



Module 7: Storage

AWS Academy Cloud Foundations

Module overview

Topics

- Amazon Elastic Block Store (Amazon EBS)
- Amazon Simple Storage Service (Amazon S3)
- Amazon Elastic File System (Amazon EFS)
- Amazon Simple Storage Service Glacier

Demos

- Amazon EBS console
- Amazon S3 console
- Amazon EFS console
- Amazon S3 Glacier console

Lab

- Working with Amazon EBS

Activities

- Storage solution case study



Knowledge check

Module objectives

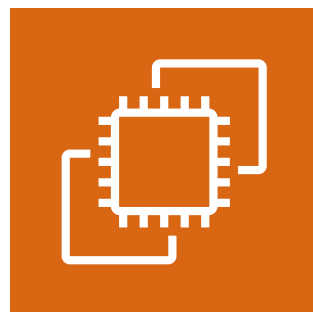
After completing this module, you should be able to:

- Identify the different types of storage
- Explain Amazon S3
- Identify the functionality in Amazon S3
- Explain Amazon EBS
- Identify the functionality in Amazon EBS
- Perform functions in Amazon EBS to build an Amazon EC2 storage solution
- Explain Amazon EFS
- Identify the functionality in Amazon EFS
- Explain Amazon S3 Glacier
- Identify the functionality in Amazon S3 Glacier
- Differentiate between Amazon EBS, Amazon S3, Amazon EFS, and Amazon S3 Glacier

Core AWS services



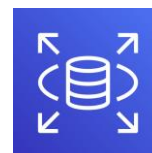
Amazon Virtual Private Cloud (Amazon VPC)



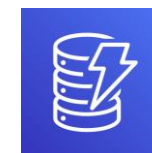
Amazon Elastic Compute Cloud (Amazon EC2)



Storage



Amazon Relational Database Service



Amazon DynamoDB

Database

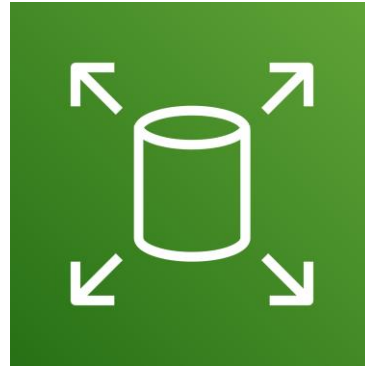


AWS Identity and Access Management (IAM)

Section 1: Amazon Elastic Block Store (Amazon EBS)

Module 7: Storage

Storage

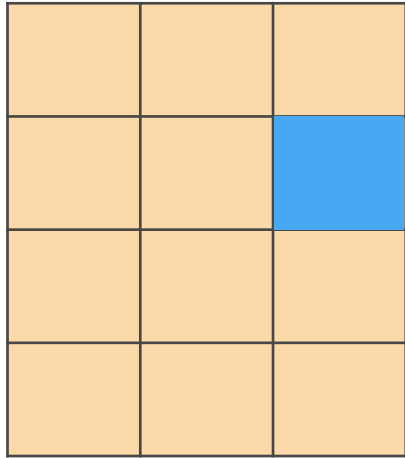


Amazon Elastic Block Store (Amazon EBS)

AWS storage options: Block storage versus object storage

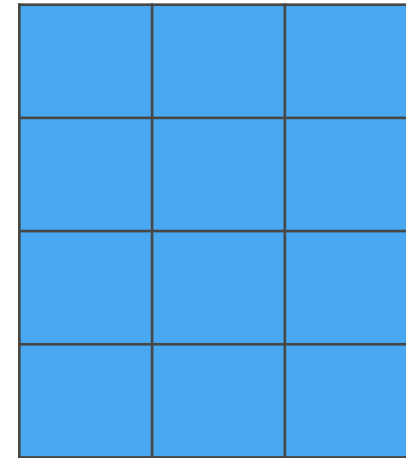


What if you want to change **one character** in a 1-GB file?



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

Amazon EBS volume types

Maximum Volume Size
Maximum IOPS/Volume
Maximum
Throughput/Volume

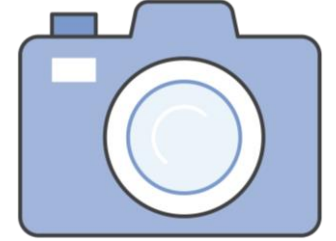
Solid State Drives (SSD)		Hard Disk Drives (HDD)	
General Purpose	Provisioned IOPS	Throughput-Optimized	Cold
16 TiB	16 TiB	16 TiB	16 TiB
16,000	64,000	500	250
250 MiB/s	1,000 MiB/s	500 MiB/s	250 MiB/s

Amazon EBS volume type use cases

Solid State Drives (SSD)		Hard Disk Drives (HDD)	
General Purpose	Provisioned IOPS	Throughput-Optimized	Cold
<ul style="list-style-type: none"> This type is recommended for most workloads 	<ul style="list-style-type: none"> Critical business applications that require sustained IOPS performance, or more than 16,000 IOPS or 250 MiB/second of throughput per volume 	<ul style="list-style-type: none"> Streaming workloads that require consistent, fast throughput at a low price 	<ul style="list-style-type: none"> Throughput-oriented storage for large volumes of data that is infrequently accessed
<ul style="list-style-type: none"> System boot volumes 	<ul style="list-style-type: none"> Large database workloads 	<ul style="list-style-type: none"> Big data 	<ul style="list-style-type: none"> Scenarios where the lowest storage cost is important
<ul style="list-style-type: none"> Virtual desktops 		<ul style="list-style-type: none"> Data warehouses 	<ul style="list-style-type: none"> It cannot be a boot volume
<ul style="list-style-type: none"> Low-latency interactive applications 		<ul style="list-style-type: none"> Log processing 	
<ul style="list-style-type: none"> Development and test environments 		<ul style="list-style-type: none"> 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



Amazon EBS: Volumes, IOPS, and pricing

1. Volumes –

- Amazon EBS volumes persist independently from the instance.
- All volume types are charged by the amount that is provisioned per month.

2. IOPS –

- General Purpose SSD:
 - Charged by the amount that you provision in GB per month until storage is released.
- Magnetic:
 - Charged by the number of requests to the volume.
- Provisioned IOPS SSD:
 - Charged by the amount that you provision in IOPS (multiplied by the percentage of days that you provision for the month).

Amazon EBS: Snapshots and data transfer

3. Snapshots –

- Added cost of Amazon EBS snapshots to Amazon S3 is per GB-month of data stored.

4. Data transfer –

- Inbound data transfer is free.
- Outbound data transfer across Regions incurs charges.

Section 1 key takeaways



Amazon EBS features:

- Persistent and customizable block storage for Amazon EC2
- HDD and SSD types
- Replicated in the same Availability Zone
- Easy and transparent encryption
- Elastic volumes
- Back up by using snapshots

Recorded demo: Amazon Elastic Block Store

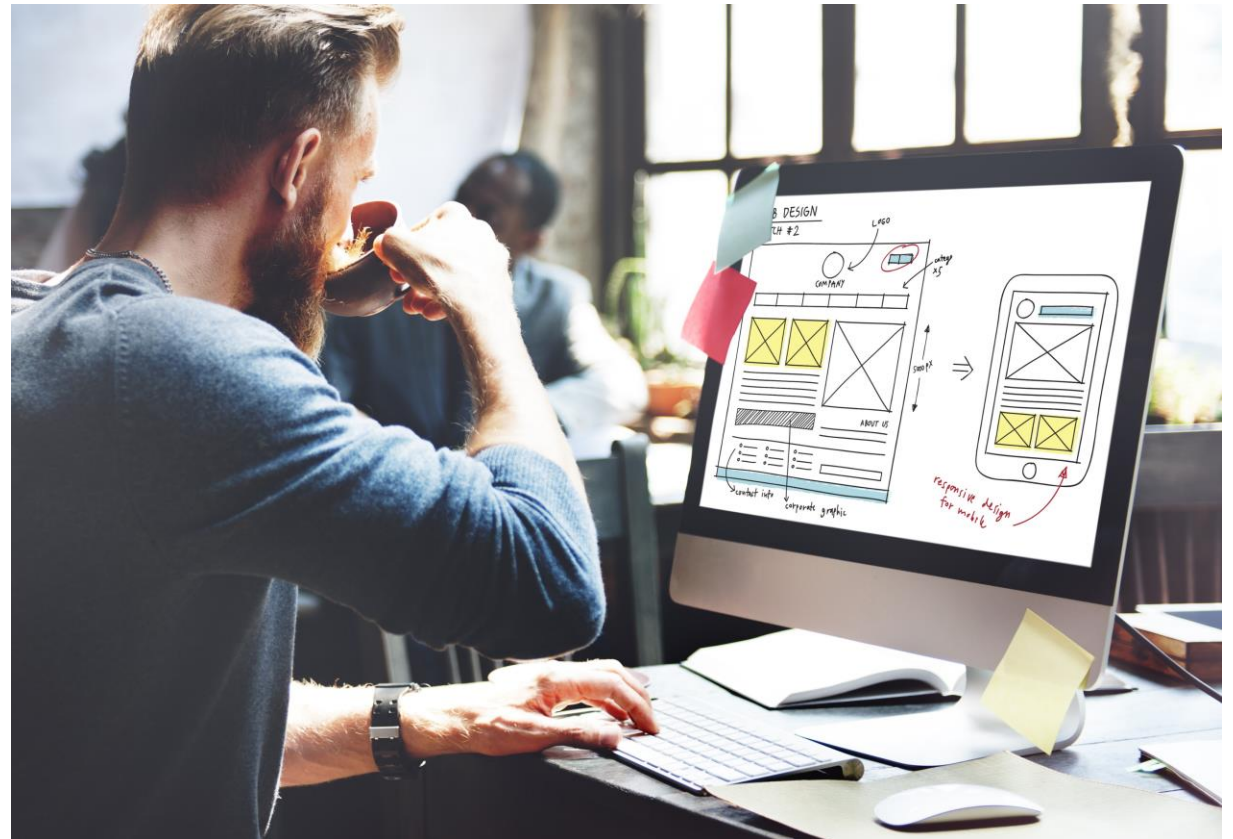


Set up demo

Amazon Elastic Block Store (EBS)

Lab 4:

Working with Amazon EBS

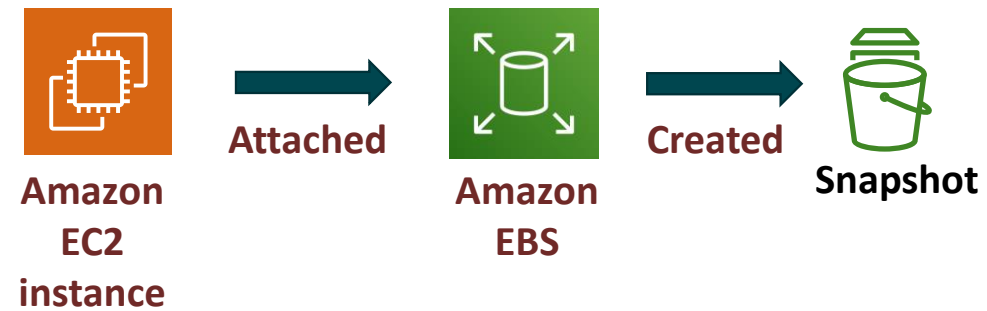


Lab 4: Scenario

This lab is designed to show you how to create an Amazon EBS volume. After you create the volume, you will attach the volume to an Amazon EC2 instance, configure the instance to use a virtual disk, create a snapshot and then restore from the snapshot.

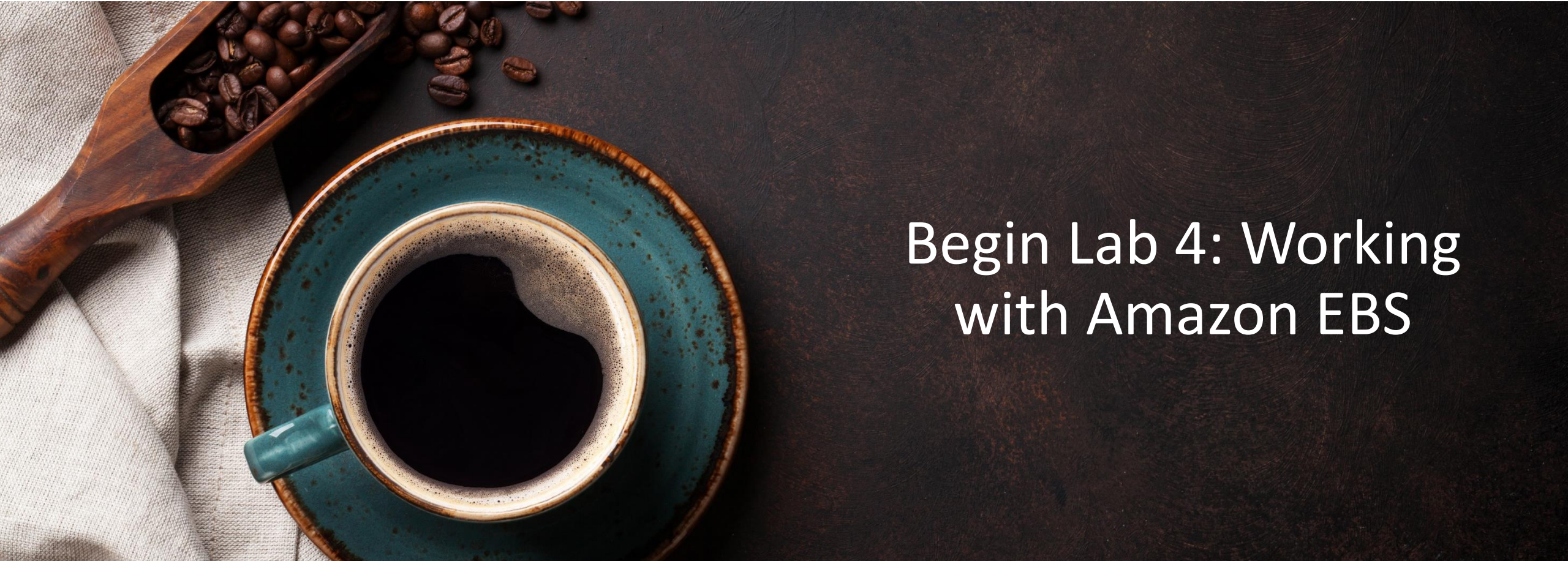


Lab 4: Final product





~ 30 minutes



Begin Lab 4: Working with Amazon EBS

Lab debrief: Key takeaways



Section 2: Amazon Simple Storage Service (Amazon S3)

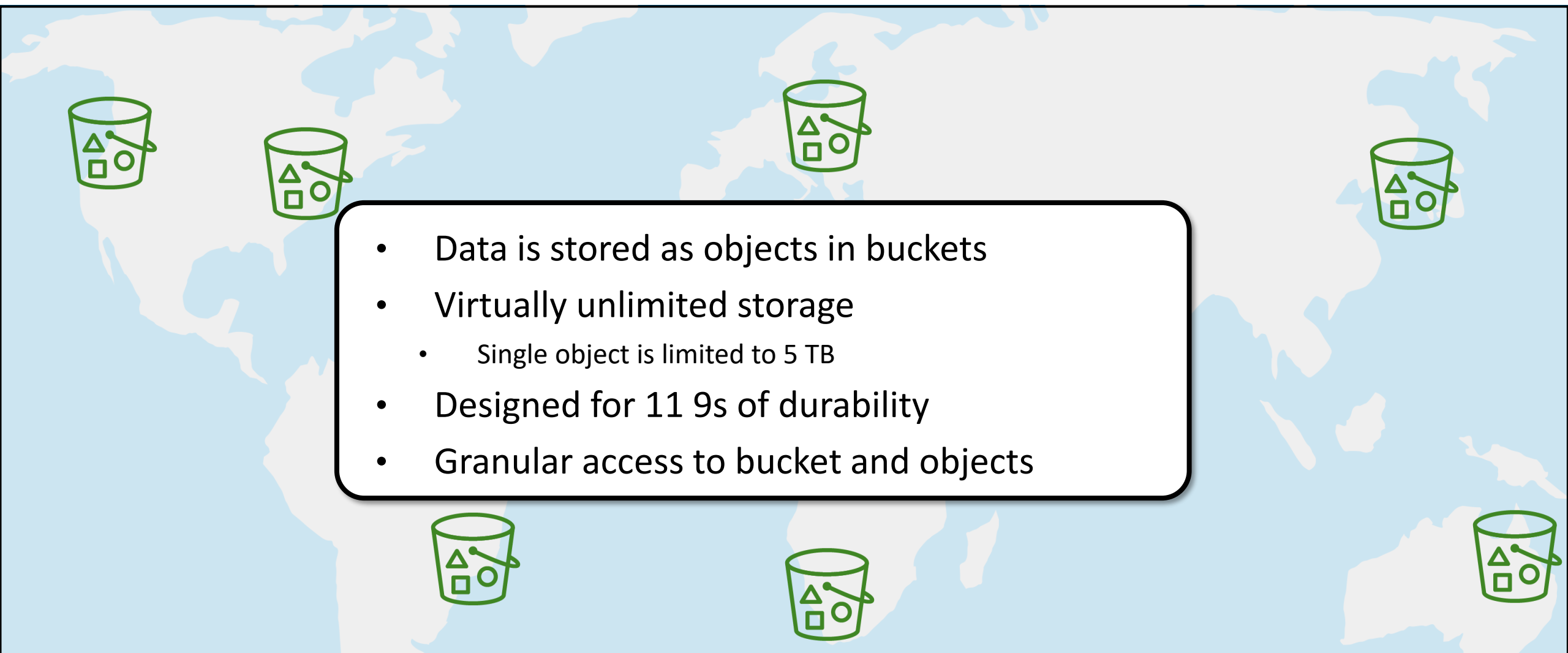
Module 7: Storage

Storage



Amazon Simple Storage Service (Amazon S3)

Amazon S3 overview

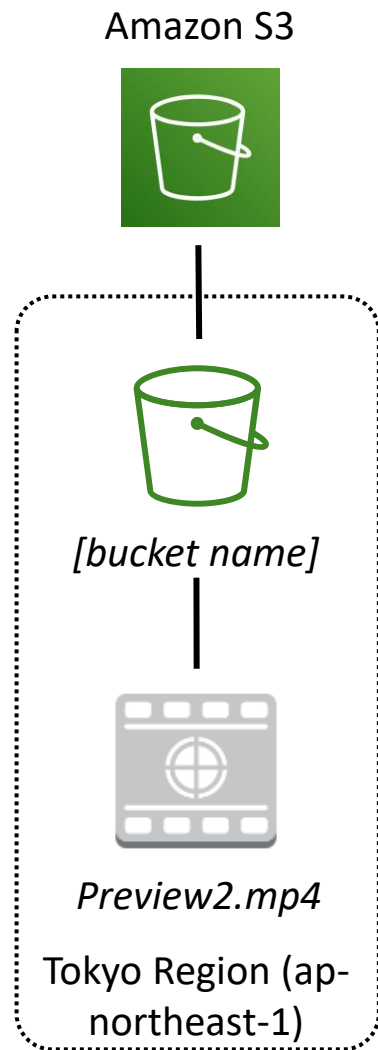
- 
- A world map with a light blue background and white landmasses. Eight green bucket icons, each containing a triangle, a square, and a circle, are placed across the map: two in North America, two in Europe, two in Asia, and two in Australia. A white rounded rectangle with a black border is centered over the map, containing a bulleted list.
- 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)



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>

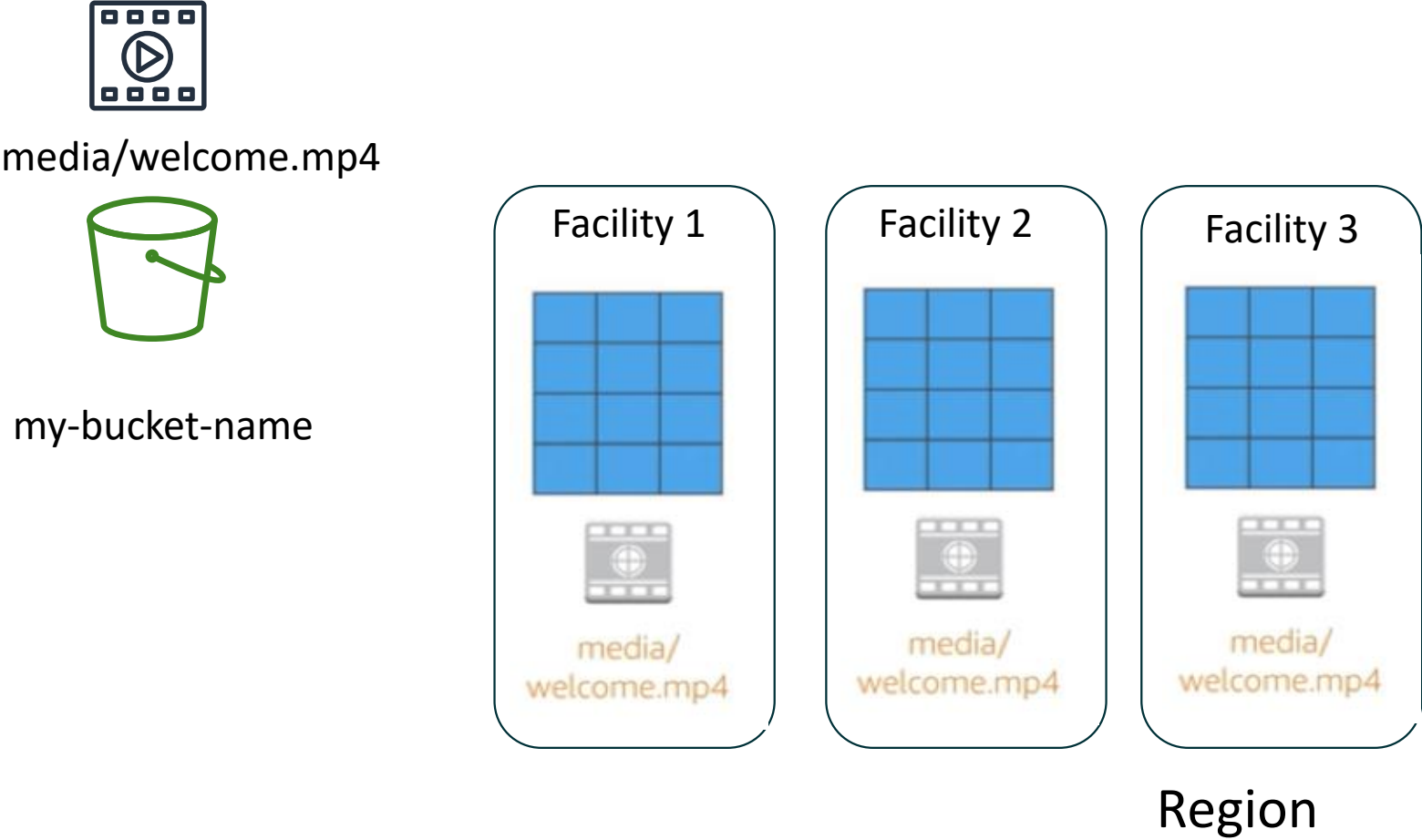
Region code Bucket name

Bucket virtual hosted-style URL endpoint:

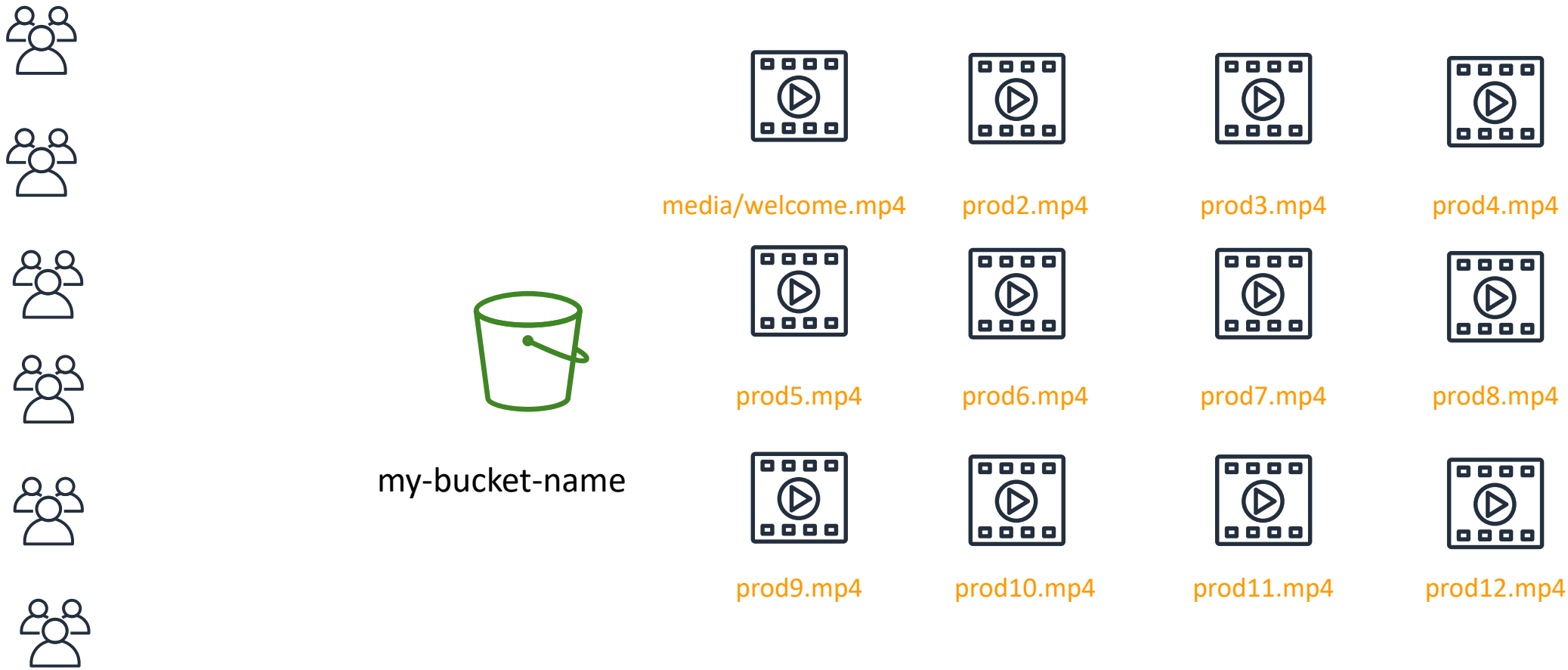
<https://bucket-name.s3-ap-northeast-1.amazonaws.com>

Bucket name Region code

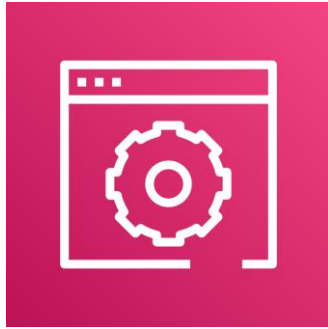
Data is redundantly stored in the Region



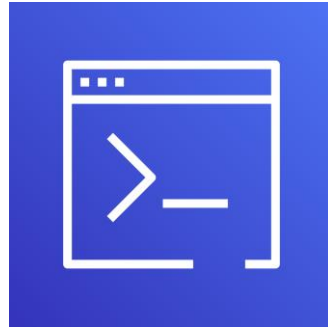
Designed for seamless scaling



Access the data anywhere



AWS Management
Console



AWS Command Line
Interface



SDK

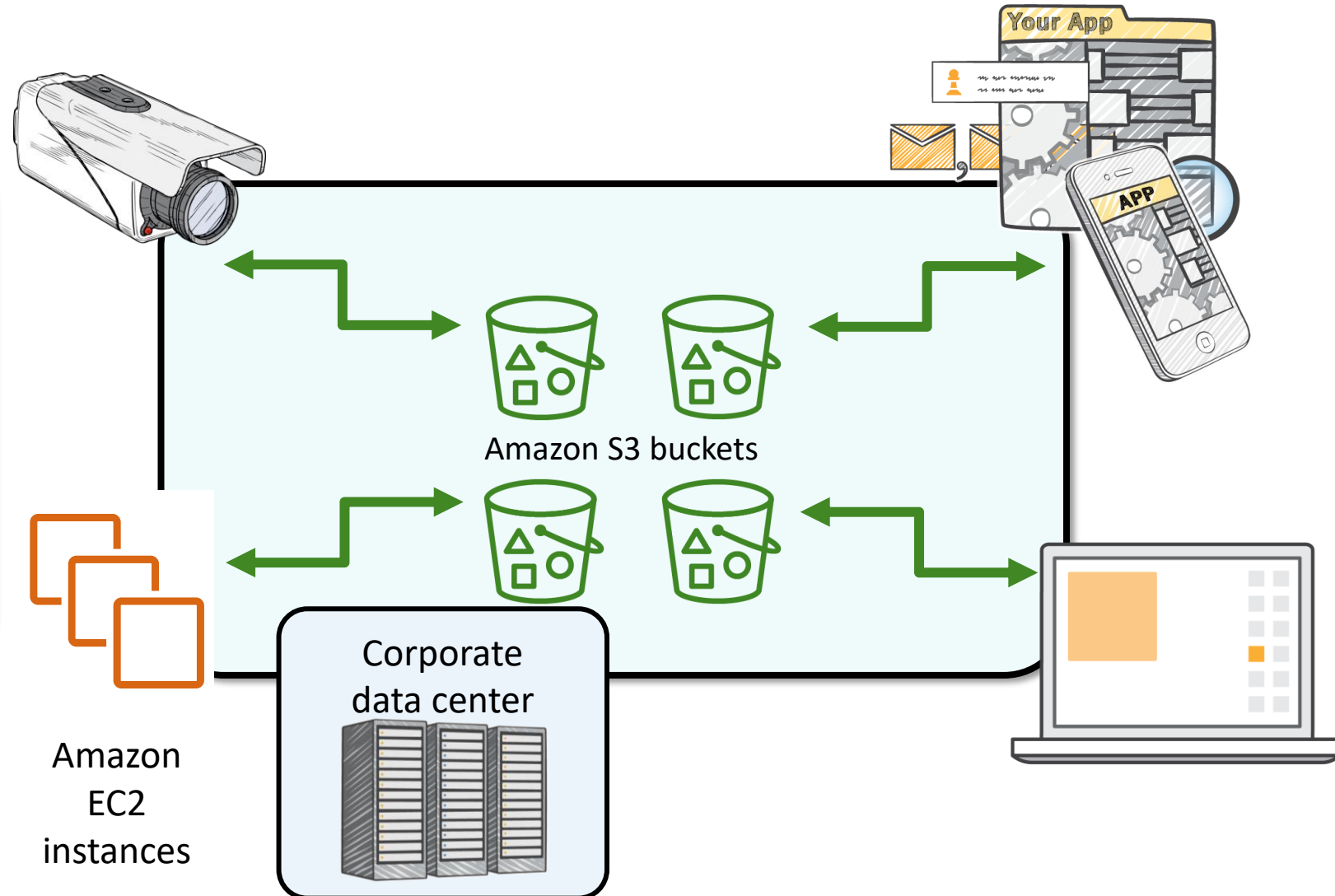
Common use cases

- 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 pricing

- Pay only for what you use, including –
 - GBs per month
 - Transfer OUT to other Regions
 - PUT, COPY, POST, LIST, and GET requests
- You do not pay for –
 - Transfers IN to Amazon S3
 - Transfers OUT from Amazon S3 to Amazon CloudFront or Amazon EC2 in the same Region

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.

Section 2 key takeaways



- Amazon S3 is a fully managed cloud storage service.
- You can store a virtually unlimited number of objects.
- You pay for only what you use.
- You can access Amazon S3 at any time from anywhere through a URL.
- Amazon S3 offers rich security controls.

Recorded demo: Amazon Simple Storage System



Set up demo

Amazon S3