"
                },
                "arn": "arn:aws:s3:::mybucket"
            },
            "object": {
                "key": "HappyFace.jpg",
                "size": 1024,
                "eTag": "d41d8cd98f00b204e9800998ecf8427e",
                "versionId": "096fKKXRTTl3on89fVO.nfljtsv6qko",
                "sequencer": "0055AED6DCD90281E5"
            }
        }
    }
]
```

# Cross-Region Replication (CRR)

Cross-region replication is a bucket-level configuration that enables automatic, asynchronous copying of objects across buckets in different AWS Regions. We refer to these buckets as *source* bucket and *destination* bucket. These buckets can be owned by different AWS accounts.

To activate this feature, you add a replication configuration to your source bucket to direct Amazon S3 to replicate objects according to the configuration. In the replication configuration, you provide information such as the following:

- The destination bucket where you want Amazon S3 to replicate the objects.
- The objects you want to replicate. You can request Amazon S3 to replicate all or a subset of objects by providing a key name prefix in the configuration. For example, you can configure cross-region replication to replicate only objects with the key name prefix `Tax/`. This causes Amazon S3 to replicate objects with a key such as `Tax/doc1` or `Tax/doc2`, but not an object with the key `Legal/doc3`.
- By default, Amazon S3 uses the storage class of the source object to create an object replica. You can optionally specify a storage class to use for object replicas in the destination bucket.

There are additional optional configurations that you can specify. For more information, see [Additional Cross-Region Replication Configurations \(p. 529\)](#).

Unless you make specific requests in the replication configuration, the object replicas in the destination bucket are exact replicas of the objects in the source bucket. For example:

- Replicas have the same key names and the same metadata—for example, creation time, user-defined metadata, and version ID.
- Amazon S3 stores object replicas using the same storage class as the source object, unless you explicitly specify a different storage class in the replication configuration.
- Assuming that the object replica continues to be owned by the source object owner, when Amazon S3 initially replicates objects, it also replicates the corresponding object access control list (ACL).

Amazon S3 encrypts all data in transit across AWS Regions using Secure Sockets Layer (SSL).

You can replicate objects from a source bucket to only one destination bucket. After Amazon S3 replicates an object, the object cannot be replicated again. For example, you might change the destination bucket in an existing replication configuration, but Amazon S3 does not replicate it again.

## Use-Case Scenarios

You might configure cross-region replication on a bucket for various reasons, including the following:

- **Compliance requirements** – Although, by default, Amazon S3 stores your data across multiple geographically distant Availability Zones, compliance requirements might dictate that you store data at even further distances. Cross-region replication allows you to replicate data between distant AWS Regions to satisfy these compliance requirements.
- **Minimize latency** – Your customers are in two geographic locations. To minimize latency in accessing objects, you can maintain object copies in AWS Regions that are geographically closer to your users.
- **Operational reasons** – You have compute clusters in two different AWS Regions that analyze the same set of objects. You might choose to maintain object copies in those Regions.
- **Maintain object copies under different ownership** – Regardless of who owns the source bucket or the source object, you can direct Amazon S3 to change replica ownership to the AWS account that owns the destination bucket. You might choose to do this to restrict access to object replicas. This is also referred to as the *owner override* option of the replication configuration.

## Requirements

Requirements for cross-region replication:

- The source and destination buckets must have versioning enabled. For more information about versioning, see [Using Versioning \(p. 448\)](#).
- The source and destination buckets must be in different AWS Regions. For a list of AWS Regions where you can create a bucket, see [Regions and Endpoints](#) in the *AWS General Reference*.
- Amazon S3 must have permissions to replicate objects from that source bucket to the destination bucket on your behalf.

You can grant these permissions by creating an IAM role. For more information about IAM roles, see [Create an IAM Role \(p. 524\)](#).

- If the source bucket owner also owns the object, the bucket owner has full permissions to replicate the object. If not, the object owner must grant the bucket owner the `READ` and `READ_ACP` permissions via the object ACL. For more information about Amazon S3 actions, see [Specifying](#)

[Permissions in a Policy \(p. 338\)](#). For more information about resources and ownership, see [Amazon S3 Resources \(p. 296\)](#).

If you are setting replication configuration in a cross-account scenario, where source and destination buckets are owned by different AWS accounts, the following additional requirements apply:

- The IAM role must have permissions to replicate objects in the destination bucket. The destination bucket owner can grant these permissions via a bucket policy. For an example, see [Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#).
- In the replication configuration, you can optionally direct Amazon S3 to change the ownership of object replica to the AWS account that owns the destination bucket. For related additional requirements, see [Cross-Region Replication Additional Configuration: Change Replica Owner \(p. 529\)](#).

## Related Topics

[What Is and Is Not Replicated \(p. 521\)](#)

[Setting Up Cross-Region Replication \(p. 523\)](#)

[Finding the Cross-Region Replication Status \(p. 552\)](#)

[Cross-Region Replication: Additional Considerations \(p. 554\)](#)

[Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account \(p. 536\)](#)

[Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#)

## What Is and Is Not Replicated

This section explains what Amazon S3 replicates and what it does not replicate after you add a replication configuration on a bucket.

### What Is Replicated

Amazon S3 replicates the following:

- Any new objects created after you add a replication configuration, with exceptions described in the next section.
- In addition to unencrypted objects, Amazon S3 replicates objects created with server-side encryption using the Amazon S3-managed encryption key. The replicated copy of the object is also encrypted using server-side encryption with the Amazon S3-managed encryption key.
- Along with the objects, Amazon S3 also replicates object metadata.

- Amazon S3 replicates only objects in the source bucket for which the bucket owner has permissions to read objects and read access control lists (ACLs). For more information about resource ownership, see [About the Resource Owner \(p. 296\)](#).
- Any object ACL updates are replicated, unless you directed Amazon S3 to change the replica ownership in a cross-account scenario (see [Cross-Region Replication Additional Configuration: Change Replica Owner \(p. 529\)](#)).

There can be some delay before Amazon S3 can bring the two ACLs in sync. This applies only to objects created after you add a replication configuration to the bucket.

- Amazon S3 replicates object tags, if any.

## Delete Operation and Cross-Region Replication

If you delete an object from the source bucket, the cross-region replication behavior is as follows:

- If a DELETE request is made without specifying an object version ID, Amazon S3 adds a delete marker, which cross-region replication replicates to the destination bucket. For more information about versioning and delete markers, see [Using Versioning \(p. 448\)](#).
- If a DELETE request specifies a particular object version ID to delete, Amazon S3 deletes that object version in the source bucket, but it does not replicate the deletion in the destination bucket (in other words, it does not delete the same object version from the destination bucket). This behavior protects data from malicious deletions.

## What Is Not Replicated

Amazon S3 does not replicate the following:

- Amazon S3 does not retroactively replicate objects that existed before you added replication configuration.
- The following encrypted objects are not replicated:
  - Objects created with server-side encryption using customer-provided (SSE-C) encryption keys.
  - Objects created with server-side encryption using AWS KMS-managed encryption (SSE-KMS) keys, unless you explicitly enable this option.

For more information about server-side encryption, see [Protecting Data Using Server-Side Encryption \(p. 410\)](#).

- Objects in the source bucket for which the bucket owner does not have permissions. This can happen when the object owner is different from the bucket owner. For information about how an object owner can grant permissions to the bucket owner, see [Granting Cross-Account Permissions to Upload Objects While Ensuring the Bucket Owner Has Full Control \(p. 369\)](#).

- Updates to bucket-level subresources are not replicated. For example, you might change lifecycle configuration on your source bucket or add notification configuration to your source bucket. These changes are not applied to the destination bucket. This allows you to have different bucket configurations on the source and destination buckets.
- Only customer actions are replicated. Actions performed by lifecycle configuration are not replicated. For more information about lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

For example, if lifecycle configuration is enabled only on your source bucket, Amazon S3 creates delete markers for expired objects, but it does not replicate those markers. However, you can have the same lifecycle configuration on both the source and destination buckets if you want the same lifecycle configuration applied to both buckets.

- Objects in the source bucket that are replicas, created by another cross-region replication, are not replicated.

Suppose that you configure cross-region replication where bucket A is the source and bucket B is the destination. Now suppose that you add another cross-region replication where bucket B is the source and bucket C is the destination. In this case, objects in bucket B that are replicas of objects in bucket A are not replicated to bucket C.

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

[Setting Up Cross-Region Replication \(p. 523\)](#)

[Finding the Cross-Region Replication Status \(p. 552\)](#)

# Setting Up Cross-Region Replication

To set up cross-region replication, you need two buckets—source and destination. These buckets must be versioning-enabled and in different AWS Regions. For a list of AWS Regions where you can create a bucket, see [Regions and Endpoints](#) in the *AWS General Reference*. You can replicate objects from a source bucket to only one destination bucket.

### Important

If you have an object expiration lifecycle policy in your non-versioned bucket and you want to maintain the same permanent delete behavior when you enable versioning, you must add a noncurrent expiration policy. The noncurrent expiration lifecycle policy will manage the deletes of the noncurrent object versions in the version-enabled bucket. (A version-enabled bucket maintains one current and zero or more noncurrent object versions.) For more information, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

### Topics

- [Setting Up Cross-Region Replication for Buckets Owned by the Same AWS Account \(p. 524\)](#)
- [Setting Up Cross-Region Replication for Buckets Owned by Different AWS Accounts \(p. 528\)](#)
- [Related Topics \(p. 529\)](#)

# Setting Up Cross-Region Replication for Buckets Owned by the Same AWS Account

If both buckets are owned by the same AWS account, do the following to set up cross-region replication from the source to the destination bucket:

- Create an IAM role in the account. This role grants Amazon S3 permission to replicate objects on your behalf.
- Add a replication configuration on the source bucket.

## Create an IAM Role

Amazon S3 replicates objects from the source bucket to the destination bucket. You must grant Amazon S3 necessary permissions via an IAM role.

### Note

By default, all Amazon S3 resources—buckets, objects, and related subresources—are private: only the resource owner can access the resource. So, Amazon S3 needs permissions to read objects from the source bucket and replicate them to the destination bucket.

When you create an IAM role, you attach the following policies to the role:

- A trust policy in which you identify Amazon S3 as the service principal who can assume the role, as shown:

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Principal": {  
                "Service": "s3.amazonaws.com"  
            },  
            "Action": "sts:AssumeRole"  
        }  
    ]  
}
```

For more information about IAM roles, see [IAM Roles](#) in the *IAM User Guide*.

- An access policy in which you grant the role permissions to perform the replication task on your behalf. When Amazon S3 assumes the role, it has the permissions you specify in this policy.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Action": [  
                "s3:GetReplicationConfiguration",  
                "s3>ListBucket"  
            ],  
            "Resource": [  
                "arn:aws:s3:::source-bucket"  
            ]  
        },  
        {  
            "Effect": "Allow",  
            "Action": [  
                "s3:PutObject",  
                "s3:PutObjectAcl"  
            ],  
            "Resource": [  
                "arn:aws:s3:::destination-bucket/  
            ]  
        }  
    ]  
}
```

```
{  
    "Effect": "Allow",  
    "Action": [  
  
        "s3:GetObjectVersion",  
        "s3:GetObjectVersionAcl",  
        "s3:GetObjectVersionTagging"  
  
    ],  
    "Resource": [  
        "arn:aws:s3:::source-bucket/*"  
    ]  
},  
{  
    "Effect": "Allow",  
    "Action": [  
        "s3:ReplicateObject",  
        "s3:ReplicateDelete",  
        "s3:ReplicateTags"  
    ],  
    "Resource": "arn:aws:s3:::destination-bucket/*"  
}  
]  
}
```

The access policy grants permissions for these actions:

- `s3:GetReplicationConfiguration` and `s3>ListBucket` - Permissions for these actions on the *source* bucket enable Amazon S3 to retrieve replication configuration and list bucket (the current permission model requires the `s3>ListBucket` permission to access the delete markers).
- `s3GetObjectVersion` and `s3GetObjectVersionAcl` - Permissions for these actions granted on all objects enable Amazon S3 to get a specific object version and access control list (ACL) on it.
- `s3ReplicateObject` and `s3ReplicateDelete` - Permissions for these actions on objects in the *destination* bucket enable Amazon S3 to replicate objects or delete markers to the destination bucket. For information about delete markers, see [Delete Operation and Cross-Region Replication \(p. 522\)](#).

**Note**

Permission for the `s3ReplicateObject` action on the *destination* bucket also allows replication of object tags. Therefore, Amazon S3 also replicates object tags (you don't need to explicitly grant permission for the `s3ReplicateTags` action).

- `s3GetObjectVersionTagging` - Permission for this action on objects in the *source* bucket allows Amazon S3 to read object tags for replication (see [Object Tagging \(p. 116\)](#)). If Amazon S3 does not get this permission, it replicates the objects but not the object tags, if any.

For a list of Amazon S3 actions, see [Specifying Permissions in a Policy \(p. 338\)](#).

**Important**

You can grant permissions only on resources that you have permissions for. More specifically, the AWS account that owns the IAM role must have permissions for the actions that it grants to the IAM role.

For example, suppose that the source bucket contains objects owned by another AWS account. The object owner must explicitly grant the AWS account that owns the IAM role necessary permissions via the object ACL. Otherwise, cross-region replication of these objects fails (because Amazon S3 cannot access these objects as per the permissions granted in the role policy). For information about ACL permissions, see [Access Control List \(ACL\) Overview \(p. 394\)](#).

As you learn more about additional CRR configurations, you might grant Amazon S3 permissions for additional resources. The general rule still applies, that the AWS account that owns the IAM role must have permissions for the actions that it grants to the IAM role.

## Add Replication Configuration

When you add a replication configuration to a bucket, Amazon S3 stores the configuration as XML. The following are sample configurations. For more information about the XML structure, see [PUT Bucket replication](#) in the *Amazon Simple Storage Service API Reference*.

### Example 1: Replication Configuration with One Rule

Consider the following replication configuration:

```
<?xml version="1.0" encoding="UTF-8"?>

<ReplicationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Role>arn:aws:iam::AcctID:role/role-name</Role>
  <Rule>
    <Status>Enabled</Status>
    <Prefix></Prefix>

    <Destination><Bucket>arn:aws:s3:::destinationbucket</Bucket></Destination>

  </Rule>
</ReplicationConfiguration>
```

In addition to the IAM role for Amazon S3 to assume, the configuration specifies one rule as follows:

- Rule status, indicating that the rule is in effect.
- Empty prefix, indicating that the rule applies to all objects in the bucket.
- Destination bucket, where objects are replicated.

You can optionally specify a storage class for the object replicas as shown:

```
<?xml version="1.0" encoding="UTF-8"?>

<ReplicationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Role>arn:aws:iam::account-id:role/role-name</Role>
  <Rule>
    <Status>Enabled</Status>
    <Prefix></Prefix>
    <Destination>
      <Bucket>arn:aws:s3:::destinationbucket</Bucket>
      <StorageClass>storage-class</StorageClass>
    </Destination>
  </Rule>
</ReplicationConfiguration>
```

If the `<Rule>` does not specify a storage class, Amazon S3 uses the storage class of the source object to create an object replica.

You can specify any storage class that Amazon S3 supports, except the GLACIER storage class. If you want to transition objects to the GLACIER storage class, you use lifecycle configuration. For more information about lifecycle management, see [Object Lifecycle Management \(p. 125\)](#). For more information about storage classes, see [Storage Classes \(p. 111\)](#).

### Example 2: Replication Configuration with Two Rules

Consider the following replication configuration:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<ReplicationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Role>arn:aws:iam::account-id:role/role-name</Role>
  <Rule>
    <Prefix>Tax</Prefix>
    <Status>Enabled</Status>
    <Destination>
      <Bucket>arn:aws:s3:::destinationbucket</Bucket>
    </Destination>
    ...
  </Rule>
  <Rule>
    <Prefix>Project</Prefix>
    <Status>Enabled</Status>
    <Destination>
      <Bucket>arn:aws:s3:::destinationbucket</Bucket>
    </Destination>
    ...
  </Rule>

</ReplicationConfiguration>
```

In the replication configuration:

- Each rule specifies a different key name prefix, identifying a separate set of objects in the source bucket to which the rule applies. Amazon S3 then replicates only objects with specific key prefixes. For example, Amazon S3 replicates objects with key names Tax/doc1.pdf and Project/project1.txt, but it does not replicate any object with the key name PersonalDoc/documentA.
- Both rules specify the same destination bucket.
- Both rules are enabled.

You cannot specify overlapping prefixes as shown:

```
<ReplicationConfiguration>

  <Role>arn:aws:iam::AcctID:role/role-name</Role>

  <Rule>
    <Prefix>TaxDocs</Prefix>
    <Status>Enabled</Status>
    <Destination>
      <Bucket>arn:aws:s3:::destinationbucket</Bucket>
    </Destination>
  </Rule>
  <Rule>
    <Prefix>TaxDocs/2015</Prefix>
    <Status>Enabled</Status>
    <Destination>
      <Bucket>arn:aws:s3:::destinationbucket</Bucket>
    </Destination>
  </Rule>
</ReplicationConfiguration>
```

The two rules specify overlapping prefixes Tax/ and Tax/2015, which is not allowed.

### Example 3: Example Walkthrough

When both the source and destination buckets are owned by the same AWS account, you can use the Amazon S3 console to set up cross-region replication. Assuming you have source and destination buckets that are both versioning-enabled, you can use the console to add replication configuration on the source bucket. For more information, see the following topics:

- [Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account \(p. 536\)](#)
- [Enabling Cross-Region Replication in the Amazon Simple Storage Service Console User Guide](#)

## Setting Up Cross-Region Replication for Buckets Owned by Different AWS Accounts

When setting up replication configuration in a cross-account scenario, in addition to doing the same configuration as outlined in the [preceding section](#), the destination bucket owner must also add a bucket policy to grant the source bucket owner permissions to perform replication actions.

```
{  
    "Version": "2008-10-17",  
    "Id": "PolicyForDestinationBucket",  
    "Statement": [  
        {  
            "Sid": "1",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "SourceBucket-AcctID"  
            },  
            "Action": [  
                "s3:ReplicateDelete",  
                "s3:ReplicateObject"  
            ],  
            "Resource": "arn:aws:s3:::destinationbucket/*"  
        },  
        {  
            "Sid": "2",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "SourceBucket-AcctID"  
            },  
            "Action": "s3>List*",  
            "Resource": "arn:aws:s3:::destinationbucket"  
        }  
    ]  
}
```

For an example, see [Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#).

If objects in the source bucket are tagged, note the following:

- If the source bucket owner grants Amazon S3 permission for the `s3:GetObjectVersionTagging` and `s3:ReplicateTags` actions to replicate object tags (via the IAM role), Amazon S3 replicates the tags along with the objects. For information about the IAM role, see [Create an IAM Role \(p. 524\)](#).
- If the destination bucket owner does not want the tags replicated, the owner can add the following statement to the destination bucket policy to explicitly deny permission for the `s3:ReplicateTags` action.

```
...  
    "Statement": [  
        {  
            "Effect": "Deny",  
            "Principal": {  
                "AWS": "arn:aws:iam::SourceBucket-AcctID:root"  
            },  
            "Action": "s3:ReplicateTags"  
        }  
    ]  
}
```

```
        "Action": [ "s3:ReplicateTags" ],
        "Resource": "arn:aws:s3:::destinationbucket/*"
    }
...
}
```

## Change Replica Ownership

You can also optionally direct Amazon S3 to change the replica ownership to the AWS account that owns the destination bucket. This is also referred to as the *owner override* option of the replication configuration. For more information, see, [Cross-Region Replication Additional Configuration: Change Replica Owner \(p. 529\)](#).

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

[What Is and Is Not Replicated \(p. 521\)](#)

[Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account \(p. 536\)](#)

[Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#)

[Finding the Cross-Region Replication Status \(p. 552\)](#)

[Troubleshooting Cross-Region Replication in Amazon S3 \(p. 553\)](#)

# Additional Cross-Region Replication Configurations

## Topics

- [Cross-Region Replication Additional Configuration: Change Replica Owner \(p. 529\)](#)
- [CRR Additional Configuration: Replicating Objects Created with Server-Side Encryption \(SSE\) Using AWS KMS-Managed Encryption Keys \(p. 531\)](#)

This section describes optional configurations related to the cross-region replication. For information about the core replication, see [Setting Up Cross-Region Replication \(p. 523\)](#).

## Cross-Region Replication Additional Configuration: Change Replica Owner

Regardless of who owns the source bucket or the source object, you can direct Amazon S3 to change replica ownership to the AWS account that owns the destination bucket. You might choose to do this to restrict access to object replicas. This is also referred to as the *owner override* option of the replication configuration.

### Warning

Add the owner override option only when the source and destination buckets are owned by different AWS accounts.

For information about setting replication configuration in cross-account scenario, see [Setting Up Cross-Region Replication for Buckets Owned by Different AWS Accounts \(p. 528\)](#). This section provides only the additional information to direct Amazon S3 to change the replica ownership to the AWS account that owns the destination bucket.

- Add the `<Account>` and `<AccessControlTranslation>` elements as the child element of the `<Destination>` element, as shown in the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<ReplicationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
    <Role>arn:aws:iam::account-id:role/role-name</Role>
    <Rule>
        <Status>Enabled</Status>
        <Prefix></Prefix>
        <Destination>
            <Bucket>arn:aws:s3:::destination-bucket</Bucket>
            <Account>destination-bucket-owner-account-id</Account>
            <AccessControlTranslation>
                <Owner>Destination</Owner>
            </AccessControlTranslation>
        </Destination>
    </Rule>
</ReplicationConfiguration>
```

- Add more permissions to the IAM role to allow Amazon S3 to change replica ownership.

Allow the IAM role permission for the `s3:ObjectOwnerOverrideToBucketOwner` action on all replicas in the destination bucket, as shown in the following policy statement.

```
...
{
    "Effect": "Allow",
    "Action": [
        "s3:ObjectOwnerOverrideToBucketOwner"
    ],
    "Resource": "arn:aws:s3:::destination-bucket/*"
}
...
```

- In the bucket policy of the destination bucket, add permission for the `s3:ObjectOwnerOverrideToBucketOwner` action to allow the AWS account that owns the source bucket permission to change in replica ownership (in effect, accepting the ownership of the object replicas). You can add the following policy statement to your bucket policy.

```
...
{
    "Sid": "1",
    "Effect": "Allow",
    "Principal": {"AWS": "source-bucket-account-id"},
    "Action": ["s3:ObjectOwnerOverrideToBucketOwner"],
    "Resource": "arn:aws:s3:::destination-bucket/*"
}
...
```

### Warning

Add this owner override option to the replication configuration only when the two buckets are owned by different AWS accounts. Amazon S3 does not check if the buckets are owned by same or different accounts. If you add this option when both buckets are owned by same AWS account, the owner override still applies. That is, Amazon S3 grants full permissions to the destination bucket owner, and does not replicate subsequent updates to the source object.

access control list (ACL). The replica owner can make changes directly to the ACL associated with a replica with a `PUT ACL` request, but not via replication.

For an example, see [Walkthrough 3: Change Replica Owner to Destination Bucket Owner \(p. 542\)](#).

In a cross-account scenario, where source and destination buckets are owned by different AWS accounts, the following apply:

- Creating replication configuration with the optional owner override option - By default, the source object owner also owns the replica. And accordingly, along with the object version, Amazon S3 also replicates the ACL associated with the object version.

You can add optional owner override configuration directing Amazon S3 to change the replica owner to the AWS account that owns the destination bucket. In this case, because the owners are not the same, Amazon S3 replicates only the object version and not the ACL (also, Amazon S3 does not replicate any subsequent changes to the source object ACL). Amazon S3 sets the ACL on the replica granting full-control to the destination bucket owner.

- Updating replication configuration (enabling/disabling owner override option) – Suppose that you have replication configuration added to a bucket. Amazon S3 replicates object versions to the destination bucket. Along with it, Amazon S3 also copies the object ACL and associates it with the object replica.
- Now suppose that you update the replication configuration and add the owner override option. When Amazon S3 replicates the object version, it discards the ACL that is associated with the source object. It instead sets the ACL on the replica, giving full-control to the destination bucket owner. Any subsequent changes to the source object ACL are not replicated.

This change does not apply to object versions that were replicated before you set the owner override option. That is, any ACL updates on the source objects that were replicated before the owner override was set continue to be replicated (because the object and its replicas continue to have the same owner).

- Now suppose that you later disable the owner override configuration. Amazon S3 continues to replicate any new object versions and the associated object ACLs to the destination. When you disable the owner override, it does not apply to objects that were replicated when you had the owner override set in the replication configuration (the object ownership change that Amazon S3 made remains in effect). That is, ACLs put on the object version that were replicated when you had owner override set continue to be not replicated.

## CRR Additional Configuration: Replicating Objects Created with Server-Side Encryption (SSE) Using AWS KMS-Managed Encryption Keys

You might have objects in your source bucket that are created using server-side encryption using AWS KMS-managed keys. By default, Amazon S3 does not replicate AWS KMS-encrypted objects. If you want Amazon S3 to replicate these objects, in addition to the [basic replication configuration](#), you must do the following:

- Provide the AWS KMS-managed key for the destination bucket Region that you want Amazon S3 to use to encrypt object replicas.
- Grant additional permissions to the IAM role so that Amazon S3 can access the objects using the AWS KMS key.

#### Topics

- [Specifying Additional Information in the Replication Configuration \(p. 532\)](#)
- [IAM Role Additional Permissions \(p. 533\)](#)
- [Cross-Account Scenario: Additional Permissions \(p. 535\)](#)
- [Related Considerations \(p. 535\)](#)

## Specifying Additional Information in the Replication Configuration

In the [basic replication configuration](#), add the following additional information.

- This feature (for Amazon S3 to replicate objects that are encrypted using AWS KMS-managed keys) requires customer must explicitly opt in by adding the `<SourceSelectionCriteria>` element.

```
<SourceSelectionCriteria>
  <SseKmsEncryptedObjects>
    <Status>Enabled</Status>
  </SseKmsEncryptedObjects>
</SourceSelectionCriteria>
```

- Provide the AWS KMS key that you want Amazon S3 to use to encrypt object replicas by adding the `<EncryptionConfiguration>` element:

```
<EncryptionConfiguration>
  <ReplicaKmsKeyId>The AWS KMS key ID (S3 can use to encrypt object replicas).</ReplicaKmsKeyId>
</EncryptionConfiguration>
```

#### Important

Note that the AWS KMS key Region must be the same as the Region of the destination bucket. Make sure that the AWS KMS key is valid. The `PUT` Bucket replication API does not check for invalid AWS KMS keys. You get `200 OK` response, but if the AWS KMS key is invalid, replication fails.

Following is an example of a cross-region replication configuration that includes the optional configuration elements:

```
<ReplicationConfiguration>
  <Role>arn:aws:iam::account-id:role/role-name</Role>
  <Rule>
    <Prefix>prefix1</Prefix>
    <Status>Enabled</Status>
    <SourceSelectionCriteria>
      <SseKmsEncryptedObjects>
        <Status>Enabled</Status>
      </SseKmsEncryptedObjects>
    </SourceSelectionCriteria>
    <Destination>
      <Bucket>arn:aws:s3:::destination-bucket</Bucket>
      <EncryptionConfiguration>
```

```
<ReplicaKmsKeyId>The AWS KMS key ID (that S3 can use to encrypt object replicas).</ReplicaKmsKeyId>
    </EncryptionConfiguration>
    </Destination>
</Rule>
</ReplicationConfiguration>
```

This replication configuration has one rule. The rule applies to objects with the specified key prefix. Amazon S3 uses the AWS KMS key ID to encrypt these object replicas.

## IAM Role Additional Permissions

Amazon S3 needs additional permissions to replicate objects created using server-side encryption using AWS KMS-managed keys. You must grant the following additional permissions to the IAM role:

- Grant permission for the `s3:GetObjectVersionForReplication` action for source objects. Permission for this action allows Amazon S3 to replicate the unencrypted object and the objects created with server-side encryption using SSE-S3 (Amazon S3-managed encryption key) or AWS KMS-managed encryption (SSE-KMS) keys.

### Note

The permission for the `s3:GetObjectVersion` action allows replication of unencrypted and SSE-S3 encrypted objects. However, it does not allow replication of objects created using an AWS KMS-managed encryption key.

### Note

We recommend that you use the `s3:GetObjectVersionForReplication` action instead of the `s3:GetObjectVersion` action because it provides Amazon S3 with only the minimum permissions necessary for cross-region replication.

- Grant permissions for the following AWS KMS actions:
  - `kms:Decrypt` permissions for the AWS KMS key that was used to encrypt the source object.
  - `kms:Encrypt` permissions for the AWS KMS key used to encrypt the object replica.

We recommend that you restrict these permissions to specific buckets and objects using the AWS KMS condition keys as shown in the following example policy statements:

```
{
    "Action": ["kms:Decrypt"],
    "Effect": "Allow",
    "Condition": {
        "StringLike": {
            "kms:ViaService": "s3.source-bucket-region.amazonaws.com",
            "kms:EncryptionContext:aws:s3:arn": [
                "arn:aws:s3:::source-bucket-name/prefix1*",
            ]
        }
    },
    "Resource": [
        "List of AWS KMS key IDs that was used to encrypt source objects."
    ]
},
{
    "Action": ["kms:Encrypt"],
    "Effect": "Allow",
    "Condition": {
        "StringLike": {
            "kms:ViaService": "s3.destination-bucket-region.amazonaws.com",
            "kms:EncryptionContext:aws:s3:arn": [
                "arn:aws:s3:::destination-bucket-name/prefix1*",
            ]
        }
    }
}
```

```
    },
    "Resource": [
        "List of AWS KMS key IDs, that you want S3 to use to encrypt object replicas."
    ]
}
```

The AWS account that owns the IAM role must have permissions for these AWS KMS actions (`kms:Encrypt` and `kms:Decrypt`) for AWS KMS keys listed in the policy. If the AWS KMS keys are owned by another AWS account, the key owner must grant these permissions to the AWS account that owns the IAM role. For more information about managing access to these keys, see [Using IAM Policies with AWS KMS](#) in the AWS Key Management Service Developer Guide.

The following is a complete IAM policy that grants the necessary permissions to replicate unencrypted objects, objects created with server-side encryption using the Amazon S3-managed encryption keys, and AWS KMS-managed encryption keys.

**Note**

Objects created with server-side encryption using customer-provided (SSE-C) encryption keys are not replicated.

```
{
    "Version":"2012-10-17",
    "Statement":[
        {
            "Effect":"Allow",
            "Action":[
                "s3:GetReplicationConfiguration",
                "s3>ListBucket"
            ],
            "Resource":[
                "arn:aws:s3:::<source-bucket>"
            ]
        },
        {
            "Effect":"Allow",
            "Action":[
                "s3:GetObjectVersionForReplication",
                "s3:GetObjectVersionAcl"
            ],
            "Resource":[
                "arn:aws:s3:::<source-bucket>/prefix1*"
            ]
        },
        {
            "Effect":"Allow",
            "Action":[
                "s3:ReplicateObject",
                "s3:ReplicateDelete"
            ],
            "Resource":"arn:aws:s3:::<destination-bucket>/prefix1*"
        },
        {
            "Action":[
                "kms:Decrypt"
            ],
            "Effect":"Allow",
            "Condition":{
                "StringLike":{
                    "kms:ViaService":"s3.<source-bucket-region>.amazonaws.com",
                    "kms:EncryptionContext:aws:s3:arn":[
                        "arn:aws:s3:::<source-bucket-name>/prefix1*"
                    ]
                }
            }
        }
    ]
}
```

```
        }
    },
    "Resource": [
        "List of AWS KMS key IDs used to encrypt source objects."
    ]
},
{
    "Action": [
        "kms:Encrypt"
    ],
    "Effect": "Allow",
    "Condition": {
        "StringLike": {
            "kms:ViaService": "s3.destination-bucket-region.amazonaws.com",
            "kms:EncryptionContext:aws:s3:arn": [
                "arn:aws:s3:::destination-bucket-name/prefix1*"
            ]
        }
    },
    "Resource": [
        "List of AWS KMS key IDs that you want S3 to use to encrypt object replicas."
    ]
}
]
```

## Cross-Account Scenario: Additional Permissions

In a cross-account scenario, the destination AWS KMS key must be a customer master key (CMK). The key owner must grant the source bucket owner permission to use the key, using one of the following methods:

- Use the IAM console.
  1. Sign in to the AWS Management Console and open the IAM console at <https://console.aws.amazon.com/iam/>.
  2. Choose **Encryption keys**.
  3. Select the AWS KMS key.
  4. In **Key Policy, Key Users, External Accounts**, choose **Add External Account**.
  5. Specify source bucket account ID in the **arn:aws:iam::** box.
  6. Choose **Save Changes**.
- Use the AWS CLI. For more information, see [put-key-policy](#) in the AWS CLI Command Reference. For information about the underlying API, see [PutKeyPolicy](#) in the [AWS Key Management Service API Reference](#).

## Related Considerations

After you enable CRR, as you add a large number of new objects with AWS KMS encryption, you might experience throttling (HTTP 503 Slow Down errors). This is related to the KMS transactions per second limit supported by AWS KMS. For more information, see [Limits](#) in the AWS Key Management Service Developer Guide.

In this case, we recommend that you request an increase in your AWS KMS API rate limit by creating a case in the AWS Support Center. For more information, see <https://console.aws.amazon.com/support/home#/>.

# Cross-Region Replication Examples

This section provides the following example walkthroughs to set up cross-region replication.

## Topics

- [Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account \(p. 536\)](#)
- [Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#)
- [Cross-Region Replication: Additional Walkthroughs \(p. 542\)](#)
- [Setting Up Cross-Region Replication Using the Console \(p. 548\)](#)
- [Setting Up Cross-Region Replication Using the AWS SDK for Java \(p. 548\)](#)
- [Setting Up Cross-Region Replication Using the AWS SDK for .NET \(p. 550\)](#)

## Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account

In this section, you create two buckets (source and destination) in different AWS Regions, enable versioning on both the buckets, and then configure cross-region replication on the source bucket.

1. Create two buckets.
  - a. Create a *source* bucket in an AWS Region. For example, US West (Oregon) (us-west-2). For instructions, see [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.
  - b. Create a *destination* bucket in another AWS Region. For example, US East (N. Virginia) (us-east-1).
2. Enable versioning on both buckets. For instructions, see [How Do I Enable or Suspend Versioning for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

### Important

If you have an object expiration lifecycle policy in your non-versioned bucket and you want to maintain the same permanent delete behavior when you enable versioning, you must add a noncurrent expiration policy. The noncurrent expiration lifecycle policy will manage the deletes of the noncurrent object versions in the version-enabled bucket. (A version-enabled bucket maintains one current and zero or more noncurrent object versions.) For more information, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

3. Enable cross-region replication on the source bucket. You decide if you want to replicate all objects or only objects with a specific prefix (when using the console, think of this as deciding if you want to replicate only objects from a specific folder). For instructions, see [How Do I Enable and Configure Cross-Region Replication for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.
4. Test the setup as follows:
  - a. Create objects in the source bucket and verify that Amazon S3 replicated the objects in the destination bucket. The amount of time it takes for Amazon S3 to replicate an object depends on the object size. For information about finding replication status, see [Finding the Cross-Region Replication Status \(p. 552\)](#).

- b. Update the object's access control list (ACL) in the source bucket, and verify that changes appear in the destination bucket. For instructions, see [Setting Bucket and Object Access Permissions](#) in the *Amazon Simple Storage Service Console User Guide*.
- c. Update the object's metadata and verify that the changes appear in the destination bucket. For instructions, see [How Do I Add Metadata to an S3 Object?](#) in the *Amazon Simple Storage Service Console User Guide*.

Remember that the replicas are exact copies of the objects in the source bucket.

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

[Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#)

[What Is and Is Not Replicated \(p. 521\)](#)

[Finding the Cross-Region Replication Status \(p. 552\)](#)

## Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts

In this walkthrough, you set up cross-region replication where source and destination buckets are owned by different AWS accounts.

Because buckets are owned by different AWS accounts, you have to perform one extra step to set up cross-region replication—the destination bucket owner must create a bucket policy granting the source bucket owner permissions for replication actions.

In this exercise, you perform all the steps using the console, except the creation of an IAM role and adding replication configuration to the source bucket for the following reasons:

- The Amazon S3 console supports setting replication configuration when both buckets are owned by same AWS account. However, in a cross-account scenario, you must specify a destination bucket that is owned by another AWS account, and the Amazon S3 console UI shows only buckets in your account.
  - In the IAM console, Amazon S3 is not in the list of **AWS Service Roles**. You can optionally create an IAM role but select another service role type (such as AWS Lambda). After the role is created, you can modify the trust policy to specify Amazon S3 service principal (instead of Lambda service principal) who can assume the role. For this exercise, you use the AWS CLI to create the role.
1. Create two buckets using two different AWS accounts. In accordance with cross-region replication requirements, you create these buckets in different AWS Regions and enable versioning on both buckets.
    - a. Create a source bucket in an AWS Region. For example, US West (Oregon) (us-west-2) in account A. For instructions, go to [How Do I Create an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.
    - b. Create a destination bucket in another AWS Region. For example, US East (N. Virginia) (us-east-1) in account B.
    - c. Enable versioning on both buckets. For instructions, see [How Do I Enable or Suspend Versioning for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

**Important**

If you have an object expiration lifecycle policy in your non-versioned bucket and you want to maintain the same permanent delete behavior when you enable versioning, you must add a noncurrent expiration policy. The noncurrent expiration lifecycle policy will manage the deletes of the noncurrent object versions in the version-enabled bucket. (A version-enabled bucket maintains one current and zero or more noncurrent object versions.) For more information, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

2. Add bucket policy on the destination bucket to allow the source bucket owner to replicate objects.

```
{  
    "Version": "2008-10-17",  
    "Id": "",  
    "Statement": [  
        {  
            "Sid": "Stmt123",  
            "Effect": "Allow",  
            "Principal": {  
                "AWS": "arn:aws:iam::AWS-ID-Account-A:root"  
            },  
            "Action": [ "s3:ReplicateObject", "s3:ReplicateDelete" ],  
            "Resource": "arn:aws:s3:::destination-bucket/*"  
        }  
    ]  
}
```

For instructions, see [How Do I Add an S3 Bucket Policy?](#) in the *Amazon Simple Storage Service Console User Guide*.

3. Grant Amazon S3 permission to replicate objects on behalf of the source bucket owner.

After you configure cross-region replication on the source bucket, Amazon S3 replicates objects on your behalf. The source bucket owner can grant Amazon S3 necessary permissions using an IAM role. In this step, you create an IAM role in account A.

Use the AWS CLI to create this IAM role. For information about how to set up the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#). This exercise assumes that you have configured the AWS CLI with two profiles: accountA and accountB.

- a. Copy the following policy and save it to a file called `S3-role-trust-policy.json`. This policy grants Amazon S3 permissions to assume the role.

```
{  
    "Version": "2012-10-17",  
    "Statement": [  
        {  
            "Effect": "Allow",  
            "Principal": {  
                "Service": "s3.amazonaws.com"  
            },  
            "Action": "sts:AssumeRole"  
        }  
    ]  
}
```

- b. Copy the following policy and save it to a file named `S3-role-permissions-policy.json`. This access policy grants permissions for various Amazon S3 bucket and object actions. In the following step, you add the policy to the IAM role you are creating.

```
{
```

```

    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetObjectVersionForReplication",
                "s3:GetObjectVersionAcl"
            ],
            "Resource": [
                "arn:aws:s3:::source-bucket/*"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3>ListBucket",
                "s3:GetReplicationConfiguration"
            ],
            "Resource": [
                "arn:aws:s3:::source-bucket"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:ReplicateObject",
                "s3:ReplicateDelete"
            ],
            "Resource": "arn:aws:s3:::destination-bucket/*"
        }
    ]
}

```

- c. Run the following AWS CLI command to create a role:

```

$ aws iam create-role \
--role-name crrRole \
--assume-role-policy-document file://S3-role-trust-policy.json \
--profile accountA

```

- d. Run the following AWS CLI command to create a policy:

```

$ aws iam create-policy \
--policy-name crrRolePolicy \
--policy-document file://S3-role-permissions-policy.json \
--profile accountA

```

- e. Write down the policy Amazon Resource Name (ARN) that is returned by the `create-policy` command.
- f. Run the following AWS CLI command to attach the policy to the role:

```

$ aws iam attach-role-policy \
--role-name crrRole \
--policy-arn policy-arn \
--profile accountA

```

Now you have an IAM role in account A that Amazon S3 can assume. It has permissions for necessary Amazon S3 actions so that Amazon S3 can replicate objects from a specific source bucket to a destination bucket. You specify this role when you add cross-region replication to the source bucket in account A.

4. Add replication configuration on the source bucket in account A directing Amazon S3 to replicate objects with prefix Tax/ to a destination bucket as shown in the following example configuration:

```
<ReplicationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Role>arn:aws:iam::AWS-ID-Account-A:role/role-name</Role>
  <Rule>
    <Status>Enabled</Status>
    <Prefix>Tax</Prefix>
    <Destination><Bucket>arn:aws:s3:::destination-bucket</Bucket></Destination>
  </Rule>
</ReplicationConfiguration>
```

In this example, you can use either the AWS CLI or the AWS SDK to add the replication configuration. You can't use the console because the console doesn't support specifying a destination bucket that is in different AWS account.

- Using AWS CLI.

The AWS CLI requires you to specify the replication configuration as JSON. Save the following JSON in a file (`replication.json`).

```
{
  "Role": "arn:aws:iam::AWS-ID-Account-A:role/role-name",
  "Rules": [
    {
      "Prefix": "Tax",
      "Status": "Enabled",
      "Destination": {
        "Bucket": "arn:aws:s3:::destination-bucket"
      }
    }
  ]
}
```

Update the JSON by providing the bucket name and role ARN. Then, run the AWS CLI command to add replication configuration to your source bucket:

```
$ aws s3api put-bucket-replication \
--bucket source-bucket \
--replication-configuration file://replication.json \
--profile accountA
```

For instructions on how to set up the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

Account A can use the `get-bucket-replication` command to retrieve the replication configuration:

```
$ aws s3api get-bucket-replication \
--bucket source-bucket \
--profile accountA
```

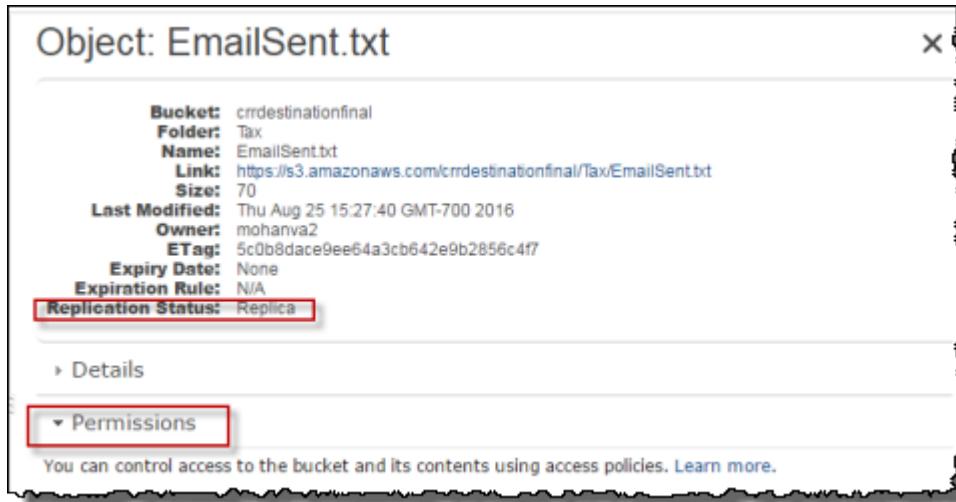
- Using the AWS SDK for Java.

For a code example, see [Setting Up Cross-Region Replication Using the AWS SDK for Java \(p. 548\)](#).

5. Test the setup. In the console, do the following:

- In the source bucket, create a folder named Tax.

- Add objects to the folder in the source bucket.
  - Verify that Amazon S3 replicated objects in the destination bucket owned by account B.
  - In object properties, notice the **Replication Status** is set to "Replica" (identifying this as a replica object).
  - In object properties, the permission section shows no permissions (the replica is still owned by the source bucket owner, and the destination bucket owner has no permission on the object replica). You can add optional configuration to direct Amazon S3 to change the replica ownership. For example, see [Walkthrough 3: Change Replica Owner to Destination Bucket Owner \(p. 542\)](#).



The amount of time it takes for Amazon S3 to replicate an object depends on the object size. For information about finding replication status, see [Finding the Cross-Region Replication Status \(p. 552\)](#).

- Update an object's ACL in the source bucket and verify that changes appear in the destination bucket.

For instructions, see [How Do I Set Permissions on an Object?](#) in the *Amazon Simple Storage Service Console User Guide*.

- Update the object's metadata. For example, make changes to the storage class. Verify that the changes appear in the destination bucket.

For instructions, see [How Do I Add Metadata to an S3 Object?](#) in the *Amazon Simple Storage Service Console User Guide*.

Remember that the replicas are exact copies of the objects in the source bucket.

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

[What Is and Is Not Replicated \(p. 521\)](#)

[Finding the Cross-Region Replication Status \(p. 552\)](#)

[Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account \(p. 536\)](#)

# Cross-Region Replication: Additional Walkthroughs

## Topics

- [Walkthrough 3: Change Replica Owner to Destination Bucket Owner \(p. 542\)](#)
- [CRR Walkthrough 4: Direct Amazon S3 to Replicate Objects Created with Server-Side Encryption Using AWS KMS-Managed Encryption Keys \(p. 545\)](#)

This section provides examples of adding the optional options in your bucket cross-region replication configuration.

## Walkthrough 3: Change Replica Owner to Destination Bucket Owner

In this exercise, you update replication configuration in exercise 2 ([Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#)) to direct Amazon S3 to change the replica owner to the AWS account that owns the destination bucket. For more information about optionally changing the replica ownership, see [Cross-Region Replication Additional Configuration: Change Replica Owner \(p. 529\)](#).

1. Complete walkthrough 2. For instructions, see [Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#).
2. Update the replication configuration rule by adding the `<AccessControlTranslation>` element, as shown following:

```
<ReplicationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
  <Role>arn:aws:iam::account-id:role/role-name</Role>
  <Rule>
    <Status>Enabled</Status>
    <Prefix></Prefix>
    <Destination>
      <Bucket>arn:aws:s3:::destinationbucket</Bucket>
      <Account>destination-bucket-owner-account-id</Account>
      <StorageClass>storage-class</StorageClass>
      <AccessControlTranslation>
        <Owner>Destination</Owner>
      </AccessControlTranslation>
    </Destination>
  </Rule>
</ReplicationConfiguration>
```

In this example, you can use either the AWS CLI or the AWS SDK to add the replication configuration. You cannot use the console because the console does not support specifying a destination bucket that is in different AWS account.

- Using the AWS CLI.

The AWS CLI requires you to specify the replication configuration as JSON. Save the following JSON in a file (`replication.json`).

```
{
  "Role": "arn:aws:iam::AWS-ID-Account-A:role/role-name",
  "Rules": [
    {
      "Prefix": "Tax",
      "Status": "Enabled",
      "Destination": {
```

```

        "Bucket": "arn:aws:s3:::destination-bucket",
        "AccessControlTranslation" : {
            "Owner" : "Destination"
        }
    }
}
]
}
}

```

Update the JSON by providing the bucket name and role Amazon Resource Name (ARN). Then, run the AWS CLI command to add replication configuration to your source bucket:

```
$ aws s3api put-bucket-replication \
--bucket source-bucket \
--replication-configuration file://replication.json \
--profile accountA
```

For instructions on how to set up the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

You can use the `get-bucket-replication` command to retrieve the replication configuration:

```
$ aws s3api get-bucket-replication \
--bucket source-bucket \
--profile accountA
```

- Using the AWS SDK for Java.

For a code example, see [Setting Up Cross-Region Replication Using the AWS SDK for Java \(p. 548\)](#).

3. In the IAM console, select the IAM role you created, and update the associated permission policy by adding permissions for the `s3:ObjectOwnerOverrideToBucketOwner` action.

The updated policy is shown:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetReplicationConfiguration",
                "s3>ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::source-bucket"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetObjectVersionForReplication",
                "s3:GetObjectVersionAcl"
            ],
            "Resource": [
                "arn:aws:s3:::source-bucket/*"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [

```

```

        "s3:ReplicateObject",
        "s3:ReplicateDelete",
        "s3:ObjectOwnerOverrideToBucketOwner"
    ],
    "Resource": "arn:aws:s3:::destination-bucket/*"
}
]
}
}

```

4. In the Amazon S3 console, select the destination bucket, and update the bucket policy as follows:
  - Grant the source object owner permission for the `s3:ObjectOwnerOverrideToBucketOwner` action.
  - Grant the source bucket owner permission for the `s3>ListBucket` and the `s3>ListBucketVersions` actions.

The following bucket policy shows the additional permissions.

```
{
  "Version": "2008-10-17",
  "Id": "PolicyForDestinationBucket",
  "Statement": [
    {
      "Sid": "1",
      "Effect": "Allow",
      "Principal": {
        "AWS": "source-bucket-owner-aws-account-id"
      },
      "Action": [
        "s3:ReplicateDelete",
        "s3:ReplicateObject",
        "s3:ObjectOwnerOverrideToBucketOwner"
      ],
      "Resource": "arn:aws:s3:::destinationbucket/*"
    },
    {
      "Sid": "2",
      "Effect": "Allow",
      "Principal": {
        "AWS": "source-bucket-owner-aws-account-id"
      },
      "Action": [
        "s3>ListBucket",
        "s3>ListBucketVersions"
      ],
      "Resource": "arn:aws:s3:::destinationbucket"
    }
  ]
}
```

5. Test the replication configuration in the Amazon S3 console:
  - a. Upload the object to the source bucket (in the `Tax` folder).
  - b. Verify that the replica is created in the destination bucket. For the replica, verify the permissions. Notice that the destination bucket owner now has full permissions on the object replica.

## CRR Walkthrough 4: Direct Amazon S3 to Replicate Objects Created with Server-Side Encryption Using AWS KMS-Managed Encryption Keys

You can have objects in your source bucket that are created using server-side encryption using AWS KMS-managed keys. By default, Amazon S3 does not replicate these objects. But you can add optional configuration to the bucket replication configuration to direct Amazon S3 to replicate these objects.

For this exercise, you first set up replication configuration in a cross-account scenario (source and destination buckets are owned by different AWS accounts). This section then provides instructions for you to update the configuration to direct Amazon S3 to replicate objects encrypted with AWS KMS-managed keys.

### Note

Although this example uses an existing walkthrough to set up CRR in a cross-account scenario, replication of SSE-KMS encrypted objects can be also configured when both the source and destination buckets have the same owner.

1. Complete CRR walkthrough 2. For instructions, see [Walkthrough 2: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by Different AWS Accounts \(p. 537\)](#).
2. Replace the replication configuration on the source bucket with the following (which adds the options that direct Amazon S3 to replicate source objects encrypted using AWS KMS keys).

```
<ReplicationConfiguration>
  <Role>IAM role ARN</Role>
  <Rule>
    <Prefix>Tax</Prefix>
    <Status>Enabled</Status>
    <SourceSelectionCriteria>
      <SseKmsEncryptedObjects>
        <Status>Enabled</Status>
      </SseKmsEncryptedObjects>
    </SourceSelectionCriteria>
    <Destination>
      <Bucket>arn:aws:s3:::dest-bucket-name</Bucket>
      <EncryptionConfiguration>
        <ReplicaKmsKeyID>AWS KMS key ID to use for encrypting object replicas.</ReplicaKmsKeyID>
      </EncryptionConfiguration>
    </Destination>
  </Rule>
</ReplicationConfiguration>
```

In this example, you can use either the AWS CLI or the AWS SDK to add the replication configuration.

- Using AWS CLI.

The AWS CLI requires you to specify the replication configuration as JSON. Save the following JSON in a file (`replication.json`).

```
{
  "Role": "IAM role ARN",
  "Rules": [
    {
      "Prefix": "Tax",
      "Status": "Enabled",
      "SourceSelectionCriteria": {
        "SseKmsEncryptedObjects": {
          "Status" : "Enabled"
        }
      }
    }
  ]
}
```

```

        }
    },
    "Destination": {
        "Bucket": "arn:aws:s3:::dest-bucket-name",
    "EncryptionConfiguration" : {
        "ReplicaKmsKeyID": "AWS KMS key ARN(created in the same region as the destination bucket)."
    }
}
]
}

```

Update the JSON by providing the bucket name and role ARN. Then, run the AWS CLI command to add replication configuration to your source bucket:

```
$ aws s3api put-bucket-replication \
--bucket source-bucket \
--replication-configuration file://replication.json \
--profile accountA
```

For instructions on how to set up the AWS CLI, see [Setting Up the Tools for the Example Walkthroughs \(p. 310\)](#).

Account A can use the get-bucket-replication command to retrieve the replication configuration:

```
$ aws s3api get-bucket-replication \
--bucket source-bucket \
--profile accountA
```

- Using the AWS SDK for Java.

For a code example, see [Setting Up Cross-Region Replication Using the AWS SDK for Java \(p. 548\)](#).

3. Update the permission policy of the IAM role by adding the permissions for AWS KMS actions.

```
{
    "Action": [
        "kms:Decrypt"
    ],
    "Effect": "Allow",
    "Condition": {
        "StringLike": {
            "kms:ViaService": "s3.source-bucket-region.amazonaws.com",
            "kms:EncryptionContext:aws:s3:arn": [
                "arn:aws:s3:::source-bucket-name/Tax"
            ]
        }
    },
    "Resource": [
        "List of AWS KMS key IDs used to encrypt source objects."
    ]
},
{
    "Action": [
        "kms:Encrypt"
    ],
    "Effect": "Allow",
    "Condition": {
        "StringLike": {

```

```

        "kms:ViaService": "s3.dest-bucket-region.amazonaws.com",
        "kms:EncryptionContext:aws:s3:arn": [
            "arn:aws:s3:::dest-bucket-name/Tax"
        ]
    },
    "Resource": [
        "List of AWS KMS key IDs that you want S3 to use to encrypt object replicas."
    ]
}

```

```

{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetObjectVersionForReplication",
                "s3:GetObjectVersionAcl"
            ],
            "Resource": [
                "arn:aws:s3:::source-bucket/Tax"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3>ListBucket",
                "s3:GetReplicationConfiguration"
            ],
            "Resource": [
                "arn:aws:s3:::source-bucket"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:ReplicateObject",
                "s3:ReplicateDelete"
            ],
            "Resource": "arn:aws:s3:::dest-bucket/*"
        },
        {
            "Action": [
                "kms:Decrypt"
            ],
            "Effect": "Allow",
            "Condition": {
                "StringLike": {
                    "kms:ViaService": "s3.source-bucket-region.amazonaws.com",
                    "kms:EncryptionContext:aws:s3:arn": [
                        "arn:aws:s3:::source-bucket/Tax*"
                    ]
                }
            },
            "Resource": [
                "List of AWS KMS key IDs used to encrypt source objects."
            ]
        },
        {
            "Action": [
                "kms:Encrypt"
            ],
            "Effect": "Allow",

```

```
        "Condition": {
            "StringLike": {
                "kms:ViaService": "s3.dest-bucket-region.amazonaws.com",
                "kms:EncryptionContext:aws:s3:arn": [
                    "arn:aws:s3:::dest-bucket/Tax*"
                ]
            }
        },
        "Resource": [
            "List of AWS KMS key IDs that you want S3 to use to encrypt object replicas."
        ]
    }
}
```

4. Test the setup. In the console, upload an object to the source bucket (in the /Tax folder) using the AWS KMS-managed key. Verify that Amazon S3 replicated the object in the destination bucket.

## Setting Up Cross-Region Replication Using the Console

When both the source and destination buckets are owned by the same AWS account, you can add replication configuration on the source bucket using the Amazon S3 console. For more information, see the following topics:

- [Walkthrough 1: Configure Cross-Region Replication Where Source and Destination Buckets Are Owned by the Same AWS Account \(p. 536\)](#)
- [How Do I Enable and Configure Cross-Region Replication for an S3 Bucket? in the \*Amazon Simple Storage Service Console User Guide\*.](#)
- [Cross-Region Replication \(CRR\) \(p. 519\)](#)
- [Setting Up Cross-Region Replication \(p. 523\)](#)

## Setting Up Cross-Region Replication Using the AWS SDK for Java

When the source and destination buckets are owned by two different AWS accounts, you can use either the AWS CLI or one of the AWS SDKs to add replication configuration on the source bucket. You cannot use the console to add the replication configuration because the console does not provide a way for you to specify a destination bucket owned by another AWS account at the time you add replication configuration on a source bucket. For more information, see [Setting Up Cross-Region Replication \(p. 523\)](#).

The following AWS SDK for Java code example first adds replication configuration to a bucket and then retrieves it. You need to update the code by providing your bucket names and IAM role ARN. For instructions on how to create and test a working sample, see [Testing the Java Code Examples \(p. 613\)](#).

```
import java.io.IOException;
import java.util.HashMap;
import java.util.Map;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.s3.AmazonS3;
```

```
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.model.BucketReplicationConfiguration;
import com.amazonaws.services.s3.model.ReplicationDestinationConfig;
import com.amazonaws.services.s3.model.ReplicationRule;
import com.amazonaws.services.s3.model.ReplicationRuleStatus;

public class CrossRegionReplicationComplete {
    private static String sourceBucketName = "source-bucket";
    private static String roleARN = "arn:aws:iam::account-id:role/role-name";
    private static String destinationBucketArn = "arn:aws:s3:::destination-bucket";

    public static void main(String[] args) throws IOException {
        AmazonS3 s3Client = new AmazonS3Client(new ProfileCredentialsProvider());
        try {
            Map<String, ReplicationRule> replicationRules = new HashMap<String,
ReplicationRule>();
            replicationRules.put(
                "a-sample-rule-id",
                new ReplicationRule()
                    .withPrefix("Tax/")
                    .withStatus(ReplicationRuleStatus.Enabled)
                    .withDestinationConfig(
                        new ReplicationDestinationConfig()
                            .withBucketARN(destinationBucketArn)

                    .withStorageClass(StorageClass.Standard_Infrequently_Accessed)
                    )
            );
            s3Client.setBucketReplicationConfiguration(
                sourceBucketName,
                new BucketReplicationConfiguration()
                    .withRoleARN(roleARN)
                    .withRules(replicationRules)
            );
            BucketReplicationConfiguration replicationConfig =
s3Client.getBucketReplicationConfiguration(sourceBucketName);

            ReplicationRule rule = replicationConfig.getRule("a-sample-rule-id");

            System.out.println("Destination Bucket ARN : " +
rule.getDestinationConfig().getBucketARN());
            System.out.println("Prefix : " + rule.getPrefix());
            System.out.println("Status : " + rule.getStatus());

        } catch (AmazonServiceException ase) {
            System.out.println("Caught an AmazonServiceException, which" +
                " means your request made it " +
                "to Amazon S3, but was rejected with an error response" +
                " for some reason.");
            System.out.println("Error Message: " + ase.getMessage());
            System.out.println("HTTP Status Code: " + ase.getStatusCode());
            System.out.println("AWS Error Code: " + ase.getErrorCode());
            System.out.println("Error Type: " + ase.getErrorType());
            System.out.println("Request ID: " + ase.getRequestId());
        } catch (AmazonClientException ace) {
            System.out.println("Caught an AmazonClientException, which means" +
                " the client encountered " +
                "a serious internal problem while trying to " +
                "communicate with Amazon S3, " +
                "such as not being able to access the network.");
            System.out.println("Error Message: " + ace.getMessage());
        }
    }
}
```

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

[Setting Up Cross-Region Replication \(p. 523\)](#)

## Setting Up Cross-Region Replication Using the AWS SDK for .NET

When the source and destination buckets are owned by two different AWS accounts, you can use either the AWS CLI or one of the AWS SDKs to add replication configuration on the source bucket. You cannot use the console to add the replication configuration because the console does not provide a way for you to specify a destination bucket owned by another AWS account at the time you add replication configuration on a source bucket. For more information, see [Setting Up Cross-Region Replication \(p. 523\)](#).

The following AWS SDK for .NET code example first adds replication configuration to a bucket and then retrieves it. You need to update the code by providing your bucket names and IAM role ARN. For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

```
using System;
using System.Collections.Generic;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class CrossRegionReplication
    {
        static string sourceBucket      = "source-bucket";
        static string destinationBucketArn = "arn:aws:s3:::destination-bucket";
        static string roleArn           = "arn:aws:iam::account-id:role/role-name";

        public static void Main(string[] args)
        {
            try
            {
                using (var client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
                {
                    EnableReplication(client);
                    RetrieveReplicationConfiguration(client);
                }

                Console.WriteLine("Press any key to continue...");
                Console.ReadKey();
            }
            catch (AmazonS3Exception amazonS3Exception)
            {
                if (amazonS3Exception.ErrorCode != null &&
                    (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                     ||
                     amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                {
                    Console.WriteLine("Check the provided AWS Credentials.");
                    Console.WriteLine(
                        "To sign up for service, go to http://aws.amazon.com/s3");
                }
                else
            }
        }
    }
}
```

```
        {
            Console.WriteLine(
                "Error occurred. Message:{0} when enabling notifications.",
                amazonS3Exception.Message);
        }
    }

    static void EnableReplication(IAmazonS3 client)
    {
        ReplicationConfiguration replConfig = new ReplicationConfiguration
        {
            Role = roleArn,
            Rules =
            {
                new ReplicationRule
                {
                    Prefix = "Tax",
                    Status = ReplicationRuleStatus.Enabled,
                    Destination = new ReplicationDestination
                    {
                        BucketArn = destinationBucketArn
                    }
                }
            }
        };
        PutBucketReplicationRequest putRequest = new PutBucketReplicationRequest
        {
            BucketName = sourceBucket,
            Configuration = replConfig
        };

        PutBucketReplicationResponse putResponse =
client.PutBucketReplication(putRequest);
    }

    private static void RetrieveReplicationConfiguration(IAmazonS3 client)
    {
        // Retrieve the configuration.
        GetBucketReplicationRequest getRequest = new GetBucketReplicationRequest
        {
            BucketName = sourceBucket
        };
        GetBucketReplicationResponse getResponse =
client.GetBucketReplication(getRequest);
        // Print.
        Console.WriteLine("Printing replication configuration information...");

        Console.WriteLine("Role ARN: {0}", getResponse.Configuration.Role);
        foreach (var rule in getResponse.Configuration.Rules)
        {
            Console.WriteLine("ID: {0}", rule.Id);
            Console.WriteLine("Prefix: {0}", rule.Prefix);
            Console.WriteLine("Status: {0}", rule.Status);
        }
    }
}
```

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

[Setting Up Cross-Region Replication \(p. 523\)](#)

## Finding the Cross-Region Replication Status

You can use the Amazon S3 inventory feature to get replication status of all objects in a bucket. Amazon S3 then delivers a .csv file to the configured destination bucket. For more information about Amazon S3 inventory, see [Amazon S3 Inventory \(p. 287\)](#).

If you want to get CRR status of a single object, read the following:

In cross-region replication, you have a source bucket on which you configure replication and a destination bucket where Amazon S3 replicates objects. When you request an object (GET object) or object metadata (HEAD object) from these buckets, Amazon S3 returns the `x-amz-replication-status` header in the response as follows:

- If requesting an object from the source bucket – Amazon S3 returns the `x-amz-replication-status` header if the object in your request is eligible for replication.

For example, suppose that in your replication configuration, you specify the object prefix `TaxDocs` requesting Amazon S3 to replicate objects with the key name prefix `TaxDocs`. Then, any objects you upload with this key name prefix—for example, `TaxDocs/document1.pdf`—are eligible for replication. For any object request with this key name prefix, Amazon S3 returns the `x-amz-replication-status` header with one of the following values for the object's replication status: `PENDING`, `COMPLETED`, or `FAILED`.

- If requesting an object from the destination bucket – Amazon S3 returns the `x-amz-replication-status` header with value `REPLICA` if the object in your request is a replica that Amazon S3 created.

You can find the object replication state in the console using the AWS CLI, or programmatically using the AWS SDK.

- In the console, you choose the object and choose **Properties** to view object properties, including the replication status.
- You can use the `head-object` AWS CLI command as shown to retrieve object metadata information:

```
aws s3api head-object --bucket source-bucket --key object-key --version-id object-version-id
```

The command returns object metadata information including the `ReplicationStatus` as shown in the following example response:

```
{  
    "AcceptRanges": "bytes",  
    "ContentType": "image/jpeg",  
    "LastModified": "Mon, 23 Mar 2015 21:02:29 GMT",  
    "ContentLength": 3191,  
    "ReplicationStatus": "COMPLETED",  
    "VersionId": "jfW.HIMOFYid_9rGbskmroXsFj3fqZ.",  
    "ETag": "\"6805f2cfc46c0f04559748bb039d69ae\"",  
    "Metadata": {}  
}
```

- You can use the AWS SDKs to retrieve the replication state of an object. Following are code fragments using AWS SDK for Java and AWS SDK for .NET.

- AWS SDK for Java

```
GetObjectMetadataRequest metadataRequest = new GetObjectMetadataRequest(bucketName,
    bucketName);
metadataRequest.setKey(key);
ObjectMetadata metadata = s3Client.getObjectMetadata(metadataRequest);

System.out.println("Replication Status : " +
    metadata.getRawMetadataValue(Headers.OBJECT_REPLICATION_STATUS));
```

- AWS SDK for .NET

```
GetObjectMetadataRequest getmetadataRequest = new GetObjectMetadataRequest
{
    BucketName = sourceBucket,
    Key        = objectKey
};

GetObjectMetadataResponse getmetadataResponse =
    client.GetObjectMetadata(getmetadataRequest);
Console.WriteLine("Object replication status: {0}",
    getmetadataResponse.ReplicationStatus);
```

**Note**

If you decide to delete an object from a source bucket that has replication enabled, you should check the replication status of the object before deletion to ensure that the object has been replicated.

If lifecycle configuration is enabled on the source bucket, Amazon S3 puts any lifecycle actions on hold until it marks the objects status as either COMPLETED or FAILED.

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

# Troubleshooting Cross-Region Replication in Amazon S3

After configuring cross-region replication, if you don't see the object replica created in the destination bucket, try the following troubleshooting methods:

- The time it takes for Amazon S3 to replicate an object depends on the object size. For large objects, it can take up to several hours. If the object in question is large, check to see if the replicated object appears in the destination bucket again at a later time.
- In the replication configuration on the source bucket:
  - Verify that the destination bucket Amazon Resource Name (ARN) is correct.
  - Verify that the key name prefix is correct. For example, if you set the configuration to replicate objects with the prefix Tax, then only objects with key names such as Tax/document1 or Tax/document2 are replicated. An object with the key name document3 is not replicated.
  - Verify that the status is enabled.
- If the destination bucket is owned by another AWS account, verify that the bucket owner has a bucket policy on the destination bucket that allows the source bucket owner to replicate objects.
- If an object replica does not appear in the destination bucket, note the following:

- An object in a source bucket that is itself a replica created by another replication configuration, Amazon S3 does not replicate the replica. For example, if you set replication configuration from bucket A to bucket B to bucket C, Amazon S3 does not replicate object replicas in bucket B.
- A bucket owner can grant other AWS accounts permission to upload objects. By default, the bucket owner does not have any permissions on the objects created by the other account. And the replication configuration replicates only the objects for which the bucket owner has access permissions. The bucket owner can grant other AWS accounts permissions to create objects conditionally requiring explicit access permissions on those objects. For an example policy, see [Granting Cross-Account Permissions to Upload Objects While Ensuring the Bucket Owner Has Full Control \(p. 369\)](#).

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

# Cross-Region Replication: Additional Considerations

In addition to replication configuration, Amazon S3 supports several other bucket configuration options including:

- Configure versioning on a bucket. For more information, see [Using Versioning \(p. 448\)](#).
- Configure a bucket for website hosting. For more information, see [Hosting a Static Website on Amazon S3 \(p. 471\)](#).
- Configure bucket access via a bucket policy or ACL. For more information, see [Using Bucket Policies and User Policies \(p. 335\)](#) and see [Managing Access with ACLs \(p. 394\)](#).
- Configure a bucket to store access logs. For more information, [Server Access Logging \(p. 596\)](#).
- Configure the lifecycle for objects in the bucket. For more information, see [Object Lifecycle Management \(p. 125\)](#).

This topic explains how bucket replication configuration influences the behavior of other bucket configurations.

## Lifecycle Configuration and Object Replicas

The time it takes for Amazon S3 to replicate an object depends on object size. For large objects, it can take several hours. Even though it might take some time before a replica is available in the destination bucket, creation time of the replica remains the same as the corresponding object in the source bucket. Therefore, if you have a lifecycle policy on the destination bucket, note that lifecycle rules honor the original creation time of the object, not when the replica became available in the destination bucket.

If you have an object expiration lifecycle policy in your non-versioned bucket, and you want to maintain the same permanent delete behavior when you enable versioning, you must add a noncurrent expiration policy to manage the deletions of the noncurrent object versions in the version-enabled bucket.

Replication configuration requires the bucket to be versioning-enabled. When you enable versioning on a bucket, keep the following in mind:

- If you have an object `Expiration` lifecycle policy, after you enable versioning, you should add a `NonCurrentVersionExpiration` policy to maintain the same permanent delete behavior (that was the case prior enabling versioning).

- If you have a Transition lifecycle policy, after you enable versioning, you should consider adding NonCurrentVersionTransition policy.

## Versioning Configuration and Replication Configuration

Both the source and destination buckets must be versioning-enabled when you configure replication on a bucket. After you enable versioning on both the source and destination buckets and configure replication on the source bucket, note the following:

- If you attempt to disable versioning on the source bucket, Amazon S3 returns an error. You must remove the replication configuration before you can disable versioning on the source bucket.
- If you disable versioning on the destination bucket, Amazon S3 stops replication.

## Logging Configuration and Replication Configuration

Note the following:

- If you have Amazon S3 delivering logs to a bucket that also has replication enabled, Amazon S3 replicates the log objects.
- If you have server access logs ([Server Access Logging \(p. 596\)](#)) or AWS CloudTrail Logs ([Logging Amazon S3 API Calls By Using AWS CloudTrail \(p. 574\)](#)) enabled on your source or destination bucket, Amazon S3 includes the CRR-related requests in the logs. For example, Amazon S3 logs each object that it replicates.

## CRR and Destination Region

In CRR configuration, the source and destination buckets must be in different AWS Regions. You might choose destination bucket Regions either based on your business needs or cost considerations. For example, inter-region data transfer charges vary depending on the Region pairing. For example, suppose US East (N. Virginia) (us-east-1) is your source bucket Region. If you choose US West (Oregon) (us-west-2) as the destination bucket Region, you pay more than if you choose the US East (Ohio) (us-east-2) Region. For pricing information, see the Data Transfer Pricing section on [Amazon S3 Pricing](#).

## Pausing Replication Configuration

If you want Amazon S3 to temporarily pause replication, you can disable the specific rule in replication configuration. If replication is enabled and you remove the IAM role that grants Amazon S3 necessary permissions, Amazon S3 fails replicating objects, and reports replication status for those objects as failed.

## Related Topics

[Cross-Region Replication \(CRR\) \(p. 519\)](#)

# Request Routing

## Topics

- [Request Redirection and the REST API \(p. 556\)](#)
- [DNS Considerations \(p. 559\)](#)

Programs that make requests against buckets created using the <CreateBucketConfiguration> API must support redirects. Additionally, some clients that do not respect DNS TTLs might encounter issues.

This section describes routing and DNS issues to consider when designing your service or application for use with Amazon S3.

## Request Redirection and the REST API

### Overview

Amazon S3 uses the Domain Name System (DNS) to route requests to facilities that can process them. This system works very effectively. However, temporary routing errors can occur.

If a request arrives at the wrong Amazon S3 location, Amazon S3 responds with a temporary redirect that tells the requester to resend the request to a new endpoint.

If a request is incorrectly formed, Amazon S3 uses permanent redirects to provide direction on how to perform the request correctly.

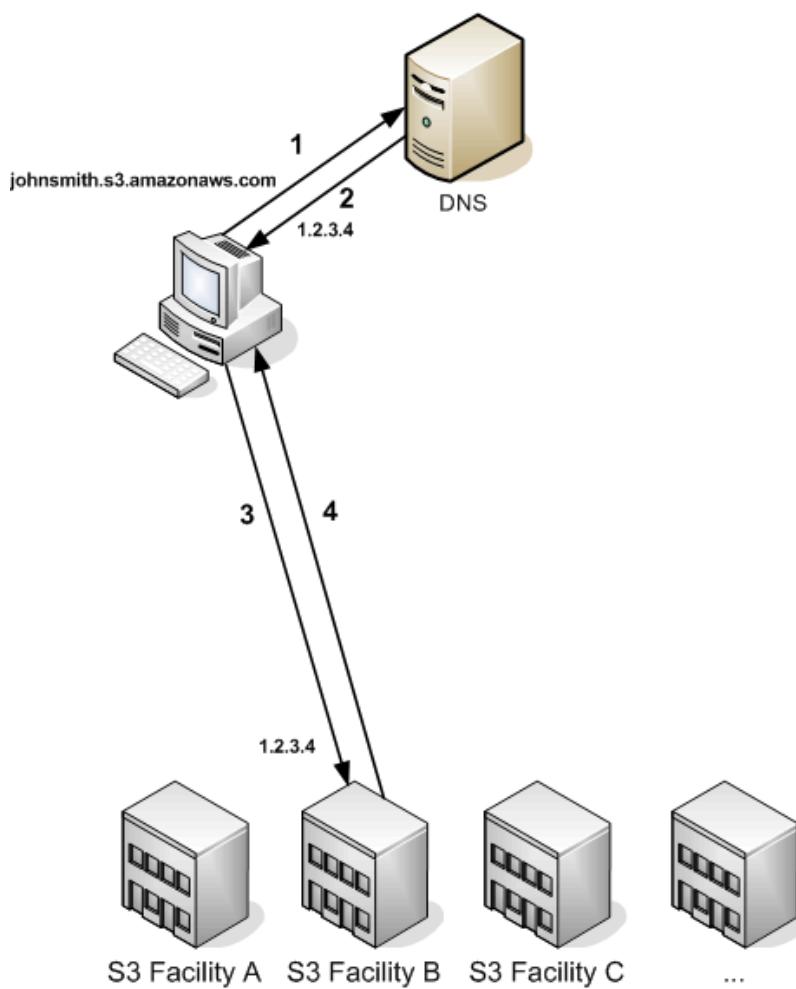
#### Important

Every Amazon S3 program must be designed to handle redirect responses. The only exception is for programs that work exclusively with buckets that were created without <CreateBucketConfiguration>. For more information on location constraints, see [Accessing a Bucket \(p. 60\)](#).

## DNS Routing

DNS routing routes requests to appropriate Amazon S3 facilities.

The following figure shows an example of DNS routing.



1	The client makes a DNS request to get an object stored on Amazon S3.
2	The client receives one or more IP addresses for facilities that can process the request.
3	The client makes a request to Amazon S3 Facility B.
4	Facility B returns a copy of the object.

## Temporary Request Redirection

A temporary redirect is a type of error response that signals to the requester that he should resend his request to a different endpoint.

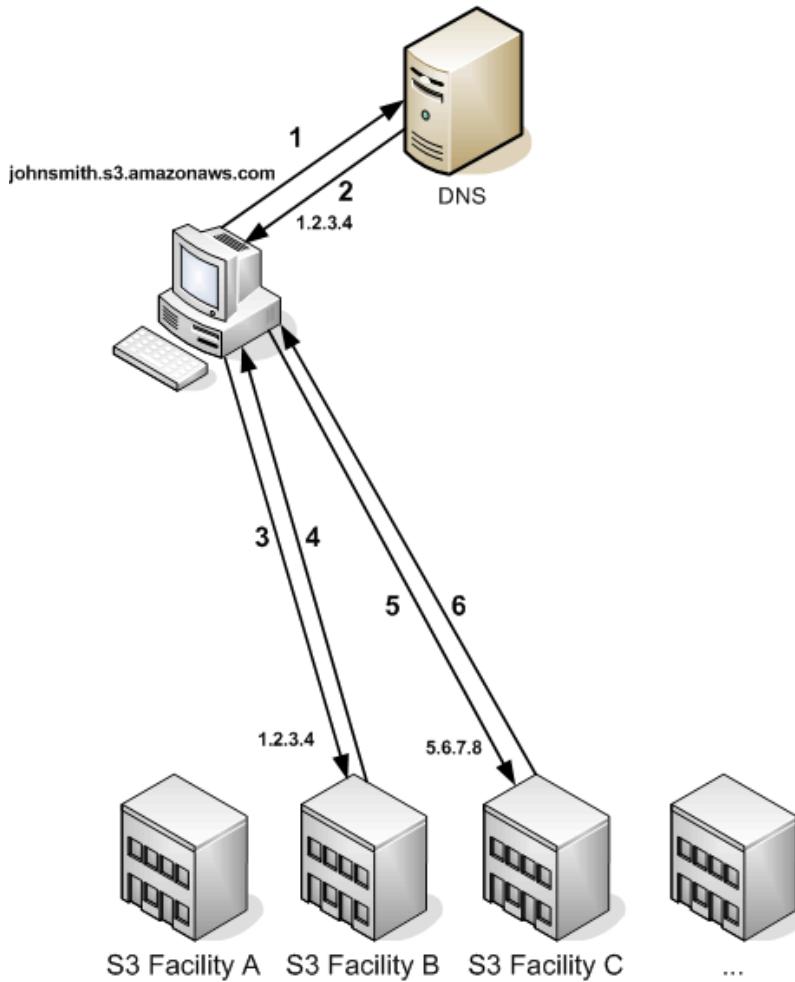
Due to the distributed nature of Amazon S3, requests can be temporarily routed to the wrong facility. This is most likely to occur immediately after buckets are created or deleted. For example, if you create a new bucket and immediately make a request to the bucket, you might receive a temporary redirect, depending on the location constraint of the bucket. If you created the bucket in the US East (N. Virginia) region (`s3.amazonaws.com` endpoint) you will not see the redirect because this is also the default endpoint. However, if the bucket is created in any other region, any requests for the bucket will go to the default endpoint while the bucket's DNS entry is propagated. The default endpoint will redirect the request to the correct endpoint with a HTTP 302 response.

Temporary redirects contain a URI to the correct facility which you can use to immediately resend the request.

**Important**

Do not reuse an endpoint provided by a previous redirect response. It might appear to work (even for long periods of time), but might provide unpredictable results and will eventually fail without notice.

The following figure shows an example of a temporary redirect.



1	The client makes a DNS request to get an object stored on Amazon S3.
2	The client receives one or more IP addresses for facilities that can process the request.
3	The client makes a request to Amazon S3 Facility B.
4	Facility B returns a redirect indicating the object is available from Location C.
5	The client resends the request to Facility C.
6	Facility C returns a copy of the object.

## Permanent Request Redirection

A permanent redirect indicates that your request addressed a resource inappropriately. For example, permanent redirects occur if you use a path-style request to access a bucket that was created using <CreateBucketConfiguration>. For more information, see [Accessing a Bucket \(p. 60\)](#).

To help you find these errors during development, this type of redirect does not contain a Location HTTP header that allows you to automatically follow the request to the correct location. Consult the resulting XML error document for help using the correct Amazon S3 endpoint.

### REST API Redirect

```
HTTP/1.1 307 Temporary Redirect
Location: http://johnsmith.s3-gztb4pa9sq.amazonaws.com/photos/puppy.jpg?rk=e2c69a31
Content-Type: application/xml
Transfer-Encoding: chunked
Date: Fri, 12 Oct 2007 01:12:56 GMT
Server: AmazonS3

<?xml version="1.0" encoding="UTF-8"?>
<Error>
  <Code>TemporaryRedirect</Code>
  <Message>Please re-send this request to the specified temporary endpoint.
  Continue to use the original request endpoint for future requests.</Message>
  <Endpoint>johnsmith.s3-gztb4pa9sq.amazonaws.com</Endpoint>
</Error>
```

### SOAP API Redirect

#### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

```
<soapenv:Body>
<soapenv:Fault>
  <Faultcode>soapenv:Client.TemporaryRedirect</Faultcode>
  <Faultstring>Please re-send this request to the specified temporary endpoint.
  Continue to use the original request endpoint for future requests.</Faultstring>
  <Detail>
    <Bucket>images</Bucket>
    <Endpoint>s3-gztb4pa9sq.amazonaws.com</Endpoint>
  </Detail>
</soapenv:Fault>
</soapenv:Body>
```

## DNS Considerations

One of the design requirements of Amazon S3 is extremely high availability. One of the ways we meet this requirement is by updating the IP addresses associated with the Amazon S3 endpoint in DNS as needed. These changes are automatically reflected in short-lived clients, but not in some long-lived clients. Long-lived clients will need to take special action to re-resolve the Amazon S3 endpoint periodically to benefit from these changes. For more information about virtual machines (VMs), refer to the following:

- For Java, Sun's JVM caches DNS lookups forever by default; go to the "InetAddress Caching" section of [the InetAddress documentation](#) for information on how to change this behavior.
- For PHP, the persistent PHP VM that runs in the most popular deployment configurations caches DNS lookups until the VM is restarted. Go to [the getHostByName PHP docs](#).

# Performance Optimization

This section discusses Amazon S3 best practices for optimizing performance in the following topics.

## Topics

- [Request Rate and Performance Considerations \(p. 561\)](#)
- [TCP Window Scaling \(p. 564\)](#)
- [TCP Selective Acknowledgement \(p. 565\)](#)

## Note

For more information about high performance tuning, see [Enabling High Performance Data Transfers](#) at the Pittsburgh Supercomputing Center (PSC) website.

## Request Rate and Performance Considerations

This topic discusses Amazon S3 best practices for optimizing performance depending on your request rates. If your workload in an Amazon S3 bucket routinely exceeds 100 PUT/LIST/DELETE requests per second or more than 300 GET requests per second, follow the guidelines in this topic to ensure the best performance and scalability.

Amazon S3 scales to support very high request rates. If your request rate grows steadily, Amazon S3 automatically partitions your buckets as needed to support higher request rates. However, if you expect a rapid increase in the request rate for a bucket to more than 300 PUT/LIST/DELETE requests per second or more than 800 GET requests per second, we recommend that you open a support case to prepare for the workload and avoid any temporary limits on your request rate. To open a support case, go to [Contact Us](#).

## Note

The Amazon S3 best practice guidelines in this topic apply only if you are routinely processing 100 or more requests per second. If your typical workload involves only occasional bursts of 100 requests per second and less than 800 requests per second, you don't need to follow these guidelines.

If your workload in Amazon S3 uses Server-Side Encryption with AWS Key Management Service (SSE-KMS), go to [Limits](#) in the *AWS Key Management Service Developer Guide* to get more information on the request rates supported for your use case.

The Amazon S3 best practice guidance given in this topic is based on two types of workloads:

- **Workloads that include a mix of request types** – If your requests are typically a mix of GET, PUT, DELETE, or GET Bucket (list objects), choosing appropriate key names for your objects will ensure

better performance by providing low-latency access to the Amazon S3 index. It will also ensure scalability regardless of the number of requests you send per second.

- **Workloads that are GET-intensive** – If the bulk of your workload consists of GET requests, we recommend using the Amazon CloudFront content delivery service.

#### Topics

- [Workloads with a Mix of Request Types \(p. 562\)](#)
- [GET-Intensive Workloads \(p. 564\)](#)

## Workloads with a Mix of Request Types

When uploading a large number of objects, customers sometimes use sequential numbers or date and time values as part of their key names. For example, you might choose key names that use some combination of the date and time, as shown in the following example, where the prefix includes a timestamp:

```
examplebucket/2013-26-05-15-00-00/cust1234234/photo1.jpg
examplebucket/2013-26-05-15-00-00/cust3857422/photo2.jpg
examplebucket/2013-26-05-15-00-00/cust1248473/photo2.jpg
examplebucket/2013-26-05-15-00-00/cust8474937/photo2.jpg
examplebucket/2013-26-05-15-00-00/cust1248473/photo3.jpg
...
examplebucket/2013-26-05-15-00-01/cust1248473/photo4.jpg
examplebucket/2013-26-05-15-00-01/cust1248473/photo5.jpg
examplebucket/2013-26-05-15-00-01/cust1248473/photo6.jpg
examplebucket/2013-26-05-15-00-01/cust1248473/photo7.jpg
...
```

The sequence pattern in the key names introduces a performance problem. To understand the issue, let's look at how Amazon S3 stores key names.

Amazon S3 maintains an index of object key names in each AWS region. Object keys are stored in UTF-8 binary ordering across multiple partitions in the index. The key name dictates which partition the key is stored in. Using a sequential prefix, such as timestamp or an alphabetical sequence, increases the likelihood that Amazon S3 will target a specific partition for a large number of your keys, overwhelming the I/O capacity of the partition. If you introduce some randomness in your key name prefixes, the key names, and therefore the I/O load, will be distributed across more than one partition.

If you anticipate that your workload will consistently exceed 100 requests per second, you should avoid sequential key names. If you must use sequential numbers or date and time patterns in key names, add a random prefix to the key name. The randomness of the prefix more evenly distributes key names across multiple index partitions. Examples of introducing randomness are provided later in this topic.

#### Note

The guidelines provided for the key name prefixes in the following section also apply to the bucket name. When Amazon S3 stores a key name in the index, it stores the bucket names as part of the key name (for example, examplebucket/object.jpg).

## Example 1: Add a Hex Hash Prefix to Key Name

One way to introduce randomness to key names is to add a hash string as prefix to the key name. For example, you can compute an MD5 hash of the character sequence that you plan to assign as the key name. From the hash, pick a specific number of characters, and add them as the prefix to the key name. The following example shows key names with a four-character hash.

**Note**

A hashed prefix of three or four characters should be sufficient. We strongly recommend using a hexadecimal hash as the prefix.

```
examplebucket/232a-2013-26-05-15-00-00/cust1234234/photo1.jpg
examplebucket/7b54-2013-26-05-15-00-00/cust3857422/photo2.jpg
examplebucket/921c-2013-26-05-15-00-00/cust1248473/photo2.jpg
examplebucket/ba65-2013-26-05-15-00-00/cust8474937/photo2.jpg
examplebucket/8761-2013-26-05-15-00-00/cust1248473/photo3.jpg
examplebucket/2e4f-2013-26-05-15-00-01/cust1248473/photo4.jpg
examplebucket/9810-2013-26-05-15-00-01/cust1248473/photo5.jpg
examplebucket/7e34-2013-26-05-15-00-01/cust1248473/photo6.jpg
examplebucket/c34a-2013-26-05-15-00-01/cust1248473/photo7.jpg
...
```

Note that this randomness does introduce some interesting challenges. Amazon S3 provides a [GET Bucket \(List Objects\)](#) operation, which returns a UTF-8 binary ordered list of key names. Here are some side-effects:

- Because of the hashed prefixes, however, the listing will appear randomly ordered.
- The problem gets compounded if you want to list object keys with specific date in the key name. The preceding example uses 4 character hex hash, so there are 65536 possible character combinations (4 character prefix, and each character can be any of the hex characters 0-f). So you will be sending 65536 List Bucket requests each with a specific prefix that is a combination of 4-digit hash and the date. For example, suppose you want to find all keys with 2013-26-05 in the key name. Then you will send List Bucket requests with prefixes such [0-f][0-f][0-f][0-f]2013-26-05.

You can optionally add more prefixes in your key name, before the hash string, to group objects. The following example adds `animations/` and `videos/` prefixes to the key names.

```
examplebucket/animations/232a-2013-26-05-15-00-00/cust1234234/animation1.obj
examplebucket/animations/7b54-2013-26-05-15-00-00/cust3857422/animation2.obj
examplebucket/animations/921c-2013-26-05-15-00-00/cust1248473/animation3.obj
examplebucket/videos/ba65-2013-26-05-15-00-00/cust8474937/video2.mpg
examplebucket/videos/8761-2013-26-05-15-00-00/cust1248473/video3.mpg
examplebucket/videos/2e4f-2013-26-05-15-00-01/cust1248473/video4.mpg
examplebucket/videos/9810-2013-26-05-15-00-01/cust1248473/video5.mpg
examplebucket/videos/7e34-2013-26-05-15-00-01/cust1248473/video6.mpg
examplebucket/videos/c34a-2013-26-05-15-00-01/cust1248473/video7.mpg
...
```

In this case, the ordered list returned by the GET Bucket (List Objects) operation will be grouped by the prefixes `animations` and `videos`.

**Note**

Again, the prefixes you add to group objects should not have sequences, or you will again overwhelm a single index partition.

## Example 2: Reverse the Key Name String

Suppose your application uploads objects with key names whose prefixes include an increasing sequence of application IDs.

```
examplebucket/2134857/data/start.png
examplebucket/2134857/data/resource.rsrc
examplebucket/2134857/data/results.txt
examplebucket/2134858/data/start.png
examplebucket/2134858/data/resource.rsrc
```

```
examplebucket/2134858/data/results.txt
examplebucket/2134859/data/start.png
examplebucket/2134859/data/resource.rsrc
examplebucket/2134859/data/results.txt
```

In this key naming scheme, write operations will overwhelm a single index partition. If you reverse the application ID strings, however, you have the key names with random prefixes:

```
examplebucket/7584312/data/start.png
examplebucket/7584312/data/resource.rsrc
examplebucket/7584312/data/results.txt
examplebucket/8584312/data/start.png
examplebucket/8584312/data/resource.rsrc
examplebucket/8584312/data/results.txt
examplebucket/9584312/data/start.png
examplebucket/9584312/data/resource.rsrc
examplebucket/9584312/data/results.txt
```

Reversing the key name string lays the groundwork for Amazon S3 to start with the following partitions, one for each distinct first character in the key name. The examplebucket refers to the name of the bucket where you upload application data.

```
examplebucket/7
examplebucket/8
examplebucket/9
```

This example illustrate how Amazon S3 can use the first character of the key name for partitioning, but for very large workloads (more than 2000 requests per seconds or for bucket that contain billions of objects), Amazon S3 can use more characters for the partitioning scheme. Amazon S3 can automatically split these partitions further as the key count and request rate increase over time.

## GET-Intensive Workloads

If your workload is mainly sending GET requests, in addition to the preceding guidelines, you should consider using Amazon CloudFront for performance optimization.

Integrating Amazon CloudFront with Amazon S3, you can distribute content to your users with low latency and a high data transfer rate. You will also send fewer direct requests to Amazon S3, which will reduce your costs.

For example, suppose you have a few objects that are very popular. Amazon CloudFront will fetch those objects from Amazon S3 and cache them. Amazon CloudFront can then serve future requests for the objects from its cache, reducing the number of GET requests it sends to Amazon S3. For more information, go to the [Amazon CloudFront product detail page](#).

## TCP Window Scaling

TCP window scaling allows you to improve network throughput performance between your operating system and application layer and Amazon S3 by supporting window sizes larger than 64 KB. At the start of the TCP session, a client advertises its supported receive window WSCALE factor, and Amazon S3 responds with its supported receive window WSCALE factor for the upstream direction.

Although TCP window scaling can improve performance, it can be challenging to set correctly. Make sure to adjust settings at both the application and kernel level. For more information about TCP window scaling, refer to your operating system's documentation and go to [RFC 1323](#).

## TCP Selective Acknowledgement

TCP selective acknowledgement is designed to improve recovery time after a large number of packet losses. TCP selective acknowledgement is supported by most newer operating systems, but might have to be enabled. For more information about TCP selective acknowledgements, refer to the documentation that accompanied your operating system and go to [RFC 2018](#).

# Monitoring Amazon S3

Monitoring is an important part of maintaining the reliability, availability, and performance of Amazon S3 and your AWS solutions. You should collect monitoring data from all of the parts of your AWS solution so that you can more easily debug a multi-point failure if one occurs. Before you start monitoring Amazon S3, however, you should create a monitoring plan that includes answers to the following questions:

- What are your monitoring goals?
- What resources will you monitor?
- How often will you monitor these resources?
- What monitoring tools will you use?
- Who will perform the monitoring tasks?
- Who should be notified when something goes wrong?

## Topics

- [Monitoring Tools \(p. 566\)](#)
- [Monitoring Metrics with Amazon CloudWatch \(p. 567\)](#)
- [Metrics Configurations for Buckets \(p. 572\)](#)
- [Logging Amazon S3 API Calls By Using AWS CloudTrail \(p. 574\)](#)

## Monitoring Tools

AWS provides various tools that you can use to monitor Amazon S3. You can configure some of these tools to do the monitoring for you, while some of the tools require manual intervention. We recommend that you automate monitoring tasks as much as possible.

### Automated Monitoring Tools

You can use the following automated monitoring tools to watch Amazon S3 and report when something is wrong:

- **Amazon CloudWatch Alarms** – Watch a single metric over a time period that you specify, and perform one or more actions based on the value of the metric relative to a given threshold over a number of time periods. The action is a notification sent to an Amazon Simple Notification Service (Amazon SNS) topic or Auto Scaling policy. CloudWatch alarms do not invoke actions simply because they are in a particular state; the state must have changed and been maintained for a specified number of periods. For more information, see [Monitoring Metrics with Amazon CloudWatch \(p. 567\)](#).

- **AWS CloudTrail Log Monitoring** – Share log files between accounts, monitor CloudTrail log files in real time by sending them to CloudWatch Logs, write log processing applications in Java, and validate that your log files have not changed after delivery by CloudTrail. For more information, see [Logging Amazon S3 API Calls By Using AWS CloudTrail \(p. 574\)](#).

## Manual Monitoring Tools

Another important part of monitoring Amazon S3 involves manually monitoring those items that the CloudWatch alarms don't cover. The Amazon S3, CloudWatch, Trusted Advisor, and other AWS console dashboards provide an at-a-glance view of the state of your AWS environment. You may want to enable server access logging, which tracks requests for access to your bucket. Each access log record provides details about a single access request, such as the requester, bucket name, request time, request action, response status, and error code, if any. For more information, see [Server Access Logging \(p. 596\)](#) in the *Amazon Simple Storage Service Developer Guide*.

- Amazon S3 dashboard shows:
  - Your buckets and the objects and properties they contain.
- CloudWatch home page shows:
  - Current alarms and status.
  - Graphs of alarms and resources.
  - Service health status.

In addition, you can use CloudWatch to do the following:

- Create [customized dashboards](#) to monitor the services you care about.
- Graph metric data to troubleshoot issues and discover trends.
- Search and browse all your AWS resource metrics.
- Create and edit alarms to be notified of problems.
- AWS Trusted Advisor can help you monitor your AWS resources to improve performance, reliability, security, and cost effectiveness. Four Trusted Advisor checks are available to all users; more than 50 checks are available to users with a Business or Enterprise support plan. For more information, see [AWS Trusted Advisor](#).

Trusted Advisor has these checks that relate to Amazon S3:

- Checks of the logging configuration of Amazon S3 buckets.
- Security checks for Amazon S3 buckets that have open access permissions.
- Fault tolerance checks for Amazon S3 buckets that do not have versioning enabled, or have versioning suspended.

## Monitoring Metrics with Amazon CloudWatch

Amazon CloudWatch metrics for Amazon S3 can help you understand and improve the performance of applications that use Amazon S3. There are two ways that you can use CloudWatch with Amazon S3.

- **Daily Storage Metrics for Buckets** - You can monitor bucket storage using CloudWatch, which collects and processes storage data from Amazon S3 into readable, daily metrics. These storage metrics for Amazon S3 are reported once per day and are provided to all customers at no additional cost.
- **Request metrics** - You can choose to monitor Amazon S3 requests to quickly identify and act on operational issues. The metrics are available at 1 minute intervals after some latency to process. These CloudWatch metrics are billed at the same rate as the Amazon CloudWatch Custom Metrics. For information on CloudWatch pricing, see [Amazon CloudWatch Pricing](#). To learn more about how to opt-in to getting these metrics, see [Metrics Configurations for Buckets \(p. 572\)](#).

When enabled, request metrics are reported for all object operations. By default, these 1-minute metrics are available at the Amazon S3 bucket level. You can also define a filter for the metrics collected –using a shared prefix or object tag– allowing you to align metrics filters to specific business applications, workflows, or internal organizations.

All CloudWatch statistics are retained for a period of fifteen months, so that you can access historical information and gain a better perspective on how your web application or service is performing. For more information on CloudWatch, see [What Are Amazon CloudWatch, Amazon CloudWatch Events, and Amazon CloudWatch Logs?](#) in the *Amazon CloudWatch User Guide*.

## Metrics and Dimensions

The storage metrics and dimensions that Amazon S3 sends to CloudWatch are listed below.

### Amazon S3 CloudWatch Daily Storage Metrics for Buckets

The AWS/S3 namespace includes the following daily storage metrics for buckets.

Metric	Description
BucketSizeBytes	<p>The amount of data in bytes stored in a bucket in the Standard storage class, Standard - Infrequent Access (Standard_IA) storage class, or the Reduced Redundancy Storage (RRS) class.</p> <p>Valid storage type filters: <code>StandardStorage</code>, or <code>StandardIAStorage</code>, or <code>ReducedRedundancyStorage</code> (see <code>StorageType</code> dimension)</p> <p>Units: Bytes</p> <p>Valid statistics: Average</p>
NumberOfObjects	<p>The total number of objects stored in a bucket for all storage classes except for the <code>GLACIER</code> storage class.</p> <p>Valid storage type filters: <code>AllStorageTypes</code> only (see <code>StorageType</code> dimension)</p> <p>Units: Count</p> <p>Valid statistics: Average</p>

### Amazon S3 CloudWatch Request metrics

The AWS/S3 namespace includes the following request metrics.

Metric	Description
AllRequests	The total number of HTTP requests made to an Amazon S3 bucket, regardless of type. If you're using a metrics configuration with a filter, then this metric only returns the HTTP requests made to the objects in the bucket that meet the filter's requirements.

Metric	Description
	Units: Count Valid statistics: Sum
GetRequests	The number of HTTP GET requests made for objects in an Amazon S3 bucket. This doesn't include list operations. Units: Count Valid statistics: Sum <b>Note</b> Paginated list-oriented requests, like <a href="#">List Multipart Uploads</a> , <a href="#">List Parts</a> , <a href="#">Get Bucket Object versions</a> , and others, are not included in this metric.
PutRequests	The number of HTTP PUT requests made for objects in an Amazon S3 bucket. Units: Count Valid statistics: Sum
DeleteRequests	The number of HTTP DELETE requests made for objects in an Amazon S3 bucket. This also includes <a href="#">Delete Multiple Objects</a> requests. This metric shows the number of requests, not the number of objects deleted. Units: Count Valid statistics: Sum
HeadRequests	The number of HTTP HEAD requests made to an Amazon S3 bucket. Units: Count Valid statistics: Sum
PostRequests	The number of HTTP POST requests made to an Amazon S3 bucket. Units: Count Valid statistics: Sum
ListRequests	The number of HTTP requests that list the contents of a bucket. Units: Count Valid statistics: Sum
BytesDownloaded	The number bytes downloaded for requests made to an Amazon S3 bucket, where the response includes a body. Units: Bytes Valid statistics: Average (bytes per request), Sum (bytes per period), Sample Count, Min, Max

Metric	Description
BytesUploaded	<p>The number bytes uploaded that contain a request body, made to an Amazon S3 bucket.</p> <p>Units: Bytes</p> <p>Valid statistics: Average (bytes per request), Sum (bytes per period), Sample Count, Min, Max</p>
4xxErrors	<p>The number of HTTP 4xx client error status code requests made to an Amazon S3 bucket with a value of either 0 or 1. The average statistic shows the error rate, and the sum statistic shows the count of that type of error, during each period.</p> <p>Units: Count</p> <p>Valid statistics: Average (reports per request), Sum (reports per period), Min, Max, Sample Count</p>
5xxErrors	<p>The number of HTTP 5xx server error status code requests made to an Amazon S3 bucket with a value of either 0 or 1. The average statistic shows the error rate, and the sum statistic shows the count of that type of error, during each period.</p> <p>Units: Counts</p> <p>Valid statistics: Average (reports per request), Sum (reports per period), Min, Max, Sample Count</p>
FirstByteLatency	<p>The per-request time from the complete request being received by an Amazon S3 bucket to when the response starts to be returned.</p> <p>Units: Milliseconds</p> <p>Valid statistics: Average, Sum, Min, Max, Sample Count</p>
TotalRequestLatency	<p>The elapsed per-request time from the first byte received to the last byte sent to an Amazon S3 bucket. This includes the time taken to receive the request body and send the response body, which is not included in FirstByteLatency.</p> <p>Units: Milliseconds</p> <p>Valid statistics: Average, Sum, Min, Max, Sample Count</p>

## Amazon S3 CloudWatch Dimensions

The following dimensions are used to filter Amazon S3 metrics.

Dimension	Description
BucketName	This dimension filters the data you request for the identified bucket only.
StorageType	This dimension filters the data you have stored in a bucket by the type of storage. The types are StandardStorage for the Standard storage class, StandardIAStorage for the Standard_IA

Dimension	Description
	storage class, <code>ReducedRedundancyStorage</code> for the Reduced Redundancy Storage (RRS) class, and <code>AllStorageTypes</code> . The <code>AllStorageTypes</code> type includes the Standard, Standard_IA, and RRS storage classes, it does not include the <code>GLACIER</code> storage class.
<code>FilterId</code>	This dimension filters metrics configurations that you specify for request metrics on a bucket, for example, a prefix or a tag. You specify a filter id when you create a metrics configuration. For more information, see <a href="#">Metrics Configurations for Buckets (p. 572)</a> .

## Accessing CloudWatch Metrics

You can use the following procedures to view the storage metrics for Amazon S3. Note that in order to get the Amazon S3 metrics involved, you must set a start and end timestamps. For metrics for any given 24-hour period, set the time period to 86400 seconds, the number of seconds in a day. Also, remember to set the `BucketName` and `StorageType` dimensions.

For example, if you use the AWS CLI to get the average of a specific bucket's size, in bytes, you could use the following command:

```
aws cloudwatch get-metric-statistics --metric-name BucketSizeBytes --namespace AWS/S3
--start-time 2016-10-19T00:00:00Z --end-time 2016-10-20T00:00:00Z --statistics Average
--unit Bytes --region us-west-2 --dimensions Name=BucketName,Value=ExampleBucket
Name=StorageType,Value=StandardStorage --period 86400 --output json
```

This example produces the following output:

```
{
    "Datapoints": [
        {
            "Timestamp": "2016-10-19T00:00:00Z",
            "Average": 1025328.0,
            "Unit": "Bytes"
        }
    ],
    "Label": "BucketSizeBytes"
}
```

### To view metrics using the CloudWatch console

1. Open the CloudWatch console at <https://console.aws.amazon.com/cloudwatch/>.
2. In the navigation pane, choose **Metrics**.
3. Choose the **S3** namespace.
4. (Optional) To view a metric, type the metric name in the search field.
5. (Optional) To filter by the **StorageType** dimension, type the name of the storage class in the search field.

### To view a list of valid metrics stored for your AWS account using the AWS CLI

- At a command prompt, use the following command:

```
aws cloudwatch list-metrics --namespace "AWS/S3"
```

## Related Resources

- [Amazon CloudWatch Logs API Reference](#)
- [Amazon CloudWatch User Guide](#)
- [list-metrics action in the AWS Command Line Interface Reference.](#)
- [get-metric-statistics action in the AWS Command Line Interface Reference.](#)
- [Metrics Configurations for Buckets \(p. 572\)](#).

## Metrics Configurations for Buckets

The CloudWatch request metrics for Amazon S3 enable you to receive 1-minute CloudWatch metrics, set CloudWatch alarms, and access CloudWatch dashboards to view near real-time operations and performance of your Amazon S3 storage. For applications that depend on Cloud storage, these metrics let you quickly identify and act on operational issues. When enabled, these 1-minute metrics are available at the Amazon S3 bucket-level, by default.

You must create a metrics configuration for a bucket if you want to get the CloudWatch request metrics for the objects in that bucket. You can also define a filter for the metrics collected –using a shared prefix or object tags– allowing you to align metrics filters to specific business applications, workflows, or internal organizations.

For more information about the CloudWatch metrics that are available and the differences between storage and request metrics, see [Monitoring Metrics with Amazon CloudWatch \(p. 567\)](#).

Keep the following in mind when using metrics configurations:

- You can have a maximum of 1000 metrics configurations per bucket.
- You can choose which objects in a bucket to include in metrics configurations by using filters. Filtering on a shared prefix or object tag allows you to align metrics filters to specific business applications, workflows, or internal organizations. To request metrics for the entire bucket, create a metrics configuration without a filter.
- Metrics configurations are necessary only to enable request metrics. Bucket-level daily storage metrics are always turned on, and are provided at no additional cost. Currently, it's not possible to get daily storage metrics for a filtered subset of objects.
- Each metrics configuration enables the full set of [available request metrics \(p. 568\)](#). Operation-specific metrics (such as `PostRequests`) will only be reported if there are requests of that type for your bucket or your filter.
- Request metrics are reported for object-level operations, and are also reported for operations that list bucket contents, like [GET Bucket \(List Objects\)](#), [GET Bucket Object Versions](#), and [List Multipart Uploads](#), but are not reported for other operations on buckets.

## Best-Effort CloudWatch Metrics Delivery

CloudWatch metrics are delivered on a best-effort basis. Most requests for an Amazon S3 object that have request metrics result in a data point being sent to CloudWatch.

The completeness and timeliness of metrics is not guaranteed. The data point for a particular request might be returned with a timestamp that is later than when the request was actually processed, or the data point for a minute might be delayed before being available through CloudWatch, or it might not be

delivered at all. CloudWatch request metrics give you an idea of the nature of traffic against your bucket in near real time. It is not meant to be a complete accounting of all requests.

It follows from the best-effort nature of this feature that the reports available at the [Billing & Cost Management Dashboard](#) might include one or more access requests that do not appear in the bucket metrics.

## Filtering Metrics Configurations

When working with CloudWatch metric configurations, you have the option of filtering the configuration into groups of related objects within a single bucket. You can filter objects in a bucket for inclusion in a metrics configuration based on one or more of the following elements:

- **Object key name prefix** – While the Amazon S3 data model is a flat structure, you can infer hierarchy by using a prefix. The Amazon S3 console supports these prefixes with the concept of folders. If you filter by prefix, objects that have the same prefix will be included in the metrics configuration.
- **Tag** – You can add tags, key value name pairs, to objects. Tags allow you to find and organize objects easily. These tags can also be used as a filter for metrics configurations.

If you specify a filter, only requests that operate on single objects can match the filter and be included in the reported metrics. Requests like [Delete Multiple Objects](#) and List requests don't return any metrics for configurations with filters.

To request more complex filtering, choose two or more elements. Only objects that have all of those elements are included in the metrics configuration. If you don't set filters, all of the objects in the bucket are included in the metrics configuration.

## How to Add Metrics Configurations

You can add metrics configurations to a bucket through the Amazon S3 console, with the AWS CLI, or with the Amazon S3 REST API. For information about how to do this in the AWS Management Console, see the [Amazon S3 Console User Guide](#).

### Add Metrics Configurations with the AWS CLI

1. Install and set up the AWS CLI. For instructions, see [Getting Set Up with the AWS Command Line Interface](#) in the [AWS Command Line Interface User Guide](#).
2. Open a terminal.
3. Run the following command to add a metrics configuration:

```
aws s3api put-bucket-metrics-configuration --endpoint http://s3-us-west-2.amazonaws.com
--bucket bucket-name --id metrics-config-id --metrics-configuration '{"Id":"' metrics-config-id '", "Filter": {"Prefix": "prefix1"}}
```

4. To verify that the configuration was added, execute the following command:

```
aws s3api get-bucket-metrics-configuration --endpoint http://s3-us-west-2.amazonaws.com
--bucket bucket-name --id metrics-config-id
```

This returns the following response:

```
{
    "MetricsConfiguration": {
        "Filter": {
            "Prefix": "prefix1"
        }
    }
}
```

```
        "Id": "metrics-config-id"  
    }  
}
```

You can also add metrics configurations programmatically with the Amazon S3 REST API. For more information, see the following topics in the Amazon Simple Storage Service API Reference:

- [PUT Bucket Metric Configuration](#)
- [GET Bucket Metric Configuration](#)
- [List Bucket Metric Configuration](#)
- [DELETE Bucket Metric Configuration](#)

## Logging Amazon S3 API Calls By Using AWS CloudTrail

Amazon S3 is integrated with CloudTrail, a service that captures specific API calls made to Amazon S3 from your AWS account and delivers the log files to an Amazon S3 bucket that you specify. CloudTrail captures API calls made from the Amazon S3 console or from the Amazon S3 API.

Using the information collected by CloudTrail, you can determine what request was made to Amazon S3, the source IP address from which the request was made, who made the request, when it was made, and so on. This information helps you to track changes made to your AWS resources and to troubleshoot operational issues. CloudTrail makes it easier to ensure compliance with internal policies and regulatory standards. To learn more about CloudTrail, including how to configure and enable it, see the [AWS CloudTrail User Guide](#).

### Amazon S3 Information in CloudTrail

When CloudTrail logging is enabled in your AWS account, API calls made to certain Amazon S3 actions are tracked in CloudTrail log files.

### Amazon S3 Bucket-Level Actions Tracked by CloudTrail Logging

By default, CloudTrail logs bucket-level actions. Amazon S3 records are written together with other AWS service records in a log file. CloudTrail determines when to create and write to a new file based on a time period and file size.

The tables in this section list the Amazon S3 bucket-level actions that are supported for logging by CloudTrail.

#### Amazon S3 Bucket-Level Actions Tracked by CloudTrail Logging

REST API Name	API Event Name Used in CloudTrail Log
<a href="#">DELETE Bucket</a>	DeleteBucket
<a href="#">DELETE Bucket cors</a>	DeleteBucketCors
<a href="#">DELETE Bucket lifecycle</a>	DeleteBucketLifecycle
<a href="#">DELETE Bucket policy</a>	DeleteBucketPolicy
<a href="#">DELETE Bucket replication</a>	DeleteBucketReplication
<a href="#">DELETE Bucket tagging</a>	DeleteBucketTagging

REST API Name	API Event Name Used in CloudTrail Log
DELETE Bucket website	DeleteBucketWebsite
GET Bucket acl	GetBucketAcl
GET Bucket cors	GetBucketCors
GET Bucket lifecycle	GetBucketLifecycle
GET Bucket policy	GetBucketPolicy
GET Bucket location	GetBucketLocation
GET Bucket logging	GetBucketLogging
GET Bucket notification	GetBucketNotification
GET Bucket replication	GetBucketReplication
GET Bucket tagging	GetBucketTagging
GET Bucket requestPayment	GetBucketRequestPay
GET Bucket versioning	GetBucketVersioning
GET Bucket website	GetBucketWebsite
GET Service (List all buckets)	ListBuckets
PUT Bucket	CreateBucket
PUT Bucket acl	PutBucketAcl
PUT Bucket cors	PutBucketCors
PUT Bucket lifecycle	PutBucketLifecycle
PUT Bucket policy	PutBucketPolicy
PUT Bucket logging	PutBucketLogging
PUT Bucket notification	PutBucketNotification
PUT Bucket replication	PutBucketReplication
PUT Bucket requestPayment	PutBucketRequestPay
PUT Bucket tagging	PutBucketTagging
PUT Bucket versioning	PutBucketVersioning
PUT Bucket website	PutBucketWebsite

In addition to these API operations, you can also use the [OPTIONS object](#) object-level action, which is treated like a bucket-level action in CloudTrail logging because the action checks the cors configuration of a bucket.

## Amazon S3 Object-Level Actions Tracked by CloudTrail Logging

You can also get CloudTrail logs for object-level Amazon S3 actions. To do this, specify the Amazon S3 object for your trail. When an object-level action occurs in your account, CloudTrail evaluates your trail settings. If the event matches the object that you specified in a trail, the event is logged. For more information, see [Data Events](#) in the *AWS CloudTrail User Guide*. The following table lists the object-level actions that CloudTrail can log:

REST API Name	API Event Name Used in CloudTrail Log
<a href="#">DeleteObject</a>	DeleteObject
<a href="#">GetObject</a>	GetObject
<a href="#">GetObjectACL</a>	GetObjectAcl
<a href="#">GetObjectTorrent</a>	GetObjectTorrent
<a href="#">HeadObject</a>	HeadObject
<a href="#">PostObject</a>	PostObject
<a href="#">PostObjectRestore</a>	RestoreObject
<a href="#">PutObject</a>	PutObject
<a href="#">PutObjectACL</a>	PutObjectAcl
<a href="#">PutObjectCopy</a>	CopyObject
<a href="#">InitiateMultipartUpload</a>	CreateMultipartUpload
<a href="#">UploadPart</a>	UploadPart
<a href="#">UploadPart - Copy</a>	UploadPartCopy
<a href="#">CompleteMultipartUpload</a>	CompleteMultipartUpload
<a href="#">AbortMultipartUpload</a>	AbortMultipartUpload
<a href="#">ListParts</a>	ListParts

In addition to these operations, you can use the following bucket-level operations to get CloudTrail logs as object-level Amazon S3 actions under certain conditions:

- [GET Bucket \(List Objects\) Version 2](#) – Select a prefix specified in the trail.
- [GET Bucket Object versions](#) – Select a prefix specified in the trail.
- [HEAD Bucket](#) – Specify a bucket and an empty prefix.
- [DeleteMultipleObjects](#) – Specify a bucket and an empty prefix.

## Object-Level Actions in Cross-Account Scenarios

The following are special use cases involving the object-level API calls in cross-account scenarios and how CloudTrail logs are reported. CloudTrail always delivers logs to the requester (who made the API call). When setting up cross-account access, consider the examples in this section.

### Note

The examples assume CloudTrail logs are appropriately configured.

### Example 1: CloudTrail Delivers Access Logs to the Bucket Owner

CloudTrail delivers access logs to the bucket owner only if the bucket owner has permissions for the same object API. Consider the following cross-account scenario:

- Account-A owns the bucket.
- Account-B (the requester) attempts to access an object in that bucket.

CloudTrail always delivers object-level API access logs to the requester. In addition, CloudTrail also delivers the same logs to the bucket owner only if the bucket owner has permissions for the same API actions on that object.

**Note**

If the bucket owner is also the object owner, the bucket owner gets the object access logs. Otherwise, the bucket owner must get permissions, through the object ACL, for the same object API to get the same object-access API logs.

### Example 2: CloudTrail Does Not Proliferate Email Addresses Used in Setting Object ACLs

Consider the following cross-account scenario:

- Account-A owns the bucket.
- Account-B (the requester) sends a request to set an object ACL grant using an email address. For information about ACLs, see [Access Control List \(ACL\) Overview \(p. 394\)](#).

The request gets the logs along with the email information. However, the bucket owner—if they eligible to receive logs as in example 1—gets the CloudTrail log reporting the event. However, the bucket owner doesn't get the ACL configuration information, specifically the grantee email and the grant. The only information the log tells the bucket owner is that an ACL API call was made by Account-B.

## CloudTrail Tracking with Amazon S3 SOAP API Calls

CloudTrail tracks Amazon S3 SOAP API calls. Amazon S3 SOAP support over HTTP is deprecated, but it is still available over HTTPS. For more information about Amazon S3 SOAP support, see [Appendix A: Using the SOAP API \(p. 619\)](#).

**Important**

Newer Amazon S3 features are not supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

### Amazon S3 SOAP Actions Tracked by CloudTrail Logging

SOAP API Name	API Event Name Used in CloudTrail Log
ListAllMyBuckets	ListBuckets
CreateBucket	CreateBucket
DeleteBucket	DeleteBucket
GetBucketAccessControlPolicy	GetBucketAcl
SetBucketAccessControlPolicy	PutBucketAcl
GetBucketLoggingStatus	GetBucketLogging
SetBucketLoggingStatus	PutBucketLogging

Every log entry contains information about who generated the request. The user identity information in the log helps you determine whether the request was made with root or IAM user credentials, with temporary security credentials for a role or federated user, or by another AWS service. For more information, see the [userIdentity](#) field in the [CloudTrail Event Reference](#).

You can store your log files in your bucket for as long as you want, but you can also define Amazon S3 lifecycle rules to archive or delete log files automatically. By default, your log files are encrypted by using Amazon S3 server-side encryption (SSE).

You can choose to have CloudTrail publish Amazon SNS notifications when new log files are delivered (for example, if you want to respond quickly to log files when they're delivered). For more information, see [Configuring Amazon Simple Notification Service Notifications for CloudTrail](#) in the *AWS CloudTrail User Guide*.

You can also aggregate Amazon S3 log files from multiple AWS Regions and multiple AWS accounts into a single Amazon S3 bucket. For more information, see [Receiving CloudTrail Log Files from Multiple Regions](#) in the *AWS CloudTrail User Guide*.

## Using CloudTrail Logs with Amazon S3 Server Access Logs and CloudWatch Logs

You can use AWS CloudTrail logs together with server access logs for Amazon S3. CloudTrail logs provide you with detailed API tracking for Amazon S3 bucket-level and object-level operations, while server access logs for Amazon S3 provide you visibility into object-level operations on your data in Amazon S3. For more information about server access logs, see [Server Access Logging \(p. 596\)](#).

You can also use CloudTrail logs together with CloudWatch for Amazon S3. CloudTrail integration with CloudWatch logs delivers S3 bucket-level API activity captured by CloudTrail to a CloudWatch log stream in the CloudWatch log group you specify. You can create CloudWatch alarms for monitoring specific API activity and receive email notifications when the specific API activity occurs. For more information about CloudWatch alarms for monitoring specific API activity, see the [AWS CloudTrail User Guide](#). For more information about using CloudWatch with Amazon S3, see [Monitoring Metrics with Amazon CloudWatch \(p. 567\)](#).

## Understanding Amazon S3 Log File Entries

CloudTrail log files contain one or more log entries where each entry is made up of multiple JSON-formatted events. A log entry represents a single request from any source and includes information about the requested action, any parameters, the date and time of the action, and so on. The log entries are not guaranteed to be in any particular order. That is, they are not an ordered stack trace of the public API calls.

The following example shows a CloudTrail log entry that demonstrates the [DELETE Bucket policy](#), [PUT Bucket acl](#), and [GET Bucket versioning](#) actions.

```
{  
    "Records": [  
        {  
            "eventVersion": "1.03",  
            "userIdentity": {  
                "type": "IAMUser",  
                "principalId": "111122223333",  
                "arn": "arn:aws:iam::111122223333:user/myUserName",  
                "accountId": "111122223333",  
                "accessKeyId": "AKIAIOSFODNN7EXAMPLE",  
                "userName": "myUserName"  
            },  
            ...  
        }  
    ]  
}
```

```
"eventTime": "2015-08-26T20:46:31Z",
"eventSource": "s3.amazonaws.com",
"eventName": "DeleteBucketPolicy",
"awsRegion": "us-west-2",
"sourceIPAddress": "127.0.0.1",
"userAgent": "[ ]",
"requestParameters": {
    "bucketName": "myawsbucket"
},
"responseElements": null,
"requestID": "47B8E8D397DCE7A6",
"eventID": "cdc4b7ed-e171-4cef-975a-ad829d4123e8",
"eventType": "AwsApiCall",
"recipientAccountId": "111122223333"
},
{
    "eventVersion": "1.03",
    "userIdentity": {
        "type": "IAMUser",
        "principalId": "111122223333",
        "arn": "arn:aws:iam::111122223333:user/myUserName",
        "accountId": "111122223333",
        "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
        "userName": "myUserName"
    },
    "eventTime": "2015-08-26T20:46:31Z",
    "eventSource": "s3.amazonaws.com",
    "eventName": "PutBucketAcl",
    "awsRegion": "us-west-2",
    "sourceIPAddress": "",
    "userAgent": "[ ]",
    "requestParameters": {
        "bucketName": "",
        "AccessControlPolicy": {
            "AccessControlList": {
                "Grant": {
                    "Grantee": {
                        "xsi:type": "CanonicalUser",
                        "xmlns:xsi": "http://www.w3.org/2001/XMLSchema-instance",
                        "ID": "d25639fbe9c19cd30a4c0f43fbf00e2d3f96400a9aa8dabfbbebe1906Example"
                    },
                    "Permission": "FULL_CONTROL"
                }
            },
            "xmlns": "http://s3.amazonaws.com/doc/2006-03-01/",
            "Owner": {
                "ID": "d25639fbe9c19cd30a4c0f43fbf00e2d3f96400a9aa8dabfbbebe1906Example"
            }
        }
    },
    "responseElements": null,
    "requestID": "BD8798EACDD16751",
    "eventID": "607b9532-1423-41c7-b048-ec2641693c47",
    "eventType": "AwsApiCall",
    "recipientAccountId": "111122223333"
},
{
    "eventVersion": "1.03",
    "userIdentity": {
        "type": "IAMUser",
        "principalId": "111122223333",
        "arn": "arn:aws:iam::111122223333:user/myUserName",
        "accountId": "111122223333",
        "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
        "userName": "myUserName"
    }
}
```

```
        },
        "eventTime": "2015-08-26T20:46:31Z",
        "eventSource": "s3.amazonaws.com",
        "eventName": "GetBucketVersioning",
        "awsRegion": "us-west-2",
        "sourceIPAddress": "",
        "userAgent": "[ ]",
        "requestParameters": {
            "bucketName": "myawsbucket"
        },
        "responseElements": null,
        "requestID": "07D681279BD94AED",
        "eventID": "f2b287f3-0df1-4961-a2f4-c4bdfed47657",
        "eventType": "AwsApiCall",
        "recipientAccountId": "111122223333"
    }
}
```

## Related Resources

- [AWS CloudTrail User Guide](#)
- [CloudTrail Event Reference](#)

# Using BitTorrent with Amazon S3

## Topics

- [How You are Charged for BitTorrent Delivery \(p. 581\)](#)
- [Using BitTorrent to Retrieve Objects Stored in Amazon S3 \(p. 582\)](#)
- [Publishing Content Using Amazon S3 and BitTorrent \(p. 583\)](#)

BitTorrent is an open, peer-to-peer protocol for distributing files. You can use the BitTorrent protocol to retrieve any publicly-accessible object in Amazon S3. This section describes why you might want to use BitTorrent to distribute your data out of Amazon S3 and how to do so.

Amazon S3 supports the BitTorrent protocol so that developers can save costs when distributing content at high scale. Amazon S3 is useful for simple, reliable storage of any data. The default distribution mechanism for Amazon S3 data is via client/server download. In client/server distribution, the entire object is transferred point-to-point from Amazon S3 to every authorized user who requests that object. While client/server delivery is appropriate for a wide variety of use cases, it is not optimal for everybody. Specifically, the costs of client/server distribution increase linearly as the number of users downloading objects increases. This can make it expensive to distribute popular objects.

BitTorrent addresses this problem by recruiting the very clients that are downloading the object as distributors themselves: Each client downloads some pieces of the object from Amazon S3 and some from other clients, while simultaneously uploading pieces of the same object to other interested "peers." The benefit for publishers is that for large, popular files the amount of data actually supplied by Amazon S3 can be substantially lower than what it would have been serving the same clients via client/server download. Less data transferred means lower costs for the publisher of the object.

### Note

You can get torrent only for objects that are less than 5 GB in size.

## How You are Charged for BitTorrent Delivery

There is no extra charge for use of BitTorrent with Amazon S3. Data transfer via the BitTorrent protocol is metered at the same rate as client/server delivery. To be precise, whenever a downloading BitTorrent client requests a "piece" of an object from the Amazon S3 "seeder," charges accrue just as if an anonymous request for that piece had been made using the REST or SOAP protocol. These charges will appear on your Amazon S3 bill and usage reports in the same way. The difference is that if a lot of clients are requesting the same object simultaneously via BitTorrent, then the amount of data Amazon S3 must

serve to satisfy those clients will be lower than with client/server delivery. This is because the BitTorrent clients are simultaneously uploading and downloading amongst themselves.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

The data transfer savings achieved from use of BitTorrent can vary widely depending on how popular your object is. Less popular objects require heavier use of the "seeder" to serve clients, and thus the difference between BitTorrent distribution costs and client/server distribution costs might be small for such objects. In particular, if only one client is ever downloading a particular object at a time, the cost of BitTorrent delivery will be the same as direct download.

## Using BitTorrent to Retrieve Objects Stored in Amazon S3

Any object in Amazon S3 that can be read anonymously can also be downloaded via BitTorrent. Doing so requires use of a BitTorrent client application. Amazon does not distribute a BitTorrent client application, but there are many free clients available. The Amazon S3BitTorrent implementation has been tested to work with the official BitTorrent client (go to <http://www.bittorrent.com/>).

The starting point for a BitTorrent download is a .torrent file. This small file describes for BitTorrent clients both the data to be downloaded and where to get started finding that data. A .torrent file is a small fraction of the size of the actual object to be downloaded. Once you feed your BitTorrent client application an Amazon S3 generated .torrent file, it should start downloading immediately from Amazon S3 and from any "peer" BitTorrent clients.

Retrieving a .torrent file for any publicly available object is easy. Simply add a "?torrent" query string parameter at the end of the REST GET request for the object. No authentication is required. Once you have a BitTorrent client installed, downloading an object using BitTorrent download might be as easy as opening this URL in your web browser.

There is no mechanism to fetch the .torrent for an Amazon S3 object using the SOAP API.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

### Example

This example retrieves the Torrent file for the "Nelson" object in the "quotes" bucket.

#### Sample Request

```
GET /quotes/Nelson?torrent HTTP/1.0
Date: Wed, 25 Nov 2009 12:00:00 GMT
```

#### Sample Response

```
HTTP/1.1 200 OK
x-amz-request-id: 7CD745EBB7AB5ED9
Date: Wed, 25 Nov 2009 12:00:00 GMT
Content-Disposition: attachment; filename=Nelson.torrent;
Content-Type: application/x-bittorrent
```

```
Content-Length: 537
Server: AmazonS3

<body: a Bencoded dictionary as defined by the BitTorrent specification>
```

## Publishing Content Using Amazon S3 and BitTorrent

Every anonymously readable object stored in Amazon S3 is automatically available for download using BitTorrent. The process for changing the ACL on an object to allow anonymous READ operations is described in [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#).

You can direct your clients to your BitTorrent accessible objects by giving them the .torrent file directly or by publishing a link to the ?torrent URL of your object. One important thing to note is that the .torrent file describing an Amazon S3 object is generated on-demand, the first time it is requested (via the REST ?torrent resource). Generating the .torrent for an object takes time proportional to the size of that object. For large objects, this time can be significant. Therefore, before publishing a ?torrent link, we suggest making the first request for it yourself. Amazon S3 might take several minutes to respond to this first request, as it generates the .torrent file. Unless you update the object in question, subsequent requests for the .torrent will be fast. Following this procedure before distributing a ?torrent link will ensure a smooth BitTorrent downloading experience for your customers.

To stop distributing a file using BitTorrent, simply remove anonymous access to it. This can be accomplished by either deleting the file from Amazon S3, or modifying your access control policy to prohibit anonymous reads. After doing so, Amazon S3 will no longer act as a "seeder" in the BitTorrent network for your file, and will no longer serve the .torrent file via the ?torrent REST API. However, after a .torrent for your file is published, this action might not stop public downloads of your object that happen exclusively using the BitTorrent peer to peer network.

# Using Amazon DevPay with Amazon S3

## Topics

- [Amazon S3 Customer Data Isolation \(p. 584\)](#)
- [Amazon DevPay Token Mechanism \(p. 585\)](#)
- [Amazon S3 and Amazon DevPay Authentication \(p. 585\)](#)
- [Amazon S3 Bucket Limitation \(p. 586\)](#)
- [Amazon S3 and Amazon DevPay Process \(p. 587\)](#)
- [Additional Information \(p. 587\)](#)

Amazon DevPay enables you to charge customers for using your Amazon S3 product through Amazon's authentication and billing infrastructure. You can charge any amount for your product including usage charges (storage, transactions, and bandwidth), monthly fixed charges, and a one-time charge.

Once a month, Amazon bills your customers for you. AWS then deducts the fixed Amazon DevPay transaction fee and pays you the difference. AWS then separately charges you for the Amazon S3 usage costs incurred by your customers and the percentage-based Amazon DevPay fee.

If your customers do not pay their bills, AWS turns off access to Amazon S3 (and your product). AWS handles all payment processing.

## Amazon S3 Customer Data Isolation

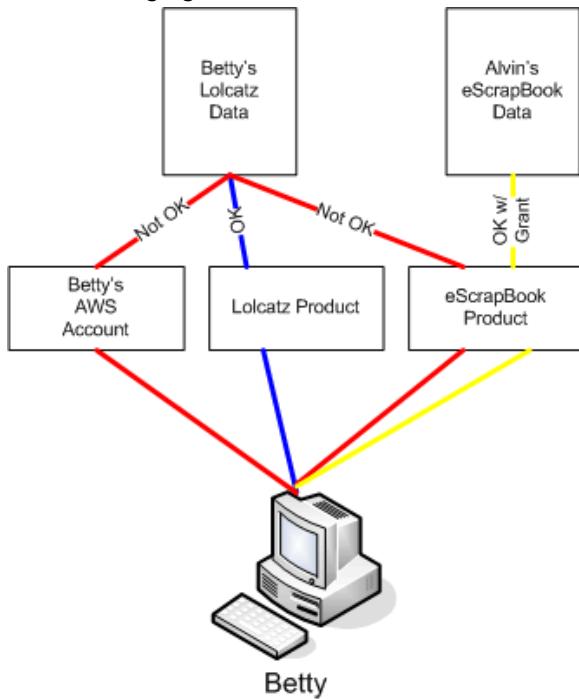
Amazon DevPay requests store and access data on behalf of the users of your product. The resources created by your application are owned by your users; unless you modify the ACL, you cannot read or modify the user's data.

Data stored by your product is isolated from other Amazon DevPay products and general Amazon S3 access. Customers that *store* data in Amazon S3 through your product can only *access* that data through your product. The data cannot be accessed through other Amazon DevPay products or through a personal AWS account.

Two users of a product can only access each others data if your application explicitly grants access through the ACL.

## Example

The following figure illustrates allowed, disallowed, and conditional (discretionary) data access.



Betty's access is limited as follows:

- She can access Lolcatz data through the Lolcatz product. If she attempts to access her Lolcatz data through another product or a personal AWS account, her requests will be denied.
- She can access Alvin's eScrapBook data through the eScrapBook product if access is explicitly granted.

## Amazon DevPay Token Mechanism

To enable you to make requests on behalf of your customers and ensure that your customers are billed for use of your application, your application must send two tokens with each request: the product token and the user token.

The product token identifies your product; you must have one product token for each Amazon DevPay product that you provide. The user token identifies a user in relationship to your product; you must have a user token for each user/product combination. For example, if you provide two products and a user subscribes to each, you must obtain a separate user token for each product.

For information on obtaining product and user tokens, refer to the *Amazon DevPay Getting Started Guide*.

## Amazon S3 and Amazon DevPay Authentication

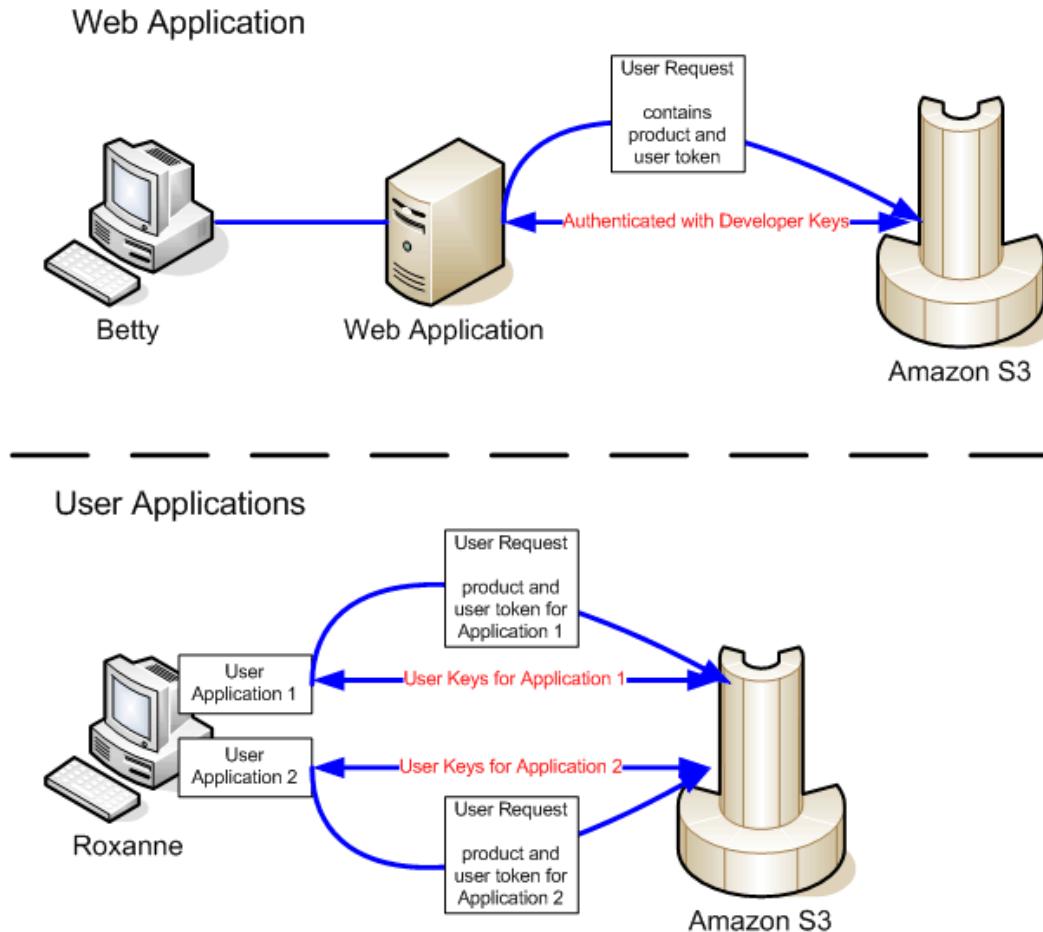
Although the token mechanism uniquely identifies a customer and product, it does not provide authentication.

Normally, your applications communicate directly with Amazon S3 using your Access Key ID and Secret Access Key. For Amazon DevPay, Amazon S3 authentication works a little differently.

If your Amazon DevPay product is a web application, you securely store the Secret Access Key on your servers and use the user token to specify the customer for which requests are being made.

However, if your Amazon S3 application is installed on your customers' computers, your application must obtain an Access Key ID and a Secret Access Key for each installation and must use those credentials when communicating with Amazon S3.

The following figure shows the differences between authentication for web applications and user applications.



## Amazon S3 Bucket Limitation

Each of your customers can have up to 100 buckets for each Amazon DevPay product that you sell. For example, if a customer uses three of your products, the customer can have up to 300 buckets ( $100 * 3$ ) plus any buckets outside of your Amazon DevPay products (i.e., buckets in Amazon DevPay products from other developers and the customer's personal AWS account).

If your customers require more than 100 buckets in an account, they can submit a bucket limit increase request. For information about how to increase your bucket limit, go to [AWS Service Limits](#) in the [AWS General Reference](#).

# Amazon S3 and Amazon DevPay Process

Following is a high-level overview of the Amazon DevPay process.

## Launch Process

1	A customer signs up for your product through Amazon.
2	The customer receives an activation key.
3	The customer enters the activation key into your application.
4	Your application communicates with Amazon and obtains the user's token. If your application is installed on the user's computer, it also obtains an Access Key ID and Secret Access Key on behalf of the customer.
5	Your application provides the customer's token and the application product token when making Amazon S3 requests on behalf of the customer. If your application is installed on the customer's computer, it authenticates with the customer's credentials.
6	Amazon uses the customer's token and your product token to determine who to bill for the Amazon S3 usage.
7	Once a month, Amazon processes usage data and bills your customers according to the terms you defined.
8	AWS deducts the fixed Amazon DevPay transaction fee and pays you the difference. AWS then separately charges you for the Amazon S3 usage costs incurred by your customers and the percentage-based Amazon DevPay fee.

## Additional Information

For information about using, setting up, and integrating with Amazon DevPay, go to [Amazon DevPay](#)

# Handling REST and SOAP Errors

## Topics

- [The REST Error Response \(p. 588\)](#)
- [The SOAP Error Response \(p. 590\)](#)
- [Amazon S3 Error Best Practices \(p. 590\)](#)

This section describes REST and SOAP errors and how to handle them.

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

## The REST Error Response

## Topics

- [Response Headers \(p. 589\)](#)
- [Error Response \(p. 589\)](#)

If a REST request results in an error, the HTTP reply has:

- An XML error document as the response body
- Content-Type: application/xml
- An appropriate 3xx, 4xx, or 5xx HTTP status code

Following is an example of a REST Error Response.

```
<?xml version="1.0" encoding="UTF-8"?>
<Error>
  <Code>NoSuchKey</Code>
  <Message>The resource you requested does not exist</Message>
  <Resource>/mybucket/myfoto.jpg</Resource>
  <RequestId>4442587FB7D0A2F9</RequestId>
```

```
</Error>
```

For more information about Amazon S3 errors, go to [ErrorCodeList](#).

## Response Headers

Following are response headers returned by all operations:

- **x-amz-request-id**: A unique ID assigned to each request by the system. In the unlikely event that you have problems with Amazon S3, Amazon can use this to help troubleshoot the problem.
- **x-amz-id-2**: A special token that will help us to troubleshoot problems.

## Error Response

Topics

- [Error Code \(p. 589\)](#)
- [Error Message \(p. 589\)](#)
- [Further Details \(p. 589\)](#)

When an Amazon S3 request is in error, the client receives an error response. The exact format of the error response is API specific: For example, the REST error response differs from the SOAP error response. However, all error responses have common elements.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

### Error Code

The error code is a string that uniquely identifies an error condition. It is meant to be read and understood by programs that detect and handle errors by type. Many error codes are common across SOAP and REST APIs, but some are API-specific. For example, `NoSuchKey` is universal, but `UnexpectedContent` can occur only in response to an invalid REST request. In all cases, SOAP fault codes carry a prefix as indicated in the table of error codes, so that a `NoSuchKey` error is actually returned in SOAP as `Client.NoSuchKey`.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

### Error Message

The error message contains a generic description of the error condition in English. It is intended for a human audience. Simple programs display the message directly to the end user if they encounter an error condition they don't know how or don't care to handle. Sophisticated programs with more exhaustive error handling and proper internationalization are more likely to ignore the error message.

### Further Details

Many error responses contain additional structured data meant to be read and understood by a developer diagnosing programming errors. For example, if you send a `Content-MD5` header with a REST `PUT` request that doesn't match the digest calculated on the server, you receive a `BadDigest` error. The

error response also includes as detail elements the digest we calculated, and the digest you told us to expect. During development, you can use this information to diagnose the error. In production, a well-behaved program might include this information in its error log.

## The SOAP Error Response

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

In SOAP, an error result is returned to the client as a SOAP fault, with the HTTP response code 500. If you do not receive a SOAP fault, then your request was successful. The Amazon S3 SOAP fault code is comprised of a standard SOAP 1.1 fault code (either "Server" or "Client") concatenated with the Amazon S3-specific error code. For example: "Server.InternalError" or "Client.NoSuchBucket". The SOAP fault string element contains a generic, human readable error message in English. Finally, the SOAP fault detail element contains miscellaneous information relevant to the error.

For example, if you attempt to delete the object "Fred", which does not exist, the body of the SOAP response contains a "NoSuchKey" SOAP fault.

### Example

```
<soapenv:Body>
<soapenv:Fault>
  <Faultcode>soapenv:Client.NoSuchKey</Faultcode>
  <Faultstring>The specified key does not exist.</Faultstring>
  <Detail>
    <Key>Fred</Key>
  </Detail>
</soapenv:Fault>
</soapenv:Body>
```

For more information about Amazon S3 errors, go to [ErrorCodeList](#).

## Amazon S3 Error Best Practices

When designing an application for use with Amazon S3, it is important to handle Amazon S3 errors appropriately. This section describes issues to consider when designing your application.

### Retry InternalErrors

Internal errors are errors that occur within the Amazon S3 environment.

Requests that receive an InternalError response might not have processed. For example, if a PUT request returns InternalError, a subsequent GET might retrieve the old value or the updated value.

If Amazon S3 returns an InternalError response, retry the request.

### Tune Application for Repeated SlowDown errors

As with any distributed system, S3 has protection mechanisms which detect intentional or unintentional resource over-consumption and react accordingly. SlowDown errors can occur when a high request rate triggers one of these mechanisms. Reducing your request rate will decrease or eliminate errors of this

type. Generally speaking, most users will not experience these errors regularly; however, if you would like more information or are experiencing high or unexpected SlowDown errors, please post to our Amazon S3 developer forum <https://forums.aws.amazon.com/> or sign up for AWS Premium Support <https://aws.amazon.com/premiumsupport/>.

## Isolate Errors

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

Amazon S3 provides a set of error codes that are used by both the SOAP and REST API. The SOAP API returns standard Amazon S3 error codes. The REST API is designed to look like a standard HTTP server and interact with existing HTTP clients (e.g., browsers, HTTP client libraries, proxies, caches, and so on). To ensure the HTTP clients handle errors properly, we map each Amazon S3 error to an HTTP status code.

HTTP status codes are less expressive than Amazon S3 error codes and contain less information about the error. For example, the `NoSuchKey` and `NoSuchBucket` Amazon S3 errors both map to the `HTTP 404 Not Found` status code.

Although the HTTP status codes contain less information about the error, clients that understand HTTP, but not the Amazon S3 API, will usually handle the error correctly.

Therefore, when handling errors or reporting Amazon S3 errors to end users, use the Amazon S3 error code instead of the HTTP status code as it contains the most information about the error. Additionally, when debugging your application, you should also consult the human readable `<Details>` element of the XML error response.

# Troubleshooting Amazon S3

This section describes how to troubleshoot Amazon S3 and explains how to get request IDs that you'll need when you contact AWS Support.

## Topics

- [Troubleshooting Amazon S3 by Symptom \(p. 592\)](#)
- [Getting Amazon S3 Request IDs for AWS Support \(p. 593\)](#)
- [Related Topics \(p. 595\)](#)

## Troubleshooting Amazon S3 by Symptom

The following topics lists symptoms to help you troubleshoot some of the issues that you might encounter when working with Amazon S3.

### Symptoms

- [Significant Increases in HTTP 503 Responses to Amazon S3 Requests to Buckets with Versioning Enabled \(p. 592\)](#)
- [Unexpected Behavior When Accessing Buckets Set with CORS \(p. 593\)](#)

## Significant Increases in HTTP 503 Responses to Amazon S3 Requests to Buckets with Versioning Enabled

If you notice a significant increase in the number of HTTP 503-slow down responses received for Amazon S3 PUT or DELETE object requests to a bucket that has versioning enabled, you might have one or more objects in the bucket for which there are millions of versions. When you have objects with millions of versions, Amazon S3 automatically throttles requests to the bucket to protect the customer from an excessive amount of request traffic, which could potentially impede other requests made to the same bucket.

To determine which S3 objects have millions of versions, use the Amazon S3 inventory tool. The inventory tool generates a report that provides a flat file list of the objects in a bucket. For more information, see [Amazon S3 Inventory \(p. 287\)](#).

The Amazon S3 team encourages customers to investigate applications that repeatedly overwrite the same S3 object, potentially creating millions of versions for that object, to determine whether the application is working as intended. If you have a use case that requires millions of versions for one or more S3 objects, contact the AWS Support team at [AWS Support](#) to discuss your use case and to help us assist you in determining the optimal solution for your use case scenario.

## Unexpected Behavior When Accessing Buckets Set with CORS

If you encounter unexpected behavior when accessing buckets set with the cross-origin resource sharing (CORS) configuration, see [Troubleshooting CORS Issues \(p. 167\)](#).

## Getting Amazon S3 Request IDs for AWS Support

Whenever you need to contact AWS Support due to encountering errors or unexpected behavior in Amazon S3, you will need to get the request IDs associated with the failed action. Getting these request IDs enables AWS Support to help you resolve the problems you're experiencing. Request IDs come in pairs, are returned in every response that Amazon S3 processes (even the erroneous ones), and can be accessed through verbose logs. There are a number of common methods for getting your request IDs.

After you've recovered these logs, copy and retain those two values, because you'll need them when you contact AWS Support. For information about contacting AWS Support, see [Contact Us](#).

### Topics

- [Using HTTP to Obtain Request IDs \(p. 593\)](#)
- [Using a Web Browser to Obtain Request IDs \(p. 593\)](#)
- [Using AWS SDKs to Obtain Request IDs \(p. 594\)](#)
- [Using the AWS CLI to Obtain Request IDs \(p. 595\)](#)

## Using HTTP to Obtain Request IDs

You can obtain your request IDs, `x-amz-request-id` and `x-amz-id-2` by logging the bits of an HTTP request before it reaches the target application. There are a variety of third-party tools that can be used to recover verbose logs for HTTP requests. Choose one you trust, and run the tool, listening on the port that your Amazon S3 traffic travels on, as you send out another Amazon S3 HTTP request.

For HTTP requests, the pair of request IDs will look like the following examples.

```
x-amz-request-id: 79104EXAMPLEB723
x-amz-id-2: IOWQ4fDEXAMPLEQM+ey7N9WgVhSnQ6JEXAMPLEZb7hSQDASK+Jd1vEXAMPLEa3Km
```

### Note

HTTPS requests are encrypted and hidden in most packet captures.

## Using a Web Browser to Obtain Request IDs

Most web browsers have developer tools that allow you to view request headers.

For web browser-based requests that return an error, the pair of requests IDs will look like the following examples.

```
<Error><Code>AccessDenied</Code><Message>Access Denied</Message>
```

```
<RequestId>79104EXAMPLEB723</RequestId><HostId>IOWQ4fDEXAMPLEQM+ey7N9WgVhSnQ6JEXAMPLEZb7hSQDASK+Jd1vEXAMPLEa3Km</HostId></Error>
```

For obtaining the request ID pair from successful requests, you'll need to use the developer tools to look at the HTTP response headers. For information about developer tools for specific browsers, see [Amazon S3 Troubleshooting - How to recover your S3 request IDs](#) in the AWS Developer Forums.

## Using AWS SDKs to Obtain Request IDs

The following sections include information for configuring logging using an AWS SDK. While you can enable verbose logging on every request and response, you should not enable logging in production systems since large requests/responses can cause significant slowdown in an application.

For AWS SDK requests, the pair of request IDs will look like the following examples.

```
Status Code: 403, AWS Service: Amazon S3, AWS Request ID: 79104EXAMPLEB723
AWS Error Code: AccessDenied AWS Error Message: Access Denied
S3 Extended Request ID: IOWQ4fDEXAMPLEQM+ey7N9WgVhSnQ6JEXAMPLEZb7hSQDASK+Jd1vEXAMPLEa3Km
```

## Using the SDK for PHP to Obtain Request IDs

You can configure logging using PHP. For more information, see [How can I see what data is sent over the wire?](#) in the FAQ for the [AWS SDK for PHP](#).

## Using the SDK for Java to Obtain Request IDs

You can enable logging for specific requests or responses, allowing you to catch and return only the relevant headers. To do this, import the `com.amazonaws.services.s3.S3ResponseMetadata` class. Afterwards, you can store the request in a variable before performing the actual request. Call `getCachedResponseMetadata(AmazonWebServiceRequest request).getRequestID()` to get the logged request or response.

### Example

```
PutObjectRequest req = new PutObjectRequest(bucketName, key, createSampleFile());
s3.putObject(req);
S3ResponseMetadata md = s3.getCachedResponseMetadata(req);
System.out.println("Host ID: " + md.getHostId() + " RequestID: " + md.getRequestId());
```

Alternatively, you can use verbose logging of every Java request and response. For more information, see [Verbose Wire Logging](#) in the [Logging AWS SDK for Java Calls](#) topic in the [AWS SDK for Java Developer Guide](#).

## Using the AWS SDK for .NET to Obtain Request IDs

You can configure logging in AWS SDK for .NET using the built-in `System.Diagnostics` logging tool. For more information, see the [Logging with the AWS SDK for .NET](#) AWS Developer Blog post.

### Note

By default, the returned log contains only error information. The config file needs to have `AWSLogMetrics` (and optionally, `AWSResponseLogging`) added to get the request IDs.

## Using the SDK for Python to Obtain Request IDs

You can configure logging in Python by adding the following lines to your code to output debug information to a file.

```
import logging
logging.basicConfig(filename="mylog.log", level=logging.DEBUG)
```

If you're using the Boto Python interface for AWS, you can set the debug level to two as per the Boto docs, [here](#).

## Using the SDK for Ruby to Obtain Request IDs

You can get your request IDs using either the SDK for Ruby - Version 1, Version 2, or Version 3.

- **Using the SDK for Ruby - Version 1**– You can enable HTTP wire logging globally with the following line of code.

```
s3 = AWS::S3.new(:logger => Logger.new($stdout), :http_wire_trace => true)
```

- **Using the SDK for Ruby - Version 2 or Version 3**– You can enable HTTP wire logging globally with the following line of code.

```
s3 = Aws::S3::Client.new(:logger => Logger.new($stdout), :http_wire_trace => true)
```

## Using the AWS CLI to Obtain Request IDs

You can get your request IDs in the AWS CLI by adding `--debug` to your command.

## Related Topics

For other troubleshooting and support topics, see the following:

- [Troubleshooting CORS Issues \(p. 167\)](#)
- [Handling REST and SOAP Errors \(p. 588\)](#)
- [AWS Support Documentation](#)

For troubleshooting information regarding third-party tools, see [Getting Amazon S3 request IDs](#) in the AWS Developer Forums.

# Server Access Logging

## Overview

In order to track requests for access to your bucket, you can enable access logging. Each access log record provides details about a single access request, such as the requester, bucket name, request time, request action, response status, and error code, if any. Access log information can be useful in security and access audits. It can also help you learn about your customer base and understand your Amazon S3 bill.

### Note

There is no extra charge for enabling server access logging on an Amazon S3 bucket; however, any log files the system delivers to you will accrue the usual charges for storage. (You can delete the log files at any time.) No data transfer charges will be assessed for log file delivery, but access to the delivered log files is charged the same as any other data transfer.

By default, logging is disabled. To enable access logging, you must do the following:

- Turn on the log delivery by adding logging configuration on the bucket for which you want Amazon S3 to deliver access logs. We will refer to this bucket as the *source bucket*.
- Grant the Amazon S3 Log Delivery group write permission on the bucket where you want the access logs saved. We will refer to this bucket as the *target bucket*.

To turn on log delivery, you provide the following logging configuration information:

- Name of the target bucket name where you want Amazon S3 to save the access logs as objects. You can have logs delivered to any bucket that you own, including the source bucket. We recommend that you save access logs in a different bucket so you can easily manage the logs. If you choose to save access logs in the same bucket as the source bucket, we recommend you specify a prefix to all log object keys so that you can easily identify the log objects.

### Note

Both the source and target buckets must be owned by the same AWS account.

- (Optional) A prefix for Amazon S3 to assign to all log object keys. The prefix will make it simpler for you to locate the log objects.

For example, if you specify the prefix value `logs/`, each log object that Amazon S3 creates will begin with the `logs/` prefix in its key, as in this example:

```
logs/2013-11-01-21-32-16-E568B2907131C0C0
```

The key prefix can help when you delete the logs. For example, you can set a lifecycle configuration rule for Amazon S3 to delete objects with a specific key prefix. For more information, see [Deleting Log Files \(p. 608\)](#).

- (Optional) Permissions so that others can access the generated logs. By default, the bucket owner always has full access to the log objects. You can optionally grant access to other users.

## Log Object Key Format

Amazon S3 uses the following object key format for the log objects it uploads in the target bucket:

```
TargetPrefixYYYY-mm-DD-HH-MM-SS-UniqueString
```

In the key, YYYY, mm, DD, HH, MM and SS are the digits of the year, month, day, hour, minute, and seconds (respectively) when the log file was delivered.

A log file delivered at a specific time can contain records written at any point before that time. There is no way to know whether all log records for a certain time interval have been delivered or not.

The UniqueString component of the key is there to prevent overwriting of files. It has no meaning, and log processing software should ignore it.

## How are Logs Delivered?

Amazon S3 periodically collects access log records, consolidates the records in log files, and then uploads log files to your target bucket as log objects. If you enable logging on multiple source buckets that identify the same target bucket, the target bucket will have access logs for all those source buckets, but each log object will report access log records for a specific source bucket.

Amazon S3 uses a special log delivery account, called the Log Delivery group, to write access logs. These writes are subject to the usual access control restrictions. You will need to grant the Log Delivery group write permission on the target bucket by adding a grant entry in the bucket's access control list (ACL). If you use the Amazon S3 console to enable logging on a bucket, the console will both enable logging on the source bucket and update the ACL on the target bucket to grant write permission to the Log Delivery group.

## Best Effort Server Log Delivery

Server access log records are delivered on a best effort basis. Most requests for a bucket that is properly configured for logging will result in a delivered log record, and most log records will be delivered within a few hours of the time that they were recorded.

The completeness and timeliness of server logging, however, is not guaranteed. The log record for a particular request might be delivered long after the request was actually processed, or it might not be delivered at all. The purpose of server logs is to give you an idea of the nature of traffic against your bucket. It is not meant to be a complete accounting of all requests. It is rare to lose log records, but server logging is not meant to be a complete accounting of all requests.

It follows from the best-effort nature of the server logging feature that the usage reports available at the AWS portal (Billing and Cost Management reports on the [AWS Management Console](#)) might include one or more access requests that do not appear in a delivered server log.

## Bucket Logging Status Changes Take Effect Over Time

Changes to the logging status of a bucket take time to actually affect the delivery of log files. For example, if you enable logging for a bucket, some requests made in the following hour might be logged, while others might not. If you change the target bucket for logging from bucket A to bucket B, some logs for the next hour might continue to be delivered to bucket A, while others might be delivered to the new target bucket B. In all cases, the new settings will eventually take effect without any further action on your part.

## Related Topics

For more information about server access logging, see the following topics.

- [Enabling Logging Using the Console \(p. 598\)](#)
- [Enabling Logging Programmatically \(p. 598\)](#)
- [Server Access Log Format \(p. 601\)](#)
- [Deleting Log Files \(p. 608\)](#)

## Enabling Logging Using the Console

For information about enabling Server Access Logging (p. 596) in the [AWS Management Console](#), see [How Do I Enable Server Access Logging for an S3 Bucket?](#) in the *Amazon Simple Storage Service Console User Guide*.

When you enable logging on a bucket the console will both enable logging on the source bucket and add a grant in the target bucket's ACL granting write permission to the Log Delivery group.

For information about enable logging programmatically, see [Enabling Logging Programmatically \(p. 598\)](#).

For information about the log record format, including the list of fields and their descriptions, see [Server Access Log Format \(p. 601\)](#).

## Enabling Logging Programmatically

You can enable or disable logging programmatically by using either the Amazon S3 API or the AWS SDKs. To do so, you both enable logging on the bucket and grant the Log Delivery group permission to write logs to the target bucket.

### Topics

- [Enabling logging \(p. 599\)](#)
- [Granting the Log Delivery Group WRITE and READ\\_ACP Permissions \(p. 599\)](#)
- [Example: AWS SDK for .NET \(p. 600\)](#)

## Enabling logging

To enable logging, you submit a [PUT Bucket logging](#) request to add the logging configuration on source bucket. The request specifies the target bucket and, optionally, the prefix to be used with all log object keys. The following example identifies logbucket as the target bucket and logs/ as the prefix.

```
<BucketLoggingStatus xmlns="http://doc.s3.amazonaws.com/2006-03-01">
  <LoggingEnabled>
    <TargetBucket>logbucket</TargetBucket>
    <TargetPrefix>logs/</TargetPrefix>
  </LoggingEnabled>
</BucketLoggingStatus>
```

The log objects are written and owned by the Log Delivery account and the bucket owner is granted full permissions on the log objects. In addition, you can optionally grant permissions to other users so that they may access the logs. For more information, see [PUT Bucket logging](#).

Amazon S3 also provides the [GET Bucket logging](#) API to retrieve logging configuration on a bucket. To delete logging configuration you send the PUT Bucket logging request with empty <BucketLoggingStatus> empty.

```
<BucketLoggingStatus xmlns="http://doc.s3.amazonaws.com/2006-03-01">
</BucketLoggingStatus>
```

You can use either the Amazon S3 API or the AWS SDK wrapper libraries to enable logging on a bucket.

## Granting the Log Delivery Group WRITE and READ\_ACP Permissions

Amazon S3 writes the log files to the target bucket as a member of the predefined Amazon S3 group Log Delivery. These writes are subject to the usual access control restrictions. You will need to grant s3:GetObjectAcl and s3:PutObject permissions to this group by adding grants to the access control list (ACL) of the target bucket. The Log Delivery group is represented by the following URL.

```
http://acs.amazonaws.com/groups/s3/LogDelivery
```

To grant WRITE and READ\_ACP permissions, you have to add the following grants. For information about ACLs, see [Managing Access with ACLs \(p. 394\)](#).

```
<Grant>
  <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="Group">
    <URI>http://acs.amazonaws.com/groups/s3/LogDelivery</URI>
  </Grantee>
  <Permission>WRITE</Permission>
</Grant>
<Grant>
  <Grantee xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="Group">
    <URI>http://acs.amazonaws.com/groups/s3/LogDelivery</URI>
  </Grantee>
  <Permission>READ_ACP</Permission>
</Grant>
```

For examples of adding ACL grants programmatically using AWS SDKs, see [Managing ACLs Using the AWS SDK for Java \(p. 400\)](#) and [Managing ACLs Using the AWS SDK for .NET \(p. 403\)](#).

## Example: AWS SDK for .NET

The following C# example enables logging on a bucket. You will need to create two buckets, source bucket and target bucket. The example first grants the Log Delivery group necessary permission to write logs to the target bucket and then enable logging on the source bucket. For more information, see [Enabling Logging Programmatically \(p. 598\)](#). For instructions on how to create and test a working sample, see [Running the Amazon S3 .NET Code Examples \(p. 615\)](#).

### Example

```
using System;
using Amazon.S3;
using Amazon.S3.Model;

namespace s3.amazonaws.com.docsamples
{
    class ServerAccessLogging
    {
        static string sourceBucket = "*** Provide bucket name ***"; // On which to enable
logging.
        static string targetBucket = "*** Provide bucket name ***"; // Where access logs
can be stored.
        static string logObjectKeyPrefix = "Logs";
        static IAmazonS3 client;

        public static void Main(string[] args)
        {
            using (client = new AmazonS3Client(Amazon.RegionEndpoint.USEast1))
            {
                Console.WriteLine("Enabling logging on source bucket...");
                try
                {
                    // Step 1 - Grant Log Delivery group permission to write log to the
target bucket.
                    GrantLogDeliveryPermissionToWriteLogsInTargetBucket();
                    // Step 2 - Enable logging on the source bucket.
                    EnableDisableLogging();
                }
                catch (AmazonS3Exception amazonS3Exception)
                {
                    if (amazonS3Exception.ErrorCode != null &&
                        (amazonS3Exception.ErrorCode.Equals("InvalidAccessKeyId")
                         ||
                         amazonS3Exception.ErrorCode.Equals("InvalidSecurity")))
                    {
                        Console.WriteLine("Check the provided AWS Credentials.");
                        Console.WriteLine(
                            "To sign up for service, go to http://aws.amazon.com/s3");
                    }
                    else
                    {
                        Console.WriteLine(
                            "Error occurred. Message:{0} when enabling logging",
                            amazonS3Exception.Message);
                    }
                }
            }

            Console.WriteLine("Press any key to continue...");
            Console.ReadKey();
        }

        static void GrantLogDeliveryPermissionToWriteLogsInTargetBucket()
```

```

    {
        S3AccessControlList bucketACL = new S3AccessControlList();
        GetACLResponse aclResponse = client.GetACL(new GetACLRequest { BucketName =
targetBucket });
        bucketACL = aclResponse.AccessControlList;
        bucketACL.AddGrant(new S3Grantee { URI = "http://acs.amazonaws.com/groups/s3/
LogDelivery" }, S3Permission.WRITE);
        bucketACL.AddGrant(new S3Grantee { URI = "http://acs.amazonaws.com/groups/s3/
LogDelivery" }, S3Permission.READ_ACP);
        PutACLRequest setACLRequest = new PutACLRequest
        {
            AccessControlList = bucketACL,
            BucketName = targetBucket
        };
        client.PutACL(setACLRequest);
    }

    static void EnableDisableLogging()
    {
        S3BucketLoggingConfig loggingConfig = new S3BucketLoggingConfig
        {
            TargetBucketName = targetBucket,
            TargetPrefix = logObjectKeyPrefix
        };

        // Send request.
        PutBucketLoggingRequest putBucketLoggingRequest = new PutBucketLoggingRequest
        {
            BucketName = sourceBucket,
            LoggingConfig = loggingConfig
        };
        PutBucketLoggingResponse response =
client.PutBucketLogging(putBucketLoggingRequest);
    }
}

```

# Server Access Log Format

The server access log files consist of a sequence of new-line delimited log records. Each log record represents one request and consists of space delimited fields. The following is an example log consisting of six log records.

```
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be mybucket [06/Feb/2014:00:00:38 +0000] 192.0.2.3
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be 3E57427F3EXAMPLE
REST.GET.VERSIONING - "GET /mybucket?versioning HTTP/1.1" 200 - 113 - 7 - ""
"S3Console/0.4" -
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be mybucket [06/Feb/2014:00:00:38 +0000] 192.0.2.3
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be 891CE47D2EXAMPLE
REST.GET.LOGGING_STATUS - "GET /mybucket?logging HTTP/1.1" 200 - 242 - 11 - ""
"S3Console/0.4" -
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be mybucket [06/Feb/2014:00:00:38 +0000] 192.0.2.3
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be A1206F460EXAMPLE
REST.GET.BUCKETPOLICY - "GET /mybucket?policy HTTP/1.1" 404 NoSuchBucketPolicy 297 - 38 -
"-" "S3Console/0.4" -
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be mybucket [06/Feb/2014:00:01:00 +0000] 192.0.2.3
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be 7B4A0FABEXAMPLE
```

```
REST.GET.VERSIONING - "GET /mybucket?versioning HTTP/1.1" 200 - 113 - 33 - "-"
"S3Console/0.4" -
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be mybucket [06/
Feb/2014:00:01:57 +0000] 192.0.2.3
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be DD6CC733AEXAMPLE
REST.PUT.OBJECT s3-dg.pdf "PUT /mybucket/s3-dg.pdf HTTP/1.1" 200 - - 4406583 41754 28 "-"
"S3Console/0.4" -
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be mybucket [06/
Feb/2014:00:03:21 +0000] 192.0.2.3
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be BC3C074D0EXAMPLE
REST.GET.VERSIONING - "GET /mybucket?versioning HTTP/1.1" 200 - 113 - 28 -
"S3Console/0.4" -
```

### Note

Any field can be set to – to indicate that the data was unknown or unavailable, or that the field was not applicable to this request.

The following list describes the log record fields.

#### Bucket Owner

The canonical user ID of the owner of the source bucket.

#### Example Entry

```
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be
```

#### Bucket

The name of the bucket that the request was processed against. If the system receives a malformed request and cannot determine the bucket, the request will not appear in any server access log.

#### Example Entry

```
mybucket
```

#### Time

The time at which the request was received. The format, using `strftime()` terminology, is as follows: [%d/%b/%Y:%H:%M:%S %z]

#### Example Entry

```
[06/Feb/2014:00:00:38 +0000]
```

#### Remote IP

The apparent Internet address of the requester. Intermediate proxies and firewalls might obscure the actual address of the machine making the request.

#### Example Entry

```
192.0.2.3
```

#### Requester

The canonical user ID of the requester, or a – for unauthenticated requests. If the requester was an IAM user, this field will return the requester's IAM user name along with the AWS root account that the IAM user belongs to. This identifier is the same one used for access control purposes.

**Example Entry**

```
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be
```

**Request ID**

The request ID is a string generated by Amazon S3 to uniquely identify each request.

**Example Entry**

```
3E57427F33A59F07
```

**Operation**

The operation listed here is declared as SOAP.*operation*, REST.*HTTP\_method.resource\_type*, WEBSITE.*HTTP\_method.resource\_type*, or BATCH.DELETE.OBJECT.

**Example Entry**

```
REST.PUT.OBJECT
```

**Key**

The "key" part of the request, URL encoded, or "-" if the operation does not take a key parameter.

**Example Entry**

```
/photos/2014/08/puppy.jpg
```

**Request-URI**

The Request-URI part of the HTTP request message.

**Example Entry**

```
"GET /mybucket/photos/2014/08/puppy.jpg?x-foo=bar HTTP/1.1"
```

**HTTP status**

The numeric HTTP status code of the response.

**Example Entry**

```
200
```

**Error Code**

The Amazon S3 [Error Code \(p. 589\)](#), or "-" if no error occurred.

**Example Entry**

```
NoSuchBucket
```

**Bytes Sent**

The number of response bytes sent, excluding HTTP protocol overhead, or "-" if zero.

**Example Entry**

```
2662992
```

**Object Size**

The total size of the object in question.

**Example Entry**

```
3462992
```

**Total Time**

The number of milliseconds the request was in flight from the server's perspective. This value is measured from the time your request is received to the time that the last byte of the response is sent. Measurements made from the client's perspective might be longer due to network latency.

**Example Entry**

```
70
```

**Turn-Around Time**

The number of milliseconds that Amazon S3 spent processing your request. This value is measured from the time the last byte of your request was received until the time the first byte of the response was sent.

**Example Entry**

```
10
```

**Referrer**

The value of the HTTP Referrer header, if present. HTTP user-agents (e.g. browsers) typically set this header to the URL of the linking or embedding page when making a request.

**Example Entry**

```
"http://www.amazon.com/webservices"
```

**User-Agent**

The value of the HTTP User-Agent header.

**Example Entry**

```
"curl/7.15.1"
```

**Version Id**

The version ID in the request, or "-" if the operation does not take a `versionId` parameter.

**Example Entry**

```
3HL4kqtJvjVBH40Nrjfkd
```

## Custom Access Log Information

You can include custom information to be stored in the access log record for a request by adding a custom query-string parameter to the URL for the request. Amazon S3 will ignore query-string parameters that begin with "x-", but will include those parameters in the access log record for the request, as part of the Request-URI field of the log record. For example, a GET request for "s3.amazonaws.com/mybucket/photos/2014/08/puppy.jpg?x-user=johndoe" will work the same as the same request for "s3.amazonaws.com/mybucket/photos/2014/08/puppy.jpg", except that the "x-user=johndoe" string will be included in the Request-URI field for the associated log record. This functionality is available in the REST interface only.

## Programming Considerations for Extensible Server Access Log Format

From time to time, we might extend the access log record format by adding new fields to the end of each line. Code that parses server access logs must be written to handle trailing fields that it does not understand.

## Additional Logging for Copy Operations

A copy operation involves a GET and a PUT. For that reason, we log two records when performing a copy operation. The previous table describes the fields related to the PUT part of the operation. The following list describes the fields in the record that relate to the GET part of the copy operation.

### Bucket Owner

The canonical user ID of the bucket that stores the object being copied.

#### Example Entry

```
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be
```

### Bucket

The name of the bucket that stores the object being copied.

#### Example Entry

```
mybucket
```

### Time

The time at which the request was received. The format, using `strftime()` terminology, is as follows: [%d/%B/%Y:%H:%M:%S %z]

#### Example Entry

```
[06/Feb/2014:00:00:38 +0000]
```

### Remote IP

The apparent Internet address of the requester. Intermediate proxies and firewalls might obscure the actual address of the machine making the request.

#### Example Entry

```
192.0.2.3
```

#### Requester

The canonical user ID of the requester, or a – for unauthenticated requests. If the requester was an IAM user, this field will return the requester's IAM user name along with the AWS root account that the IAM user belongs to. This identifier is the same one used for access control purposes.

#### Example Entry

```
79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be
```

#### Request ID

The request ID is a string generated by Amazon S3 to uniquely identify each request.

#### Example Entry

```
3E57427F33A59F07
```

#### Operation

The operation listed here is declared as SOAP.*operation*, REST.*HTTP\_method.resource\_type*, WEBSITE.*HTTP\_method.resource\_type*, or BATCH.DELETE.OBJECT.

#### Example Entry

```
REST.COPY.OBJECT_GET
```

#### Key

The "key" of the object being copied or "-" if the operation does not take a key parameter.

#### Example Entry

```
/photos/2014/08/puppy.jpg
```

#### Request-URI

The Request-URI part of the HTTP request message.

#### Example Entry

```
"GET /mybucket/photos/2014/08/puppy.jpg?x-foo=bar"
```

#### HTTP status

The numeric HTTP status code of the GET portion of the copy operation.

#### Example Entry

```
200
```

#### Error Code

The Amazon S3 [Error Code \(p. 589\)](#), of the GET portion of the copy operation or "-" if no error occurred.

**Example Entry**

```
NoSuchBucket
```

**Bytes Sent**

The number of response bytes sent, excluding HTTP protocol overhead, or "-" if zero.

**Example Entry**

```
2662992
```

**Object Size**

The total size of the object in question.

**Example Entry**

```
3462992
```

**Total Time**

The number of milliseconds the request was in flight from the server's perspective. This value is measured from the time your request is received to the time that the last byte of the response is sent. Measurements made from the client's perspective might be longer due to network latency.

**Example Entry**

```
70
```

**Turn-Around Time**

The number of milliseconds that Amazon S3 spent processing your request. This value is measured from the time the last byte of your request was received until the time the first byte of the response was sent.

**Example Entry**

```
10
```

**Referrer**

The value of the HTTP Referrer header, if present. HTTP user-agents (e.g. browsers) typically set this header to the URL of the linking or embedding page when making a request.

**Example Entry**

```
"http://www.amazon.com/webservices"
```

**User-Agent**

The value of the HTTP User-Agent header.

**Example Entry**

```
"curl/7.15.1"
```

### Version Id

The version ID of the object being copied or "-" if the x-amz-copy-source header didn't specify a `versionId` parameter as part of the copy source.

### Example Entry

```
3HL4kqtJvjVBH40Nrjfkd
```

## Deleting Log Files

A logging enabled bucket (see [Server Access Logging \(p. 596\)](#)) can have many server log objects created over time. Your application might need these access logs for a specific period after creation, and after that you may want to delete them. You can use Amazon S3 lifecycle configuration to set rules so that Amazon S3 automatically queues these objects for deletion at the end of their life.

If you specified a prefix in your logging configuration, you can set lifecycle configuration rule to delete log objects with that prefix. For example, if you log objects have prefix `logs/` after a specified time, you can set lifecycle configuration rule to delete objects with prefix `/logs`. For more information about lifecycle configuration, see [Object Lifecycle Management \(p. 125\)](#).

# Using the AWS SDKs, CLI, and Explorers

## Topics

- [Specifying Signature Version in Request Authentication \(p. 610\)](#)
- [Set Up the AWS CLI \(p. 611\)](#)
- [Using the AWS SDK for Java \(p. 612\)](#)
- [Using the AWS SDK for .NET \(p. 614\)](#)
- [Using the AWS SDK for PHP and Running PHP Examples \(p. 615\)](#)
- [Using the AWS SDK for Ruby - Version 3 \(p. 617\)](#)
- [Using the AWS SDK for Python \(Boto\) \(p. 618\)](#)

You can use the AWS SDKs when developing applications with Amazon S3. The AWS SDKs simplify your programming tasks by wrapping the underlying REST API. Mobile SDKs are also available for building connected mobile applications using AWS. This section provides an overview of using AWS SDKs for developing Amazon S3 applications. This section also describes how you can test the AWS SDK code examples provided in this guide.

In addition to the AWS SDKs, AWS Explorers are available for Visual Studio and Eclipse for Java IDE. In this case, the SDKs and the explorers are available bundled together as AWS Toolkits.

You can also use the AWS Command Line Interface (AWS CLI) to manage Amazon S3 buckets and objects.

### AWS Toolkit for Eclipse

The AWS Toolkit for Eclipse includes both the AWS SDK for Java and AWS Explorer for Eclipse. The AWS Explorer for Eclipse is an open source plugin for Eclipse for Java IDE that makes it easier for developers to develop, debug, and deploy Java applications using AWS. The easy to use GUI interface enables you to access and administer your AWS infrastructure including Amazon S3. You can perform common operations such as manage your buckets and objects, set IAM policies, while developing applications,

all from within the context of Eclipse for Java IDE. For set up instructions, see [Set up the Toolkit](#). For examples of using the explorer, see [How to Access AWS Explorer](#).

#### AWS Toolkit for Visual Studio

AWS Explorer for Visual Studio is an extension for Microsoft Visual Studio that makes it easier for developers to develop, debug, and deploy .NET applications using Amazon Web Services. The easy-to-use GUI enables you to access and administer your AWS infrastructure including Amazon S3. You can perform common operations such as managing your buckets and objects or setting IAM policies, while developing applications, all from within the context of Visual Studio. For setup instructions, go to [Setting Up the AWS Toolkit for Visual Studio](#). For examples of using Amazon S3 using the explorer, go to [Using Amazon S3 from AWS Explorer](#).

#### AWS SDKs

You can download only the SDKs. For information about downloading the SDK libraries, go to [Sample Code Libraries](#).

#### AWS CLI

The AWS CLI is a unified tool to manage your AWS services, including Amazon S3. For information about downloading the AWS CLI, go to [AWS Command Line Interface](#).

## Specifying Signature Version in Request Authentication

In the Asia Pacific (Mumbai), Asia Pacific (Seoul), EU (Frankfurt), EU (London), and China (Beijing) Regions, Amazon S3 supports only Signature Version 4. In all other Regions, Amazon S3 supports both Signature Version 4 and Signature Version 2.

For all AWS Regions, AWS SDKs use Signature Version 4 by default to authenticate requests. When using AWS SDKs that were released before May 2016, you may be required to request Signature Version 4 as shown in the following table:

SDK	Requesting Signature Version 4 for Request Authentication
AWS CLI	<p>For the default profile, run the following command.</p> <pre>\$ aws configure set default.s3.signature_version s3v4</pre> <p>For a custom profile, run the following command.</p> <pre>\$ aws configure set profile.your_profile_name.s3.signature_version s3v4</pre>
Java SDK	<p>Add the following in your code.</p> <pre>System.setProperty(SDKGlobalConfiguration.ENABLE_S3_SIGV4_SYSTEM_PROPERTY, "true");</pre> <p>Or, on the command line, specify the following.</p> <pre>-Dcom.amazonaws.services.s3.enableV4</pre>

SDK	Requesting Signature Version 4 for Request Authentication
JavaScript SDK	<p>Set the <code>signatureVersion</code> parameter to <code>v4</code> when constructing the client.</p> <pre>var s3 = new AWS.S3({signatureVersion: 'v4'});</pre>
PHP SDK	<p>Set the <code>signature</code> parameter to <code>v4</code> when constructing the Amazon S3 service client.</p> <pre>&lt;?php \$s3 = \Aws\S3\S3Client::factory(array('signature' =&gt; 'v4'));</pre>
Python-Boto SDK	<p>Specify the following in the boto default config file.</p> <pre>[s3] use-sigv4 = True</pre>
Ruby SDK	<p>Ruby SDK - Version 1: Set the <code>:s3_signature_version</code> parameter to <code>:v4</code> when constructing the client.</p> <pre>s3 = AWS::S3::Client.new(:s3_signature_version =&gt; :v4)</pre> <p>Ruby SDK - Version 3: Set the <code>signature_version</code> parameter to <code>v4</code> when constructing the client.</p> <pre>s3 = Aws::S3::Client.new(signature_version: 'v4')</pre>
.NET SDK	<p>Add the following to the code before creating the Amazon S3 client.</p> <pre>AWSConfigs.S3UseSignatureVersion4 = true;</pre> <p>Or, add the following to the config file.</p> <pre>&lt;appSettings&gt; &lt;add key="AWS.S3.UseSignatureVersion4" value='true'/&gt; &lt;/appSettings&gt;</pre>

## Set Up the AWS CLI

Follow the steps to download and configure AWS Command Line Interface (AWS CLI).

**Note**

Services in AWS, such as Amazon S3, require that you provide credentials when you access them, so that the service can determine whether you have permissions to access the resources owned by that service. The console requires your password. You can create access keys for your AWS account to access the AWS CLI or API. However, we don't recommend that you access AWS using the credentials for your AWS account. Instead, we recommend that you use AWS Identity and Access Management (IAM). Create an IAM user, add the user to an IAM group with administrative permissions, and then grant administrative permissions to the IAM user that you created. You

can then access AWS using a special URL and that IAM user's credentials. For instructions, go to [Creating Your First IAM User and Administrators Group](#) in the *IAM User Guide*.

### To set up the AWS CLI

1. Download and configure the AWS CLI. For instructions, see the following topics in the *AWS Command Line Interface User Guide*.
  - [Getting Set Up with the AWS Command Line Interface](#)
  - [Configuring the AWS Command Line Interface](#)
2. Add a named profile for the administrator user in the AWS CLI config file. You use this profile when executing the AWS CLI commands.

```
[adminuser]
aws_access_key_id = adminuser access key ID
aws_secret_access_key = adminuser secret access key
region = aws-region
```

For a list of available AWS Regions, see [Regions and Endpoints](#) in the *AWS General Reference*.

3. Verify the setup by entering the following commands at the command prompt.

- Try the help command to verify that the AWS CLI is installed on your computer:

```
aws help
```

- Try an S3 command to verify that the user can reach Amazon S3. This command lists buckets in your account. The AWS CLI uses the adminuser credentials to authenticate the request.

```
aws s3 ls --profile adminuser
```

## Using the AWS SDK for Java

The AWS SDK for Java provides an API for the Amazon S3 bucket and object operations. For object operations, in addition to providing the API to upload objects in a single operation, the SDK provides API to upload large objects in parts (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). The API gives you the option of using a high-level or low-level API.

### Low-Level API

The low-level APIs correspond to the underlying Amazon S3 REST operations, such as create, update, and delete operations that apply to buckets and objects. When you upload large objects using the low-level multipart upload API, it provides greater control such as letting you pause and resume multipart uploads, vary part sizes during the upload, or to begin uploads when you do not know the size of the data in advance. If you do not have these requirements, use the high-level API to upload objects.

### High-Level API

For uploading objects, the SDK provides a higher level of abstraction by providing the `TransferManager` class. The high-level API is a simpler API, where in just a few lines of code you can upload files and streams to Amazon S3. You should use this API to upload data unless you need to control the upload as described in the preceding Low-Level API section.

For smaller data size the `TransferManager` API uploads data in a single operation. However, the `TransferManager` switches to using the multipart upload API when data size reaches certain threshold. When possible, the `TransferManager` uses multiple threads to concurrently upload the parts. If a part

upload fails, the API retries the failed part upload up to three times. However, these are configurable options using the `TransferManagerConfiguration` class.

**Note**

When using a stream for the source of data, the `TransferManager` class will not do concurrent uploads.

## The Java API Organization

The following packages in the AWS SDK for Java provide the API:

- **com.amazonaws.services.s3**—Provides the implementation APIs for Amazon S3 bucket and object operations.

For example, it provides methods to create buckets, upload objects, get objects, delete objects, and to list keys.

- **com.amazonaws.services.s3.transfer**—Provides the high-level API data upload.

This high-level API is designed to further simplify uploading objects to Amazon S3. It includes the `TransferManager` class. It is particularly useful when uploading large objects in parts. It also includes the `TransferManagerConfiguration` class which you can use to configure the minimum part size for uploading parts and the threshold in bytes of when to use multipart uploads.

- **com.amazonaws.services.s3.model**—Provides the low-level API classes to create requests and process responses.

For example, it includes the `GetObjectRequest` class to describe your get object request, the `ListObjectRequest` class to describe your list keys requests, and the `InitiateMultipartUploadRequest` and `InitiateMultipartUploadResult` classes when initiating a multipart upload.

For more information about the AWS SDK for Java API, go to [AWS SDK for Java API Reference](#).

## Testing the Java Code Examples

The easiest way to get started with the Java code examples is to install the latest AWS Toolkit for Eclipse. For information on setting up your Java development environment and the AWS Toolkit for Eclipse, see [Installing the AWS SDK for Java in the AWS SDK for Java Developer Guide](#).

The following tasks guide you through the creation and testing of the Java code examples provided in this guide.

### General Process of Creating Java Code Examples

1	Create an AWS credentials profile file as described in <a href="#">Set Up your AWS Credentials for Use with the AWS SDK for Java</a> in the <a href="#">AWS SDK for Java Developer Guide</a> .
2	Create a new AWS Java project in Eclipse. The project is pre-configured with the AWS SDK for Java.
3	Copy the code from the section you are reading to your project.
4	Update the code by providing any required data. For example, if uploading a file, provide the file path and the bucket name.
5	Run the code. Verify that the object is created by using the AWS Management Console. For more information about the AWS Management Console, go to <a href="https://aws.amazon.com/console/">https://aws.amazon.com/console/</a> .

# Using the AWS SDK for .NET

## Topics

- [The .NET API Organization \(p. 614\)](#)
- [Running the Amazon S3 .NET Code Examples \(p. 615\)](#)

The AWS SDK for .NET provides the API for the Amazon S3 bucket and object operations. For object operations, in addition to providing the API to upload objects in a single operation, the SDK provides the API to upload large objects in parts (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)). The API gives you the option of using a high-level or low-level API.

### Low-Level API

The low-level APIs correspond to the underlying Amazon S3 REST operations, including the create, update, and delete operations that apply to buckets and objects. When you upload large objects using the low-level multipart upload API (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)) it provides greater control, such as letting you pause and resume multipart uploads, vary part sizes during the upload, or to begin uploads when you do not know the size of the data in advance. If you do not have these requirements, use the high-level API for uploading objects.

### High-Level API

For uploading objects, the SDK provides a higher level of abstraction by providing the `TransferUtility` class. The high-level API is a simpler API, where in just a few lines of code you can upload files and streams to Amazon S3. You should use this API to upload data unless you need to control the upload as described in the preceding Low-Level API section.

For smaller data size the `TransferUtility` API uploads data in a single operation. However, the `TransferUtility` switches to using the multipart upload API when data size reaches certain threshold. By default, it uses multiple threads to concurrently upload the parts. If a part upload fails, the API retries the failed part upload up to three times. However, these are configurable options.

#### Note

When using a stream for the source of data, the `TransferUtility` class will not do concurrent uploads.

## The .NET API Organization

When writing Amazon S3 applications using the AWS SDK for .NET, you use the `AWSSDK.dll`. The following namespaces in this assembly provide the multipart upload API:

- **Amazon.S3.Transfer**—Provides the high-level API to upload your data in parts.  
  
It includes the `TransferUtility` class that enables you to specify a file, directory, or stream for uploading your data. It also includes the `TransferUtilityUploadRequest` and `TransferUtilityUploadDirectoryRequest` classes to configure advanced settings such as the number of concurrent threads, part size, object metadata, the storage class (STANDARD, REDUCED\_REDUNDANCY) and object ACL.
- **Amazon.S3**—Provides the implementation for the low-level APIs.  
  
It provides methods that correspond to the Amazon S3 REST multipart upload API (see [Using the REST API for Multipart Upload \(p. 221\)](#)).
- **Amazon.S3.Model**—Provides the low-level API classes to create requests and process responses.  
  
For example, it provides the `InitiateMultipartUploadRequest` and `InitiateMultipartUploadResponse` classes you can use when initiating a multipart upload, and the `UploadPartRequest` and `UploadPartResponse` classes when uploading parts.

For more information about the AWS SDK for .NET API, go to [AWS SDK for .NET Reference](#).

## Running the Amazon S3 .NET Code Examples

The easiest way to get started with the .NET code examples is to install the AWS SDK for .NET. For more information, go to [AWS SDK for .NET](#).

**Note**

The examples in this guide are AWS SDK for .NET version 2.0 compliant.

The following tasks guide you through creating and testing the C# code examples provided in this section.

### General Process of Creating .NET Code Examples

1	Create a credentials profile for your AWS credentials as described in the AWS SDK for .NET topic <a href="#">Configuring AWS Credentials</a> .
2	Create a new Visual Studio project using the <i>AWS Empty Project</i> template.
3	Replace the code in the project file, <code>Program.cs</code> , with the code in the section you are reading.
4	Run the code. Verify that the object is created using the AWS Management Console. For more information about AWS Management Console, go to <a href="https://aws.amazon.com/console/">https://aws.amazon.com/console/</a> .

## Using the AWS SDK for PHP and Running PHP Examples

The AWS SDK for PHP provides access to the API for Amazon S3 bucket and object operations. The SDK gives you the option of using the service's low-level API or using higher-level abstractions.

The SDK is available at [AWS SDK for PHP](#), which also has instructions for installing and getting started with the SDK.

**Note**

The setup for using the AWS SDK for PHP depends on your environment and how you want to run your application. To set up your environment to run the examples in this documentation, see the [AWS SDK for PHP Getting Started Guide](#).

## AWS SDK for PHP Levels

### Low-Level API

The low-level APIs correspond to the underlying Amazon S3 REST operations, including the create, update, and delete operations on buckets and objects. The low-level APIs provide greater control over these operations. For example, you can batch your requests and execute them in parallel, or when using the multipart upload API (see [Uploading Objects Using Multipart Upload API \(p. 187\)](#)), you can manage the object parts individually. Note that these low-level API calls return a result that includes all the Amazon S3 response details.

### High-Level Abstractions

The high-level abstractions are intended to simplify common use cases. For example, for uploading large objects using the low-level API, you must first call `Aws\S3\S3Client::createMultipartUpload()`,

then call the `Aws\S3\S3Client::uploadPart()` method to uploads object parts and then call the `Aws\S3\S3Client::completeMultipartUpload()` method to complete the upload. Instead, you could use the higher-level `Aws\S3\Model\MultipartUpload\UploadBuilder` object that simplifies creating a multipart upload.

Another example of using a higher-level abstraction is when enumerating objects in a bucket you can use the iterators feature of the AWS SDK for PHP to return all the object keys, regardless of how many objects you have stored in the bucket. If you use the low-level API the response returns only up to 1,000 keys and if you have more than a 1,000 objects in the bucket, the result will be truncated and you will have to manage the response and check for any truncation.

## Running PHP Examples

The following procedure describes how to run the PHP code examples in this guide.

### To Run the PHP Code Examples

1	Download and install the <a href="#">AWS SDK for PHP</a> , and then verify that your environment meets the minimum requirements as described in the <a href="#">AWS SDK for PHP Getting Started Guide</a> .
2	Install the AWS SDK for PHP according to the instructions in the <a href="#">AWS SDK for PHP Getting Started Guide</a> . Depending on the installation method that you use, you might have to modify your code to resolve dependencies among the PHP extensions.  All of the PHP code examples in this document use the Composer dependency manager that is described in the <a href="#">AWS SDK for PHP Getting Started Guide</a> . Each code sample includes the following line to include its dependencies:  <pre>require 'vendor/autoload.php';</pre>
3	Create a credentials profile for your AWS credentials as described in the AWS SDK for PHP topic <a href="#">Using the AWS credentials file and credential profiles</a> . At run time, when you create a new Amazon S3 client object, the client will obtain your AWS credentials from the credentials profile.
4	Copy the example code from the document to your project. Depending upon your environment, you might need to add lines to the code example that reference your configuration and SDK files.  For example, to load a PHP example in a browser, add the following to the top of the PHP code, and then save it as a PHP file (extension <code>.php</code> ) in the Web application directory (such as <code>www</code> or <code>htdocs</code> ):  <pre>&lt;?php header('Content-Type: text/plain; charset=utf-8');  // Include the AWS SDK using the Composer autoloader require 'vendor/autoload.php';</pre>
5	Test the example according to your setup.

## Related Resources

- [AWS SDK for PHP for Amazon S3](#)
- [AWS SDK for PHP Documentation](#)

# Using the AWS SDK for Ruby - Version 3

The AWS SDK for Ruby provides an API for Amazon S3 bucket and object operations. For object operations, you can use the API to upload objects in a single operation or upload large objects in parts (see [Using the AWS SDK for Ruby for Multipart Upload \(p. 220\)](#)). However, the API for a single operation upload can accept large objects as well and behind the scenes manage the upload in parts for you thereby reducing the amount of script you need to write.

## The Ruby API Organization

When creating Amazon S3 applications using the AWS SDK for Ruby, you must install the SDK for Ruby gem. For more information, see the [AWS SDK for Ruby - Version 3](#). Once installed, you can access the API, including the following key classes:

- **Aws::S3::Resource**—Represents the interface to Amazon S3 for the Ruby SDK and provides methods for creating and enumerating buckets.

The S3 class provides the #buckets instance method for accessing existing buckets or creating new ones.

- **Aws::S3::Bucket**—Represents an Amazon S3 bucket.

The Bucket class provides the #object(key) and #objects methods for accessing the objects in a bucket, as well as methods to delete a bucket and return information about a bucket, like the bucket policy.

- **Aws::S3::Object**—Represents an Amazon S3 object identified by its key.

The Object class provides methods for getting and setting properties of an object, specifying the storage class for storing objects, and setting object permissions using access control lists. The Object class also has methods for deleting, uploading and copying objects. When uploading objects in parts, this class provides options for you to specify the order of parts uploaded and the part size.

For more information about the AWS SDK for Ruby API, go to [AWS SDK for Ruby - Version 2](#).

## Testing the Ruby Script Examples

The easiest way to get started with the Ruby script examples is to install the latest AWS SDK for Ruby gem. For information about installing or updating to the latest gem, go to [AWS SDK for Ruby - Version 3](#). The following tasks guide you through the creation and testing of the Ruby script examples assuming that you have installed the AWS SDK for Ruby.

### General Process of Creating and Testing Ruby Script Examples

1	To access AWS, you must provide a set of credentials for your SDK for Ruby application. For more information, see <a href="#">Configuring the AWS SDK for Ruby</a> .
2	Create a new SDK for Ruby script and add the following lines to the top of the script.  <pre>#!/usr/bin/env ruby  require 'rubygems' require 'aws-sdk-s3'</pre> The first line is the interpreter directive and the two require statements import two required gems into your script.

3	Copy the code from the section you are reading to your script.
4	Update the code by providing any required data. For example, if uploading a file, provide the file path and the bucket name.
5	Run the script. Verify changes to buckets and objects by using the AWS Management Console. For more information about the AWS Management Console, go to <a href="https://aws.amazon.com/console/">https://aws.amazon.com/console/</a> .

### Ruby Samples

The following links contain samples to help get you started with the SDK for Ruby – Version 3:

- [Using the AWS SDK for Ruby Version 3 \(p. 67\)](#)
- [Upload an Object Using the AWS SDK for Ruby \(p. 186\)](#)

## Using the AWS SDK for Python (Boto)

Boto is a Python package that provides interfaces to AWS including Amazon S3. For more information about Boto, go to the [AWS SDK for Python \(Boto\)](#). The getting started link on this page provides step-by-step instructions to get started.

# Appendices

This Amazon Simple Storage Service Developer Guide appendix include the following sections.

## Topics

- [Appendix A: Using the SOAP API \(p. 619\)](#)
- [Appendix B: Authenticating Requests \(AWS Signature Version 2\) \(p. 622\)](#)

## Appendix A: Using the SOAP API

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

This section contains information specific to the Amazon S3 SOAP API.

### Note

SOAP requests, both authenticated and anonymous, must be sent to Amazon S3 using SSL. Amazon S3 returns an error when you send a SOAP request over HTTP.

## Common SOAP API Elements

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

You can interact with Amazon S3 using SOAP 1.1 over HTTP. The Amazon S3 WSDL, which describes the Amazon S3 API in a machine-readable way, is available at: <http://doc.s3.amazonaws.com/2006-03-01/AmazonS3.wsdl>. The Amazon S3 schema is available at <http://doc.s3.amazonaws.com/2006-03-01/AmazonS3.xsd>.

Most users will interact with Amazon S3 using a SOAP toolkit tailored for their language and development environment. Different toolkits will expose the Amazon S3 API in different ways. Please refer to your specific toolkit documentation to understand how to use it. This section illustrates the Amazon S3 SOAP operations in a toolkit-independent way by exhibiting the XML requests and responses as they appear "on the wire."

## Common Elements

You can include the following authorization-related elements with any SOAP request:

- **AWSAccessKeyId**: The AWS Access Key ID of the requester
- **Timestamp**: The current time on your system
- **Signature**: The signature for the request

## Authenticating SOAP Requests

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

Every non-anonymous request must contain authentication information to establish the identity of the principal making the request. In SOAP, the authentication information is put into the following elements of the SOAP request:

- Your AWS Access Key ID

### Note

When making authenticated SOAP requests, temporary security credentials are not supported. For more information about types of credentials, see [Making Requests \(p. 11\)](#).

- **Timestamp**: This must be a `dateTime` (go to <http://www.w3.org/TR/xmlschema-2/#dateTime>) in the Coordinated Universal Time (Greenwich Mean Time) time zone, such as `2009-01-01T12:00:00.000Z`. Authorization will fail if this timestamp is more than 15 minutes away from the clock on Amazon S3 servers.
- **Signature**: The RFC 2104 HMAC-SHA1 digest (go to <http://www.ietf.org/rfc/rfc2104.txt>) of the concatenation of "AmazonS3" + OPERATION + Timestamp, using your AWS Secret Access Key as the key. For example, in the following CreateBucket sample request, the signature element would contain the HMAC-SHA1 digest of the value "AmazonS3CreateBucket2009-01-01T12:00:00.000Z":

For example, in the following CreateBucket sample request, the signature element would contain the HMAC-SHA1 digest of the value "AmazonS3CreateBucket2009-01-01T12:00:00.000Z":

### Example

```
<CreateBucket xmlns="http://doc.s3.amazonaws.com/2006-03-01">
  <Bucket>quotes</Bucket>
  <Acl>private</Acl>
  <AWSAccessKeyId>AKIAIOSFODNN7EXAMPLE</AWSAccessKeyId>
  <Timestamp>2009-01-01T12:00:00.000Z</Timestamp>
  <Signature>Iuyz3d3P0aTou39dzbqaEXAMPLE=</Signature>
</CreateBucket>
```

### Note

SOAP requests, both authenticated and anonymous, must be sent to Amazon S3 using SSL. Amazon S3 returns an error when you send a SOAP request over HTTP.

### Important

Due to different interpretations regarding how extra time precision should be dropped, .NET users should take care not to send Amazon S3 overly specific time stamps. This can be accomplished by manually constructing `DateTime` objects with only millisecond precision.

## Setting Access Policy with SOAP

### Note

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

Access control can be set at the time a bucket or object is written by including the "AccessControlList" element with the request to `CreateBucket`, `PutObjectInline`, or `PutObject`. The `AccessControlList` element is described in [Managing Access Permissions to Your Amazon S3 Resources \(p. 295\)](#). If no access control list is specified with these operations, the resource is created with a default access policy that gives the requester `FULL_CONTROL` access (this is the case even if the request is a `PutObjectInline` or `PutObject` request for an object that already exists).

Following is a request that writes data to an object, makes the object readable by anonymous principals, and gives the specified user `FULL_CONTROL` rights to the bucket (Most developers will want to give themselves `FULL_CONTROL` access to their own bucket).

### Example

Following is a request that writes data to an object and makes the object readable by anonymous principals.

#### Sample Request

```
<PutObjectInline xmlns="http://doc.s3.amazonaws.com/2006-03-01">
  <Bucket>quotes</Bucket>
  <Key>Nelson</Key>
  <Metadata>
    <Name>Content-Type</Name>
    <Value>text/plain</Value>
  </Metadata>
  <Data>aGETaGE=</Data>
  <ContentLength>5</ContentLength>
  <AccessControlList>
    <Grant>
      <Grantee xsi:type="CanonicalUser">
        <ID>75cc57f09aa0c8caeab4f8c24e99d10f8e7faeef76c078efc7c6caea54ba06a</ID>
        <DisplayName>chriscustomer</DisplayName>
      </Grantee>
      <Permission>FULL_CONTROL</Permission>
    </Grant>
    <Grant>
      <Grantee xsi:type="Group">
        <URI>http://acs.amazonaws.com/groups/global/AllUsers<URI>
      </Grantee>
      <Permission>READ</Permission>
    </Grant>
  </AccessControlList>
  <AWSAccessKeyId>AKIAIOSFODNN7EXAMPLE</AWSAccessKeyId>
  <Timestamp>2009-03-01T12:00:00.183Z</Timestamp>
  <Signature>Iuyz3d3P0aTou39dzbqaEXAMPLE=</Signature>
</PutObjectInline>
```

#### Sample Response

```
<PutObjectInlineResponse xmlns="http://s3.amazonaws.com/doc/2006-03-01">
  <PutObjectInlineResponse>
    <ETag>&quot;828ef3fd9a96f00ad9f27c383fc9ac7f&quot;</ETag>
    <LastModified>2009-01-01T12:00:00.000Z</LastModified>
  </PutObjectInlineResponse>
```

```
</PutObjectInlineResponse>
```

The access control policy can be read or set for an existing bucket or object using the `GetBucketAccessControlPolicy`, `GetObjectAccessControlPolicy`, `SetBucketAccessControlPolicy`, and `SetObjectAccessControlPolicy` methods. For more information, see the detailed explanation of these methods.

## Appendix B: Authenticating Requests (AWS Signature Version 2)

### Topics

- [Authenticating Requests Using the REST API \(p. 623\)](#)
- [Signing and Authenticating REST Requests \(p. 625\)](#)
- [Browser-Based Uploads Using POST \(AWS Signature Version 2\) \(p. 634\)](#)

### Note

This topic explains authenticating requests using Signature Version 2. Amazon S3 now supports the latest Signature Version 4, which is supported in all regions; it is the only version supported for new AWS regions. For more information, go to [Authenticating Requests \(AWS Signature Version 4\)](#) in the *Amazon Simple Storage Service API Reference*.

# Authenticating Requests Using the REST API

When accessing Amazon S3 using REST, you must provide the following items in your request so the request can be authenticated:

## Request Elements

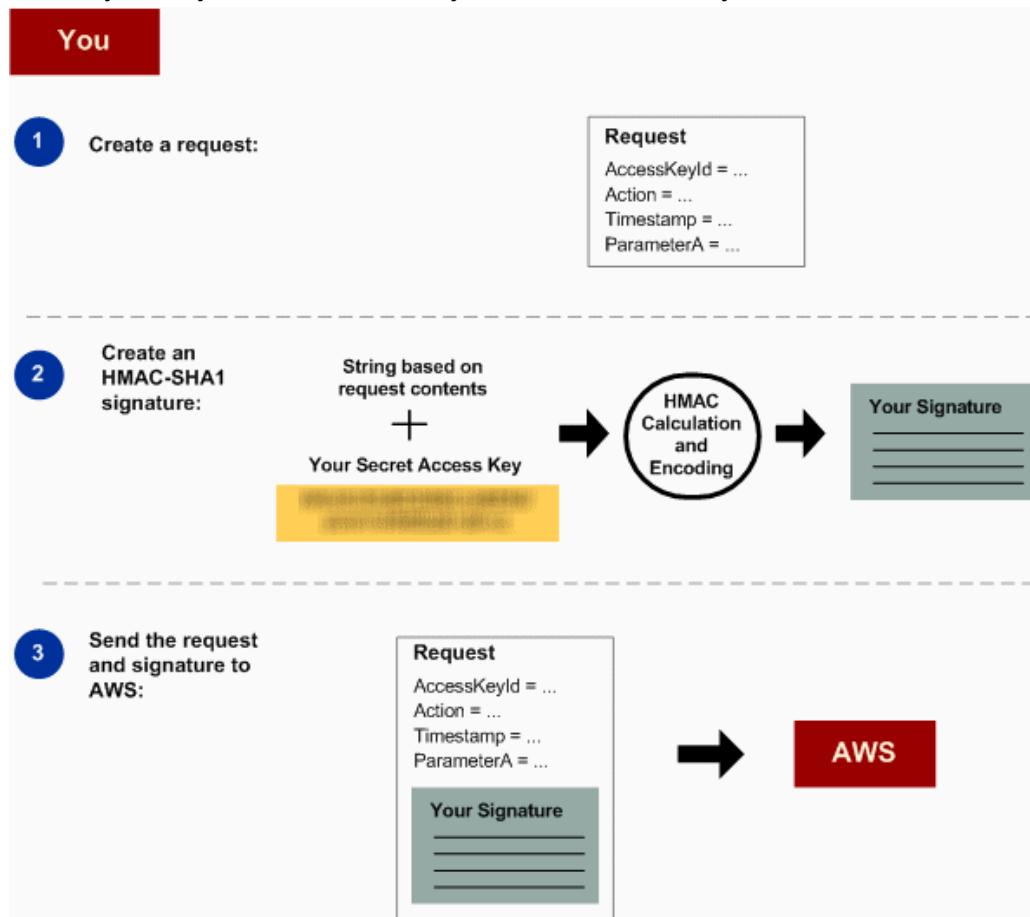
- **AWS Access Key Id** – Each request must contain the access key ID of the identity you are using to send your request.
- **Signature** – Each request must contain a valid request signature, or the request is rejected.

A request signature is calculated using your secret access key, which is a shared secret known only to you and AWS.

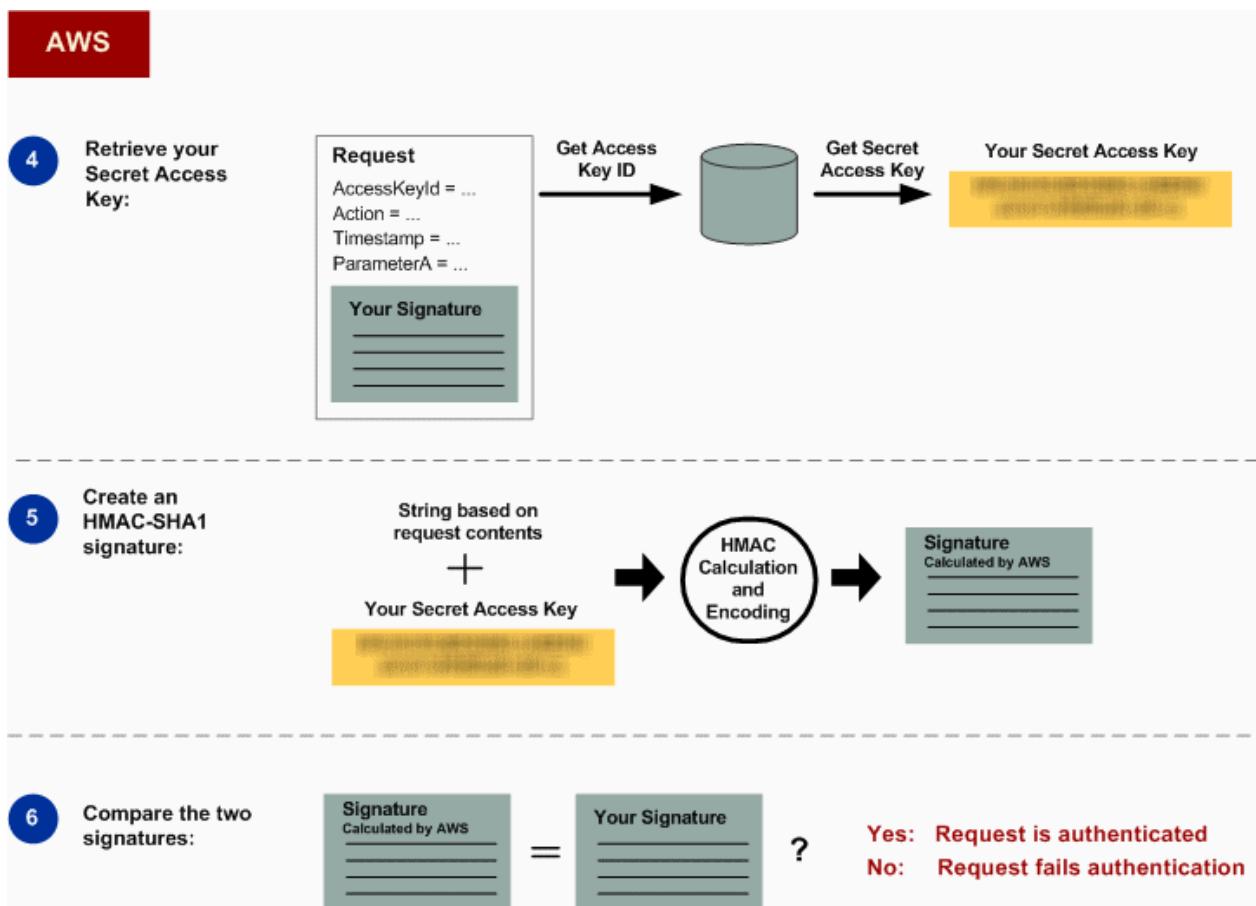
- **Time stamp** – Each request must contain the date and time the request was created, represented as a string in UTC.
- **Date** – Each request must contain the time stamp of the request.

Depending on the API action you're using, you can provide an expiration date and time for the request instead of or in addition to the time stamp. See the authentication topic for the particular action to determine what it requires.

Following are the general steps for authenticating requests to Amazon S3. It is assumed you have the necessary security credentials, access key ID and secret access key.



1	Construct a request to AWS.
2	Calculate the signature using your secret access key.
3	Send the request to Amazon S3. Include your access key ID and the signature in your request. Amazon S3 performs the next three steps.



4	Amazon S3 uses the access key ID to look up your secret access key.
5	Amazon S3 calculates a signature from the request data and the secret access key using the same algorithm that you used to calculate the signature you sent in the request.
6	If the signature generated by Amazon S3 matches the one you sent in the request, the request is considered authentic. If the comparison fails, the request is discarded, and Amazon S3 returns an error response.

## Detailed Authentication Information

For detailed information about REST authentication, see [Signing and Authenticating REST Requests \(p. 625\)](#).

# Signing and Authenticating REST Requests

## Topics

- [Using Temporary Security Credentials \(p. 626\)](#)
- [The Authentication Header \(p. 626\)](#)
- [Request Canonicalization for Signing \(p. 627\)](#)
- [Constructing the CanonicalizedResource Element \(p. 627\)](#)
- [Constructing the CanonicalizedAmzHeaders Element \(p. 628\)](#)
- [Positional versus Named HTTP Header StringToSign Elements \(p. 628\)](#)
- [Time Stamp Requirement \(p. 628\)](#)
- [Authentication Examples \(p. 629\)](#)
- [REST Request Signing Problems \(p. 632\)](#)
- [Query String Request Authentication Alternative \(p. 632\)](#)

### Note

This topic explains authenticating requests using Signature Version 2. Amazon S3 now supports the latest Signature Version 4. This latest signature version is supported in all regions and any new regions after January 30, 2014 will support only Signature Version 4. For more information, go to [Authenticating Requests \(AWS Signature Version 4\)](#) in the *Amazon Simple Storage Service API Reference*.

Authentication is the process of proving your identity to the system. Identity is an important factor in Amazon S3 access control decisions. Requests are allowed or denied in part based on the identity of the requester. For example, the right to create buckets is reserved for registered developers and (by default) the right to create objects in a bucket is reserved for the owner of the bucket in question. As a developer, you'll be making requests that invoke these privileges, so you'll need to prove your identity to the system by authenticating your requests. This section shows you how.

### Note

The content in this section does not apply to HTTP POST. For more information, see [Browser-Based Uploads Using POST \(AWS Signature Version 2\) \(p. 634\)](#).

The Amazon S3 REST API uses a custom HTTP scheme based on a keyed-HMAC (Hash Message Authentication Code) for authentication. To authenticate a request, you first concatenate selected elements of the request to form a string. You then use your AWS secret access key to calculate the HMAC of that string. Informally, we call this process "signing the request," and we call the output of the HMAC algorithm the signature, because it simulates the security properties of a real signature. Finally, you add this signature as a parameter of the request by using the syntax described in this section.

When the system receives an authenticated request, it fetches the AWS secret access key that you claim to have and uses it in the same way to compute a signature for the message it received. It then compares the signature it calculated against the signature presented by the requester. If the two signatures match, the system concludes that the requester must have access to the AWS secret access key and therefore acts with the authority of the principal to whom the key was issued. If the two signatures do not match, the request is dropped and the system responds with an error message.

### Example Authenticated Amazon S3 REST Request

```
GET /photos/puppy.jpg HTTP/1.1
Host: johnsmith.s3.amazonaws.com
Date: Mon, 26 Mar 2007 19:37:58 +0000
```

```
Authorization: AWS AKIAIOSFODNN7EXAMPLE:frJIUN8DYpKDtOLCwo//yllqDzg=
```

## Using Temporary Security Credentials

If you are signing your request using temporary security credentials (see [Making Requests \(p. 11\)](#)), you must include the corresponding security token in your request by adding the `x-amz-security-token` header.

When you obtain temporary security credentials using the AWS Security Token Service API, the response includes temporary security credentials and a session token. You provide the session token value in the `x-amz-security-token` header when you send requests to Amazon S3. For information about the AWS Security Token Service API provided by IAM, go to [Action in the AWS Security Token Service API Reference Guide](#).

## The Authentication Header

The Amazon S3 REST API uses the standard HTTP Authorization header to pass authentication information. (The name of the standard header is unfortunate because it carries authentication information, not authorization.) Under the Amazon S3 authentication scheme, the Authorization header has the following form:

```
Authorization: AWS AWSAccessKeyId:Signature
```

Developers are issued an AWS access key ID and AWS secret access key when they register. For request authentication, the `AWSAccessKeyId` element identifies the access key ID that was used to compute the signature and, indirectly, the developer making the request.

The `Signature` element is the RFC 2104 HMAC-SHA1 of selected elements from the request, and so the `Signature` part of the Authorization header will vary from request to request. If the request signature calculated by the system matches the `Signature` included with the request, the requester will have demonstrated possession of the AWS secret access key. The request will then be processed under the identity, and with the authority, of the developer to whom the key was issued.

Following is pseudogrammar that illustrates the construction of the `Authorization` request header. (In the example, `\n` means the Unicode code point U+000A, commonly called newline).

```
Authorization = "AWS" + " " + AWSAccessKeyId + ":" + Signature;

Signature = Base64( HMAC-SHA1( YourSecretAccessKeyID, UTF-8-Encoding-
Of( StringToSign ) ) );

StringToSign = HTTP-Verb + "\n" +
Content-MD5 + "\n" +
Content-Type + "\n" +
Date + "\n" +
CanonicalizedAmzHeaders +
CanonicalizedResource;

CanonicalizedResource = [ "/" + Bucket ] +
<HTTP-Request-URI, from the protocol name up to the query string> +
[ subresource, if present. For example "?acl", "?location", "?logging", or "?torrent"];

CanonicalizedAmzHeaders = <described below>
```

HMAC-SHA1 is an algorithm defined by [RFC 2104 - Keyed-Hashing for Message Authentication](#). The algorithm takes as input two byte-strings, a key and a message. For Amazon S3 request authentication,

use your AWS secret access key (`YourSecretAccessKeyID`) as the key, and the UTF-8 encoding of the `StringToSign` as the message. The output of HMAC-SHA1 is also a byte string, called the digest. The `Signature` request parameter is constructed by Base64 encoding this digest.

## Request Canonicalization for Signing

Recall that when the system receives an authenticated request, it compares the computed request signature with the signature provided in the request in `StringToSign`. For that reason, you must compute the signature by using the same method used by Amazon S3. We call the process of putting a request in an agreed-upon form for signing *canonicalization*.

## Constructing the CanonicalizedResource Element

`CanonicalizedResource` represents the Amazon S3 resource targeted by the request. Construct it for a REST request as follows:

### Launch Process

1	Start with an empty string ("").
2	<p>If the request specifies a bucket using the HTTP Host header (virtual hosted-style), append the bucket name preceded by a "/" (e.g., "/bucketname"). For path-style requests and requests that don't address a bucket, do nothing. For more information about virtual hosted-style requests, see <a href="#">Virtual Hosting of Buckets (p. 51)</a>.</p> <p>For a virtual hosted-style request "https://johnsmith.s3.amazonaws.com/photos/puppy.jpg", the <code>CanonicalizedResource</code> is "/johnsmith".</p> <p>For the path-style request, "https://s3.amazonaws.com/johnsmith/photos/puppy.jpg", the <code>CanonicalizedResource</code> is "".</p>
3	<p>Append the path part of the un-decoded HTTP Request-URI, up-to but not including the query string.</p> <p>For a virtual hosted-style request "https://johnsmith.s3.amazonaws.com/photos/puppy.jpg", the <code>CanonicalizedResource</code> is "/johnsmith/photos/puppy.jpg".</p> <p>For a path-style request, "https://s3.amazonaws.com/johnsmith/photos/puppy.jpg", the <code>CanonicalizedResource</code> is "/johnsmith/photos/puppy.jpg". At this point, the <code>CanonicalizedResource</code> is the same for both the virtual hosted-style and path-style request.</p> <p>For a request that does not address a bucket, such as <a href="#">GET Service</a>, append "/".</p>
4	<p>If the request addresses a subresource, such as <code>?versioning</code>, <code>?location</code>, <code>?acl</code>, <code>?torrent</code>, <code>?lifecycle</code>, or <code>?versionid</code>, append the subresource, its value if it has one, and the question mark. Note that in case of multiple subresources, subresources must be lexicographically sorted by subresource name and separated by '&amp;', e.g., <code>?acl&amp;versionId=value</code>.</p> <p>The subresources that must be included when constructing the <code>CanonicalizedResource</code> Element are <code>acl</code>, <code>lifecycle</code>, <code>location</code>, <code>logging</code>, <code>notification</code>, <code>partNumber</code>, <code>policy</code>, <code>requestPayment</code>, <code>torrent</code>, <code>uploadId</code>, <code>uploads</code>, <code>versionId</code>, <code>versioning</code>, <code>versions</code>, and <code>website</code>.</p> <p>If the request specifies query string parameters overriding the response header values (see <a href="#">Get Object</a>), append the query string parameters and their values. When signing, you do not encode these values; however, when making the request, you must encode these parameter values. The query string parameters in a GET request include <code>response-content-type</code>, <code>response-content-language</code>, <code>response-expires</code>, <code>response-cache-control</code>, <code>response-content-disposition</code>, and <code>response-content-encoding</code>.</p>

The delete query string parameter must be included when you create the CanonicalizedResource for a multi-object Delete request.

Elements of the CanonicalizedResource that come from the HTTP Request-URI should be signed literally as they appear in the HTTP request, including URL-Encoding meta characters.

The CanonicalizedResource might be different than the HTTP Request-URI. In particular, if your request uses the HTTP Host header to specify a bucket, the bucket does not appear in the HTTP Request-URI. However, the CanonicalizedResource continues to include the bucket. Query string parameters might also appear in the Request-URI but are not included in CanonicalizedResource. For more information, see [Virtual Hosting of Buckets \(p. 51\)](#).

## Constructing the CanonicalizedAmzHeaders Element

To construct the CanonicalizedAmzHeaders part of `StringToSign`, select all HTTP request headers that start with 'x-amz-' (using a case-insensitive comparison), and use the following process.

### CanonicalizedAmzHeaders Process

1	Convert each HTTP header name to lowercase. For example, 'X-Amz-Date' becomes 'x-amz-date'.
2	Sort the collection of headers lexicographically by header name.
3	Combine header fields with the same name into one "header-name:comma-separated-value-list" pair as prescribed by RFC 2616, section 4.2, without any whitespace between values. For example, the two metadata headers 'x-amz-meta-username: fred' and 'x-amz-meta-username: barney' would be combined into the single header 'x-amz-meta-username: fred,barney'.
4	"Unfold" long headers that span multiple lines (as allowed by RFC 2616, section 4.2) by replacing the folding whitespace (including new-line) by a single space.
5	Trim any whitespace around the colon in the header. For example, the header 'x-amz-meta-username: fred,barney' would become 'x-amz-meta-username:fred,barney'
6	Finally, append a newline character (U+000A) to each canonicalized header in the resulting list. Construct the CanonicalizedResource element by concatenating all headers in this list into a single string.

## Positional versus Named HTTP Header StringToSign Elements

The first few header elements of `StringToSign` (Content-Type, Date, and Content-MD5) are positional in nature. `StringToSign` does not include the names of these headers, only their values from the request. In contrast, the 'x-amz-' elements are named. Both the header names and the header values appear in `StringToSign`.

If a positional header called for in the definition of `StringToSign` is not present in your request (for example, Content-Type or Content-MD5 are optional for PUT requests and meaningless for GET requests), substitute the empty string ("") for that position.

## Time Stamp Requirement

A valid time stamp (using either the HTTP Date header or an x-amz-date alternative) is mandatory for authenticated requests. Furthermore, the client timestamp included with an authenticated request must be within 15 minutes of the Amazon S3 system time when the request is received. If not, the request will fail with the `RequestTimeTooSkewed` error code. The intention of these restrictions is to limit the

possibility that intercepted requests could be replayed by an adversary. For stronger protection against eavesdropping, use the HTTPS transport for authenticated requests.

**Note**

The validation constraint on request date applies only to authenticated requests that do not use query string authentication. For more information, see [Query String Request Authentication Alternative \(p. 632\)](#).

Some HTTP client libraries do not expose the ability to set the Date header for a request. If you have trouble including the value of the 'Date' header in the canonicalized headers, you can set the timestamp for the request by using an 'x-amz-date' header instead. The value of the x-amz-date header must be in one of the RFC 2616 formats (<http://www.ietf.org/rfc/rfc2616.txt>). When an x-amz-date header is present in a request, the system will ignore any Date header when computing the request signature. Therefore, if you include the x-amz-date header, use the empty string for the Date when constructing the StringToSign. See the next section for an example.

## Authentication Examples

The examples in this section use the (non-working) credentials in the following table.

Parameter	Value
AWSAccessKeyId	AKIAIOSFODNN7EXAMPLE
AWSSecretAccessKey	wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY

In the example StringToSigns, formatting is not significant, and \n means the Unicode code point U+000A, commonly called newline. Also, the examples use "+0000" to designate the time zone. You can use "GMT" to designate timezone instead, but the signatures shown in the examples will be different.

### Object GET

This example gets an object from the johnsmith bucket.

Request	StringToSign
<pre>GET /photos/puppy.jpg HTTP/1.1 Host: johnsmith.s3.amazonaws.com Date: Tue, 27 Mar 2007 19:36:42 +0000  Authorization: AWS     AKIAIOSFODNN7EXAMPLE:     bWq2s1WEIj+Ydj0vQ697zp+IXMU=</pre>	<pre>GET\n \n \n Tue, 27 Mar 2007 19:36:42 +0000\n /johnsmith/photos/puppy.jpg</pre>

Note that the CanonicalizedResource includes the bucket name, but the HTTP Request-URI does not. (The bucket is specified by the Host header.)

### Object PUT

This example puts an object into the johnsmith bucket.

Request	StringToSign
PUT /photos/puppy.jpg HTTP/1.1	PUT\n

Request	StringToSign
Content-Type: image/jpeg Content-Length: 94328 Host: johnsmith.s3.amazonaws.com Date: Tue, 27 Mar 2007 21:15:45 +0000  <i>Authorization: AWS AKIAIOSFODNN7EXAMPLE: MyyxerY7whkBe+bq8fHCL/2kKUg=</i>	\n image/jpeg\n Tue, 27 Mar 2007 21:15:45 +0000\n /johnsmith/photos/puppy.jpg

Note the Content-Type header in the request and in the StringToSign. Also note that the Content-MD5 is left blank in the StringToSign, because it is not present in the request.

## List

This example lists the content of the johnsmith bucket.

Request	StringToSign
GET /?prefix=photos&max-keys=50&marker=puppy HTTP/1.1 User-Agent: Mozilla/5.0 Host: johnsmith.s3.amazonaws.com Date: Tue, 27 Mar 2007 19:42:41 +0000  <i>Authorization: AWS AKIAIOSFODNN7EXAMPLE: htDYFYduRNen8P9ZfE/s9SuKy0U=</i>	GET\n \n \n Tue, 27 Mar 2007 19:42:41 +0000\n /johnsmith/

Note the trailing slash on the CanonicalizedResource and the absence of query string parameters.

## Fetch

This example fetches the access control policy subresource for the 'johnsmith' bucket.

Request	StringToSign
GET /acl HTTP/1.1 Host: johnsmith.s3.amazonaws.com Date: Tue, 27 Mar 2007 19:44:46 +0000  <i>Authorization: AWS AKIAIOSFODNN7EXAMPLE: c2WLPFtWHVgbEmeEG93a4cG37dM=</i>	GET\n \n \n Tue, 27 Mar 2007 19:44:46 +0000\n /johnsmith/?acl

Notice how the subresource query string parameter is included in the CanonicalizedResource.

## Delete

This example deletes an object from the 'johnsmith' bucket using the path-style and Date alternative.

Request	StringToSign
DELETE /johnsmith/photos/puppy.jpg HTTP/1.1 User-Agent: dotnet	DELETE\n \n

Request	StringToSign
<pre>Host: s3.amazonaws.com Date: Tue, 27 Mar 2007 21:20:27 +0000 x-amz-date: Tue, 27 Mar 2007 21:20:26 +0000 Authorization: AWS AKIAIOSFODNN7EXAMPLE:lx3byBScXR6KzyMaifNkardMwNk=</pre>	<pre>\n Tue, 27 Mar 2007 21:20:26 +0000\n /johnsmith/photos/puppy.jpg</pre>

Note how we used the alternate 'x-amz-date' method of specifying the date (because our client library prevented us from setting the date, say). In this case, the x-amz-date takes precedence over the Date header. Therefore, date entry in the signature must contain the value of the x-amz-date header.

## Upload

This example uploads an object to a CNAME style virtual hosted bucket with metadata.

Request	StringToSign
<pre>PUT /db-backup.dat.gz HTTP/1.1 User-Agent: curl/7.15.5 Host: static.johnsmith.net:8080 Date: Tue, 27 Mar 2007 21:06:08 +0000  x-amz-acl: public-read content-type: application/x-download Content-MD5: 4gJE4saaMU4BqNR0kLY+lw== X-Amz-Meta-ReviewedBy: joe@johnsmith.net X-Amz-Meta-ReviewedBy: jane@johnsmith.net X-Amz-Meta-FileChecksum: 0x02661779 X-Amz-Meta-ChecksumAlgorithm: crc32 Content-Disposition: attachment; filename=database.dat Content-Encoding: gzip Content-Length: 5913339  Authorization: AWS AKIAIOSFODNN7EXAMPLE: iIyl83RwaSoYIEdixDQcA4OnAnc=</pre>	<pre>PUT\n 4gJE4saaMU4BqNR0kLY+lw==\n application/x-download\n Tue, 27 Mar 2007 21:06:08 +0000\n  x-amz-acl:public-read\n x-amz-meta-checksumalgorithm:crc32\n x-amz-meta-filechecksum:0x02661779\n x-amz-meta-reviewedby: joe@johnsmith.net,jane@johnsmith.net\n /static.johnsmith.net/db-backup.dat.gz</pre>

Notice how the 'x-amz-' headers are sorted, trimmed of whitespace, and converted to lowercase. Note also that multiple headers with the same name have been joined using commas to separate values.

Note how only the Content-Type and Content-MD5 HTTP entity headers appear in the StringToSign. The other Content-\* entity headers do not.

Again, note that the CanonicalizedResource includes the bucket name, but the HTTP Request-URI does not. (The bucket is specified by the Host header.)

## List All My Buckets

Request	StringToSign
<pre>GET / HTTP/1.1 Host: s3.amazonaws.com Date: Wed, 28 Mar 2007 01:29:59 +0000</pre>	<pre>GET\n \n \n</pre>

Request	StringToSign
<pre style="font-family: monospace; margin: 0;">Authorization: AWS AKIAIOSFODNN7EXAMPLE:qGdzdERIC03wnaRNKh6OqZehG9s=</pre>	<pre style="font-family: monospace; margin: 0;">Wed, 28 Mar 2007 01:29:59 +0000\n /</pre>

## Unicode Keys

Request	StringToSign
<pre style="font-family: monospace; margin: 0;">GET /dictionary/fran%C3%A7ais/pr%c3%a9f %c3%a8re HTTP/1.1 Host: s3.amazonaws.com Date: Wed, 28 Mar 2007 01:49:49 +0000 Authorization: AWS AKIAIOSFODNN7EXAMPLE:DNEZGsoieTZ92F3bUfSPQcbGm2e3 %c3%a8re</pre>	<pre style="font-family: monospace; margin: 0;">GET\n \n \n Wed, 28 Mar 2007 01:49:49 +0000\n /dictionary/fran%C3%A7ais/pr%c3%a9f %c3%a8re</pre>

### Note

The elements in `StringToSign` that were derived from the Request-URI are taken literally, including URL-Encoding and capitalization.

## REST Request Signing Problems

When REST request authentication fails, the system responds to the request with an XML error document. The information contained in this error document is meant to help developers diagnose the problem. In particular, the `StringToSign` element of the `SignatureDoesNotMatch` error document tells you exactly what request canonicalization the system is using.

Some toolkits silently insert headers that you do not know about beforehand, such as adding the header `Content-Type` during a `PUT`. In most of these cases, the value of the inserted header remains constant, allowing you to discover the missing headers by using tools such as Ethereal or `tcpmon`.

## Query String Request Authentication Alternative

You can authenticate certain types of requests by passing the required information as query-string parameters instead of using the `Authorization` HTTP header. This is useful for enabling direct third-party browser access to your private Amazon S3 data without proxying the request. The idea is to construct a "pre-signed" request and encode it as a URL that an end-user's browser can retrieve. Additionally, you can limit a pre-signed request by specifying an expiration time.

### Note

For examples of using the AWS SDKs to generating pre-signed URLs, see [Share an Object with Others \(p. 176\)](#).

## Creating a Signature

Following is an example query string authenticated Amazon S3 REST request.

```
GET /photos/puppy.jpg
?AWSAccessKeyId=AKIAIOSFODNN7EXAMPLE&Expires=1141889120&Signature=vjbyPxybdZaNmGa
%2ByT272YEAiv4%3D HTTP/1.1
Host: johnsmith.s3.amazonaws.com
```

Date: Mon, 26 Mar 2007 19:37:58 +0000

The query string request authentication method doesn't require any special HTTP headers. Instead, the required authentication elements are specified as query string parameters:

Query String Parameter Name	Example Value	Description
AWSAccessKeyId	AKIAIOSFODNN7EXAMPLE	Your AWS access key ID. Specifies the AWS secret access key used to sign the request and, indirectly, the identity of the developer making the request.
Expires	1141889120	The time when the signature expires, specified as the number of seconds since the epoch (00:00:00 UTC on January 1, 1970). A request received after this time (according to the server) will be rejected.
Signature	vjbyPxybdZaNmGa%2ByT272YEAv4%3D	The URL encoding of the Base64 encoding of the HMAC-SHA1 of StringToSign.

The query string request authentication method differs slightly from the ordinary method but only in the format of the `Signature` request parameter and the `StringToSign` element. Following is pseudo-grammar that illustrates the query string request authentication method.

```

Signature = URL-Encode( Base64( HMAC-SHA1( YourSecretAccessKeyID, UTF-8-Encoding-
Of( StringToSign ) ) ) );

StringToSign = HTTP-VERB + "\n" +
Content-MD5 + "\n" +
Content-Type + "\n" +
Expires + "\n" +
CanonicalizedAmzHeaders +
CanonicalizedResource;

```

`YourSecretAccessKeyID` is the AWS secret access key ID that Amazon assigns to you when you sign up to be an Amazon Web Service developer. Notice how the `Signature` is URL-Encoded to make it suitable for placement in the query string. Note also that in `StringToSign`, the `HTTP Date` positional element has been replaced with `Expires`. The `CanonicalizedAmzHeaders` and `CanonicalizedResource` are the same.

#### Note

In the query string authentication method, you do not use the `Date` or the `x-amz-date` request header when calculating the string to sign.

### Query String Request Authentication

Request	StringToSign
GET /photos/puppy.jpg? AWSAccessKeyId=AKIAIOSFODNN7EXAMPLE&	GET\n\n\n

Request	StringToSign
Signature=NpgCjnDzrM %2BWFzoENXmpNDUsSn8%3D& Expires=1175139620 HTTP/1.1  Host: johnsmith.s3.amazonaws.com	1175139620\n /johnsmith/photos/puppy.jpg

We assume that when a browser makes the GET request, it won't provide a Content-MD5 or a Content-Type header, nor will it set any x-amz- headers, so those parts of the StringToSign are left blank.

### Using Base64 Encoding

HMAC request signatures must be Base64 encoded. Base64 encoding converts the signature into a simple ASCII string that can be attached to the request. Characters that could appear in the signature string like plus (+), forward slash (/), and equals (=) must be encoded if used in a URI. For example, if the authentication code includes a plus (+) sign, encode it as %2B in the request. Encode a forward slash as %2F and equals as %3D.

For examples of Base64 encoding, refer to the Amazon S3 [Authentication Examples \(p. 629\)](#).

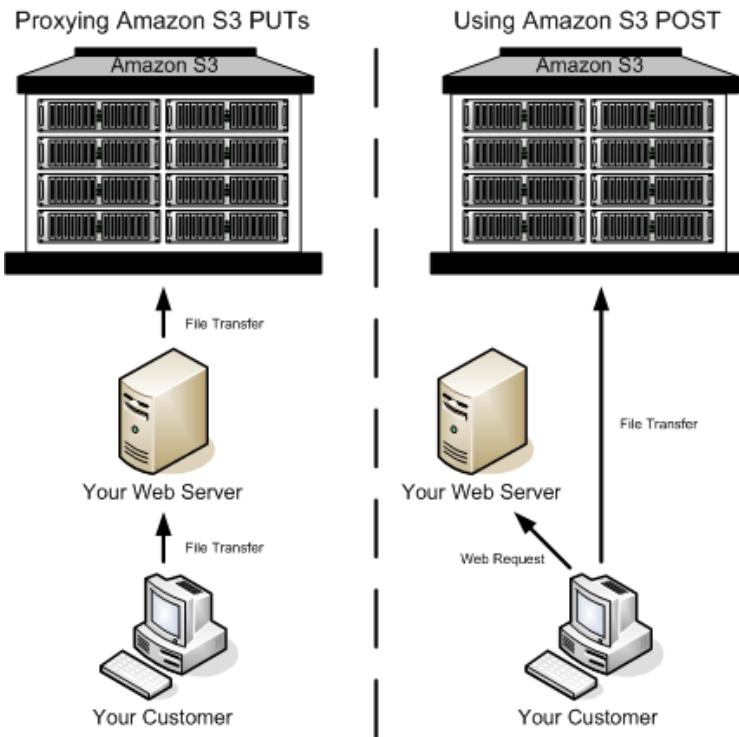
## Browser-Based Uploads Using POST (AWS Signature Version 2)

Amazon S3 supports POST, which allows your users to upload content directly to Amazon S3. POST is designed to simplify uploads, reduce upload latency, and save you money on applications where users upload data to store in Amazon S3.

### Note

The request authentication discussed in this section is based on AWS Signature Version 2, a protocol for authenticating inbound API requests to AWS services. Amazon S3 now supports Signature Version 4, a protocol for authenticating inbound API requests to AWS services, in all AWS regions. At this time, AWS regions created before January 30, 2014 will continue to support the previous protocol, Signature Version 2. Any new regions after January 30, 2014 will support only Signature Version 4 and therefore all requests to those regions must be made with Signature Version 4. For more information, see [Authenticating Requests in Browser-Based Uploads Using POST \(AWS Signature Version 4\)](#) in the *Amazon Simple Storage Service API Reference*.

The following figure shows an upload using Amazon S3 POST.



### Uploading Using POST

1	The user opens a web browser and accesses your web page.
2	Your web page contains an HTTP form that contains all the information necessary for the user to upload content to Amazon S3.
3	The user uploads content directly to Amazon S3.

#### Note

Query string authentication is not supported for POST.

## HTML Forms (AWS Signature Version 2)

### Topics

- [HTML Form Encoding \(p. 636\)](#)
- [HTML Form Declaration \(p. 636\)](#)
- [HTML Form Fields \(p. 637\)](#)
- [Policy Construction \(p. 639\)](#)
- [Constructing a Signature \(p. 642\)](#)
- [Redirection \(p. 642\)](#)

When you communicate with Amazon S3, you normally use the REST or SOAP API to perform put, get, delete, and other operations. With POST, users upload data directly to Amazon S3 through their browsers, which cannot process the SOAP API or create a REST PUT request.

**Note**

SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.

To allow users to upload content to Amazon S3 by using their browsers, you use HTML forms. HTML forms consist of a form declaration and form fields. The form declaration contains high-level information about the request. The form fields contain detailed information about the request, as well as the policy that is used to authenticate it and ensure that it meets the conditions that you specify.

**Note**

The form data and boundaries (excluding the contents of the file) cannot exceed 20 KB.

This section explains how to use HTML forms.

## HTML Form Encoding

The form and policy must be UTF-8 encoded. You can apply UTF-8 encoding to the form by specifying it in the HTML heading or as a request header.

**Note**

The HTML form declaration does not accept query string authentication parameters.

The following is an example of UTF-8 encoding in the HTML heading:

```
<html>
  <head>
    ...
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    ...
  </head>
  <body>
```

The following is an example of UTF-8 encoding in a request header:

```
Content-Type: text/html; charset=UTF-8
```

## HTML Form Declaration

The form declaration has three components: the action, the method, and the enclosure type. If any of these values is improperly set, the request fails.

The action specifies the URL that processes the request, which must be set to the URL of the bucket. For example, if the name of your bucket is "johnsmith", the URL is "http://johnsmith.s3.amazonaws.com/".

**Note**

The key name is specified in a form field.

The method must be POST.

The enclosure type (enctype) must be specified and must be set to multipart/form-data for both file uploads and text area uploads. For more information, go to [RFC 1867](#).

### Example

The following example is a form declaration for the bucket "johnsmith".

```
<form action="http://johnsmith.s3.amazonaws.com/" method="post"
```

```
enctype="multipart/form-data">
```

## HTML Form Fields

The following table describes fields that can be used within an HTML form.

**Note**

The variable \${filename} is automatically replaced with the name of the file provided by the user and is recognized by all form fields. If the browser or client provides a full or partial path to the file, only the text following the last slash (/) or backslash (\) will be used. For example, "C:\Program Files\directory1\file.txt" will be interpreted as "file.txt". If no file or file name is provided, the variable is replaced with an empty string.

Field Name	Description	Required
AWSAccessKeyId	The AWS Access Key ID of the owner of the bucket who grants an anonymous user access for a request that satisfies the set of constraints in the policy. This field is required if the request includes a policy document.	Conditional
acl	An Amazon S3 access control list (ACL). If an invalid access control list is specified, an error is generated. For more information on ACLs, see <a href="#">Access Control Lists (p. 8)</a> .  Type: String  Default: private  Valid Values: private   public-read   public-read-write   aws-exec-read   authenticated-read   bucket-owner-read   bucket-owner-full-control	No
Cache-Control, Content-Type, Content-Disposition, Content-Encoding, Expires	REST-specific headers. For more information, see <a href="#">PUT Object</a> .	No
key	The name of the uploaded key.  To use the filename provided by the user, use the \${filename} variable. For example, if user Betty uploads the file lolcatz.jpg and you specify /user/betty/\${filename}, the file is stored as /user/betty/lolcatz.jpg.  For more information, see <a href="#">Object Key and Metadata (p. 107)</a> .	Yes
policy	Security policy describing what is permitted in the request. Requests without a security policy are considered anonymous and will succeed only on publicly writable buckets.	No
success_action_redirect, redirect	The URL to which the client is redirected upon successful upload. Amazon S3 appends the	No

Field Name	Description	Required
	<p>bucket, key, and etag values as query string parameters to the URL.</p> <p>If success_action_redirect is not specified, Amazon S3 returns the empty document type specified in the success_action_status field.</p> <p>If Amazon S3 cannot interpret the URL, it ignores the field.</p> <p>If the upload fails, Amazon S3 displays an error and does not redirect the user to a URL.</p> <p>For more information, see <a href="#">Redirection (p. 642)</a>.</p> <p><b>Note</b> The redirect field name is deprecated and support for the redirect field name will be removed in the future.</p>	
success_action_status	<p>The status code returned to the client upon successful upload if success_action_redirect is not specified.</p> <p>Valid values are 200, 201, or 204 (default).</p> <p>If the value is set to 200 or 204, Amazon S3 returns an empty document with a 200 or 204 status code.</p> <p>If the value is set to 201, Amazon S3 returns an XML document with a 201 status code. For information about the content of the XML document, see <a href="#">POST Object</a>.</p> <p>If the value is not set or if it is set to an invalid value, Amazon S3 returns an empty document with a 204 status code.</p> <p><b>Note</b> Some versions of the Adobe Flash player do not properly handle HTTP responses with an empty body. To support uploads through Adobe Flash, we recommend setting success_action_status to 201.</p>	No
signature	<p>The HMAC signature constructed by using the secret access key that corresponds to the provided AWSAccessKeyId. This field is required if a policy document is included with the request.</p> <p>For more information, see <a href="#">Using Auth Access</a> .</p>	Conditional

Field Name	Description	Required
x-amz-security-token	<p>A security token used by Amazon DevPay and session credentials</p> <p>If the request is using Amazon DevPay then it requires two x-amz-security-token form fields: one for the product token and one for the user token. For more information, go to <a href="#">Using DevPay</a>.</p> <p>If the request is using session credentials, then it requires one x-amz-security-token form. For more information, see <a href="#">Temporary Security Credentials</a> in the <i>IAM User Guide</i>.</p>	No
Other field names prefixed with x-amz-meta-	<p>User-specified metadata.</p> <p>Amazon S3 does not validate or use this data.</p> <p>For more information, see <a href="#">PUT Object</a>.</p>	No
file	<p>File or text content.</p> <p>The file or content must be the last field in the form. Any fields below it are ignored.</p> <p>You cannot upload more than one file at a time.</p>	Yes

## Policy Construction

### Topics

- [Expiration \(p. 640\)](#)
- [Conditions \(p. 640\)](#)
- [Condition Matching \(p. 641\)](#)
- [Character Escaping \(p. 642\)](#)

The policy is a UTF-8 and Base64-encoded JSON document that specifies conditions that the request must meet and is used to authenticate the content. Depending on how you design your policy documents, you can use them per upload, per user, for all uploads, or according to other designs that meet your needs.

### Note

Although the policy document is optional, we highly recommend it over making a bucket publicly writable.

The following is an example of a policy document:

```
{
  "expiration": "2007-12-01T12:00:00.000Z",
  "conditions": [
    {"acl": "public-read"},
    {"bucket": "johnsmith"},
    ["starts-with", "$key", "user/eric/"],
  ]
}
```

```
        ]  
    }
```

The policy document contains the expiration and conditions.

### Expiration

The expiration element specifies the expiration date of the policy in ISO 8601 UTC date format. For example, "2007-12-01T12:00:00.000Z" specifies that the policy is not valid after midnight UTC on 2007-12-01. Expiration is required in a policy.

### Conditions

The conditions in the policy document validate the contents of the uploaded object. Each form field that you specify in the form (except AWSAccessKeyId, signature, file, policy, and field names that have an x-ignore- prefix) must be included in the list of conditions.

#### Note

If you have multiple fields with the same name, the values must be separated by commas. For example, if you have two fields named "x-amz-meta-tag" and the first one has a value of "Ninja" and second has a value of "Stallman", you would set the policy document to Ninja, Stallman. All variables within the form are expanded before the policy is validated. Therefore, all condition matching should be performed against the expanded fields. For example, if you set the key field to user/betty/\${filename}, your policy might be [ "starts-with", "\$key", "user/betty/" ]. Do not enter [ "starts-with", "\$key", "user/betty/\${filename}" ]. For more information, see [Condition Matching \(p. 641\)](#).

The following table describes policy document conditions.

Element Name	Description
acl	Specifies conditions that the ACL must meet. Supports exact matching and starts-with.
content-length-range	Specifies the minimum and maximum allowable size for the uploaded content. Supports range matching.
Cache-Control, Content-Type, Content-Disposition, Content-Encoding, Expires	REST-specific headers. Supports exact matching and starts-with.
key	The name of the uploaded key. Supports exact matching and starts-with.
success_action_redirect, redirect	The URL to which the client is redirected upon successful upload. Supports exact matching and starts-with.
success_action_status	The status code returned to the client upon successful upload if success_action_redirect is not specified. Supports exact matching.
x-amz-security-token	Amazon DevPay security token.

Element Name	Description
	<p>Each request that uses Amazon DevPay requires two <code>x-amz-security-token</code> form fields: one for the product token and one for the user token. As a result, the values must be separated by commas. For example, if the user token is <code>eW91dHVIZQ==</code> and the product token is <code>b0hnNVNKVVJIQTA=</code>, you set the policy entry to: { "x-amz-security-token": "eW91dHVIZQ==,b0hnNVNKVVJIQTA=" }.</p> <p>For more information about Amazon DevPay, see <a href="#">Using DevPay</a>.</p>
Other field names prefixed with <code>x-amz-meta-</code>	<p>User-specified metadata.</p> <p>Supports exact matching and <code>starts-with</code>.</p>

#### Note

If your toolkit adds additional fields (e.g., Flash adds filename), you must add them to the policy document. If you can control this functionality, prefix `x-ignore-` to the field so Amazon S3 ignores the feature and it won't affect future versions of this feature.

#### Condition Matching

The following table describes condition matching types. Although you must specify one condition for each form field that you specify in the form, you can create more complex matching criteria by specifying multiple conditions for a form field.

Condition	Description
Exact Matches	<p>Exact matches verify that fields match specific values. This example indicates that the ACL must be set to public-read:</p> <pre>{ "acl": "public-read" }</pre> <p>This example is an alternate way to indicate that the ACL must be set to public-read:</p> <pre>[ "eq", "\$acl", "public-read" ]</pre>
Starts With	<p>If the value must start with a certain value, use <code>starts-with</code>. This example indicates that the key must start with <code>user/betty</code>:</p> <pre>[ "starts-with", "\$key", "user/betty/" ]</pre>
Matching Any Content	<p>To configure the policy to allow any content within a field, use <code>starts-with</code> with an empty value. This example allows any <code>success_action_redirect</code>:</p> <pre>[ "starts-with", "\$success_action_redirect", "" ]</pre>
Specifying Ranges	<p>For fields that accept ranges, separate the upper and lower ranges with a comma. This example allows a file size from 1 to 10 megabytes:</p> <pre>[ "content-length-range", 1048579, 10485760 ]</pre>

## Character Escaping

The following table describes characters that must be escaped within a policy document.

Escape Sequence	Description
\\	Backslash
\\$	Dollar sign
\b	Backspace
\f	Form feed
\n	New line
\r	Carriage return
\t	Horizontal tab
\v	Vertical tab
\uXXXX	All Unicode characters

## Constructing a Signature

Step	Description
1	Encode the policy by using UTF-8.
2	Encode those UTF-8 bytes by using Base64.
3	Sign the policy with your secret access key by using HMAC SHA-1.
4	Encode the SHA-1 signature by using Base64.

For general information about authentication, see [Using Auth Access](#).

## Redirection

This section describes how to handle redirects.

### General Redirection

On completion of the POST request, the user is redirected to the location that you specified in the `success_action_redirect` field. If Amazon S3 cannot interpret the URL, it ignores the `success_action_redirect` field.

If `success_action_redirect` is not specified, Amazon S3 returns the empty document type specified in the `success_action_status` field.

If the POST request fails, Amazon S3 displays an error and does not provide a redirect.

### Pre-Upload Redirection

If your bucket was created using `<CreateBucketConfiguration>`, your end users might require a redirect. If this occurs, some browsers might handle the redirect incorrectly. This is relatively rare but is most likely to occur right after a bucket is created.

## Upload Examples (AWS Signature Version 2)

### Topics

- [File Upload \(p. 643\)](#)
- [Text Area Upload \(p. 645\)](#)

### Note

The request authentication discussed in this section is based on AWS Signature Version 2, a protocol for authenticating inbound API requests to AWS services.

Amazon S3 now supports Signature Version 4, a protocol for authenticating inbound API requests to AWS services, in all AWS regions. At this time, AWS regions created before January 30, 2014 will continue to support the previous protocol, Signature Version 2. Any new regions after January 30, 2014 will support only Signature Version 4 and therefore all requests to those regions must be made with Signature Version 4. For more information, see [Examples: Browser-Based Upload using HTTP POST \(Using AWS Signature Version 4\)](#) in the *Amazon Simple Storage Service API Reference*.

## File Upload

This example shows the complete process for constructing a policy and form that can be used to upload a file attachment.

### Policy and Form Construction

The following policy supports uploads to Amazon S3 for the johnsmith bucket.

```
{ "expiration": "2007-12-01T12:00:00.000Z",
  "conditions": [
    {"bucket": "johnsmith"},
    ["starts-with", "$key", "user/eric/"],
    {"acl": "public-read"},
    {"success_action_redirect": "http://johnsmith.s3.amazonaws.com/
successful_upload.html"},
    ["starts-with", "$Content-Type", "image/"],
    {"x-amz-meta-uuid": "14365123651274"},
    ["starts-with", "$x-amz-meta-tag", ""]
  ]
}
```

This policy requires the following:

- The upload must occur before 12:00 UTC on December 1, 2007.
- The content must be uploaded to the johnsmith bucket.
- The key must start with "user/eric/".
- The ACL is set to public-read.
- The success\_action\_redirect is set to [http://johnsmith.s3.amazonaws.com/successful\\_upload.html](http://johnsmith.s3.amazonaws.com/successful_upload.html).
- The object is an image file.
- The x-amz-meta-uuid tag must be set to 14365123651274.
- The x-amz-meta-tag can contain any value.

The following is a Base64-encoded version of this policy.

```
eyAizXhwaxJhdGlvbIi6IClEyMDA3LTEyLTAxVDEyOjAwOjAwLjAwMFOiLAogICJjb25kaXRpb25zIjogWwogICAgeyJidWNrZXQioiA
```

Using your credentials create a signature, for example 0RavWzkygo6QX9caELEqKi9kDbU= is the signature for the preceding policy document.

The following form supports a POST request to the johnsmith.net bucket that uses this policy.

```
<html>
<head>
  ...
  <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
  ...
</head>
<body>
  ...
<form action="http://johnsmith.s3.amazonaws.com/" method="post" enctype="multipart/form-data">
  Key to upload: <input type="input" name="key" value="user/eric/" /><br />
  <input type="hidden" name="acl" value="public-read" />
  <input type="hidden" name="success_action_redirect" value="http://
johnsmith.s3.amazonaws.com/successful_upload.html" />
  Content-Type: <input type="input" name="Content-Type" value="image/jpeg" /><br />
  <input type="hidden" name="x-amz-meta-uuid" value="14365123651274" />
  Tags for File: <input type="input" name="x-amz-meta-tag" value="" /><br />
  <input type="hidden" name="AWSAccessKeyId" value="AKIAIOSFODNN7EXAMPLE" />
  <input type="hidden" name="Policy" value="POLICY" />
  <input type="hidden" name="Signature" value="SIGNATURE" />
  File: <input type="file" name="file" /> <br />
  <!-- The elements after this will be ignored -->
  <input type="submit" name="submit" value="Upload to Amazon S3" />
</form>
  ...
</html>
```

## Sample Request

This request assumes that the image uploaded is 117,108 bytes; the image data is not included.

```
POST / HTTP/1.1
Host: johnsmith.s3.amazonaws.com
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.8.1.10) Gecko/20071115
  Firefox/2.0.0.10
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/
plain;q=0.8,image/png,*/*;q=0.5
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip,deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Content-Type: multipart/form-data; boundary=9431149156168
Content-Length: 118698

--9431149156168
Content-Disposition: form-data; name="key"

user/eric/MyPicture.jpg
--9431149156168
Content-Disposition: form-data; name="acl"

public-read
--9431149156168
Content-Disposition: form-data; name="success_action_redirect"

http://johnsmith.s3.amazonaws.com/successful_upload.html
--9431149156168
```

```
Content-Disposition: form-data; name="Content-Type"  
  
image/jpeg  
--9431149156168  
Content-Disposition: form-data; name="x-amz-meta-uuid"  
  
14365123651274  
--9431149156168  
Content-Disposition: form-data; name="x-amz-meta-tag"  
  
Some,Tag,For,Picture  
--9431149156168  
Content-Disposition: form-data; name="AWSAccessKeyId"  
  
AKIAIOSFODNN7EXAMPLE  
--9431149156168  
Content-Disposition: form-data; name="Policy"  
  
eyAiZXhwaXJhdGlvbiI6IClEyMDA3LTEyLTAxVDEyOjAwOjAwLjAwMFOiLAogICJjb25kaXRpb25zIjogWwogICAgeyJidWNrZXQiOiA  
--9431149156168  
Content-Disposition: form-data; name="Signature"  
  
0RavWzkygo6QX9caELEqKi9kDbU=  
--9431149156168  
Content-Disposition: form-data; name="file"; filename="MyFilename.jpg"  
Content-Type: image/jpeg  
  
. . . file content...  
--9431149156168  
Content-Disposition: form-data; name="submit"  
  
Upload to Amazon S3  
--9431149156168--
```

## Sample Response

```
HTTP/1.1 303 Redirect  
x-amz-request-id: 1AEE782442F35865  
x-amz-id-2: cxzFLJRatFH+NGtaDFRR8YvI9BHmgLxjvJzNiGGICARZ/mVXHj7T+qQKhdpzHFh  
Content-Type: application/xml  
Date: Wed, 14 Nov 2007 21:21:33 GMT  
Connection: close  
Location: http://johnsmith.s3.amazonaws.com/successful_upload.html?  
bucket=johnsmith&key=user/eric/  
MyPicture.jpg&etag="39d459dfbc0faabbb5e179358dfb94c3"  
Server: AmazonS3
```

## Text Area Upload

### Topics

- [Policy and Form Construction \(p. 645\)](#)
- [Sample Request \(p. 647\)](#)
- [Sample Response \(p. 648\)](#)

The following example shows the complete process for constructing a policy and form to upload a text area. Uploading a text area is useful for submitting user-created content, such as blog postings.

### Policy and Form Construction

The following policy supports text area uploads to Amazon S3 for the johnsmith bucket.

```
{ "expiration": "2007-12-01T12:00:00.000Z",
  "conditions": [
    {"bucket": "johnsmith"},
    ["starts-with", "$key", "user/eric/"],
    {"acl": "public-read"},
    {"success_action_redirect": "http://johnsmith.s3.amazonaws.com/new_post.html"},
    ["eq", "$Content-Type", "text/html"],
    {"x-amz-meta-uuid": "14365123651274"},
    ["starts-with", "$x-amz-meta-tag", ""]
  ]
}
```

This policy requires the following:

- The upload must occur before 12:00 GMT on 2007-12-01.
- The content must be uploaded to the johnsmith bucket.
- The key must start with "user/eric/".
- The ACL is set to public-read.
- The success\_action\_redirect is set to [http://johnsmith.s3.amazonaws.com/new\\_post.html](http://johnsmith.s3.amazonaws.com/new_post.html).
- The object is HTML text.
- The x-amz-meta-uuid tag must be set to 14365123651274.
- The x-amz-meta-tag can contain any value.

Following is a Base64-encoded version of this policy.

```
eyAiZXhwaXJhdGvbIi6ICiYMDA3LTEyLTAxVDEyOjAwOjAwMfoiLAogICJjb25kaXRpb25zIjogWwogICAgeyJidWNrZXQiOiAiam9obnNtaXRoIn0scCiAgICBbInN0YXJ0cy13aXRoIiwgIiRrZXkilCAidXNlci9lcmljLyIAogICAgeyJhY2wiOiAicHVibGljLXJ1YWQifSwKICAgIHsic3VjY2Vzc19hY3Rpb25fcmlVkaXJ1Y3QiOiaHR0cDovL2pvaG5zbWLc5zM5hbWF6b25hd3MuY29tL251d19wb3N0Lmh0bWwifSwKICAgIFSizXEiLCaiJENvbnRlbnQtVHlwZSISICJ0ZXh0L2h0bWwiXSwsKCAGIHsieC1hbXotbWV0YS11dWlkIjogIjeOMzy1MTIzNjUxMjc0In0scCiAgICBbInN0YXJ0cy13aXRoIiwgIiR4LWFtei1tzXrhLXRhIsICIixQogIF0KfQo=
```

Using your credentials, create a signature. For example, qA7FWXKq6VvU68lI9KdveT1cWgF= is the signature for the preceding policy document.

The following form supports a POST request to the johnsmith.net bucket that uses this policy.

```
<html>
  <head>
    ...
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    ...
  </head>
  <body>
    ...
    <form action="http://johnsmith.s3.amazonaws.com/" method="post" enctype="multipart/form-data">
      Key to upload: <input type="input" name="key" value="user/eric/" /><br />
      <input type="hidden" name="acl" value="public-read" />
      <input type="hidden" name="success_action_redirect" value="http://johnsmith.s3.amazonaws.com/new_post.html" />
      <input type="hidden" name="Content-Type" value="text/html" />
      <input type="hidden" name="x-amz-meta-uuid" value="14365123651274" />
      Tags for File: <input type="input" name="x-amz-meta-tag" value="" /><br />
      <input type="hidden" name="AWSAccessKeyId" value="AKIAIOSFODNN7EXAMPLE" />
      <input type="hidden" name="Policy" value="POLICY" />
      <input type="hidden" name="Signature" value="SIGNATURE" />
      Entry: <textarea name="file" cols="60" rows="10">
```

```
Your blog post goes here.
```

```
</textarea><br />
<!-- The elements after this will be ignored -->
<input type="submit" name="submit" value="Upload to Amazon S3" />
</form>
...
</html>
```

## Sample Request

This request assumes that the image uploaded is 117,108 bytes; the image data is not included.

```
POST / HTTP/1.1
Host: johnsmith.s3.amazonaws.com
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.8.1.10) Gecko/20071115
    Firefox/2.0.0.10
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/
plain;q=0.8,image/png,*/*;q=0.5
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip,deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Content-Type: multipart/form-data; boundary=178521717625888
Content-Length: 118635

-178521717625888
Content-Disposition: form-data; name="key"

ser/eric/NewEntry.html
--178521717625888
Content-Disposition: form-data; name="acl"

public-read
--178521717625888
Content-Disposition: form-data; name="success_action_redirect"

http://johnsmith.s3.amazonaws.com/new_post.html
--178521717625888
Content-Disposition: form-data; name="Content-Type"

text/html
--178521717625888
Content-Disposition: form-data; name="x-amz-meta-uuid"

14365123651274
--178521717625888
Content-Disposition: form-data; name="x-amz-meta-tag"

Interesting Post
--178521717625888
Content-Disposition: form-data; name="AWSAccessKeyId"

AKIAIOSFODNN7EXAMPLE
--178521717625888
Content-Disposition: form-data; name="Policy"
eyAIZXhwaXJhdGlvbiI6IClEyMDA3LTEyLTAxVDEyOjAwOjAwLjAwMFOiLAogICJjb25kaXRpb25zIjogWwogICAgeyJidWNrZXQioiA

--178521717625888
Content-Disposition: form-data; name="Signature"

qA7FWXKq6VvU68lI9KdveT1cWgF=
```

```
--178521717625888
Content-Disposition: form-data; name="file"

...content goes here...
--178521717625888
Content-Disposition: form-data; name="submit"

Upload to Amazon S3
--178521717625888--
```

## Sample Response

```
HTTP/1.1 303 Redirect
x-amz-request-id: 1AEE782442F35865
x-amz-id-2: cxzFLJRatFHy+NGtaDFRR8YvI9BHmgLxjvJzNiGGICARZ/mVXHj7T+qQKhdpzHFh
Content-Type: application/xml
Date: Wed, 14 Nov 2007 21:21:33 GMT
Connection: close
Location: http://johnsmith.s3.amazonaws.com/new_post.html?bucket=johnsmith&key=user/eric/
NewEntry.html&etag=40c3271af26b7f1672e41b8a274d28d4
Server: AmazonS3
```

## POST with Adobe Flash

This section describes how to use POST with Adobe Flash.

### Adobe Flash Player Security

By default, the Adobe Flash Player security model prohibits Adobe Flash Players from making network connections to servers outside the domain that serves the SWF file.

To override the default, you must upload a publicly readable crossdomain.xml file to the bucket that will accept POST uploads. The following is a sample crossdomain.xml file.

```
<?xml version="1.0"?>
<!DOCTYPE cross-domain-policy SYSTEM
"http://www.macromedia.com/xml/dtds/cross-domain-policy.dtd">
<cross-domain-policy>
<allow-access-from domain="*" secure="false" />
</cross-domain-policy>
```

#### Note

For more information about the Adobe Flash security model, go to the Adobe website. Adding the crossdomain.xml file to your bucket allows any Adobe Flash Player to connect to the crossdomain.xml file within your bucket; however, it does not grant access to the actual Amazon S3 bucket.

### Adobe Flash Considerations

The FileReference API in Adobe Flash adds the `Filename` form field to the POST request. When you build Adobe Flash applications that upload to Amazon S3 by using the FileReference API action, include the following condition in your policy:

```
[ 'starts-with', '$Filename', '' ]
```

Some versions of the Adobe Flash Player do not properly handle HTTP responses that have an empty body. To configure POST to return a response that does not have an empty body, set `success_action_status` to 201. Amazon S3 will then return an XML document with a 201 status

code. For information about the content of the XML document, see [POST Object](#). For information about form fields, see [HTML Form Fields \(p. 637\)](#).

# Amazon S3 Resources

Following is a table that lists related resources that you'll find useful as you work with this service.

Resource	Description
<a href="#">Amazon Simple Storage Service Getting Started Guide</a>	The Getting Started Guide provides a quick tutorial of the service based on a simple use case.
<a href="#">Amazon Simple Storage Service API Reference</a>	The API Reference describes Amazon S3 operations in detail.
<a href="#">Amazon S3Technical FAQ</a>	The FAQ covers the top questions developers have asked about this product.
<a href="#">AWS Developer Resource Center</a>	A central starting point to find documentation, code samples, release notes, and other information to help you build innovative applications with AWS.
<a href="#">AWS Management Console</a>	The console allows you to perform most of the functions of Amazon S3without programming.
<a href="https://forums.aws.amazon.com/">https://forums.aws.amazon.com/</a>	A community-based forum for developers to discuss technical questions related to AWS.
<a href="#">AWS Support Center</a>	The home page for AWS Technical Support, including access to our Developer Forums, Technical FAQs, Service Status page, and Premium Support.
<a href="#">AWS Premium Support</a>	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.
<a href="#">Amazon S3 product information</a>	The primary web page for information about Amazon S3.
<a href="#">Contact Us</a>	A central contact point for inquiries concerning AWS billing, account, events, abuse etc.
<a href="#">Conditions of Use</a>	Detailed information about the copyright and trademark usage at Amazon.com and other topics.

# Document History

The following table describes the important changes since the last release of the *Amazon Simple Storage Service Developer Guide*.

## Relevant Dates to this History:

- **Current product version:** 2006-03-01
- **Last documentation update:** November 17, 2017

Change	Description	Date
Support for ORC-formatted Amazon S3 inventory files	Amazon S3 now supports the <a href="#">Apache optimized row columnar (ORC)</a> format in addition to comma-separated values (CSV) file format for inventory output files. Also, you can now query Amazon S3 inventory using standard SQL by using Amazon Athena, Amazon Redshift Spectrum, and other tools such as <a href="#">Presto</a> , <a href="#">Apache Hive</a> , and <a href="#">Apache Spark</a> . For more information, see <a href="#">Amazon S3 Inventory (p. 287)</a> .	In this release
Default encryption for S3 buckets	Amazon S3 default encryption provides a way to set the default encryption behavior for an S3 bucket. You can set default encryption on a bucket so that all objects are encrypted when they are stored in the bucket. The objects are encrypted using server-side encryption with either Amazon S3-managed keys (SSE-S3) or AWS KMS-managed keys (SSE-KMS). For more information, see <a href="#">Amazon S3 Default Encryption for S3 Buckets (p. 71)</a> .	November 06, 2017
Encryption status in Amazon S3 inventory	Amazon S3 now supports including encryption status in Amazon S3 inventory so you can see how your objects are encrypted at rest for compliance auditing or other purposes. You can also configure to encrypt S3 inventory with server-side encryption (SSE) or SSE-KMS so that all inventory files are encrypted accordingly. For more information, see <a href="#">Amazon S3 Inventory (p. 287)</a> .	November 06, 2017
Cross-region replication (CRR) enhancements	Cross-region replication now supports the following: <ul style="list-style-type: none"> <li>• In a cross-account scenario, you can add a CRR configuration to change replica ownership to the AWS account that</li> </ul>	November 06, 2017

Change	Description	Date
	<p>owns the destination bucket. For more information, see <a href="#">Cross-Region Replication Additional Configuration: Change Replica Owner (p. 529)</a>.</p> <ul style="list-style-type: none"> <li>By default, Amazon S3 does not replicate objects in your source bucket that are created using server-side encryption using AWS KMS-managed keys. In your CRR configuration, you can now direct Amazon S3 to replicate these objects. For more information, see <a href="#">CRR Additional Configuration: Replicating Objects Created with Server-Side Encryption (SSE) Using AWS KMS-Managed Encryption Keys (p. 531)</a>.</li> </ul>	
EU (London) Region	Amazon S3 is now available in the EU (London) Region. For more information about Amazon S3 regions and endpoints, see <a href="#">Regions and Endpoints</a> in the <i>AWS General Reference</i> .	December 13, 2016
Canada (Central) Region	Amazon S3 is now available in the Canada (Central) Region. For more information about Amazon S3 regions and endpoints, see <a href="#">Regions and Endpoints</a> in the <i>AWS General Reference</i> .	December 8, 2016
Object tagging	<p>Amazon S3 now supports object tagging. Object tagging enables you to categorize storage. Object key name prefixes also enable you to categorize storage, object tagging adds another dimension to it.</p> <p>There are added benefits tagging offers. These include:</p> <ul style="list-style-type: none"> <li>Object tags enable fine-grained access control of permissions (for example, you could grant an IAM user permissions to read-only objects with specific tags).</li> <li>Fine-grained control in specifying lifecycle configuration. You can specify tags to select a subset of objects to which lifecycle rule applies.</li> <li>If you have cross-region replication (CRR) configured, Amazon S3 can replicate the tags. You must grant necessary permission to the IAM role created for Amazon S3 to assume to replicate objects on your behalf.</li> <li>You can also customize CloudWatch metrics and CloudTrail events to display information by specific tag filters.</li> </ul> <p>For more information, see <a href="#">Object Tagging (p. 116)</a>.</p>	November 29, 2016
S3 lifecycle now support tag based filter	Amazon S3 now supports tag based filtering in lifecycle configuration. You can now specify lifecycle rule in which you can specify a key prefix, one or more object tags, or combination of both to select a subset of objects to which the lifecycle rule applies. For more information, see <a href="#">Object Lifecycle Management (p. 125)</a> .	November 29, 2016
CloudWatch request metrics for buckets	Amazon S3 now supports CloudWatch metrics for requests made on buckets. When you enable these metrics for a bucket, the metrics report at 1 minute intervals. You can also configure which objects in a bucket will report these request metrics. For more information, see <a href="#">Monitoring Metrics with Amazon CloudWatch (p. 567)</a> .	November 29, 2016

Change	Description	Date
Amazon S3 Inventory	<p>Amazon S3 now supports storage inventory. Amazon S3 inventory provides a flat-file output of your objects and their corresponding metadata on a daily or weekly basis for an S3 bucket or a shared prefix (that is, objects that have names that begin with a common string).</p> <p>For more information, see <a href="#">Amazon S3 Inventory (p. 287)</a>.</p>	November 29, 2016
Amazon S3 Analytics – Storage Class Analysis	<p>The new Amazon S3 analytics – storage class analysis feature observes data access patterns to help you determine when to transition less frequently accessed STANDARD storage to the STANDARD_IA (IA, for infrequent access) storage class. After storage class analysis observes the infrequent access patterns of a filtered set of data over a period of time, you can use the analysis results to help you improve your lifecycle policies. This feature also includes a detailed daily analysis of your storage usage at the specified bucket, prefix, or tag level that you can export to a S3 bucket.</p> <p>For more information, see <a href="#">Amazon S3 Analytics – Storage Class Analysis (p. 281)</a> in the <i>Amazon Simple Storage Service Developer Guide</i>.</p>	November 29, 2016
New Expedited and Bulk data retrievals when restoring archived objects from Amazon Glacier	<p>Amazon S3 now supports Expedited and Bulk data retrievals in addition to Standard retrievals when restoring objects archived to Amazon Glacier. For more information, see <a href="#">Restoring Archived Objects (p. 275)</a>.</p>	November 21, 2016
CloudTrail object logging	<p>CloudTrail supports logging Amazon S3 object level API operations such as GetObject, PutObject, and DeleteObject. You can configure your event selectors to log object level API operations. For more information, see <a href="#">Logging Amazon S3 API Calls By Using AWS CloudTrail (p. 574)</a>.</p>	November 21, 2016
US East (Ohio) Region	<p>Amazon S3 is now available in the US East (Ohio) Region. For more information about Amazon S3 regions and endpoints, see <a href="#">Regions and Endpoints</a> in the <i>AWS General Reference</i>.</p>	October 17, 2016
IPv6 support for Amazon S3 Transfer Acceleration	<p>Amazon S3 now supports Internet Protocol version 6 (IPv6) for Amazon S3 Transfer Acceleration. You can connect to Amazon S3 over IPv6 by using the new dual-stack for Transfer Acceleration endpoint. For more information, see <a href="#">Getting Started with Amazon S3 Transfer Acceleration (p. 82)</a>.</p>	October 6, 2016
IPv6 support	<p>Amazon S3 now supports Internet Protocol version 6 (IPv6). You can access Amazon S3 over IPv6 by using dual-stack endpoints. For more information, see <a href="#">Making Requests to Amazon S3 over IPv6 (p. 13)</a>.</p>	August 11, 2016
Asia Pacific (Mumbai) Region	<p>Amazon S3 is now available in the Asia Pacific (Mumbai) Region. For more information about Amazon S3 regions and endpoints, see <a href="#">Regions and Endpoints</a> in the <i>AWS General Reference</i>.</p>	June 27, 2016

Change	Description	Date
Amazon S3 Transfer Acceleration	<p>Amazon S3 Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your client and an S3 bucket. Transfer Acceleration takes advantage of Amazon CloudFront's globally distributed edge locations.</p> <p>For more information, see <a href="#">Amazon S3 Transfer Acceleration (p. 81)</a>.</p>	April 19, 2016
Lifecycle support to remove expired object delete markers	<p>Lifecycle configuration <code>Expiration</code> action now allows you to direct Amazon S3 to remove expired object delete markers in a versioned bucket. For more information, see <a href="#">Elements to Describe Lifecycle Actions (p. 134)</a>.</p>	March 16, 2016
Bucket lifecycle configuration now supports action to abort incomplete multipart uploads	<p>Bucket lifecycle configuration now supports the <code>AbortIncompleteMultipartUpload</code> action that you can use to direct Amazon S3 to abort multipart uploads that don't complete within a specified number of days after being initiated. When a multipart upload becomes eligible for an abort operation, Amazon S3 deletes any uploaded parts and aborts the multipart upload.</p> <p>For conceptual information, see the following topics in the <i>Amazon Simple Storage Service Developer Guide</i>:</p> <ul style="list-style-type: none"> <li>• <a href="#">Aborting Incomplete Multipart Uploads Using a Bucket Lifecycle Policy (p. 189)</a></li> <li>• <a href="#">Elements to Describe Lifecycle Actions (p. 134)</a></li> </ul> <p>The following API operations have been updated to support the new action:</p> <ul style="list-style-type: none"> <li>• <a href="#">PUT Bucket lifecycle</a> – The XML configuration now allows you to specify the <code>AbortIncompleteMultipartUpload</code> action in a lifecycle configuration rule.</li> <li>• <a href="#">List Parts</a> and <a href="#">Initiate Multipart Upload</a> – Both of these API operations now return two additional response headers (<code>x-amz-abort-date</code>, and <code>x-amz-abort-rule-id</code>) if the bucket has a lifecycle rule that specifies the <code>AbortIncompleteMultipartUpload</code> action. These headers in the response indicate when the initiated multipart upload will become eligible for abort operation and which lifecycle rule is applicable.</li> </ul>	March 16, 2016
Asia Pacific (Seoul) region	<p>Amazon S3 is now available in the Asia Pacific (Seoul) region. For more information about Amazon S3 regions and endpoints, see <a href="#">Regions and Endpoints</a> in the <i>AWS General Reference</i>.</p>	January 6, 2016
New condition key and a Multipart Upload change	<p>IAM policies now support an Amazon S3 <code>s3:x-amz-storage-class</code> condition key. For more information, see <a href="#">Specifying Conditions in a Policy (p. 343)</a>.</p> <p>You no longer need to be the initiator of a multipart upload to upload parts and complete the upload. For more information, see <a href="#">Multipart Upload API and Permissions (p. 191)</a>.</p>	December 14, 2015

Change	Description	Date
Renamed the US Standard region	Changed the region name string from "US Standard" to "US East (N. Virginia)." This is only a region name update, there is no change in the functionality.	December 11, 2015
New storage class	<p>Amazon S3 now offers a new storage class, STANDARD_IA (IA, for infrequent access) for storing objects. This storage class is optimized for long-lived and less frequently accessed data. For more information, see <a href="#">Storage Classes (p. 111)</a>.</p> <p>Lifecycle configuration feature updates now allow you to transition objects to the STANDARD_IA storage class. For more information, see <a href="#">Object Lifecycle Management (p. 125)</a>.</p> <p>Previously, the cross-region replication feature used the storage class of the source object for object replicas. Now, when you configure cross-region replication you can specify a storage class for the object replica created in the destination bucket. For more information, see <a href="#">Cross-Region Replication (CRR) (p. 519)</a>.</p>	September 16, 2015
AWS CloudTrail integration	New AWS CloudTrail integration allows you to record Amazon S3 API activity in your S3 bucket. You can use CloudTrail to track S3 bucket creations or deletions, access control modifications, or lifecycle policy changes. For more information, see <a href="#">Logging Amazon S3 API Calls By Using AWS CloudTrail (p. 574)</a> .	September 1, 2015
Bucket limit increase	Amazon S3 now supports bucket limit increases. By default, customers can create up to 100 buckets in their AWS account. Customers who need additional buckets can increase that limit by submitting a service limit increase. For information about how to increase your bucket limit, go to <a href="#">AWS Service Limits</a> in the <i>AWS General Reference</i> . For more information, see <a href="#">Creating a Bucket (p. 59)</a> and <a href="#">Bucket Restrictions and Limitations (p. 62)</a> .	August 4, 2015
Consistency model update	Amazon S3 now supports read-after-write consistency for new objects added to Amazon S3 in the US East (N. Virginia) region. Prior to this update, all regions except US East (N. Virginia) region supported read-after-write consistency for new objects uploaded to Amazon S3. With this enhancement, Amazon S3 now supports read-after-write consistency in all regions for new objects added to Amazon S3. Read-after-write consistency allows you to retrieve objects immediately after creation in Amazon S3. For more information, see <a href="#">Regions (p. 4)</a> .	August 4, 2015
Event notifications	Amazon S3 event notifications have been updated to add notifications when objects are deleted and to add filtering on object names with prefix and suffix matching. For more information, see <a href="#">Configuring Amazon S3 Event Notifications (p. 500)</a> .	July 28, 2015

Change	Description	Date
Amazon CloudWatch integration	New Amazon CloudWatch integration allows you to monitor and set alarms on your Amazon S3 usage through CloudWatch metrics for Amazon S3. Supported metrics include total bytes for standard storage, total bytes for Reduced-Redundancy storage, and total number of objects for a given S3 bucket. For more information, see <a href="#">Monitoring Metrics with Amazon CloudWatch (p. 567)</a> .	July 28, 2015
Support for deleting and emptying non-empty buckets	Amazon S3 now supports deleting and emptying non-empty buckets. For more information, see <a href="#">Deleting or Emptying a Bucket (p. 67)</a> .	July 16, 2015
Bucket policies for Amazon VPC endpoints	Amazon S3 has added support for bucket policies for Amazon Virtual Private Cloud (Amazon VPC) endpoints. You can use S3 bucket policies to control access to buckets from specific Amazon VPC endpoints, or specific VPCs. VPC endpoints are easy to configure, are highly reliable, and provide a secure connection to Amazon S3 without requiring a gateway or a NAT instance. For more information, see <a href="#">Example Bucket Policies for VPC Endpoints for Amazon S3 (p. 370)</a> .	April 29, 2015
Event notifications	Amazon S3 event notifications have been updated to support the switch to resource-based permissions for AWS Lambda functions. For more information, see <a href="#">Configuring Amazon S3 Event Notifications (p. 500)</a> .	April 9, 2015
Cross-region replication	Amazon S3 now supports cross-region replication. Cross-region replication is the automatic, asynchronous copying of objects across buckets in different AWS regions. For more information, see <a href="#">Cross-Region Replication (CRR) (p. 519)</a> .	March 24, 2015
Event notifications	Amazon S3 now supports new event types and destinations in a bucket notification configuration. Prior to this release, Amazon S3 supported only the <code>s3:ReducedRedundancyLostObject</code> event type and an Amazon SNS topic as the destination. For more information about the new event types, see <a href="#">Configuring Amazon S3 Event Notifications (p. 500)</a> .	November 13, 2014
Server-side encryption with customer-provided encryption keys	<p>Server-side encryption with AWS Key Management Service (AWS KMS)</p> <p>Amazon S3 now supports server-side encryption using AWS Key Management Service. This feature allows you to manage the envelope key through AWS KMS, and Amazon S3 calls AWS KMS to access the envelope key within the permissions you set.</p> <p>For more information about server-side encryption with AWS KMS, see <a href="#">Protecting Data Using Server-Side Encryption with AWS Key Management Service</a>.</p>	November 12, 2014
EU (Frankfurt) region	Amazon S3 is now available in the EU (Frankfurt) region.	October 23, 2014

Change	Description	Date
Server-side encryption with customer-provided encryption keys	<p>Amazon S3 now supports server-side encryption using customer-provided encryption keys (SSE-C). Server-side encryption enables you to request Amazon S3 to encrypt your data at rest. When using SSE-C, Amazon S3 encrypts your objects with the custom encryption keys that you provide. Since Amazon S3 performs the encryption for you, you get the benefits of using your own encryption keys without the cost of writing or executing your own encryption code.</p> <p>For more information about SSE-C, see <a href="#">Server-Side Encryption (Using Customer-Provided Encryption Keys)</a>.</p>	June 12, 2014
Lifecycle support for versioning	<p>Prior to this release, lifecycle configuration was supported only on nonversioned buckets. Now you can configure lifecycle on both nonversioned and versioning-enabled buckets. For more information, see <a href="#">Object Lifecycle Management (p. 125)</a>.</p>	May 20, 2014
Access control topics revised	<p>Revised Amazon S3 access control documentation. For more information, see <a href="#">Managing Access Permissions to Your Amazon S3 Resources (p. 295)</a>.</p>	April 15, 2014
Server access logging topic revised	<p>Revised server access logging documentation. For more information, see <a href="#">Server Access Logging (p. 596)</a>.</p>	November 26, 2013
.NET SDK samples updated to version 2.0	<p>.NET SDK samples in this guide are now compliant to version 2.0.</p>	November 26, 2013
SOAP Support Over HTTP Deprecated	<p>SOAP support over HTTP is deprecated, but it is still available over HTTPS. New Amazon S3 features will not be supported for SOAP. We recommend that you use either the REST API or the AWS SDKs.</p>	September 20, 2013
IAM policy variable support	<p>The IAM access policy language now supports variables. When a policy is evaluated, any policy variables are replaced with values that are supplied by context-based information from the authenticated user's session. You can use policy variables to define general purpose policies without explicitly listing all the components of the policy. For more information about policy variables, see <a href="#">IAM Policy Variables Overview</a> in the <i>IAM User Guide</i>.</p> <p>For examples of policy variables in Amazon S3, see <a href="#">User Policy Examples (p. 372)</a>.</p>	April 3, 2013
Console support for Requester Pays	<p>You can now configure your bucket for Requester Pays by using the Amazon S3 console. For more information, see <a href="#">Configure Requester Pays by Using the Amazon S3 Console (p. 93)</a>.</p>	December 31, 2012

Change	Description	Date
Root domain support for website hosting	<p>Amazon S3 now supports hosting static websites at the root domain. Visitors to your website can access your site from their browser without specifying "www" in the web address (e.g., "example.com"). Many customers already host static websites on Amazon S3 that are accessible from a "www" subdomain (e.g., "www.example.com"). Previously, to support root domain access, you needed to run your own web server to proxy root domain requests from browsers to your website on Amazon S3. Running a web server to proxy requests introduces additional costs, operational burden, and another potential point of failure. Now, you can take advantage of the high availability and durability of Amazon S3 for both "www" and root domain addresses. For more information, see <a href="#">Hosting a Static Website on Amazon S3 (p. 471)</a>.</p>	December 27, 2012
Console revision	<p>Amazon S3 console has been updated. The documentation topics that refer to the console have been revised accordingly.</p>	December 14, 2012
Support for Archiving Data to Amazon Glacier	<p>Amazon S3 now supports a storage option that enables you to utilize Amazon Glacier's low-cost storage service for data archival. To archive objects, you define archival rules identifying objects and a timeline when you want Amazon S3 to archive these objects to Amazon Glacier. You can easily set the rules on a bucket using the Amazon S3 console or programmatically using the Amazon S3 API or AWS SDKs.</p> <p>For more information, see <a href="#">Object Lifecycle Management (p. 125)</a>.</p>	November 13, 2012
Support for Website Page Redirects	<p>For a bucket that is configured as a website, Amazon S3 now supports redirecting a request for an object to another object in the same bucket or to an external URL. For more information, see <a href="#">(Optional) Configuring a Webpage Redirect (p. 478)</a>.</p> <p>For information about hosting websites, see <a href="#">Hosting a Static Website on Amazon S3 (p. 471)</a>.</p>	October 4, 2012
Support for Cross-Origin Resource Sharing (CORS)	<p>Amazon S3 now supports Cross-Origin Resource Sharing (CORS). CORS defines a way in which client web applications that are loaded in one domain can interact with or access resources in a different domain. With CORS support in Amazon S3, you can build rich client-side web applications on top of Amazon S3 and selectively allow cross-domain access to your Amazon S3 resources. For more information, see <a href="#">Cross-Origin Resource Sharing (CORS) (p. 155)</a>.</p>	August 31, 2012
Support for Cost Allocation Tags	<p>Amazon S3 now supports cost allocation tagging, which allows you to label S3 buckets so you can more easily track their cost against projects or other criteria. For more information about using tagging for buckets, see <a href="#">Using Cost Allocation Tags for S3 Buckets (p. 104)</a>.</p>	August 21, 2012

Change	Description	Date
Support for MFA-protected API access in bucket policies	<p>Amazon S3 now supports MFA-protected API access, a feature that can enforce AWS Multi-Factor Authentication for an extra level of security when accessing your Amazon S3 resources. It is a security feature that requires users to prove physical possession of an MFA device by providing a valid MFA code. For more information, go to <a href="#">AWS Multi-Factor Authentication</a>. You can now require MFA authentication for any requests to access your Amazon S3 resources.</p> <p>To enforce MFA authentication, Amazon S3 now supports the <code>aws:MultiFactorAuthAge</code> key in a bucket policy. For an example bucket policy, see <a href="#">Adding a Bucket Policy to Require MFA (p. 367)</a>.</p>	July 10, 2012
Object Expiration support	You can use Object Expiration to schedule automatic removal of data after a configured time period. You set object expiration by adding lifecycle configuration to a bucket.	27 December 2011
New region supported	Amazon S3 now supports the South America (São Paulo) region. For more information, see <a href="#">Accessing a Bucket (p. 60)</a> .	December 14, 2011
Multi-Object Delete	Amazon S3 now supports Multi-Object Delete API that enables you to delete multiple objects in a single request. With this feature, you can remove large numbers of objects from Amazon S3 more quickly than using multiple individual DELETE requests. For more information, see <a href="#">Deleting Objects (p. 249)</a> .	December 7, 2011
New region supported	Amazon S3 now supports the US West (Oregon) region. For more information, see <a href="#">Buckets and Regions (p. 60)</a> .	November 8, 2011
Documentation Update	Documentation bug fixes.	November 8, 2011
Documentation Update	<p>In addition to documentation bug fixes, this release includes the following enhancements:</p> <ul style="list-style-type: none"> <li>• New server-side encryption sections using the AWS SDK for PHP (see <a href="#">Specifying Server-Side Encryption Using the AWS SDK for PHP (p. 419)</a>) and the AWS SDK for Ruby (see <a href="#">Specifying Server-Side Encryption Using the AWS SDK for Ruby (p. 421)</a>).</li> <li>• New section on creating and testing Ruby samples (see <a href="#">Using the AWS SDK for Ruby - Version 3 (p. 617)</a>).</li> </ul>	October 17, 2011
Server-side encryption support	Amazon S3 now supports server-side encryption. It enables you to request Amazon S3 to encrypt your data at rest, that is, encrypt your object data when Amazon S3 writes your data to disks in its data centers. In addition to REST API updates, the AWS SDK for Java and .NET provide necessary functionality to request server-side encryption. You can also request server-side encryption when uploading objects using AWS Management Console. To learn more about data encryption, go to <a href="#">Using Data Encryption</a> .	October 4, 2011

Change	Description	Date
Documentation Update	<p>In addition to documentation bug fixes, this release includes the following enhancements:</p> <ul style="list-style-type: none"> <li>• Added Ruby and PHP samples to the <a href="#">Making Requests (p. 11)</a> section.</li> <li>• Added sections describing how to generate and use pre-signed URLs. For more information, see <a href="#">Share an Object with Others (p. 176)</a> and <a href="#">Uploading Objects Using Pre-Signed URLs (p. 221)</a>.</li> <li>• Updated an existing section to introduce AWS Explorers for Eclipse and Visual Studio. For more information, see <a href="#">Using the AWS SDKs, CLI, and Explorers (p. 609)</a>.</li> </ul>	September 22, 2011
Support for sending requests using temporary security credentials	<p>In addition to using your AWS account and IAM user security credentials to send authenticated requests to Amazon S3, you can now send requests using temporary security credentials you obtain from AWS Identity and Access Management (IAM). You can use the AWS Security Token Service API or the AWS SDK wrapper libraries to request these temporary credentials from IAM. You can request these temporary security credentials for your own use or hand them out to federated users and applications. This feature enables you to manage your users outside AWS and provide them with temporary security credentials to access your AWS resources.</p> <p>For more information, see <a href="#">Making Requests (p. 11)</a>.</p> <p>For more information about IAM support for temporary security credentials, see <a href="#">Temporary Security Credentials</a> in the <i>IAM User Guide</i>.</p>	August 3, 2011
Multipart Upload API extended to enable copying objects up to 5 TB	<p>Prior to this release, Amazon S3 API supported copying objects of up to 5 GB in size. To enable copying objects larger than 5 GB, Amazon S3 now extends the multipart upload API with a new operation, <code>Upload Part (Copy)</code>. You can use this multipart upload operation to copy objects up to 5 TB in size. For more information, see <a href="#">Copying Objects (p. 227)</a>.</p> <p>For conceptual information about multipart upload API, see <a href="#">Uploading Objects Using Multipart Upload API (p. 187)</a>.</p>	June 21, 2011
SOAP API calls over HTTP disabled	To increase security, SOAP API calls over HTTP are disabled. Authenticated and anonymous SOAP requests must be sent to Amazon S3 using SSL.	June 6, 2011

Change	Description	Date
IAM enables cross-account delegation	<p>Previously, to access an Amazon S3 resource, an IAM user needed permissions from both the parent AWS account and the Amazon S3 resource owner. With cross-account access, the IAM user now only needs permission from the owner account. That is, If a resource owner grants access to an AWS account, the AWS account can now grant its IAM users access to these resources.</p> <p>For more information, see <a href="#">Creating a Role to Delegate Permissions to an IAM User</a> in the <i>IAM User Guide</i>.</p> <p>For more information on specifying principals in a bucket policy, see <a href="#">Specifying a Principal in a Policy (p. 337)</a>.</p>	June 6, 2011
New link	This service's endpoint information is now located in the AWS General Reference. For more information, go to Regions and Endpoints in <a href="#">AWS General Reference</a> .	March 1, 2011
Support for hosting static websites in Amazon S3	Amazon S3 introduces enhanced support for hosting static websites. This includes support for index documents and custom error documents. When using these features, requests to the root of your bucket or a subfolder (e.g., <code>http://mywebsite.com/subfolder</code> ) returns your index document instead of the list of objects in your bucket. If an error is encountered, Amazon S3 returns your custom error message instead of an Amazon S3 error message. For more information, see <a href="#">Hosting a Static Website on Amazon S3 (p. 471)</a> .	February 17, 2011
Response Header API Support	The GET Object REST API now allows you to change the response headers of the REST GET Object request for each request. That is, you can alter object metadata in the response, without altering the object itself. For more information, see <a href="#">Getting Objects (p. 168)</a> .	January 14, 2011
Large object support	Amazon S3 has increased the maximum size of an object you can store in an S3 bucket from 5 GB to 5 TB. If you are using the REST API you can upload objects of up to 5 GB size in a single PUT operation. For larger objects, you must use the Multipart Upload REST API to upload objects in parts. For more information, see <a href="#">Uploading Objects Using Multipart Upload API (p. 187)</a> .	December 9, 2010
Multipart upload	Multipart upload enables faster, more flexible uploads into Amazon S3. It allows you to upload a single object as a set of parts. For more information, see <a href="#">Uploading Objects Using Multipart Upload API (p. 187)</a> .	November 10, 2010
Canonical ID support in bucket policies	You can now specify canonical IDs in bucket policies. For more information, see <a href="#">Access Policy Language Overview (p. 335)</a>	September 17, 2010
Amazon S3 works with IAM	This service now integrates with AWS Identity and Access Management (IAM). For more information, go to <a href="#">AWS Services That Work with IAM</a> in the <i>IAM User Guide</i> .	September 2, 2010

Change	Description	Date
Notifications	The Amazon S3 notifications feature enables you to configure a bucket so that Amazon S3 publishes a message to an Amazon Simple Notification Service (Amazon SNS) topic when Amazon S3 detects a key event on a bucket. For more information, see <a href="#">Setting Up Notification of Bucket Events (p. 500)</a> .	July 14, 2010
Bucket policies	Bucket policies is an access management system you use to set access permissions across buckets, objects, and sets of objects. This functionality supplements and in many cases replaces access control lists. For more information, see <a href="#">Using Bucket Policies and User Policies (p. 335)</a> .	July 6, 2010
Path-style syntax available in all regions	Amazon S3 now supports the path-style syntax for any bucket in the US Classic Region, or if the bucket is in the same region as the endpoint of the request. For more information, see <a href="#">Virtual Hosting (p. 51)</a> .	June 9, 2010
New endpoint for EU (Ireland)	Amazon S3 now provides an endpoint for EU (Ireland): <a href="http://s3-eu-west-1.amazonaws.com">http://s3-eu-west-1.amazonaws.com</a> .	June 9, 2010
Console	You can now use Amazon S3 through the AWS Management Console. You can read about all of the Amazon S3 functionality in the console in the Amazon Simple Storage Service Console User Guide.	June 9, 2010
Reduced Redundancy	Amazon S3 now enables you to reduce your storage costs by storing objects in Amazon S3 with reduced redundancy. For more information, see <a href="#">Reduced Redundancy Storage (p. 6)</a> .	May 12, 2010
New region supported	Amazon S3 now supports the Asia Pacific (Singapore) region. For more information, see <a href="#">Buckets and Regions (p. 60)</a> .	April 28, 2010
Object Versioning	This release introduces object versioning. All objects now can have a key and a version. If you enable versioning for a bucket, Amazon S3 gives all objects added to a bucket a unique version ID. This feature enables you to recover from unintended overwrites and deletions. For more information, see <a href="#">Versioning (p. 8)</a> and <a href="#">Using Versioning (p. 448)</a> .	February 8, 2010
New region supported	Amazon S3 now supports the US West (N. California) region. The new endpoint for requests to this Region is <a href="http://s3-us-west-1.amazonaws.com">s3-us-west-1.amazonaws.com</a> . For more information, see <a href="#">Buckets and Regions (p. 60)</a> .	December 2, 2009
AWS SDK for .NET	AWS now provides libraries, sample code, tutorials, and other resources for software developers who prefer to build applications using .NET language-specific API operations instead of REST or SOAP. These libraries provide basic functions (not included in the REST or SOAP APIs), such as request authentication, request retries, and error handling so that it's easier to get started. For more information about language-specific libraries and resources, see <a href="#">Using the AWS SDKs, CLI, and Explorers (p. 609)</a> .	November 11, 2009

# AWS Glossary

For the latest AWS terminology, see the [AWS Glossary](#) in the *AWS General Reference*.