

## **Amazon Simple Storage Service (S3)**



Welcome to the sixth lesson of the AWS Solutions Architect Associate level course—Amazon Simple Storage Services (S3).

By the end of the lesson you will be able to:

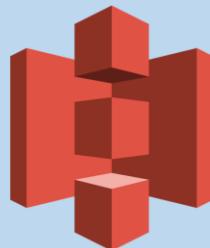
- Explain S3 and its uses
- Describe Amazon S3 bucket
- List all the different storage types available
- Illustrate S3 version control and lifecycle management
- Discuss how S3 integrates with CloudFront and CDNs
- Secure and encrypt your data on S3
- Describe how to get your data in and out of S3
- Outline the AWS recommended best practices for S3
- Identify the costs associated with S3

### **Amazon S3 Overview**

In this section, you will learn about S3 and its benefits.

## Simple Storage Service (S3)

Amazon Simple Storage Service (S3) provides developers and IT teams with secure, durable, and highly-scalable cloud storage.

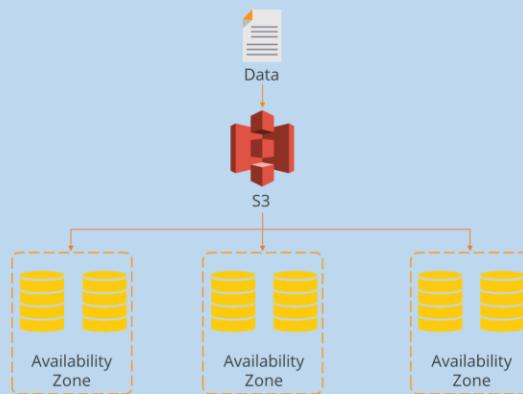


Amazon S3

Amazon Simple Storage Service (S3) provides developers and IT teams with secure, durable, and highly-scalable cloud storage.

## Durable

Amazon S3 provides 11 9's of durability.

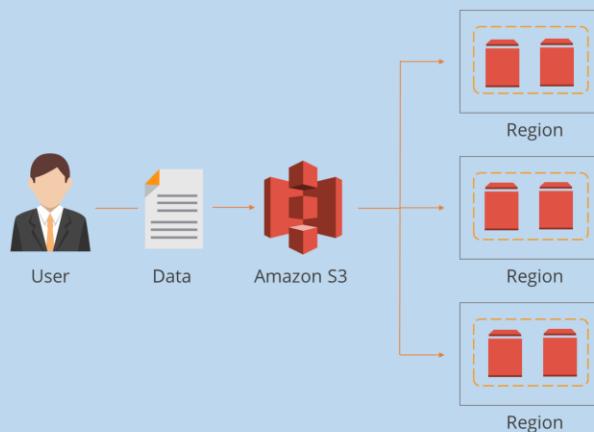


Amazon S3 is extremely durable, it provides 11 9's of durability. The data is redundantly stored across multiple facilities and multiple devices in each facility.

AWS S3 has 11 9's of durability, that is, if you store 10,000 objects with Amazon S3, you can, on an average, expect to incur a loss of only a single object once every 10,000,000 years.

## Available

Amazon S3 is designed for 99.99% availability. You can choose the AWS region to store your data to optimize latency, minimize costs, or address regulatory compliance.



Amazon S3 is designed for 99.99% availability. You can choose the AWS region where you want to store your data to optimize latency, minimize costs, or address regulatory compliance.

## Cost Efficient

You can store large amounts of data at a very low cost. You have to pay for what you use, and you are charged for GB per month usage. S3 offers a variety of different storage classes based on which you can categorize your data.



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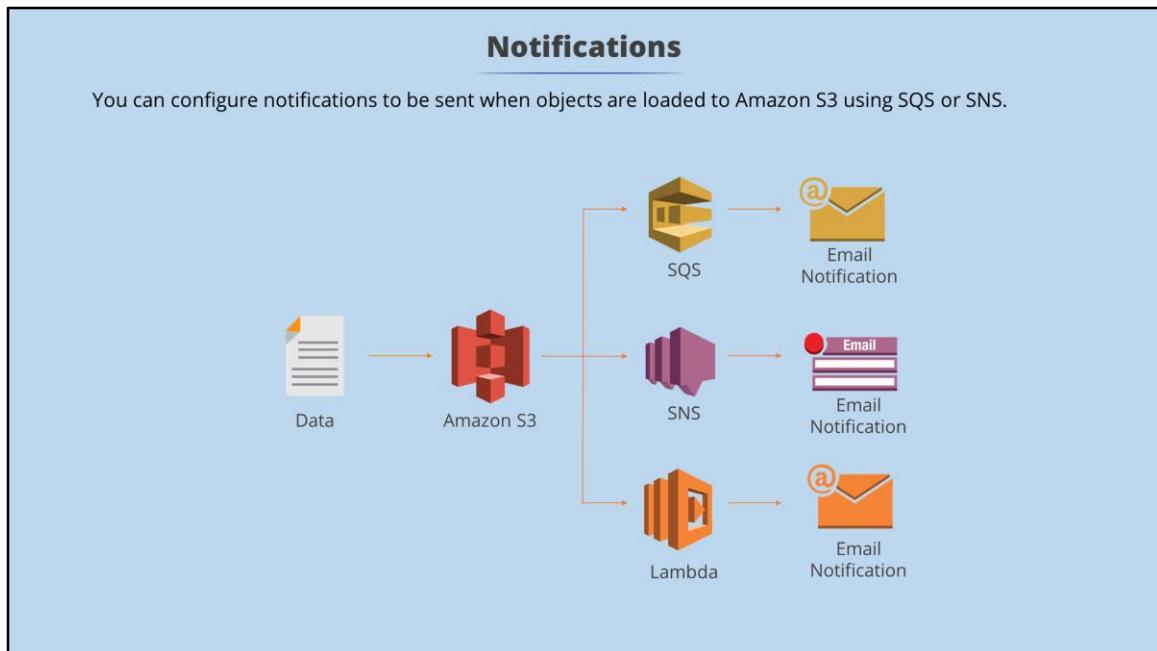
Amazon S3 supports SSL data transfer and data encryption once it is uploaded. You can control access to your data using Identity Access Management (IAM). You can also control objects' permissions using the S3 policies.

## Scalable

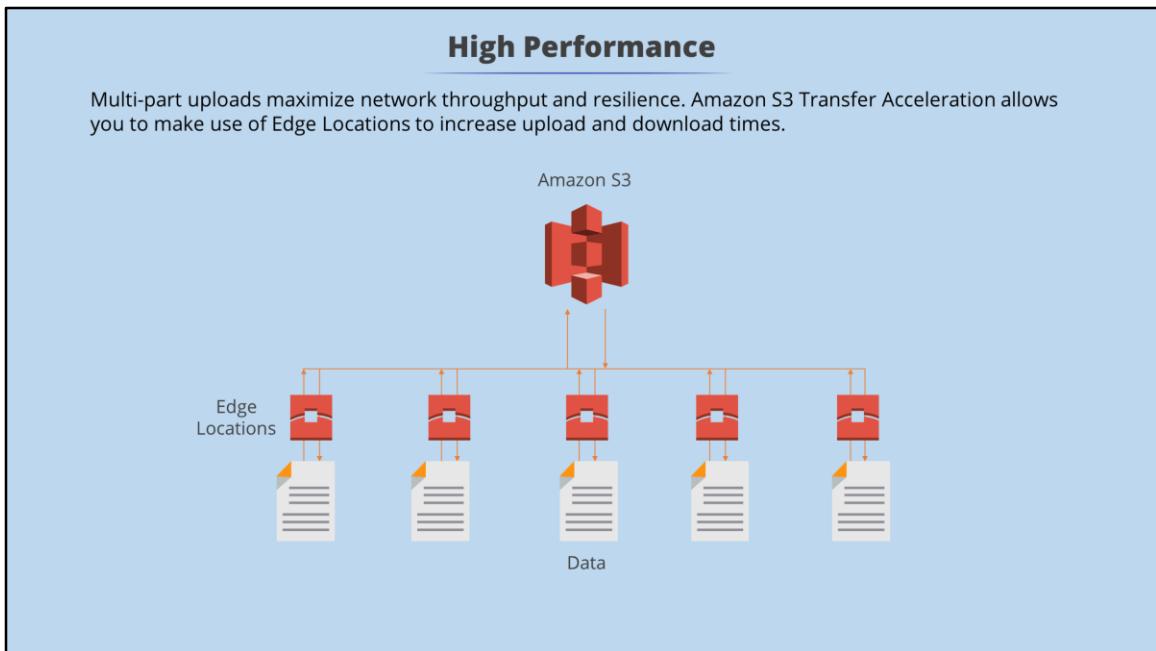
Amazon S3 allows you to store as much data as you want. The storage is elastic, so you can scale up and down as required.



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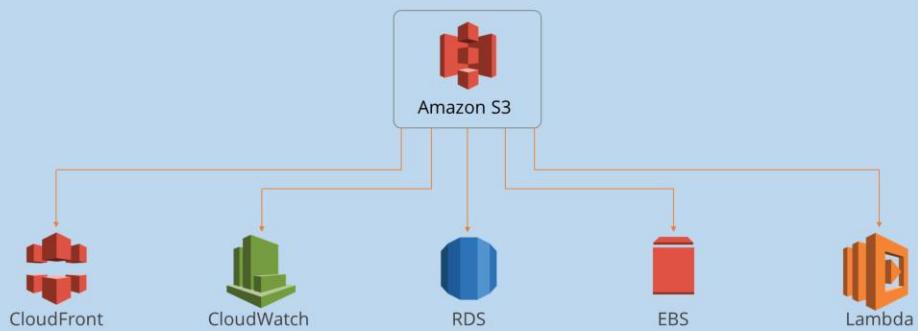
You can configure notifications to be sent when objects are loaded to Amazon S3 using SQS or SNS; this allows you to set up work-flows for your files.



Multi-part uploads maximize network throughput and resilience. Amazon S3 Transfer Acceleration allows you to make use of edge locations to increase upload and download times.

## Integrated

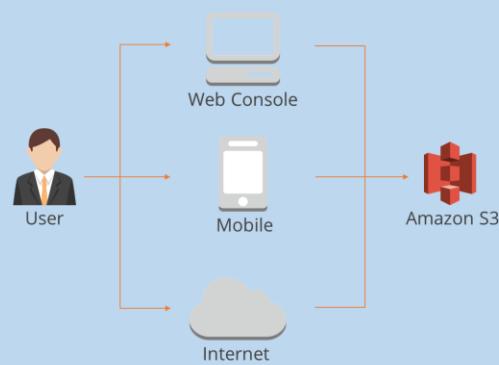
S3 is integrated with many AWS products such as CloudFront, CloudWatch, RDS, EBS, and Lambda.



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## Easy to Use

S3 has multiple connectivity options: Simple web-based console, AWS CLI, mobile app, and API/SDK access.



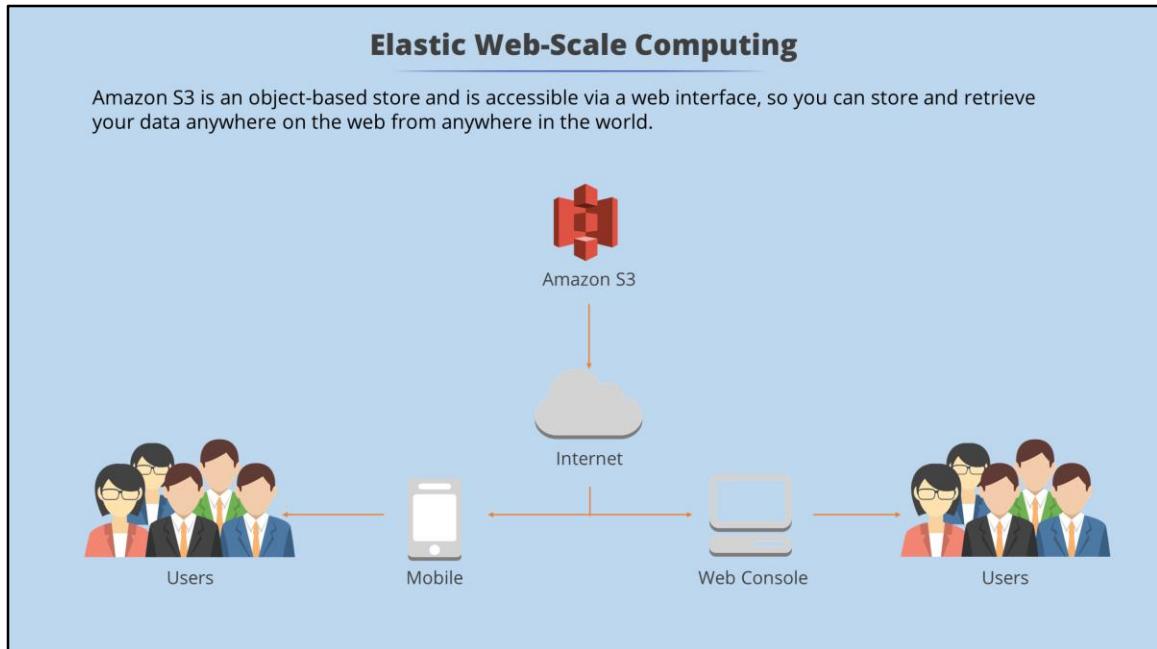
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## Backup and Archiving

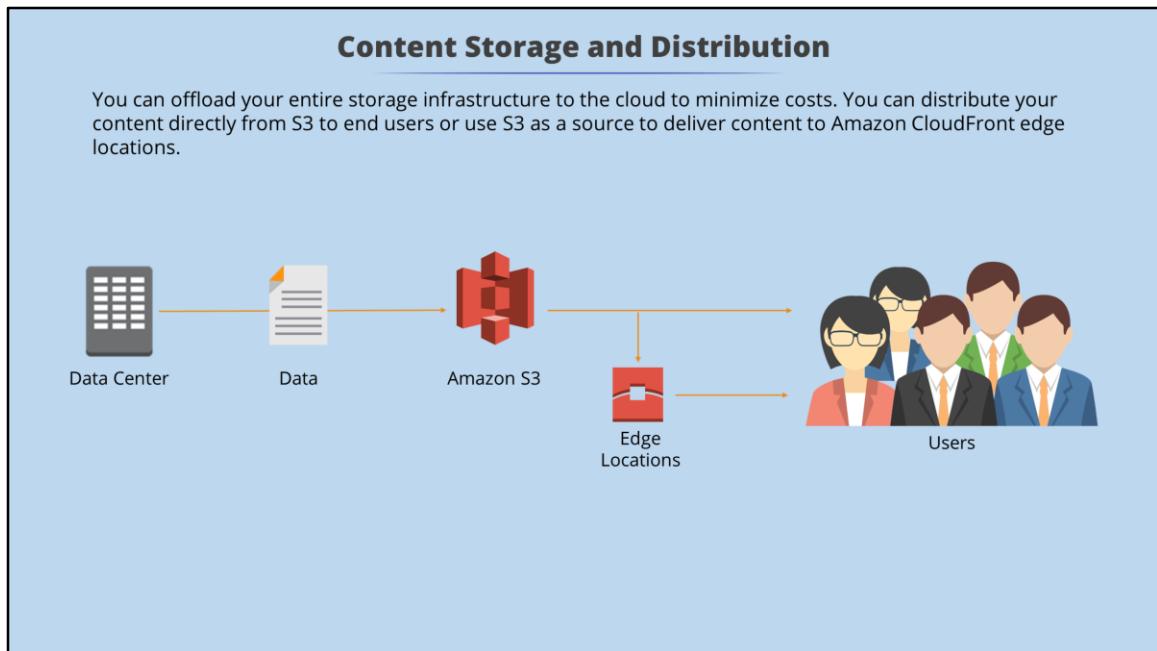
Amazon S3 is ideal for backing up and archiving critical data. You can store unlimited amount of data if required.



Amazon S3 is ideal for backing up and archiving critical data. You can store unlimited amount of data if required. Traditional IT infrastructure offers a finite storage capacity where you'd have to manage the backups you can retain, but with S3 you can retain as many backups as you want at a low cost.



Amazon S3 is an object-based storage and is accessible via a web interface, so you can store and retrieve your data anywhere on the web from anywhere in the world.



You can offload your entire storage infrastructure to the Cloud to minimize costs. You can distribute your content directly from S3 to end users, or use S3 as a source for delivering content to Amazon CloudFront edge locations.

## Big Data

Amazon S3 is designed to be used as a Big Data object store for things like photos, videos, and financial data.



Amazon S3 is designed to be used as a Big Data object store for objects such as photos, videos, financial data, and so on. Using AWS products and services, you can perform Big Data analytics.

## Static Website Hosting

Amazon S3 allows you to host your entire static website at a low cost. It provides you with a highly available hosting solution.



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## Disaster Recovery

Amazon S3 offers a robust disaster recovery solution. All data stored on S3 is automatically replicated to a different Availability Zone, and you can copy it to other regions using Cross-Region Replication.

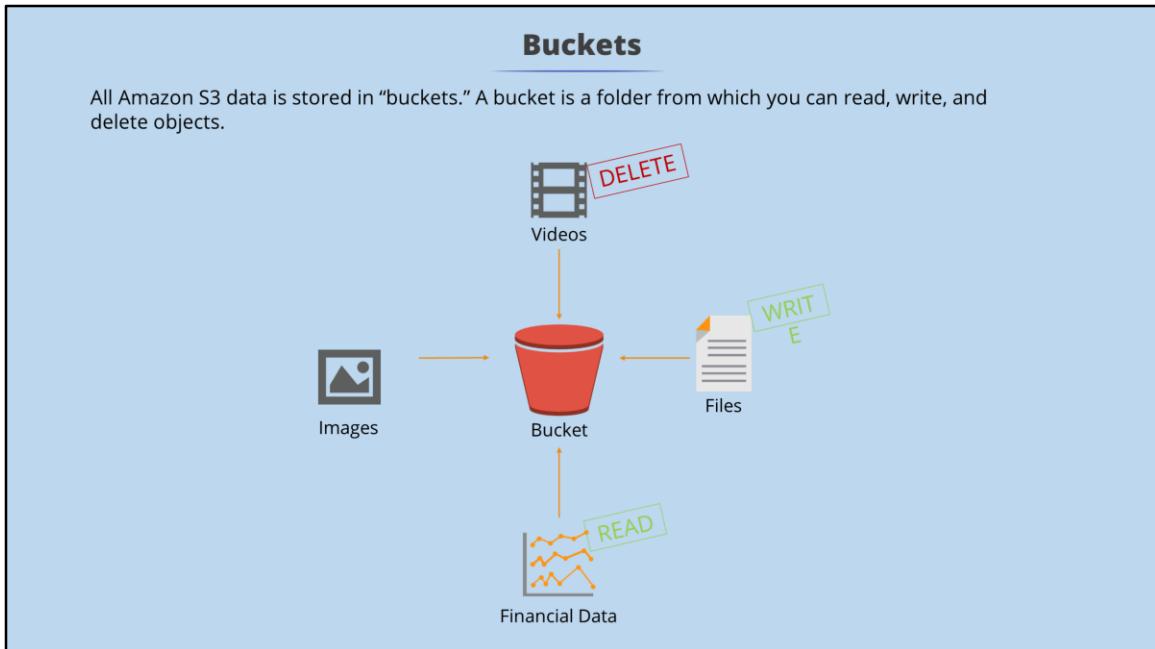
```
graph LR; DC1[Data Center] -- "Data" --> D1[Data]; DC2[Data Center] -- "Data" --> D1;
```

Amazon S3 offers a robust disaster recovery solution. All data stored on S3 is automatically replicated to a different Availability Zone and you can copy it to other regions using Cross-Region Replication.

You can add further recovery options by storing multiple versions of an object for point-in-time recovery.

## **Amazon S3 Buckets**

In this section, you will learn about Amazon S3 buckets.

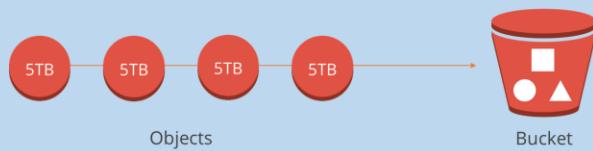


All Amazon S3 data is stored in “buckets.”

A bucket is a folder from which you can read, write, and delete objects.

### Buckets (Contd.)

You can store as many objects as you want in a bucket, but objects are limited in size to 5TB, and the largest PUT operation is 5GB.



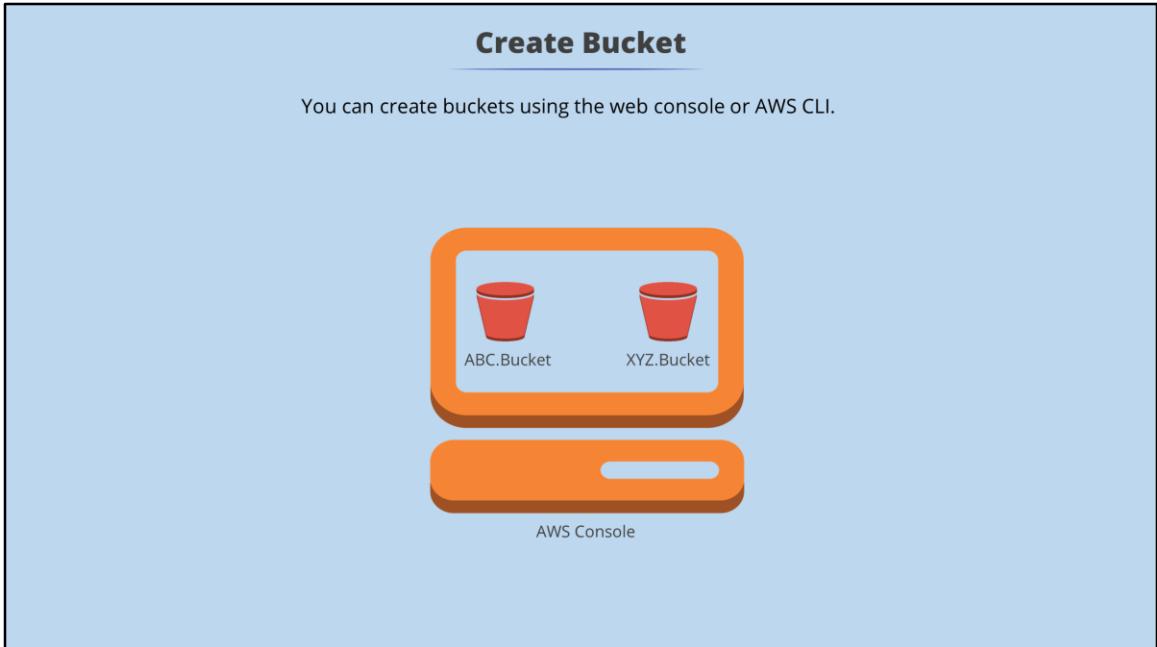
You can store as many objects as you want in a bucket, but objects are limited in size to 5TB and the largest PUT operation is 5GB.

## Bucket Security

You can control access to each bucket action: create, delete, and retrieve objects.

```
graph LR; U1[User] -- Create --> L1[Lock]; U2[User] -- Create --> L1; U3[User] -- Retrieve --> L2[Lock]; U4[User] -- Retrieve --> L2; U5[User] -- Delete --> L3[Lock]; U6[User] -- Delete --> L3; L1 --> BR[Bucket Region]; L2 --> BR; L3 --> BR;
```

You can control access to each bucket action: create, delete, and retrieve objects.  
You can control who can access bucket logs and its objects. You can choose the AWS region where a bucket is stored.



You can create buckets using the web console or AWS CLI. Ensure that the bucket name is unique across all existing bucket names in Amazon S3. AWS recommends that to ensure unique names you should add the name of your organization as a prefix to the bucket name.

## Bucket Names

Follow the listed bucket-naming conventions to avoid errors.

-  Bucket names must be between 3 and 63 characters long.
-  Bucket names must be a series of one or more labels.
-  AWS recommends separating labels with 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.

The following points need to be kept in mind while creating bucket names:

- The bucket name must be at least three characters long and can contain no more than 63 characters.
- The bucket names must be a series of one or more labels.
- AWS recommends separating labels with a single period (.)
- The bucket name can contain lowercase letters, numbers, and hyphens.
- Each label must start and end with a lowercase letter or a number.

Following are a few examples of correct bucket names: myawsbucket.1, myawsbucket, and my.aws.bucket

## Bucket Restrictions

Buckets have the following restrictions attached to them:

- You can create a maximum of 100 buckets in each of your AWS accounts.
- You can't transfer the ownership of a bucket.
- You can store an unlimited number of objects in a bucket.
- You can't create a bucket within another bucket.

Bucket name ownership is not transferable; however, if a bucket is empty, you can delete it, and it will eventually become available for use.

You can create up to 100 buckets in each of your AWS accounts. There is no limit to the number of objects that can be stored in a bucket, and there is no difference in performance whether you use many buckets or just a few. However, you cannot create a bucket within another bucket.

## Amazon S3 Storage Classes

Amazon S3 comes in the following range of storage classes:

- Amazon S3 Standard
- Amazon S3 Standard: Infrequent Access
- Amazon S3 Reduced Redundancy Storage
- Amazon Glacier
- Amazon S3 One Zone-Infrequent Access

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- Amazon S3 Standard
- Amazon S3 Standard—Infrequent Access
- Amazon S3 Reduced Redundancy Storage
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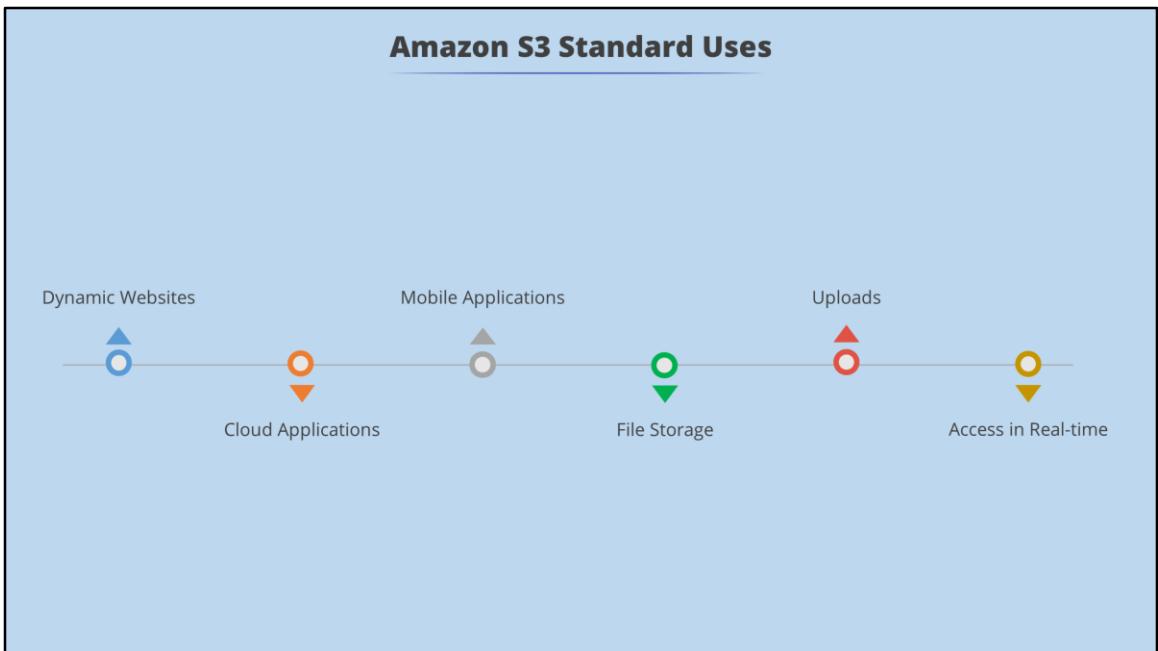
## Amazon S3 Standard

Features of Amazon S3 Standard:

- 01 | Designed for high availability and durability
- 02 | Used to store frequently accessed data
- 03 | Designed for 11 9's of durability
- 04 | Designed for 99.99% availability
- 05 | Low latency and high throughput

Following are the features of Amazon S3 Standard:

- High availability and durability
- Storing frequently accessed data
- 11 9's durability
- 99.99% availability
- Low latency and high throughput



Amazon S3 Standard is ideal for dynamic websites, cloud applications, content distribution, mobile apps, and so on. It can be used as a regular file storage for your business. End users can use Amazon S3 to upload photos and videos.

## Amazon S3 Standard: Infrequent Access

Features of Amazon S3 Standard: Infrequent Access:

01 | Designed for objects that are accessed less frequently

02 | Demands rapid access

03 | Designed for 11 9's of durability, high throughput, and low latency

04 | Lower cost per GB but has a per GB retrieval fee

Following are the features of Amazon S3 Standard—Infrequent Access:

- It is designed for objects that are accessed less frequently, but when required, they demand fast access.
- It provides 11 9's of durability.
- It is designed for 99.9% availability.
- It offers low latency and high throughput.

Standard—Infrequent Access offers the same durability, throughput, and low latency of Standard, but with a lower cost per GB and a per GB retrieval fee.

### **Amazon S3 Standard: Infrequent Access Uses**

Amazon S3 Standard: Infrequent Access is used for data not required very often, for example, database backups taken earlier in the month that might be required at a moment's notice.

Amazon S3 Standard—Infrequent Access is used for data that is not often required, for example, database backups taken earlier in the month, but which might be required at a moment's notice.

## Amazon S3 Reduced Redundancy Storage

Features of Amazon Reduced Redundancy Storage:

01 | Designed to store noncritical data at lower costs

02 | Designed for noncritical objects

03 | Designed for objects that are reproducible

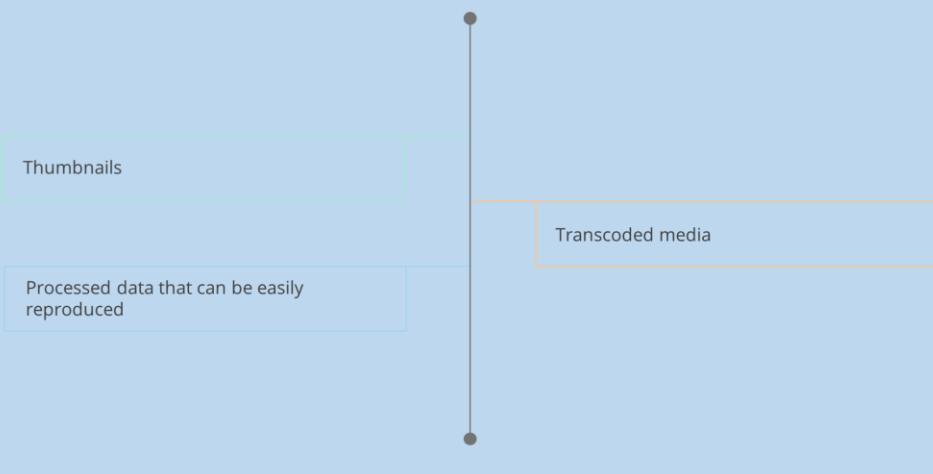
04 | Designed for lower durability

05 | Designed for lower availability

Reduced Redundancy Storage (RRS) is an Amazon S3 storage option that enables customers to reduce their costs by storing non-critical, reproducible data at lower levels of redundancy than Amazon S3's standard storage.

### Amazon S3 Standard Reduced Redundancy Storage Uses

Amazon S3 Reduced Redundancy Storage is a cost-effective solution for distributing data that is easily reproducible and has been durably stored elsewhere.



It provides a cost-effective solution for distributing or sharing data that has been durably stored elsewhere, or for storing thumbnails, transcoded media, or other processed data that can be easily reproduced.

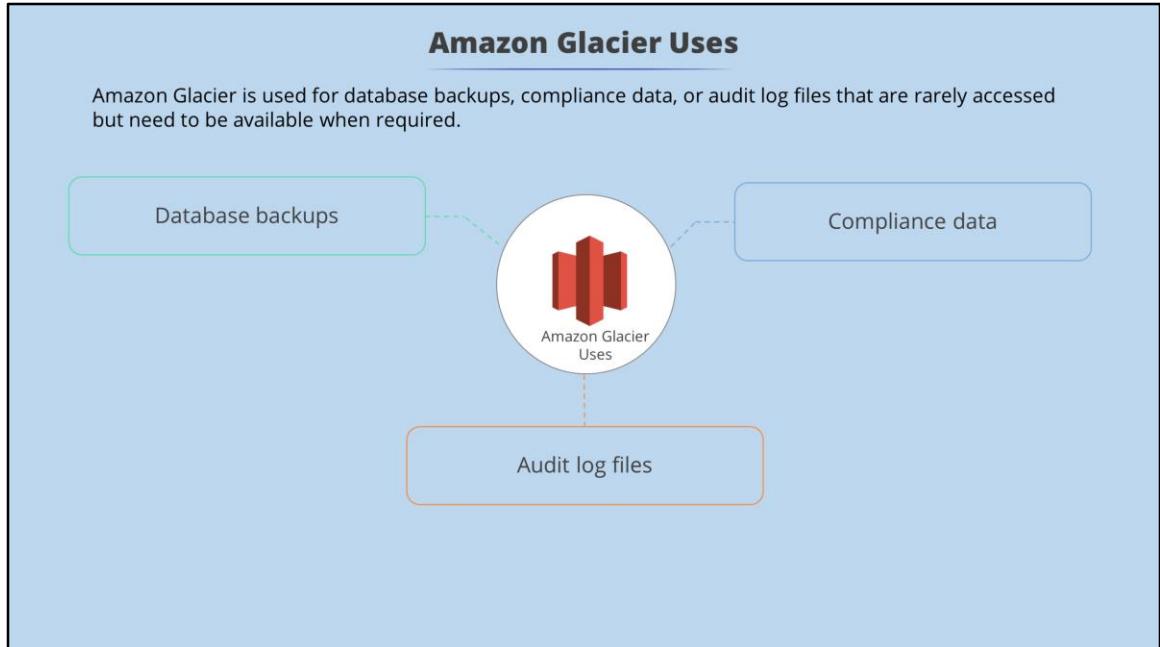
## Amazon Glacier

Following are the features of Amazon Glacier:

- |    |  |
|----|--|
| 01 | Designed for archiving rarely accessed data  |
| 02 | Provided only longer file retrieval time but now provides a retrieval option to pay more and get files quickly |
| 03 | Designed for durability of 11 9s   |
| 04 | Provides a secure vault lock feature   |
| 05 | Provides the lowest cost availability  |

Following are the features of Amazon Glacier:

- It is used to archive data that is rarely accessed, and where a retrieval time of several hours won't matter.
- It provides 11 9's of durability.
- It provides a vault lock feature that enforces compliance.
- It provides a long-term archive feature.



Amazon Glacier is used for database backups, compliance data, or audit log files that are rarely accessed but need to be available when required.

For example, database backups from months or even years ago.

## Amazon Retrieval Options

The following table presents the retrieval options:

|                    | EXPEDITED          | STANDARD                 | BULK                              |
|--------------------|--------------------|--------------------------|-----------------------------------|
| Retrieval Time     | 1-5 minutes        | 3-5 hours                | 5-8 hours                         |
| Retrieval Requests | Charge per request | Charge per 1000 requests | Lowest charge per 1000 requests + |
| Data Retrieval     | Charge per GB      | Lower charge per GB      | Lowest charge per GB              |

Amazon S3 storage provides four different options:

- Standard
- Standard—IA
- Glacier
- RRS

### Amazon S3 Storage Comparison

The following table presents the comparisons between the four storage options:

|                      | STANDARD           | STANDARD - IA      | GLACIER            | RRS          | S3 One Zone-IA      |
|----------------------|--------------------|--------------------|--------------------|--------------|---------------------|
| Durability           | 99.999999999%<br>% | 99.999999999%<br>% | 99.999999999%<br>% | 99.99%       | 99.999999999%<br>%+ |
| Availability         | 99.99%             | 99.99%             | N/A                | 99.99%       | 99.5%               |
| Min Storage Duration | N/A                | 30 days            | 90 days            | N/A          | 30 days             |
| Retrieval Fee        | N/A                | Per GB retrieved   | Per GB retrieved   | N/A          | Per GB retrieved    |
| First Byte Latency   | Milliseconds       | Milliseconds       | Minutes-hours      | Milliseconds | Milliseconds        |

Amazon S3 storage provides four different options:

- Standard
- Standard—IA
- Glacier
- RRS
- S3 One Zone-IA

### S3 Glacier Deep Archive

S3 Glacier Deep Archive is a new Amazon S3 storage class that provides secure, durable object storage for long-term data retention and digital preservation



Coming soon.

S3 Glacier Deep Archive is a new Amazon S3 storage class that provides secure, durable object storage for long-term data retention and digital preservation. S3 Glacier Deep Archive offers the lowest price of storage in AWS, and reliably stores any amount of data. It is the ideal storage class for customers who need to make archival, durable copies of data that rarely, if ever, need to be accessed.

This means that customers can eliminate the need for on-premises tape libraries, and no longer have to manage hardware refreshes and re-write data to new tapes as technologies evolve.

All data stored in S3 Glacier Deep Archive can be retrieved within 12 hours

### Access Amazon S3 from the Internet

You can easily host static websites from Amazon S3. You can configure buckets for static website hosting and then upload your website code to your bucket. It will become accessible from the URLs.

The naming convention is: <bucket-name>.s3-website-<AWS-region>.amazonaws.com



You can easily host static websites from Amazon S3. You can configure buckets for static website hosting and then upload your website code to your bucket. It will become accessible from the URLs.

The naming convention is: <bucket-name>.s3-website-<AWS-region>.amazonaws.com

## URL Access from Amazon S3

You can provide URL access to the objects stored in your bucket by enabling website hosting. For example, the following URL will request the photo.jpg object that is stored at the root level in a bucket.

`http://<bucket-name>.s3-website-<AWS-region>.amazonaws.com /photo.jpg`

You can also provide URL access to the objects without enabling website hosting as long as you set up appropriate information in the URL. The following URL requests access to the healthcheck.html file that is stored in a bucket named "simplilearn."

`https://s3.amazonaws.com/simplilearn/health_check.html`

You can provide URL access to the objects stored in your bucket by enabling website hosting. For example, the following URL will request the photo.jpg object, which is stored at the root level in a bucket.

`http://<bucket-name>.s3-website-<AWS-region>.amazonaws.com /photo.jpg`

You can also provide URL access to the objects without enabling website hosting as long as you set up appropriate information in the URL. The following URL requests access to the healthcheck.html file that is stored in a bucket named "simplilearn."

`https://s3.amazonaws.com/simplilearn/health_check.html`

The screenshot shows the 'New Amazon S3 Console' interface. At the top, there's a navigation bar with tabs: 'Objects' (selected), 'Properties', 'Permissions', and 'Management'. Below the navigation bar, there are two main sections: 'Versioning' and 'Logging'.  
**Versioning:** A box containing the text 'Keep multiple versions of an object in the same bucket.' with a 'Learn more' link. It has a checked checkbox labeled 'Enabled'.  
**Logging:** A box containing the text 'Set up access log records that provide details about access requests.' with a 'Learn more' link. It has an unchecked checkbox labeled 'Disabled'.  
At the bottom of the screenshot, a text box states: 'Amazon S3 Console enhances security by showing the number of objects affected before operation initiation.'



Amazon S3 storage options four different options:

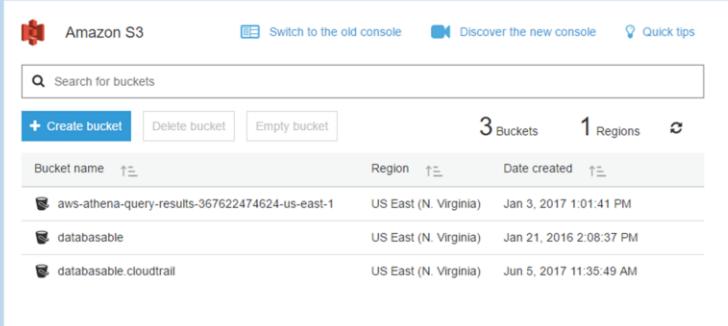
Standard

Standard-IA

Glacier

RRS

And you can compare their features in the table given.



The screenshot shows the New Amazon S3 Console interface. At the top, it says "New Amazon S3 Console". Below that is the "Amazon S3" logo. There are links to "Switch to the old console", "Discover the new console", and "Quick tips". A search bar labeled "Search for buckets" is present. Below the search bar are three buttons: "+ Create bucket", "Delete bucket", and "Empty bucket". To the right, it shows "3 Buckets" and "1 Regions". A table lists three buckets: "aws-athena-query-results-367622474624-us-east-1" (Region: US East (N. Virginia), Date created: Jan 3, 2017 1:01:41 PM); "databasable" (Region: US East (N. Virginia), Date created: Jan 21, 2016 2:08:37 PM); and "databasable.cloudtrail" (Region: US East (N. Virginia), Date created: Jun 5, 2017 11:35:49 AM). A message at the bottom says "Object operation status is now reported in a progress bar." A speaker icon in the bottom right corner indicates audio content.

Amazon S3 storage options four different options:

Standard

Standard-IA

Glacier

RRS

And you can compare their features in the table given.

**Demo: Create and access an Amazon S3 Bucket**

In this demonstration, you will learn how to create and access an Amazon S3 bucket.

Knowledge Check

**Knowledge**

**Check**

**Amazon S3 bucket names have to be \_\_\_\_.**

**1**

- a. unique in each region
- b. unique in each Availability Zone
- c. unique across all regions
- d. more than 63 characters long

**Amazon S3 bucket names have to be \_\_\_\_.**

1

- unique in each region
- unique in each Availability Zone
- unique across all regions
- more than 63 characters long

c

**Amazon S3 bucket names have to be unique globally and between 3 and 63 characters in length.**

## **Version Control**

In this section, you will learn about version control.

## Version Control

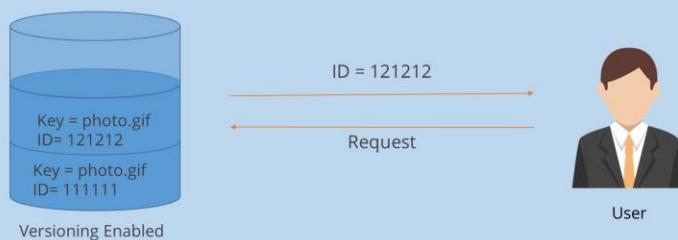
Versioning is used to preserve, retrieve, and restore earlier versions of every object you store in your S3 buckets.

The diagram illustrates the concept of version control in AWS S3. It features a central red bucket containing three white geometric shapes (square, circle, triangle). Above the bucket, three red circles are arranged vertically, each labeled "V.0" followed by a number (1, 2, or 3). To the right of the bucket, three yellow squares are also arranged vertically, each labeled "V.0" followed by a number (1, 2, or 3). Arrows point from the red circles to the yellow squares, labeled "Preserve", "Retrieve", and "Restore" respectively, indicating the process of managing and recovering previous versions of objects stored in the bucket.

Versioning is used to preserve, retrieve, and restore earlier versions of every object you store in your S3 buckets.

## Version Control (Contd.)

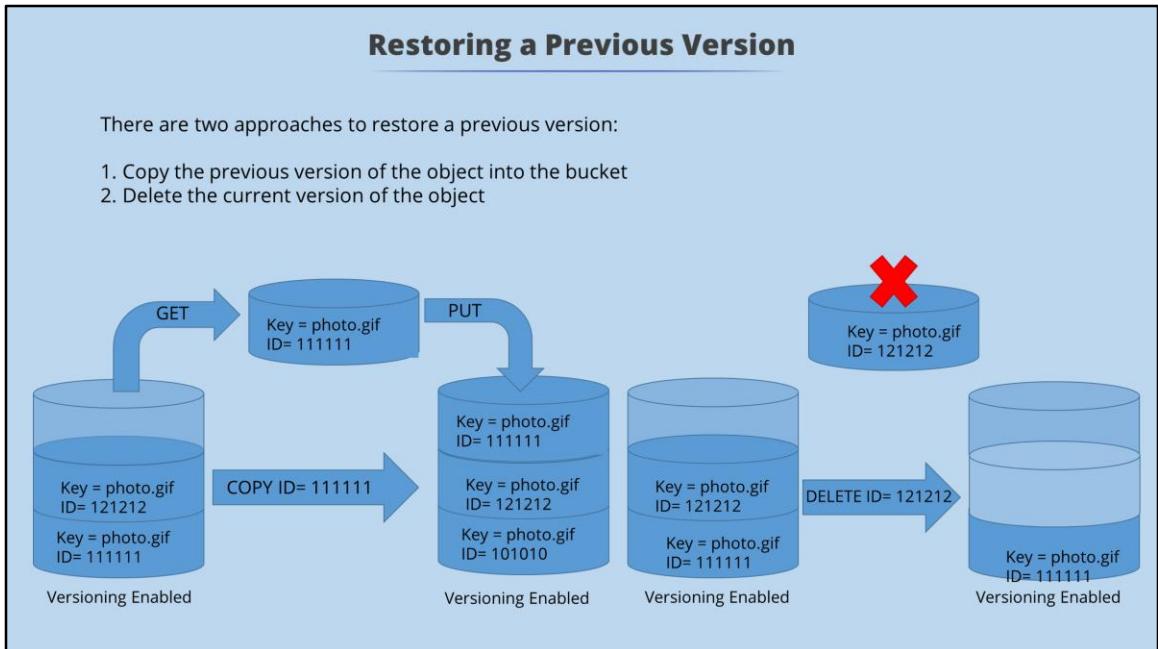
Versioning helps you recover your files from accidental deletion or overwrite.



Version control allows you to recover objects due to end-user mistakes and application failures by protecting against accidental deletion or overwriting.

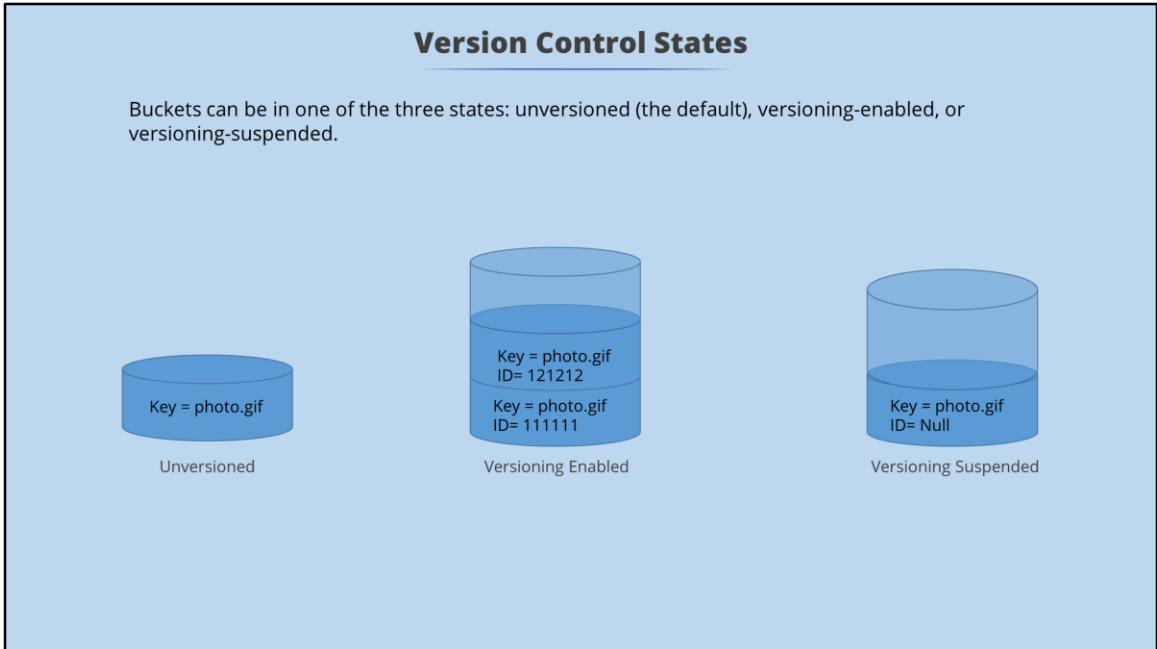
Each time a file is updated or deleted, the previous version is stored, but with a different ID. A request for a file will, by default, restore the file with the most recent ID.

Storage rates are applied for every version that is stored.



There are two approaches to restore a previous version:

- Copy the previous version of the object into the bucket: Copied object will become the current version of that object and all previous object versions will be preserved.
- Delete the current version of the object: Deleting the current object version will make the previous version the current version of that object.



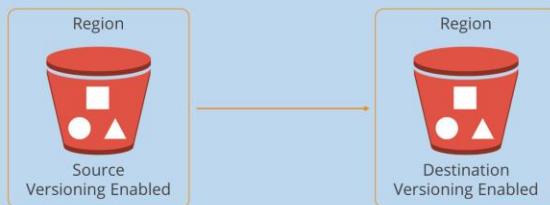
Buckets can be in one of the three states: unversioned (the default), versioning-enabled, or versioning-suspended.

Once you version-enable a bucket, it can never return to an unversioned state. You can, however, suspend versioning on that bucket.

Suspended versioning means that for each file update, the ID is updated to NULL.

## Cross-Region Replication

Cross-region replication is a bucket-level feature that enables automatic, asynchronous copying of objects across buckets in different AWS regions. You need to enable versioning on both the source and destination buckets.



Cross-region replication is a bucket-level feature that enables automatic, asynchronous copying of objects across buckets in different AWS regions.

You can use this feature to provide low-latency versions of your data to users in other regions or to provide additional redundancy.

For cross-region replication to work, you need to have versioning enabled on both the source and destination buckets and you can only replicate to one destination bucket.



Amazon S3 allows you to protect your data by enabling MFA (Multi-Factor Authentication) delete. This provides additional authentication for the following operations:

- Changing the versioning state of your bucket
- Permanently deleting an object version

### **Demo: Amazon S3 Version Control**

In this demonstration, you will learn about the version control functionality.

### Knowledge Check

Knowledge  
Check  
**1**

**Which of the following is NOT an Amazon S3 version control state?**

- a. Unversioned
- b. Versioning-enabled
- c. Versioning-disabled
- d. Versioning-suspended



simplilearn

**Knowledge Check**

**1**

**Which of the following is NOT an Amazon S3 version control state?**

a. Unversioned  
b. Versioning-enabled  
c. Versioning-disabled  
d. Versioning-suspended



The correct answer is **C**

---

**Versioning cannot be disabled; it can only be enabled or suspended.**

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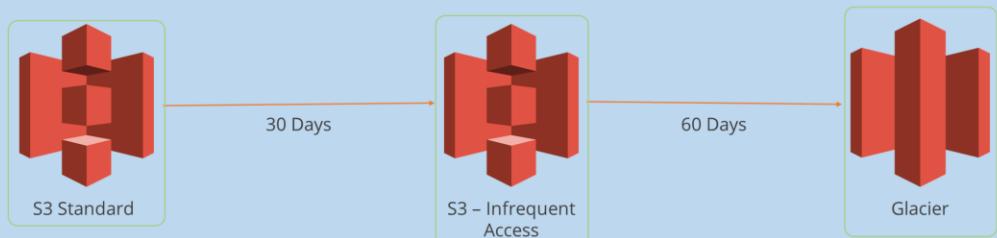
57

## **Amazon S3 Lifecycle Management**

In this section, you'll learn about Amazon S3 lifecycle management.

## Lifecycle Management

S3 allows you to define how Amazon manages objects during their lifetime. You can configure S3 to move your data between the various storage classes on a defined schedule.



S3 allows you to define how Amazon manages objects during their lifetime. You can configure S3 to move your data between the various storage classes on a defined schedule.

## Lifecycle Management (Contd.)

You can configure Lifecycle configuration rules such as:

Automatically delete files after a certain period of time, for example, log files that you might only need for a week.

Certain files might only need to be accessed for a limited period of time and can then be archived.

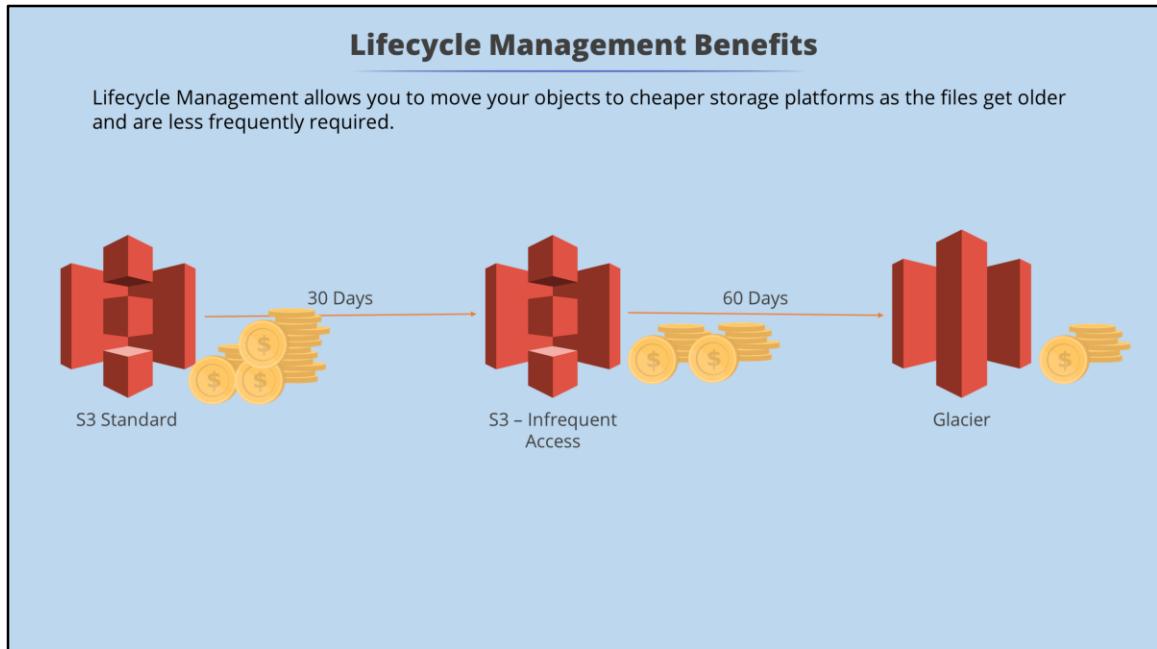
Files kept only for regulatory or compliance reasons can be archived and stored for a longer term.

You can configure Lifecycle configuration rules such as the following:

Automatically delete files after a certain period of time, for example, log files that you might only need for a week.

Files required for a limited period of time to be archived at a pre-defined schedule.

Files kept for regulatory or compliance reasons should be archived and stored for longer terms.



Lifecycle Management allows you to move your objects to cheaper storage platforms as the files get older and are less frequently required.

## Lifecycle Management Rules

You can configure as many as 1000 lifecycle rules per bucket.

You can define a rule for all objects or a subset of objects in the bucket.

You can disable a rule temporarily.

Following are the Lifecycle management rules:

- You can configure as many as 1000 lifecycle rules per bucket.
- You can define a rule for all objects or a subset of objects in the bucket.
- You can temporarily disable a rule if required.

### Standard/RRS to Standard: IA

The listed rules required to be followed while moving objects from Standard/RRS to Standard: IA are as follows:

Objects must be larger than 128KB.

Objects must be stored at least 30 days in Standard/RRS.

Versioned objects must also be at least 30 days old.

Amazon S3 does not move objects smaller than 128 kilobytes in size to the Standard—IA storage class because it is not cost effective.

Objects must be stored at least 30 days in the current storage class before you can transition them to Standard—IA.

If you are transitioning noncurrent objects, which means older object versions, you can only move objects that are >30 days old to Standard—IA.

### Standard/RRS/Standard: IA to GLACIER

The rules required to be followed while moving objects from Standard/RRS/Standard: IA to Glacier are as follows:

Glacier stored objects are not available in real time.

To access an archived object in Glacier, you first need to restore a temporary copy of it.

The restored object is only available for the duration you specify during the restore request.

Glacier requests can take up to 5 hours.

You can transition from Standard/RRS/Standard—IA to Glacier at any time, however, the following restrictions exist with Glacier:

- Glacier stored objects are not available in real time.
- To access an archived object in Glacier, you first need to restore a temporary copy of it.
- The restored object is only available for the duration you specify during the “restore request.”
- Glacier requests can take up to 5 hours.

## Other Restrictions

The following restrictions are associated with the movement of objects between the different storage options:

You cannot transition from Standard: IA to Standard or Reduced Redundancy.

You cannot transition from Glacier to any other storage class.

You cannot transition from any storage class to Reduced Redundancy.

You cannot transition from Standard—IA to Standard or Reduced Redundancy.

You cannot transition from Glacier to any other storage class.

You cannot transition from any storage class to Reduced Redundancy.

### **Demo: Amazon S3 Lifecycle Management**

In this demonstration, you'll learn how to configure and use Lifecycle Management.

**Knowledge Check**

1 Which of the following Lifecycle Management rules is possible?

Glacier to Standard

Standard IA to Standard

Glacier to RRS

Standard to Standard IA

**Which of the following Lifecycle Management rules is possible?**

1

Glacier to Standard

Standard IA to Standard

Glacier to RRS

Standard to Standard IA

d

**Standard to Standard IA is a supported Lifecycle Management rule, as is RRS to Standard IA, RRS to Glacier, and Standard IA to Glacier.**

## **CloudFront and CDNs**

In this section, you'll learn about CloudFront and Content Delivery Networks (CDN).

## Amazon CloudFront

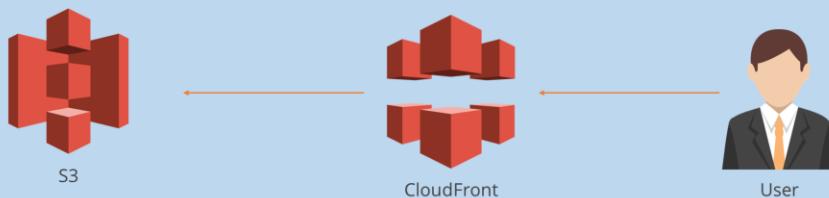
Amazon CloudFront is a global Content Delivery Network (CDN) service that provides a way to distribute content to end users with low latency, high data transfer speeds, and no minimum usage commitments.



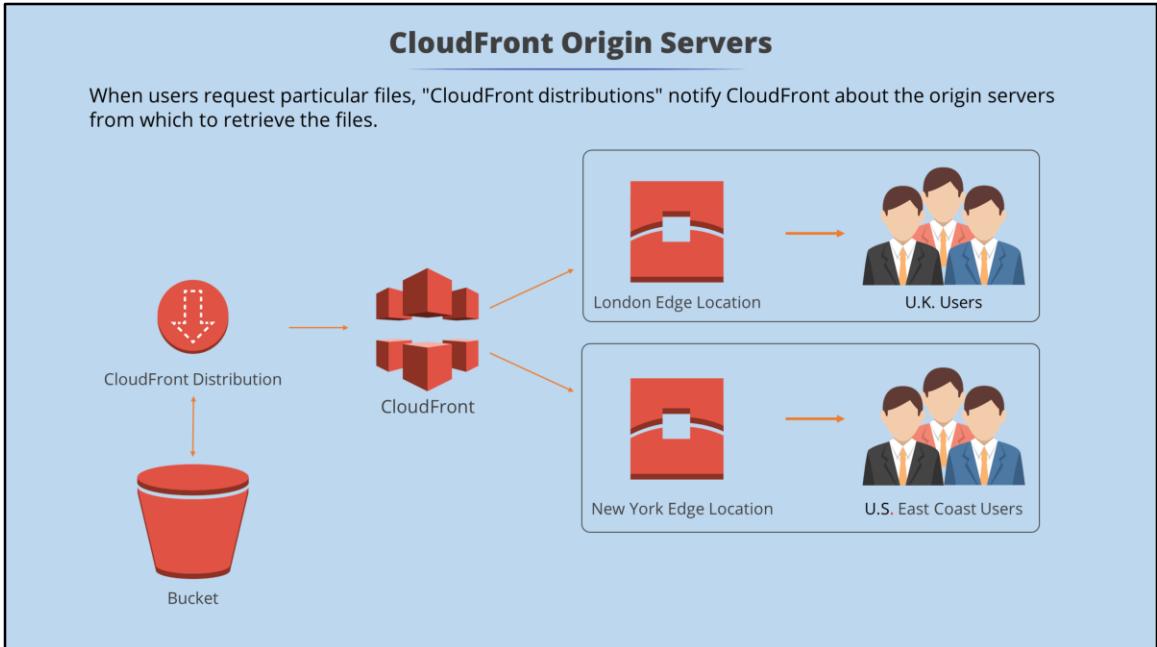
Amazon CloudFront is a global Content Delivery Network (CDN) service which provides a way to distribute content to end users with low latency, high data-transfer speeds, and no minimum usage commitments.

## CloudFront and S3

Amazon S3 can be used as an “origin” server to store original versions of your files. An origin server is the location of the definitive version of an object.



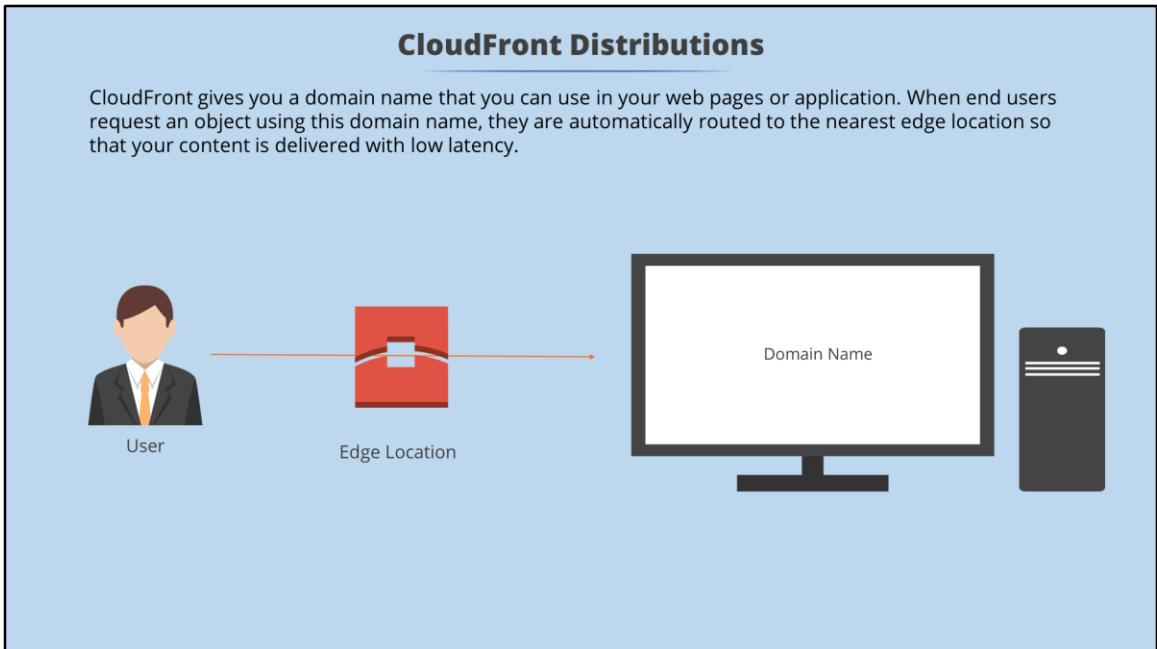
Amazon S3 can be used as an “origin” server to store original versions of your files.  
An origin server is the location of the definitive version of an object.



"Cloudfront distributions" notify Cloudfront about the origin servers from which to get the files from when users request them from a website or application.

You can also specify if you want CloudFront to log requests and when you want the distribution to be enabled.

In the diagram, CloudFront specifies the bucket from which to retrieve the data. When users request access to your website, CloudFront pushes the access request directly to the edge locations closest to the end users.



Cloudfront gives you a domain name which you can use in your web pages or application.

When end users request an object using this domain name, they are automatically routed to the nearest edge location so that your content is delivered with low latency.

You have to pay for the data transfer and requests that you actually use.

## Web Distribution vs. RTMP

Difference between Web distribution and RTMP:

Web Distribution is used to deliver content such as HTML, CSS, and image files over HTTP or HTTPS

RTMP is used for media streaming using Adobe Media server and Adobe Real-Time Messaging Protocol

Web Distribution is used to deliver content such as html, CSS, image files, and so on over HTTP or HTTPS.

RTMP is used for media streaming through Adobe Media server and Adobe Real-Time Messaging Protocol.

## CloudFront Rules

Edge locations are not just read-only; you can also write to them.

Objects are cached for the life of the TTL (time to live).

You can clear cached objects, but you'll be charged for them.

Following are the CloudFront rules:

- Edge locations are not just read-only; you can also write to them.
- Objects are cached for the life of the TTL (time to live).
- By default, each object automatically expires after 24 hours.
- You can clear cached objects if you update your origin files, but it is chargeable.

**Demo: Amazon CloudFront**

In this demonstration, you'll learn how to use Amazon CloudFront and Amazon S3

### Knowledge Check

**What is the purpose of Amazon CloudFront?**

1

- To provide disaster recovery for objects stored in your S3 buckets
- To distribute content to end users with low latency
- To reduce the costs of running a web site or media streaming service
- To host your website source code

**What is the purpose of Amazon CloudFront?**

1

- To provide disaster recovery for objects stored in your S3 buckets
- To distribute content to end users with low latency
- To reduce the costs of running a web site or media streaming service
- To host your website source code

b

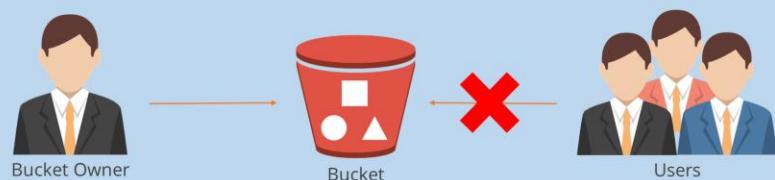
**Amazon CloudFront is a way to distribute content to end users with low latency and high data transfer speeds.**

## **Security and Encryption**

In this section, you'll learn about the security and encryption associated with S3.

## Security Methods

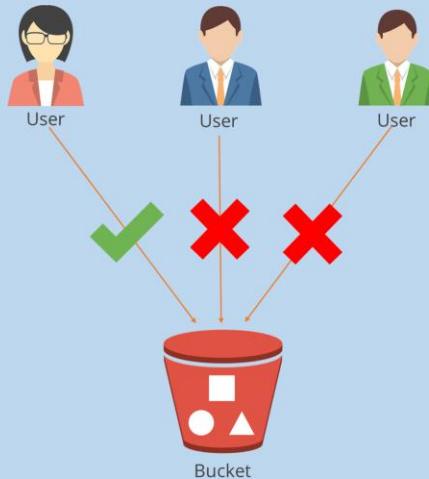
All data stored in Amazon S3 is secure by default as only bucket and object owners have access to the Amazon S3 resources they create.



All data stored in Amazon S3 is secure by default as only the bucket and object owners have access to the Amazon S3 resources they create.

## Bucket Policies

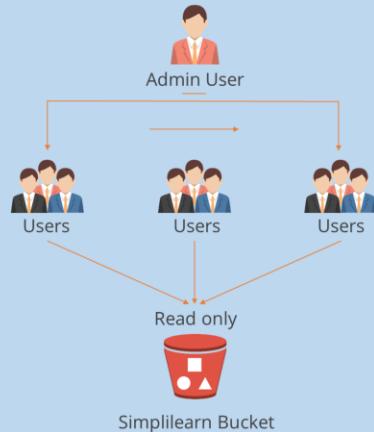
Bucket policies are created to add or deny permissions across some or all of the objects within an S3 bucket. You can define access by creating and keeping Access Control Lists up-to-date.



Bucket policies are created to add or deny permissions across some or all of the objects within an S3 bucket. You can define access by creating and keeping Access Control Lists up-to-date.

## IAM Policies

IAM policies can be created to allow roles to inherit specific permissions to access S3 buckets or objects.



IAM policies can be created to allow specific access to S3 buckets. In the example, you can specify which users can access the Simplilearn S3 bucket.

## Query String Authentication

You can use Query string authentication to share Amazon S3 objects through URLs that are valid for a specified period of time.

Using Query string authentication, you can share Amazon S3 objects through URLs that are valid for a specified period of time.

## Encryption: Data Transfer

Using Amazon S3 SSL-encrypted endpoints that use the HTTPS protocol, you can securely upload or download your data.

Using Amazon S3 SSL-encrypted endpoints that use the HTTPS protocol, you can securely upload or download your data.

## Encryption Data at Rest

Amazon S3 can automatically encrypt your data using the following key management options:

01 Server-Side Encryption with Amazon S3-Managed Keys (SSE-S3)

02 Server-Side Encryption with AWS KMS-Managed Keys (SSE-KMS)

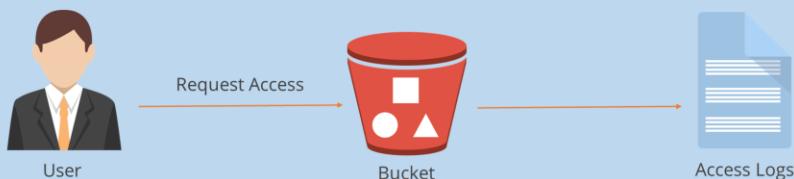
03 Server-Side Encryption with Customer-Provided Keys (SSE-C)

Amazon S3 can automatically encrypt your data at rest using the following key management options:

- 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.
- Server-Side Encryption with AWS KMS-Managed Keys (SSE-KMS):
- They are the same as SSE-S3 but with extra features (and charges). There are separate permissions for the use of an envelope key (a key that protects your data's encryption key) that provides added protection against unauthorized access of your objects in S3. It provides an audit trail of who used your key and when.
- Server-Side Encryption with Customer-Provided Keys (SSE-C):
- In this option you manage the encryption keys and Amazon manages the encryption.

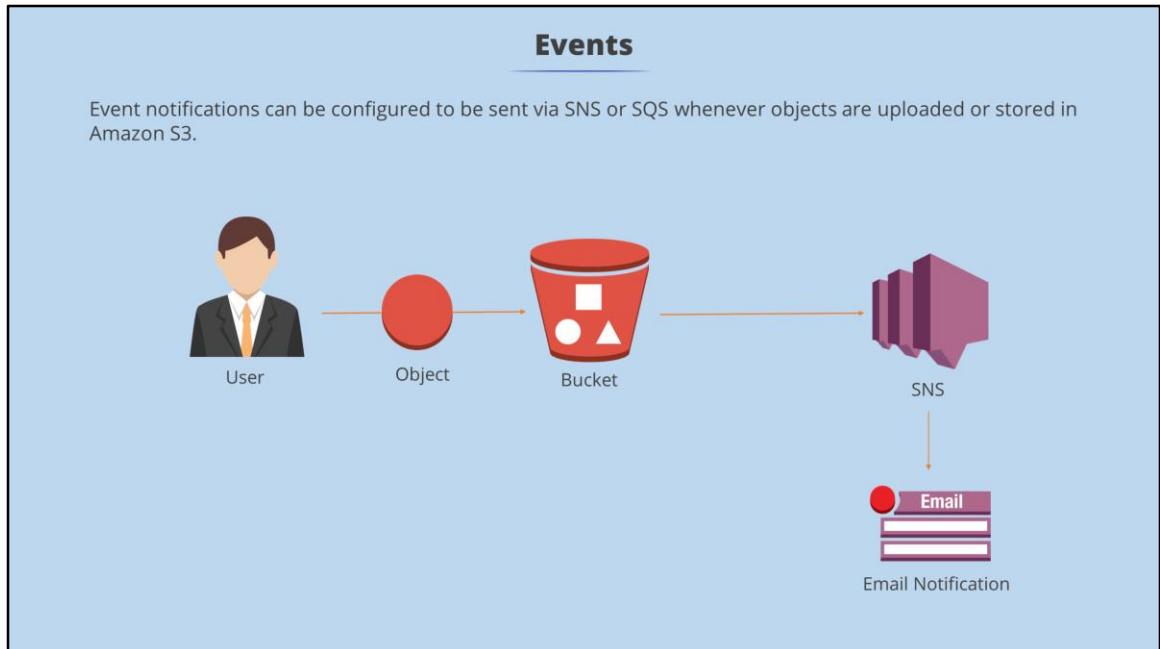
## Logging

You can log requests made against your Amazon S3 resources by configuring your Amazon S3 bucket to create access log records.



You can log requests made against your Amazon S3 resources by configuring your Amazon S3 bucket to create access log records.

The access logs capture all requests made against a bucket, or the objects in it, so you can have all the information required for auditors.



Event notifications can be configured to be sent via SNS or SQS whenever objects are uploaded or stored in Amazon S3.

You can create workflows by delivering event notifications to other AWS services such as Lambda to perform actions based on changes to your S3 objects.

### **Demo: Security and Encryption**

In this demonstration, you'll learn about the Security and Encryption features of Amazon S3.

### Knowledge Check

**Which of the following is NOT a method of securing access to Amazon S3 buckets?**

1

Query String Authentication

IAM policies

Bucket Policies

Encryption

**Which of the following is NOT a method of securing access to Amazon S3 buckets?**

1

Query String Authentication

IAM policies

Bucket Policies

Encryption

d

**Encryption protects the objects stored in Amazon S3, but it doesn't provide secured access to the objects.**

**Demo: Amazon S3/Glacier Select**

## S3 Select

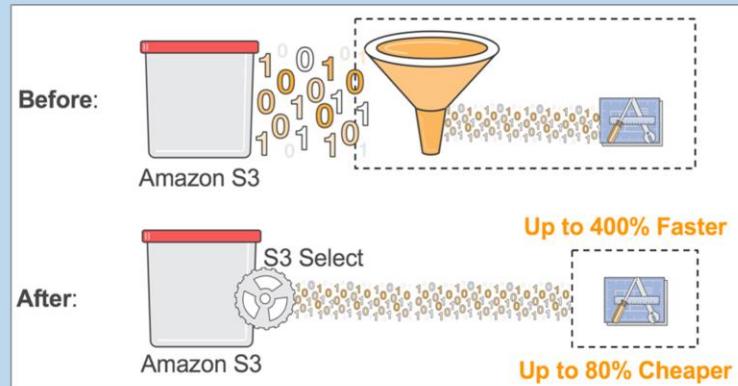
S3 Select allows you to query files stored in S3 buckets using simple SQL expressions so you only return the data that you need, rather than the entire file.



S3 Select allows you to query files stored in S3 buckets using simple SQL expressions, so you only return the data that you need, rather than the entire file.

## S3 Select: Example

S3 Select allows you to query the files directly in place and return only the required data.



Before S3 Select you would have to download all the files that may contain useful data, extract them (if they are compressed) and then find the data you require.

With S3 Select you would just query the files directly in place and return only the data you need.

This can reduce costs by up to 80% and can be up to 400% faster.

## Glacier Select

Glacier Select operates exactly the same as S3 Select; however, the price of the job is determined by how fast you want your results returned.

There are three options:

- Expedited, which takes 1-5 mins
- Standard, which takes 3-5 hours
- Bulk, which takes 5-12 hours

Glacier Select operates exactly the same, however the price of the job is determined by how fast you want your results:

Expedited 1-5 mins

Standard 3-5 hours

Bulk 5-12 hours

### Knowledge Check

**What is the key benefit of S3 select?**

1

Faster download of files stored on S3

Greater security of files stored on S3

Faster return of data from files stored on S3

Cheaper storage costs of S3 files

**What is the key benefit of S3 select?**

1

- Faster download of files stored on S3
- Greater security of files stored on S3
- Faster return of data from files stored on S3
- Cheaper storage costs of S3 files

c

**S3 Select allows you to return data from files stored on S3 much faster than previously.**

### **Amazon Import/Export Snowball**

In this section, you'll learn about the features and benefits of Amazon Import/Export Snowball.

## Import/Export Snowball

Snowball is a petabyte-scale data transport solution that uses secure appliances to transfer large amounts of data into and out of the AWS Cloud. Snowball removes the need to transfer large amounts of data over the Internet.



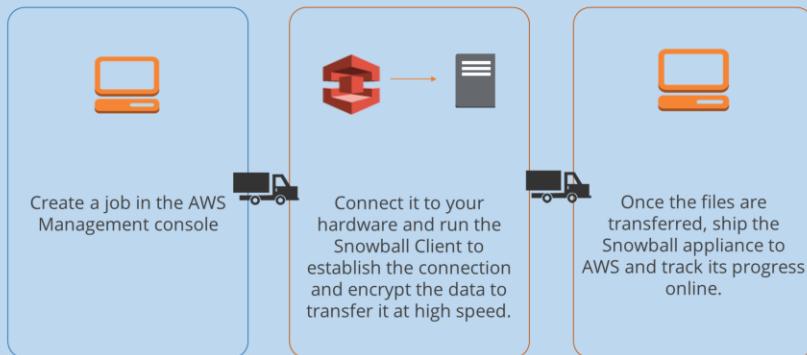
Snowball is a petabyte-scale data transport solution that uses secure appliances to transfer large amounts of data into and out of the AWS Cloud.

Snowball removes the need to transfer large amounts of data over the Internet. Traditional transfer methods take huge amounts of time, incur high network costs, and can have security issues.

Snowball is simple, fast, and secure and can be as little as 20 percent of the cost of Internet.

## Import/Export Snowball (Contd.)

Snowball is a TB appliance that AWS ships to you to transfer your data.



Snowball is a TB appliance that AWS ship to you. You attach to your hardware and run the snowball client to establish a connection and encrypt and transfer the data onto it at high speed.

As of January 2017 it's either 50 or 80TB, depending on the region.

Once the transfer is complete the E Ink shipping label will automatically update and you simply send it back to AWS. You can track it's progress online.

With Snowball, you don't need to write any code or purchase any hardware to transfer your data. You need to create a job in the AWS Management Console and a Snowball appliance will be shipped to you. Once it arrives, attach the appliance to your local network, download and run the Snowball client to establish a connection, and then use the client to select the file directories that you want to transfer to the appliance. The client will then encrypt and transfer the files to the appliance at high speed. When the transfer is complete and the appliance is ready to be returned, the E Ink shipping label will automatically update and you can track the job status via [Amazon Simple Notification Service \(SNS\)](#), text messages, or directly in the Console.

## AWS Snowball Edge

01

It is an updated version of Snowball with on-board storage and compute power for select AWS capabilities.

02

It is a 100 TB device.

03

In addition to transferring day-to-day data, it can also undertake local processing and Edge computing workloads.



AWS Snowball Edge

Snowball Edge is an update version of the Snowball that has on-board storage and compute power for select AWS capabilities

As of Jan 2017 it's a 100TB device.

In addition to transferring data to AWS, Snowball Edge can undertake local processing and edge-computing workloads.

## AWS Snowmobile

01

It is an Exabyte scale data transfer service used to move extremely large amounts of data to AWS.

02

It can be used to transfer up to 100PB of data.

03

It is semi-trailer truck that can be used to move entire data centers to AWS.



AWS Snowmobile

AWS Snowmobile is an Exabyte-scale data transfer service used to move extremely large amounts of data to AWS.

You can transfer up to 100PB per Snowmobile, a 45-foot long ruggedized shipping container, pulled by a semi-trailer truck.

## Import/Export Snowball Uses

Cloud Migration

Disaster Recovery

Datacenter Decommission

Content Distribution

### Functions of Snowball:

- Cloud Migration: If you have huge amounts of data that you need to move to AWS, then Snowball is a fast and cost effective way of achieving it.
- Disaster Recovery: If you need to quickly get hold of a large amount of data stored in S3, then you can use Snowball to transfer the data back to your site.
- Datacenter Decommission: Securely store data while you decommission your data center; the data can be moved to S3 temporarily, or permanently.
- Content Distribution: If you regularly have to send large amounts of data to clients or customers, then Snowball can be sent directly from AWS to them.

## Amazon S3 Transfer Acceleration

Amazon S3 Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your client and your Amazon S3 bucket.

Amazon S3 Transfer Acceleration enables fast, easy, and secure transfer of files over long distances between your client and your Amazon S3 bucket.

Transfer acceleration is achieved by copying data into S3 via the closest edge locations rather than directly over the Internet to the specified AWS location.

Transfer acceleration is higher when the source is farther from the destination, when there is more available bandwidth, and/or when the object size is bigger. This way the data travels over an optimized path. You are only charged if transfer acceleration is achieved.

**Knowledge Check**

**What is the capacity of AWS Snowball?**

1

70 Terabytes

50 Petabytes

80 Terabytes and 50 Terabytes

80 Terabytes and 40 Terabytes

**What is the capacity of AWS Snowball?**

1

70 Terabytes

50 Petabytes

80 Terabytes and 50 Terabytes

80 Terabytes and 40 Terabytes

d

**AWS Snowball is now available in 80 Terabytes and 50 terabytes. It was earlier available in only 80 Terabytes. To Achieve Petabyte scale transfers, you need to send multiple snowball appliances.**

## **Amazon S3 Best Practices**

In this section, you'll learn about the Amazon S3 best practices.

## AWS S3 Best Practices

Versioning and Lifecycle Management

Encryption

Detailed Billing Reports

Restrict Deletes

Maximize Performance

1. Enable versioning to protect your data and configure lifecycle policies to move your old versions to Glacier to save storage costs.
2. Configure old versions to be deleted at a suitable time in the future.

### Versioning and Lifecycle Management:

- Enable versioning to protect your data and configure lifecycle policies to move your old versions to Glacier to save storage costs.
- Configure old versions to be deleted at a suitable time in the future.

## AWS S3 Best Practices (Contd.)

Versioning and Lifecycle Management

Encryption

Detailed Billing Reports

Restrict Deletes

Maximize Performance

1. SSE with Amazon S3 managed keys: check the box to encrypt your data at rest.
2. SSE with customer provided keys: you manage keys and provide them for PUTS and GETS.
3. SSE with AWS KMS: the keys are managed centrally by AWS KMS.

### Encryption:

- SSE with Amazon S3 managed keys—check the box to encrypt your data at rest.
- SSE with customer provided keys—you manage keys and provide them for PUTS and GETS functions.
- SSE with AWS KMS—the keys are managed centrally by AWS KMS.

## AWS S3 Best Practices (Contd.)

Versioning and Lifecycle Management

Encryption

Detailed Billing Reports

Restrict Deletes

Maximize Performance

1. They provide object counts, storage GB, requests, and data transfer usage down to the bucket level.
2. You can turn them on via the preferences page in the Billing and Costs Management console.
3. They can be delivered to an S3 bucket of your choice.

### Detailed Billing Reports:

- They provide object counts, storage GB, requests, and data transfer usage down to the bucket level.
- You can turn them on via the preferences page in the Billing and Costs Management console.
- It can be delivered to the S3 bucket of your choice.

## AWS S3 Best Practices (Contd.)

Versioning and Lifecycle Management

1. Remove delete permissions from the bucket policy.
2. Enable MFA for deletes.

Encryption

Detailed Billing Reports

Restrict Deletes

Maximize Performance

### Restrict Deletes:

- Remove delete permissions from the bucket policy
- Enable MFA for deletes

## AWS S3 Best Practices (Contd.)

Versioning and Lifecycle Management

Encryption

Detailed Billing Reports

Restrict Deletes

Maximize Performance

1. Multipart upload provides parallelism; it is encouraged for objects larger than 100MB.
2. Transfer acceleration enables fast, easy, and secure transfers of files over long distances.

### Maximize Performance:

- Multipart upload provides parallelism; it is encouraged for objects larger than 100MB.
- It supports transfer acceleration.

## **Amazon S3 Costs**

In this section, you'll learn about the costs associated with Amazon S3.

## Amazon S3 Costs

The following costs are associated with Amazon S3:

|    |  |
|----|--|
| 01 | Storage costs per storage type   |
| 02 | Discounts per GB as the amount of storage you use increases                                  |
| 03 | Cost per 1000 requests for PUT, COPY, POST, LIST, and lifecycle transitions into Standard-IA |
| 04 | Cost per 10000 GET requests  |
| 05 | Data transfer out to Internet  |
| 06 | Data transfer between AWS regions  |

Following are the costs associated with Amazon S3:

- Storage costs per storage type
- Discounts per GB as the amount of storage you use increases
- Cost per 1000 requests for PUT, COPY, POST, LIST and lifecycle transitions into Standard-IA
- Cost per 10000 GET requests
- Data transfer out to Internet
- Data transfer between AWS regions

## Amazon S3 Costs (Contd.)

The following cost is associated with AWS Transfer Acceleration:

Data in/out to Internet and between AWS Regions

The following cost is associated with AWS Transfer Acceleration:

- Data transfer in/out to Internet and between AWS Regions

### Amazon S3 Costs (Contd.)

The following costs are associated with AWS CloudFront:

- |    |                                      |
|----|--------------------------------------|
| 01 | Data transfer out to Internet/Origin |
| 02 | Cost per 10000 requests              |

The following costs are associated with AWS CloudFront:

- Data transfer out to Internet/Origin
- Cost per 10000 requests

| <b>S3 vs EFS vs EBS</b> |  |                              |   |
|-------------------------|--|------------------------------|---|
| <b>Feature</b>          | <b>S3</b>  | <b>EFS</b>                   | <b>EBS</b>                                    |
| Storage Size            | No limit on the number of objects  | No limitations               | Max 16TiB                                     |
| File Size Limitation    | 0 bytes – 5 TB   | Max file size 52TiB          | No limitation                                 |
| Data Throughput         | Multipart upload recommended for the objects > 100MB                               | Default throughput of 3GB    | Variable depending on disk type               |
| Data Access             | Accessible from anywhere   | Can be accessed concurrently | Limited to a single EC2 instance              |
| Operating System        | N/A  | Windows not supported        | All operating systems                         |
| AZ Failure              | Can withstand up to two concurrent AZ failures.<br>Can replicate to other regions. | Can survive one AZ failure   | Cannot withstand AZ failure without snapshots |

This table might look familiar, we saw it earlier on in the course in the compute section.

It's been modified to describe how S3 compares to EFS and EBS to help you identify when you would use each service.

Firstly, S3 is object storage, whereas EFS is filesystem storage and EBS is block storage.

Like EFS, S3 has no limit to the amount of storage you can use.

And also like EFS, S3 has a file size limitation, which is 5TB. Notice that AWS are getting fast and loose with listing sizes switching between tebibytes and terabytes. The largest object that can be uploaded in a single PUT is 5 gigabyte, after that size you should be using the multipart upload, which is recommended for objects > 100MB

S3 is accessible from absolutely anywhere as long as the correct permissions have been granted.

S3 can withstand up to two concurrent AZ failures, but you can also replicate your buckets to other regions.

**Practice Assignment: Create an Amazon S3 bucket**

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

1. Frequently accessed critical data: This data needs to be always available and needs to be protected against accidental deletes.
2. Limited period critical data: This data is critical only for the first 30 days, then it is only accessed periodically for another 60 days. After that, it is rarely accessed.
3. Archive data – This data is older and needs to be archived for auditing purposes.

Create three buckets for each of the data categories and configure Versioning and Lifecycle Management where appropriate.

- Amazon S3, provides developers and IT teams with secure, durable, highly-scalable cloud storage.
- Amazon S3 provides different storage options with various features.
- S3 allows you define how Amazon manages objects during their lifetime.
- All data stored in Amazon S3 is secure by default as only bucket and object owners have access to the Amazon S3 resources they create.
- Snowball is a petabyte-scale data transport solution that uses secure appliances to transfer large amounts of data into and out of the AWS cloud.

### Knowledge Check

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

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Create three buckets for each of the data categories and configure Versioning and Lifecycle Management where appropriate.

**Which object encryption is NOT available in Amazon S3?**

1

Server-side encryption using customer keys

Server-side encryption using Amazon keys

Client-side encryption using customer keys

Cloud HSM

**Which object encryption is NOT available in Amazon S3?**

1

Server-side encryption using customer keys

Server-side encryption using Amazon keys

Client-side encryption using customer keys

Cloud HSM

d

CloudHSM is not a valid encryption method for Amazon S3.

2

**What could be the cause of an error while creating a bucket called "productionbucket"?**

You need to try creating it in a different region.

The bucket name needs to contain a ":".

The bucket name needs to contain a number.

Someone else might be using the bucket name.

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

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The bucket name needs to contain a number.

Someone else might be using the bucket name.

**d**

**Bucket names need to be unique; this bucket name is probably already taken.**

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

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3. Archived data—This data is older and needs to be archived for auditing purposes.

Create three buckets for each of the data categories and configure Versioning and Lifecycle Management where appropriate.

3 Which of the following will be the URL for a bucket called "simplilearn" that was created in the US-EAST-1 region?

<https://s3-us-east-1.amazonaws.com/simplilearn>

<https://s3-us-west-1.amazonaws.com/simplilearn>

<https://s3-simplilearn-us-west-1.amazonaws.com>

<https://s3-simplilearn.amazonaws.com/us-east-1>

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

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- <https://s3-us-west-1.amazonaws.com/simplilearn>
- <https://s3-simplilearn-us-west-1.amazonaws.com>
- <https://s3-simplilearn.amazonaws.com/us-east-1>

a

The correct format is s3-.amazonaws.com/

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

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3. Archived data—This data is older and needs to be archived for auditing purposes.

Create three buckets for each of the data categories and configure Versioning and Lifecycle Management where appropriate.

4

**Your company needs to migrate 60TB of data to AWS. What is the quickest way to do this?**

Transfer over your existing 10Mbps Internet connection.

Transfer the data using AWS import/export Snowball.

Transfer the data to tapes and send them to AWS.

Make use of Cross Region Replication between S3 and your data center.

Your client wants to move all its data to Amazon S3. The company has categorized its data into the following:

1. Frequently accessed critical data—This data needs to be always available and protected against accidental deletes.
2. Limited period critical data—This data is critical only for the first 30 days, then it is only accessed periodically for another 60 days, after that it is rarely accessed.
3. Archived data—This data is older and needs to be archived for auditing purposes.

Create three buckets for each of the data categories and configure Versioning and Lifecycle Management where appropriate.

4

**Your company needs to migrate 60TB of data to AWS. What is the quickest way to do this?**

Transfer over your existing 10Mbps Internet connection.

Transfer the data using AWS import/export Snowball.

Transfer the data to tapes and send them to AWS.

Make use of Cross Region Replication between S3 and your data center.

b

**AWS import/export Snowball is the fastest and most cost-effective way to transfer data to AWS.**

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5      Which Amazon S3 storage type is most suitable to store audit data cost effectively for compliance purposes?

Glacier

Standard

Standard - IA

RRS

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Amazon Glacier is the lowest cost-storage solution, but it has a recovery period of 5 hours.

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