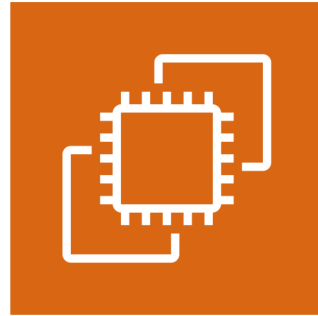# Module 7: Storage

AWS Academy Cloud Foundations

Core AWS services

Amazon Virtual Private Cloud (Amazon VPC)

Amazon Elastic Compute Cloud (Amazon EC2)

Amazon S3

Amazon EBS

Amazon EFS

Amazon S3 Glacier

Storage

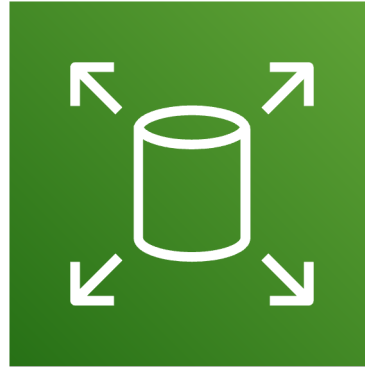**AWS Identity and Access Management (IAM)**

Amazon Relational Database Service
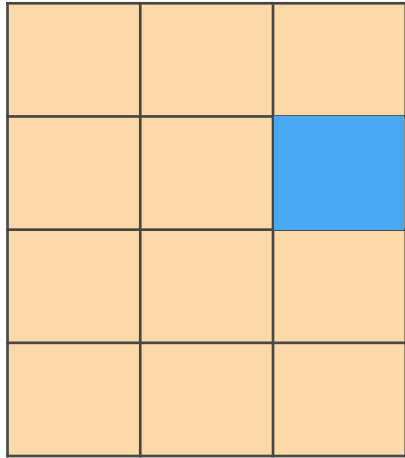
Amazon DynamoDB

Database

Storage

**Amazon Elastic Block Store
(Amazon EBS)**

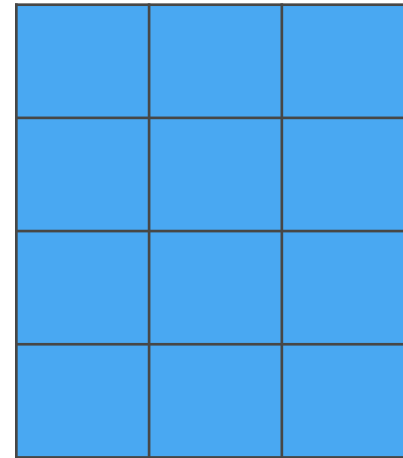# AWS storage options: Block storage versus object storage

What if you want to change **one character** in a 1-GB file?

Block storage

Change one block (piece of the file)

that contains the character

Object storage

Entire file must be updated

Amazon EBS

Amazon EBS enables you to **create individual storage volumes** and **attach them** to an Amazon EC2 instance:

- Amazon EBS offers block-level storage.

- Volumes are automatically replicated within its Availability Zone.

- It can be backed up automatically to Amazon S3 through snapshots.

- Uses include –
  - Boot volumes and storage for Amazon Elastic Compute Cloud (Amazon EC2) instances
  - Data storage with a file system
  - Database hosts
  - Enterprise applications

aws

Amazon EBS volume types

	Solid State Drives (SSD)		Hard Disk Drives (HDD)	
	General Purpose	Provisioned IOPS	Throughput-Optimized	Cold
Maximum Volume Size	16 TiB	16 TiB	16 TiB	16 TiB
Maximum IOPS/Volume	16,000	64,000	500	250
Maximum Throughput/Volume	250 MiB/s	1,000 MiB/s	500 MiB/s	250 MiB/s

Amazon EBS volume type use cases

Solid State Drives (SSD)		Hard Disk Drives (HDD)	
General Purpose	Provisioned IOPS	Throughput-Optimized	Cold
• This type is recommended for most workloads	• Critical business applications that require sustained IOPS performance, or more than 16,000 IOPS or 250 MiB/second of throughput per volume	• Streaming workloads that require consistent, fast throughput at a low price	• Throughput-oriented storage for large volumes of data that is infrequently accessed
• System boot volumes	• Large database workloads	• Big data	• Scenarios where the lowest storage cost is important
• Virtual desktops		• Data warehouses	• It cannot be a boot volume
• Low-latency interactive applications		• Log processing	
• Development and test environments		• It cannot be a boot volume	

Amazon EBS features

- Snapshots –
  - Point-in-time snapshots
  - Recreate a new volume at any time
- Encryption –
  - Encrypted Amazon EBS volumes
  - No additional cost
- Elasticity –
  - Increase capacity
  - Change to different types
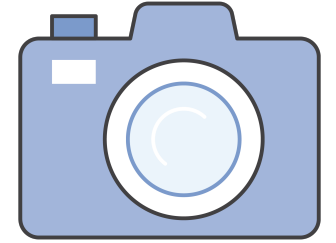
Storage

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

Amazon S3 overview

- Data is stored as objects in buckets
- Virtually unlimited storage
  - Single object is limited to 5 TB
- Designed for 11 9s of durability
- Granular access to bucket and objects

Amazon S3 storage classes

Amazon S3 offers a range of object-level storage classes that are designed for different use cases:

- Amazon S3 Standard

- Amazon S3 Intelligent-Tiering

- Amazon S3 Standard-Infrequent Access (Amazon S3 Standard-IA)

- Amazon S3 One Zone-Infrequent Access (Amazon S3 One Zone-IA)

- Amazon S3 Glacier

- Amazon S3 Glacier Deep Archive

Amazon S3 bucket URLs (two styles)

Amazon S3

[bucket name]

Preview2.mp4

Tokyo Region (ap-northeast-1)
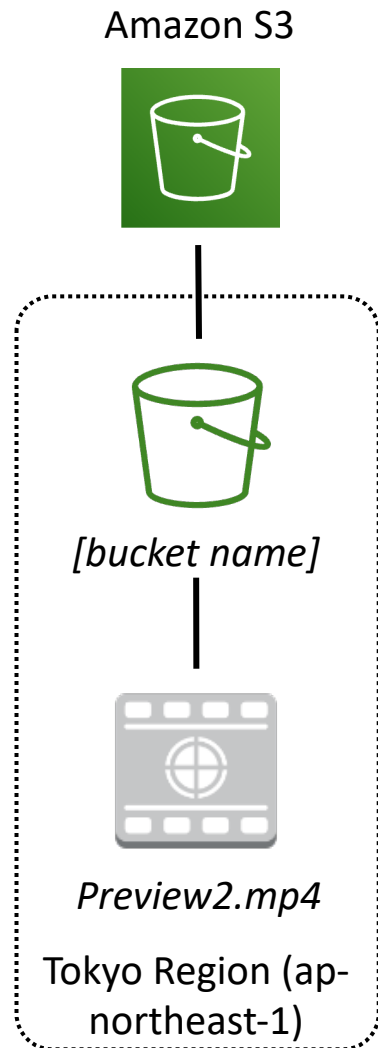
To upload your data:

1. Create a **bucket** in an AWS Region.

2. Upload almost any number of **objects** to the bucket.

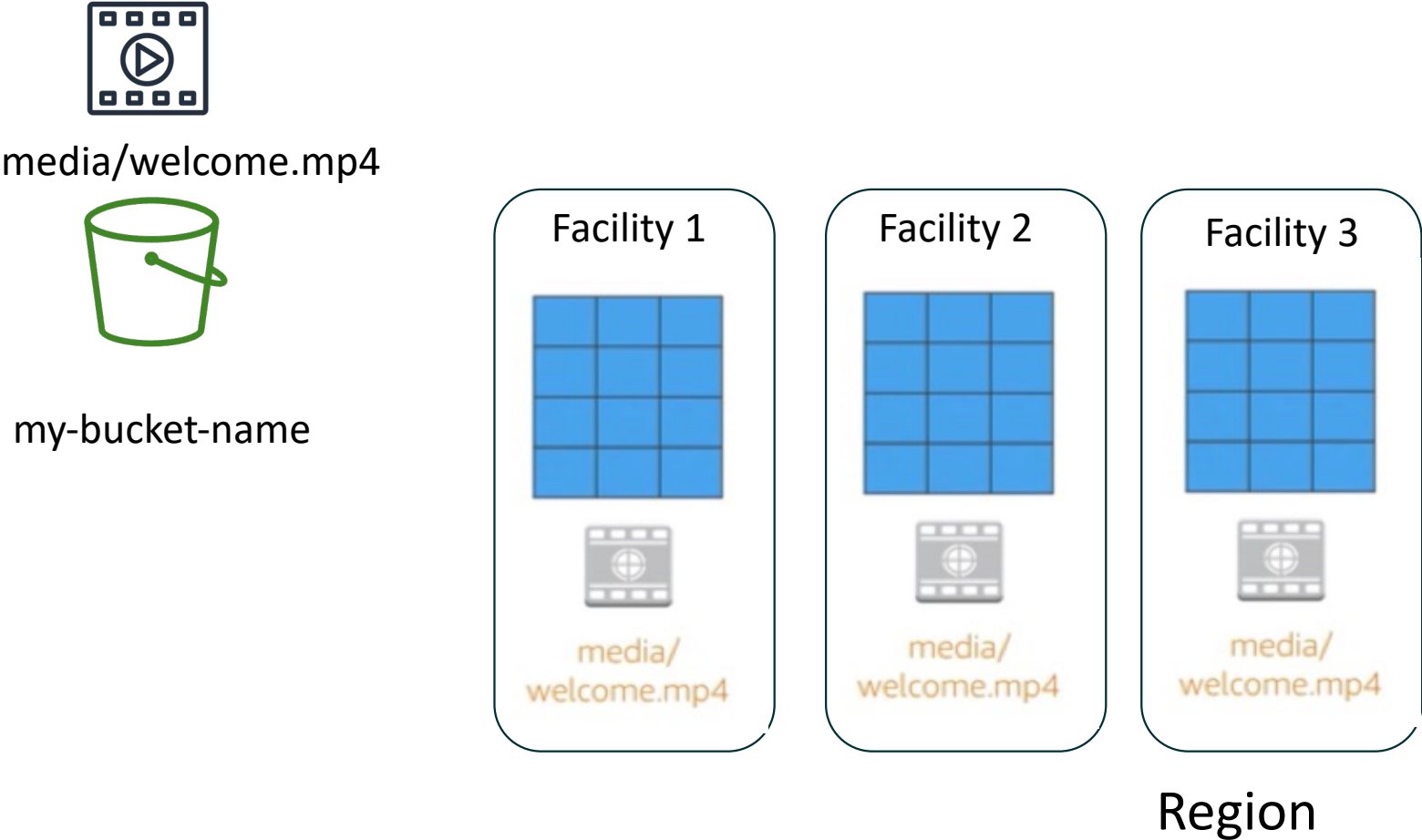Bucket path-style URL endpoint:

https://s3.ap-northeast-1.amazonaws.com/bucket-name

Region code   Bucket name

Bucket virtual hosted-style URL endpoint:

https:// bucket-name.s3-ap-northeast-1.amazonaws.com

Bucket name   Region code

Data is redundantly stored in the Region

media/welcome.mp4

my-bucket-name

Facility 1

Facility 2

Facility 3

media/
welcome.mp4

media/
welcome.mp4

media/
welcome.mp4

Region

Access the data anywhere
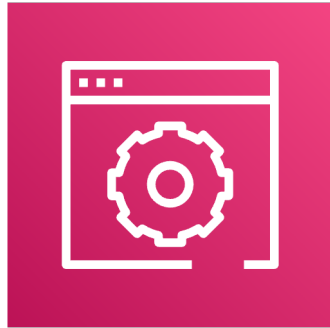
AWS Management
Console

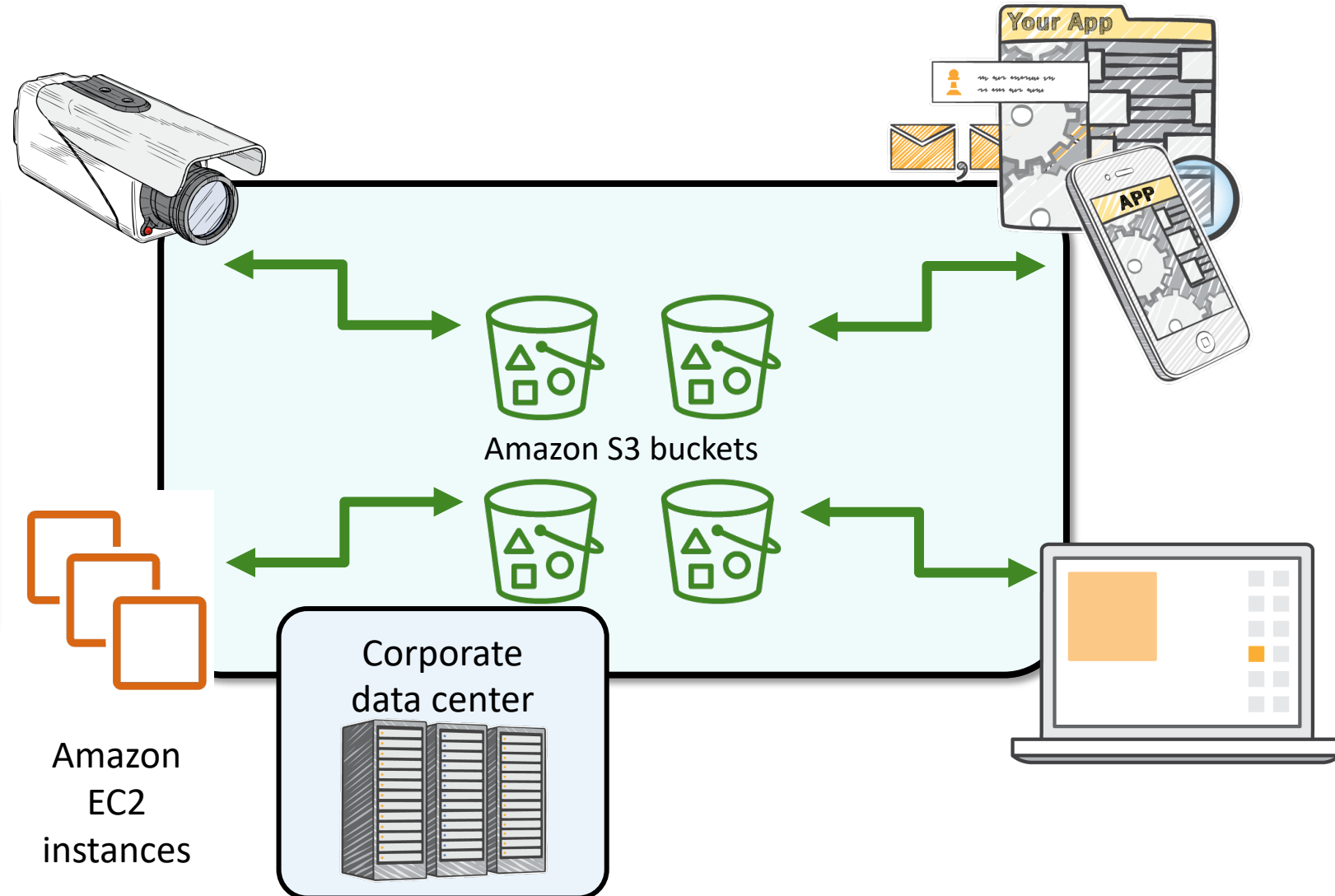AWS Command Line
Interface

SDK

Common use cases

- Storing application assets

- Static web hosting

- Backup and disaster recovery (DR)

- Staging area for big data

- *Many more....*

Amazon S3 common scenarios

- Backup and storage
- Application hosting
- Media hosting
- Software delivery

Amazon S3 buckets

Amazon EC2 instances

Corporate data center

Your App

APP

aws

Amazon S3: Storage pricing (1 of 2)

To estimate Amazon S3 costs, consider the following:

1. Storage class type –

   - Standard storage is designed for:

     - 11 9s of durability

     - Four 9s of availability

   - S3 Standard-Infrequent Access (S-IA) is designed for:

     - 11 9s of durability

     - Three 9s of availability

2. Amount of storage –

   - The number and size of objects

Amazon S3: Storage pricing (2 of 2)

3. Requests –

- The number and type of requests **(GET, PUT, COPY)**

- Type of requests:

  - Different rates for GET requests than other requests.

4. Data transfer –

- Pricing is based on the amount of data that is transferred out of the Amazon S3 Region

  - Data transfer in is free, but you incur charges for data that is transferred out.
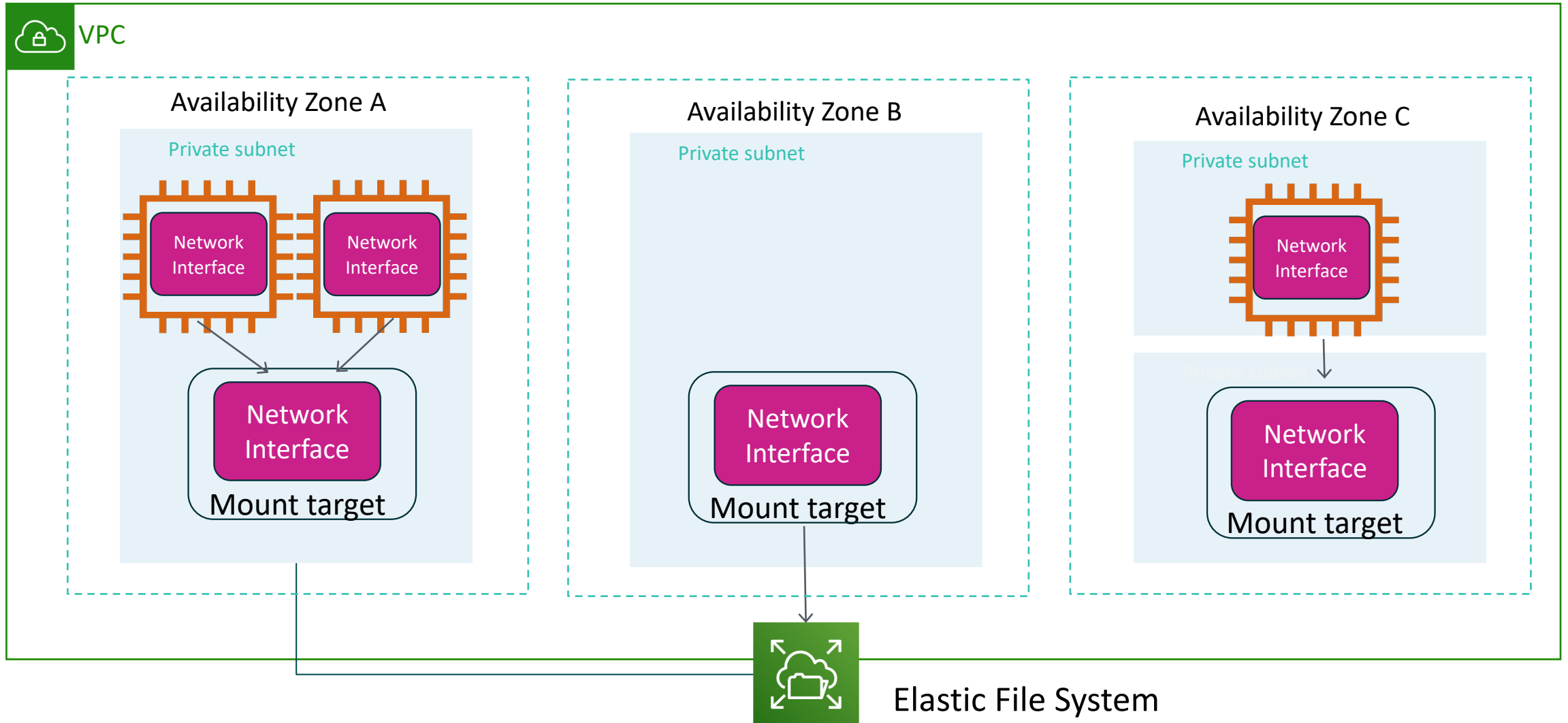
Storage

**Amazon Elastic File System
(Amazon EFS)**

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Amazon EFS features

- File storage in the AWS Cloud

- Works well for big data and analytics, media processing workflows, content management, web serving, and home directories

- Petabyte-scale, low-latency file system

- Shared storage

- Elastic capacity

- Supports Network File System (NFS) versions 4.0 and 4.1 (NFSv4)

- Compatible with all Linux-based AMIs for Amazon EC2

Amazon EFS architecture

Storage

Amazon S3 Glacier

Amazon S3 Glacier review

Amazon S3 Glacier is a data archiving service that is designed for security, durability, and an extremely low cost.

- Amazon S3 Glacier is designed to provide 11 9s of durability for objects.

- It supports the encryption of data in transit and at rest through Secure Sockets Layer (SSL) or Transport Layer Security (TLS).

- The Vault Lock feature enforces compliance through a policy.

- Extremely low-cost design works well for long-term archiving.

  - Provides three options for access to archives—expedited, standard, and bulk—retrieval times range from a few minutes to several hours.

Amazon S3 Glacier

- Storage service for low-cost data archiving and long-term backup

- You can configure lifecycle archiving of Amazon S3 content to Amazon S3 Glacier

- Retrieval options –
  - Standard: 3–5 hours
  - Bulk: 5–12 hours
  - Expedited: 1–5 minutes

Archive after 30 days

Delete after 5 years

Amazon S3 bucket

Amazon S3 Glacier Archive
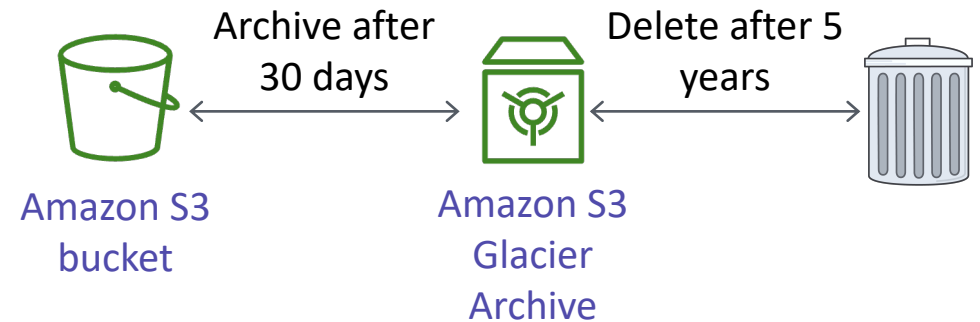
Amazon S3 Glacier use cases

Media asset archiving

Healthcare information archiving

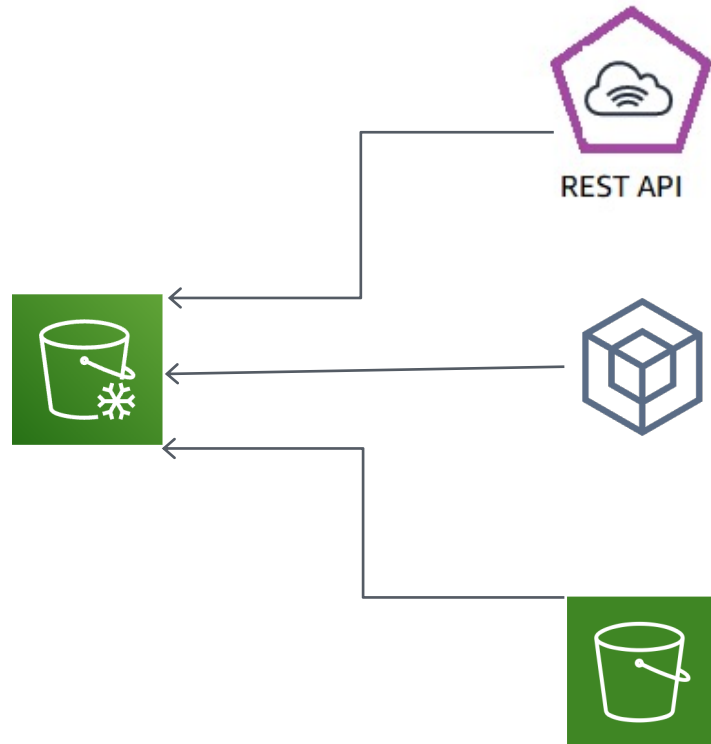Regulatory and compliance archiving

Scientific data archiving

Digital preservation

Magnetic tape replacement
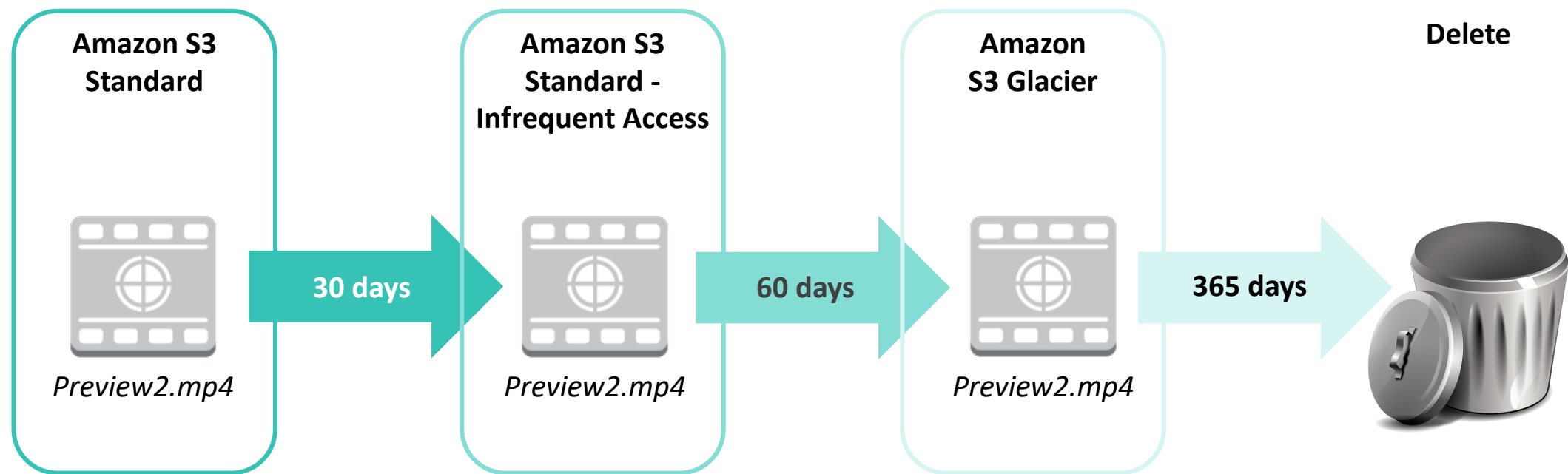
Using Amazon S3 Glacier

REST API

RESTful
web services

Java or .NET
SDKs

Amazon S3 with
lifecycle policies

Lifecycle policies

Amazon S3 lifecycle policies enable you to delete or move objects based on age.

Storage comparison

	Amazon S3	Amazon S3 Glacier
Data Volume	No limit	No limit
Average Latency	ms	minutes/hours
Item Size	5 TB maximum	40 TB maximum
Cost/GB per Month	Higher cost	Lower cost
Billed Requests	PUT, COPY, POST, LIST, and GET	UPLOAD and retrieval
Retrieval Pricing	¢ Per request	¢¢ Per request and per GB

Server-side encryption
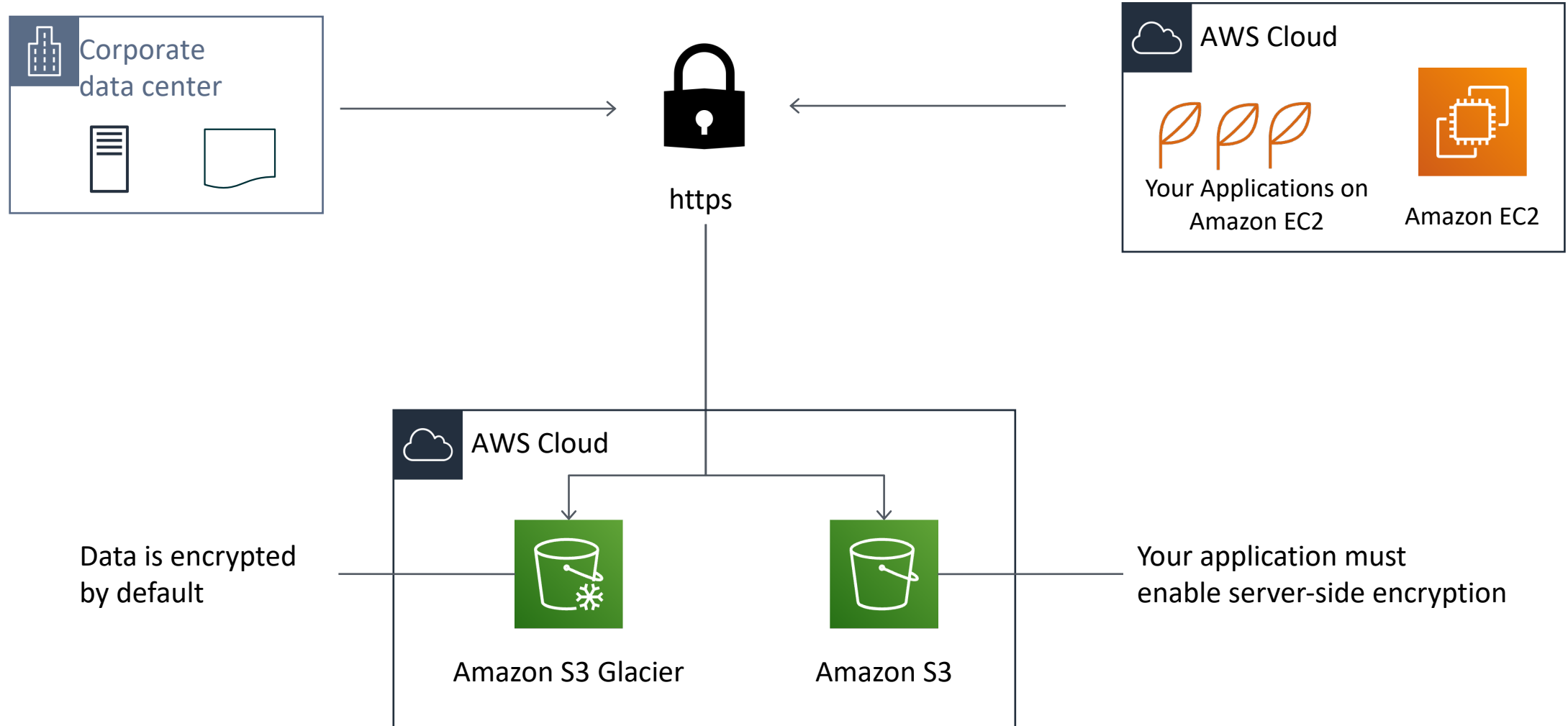
Security with Amazon S3 Glacier

Amazon S3 Glacier

Control access with IAM

Amazon S3 Glacier encrypts your data with AES-256

Amazon S3 Glacier manages your keys for you

Thank you

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