



Amazon
Web Services



AWS TRAINING SERVICES

PART 3

S3

Simple Storage Service

PhD.Vurğun Hacıyev

AWS Certifications

aws  certified
Updated May 2019

Professional

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



Associate

One year of experience solving problems and implementing solutions using the AWS Cloud

Architect



Foundational

Six months of fundamental AWS Cloud and industry knowledge

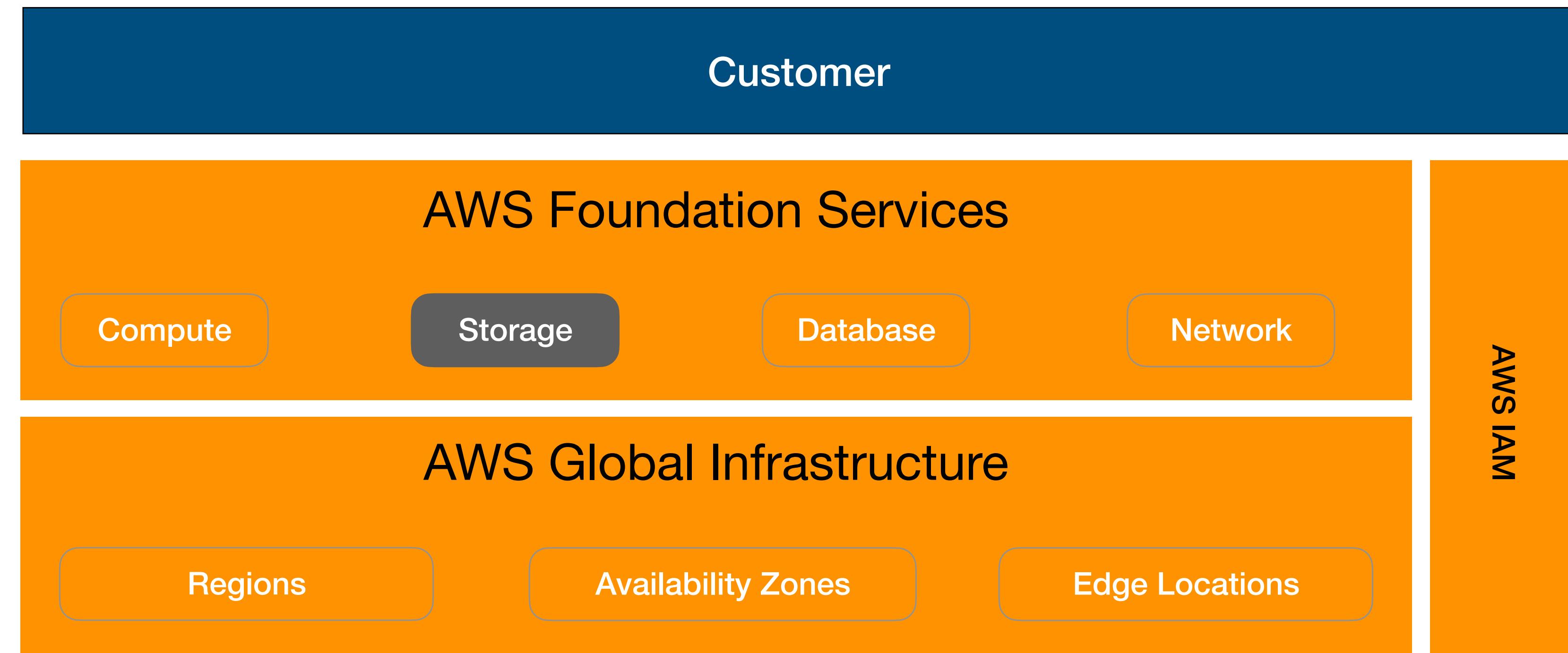
Cloud Practitioner

Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the [exam guide](#)



AWS (Amazon Web Services)

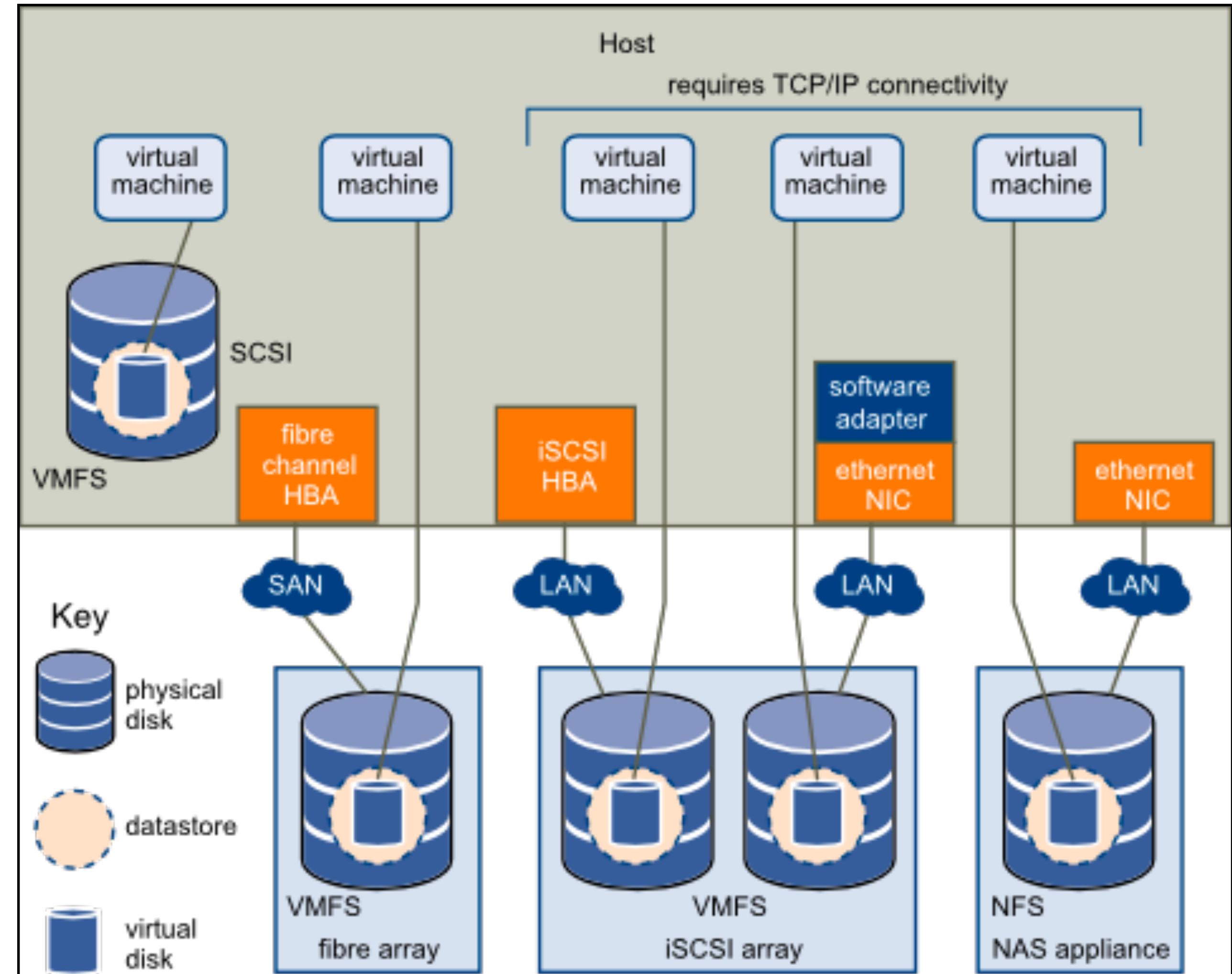




What is Storage Technology?

Types of Storage

- Primary Storage
- Secondary Storage
- Tertiary Storage
- Off-line Storage



Storage Technologies

Storage area network (SAN)—Block devices (virtual disk LUNs) on dedicated SANs often provide the highest level of disk performance and durability for both business-critical file data and database storage.

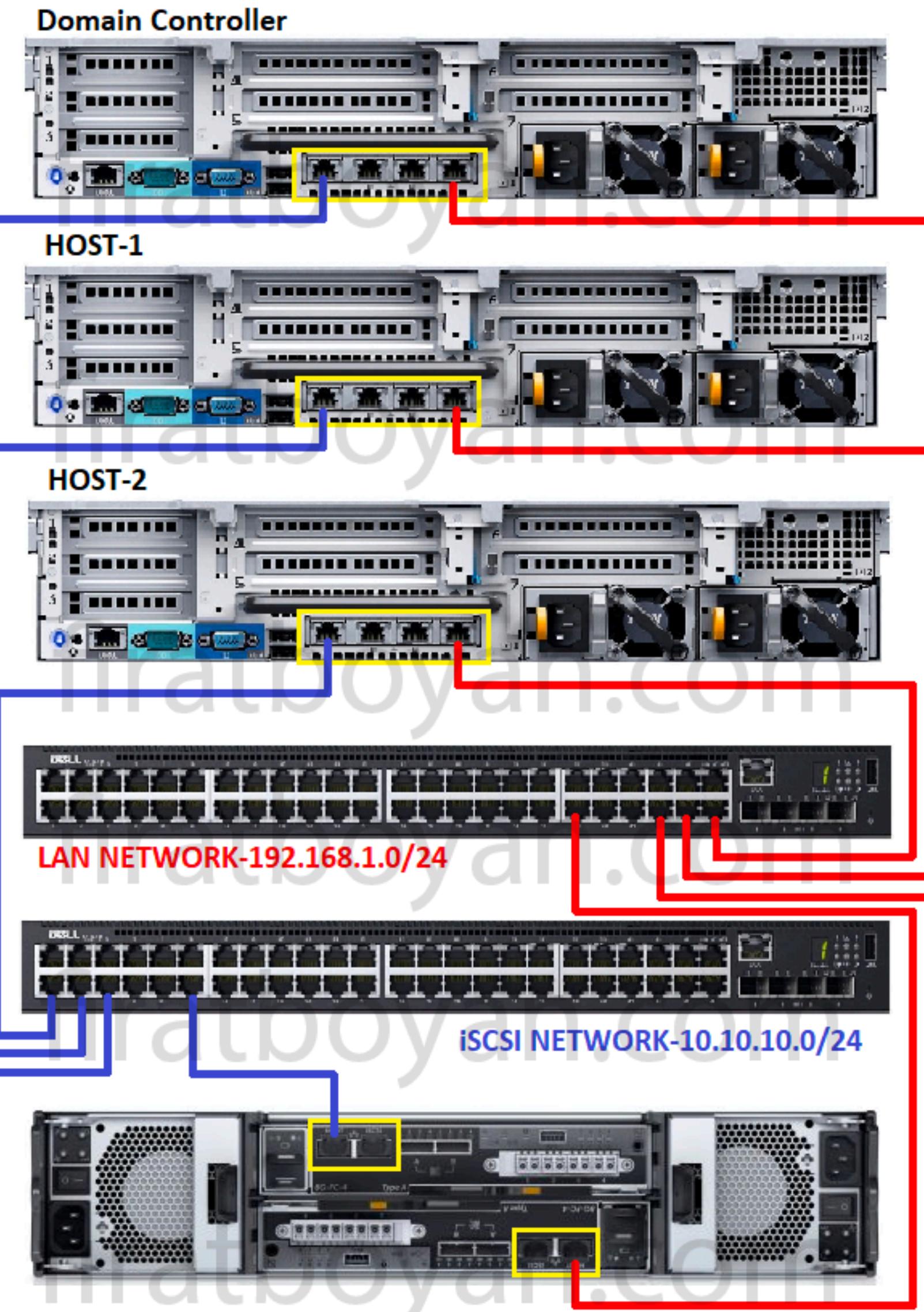
#connection types- ISCSI, FC

Direct-attached storage (DAS)—Local hard disk drives or arrays residing in each server provide higher performance than a SAN, but lower durability for temporary and persistent files, database storage, and operating system (OS) boot storage than a SAN.

#connection types- SAS,ISCSI,FC

Network attached storage (NAS)—NAS storage provides a file-level interface to storage that can be shared across multiple systems. NAS tends to be slower than either SAN or DAS.

#connection types- network



Throughput = IOPS * Block size



Types of Disk

- SATA
- SAS -10k 15K
- NSAS-7200 rpm
- SSD (read intensive, write intensive, mix)

Disk Arrays

- Controllers
- Access Ports
- Cache
- Disk Enclosure
- Power



- IOPS
- Throughput
- Latency



What is Storage?

Storage type

- **Block Storage**

In block storage, data is presented to your instance as a disk volume. It provides low, single-digit latency access to single Amazon EC2 instances. Elastic Block Store is popular, for example, for boot volumes and databases.

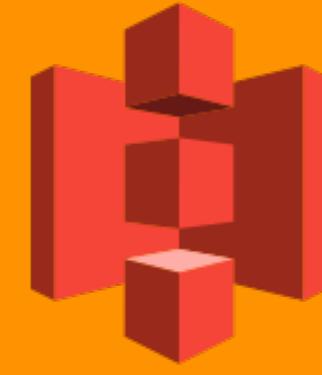
- **File Storage**

In file storage, data is presented via a file system interface and with file system semantics to instances. When attached to an instance, it acts just like a local file system. Amazon Elastic File System (EFS) provides shared access to data via multiple Amazon EC2 instances, with low latencies.

- **Object Storage**

An object is a piece of data, like a document, image, or video that is stored with some metadata in a flat structure. It provides that data to applications via APIs over the Internet. It is simple to build anything on top of an object store. For example, you can easily develop a web application on top of Amazon S3 that delivers content to users by making API calls over the Internet.

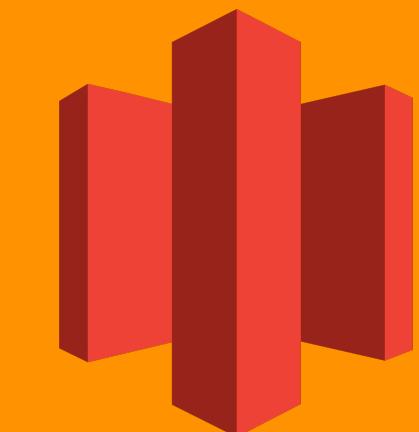




Amazon
S3



Amazon
EBS



Amazon
Glacier



Amazon
Storage Gateway



S3 - The Basics

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



S3 - The Basics

- S3 is a **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

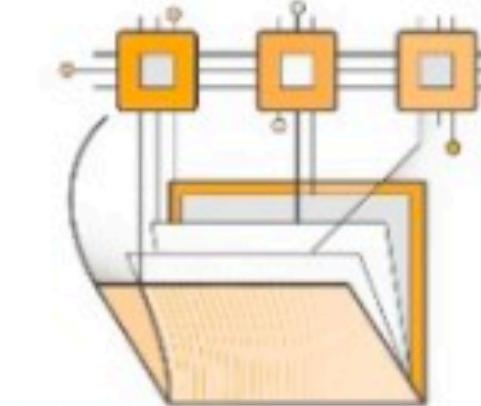


S3 - The Basics

- S3 is a universal namespace. That is, names be unique globally.
- <https://s3-eu-west-1.amazonaws.com/atlacademy>
- When you upload a files to S3, you will receive a
- HTTP 200 code if the upload was successful

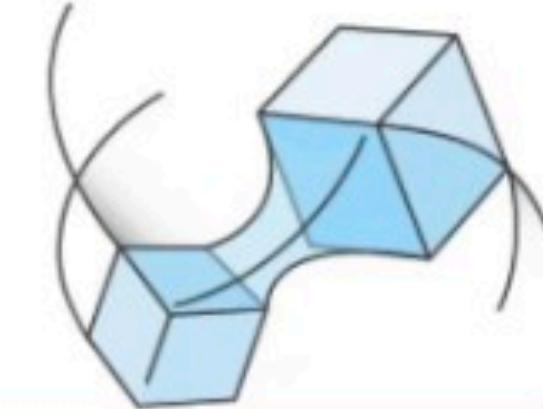


S3 - Objects



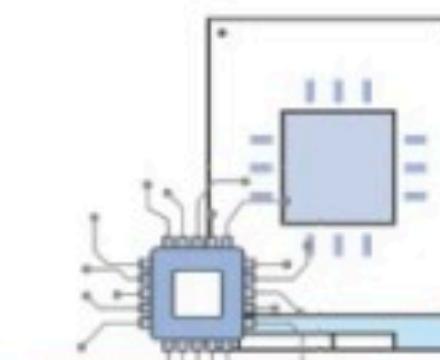
Amazon EFS

File

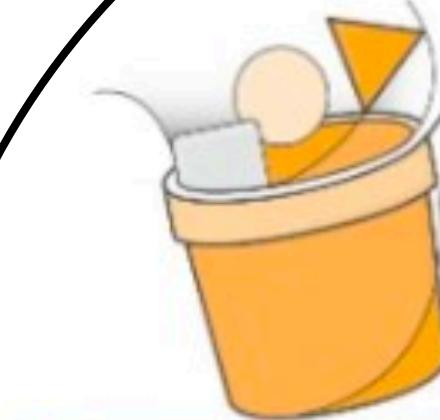


Amazon EBS

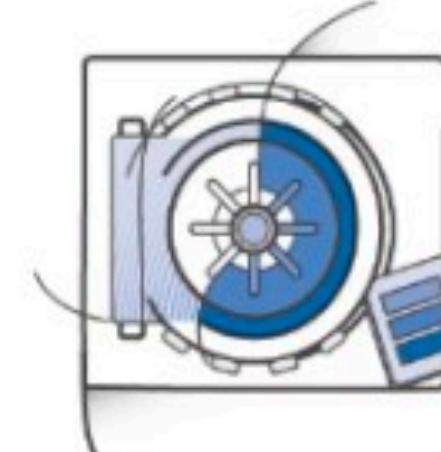
Block



Amazon EC2
Instance Store



Amazon S3

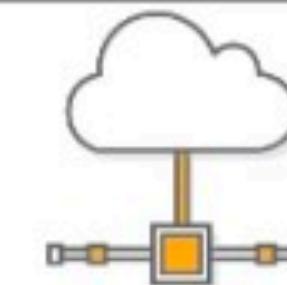


Amazon Glacier

Object



Data Transfer



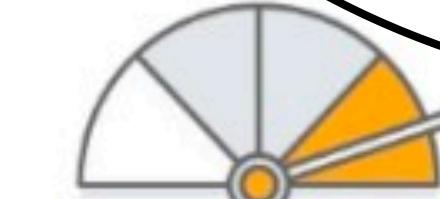
AWS Direct
Connect



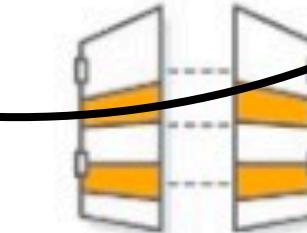
AWS Snowball/SV Connectors



Amazon Kinesis
Firehose



S3 Transfer
Acceleration

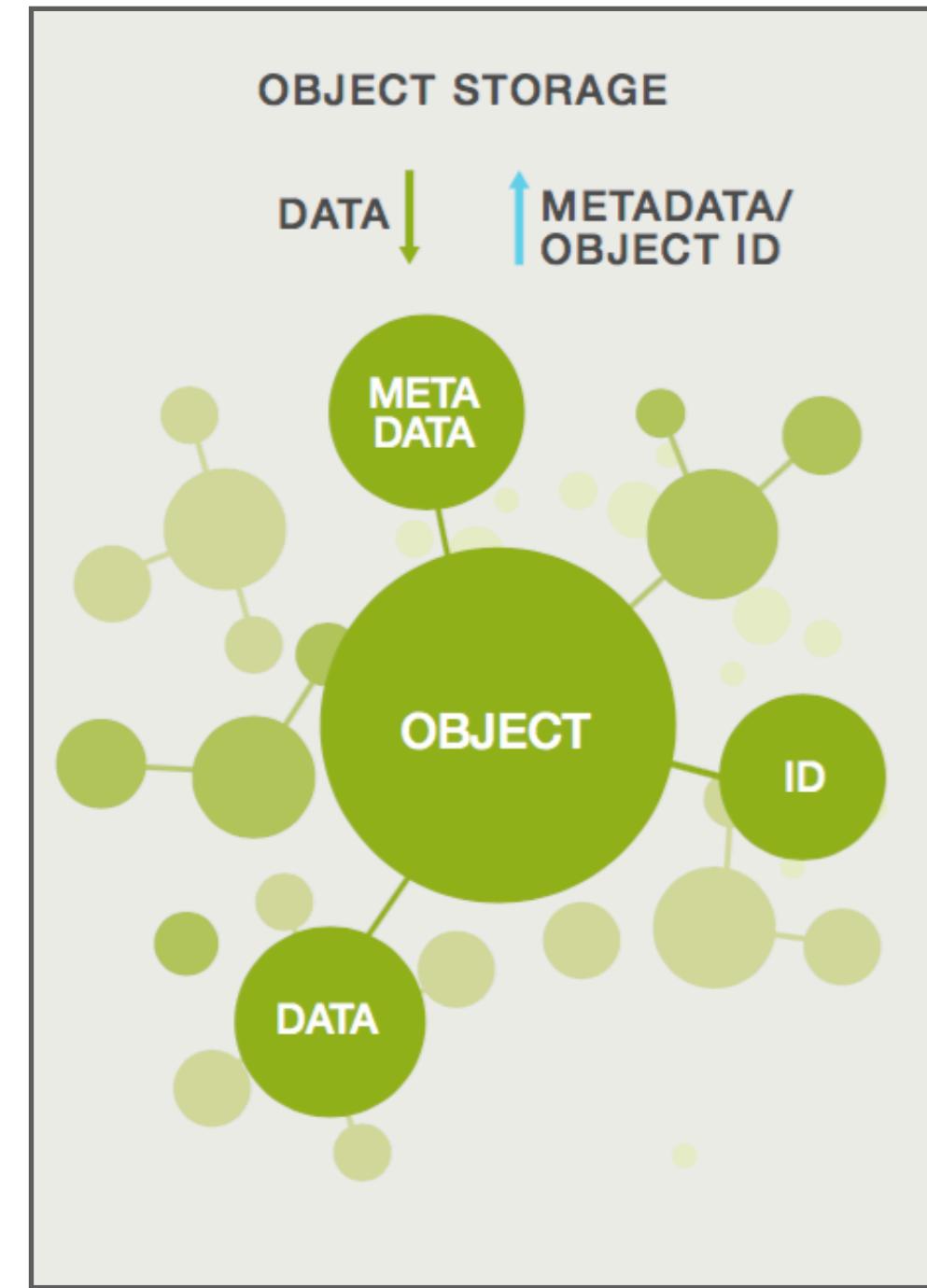


Storage
Gateway

S3 - Objects

S3 is Object based. Think of Objects just as files.

- 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 data you are storing)
- Subresources;
 - Access Control Lists
 - Torrent



Data Consistency Model For S3

How does data consistency work for S3?

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

In Other Words;

- If you write a new file and read it immediately afterwards, you will be able to view that data.
- If you update AN EXISTING file or delete a file and read immediately, you may get older version, or you may not. Basically changes to objects can take a little bit of time to propagate.



S3 - Guarantees

S3 has the following guarantees from Amazon;

- Built for 99.99% availability for the S3 platform.
- Amazing Guarantee 99.9% availability
- Amazon guarantees 99.00000000% durability for S3 information.



S3- Features

S3 has the following features;

- Tiered Storage Available
- Lifecycle Management
- Versioning
- Encryption
- MFA Delete
- Secure your data using Access Control Lists and Bucket Policy



S3 Storage Classes

1 S3 Standard

- 99.99% availability
- 99.9999999% durability
- Stored redundantly across multiple devices in multiply facilities
- Designed to sustain the loss of 2 facilities concurrently

2 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.



S3 Storage Classes

3 S3 One Zone - IA

- For where you want a lower-cost option for infrequently accessed data, but do not require the multiple Availability Zone data resilience.

4 S3 - IA (Infrequently Accessed)

- Designed to optimize costs by automatically moving data to the most cost-effective access tier, without performance impact or operational overhead.

S3 Storage Classes

5

S3 Glacier

- S3 Glacier is a secure, durable and low-cost storage class for data archiving. You can reliably store any amount of data at costs that are competitive on-premises solution. Retrieval times configurable from minutes to hours.

6

S3 -Glacier Deep Archive

- S3 Glacier Deep Archive is Amazon S3's lowest- cost storage class where a retrieval time of 13 hours is acceptable.



S3 Storage Classes

	S3 Standard	S3 Intelligent-Tiering*	S3 Standard-IA	S3 One Zone-IA†	S3 Glacier	S3 Glacier Deep Archive
Designed for durability	99.999999999% (11 9's)					
Designed for availability	99.99%	99.9%	99.9%	99.5%	99.99%	99.99%
Availability SLA	99.9%	99%	99%	99%	99.9%	99.9%
Availability Zones	≥3	≥3	≥3	1	≥3	≥3
Minimum capacity charge per object	N/A	N/A	128KB	128KB	40KB	40KB
Minimum storage duration charge	N/A	30 days	30 days	30 days	90 days	180 days
Retrieval fee	N/A	N/A	per GB retrieved	per GB retrieved	per GB retrieved	per GB retrieved
First byte latency	milliseconds	milliseconds	milliseconds	milliseconds	select minutes or hours	select hours
Storage type	Object	Object	Object	Object	Object	Object
Lifecycle transitions	Yes	Yes	Yes	Yes	Yes	Yes



S3 - Charges

You are charged for S3 in the following ways;

- Storage
- Requests
- Storage management Pricing
- Data Transfer Pricing
- Transfer Acceleration
- Cross Region Replication Pricing



Create an S3 Bucket - LAB





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S3

Security & Encryption

PhD.Vurğun Hacıyev

Ch.S3.2

S3 - The Basics

*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 sent to another bucket and even another bucket in another account.



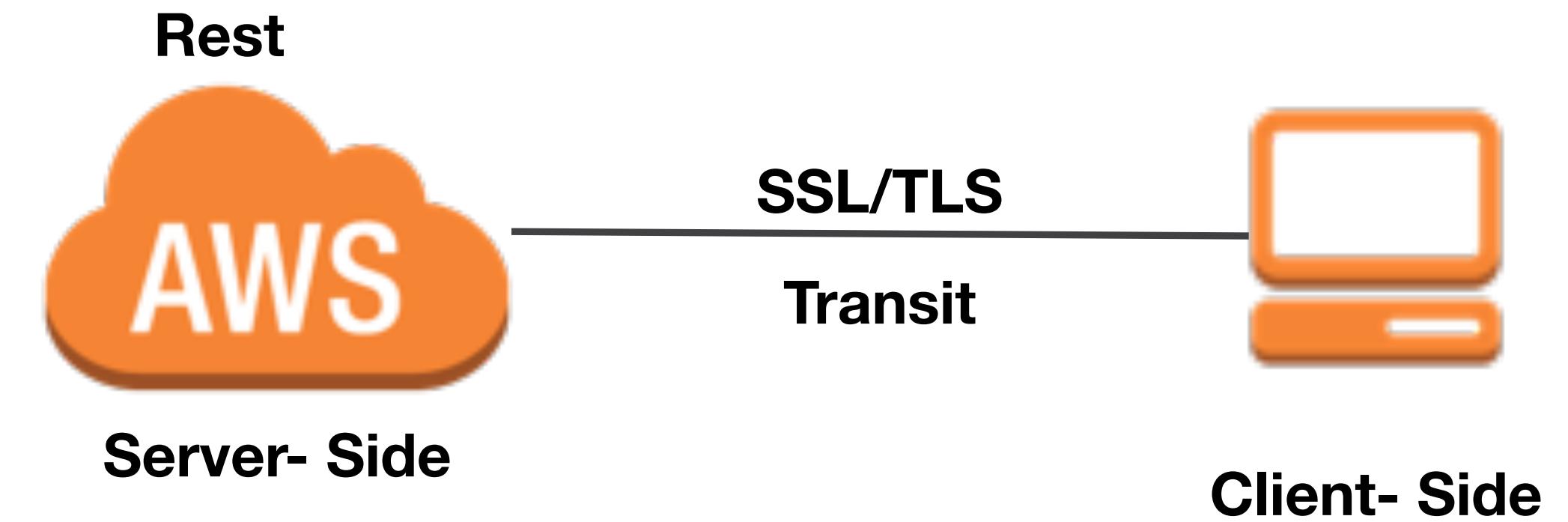
S3 - The Basics

Encryption In Transit archived by

- SSL/TLS

Encryption At Rest (Server Side) is archived

- **AWS Key Management Service**
 - S3 Managed Keys - SSE-S3
 - Managed Keys - SSE-KMS
 - Server Side Encryption With Customer Provided Keys - SSE-C



Client Side Encryption



Create Encryption - LAB

Solutions Architect
Associate





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S3 Versioning

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Ch.S3.3

S3 - Versioning

Using VERSIONING with S3;

- 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



S3 Versioning - LAB

Solutions Architect
Associate





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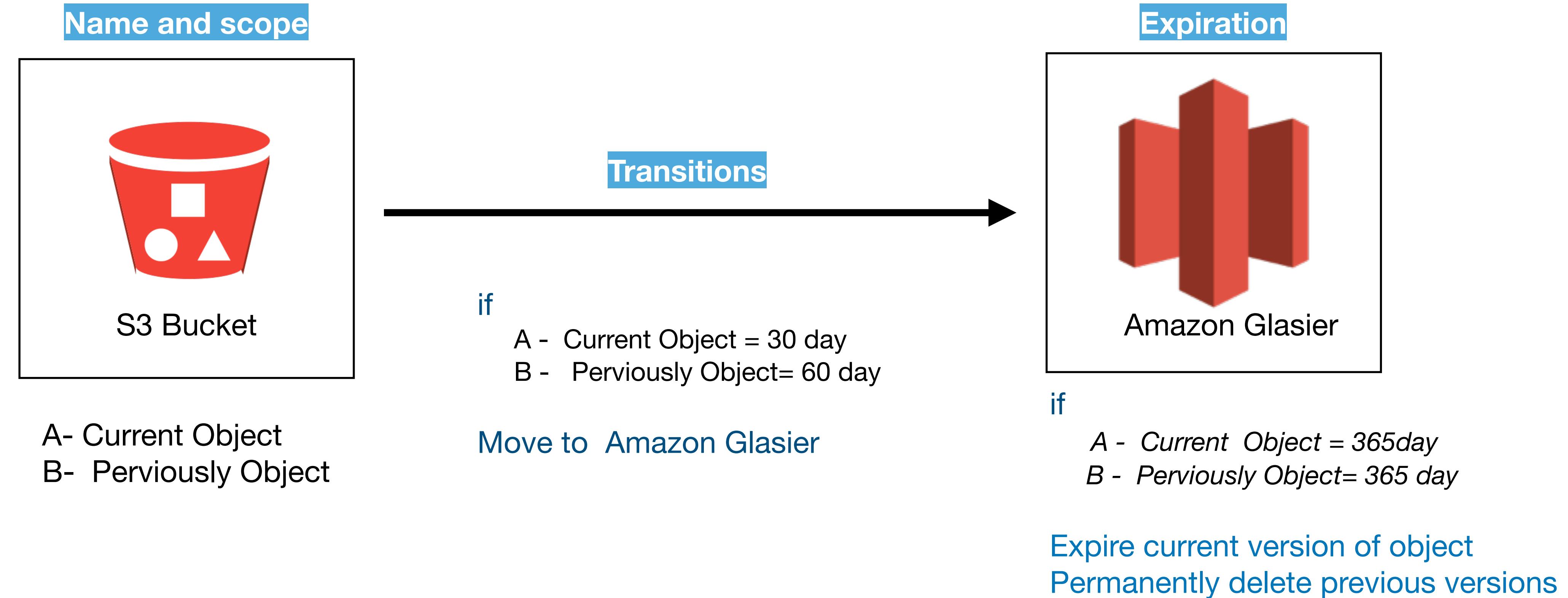
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Lifecycle Management with S3 - LAB

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Lifecycle Management with S3 - LAB





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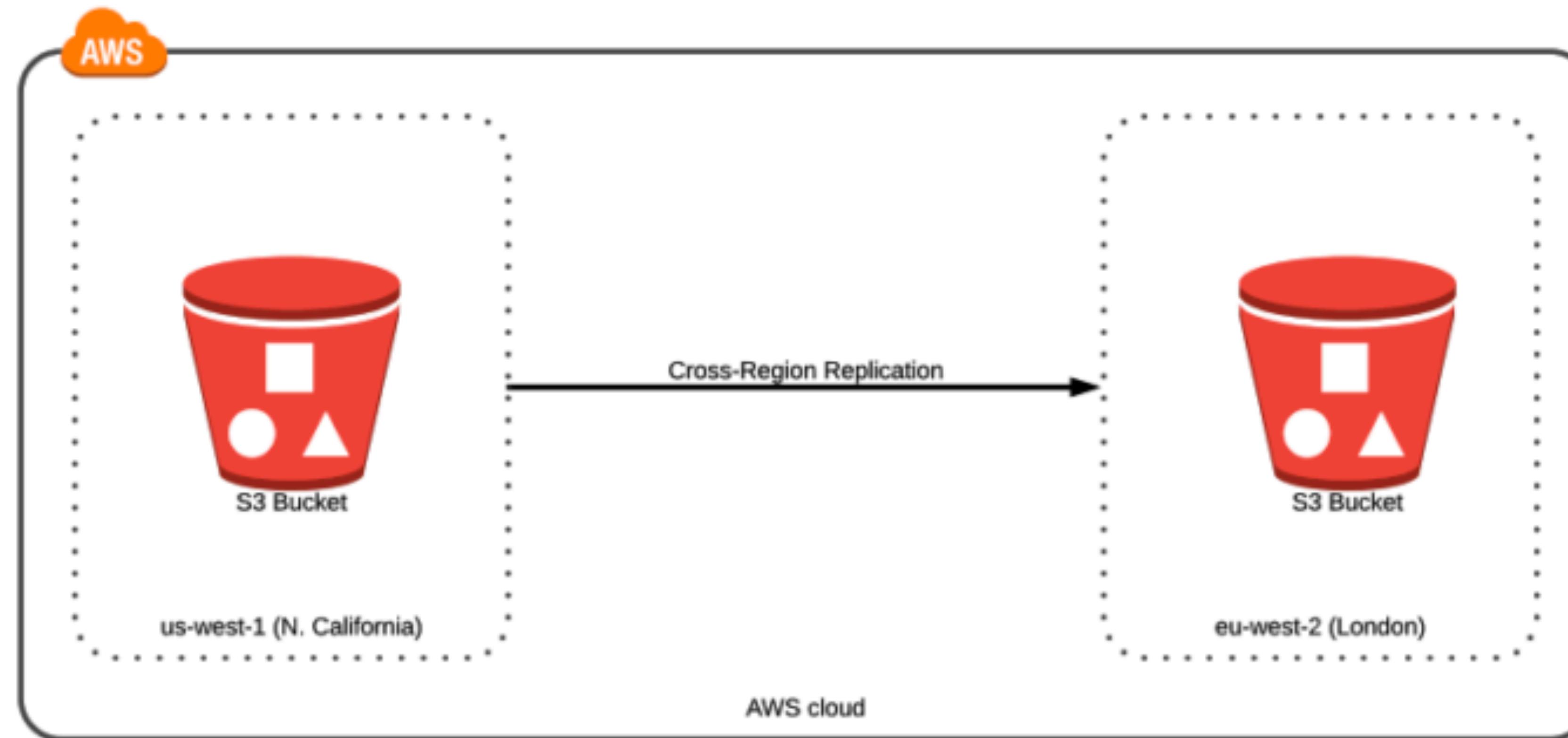
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Cross Region Replication S3 - LAB

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Cross Region Replication. Lab





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S3

Transfer Acceleration

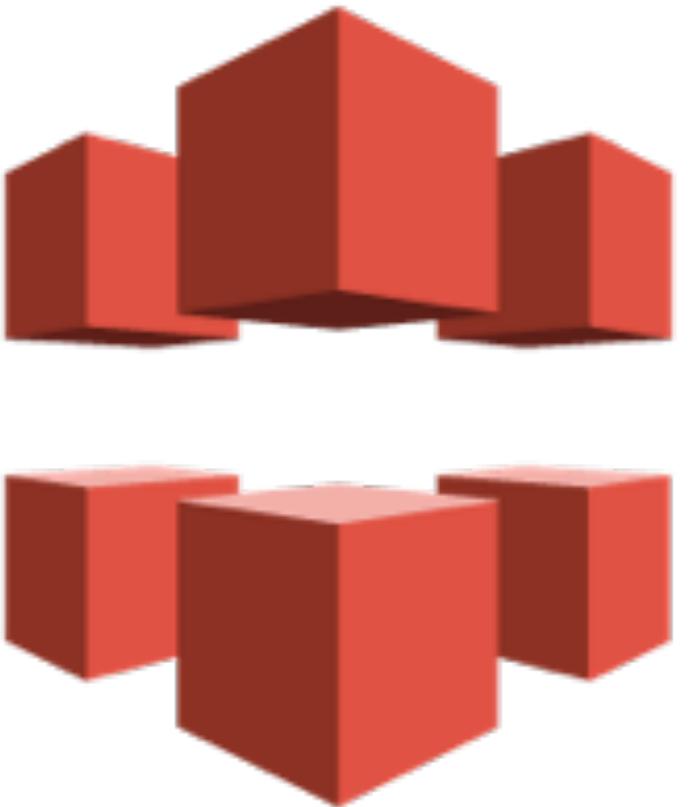
PhD.Vurğun Hacıyev

Ch.S3.6

S3 - Transfer Acceleration (S3TA)

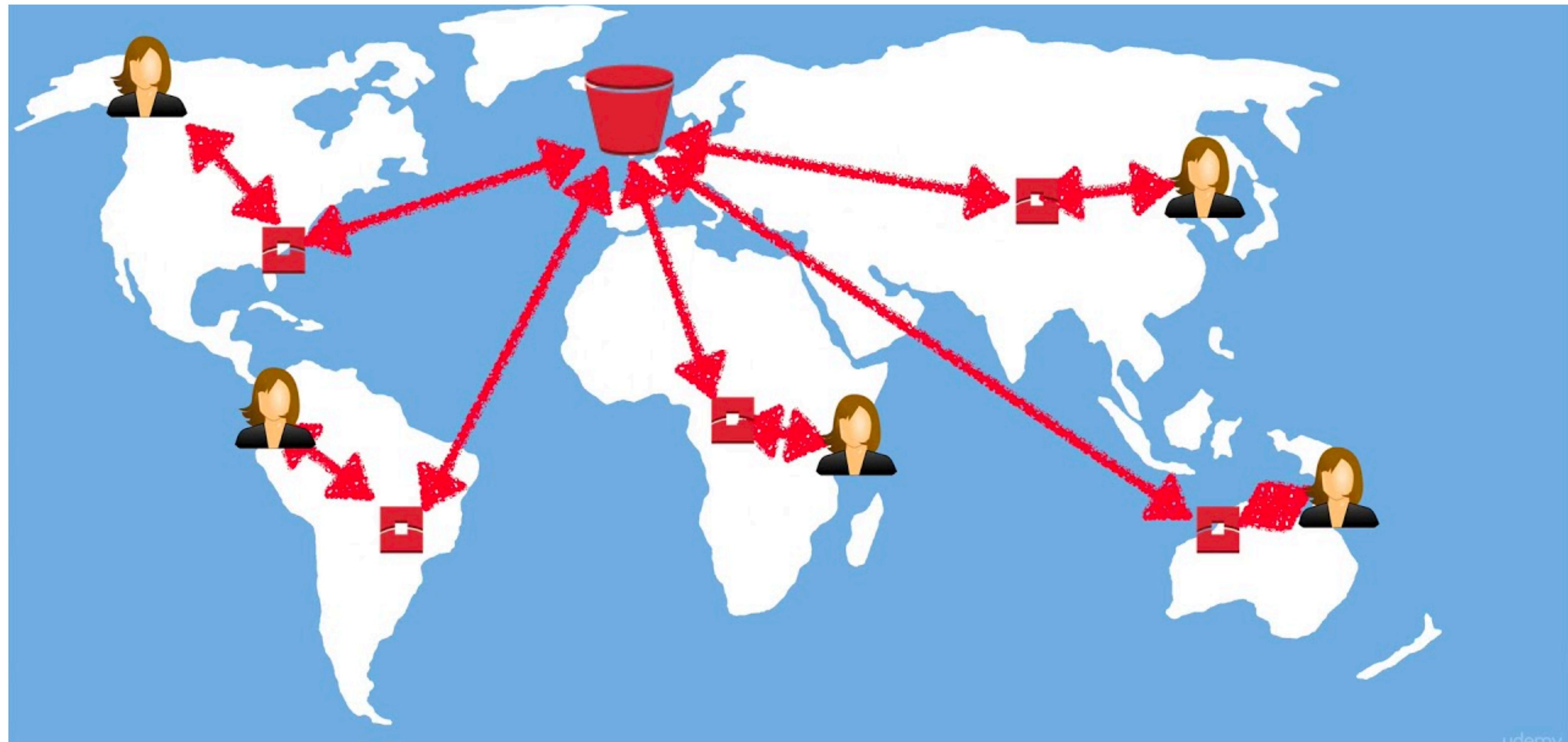
- S3 Transfer Acceleration utilizes the CloudFront Edge Network to accelerate your uploads to S3. Instead of uploading directly to your S3 bucket, you can use a distinct URL to upload directly to an edge location which will then transfer that file to S3. You will get a distinct URL to upload to:

atlacademy.s3-accelerate.amazonaws.com



CloudFront

S3 - Transfer Acceleration



S3 - Transfer Acceleration

Google search results for "s3 transfer acceleration tool".

All Shopping News Videos Images More Settings Tools

About 6,190,000 results (0.46 seconds)

S3 Transfer Acceleration - Amazon AWS
<https://s3-accelerate-speedtest.s3-accelerate.amazonaws.com/.../accelerate-speed-comp...> ▾
This speed checker uses multipart uploads to transfer a file from your browser to various Amazon S3 regions with and without Amazon S3 Transfer Acceleration.

Test the Upload Speed of Amazon S3 Transfer Acceleration for a ...

<https://aws.amazon.com/premiumsupport/.../upload-speed-s3-transfer-acceleration/> ▾

8 Aug 2018 - I want to use S3 Transfer Acceleration to improve the file upload speed to my Amazon Simple Storage Service (Amazon S3) bucket. I want to ...

Amazon S3 Transfer Acceleration - Amazon Simple Storage Service

<https://docs.aws.amazon.com/AmazonS3/latest/dev/transfer-acceleration.html> ▾

You can use the Amazon S3 Transfer Acceleration Speed Comparison tool to compare accelerated and non-accelerated upload speeds across Amazon S3 ...

How Do I Enable Transfer Acceleration for an S3 Bucket? - Amazon ...

<https://docs.aws.amazon.com/AmazonS3/latest/user.../enable-transfer-acceleration.html> ▾

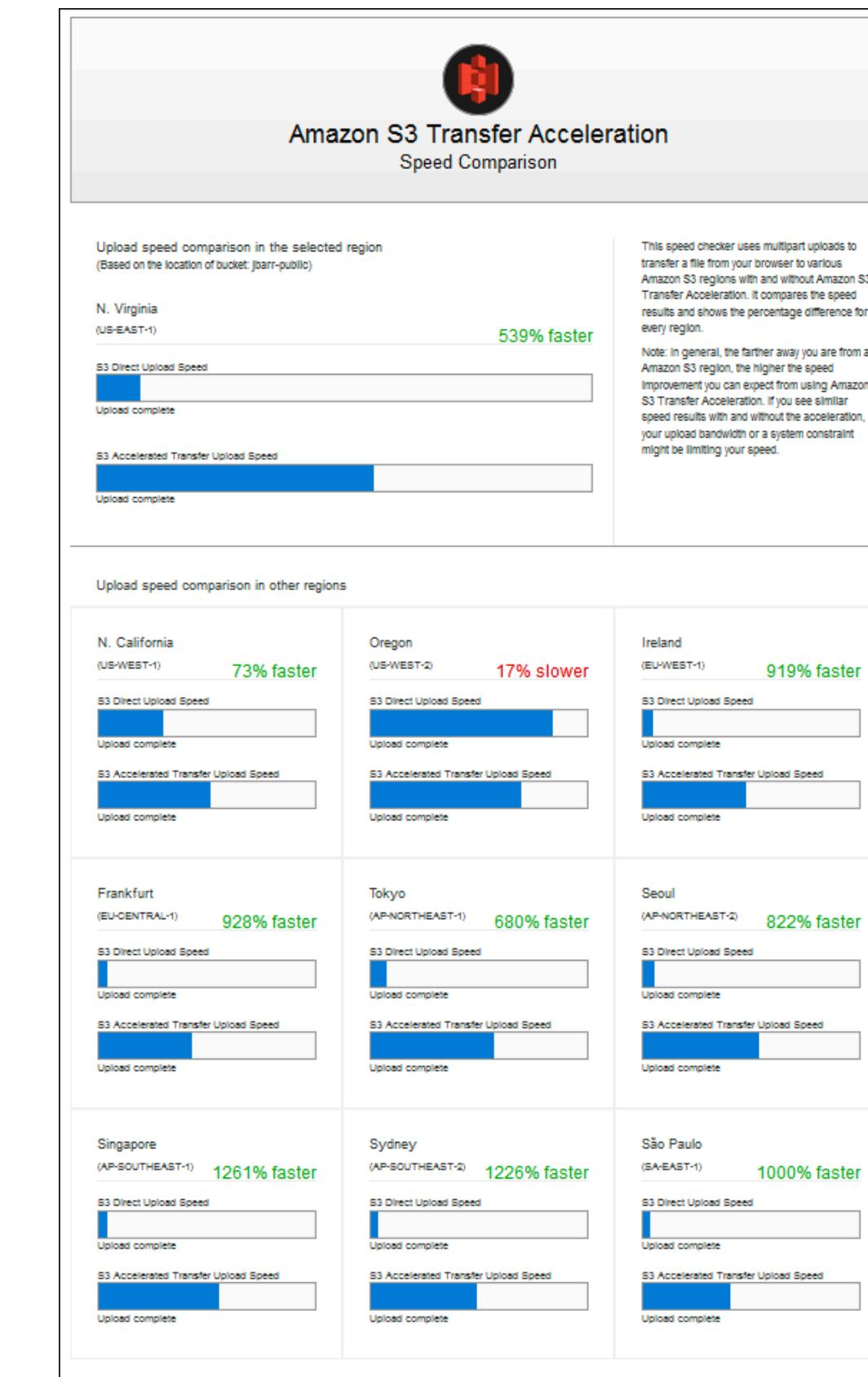
Amazon Simple Storage Service (Amazon S3) transfer acceleration enables fast, ... Transfer Acceleration Speed Comparison tool, which compares accelerated ...

AWS Storage Update – Amazon S3 Transfer Acceleration + Larger ...

<https://aws.amazon.com/.../aws-storage-update-amazon-s3-transfer-acceleration-larger...> ▾

19 Apr 2016 - Amazon S3 Transfer Acceleration – This new feature accelerates ... it to <https://jbarr-public.s3-accelerate.amazonaws.com/> in my upload tool ...

<https://s3-accelerate-speedtest.s3-accelerate.amazonaws.com/en/accelerate-speed-comparison.html>





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AWS CloudFront

PhD.Vurğun Hacıyev

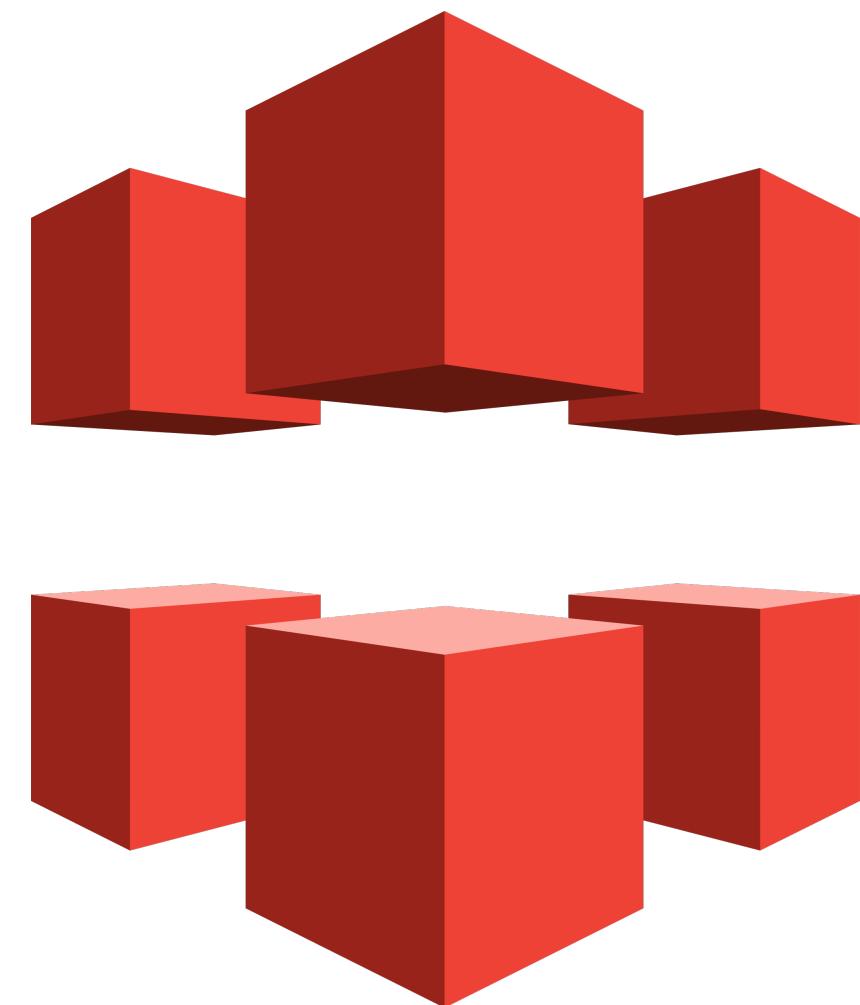
Ch.S3.7

What is CloudFront?

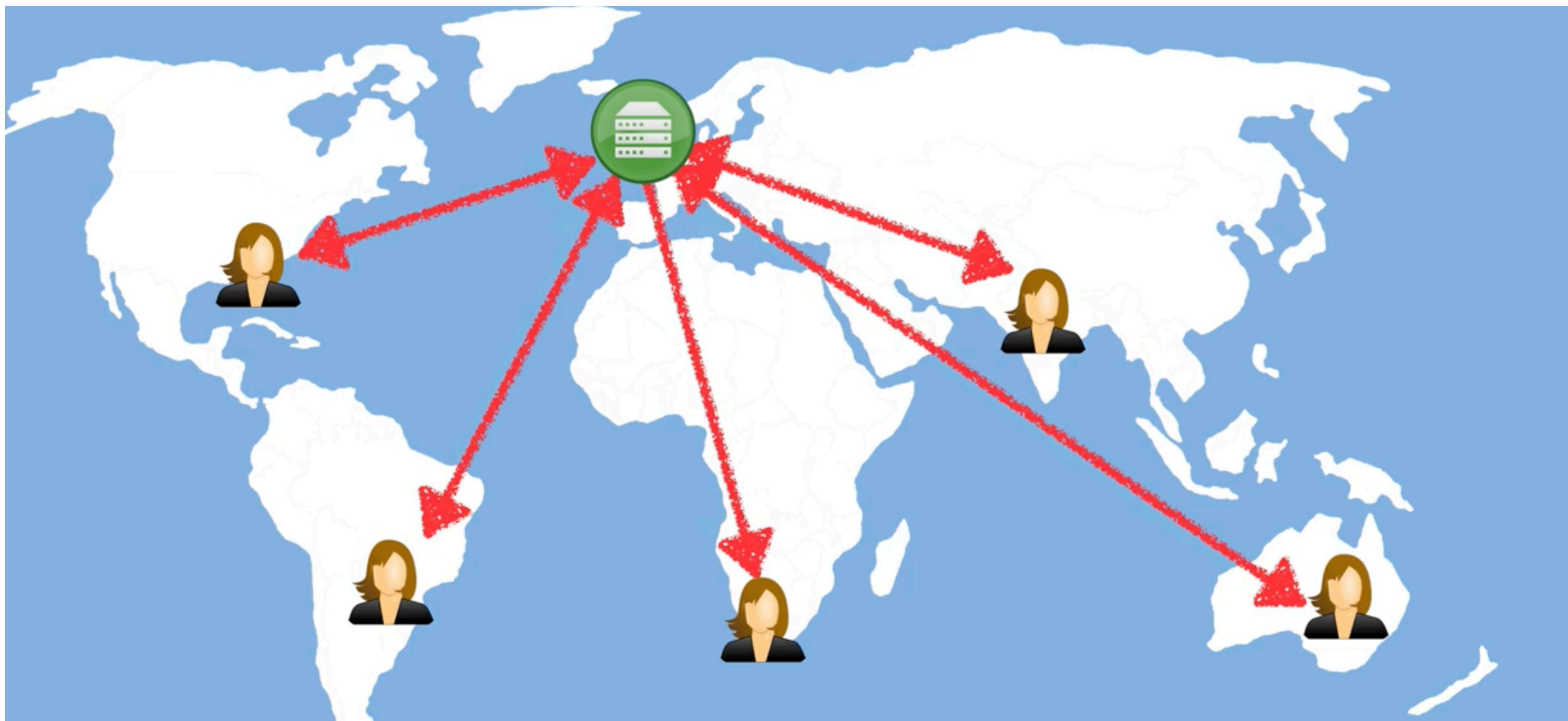
Amazon CloudFront is a web service that speeds up distribution of your static and dynamic web content.

CloudFront delivers your content through a worldwide network of data centers called edge locations. When a user requests content that you're serving with CloudFront, the user is routed to the edge location that provides the lowest latency (time delay), so that content is delivered with the best possible performance.

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 content delivery server.

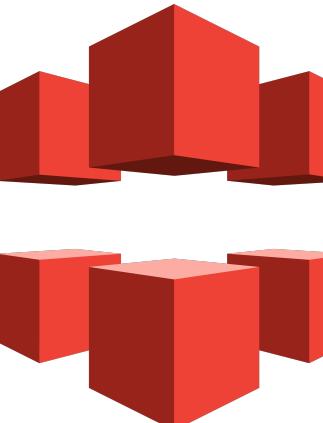


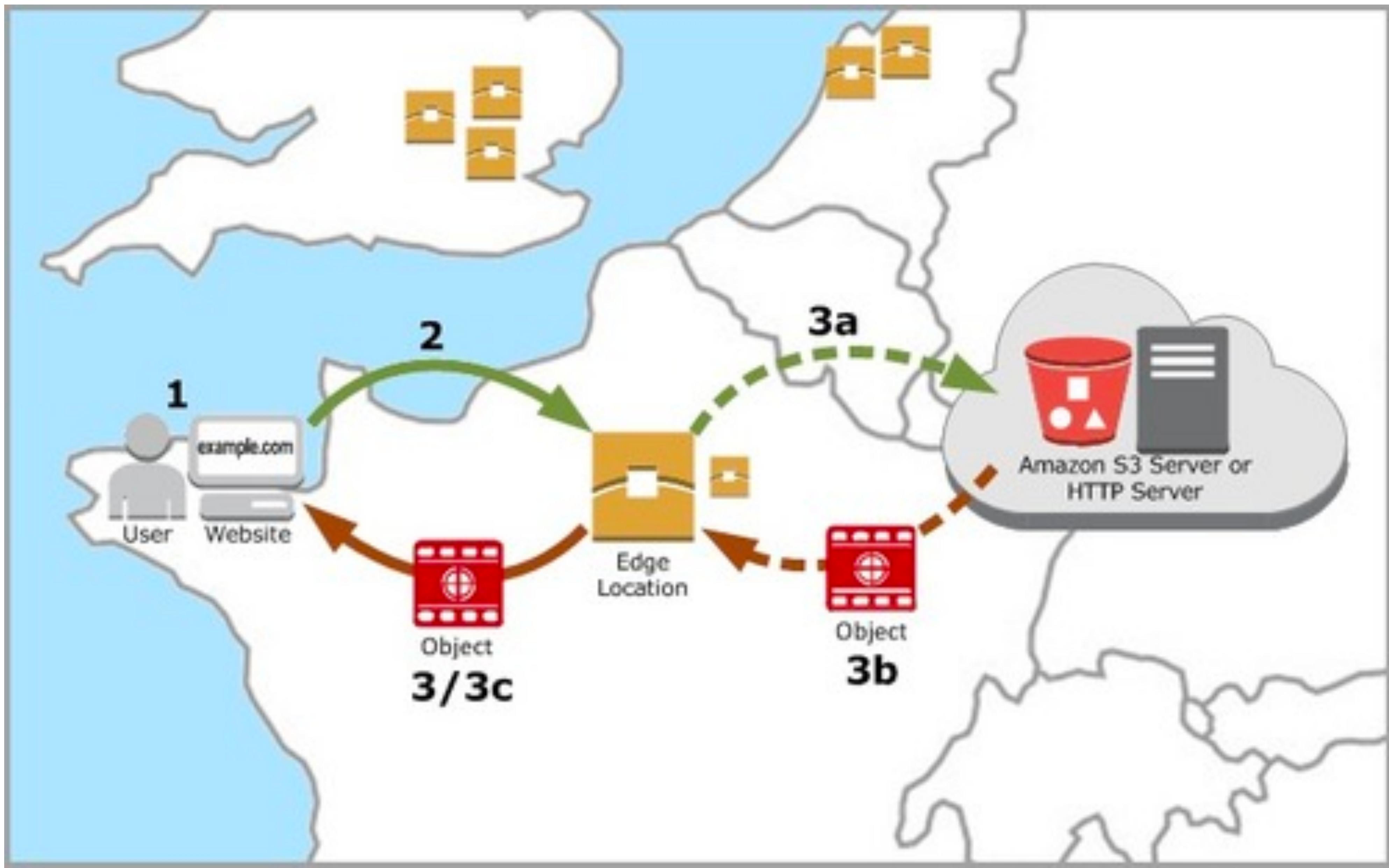
What is CDN?



CloudFront - Key Terminology

- **Edge Location-** This is the location where content will be cashed. This is separate to an AWS Region/AZ.
- **Origin-** This is the origin of all the that the CDN will distribute. This can be an S3 Bucket, an EC2 Instance, an Elastic Load Balancer, or Route 53.
- **Distribution-** This is the name given the CDN which consists of a collection of Edge Locations.





CloudFront - Key Terminology

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



Create A CloudFront Distribution - LAB

Solutions Architect
Associate





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Snowball

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Ch.S3.8

What is Snowball?

Snowball is a petabyte-scale data transport solution that uses devices designed to be secure to transfer large amounts of data into and out of the AWS Cloud. Using Snowball addresses common challenges with large-scale data transfers including high network costs, long transfer times, and security concerns. Customers today use Snowball to migrate analytics data, genomics data, video libraries, image repositories, backups, and to archive part of data center shutdowns, tape replacement or application migration projects. Transferring data with Snowball is simple, fast, more secure, and can be as little as one-fifth the cost of transferring data via high-speed Internet.



Snowball Features

- 80 TB and 50 TB models are available in US Regions; 50 TB model available in all other AWS Regions.
- Enforced encryption protects your data at rest and in physical transit.
- There's no need to buy or maintain your own hardware devices.
- You can manage your jobs through the AWS Snowball Management Console or programmatically with the job management API.
- You can perform local data transfers between your on-premises data center and a Snowball.



Snowball - LAB

Snowball - LAB





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Storage Gateway

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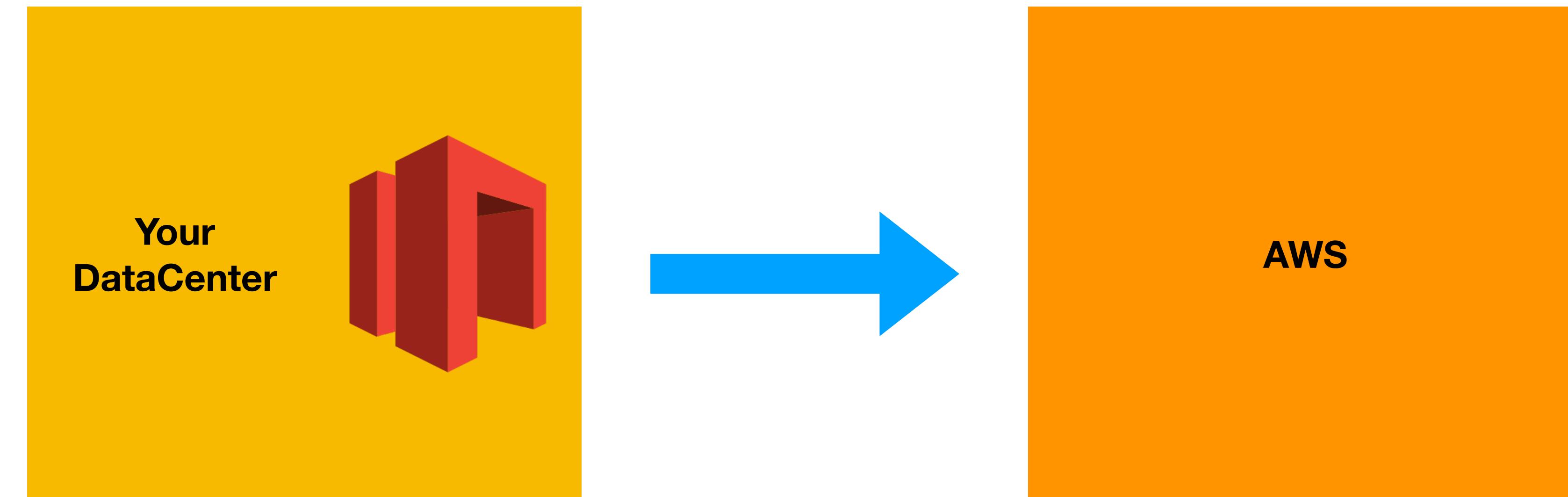
Ch.S3.9

What is Storage Getaway?

AWS Storage Gateway is a service that connects an on-premises software application 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.



What is Storage Getaway?

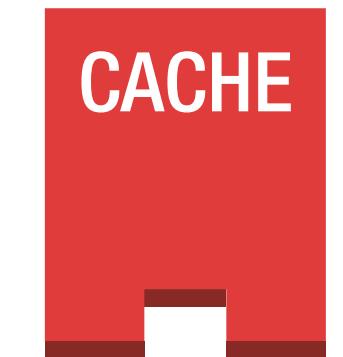
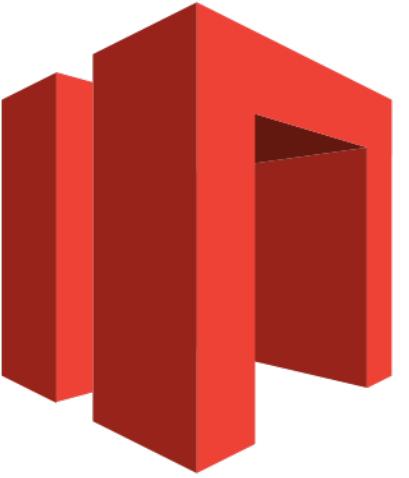
AWS Storage Gateway's software appliance is available for download as a virtual machine (VM) image that you install on a host in your datacenter. Storage Gateway support either VMware ESXi or Microsoft Hyper-V. Once you've installed your gateway and associated it with your AWS account through the activation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



Storage Gateway Types

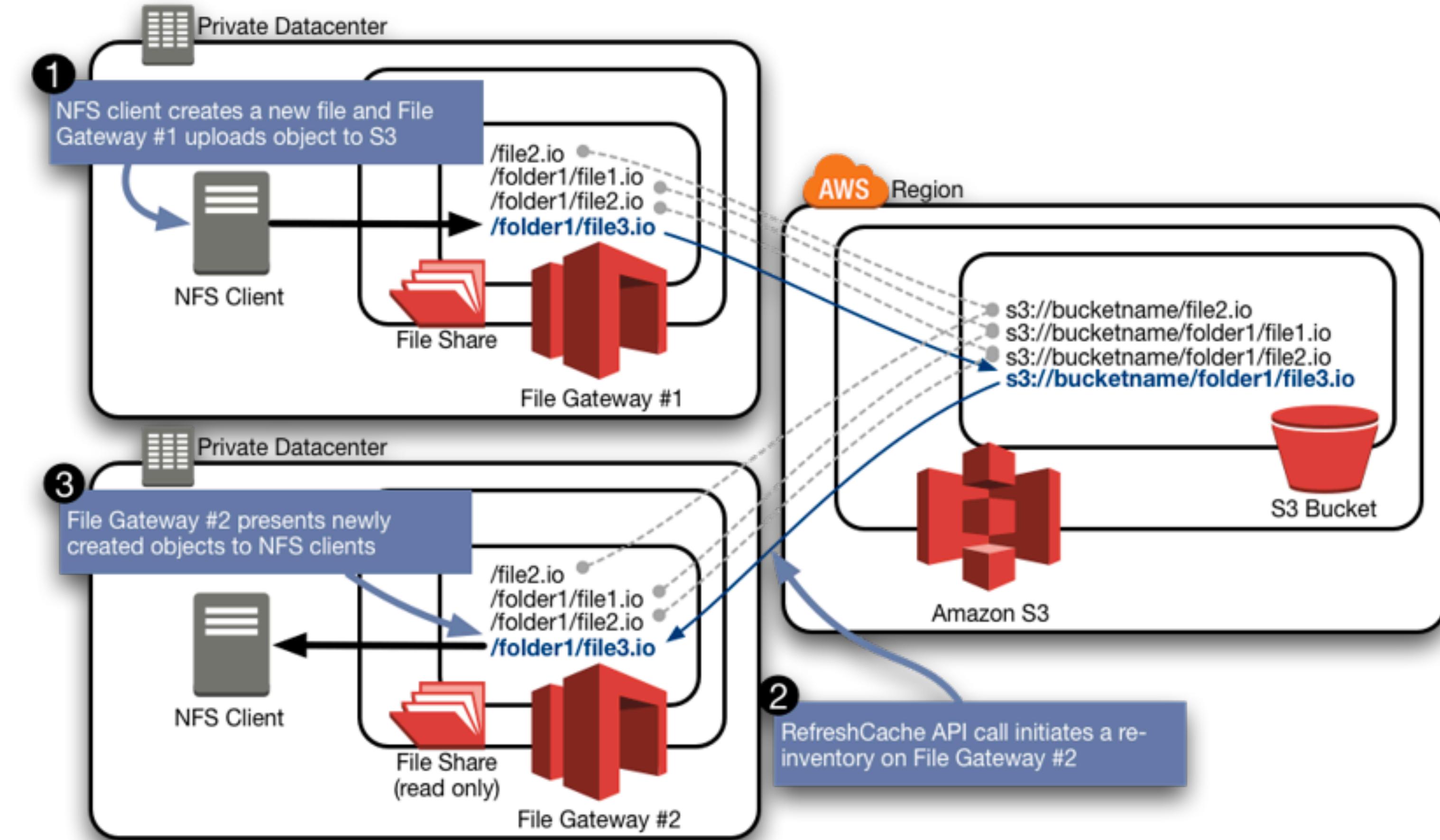
The three different types of Storage Gateway are follows ;

- **File Gateway (NFS & SMB)**
- **Volume Gateway (iSCSI)**
 - **Stored Volumes**
 - **Cached Volumes**
- **Tape Gateway (VTL)**

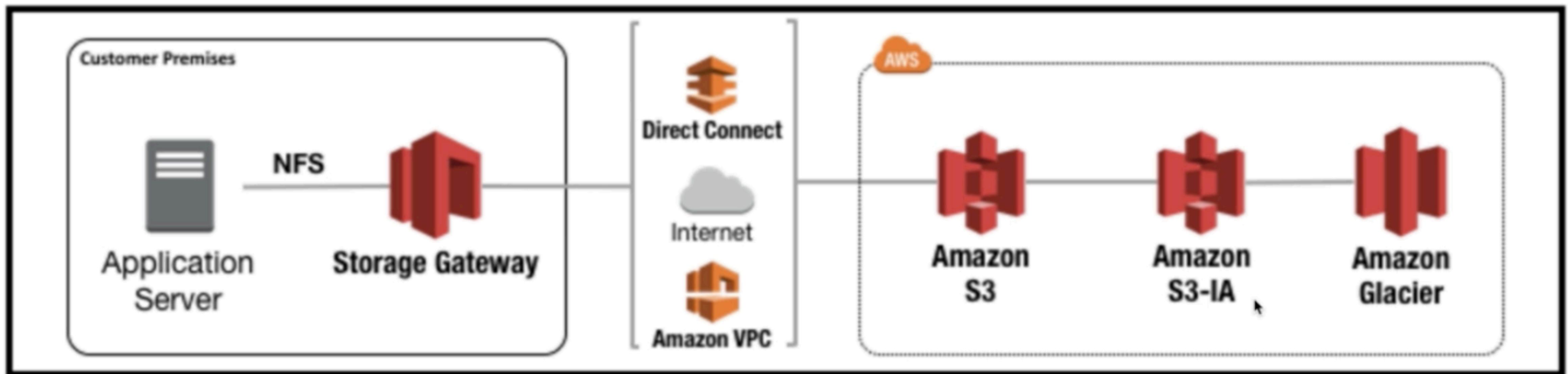


File Gateway

Files are stored as objects in your S3 buckets, accessed through a Network Files 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

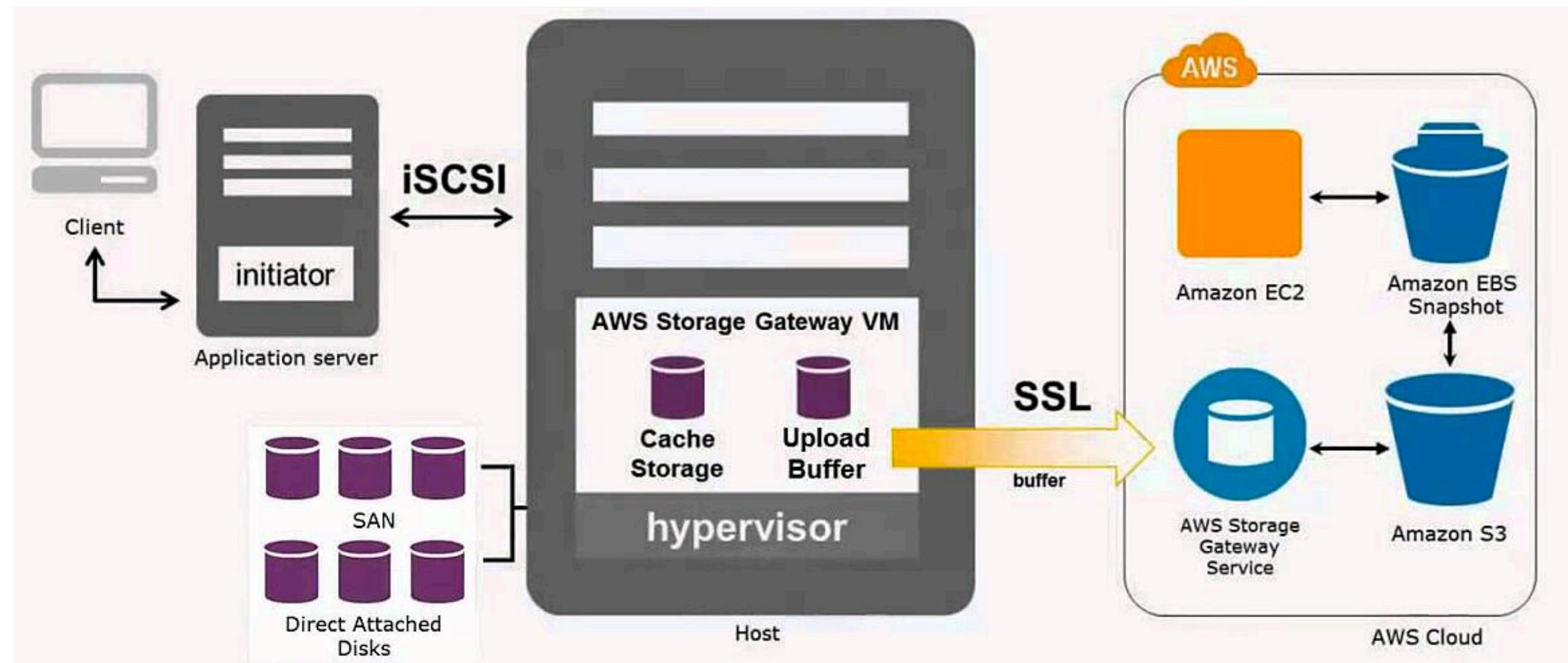


Volume Gateway

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 an incremental backup that captures only changed blocks. All snapshots stored are also compressed to minimize your storage.



Volume Gateway -Stored Volumes

Stored volumes let you store your prime data locally.

While asynchronously bacon up data to AWS.

Treats your local storage as main data storage, but performs asynchronous backup to Amazon S3, as an EBS snapshot. This gives you an off-site backup of a local drive. The Stored Volume is mounted as an iSCSI device within on-premise applications. Stored Volumes can be 1GB to 16TB in size



Volume Gateway -Cached Volumes

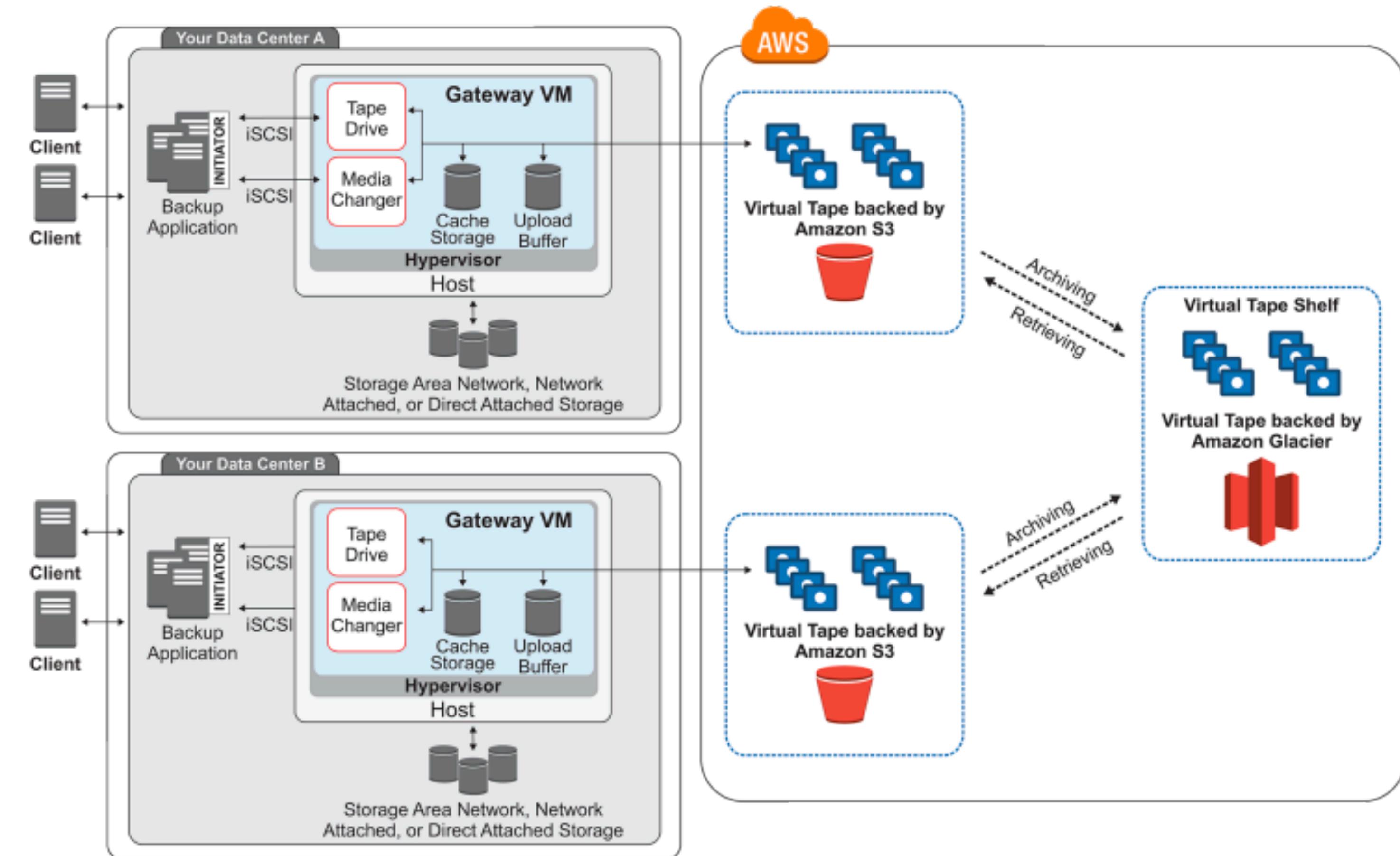
Cached Volumes—stores frequently accessed data locally using EBS, with Amazon S3 as main data storage. You can create a storage volume of up to 32TB and connect it to local systems as an iSCSI device. The storage volume then stores any infrequently-used data automatically to S3, reducing the load on local store, while using cloud storage in a cost-effective manner.



Tape Gateway

The Tape Gateway uses a Virtual Tape Library (VTL) interface, and lets you store data on virtual tapes, with the actual data stored in Amazon S3, Amazon S3 Glacier, or Amazon S3 Glacier Deep Archive. The idea is to replace physical tapes with a compatible interface that lets you store data on Amazon.

You can connect the Tape Gateway to existing backup devices using the iSCSI protocol, maintaining existing backup workflows and systems. Tape Gateway lets you save data directly to your S3 buckets, or use third-party backup services like NetBackup and Veeam.



Thank you

