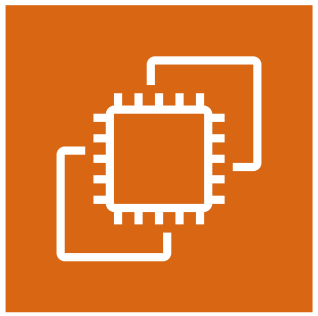
Day 3: Cloud Storage

AWS EBS + AWS S3

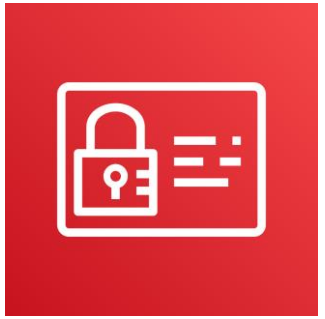
Core AWS services

Amazon Virtual Private Cloud (Amazon VPC)



Amazon Elastic Compute Cloud (Amazon EC2)

Storage



AWS Identity and Access Management (IAM)

Amazon Relational Database Service

Amazon DynamoDB

Database

Amazon Elastic Block Store (Amazon EBS)

Cloud Storage

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

	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

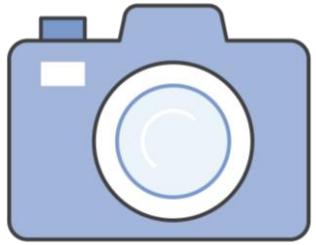
*Only SSDs can be used as boot volumes for EC2 instances

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



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

Lab: Scenario

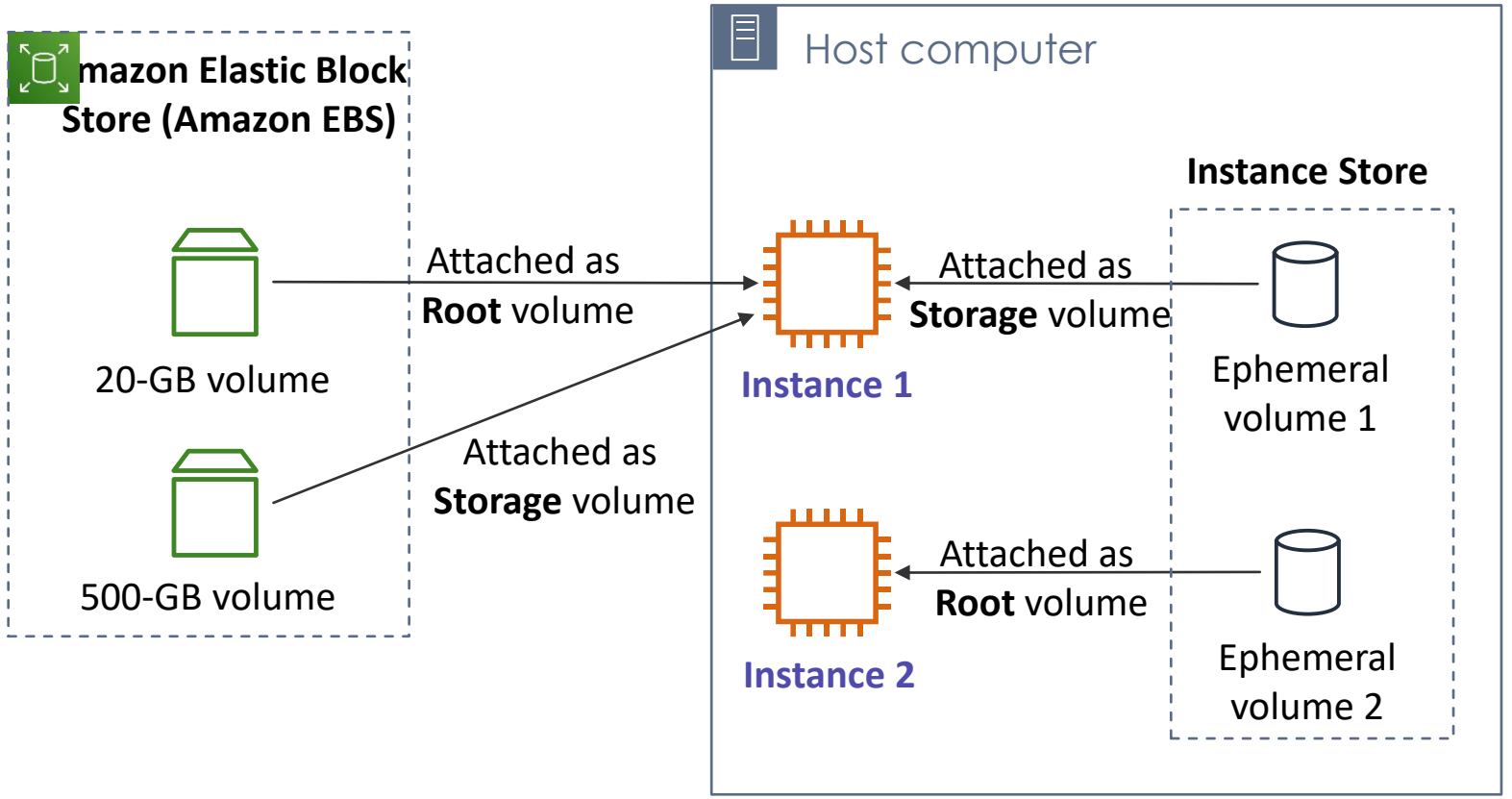
This lab is designed to show you how to create an Amazon EBS volume. After you create the volume, you will attach the volume to an Amazon EC2 instance, configure the instance to use a virtual disk, create a snapshot and then restore from the snapshot.

Lab: Commands to mount the newly attached volume

1. Open SSH window to the EC2 instance
   - ls -l /dev/xvdf (where sdf is the name of the volume you created)
2. Make filesystem on the EBS volume
   - sudo mkfs -t ext4 /dev/xvdf
3. Mount to the operating system
   - Create mount point: sudo mkdir /mnt/myebs/
   - See if it is created: ls -ld /mnt/myebs
   - Finally, mount the EBS: sudo mount /dev/sdf /mnt/myebs
   - Verify that EBS is mounted: df –h
   - Optional: Mount automatically at boot: Edit the /etc/fstab file and add a line for the EBS like /dev/sdf /mnt/myebs/ ext4 defaults 0 2

Example storage options

- **Instance 1** characteristics –
  - It has an **Amazon EBS** *root volume* type for the operating system.
  - What will happen if the instance is stopped and then started again?
- **Instance 2** characteristics –
  - It has an **Instance Store** *root volume* type for the operating system.
  - What will happen if the instance stops (because of user error or a system malfunction)?



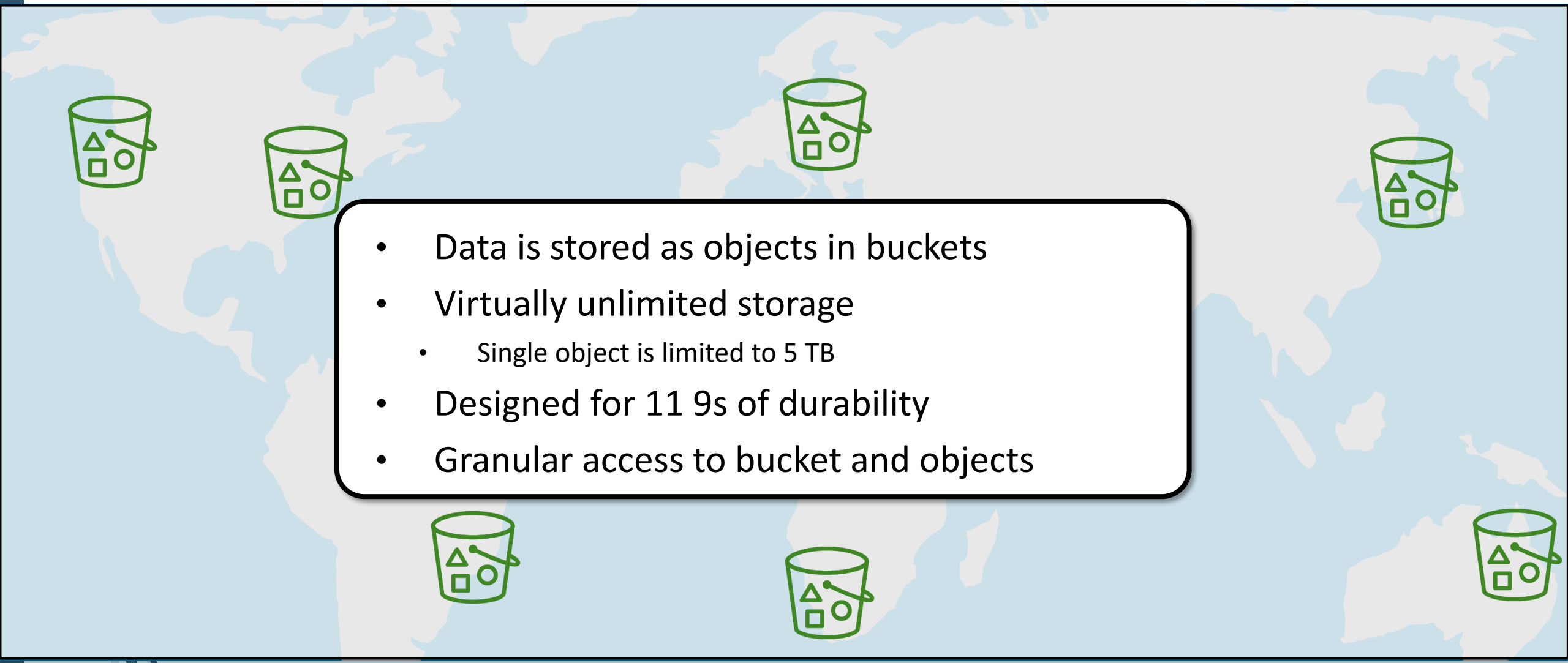
Amazon Simple Storage Service (Amazon S3)

Cloud Storage

Storage

Amazon Simple Storage Service (Amazon S3)

Amazon S3 overview



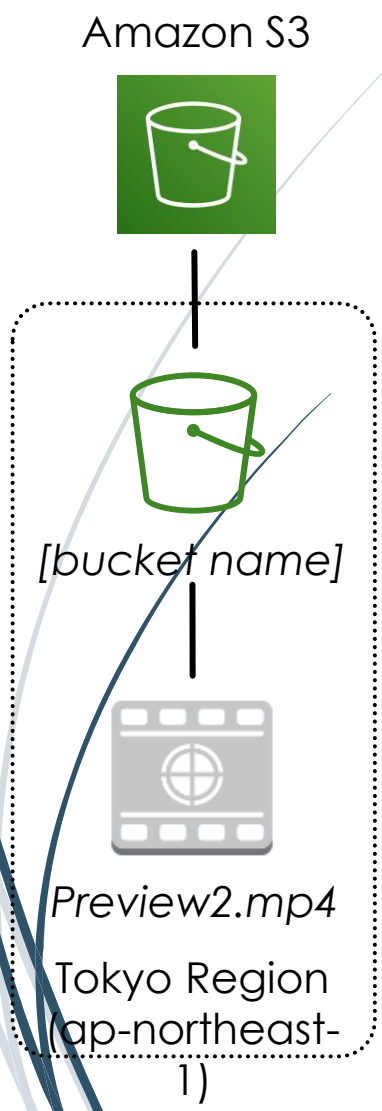
- Data is stored as objects in buckets
- Virtually unlimited storage
  - Single object is limited to 5 TB
- Designed for 11 9s of durability
- Granular access to bucket and objects

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)



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

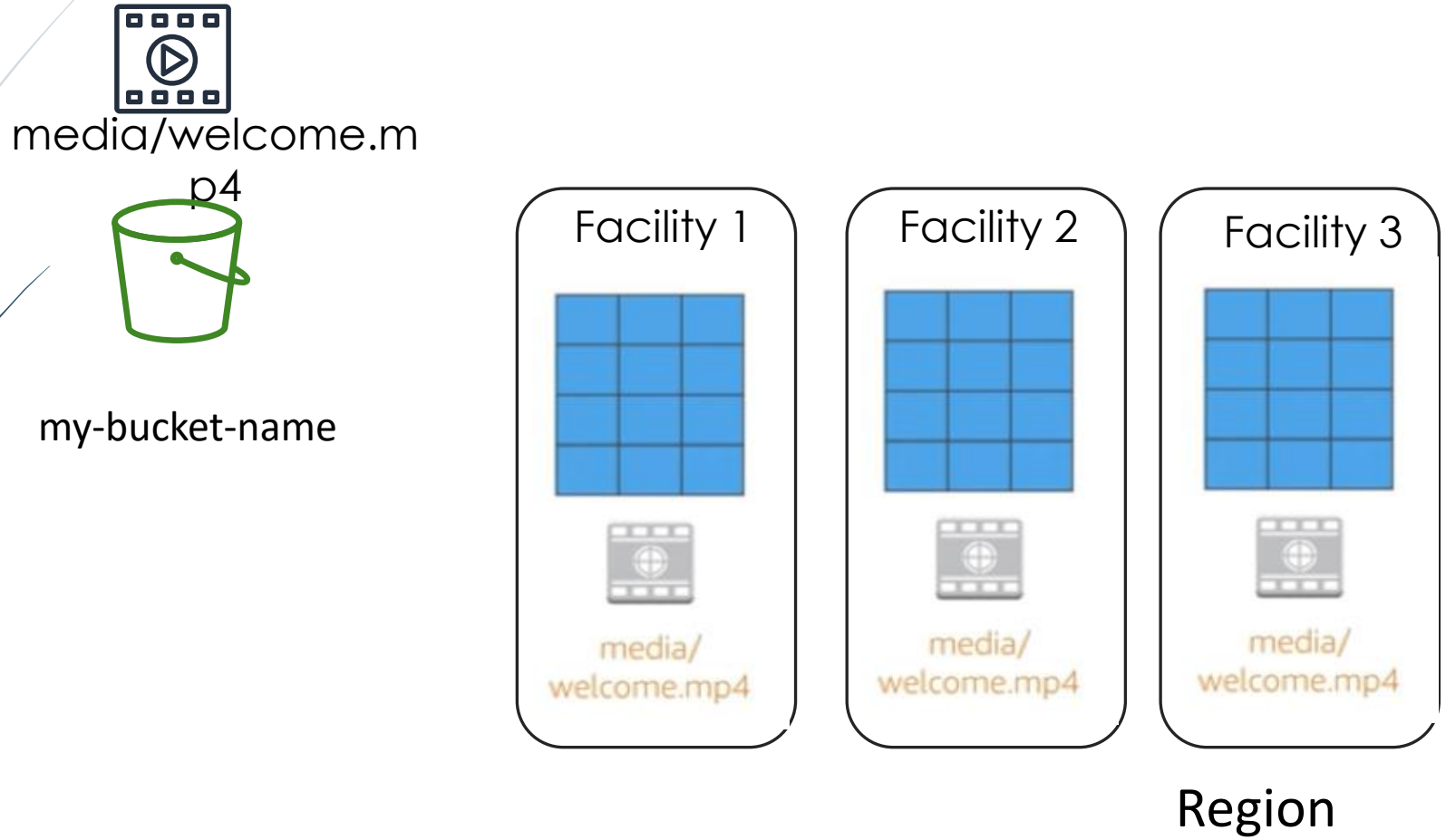
Region code **Bucket name**

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

my-bucket-name

media/welcome.mp4

prod2.mp4

prod3.mp4

prod4.mp4

prod5.mp4

prod6.mp4

prod7.mp4

prod8.mp4

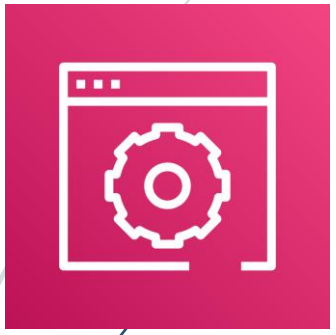
prod9.mp4

prod10.mp4

prod11.mp4

prod12.mp4

Access the data anywhere



AWS Management Console

AWS Command Line Interface

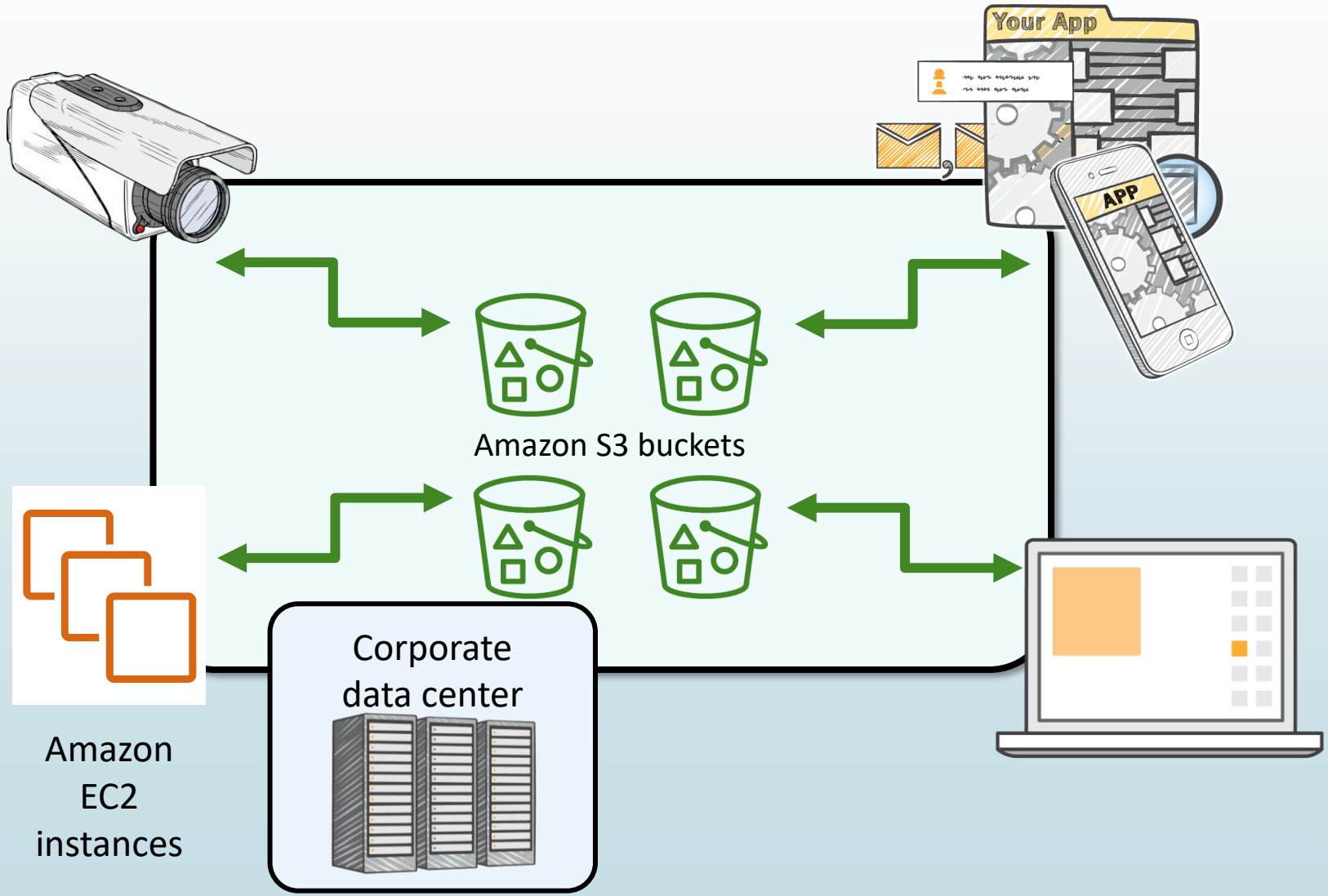
SDK

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.

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.