

# S3 - 101



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What is S3?



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**S3 provides developers and IT teams with secure, durable, highly-scalable object storage. Amazon S3 is easy to use, with a simple web services interface to store and retrieve any amount of data from anywhere on the web.**

## What is S3?



**S3 is a safe place to store your files.**

**It is Object based storage.**

**The data is spread across multiple devices and facilities**

**Objects: Videos, Images , PDF files, flat files.**

**S3 is not a place where you will install OS or run a Database.**

## S3 - The Basics



- S3 is Object based i.e. allows you to upload files.
- Files can be from 0 Bytes to 5 TB.
- There is unlimited storage
- Files are stored in Buckets.
- S3 is a universal namespace, that is, names must be unique globally.
- <https://s3-eu-west-1.amazonaws.com/acloudguru>
- When you upload a file to S3 you will receive a HTTP 200 code if the upload was successful.

- Read after Write consistency for PUTS of new Objects
- Eventual Consistency for overwrite PUTS and Deletes (can take some time to propagate)

**1<sup>st</sup> point means: If we put new data to S3, we can immediately read the data as soon as we put the data in S3.**

**2<sup>nd</sup> point means: If we update or delete any existing data in S3, it can take some time to propagate. Update or delete in S3 is atomic, this mean we will be able to read the existing data or updated data, there is no data inconsistency or partial update.**

- S3 is Object based. Objects consist of the following;
  - Key (This is simply the name of the object)
  - Value (This is simply the data and is made up of a sequence of bytes).
  - Version ID (Important for versioning)
  - Metadata (Data about the data you are storing)
  - Subresources
    - Access Control Lists
    - Torrent

## S3 - The Basics



- Built for 99.99% availability for the S3 platform.
- Amazon Guarantee 99.9% availability
- Amazon guarantees 99.999999999% durability for S3 information. (Remember 11 x 9's).
- Tiered Storage Available
- Lifecycle Management
- Versioning
- Encryption
- Secure your data using Access Control Lists and Bucket Policies

## S3 - Storage Tiers/Classes



- S3 - 99.99% availability, 99.99999999% durability, stored redundantly across multiple devices in multiple facilities and is designed to sustain the loss of 2 facilities concurrently.
- S3 - IA (Infrequently Accessed) For data that is accessed less frequently, but requires rapid access when needed. Lower fee than S3, but you are charged a retrieval fee.
- Reduced Redundancy Storage - Designed to provide 99.99% durability and 99.99% availability of objects over a given year.
- Glacier - Very cheap, but used for archival only. It takes 3 - 5 hours to restore from Glacier.

## S3 - Storage Tiers/Classes



	Standard	Standard - Infrequent Access	Reduced Redundancy Storage
Durability	99.999999999%	99.999999999%	99.99%
Availability	99.99%	99.9%	99.99%
Concurrent facility fault tolerance	2	2	1
SSL support	Yes	Yes	Yes
First byte latency	Milliseconds	Milliseconds	Milliseconds
Lifecycle Management Policies	Yes	Yes	Yes

## What is Glacier?



**Glacier is an extremely low-cost storage service for data archival. Amazon Glacier stores data for as little as \$0.01 per gigabyte per month, and is optimized for data that is infrequently accessed and for which retrieval times of 3 to 5 hours are suitable.**

# S3 vs Glacier



	Standard	Standard - IA	Amazon Glacier
Designed for Durability	99.99999999%	99.99999999%	99.99999999%
Designed for Availability	99.99%	99.9%	N/A
Availability SLA	99.9%	99%	N/A
Minimum Object Size	N/A	128KB*	N/A
Minimum Storage Duration	N/A	30 days	90 days
Retrieval Fee	N/A	per GB retrieved	per GB retrieved**
First Byte Latency	milliseconds	milliseconds	select minutes or hours***
Storage Class	object level	object level	object level
Lifecycle Transitions	yes	yes	yes

# S3 - Charges

- Charged for;
  - Storage
  - Requests
  - Storage Management Pricing
  - Data Transfer Pricing
  - Transfer Acceleration

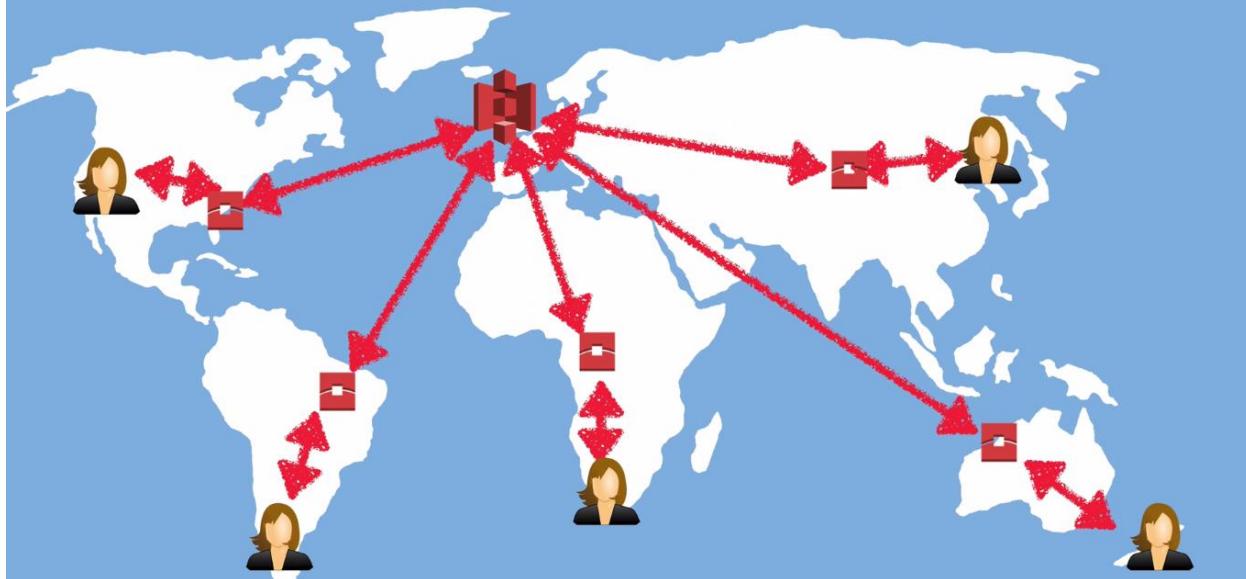
## What is S3 Transfer Acceleration?



**Amazon S3 Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your end users 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.**

## S3 Transfer Acceleration



## S3 - Exam Tips for S3 101



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## S3 - Exam Tips for S3 101



- S3 Storage Classes/Tiers
  - S3 (durable, immediately available, frequently accessed)
  - S3 - IA (durable, immediately available, infrequently accessed)
  - S3 - Reduced Redundancy Storage (data that is easily reproducible, such as thumb nails etc).
- Glacier - Archived data, where you can wait 3 - 5 hours before accessing.

# S3 - Exam Tips for S3 101



- Remember the core fundamentals of an S3 object;
  - Key (name)
  - Value (data)
  - Version ID
  - Metadata
  - Subresources
  - ACL
  - Torrent

## S3 - Exam Tips for S3 101



- Object based storage only (for files).
- **Not suitable to install an operating system on.**
- Successful uploads will generate a HTTP 200 status code.

S3 101

Read the S3 FAQ before doing the exam!



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- Read the S3 FAQ before taking the exam. It comes up A LOT!

## Hand On 01

CREATE AN S3 BUCKET - LAB

### Create an S3 Bucket - Exam Tips



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- Buckets are a universal name space
- Upload an object to S3 receive a HTTP 200 Code
- S3, S3 - IA, S3 Reduced Redundancy Storage
- Encryption
  - Client Side Encryption
  - Server Side Encryption
    - Server side encryption with Amazon S3 Managed Keys (SSE-S3)
    - Server side encryption with KMS (SSE-KMS)
    - Server side encryption with Customer Provided Keys (SSE-C)
- Control access to buckets using either a bucket ACL or using Bucket Policies
- BY DEFAULT BUCKETS ARE PRIVATE AND ALL OBJECTS STORED INSIDE THEM ARE PRIVATE

## S3 - Versioning Lab



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- Stores all versions of an object (including all writes and even if you delete an object)
- Great backup tool.
- Once enabled, Versioning cannot be disabled, only suspended.
- Integrates with Lifecycle rules
- Versioning's MFA Delete capability, which uses multi-factor authentication, can be used to provide an additional layer of security.

## Cross Region Replication - Lab





- Versioning must be enabled on both the source and destination buckets.
- Regions must be unique.
- Files in an existing bucket are not replicated automatically. All subsequent updated files will be replicated automatically.
- You cannot replicate to multiple buckets or use daisy chaining (at this time.)
- Delete markers are replicated.
- Deleting individual versions or delete markers will not be replicated.
- Understand what Cross Region Replication is at a high level.

If we copy any existing object from one bucket to other using cli, then only objects of the bucket will get copied to destination bucket. Permission defined for the object in source bucket will not be replicated.



# Lifecycle Management, IA S3 & Glacier Lab



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## S3 - Lifecycle Management Lab

00:49 Lecture 17



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- Can be used in conjunction with versioning.
- Can be applied to current versions and previous versions
- Following actions can now be done;
  - Transition to the Standard - Infrequent Access Storage Class (128Kb and 30 days after the creation date).
  - Archive to the Glacier Storage Class (30 days after IA, if relevant)
  - Permanently Delete

## What is a CDN



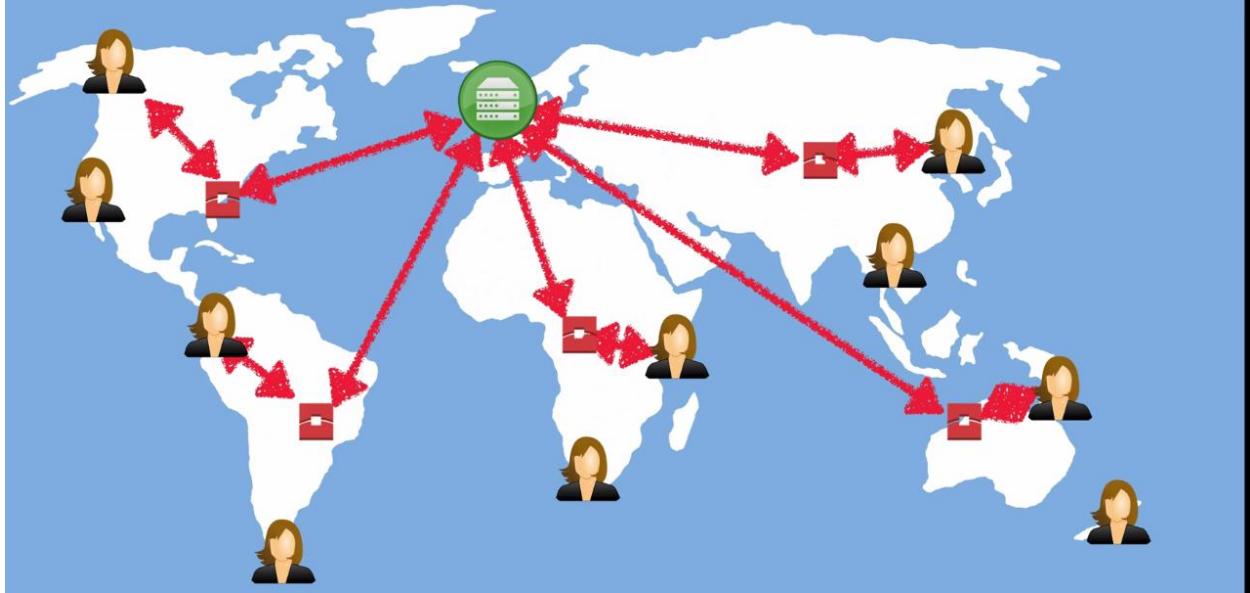
**A content delivery network (CDN) is a system of distributed servers (network) that deliver webpages and other web content to a user based on the geographic locations of the user, the origin of the webpage and a content delivery server.**

## CloudFront - Key Terminology

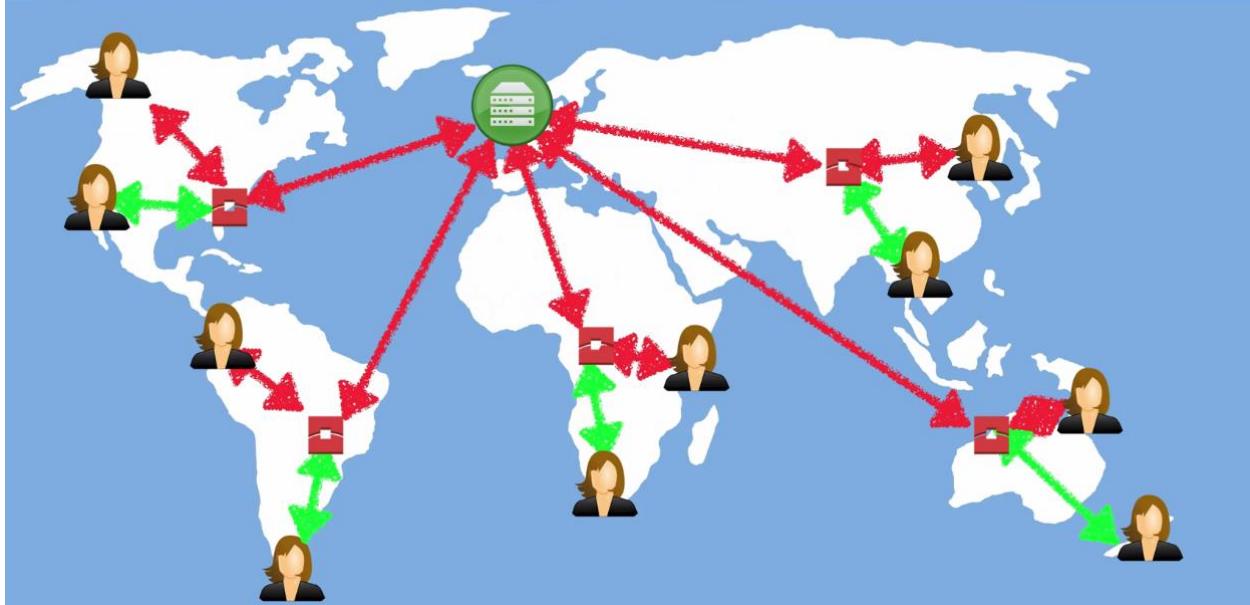


- Edge Location - This is the location where content will be cached. This is separate to an AWS Region/AZ
- Origin - This is the origin of all the files that the CDN will distribute. This can be either an S3 Bucket, an EC2 Instance, an Elastic Load Balancer or Route53.
- Distribution - This is the name given the CDN which consists of a collection of Edge Locations.

## What is a CDN



## What is a CDN



## What is CloudFront



**Amazon CloudFront is optimized to work with other Amazon Web Services, like Amazon Simple Storage Service (Amazon S3), Amazon Elastic Compute Cloud (Amazon EC2), Amazon Elastic Load Balancing, and Amazon Route 53. Amazon CloudFront also works seamlessly with any non-AWS origin server, which stores the original, definitive versions of your files.**



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## CloudFront - Key Terminology



- Web Distribution - Typically used for Websites.
- RTMP - Used for Media Streaming.

## CloudFront - Exam Tips



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## CloudFront - Exam Tips



- Edge locations are not just READ only, you can write to them too. (ie put an object on to them).
- Objects are cached for the life of the TTL (Time To Live)
- You can clear cached objects, but you will be charged.

# CloudFront Lab - Creating our CDN



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Below are the different settings we have to do while setting up cloud front:

1. Origin setting:

Exam topic: One distribution can have multiple origin.

2. Default cache behavior setting:

Exam topic:

▼ ▲

**Restrict Viewer Access  
(Use Signed URLs or  
Signed Cookies)**

Yes  
 No

If you restrict viewer access, viewers must use CloudFront signed URLs or signed cookies to access your content. For more information, see [Serving Private Content through CloudFront](#) in the Amazon CloudFront Developer Guide.

i

3. Distribution setting:

# S3 - Security & Encryption



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We can secure S3 using BUCKET POLICIES and ACCESS CONTROL LIST.

Different type of Encryption:

Lecture 26 Security & Encryption

## Encryption



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- In Transit;
  - SSL/TLS
- At Rest
  - Server Side Encryption
    - S3 Managed Keys - **SSE-S3**
    - AWS Key Management Service, Managed Keys - **SSE-KMS**
    - Server Side Encryption With Customer Provided Keys - **SSE-C**
  - Client Side Encryption

# Storage Gateway



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Storage Gateway

Storage Gateway

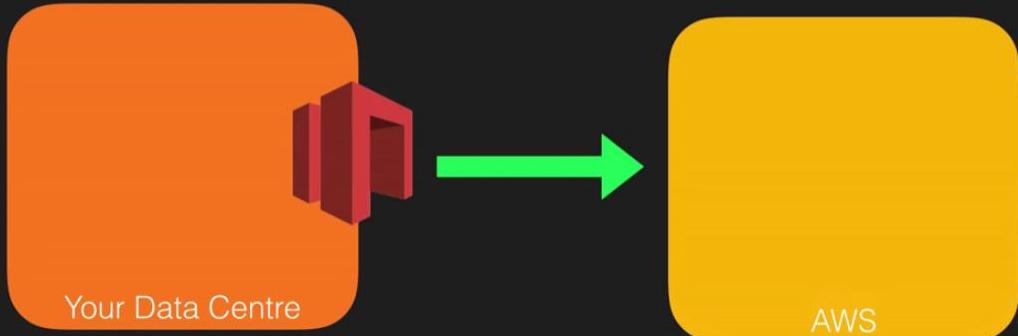


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AWS Storage Gateway is a service that connects an on-premises software appliance with cloud-based storage to provide seamless and secure integration between an organization's on-premises IT environment and AWS's storage infrastructure. The service enables you to securely store data to the AWS cloud for scalable and cost-effective storage.

## Storage Gateway



Storage Gateway

## Storage Gateway



AWS Storage Gateway's software appliance is available for download as a virtual machine (VM) image that you install on a host in your datacenter. Storage Gateway supports either VMware ESXi or Microsoft Hyper-V. Once you've installed your gateway and associated it with your AWS account through the activation process, you can use the AWS Management Console to create the storage gateway option that is right for you.

## Four Types of Storage Gateways



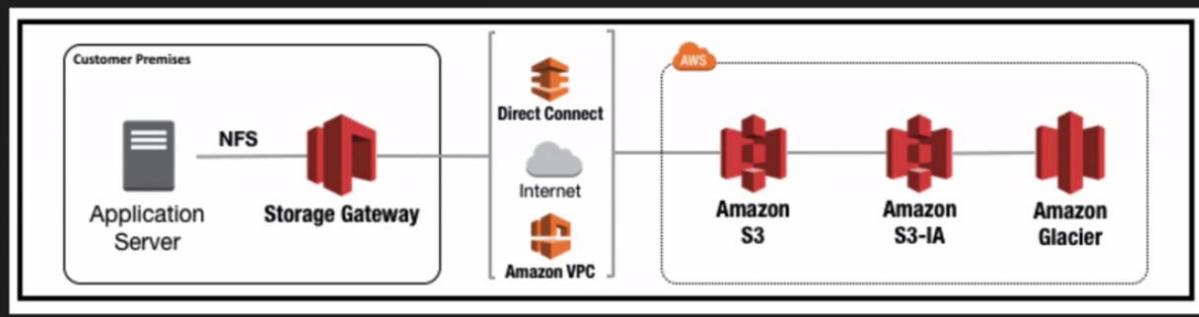
- File Gateway (NFS)
- Volumes Gateway (iSCSI)
  - Stored Volumes
  - Cached Volumes
- Tape Gateway (VTL)

### File Gateway



Files are stored as objects in your S3 buckets, accessed through a Network File System (NFS) mount point. Ownership, permissions, and timestamps are durably stored in S3 in the user-metadata of the object associated with the file. Once objects are transferred to S3, they can be managed as native S3 objects, and bucket policies such as versioning, lifecycle management, and cross-region replication apply directly to objects stored in your bucket.

### File Gateway



## Volume Gateway



The volume interface presents your applications with disk volumes using the iSCSI block protocol.

Data written to these volumes can be asynchronously backed up as point-in-time snapshots of your volumes, and stored in the cloud as Amazon EBS snapshots.

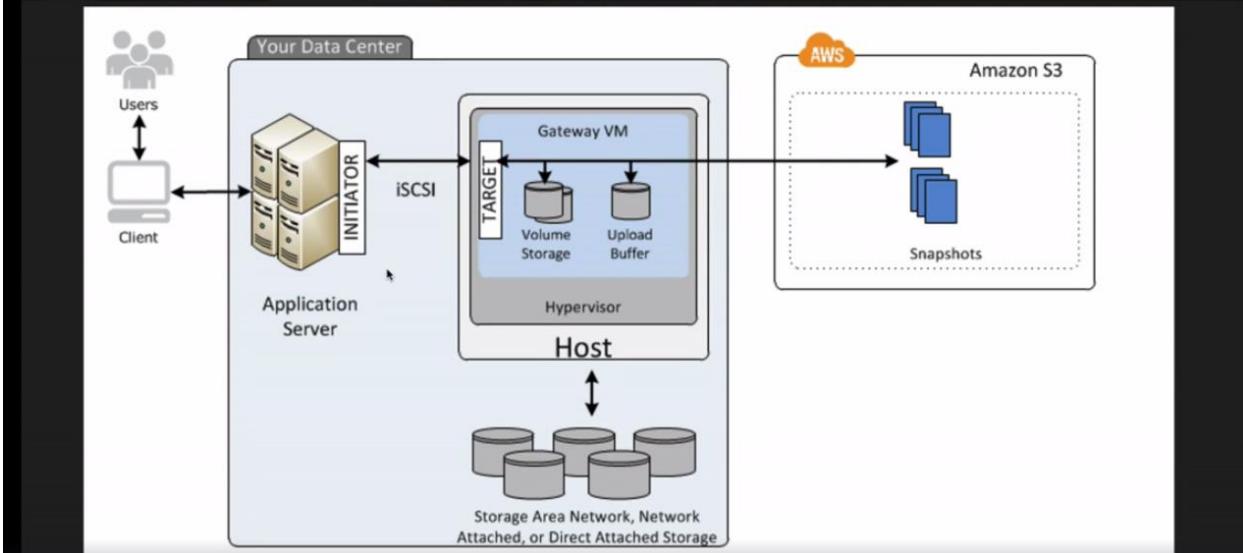
Snapshots are incremental backups that capture only changed blocks. All snapshot storage is also compressed to minimize your storage charges.

## Volume Gateway - Stored Volumes



Stored volumes let you store your primary data locally, while asynchronously backing up that data to AWS. Stored volumes provide your on-premises applications with low-latency access to their entire datasets, while providing durable, off-site backups. You can create storage volumes and mount them as iSCSI devices from your on-premises application servers. Data written to your stored volumes is stored on your on-premises storage hardware. This data is asynchronously backed up to Amazon Simple Storage Service (Amazon S3) in the form of Amazon Elastic Block Store (Amazon EBS) snapshots. 1 GB - 16 TB in size for Stored Volumes.

## Volume Gateway - Stored Volumes



## Volume Gateway - Cached Volumes

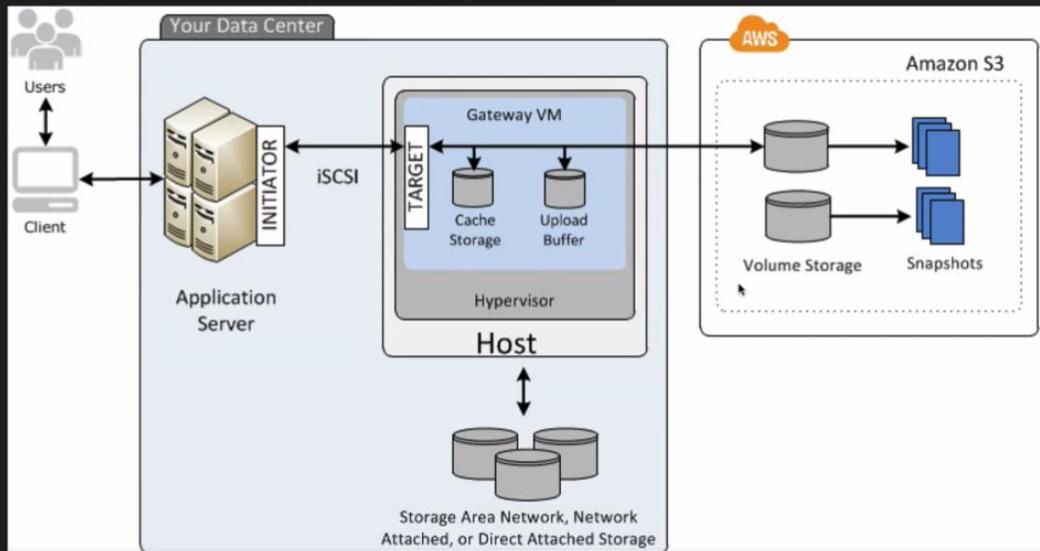


Cached volumes let you use Amazon Simple Storage Service (Amazon S3) as your primary data storage while retaining frequently accessed data locally in your storage gateway. Cached volumes minimize the need to scale your on-premises storage infrastructure, while still providing your applications with low-latency access to their frequently accessed data. You can create storage volumes up to 32 TiB in size and attach to them as iSCSI devices from your on-premises application servers. Your gateway stores data that you write to these volumes in Amazon S3 and retains recently read data in your on-premises storage gateway's cache and upload buffer storage. 1 GB - 32 TB in size for Cached Volumes.

## Volume Gateway - Cached Volumes



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## Volume Gateway - Tape Gateway

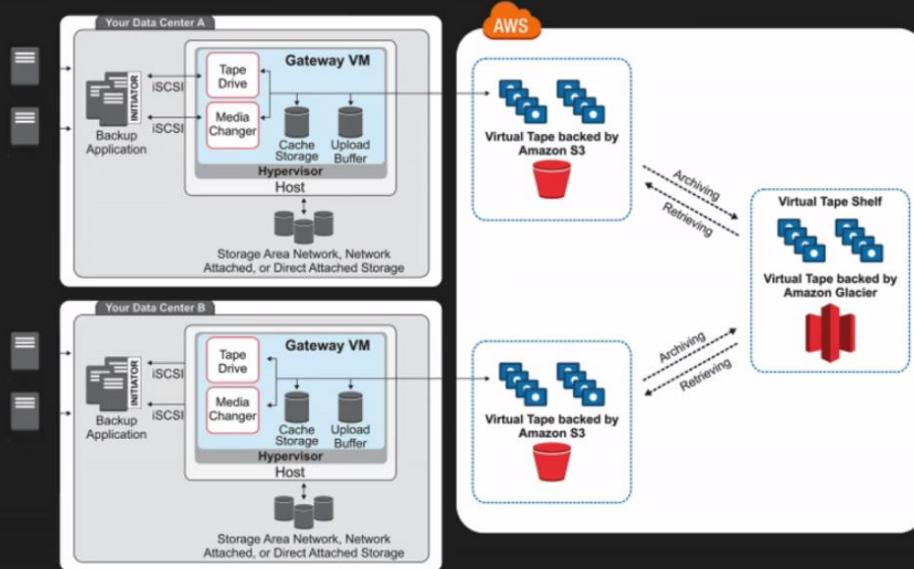
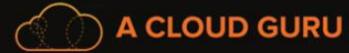


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Tape Gateway offers a durable, cost-effective solution to archive your data in the AWS Cloud. The VTL interface it provides lets you leverage your existing tape-based backup application infrastructure to store data on virtual tape cartridges that you create on your tape gateway. Each tape gateway is preconfigured with a media changer and tape drives, which are available to your existing client backup applications as iSCSI devices. You add tape cartridges as you need to archive your data. Supported by NetBackup, Backup Exec, Veeam etc.

## Volume Gateway - Tape Gateway



## Exam Tips



- File Gateway - For flat files, stored directly on S3.
- Volume Gateway:
  - Stored Volumes - Entire Dataset is stored on site and is asynchronously backed up to S3.
  - Cached Volumes - Entire Dataset is stored on S3 and the most frequently accessed data is cached on site.
- Gateway Virtual Tape Library (VTL)
  - Used for backup and uses popular backup applications like NetBackup, Backup Exec, Veeam etc.

# Snowball



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Snowball

Import/Export Disk



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AWS Import/Export Disk accelerates moving large amounts of data into and out of the AWS cloud using portable storage devices for transport. AWS Import/Export Disk transfers your data directly onto and off of storage devices using Amazon's high-speed internal network and bypassing the Internet.

Snowball

# Types Of Snowballs

- Snowball
- Snowball Edge
- Snowmobile



## Snowball



Snowball is a petabyte-scale data transport solution that uses secure appliances to transfer large amounts of data into and out of AWS. Using Snowball addresses common challenges with large-scale data transfers including high network costs, long transfer times, and security concerns. Transferring data with Snowball is simple, fast, secure, and can be as little as one-fifth the cost of high-speed Internet.

80TB snowball in all regions. Snowball uses multiple layers of security designed to protect your data including tamper-resistant enclosures, 256-bit encryption, and an industry-standard Trusted Platform Module (TPM) designed to ensure both security and full chain-of-custody of your data. Once the data transfer job has been processed and verified, AWS performs a software erasure of the Snowball appliance.

## Snowball Edge



AWS Snowball Edge is a 100TB data transfer device with on-board storage and compute capabilities. You can use Snowball Edge to move large amounts of data into and out of AWS, as a temporary storage tier for large local datasets, or to support local workloads in remote or offline locations.

Snowball Edge connects to your existing applications and infrastructure using standard storage interfaces, streamlining the data transfer process and minimizing setup and integration. Snowball Edge can cluster together to form a local storage tier and process your data on-premises, helping ensure your applications continue to run even when they are not able to access the cloud.

## 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. Snowmobile makes it easy to move massive volumes of data to the cloud, including video libraries, image repositories, or even a complete data center migration. Transferring data with Snowmobile is secure, fast and cost effective.



## Exam Tips



- Understand what Snowball is
- Understand what Import Export is
- Snowball Can
  - Import to S3
  - Export from S3

# S3 Transfer Acceleration



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DynamoDB 101

What is S3 Transfer Acceleration?

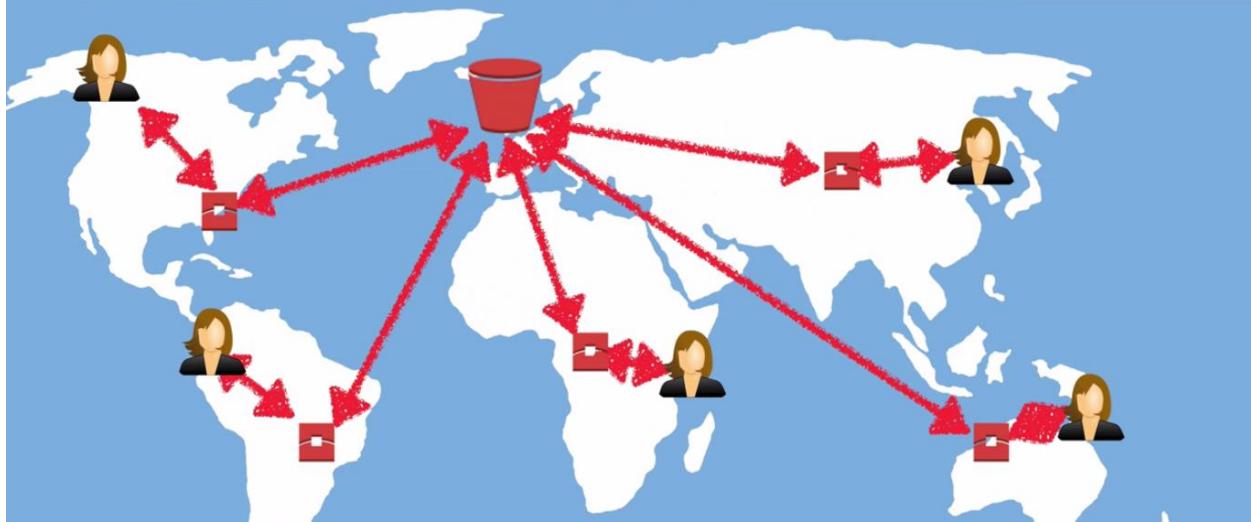


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**S3 Transfer Acceleration utilises the CloudFront Edge Network to accelerate your uploads to S3. Instead of uploading directly to your S3 bucket, you can use a distinct URL to upload directly to an edge location which will then transfer that file to S3. You will get a distinct URL to upload to;**

[acloudguru.s3-accelerate.amazonaws.com](https://acloudguru.s3-accelerate.amazonaws.com)

## S3 Transfer Acceleration



### Hosting Static Web site using S3:

Common exam question:

Identify endpoint url of static web site hosted using S3:

`http://bucketname.s3-website.regionid.amazonaws.com`

example: <http://birjutransferaccelerate.s3-website.ap-south-1.amazonaws.com>

Note: Hosting static website in S3 is highly scalable.

# Storage Summary



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S3 - Exam Tips for S3 101



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- Remember the core fundamentals of S3;
  - Key (name)
  - Value (data)
  - Version ID
  - Metadata
  - Access control lists

## S3 - Exam Tips for S3 101



- Object based storage only (for files).
- **Not suitable to install an operating system on.**

## S3 - Versioning



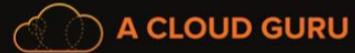
- Stores all versions of an object (including all writes and even if you delete an object)
- Great backup tool.
- Once enabled, Versioning cannot be disabled, only suspended.
- Integrates with Lifecycle rules
- Versioning's MFA Delete capability, which uses multi-factor authentication, can be used to provide an additional layer of security.
- Cross Region Replication, requires versioning enabled on the source bucket.

## S3 - Lifecycle Management



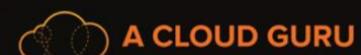
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- Objects are cached for the life of the TTL (Time To Live)
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## Securing your buckets



- By default, all newly created buckets are PRIVATE
- You can setup access control to your buckets using;
  - Bucket Policies
  - Access Control Lists
- S3 buckets can be configured to create access logs which log all requests made to the S3 bucket. This can be done to another bucket.



## Encryption

- In Transit;
  - SSL/TLS
- At Rest
  - Server Side Encryption
    - S3 Managed Keys - **SSE-S3**
    - AWS Key Management Service, Managed Keys - **SSE-KMS**
    - Server Side Encryption With Customer Provided Keys - **SSE-C**
  - Client Side Encryption



## Exam Tips

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## Snowball Exam Tips

- Snowball
- Snowball Edge
- Snowmobile

Snowball

## Exam Tips



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## Exam Tips - S3 Transfer Acceleration



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- You can speed up transfers to S3 using S3 transfer acceleration. This costs extra, and has the greatest impact on people who are in far away location.

## Exam Tips - S3 Static Websites



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- You can use S3 to host static websites
- Serverless
- Very cheap, scales automatically.
- STATIC only, cannot host dynamic sites.

S3 101

## Last Few Tips



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- Write to S3 - HTTP 200 code for a successful write.
- You can load files to S3 much faster by enabling multipart upload.
- Read the S3 FAQ before taking the exam. It comes up A LOT!

Question 1:

S3 has what consistency model for PUTS of new objects

- Read After Write Consistency

Question 2:

What is AWS Storage Gateway?

- It's an on-premise virtual appliance that can be used to cache S3 locally at a customers site.

Question 3:

One of your users is trying to upload a 7.5GB file to S3 however they keep getting the following error message - "Your proposed upload exceeds the maximum allowed object size.". What is a possible solution for this?

- Design your application to use the multi-part upload API for all objects

Question 4:

What does RRS stand for when talking about S3?

- Relational Reaction Storage

- Reduced Redundancy Storage

Question 5:

You have been asked by your company to create an S3 bucket with the name "acloudguru1234" in the EU West region. What would be the URL for this bucket?

- <https://s3-eu-west-1.amazonaws.com/acloudguru1234>

Question 6:

What is Amazon Glacier?

- A tool that allows to "freeze" an EBS volume.
- An AWS service designed for long term data archival.

Question 7:

What does S3 stand for?

- Simple SQL Service
- Simple Storage Service

Question 8:

You are a solutions architect who works with a large digital media company. The company has decided that they want to operate within the Japanese region and they need a bucket called "testbucket" set up immediately to test their web application on. You log in to the AWS console and try to create this bucket in the Japanese region however you are told that the bucket name is already taken. What should you do to resolve this?

- Change your region to Korea and then create the bucket "testbucket".
- Raise a ticket with AWS and ask them to release the name "testbucket" to you.
- Bucketnames are global, not regional. This is a popular bucket name and is already taken. You should choose another bucket name.

Question 9:

What is the availability on RRS?

- 99.9%
- 99%
- 99.99%

Question 10:

What is the durability on RRS?

99.9%

99%

99.99%

Question 11:

What is the durability on S3?

99%

99.99%

99.99%

99.999999999%

Question 12:

**What is the availability on S3?**

99%

99.9%

99.99%

Question 13:

**What is the minimum file size that I can store on S3?**

1 Kb

1 Mb

1 Gb

1 Byte

Question 14:

The difference between S3 and EBS is that EBS is object based where as S3 is block based.

True

False

Question 15:

S3 has eventual consistency for which HTTP Methods?

PUTS of new Objects and DELETES

overwrite PUTS and DELETES

Question 16:

You work for a busy digital marketing company who currently store their data on premise. They are looking to migrate to AWS S3 and to store their data in buckets. Each bucket will be named after their individual customers, followed by a random series of letters and numbers. Once written to S3 the data is rarely changed, as it has already been sent to the end customer for them to use as they see fit. However on some occasions, customers may need certain files updated quickly, and this may be for work that has been done months or even years ago. You would need to be able to access this data immediately to make changes in that case, but you must also keep your storage costs extremely low. The data is not easily reproducible if lost. Which S3 storage class should you choose to minimise costs and to maximise retrieval times?

S3

S3 - IA

Question 17:

You need to use an Object based storage solution to store your critical, non replaceable data in a cost effective way. This data will be frequently updated and will need some form of version control enabled on it. Which S3 storage solution should you use?

S3

S3 - IA

S3 - RRS

Glacier

Question 18:

You work for a health insurance company who collects large amounts of documents regarding patients health records. This data will be used usually only once when assessing a customer and will then need to be securely stored for a period of 7 years. In some rare cases you may need to retrieve this data within 24 hours of a claim being lodged. Which storage solution would best suit this scenario? You need to keep your costs as low as possible.

S3

S3 - IA

S3 - RRS

Glacier

Question 19:

You run a meme creation website that frequently generates meme images. The original images are stored in S3 and the meta data about the memes are stored in DynamoDB. You need to store the memes themselves in a low cost storage solution. If an object is lost, you have created a Lambda function that will automatically recreate this meme using the original file in S3 and the metadata in Dynamodb. Which storage solution should you consider to store this non-critical, easily reproducible data on in the most cost effective solution as possible?

S3

S3 - IA

S3 - RRS

Question 20:

You run a popular photo sharing website that is based off S3. You generate revenue from your website via paid for adverts, however you have discovered that other websites are linking directly to the images on your site, and not to the HTML pages that serve the content. This means that people are not seeing your adverts and every time a request is made to S3 to serve an image it is costing your business money. How could you resolve this issue?

Use CloudFront to serve the static content.

Remove the ability for images to be served publicly to the site and then used signed URL's with expiry dates.

Use security groups to blacklist the IP addresses of the sites that do this.

Use EBS rather than S3 to store the content.