AWS Academy Cloud Developing

Module 3: Developing Storage Solutions

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Module 3: Developing Storage Solutions

Section 1: Introduction

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Module objectives

At the end of this module, you should be able to do the following:

- Describe how Amazon Simple Storage Service (Amazon S3) can be used as a storage solution
- Identify features and components of Amazon S3
- Describe how to protect data in Amazon S3
- Describe the function of S3 object operations
- Explain how to manage access to Amazon S3 resources
- Develop with Amazon S3 by using the AWS software development kits (SDKs)

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Module overview

Sections

1. Introduction
2. Introducing Amazon S3
3. Creating S3 buckets
4. Working with S3 objects
5. Protecting data and managing access to Amazon S3 resources

Lab

- Working with Amazon S3

Knowledge check

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Café business requirement

Sofía has decided on a development environment, and she is ready to start building. She wants to create a proof-of-concept website for the café without exposing the site to the outside world yet.

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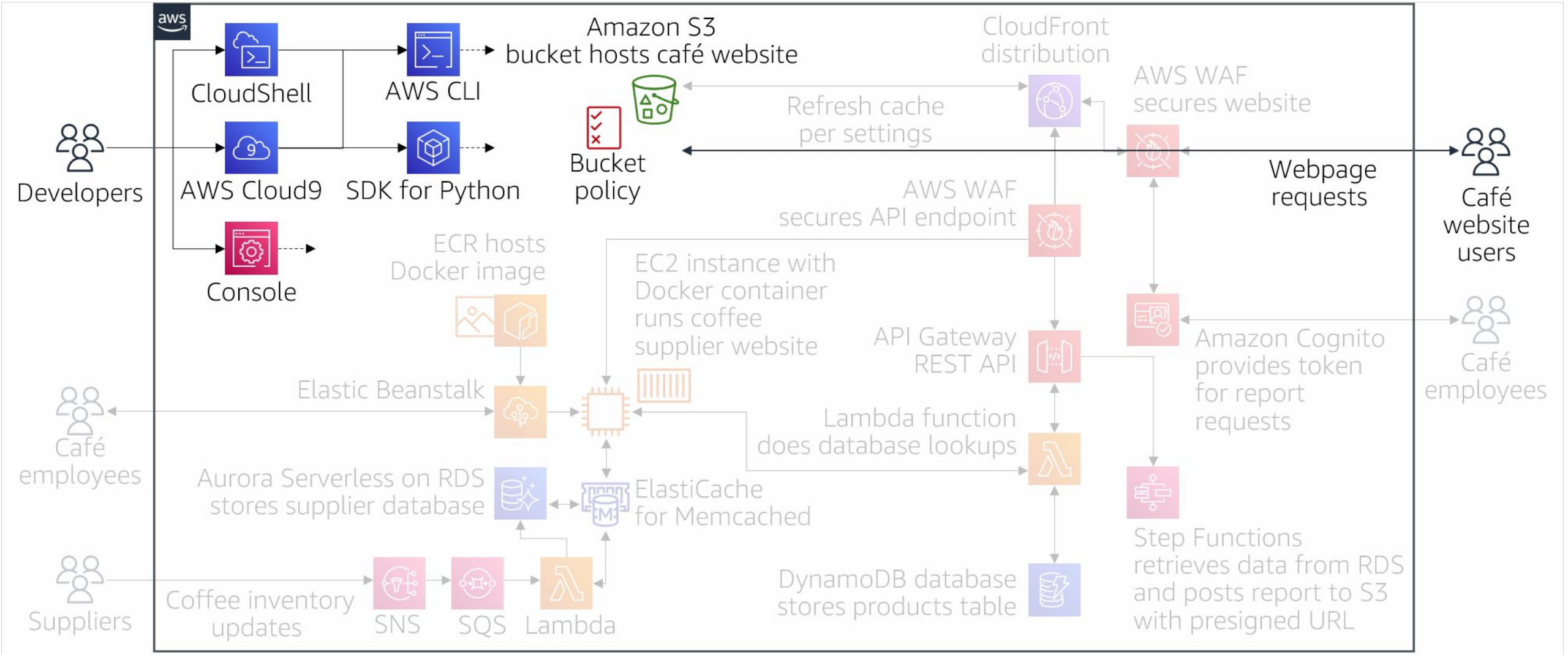
Amazon S3 as part of developing a cloud application



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Section 2: Introducing Amazon S3

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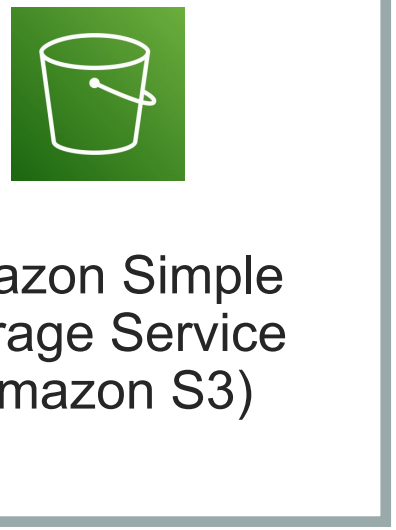
Amazon S3



Object storage service that offers scalability, data availability, security, and performance

- Designed for 99.999999999 percent (11 9s) of durability
- Provides easy-to-use management features
- Can respond to event triggers

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Amazon S3 use cases

Content storage and distribution

Backup and restore, and archive

Data lakes and big data analytics

Disaster recovery (DR)

Static website hosting

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Amazon S3 components

Bucket

https://s3-<*aws-region*>.amazonaws.com/<*bucket-name*>/

Each bucket is Regional and has a Region-specific endpoint in this format

Object

https://s3-<*aws-region*>.amazonaws.com/<*bucket-name*>/<*object-key*>

Object key example: preview.mp4

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Section 2 key takeaways

- Amazon S3 is an object storage service.
- Some uses for Amazon S3 include content storage, backups, data lakes, DR, and static websites.
- Objects in an S3 bucket can be referred to by their URL.
- The key value identifies the object in the bucket.

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Section 3: Creating S3 buckets

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S3 bucket names

- Bucket names must be globally unique.
- Additional rules to follow when you choose bucket names –
  - Use 3–63 characters.
  - Use only lowercase letters, numbers, and hyphens (-).
  - Do not use uppercase characters or underscores (_).

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Amazon S3 bucket Regions

Deciding factors:

- Latency
- Cost
- Regulatory requirements

Region
s

New Region (coming soon)

*As of February 8, 2021

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Accessing buckets: Bucket URLs

Virtual-host-style URL

- Bucket name is part of the domain name in the URL.
- Structure: `http://<bucket-name>.s3-<aws-region>.amazonaws.com/<object-key>`
- Example: `http://DOC-EXAMPLE-BUCKET.s3.eu-west-1.amazonaws.com/cat.jpg`

- Useful for hosting a static website (*must be enabled*)
- Structure: `http://<bucket-name>.s3-website-<aws-region>.amazonaws.com`
- Example: `http://DOC-EXAMPLE-BUCKET.s3-website-eu-west-1.amazonaws.com`

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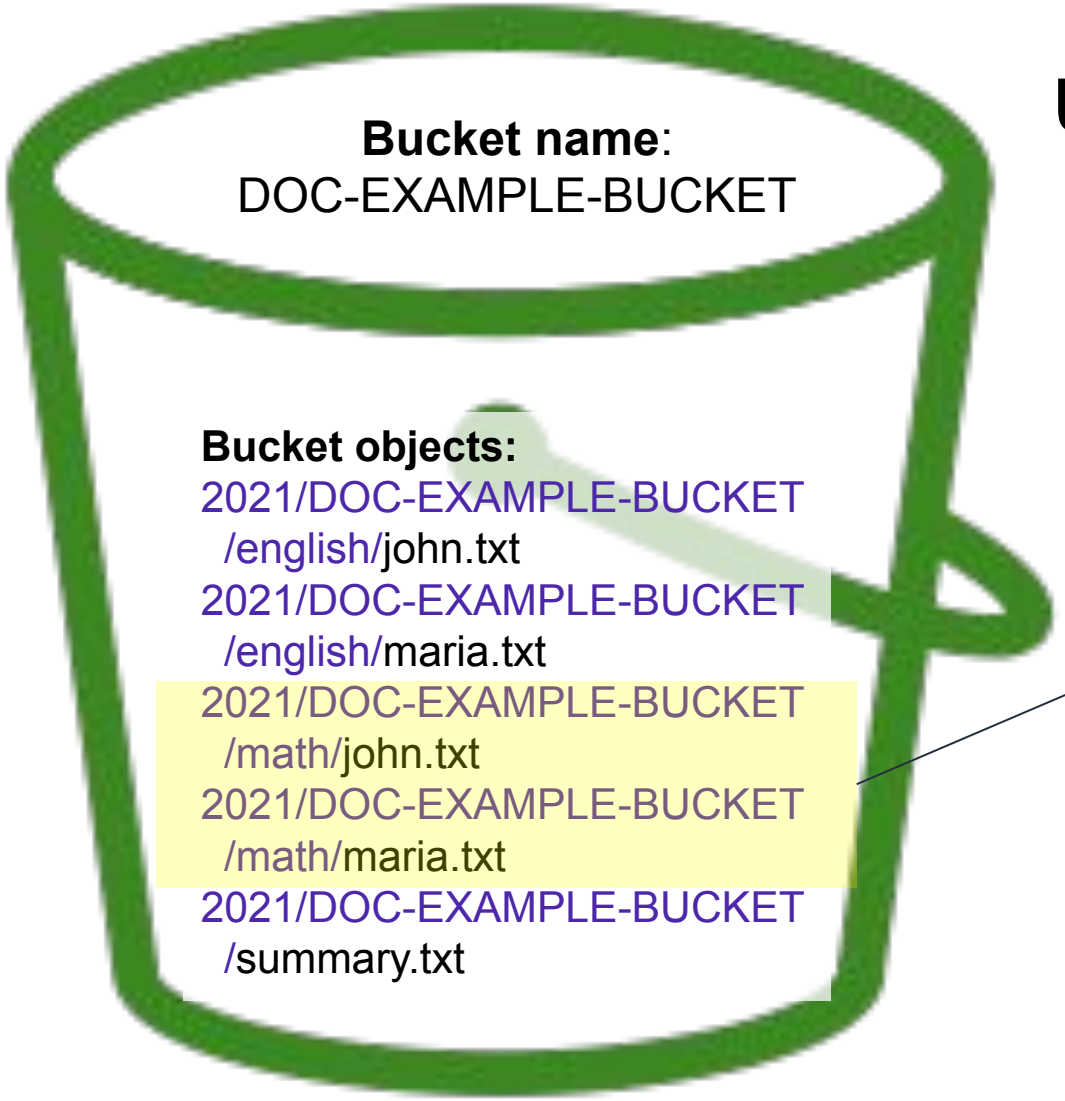
Creating folder structure in buckets: Using prefixes



Use prefixes to imply a folder structure in an S3 bucket

GET object

Specify prefix:
2021/DOC-EXAMPLE-BUCKET/math

Returns the following object keys:
- 2021/DOC-EXAMPLE-BUCKET/math/john.txt
- 2021/DOC-EXAMPLE-BUCKET/math/maria.txt

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Section 3 key takeaways

- Amazon S3 bucket names are globally unique.
- Buckets are located in Regions, which affects performance and is subject to regulatory requirements.
- Objects in buckets are referenced through virtual-host-style URLs.
- Prefixes imply a folder structure in an S3 bucket.

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Section 4: Working with S3 objects

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Object metadata

Set of key-value pairs that provides additional information about the object

System-defined

- Information that Amazon S3 controls:
  - Object-creation date
  - Object size
  - Object version
- Information that you can modify:
  - Storage-class configuration
  - Server-side encryption

User-defined

- Information that you assign to the object
- x-amz-meta key followed by a custom name
- For example:
  x-amz-meta-alt-name

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PUT object

Use the PUT object to upload entire objects to a bucket

- Should use single upload for objects up to 5 GB in a single PUT operation

- Should use multipart upload for objects over100mb
- Must use multipart upload for objects over 5 GB
  - Allows parallel uploading to improve throughput
  - Can resume uploads where it left off
  - Allows a maximum object size of 5 TB

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PUT object: Code

The following code PUTS core.css to the bucket

```
import boto3
S3API = boto3.client("s3", region_name="us-east-1")
bucket_name = ”samplebucket”
filename = "/resources/website/core.css"
S3API.upload_file(filename, bucket_name, "core.css",
ExtraArgs={'ContentType': "text/css", "CacheControl":
"max-age=0"})
```

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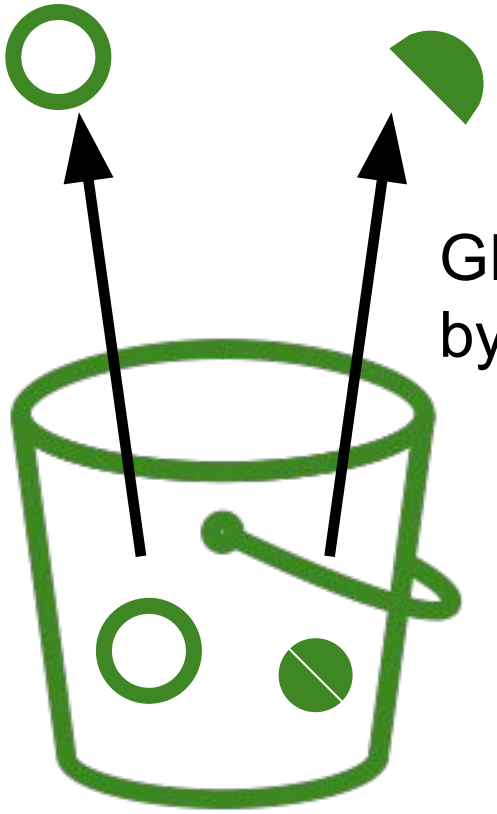
GET object

Use the GET object operation to retrieve objects from Amazon S3

GET the complete object



GET a range of bytes

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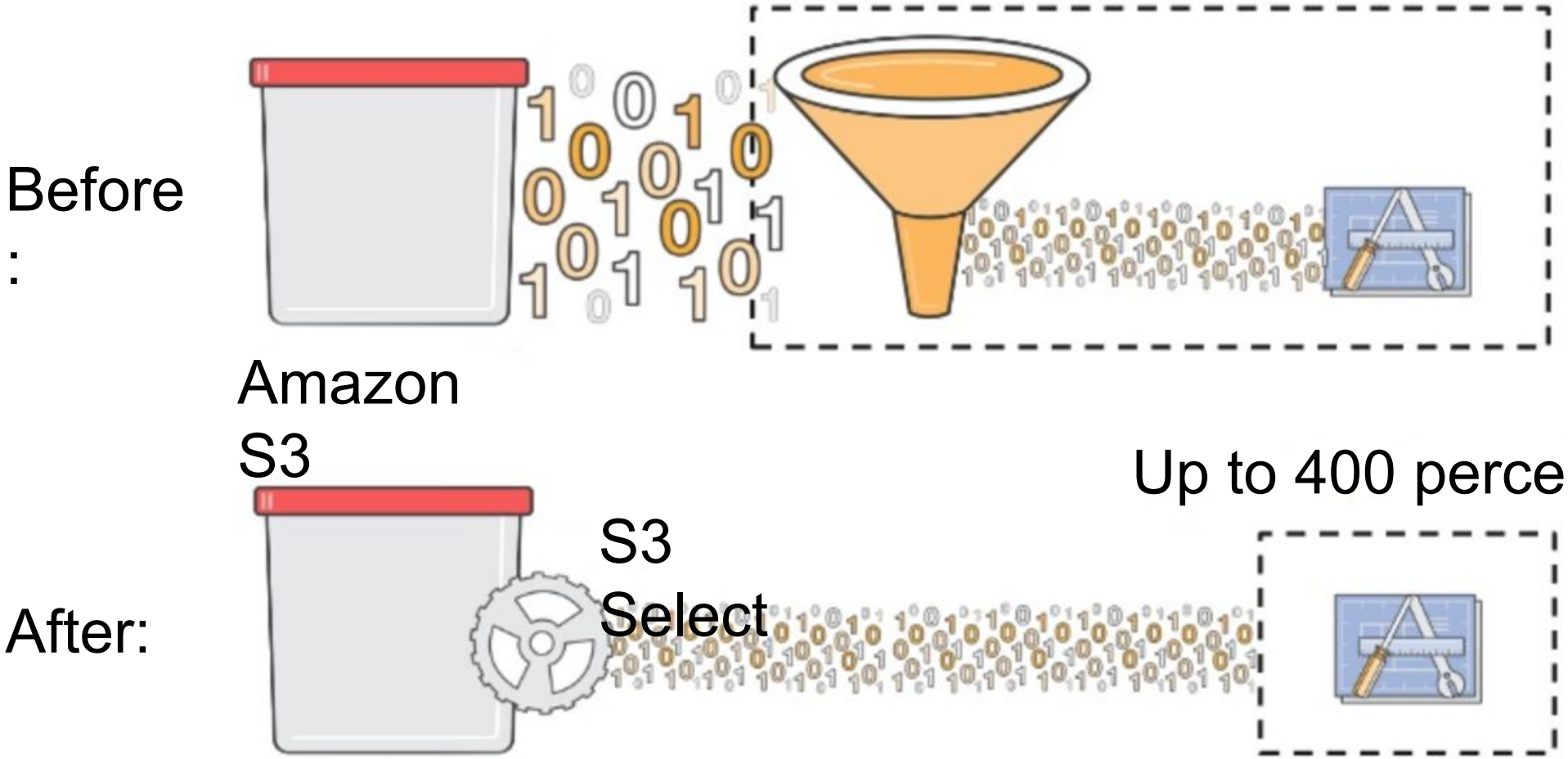
SELECT object



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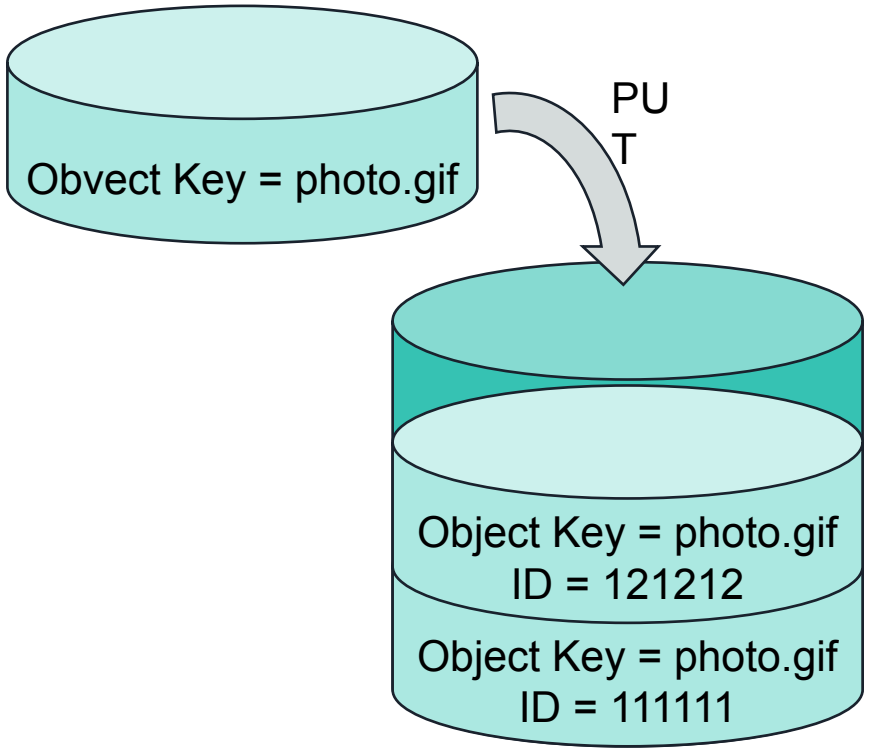
Versioning

- It is a way to keep multiple variants of an object in the same bucket.
- It is a way to recover from unintended user actions and application failures.
- In versioning-enabled S3 buckets, each object has a version ID.
- After versioning is enabled, it can only be *suspended* (it can't be disabled).
- Versioned buckets support object locking.



S3 bucket with versioning enabled

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DELETE object: Versioning disabled

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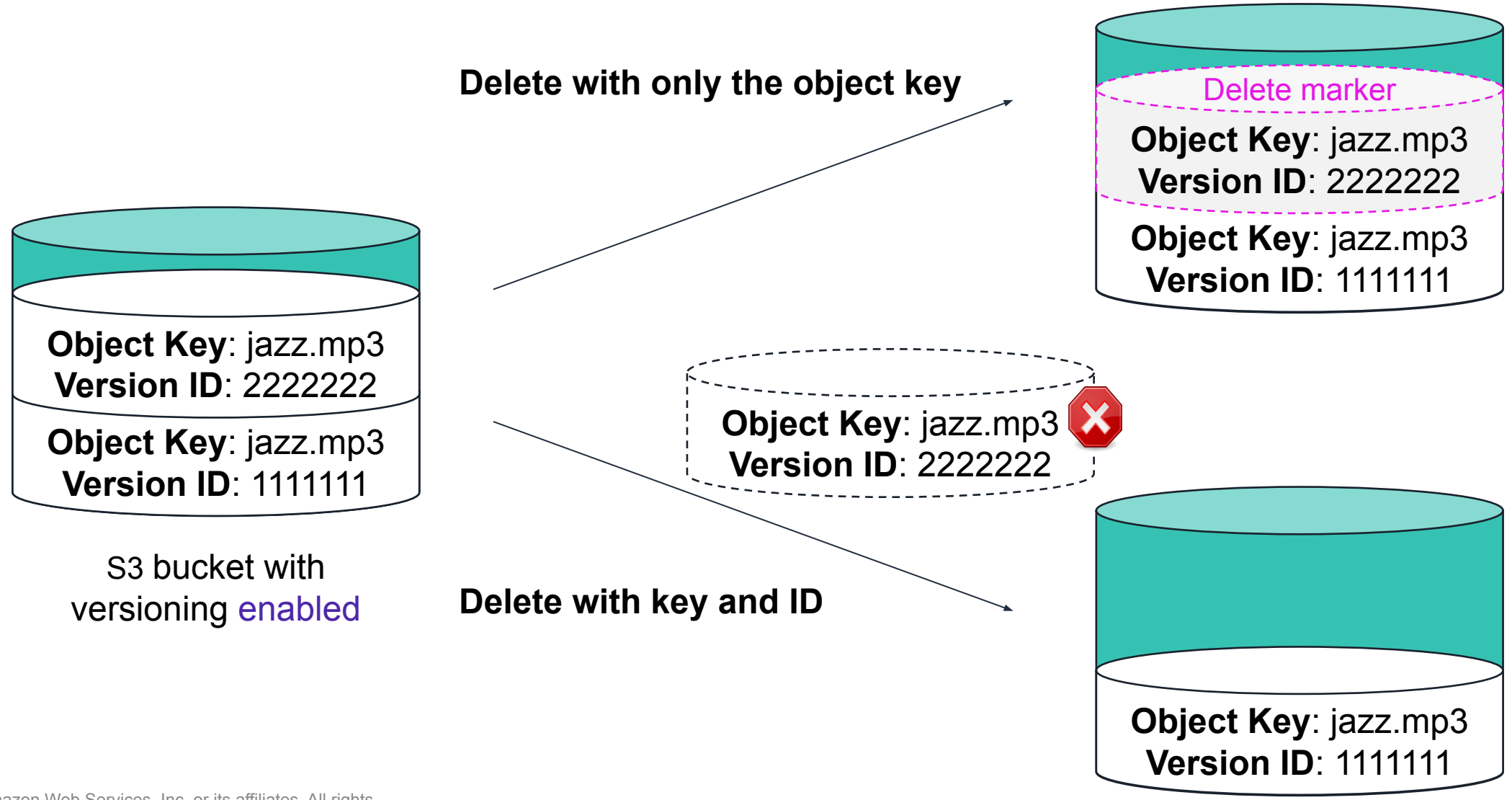
DELETE Object: Versioning enabled



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Section 4 key takeaways

- Objects in S3 buckets have two types of metadata:
  - System-defined metadata
  - User-defined metadata
- Amazon S3 has three operations:
  - PUT
  - GET
  - DELETE
- S3 Select is a powerful tool to query data in place.
- S3 bucket versioning protects objects.

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Section 5: Protecting data and managing access to Amazon S3 resources

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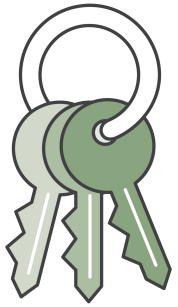
Data encryption

Securing data in transit

- SSL/TLS-encrypted endpoints with HTTPS
- Client-side encryption of data before transmission



Securing data at rest

- Client-side encryption
- Server-side encryption
  - Amazon S3-managed keys (SSE-S3)
  - AWS KMS-managed keys (SSE-KMS)
  - Customer-provided keys (SSE-C)

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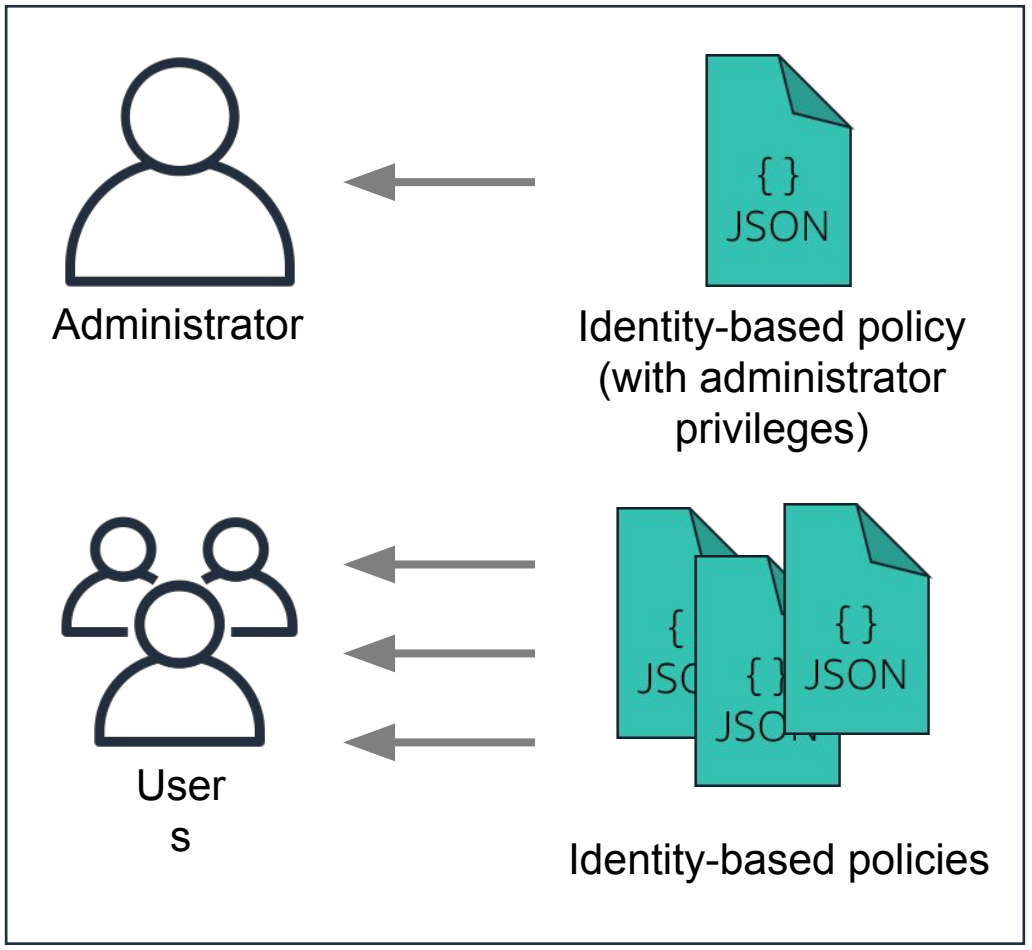
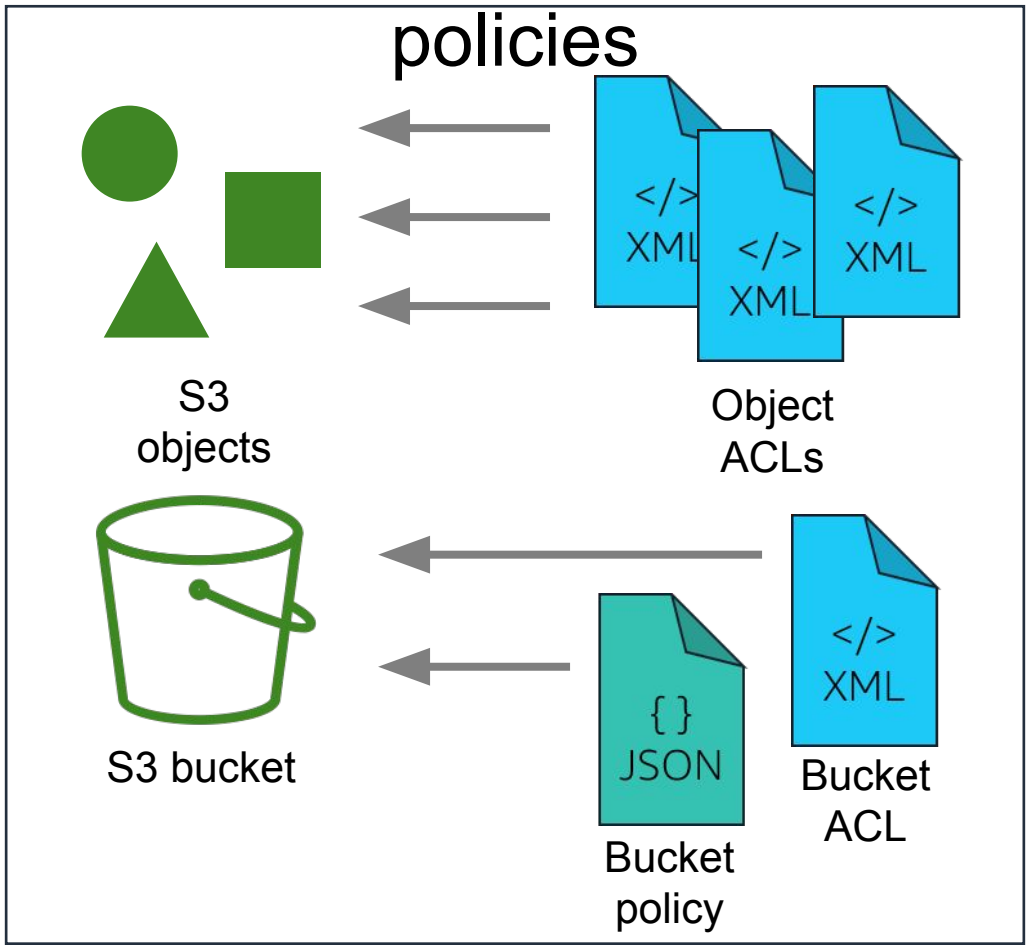
Identity-based policies and resource-based policies





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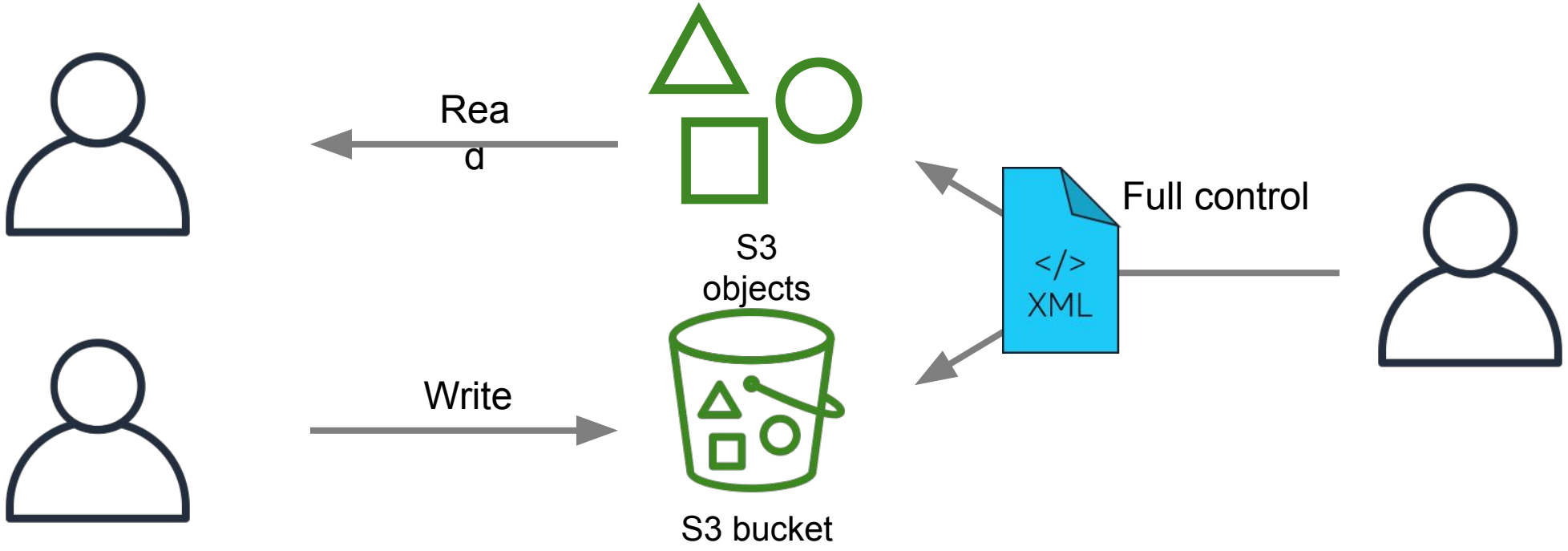
Access control lists (ACLs)



- Resource-based access policy to manage access at the object level or bucket level
- Use to grant basic read/write permissions to other AWS accounts

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Bucket policies

An IAM policy language option that grants granular permissions to Amazon S3 resources

```
{
 "Version":"2012-10-17",
 "Statement": [
 {
    "Effect":"Allow”,
        "Principal": "*",
    "Action":["s3:GetObject"],
        "Resource":["arn:aws:s3:::DOC-EXAMPLE-BUCKET/*"]
 }
 ]
}
```

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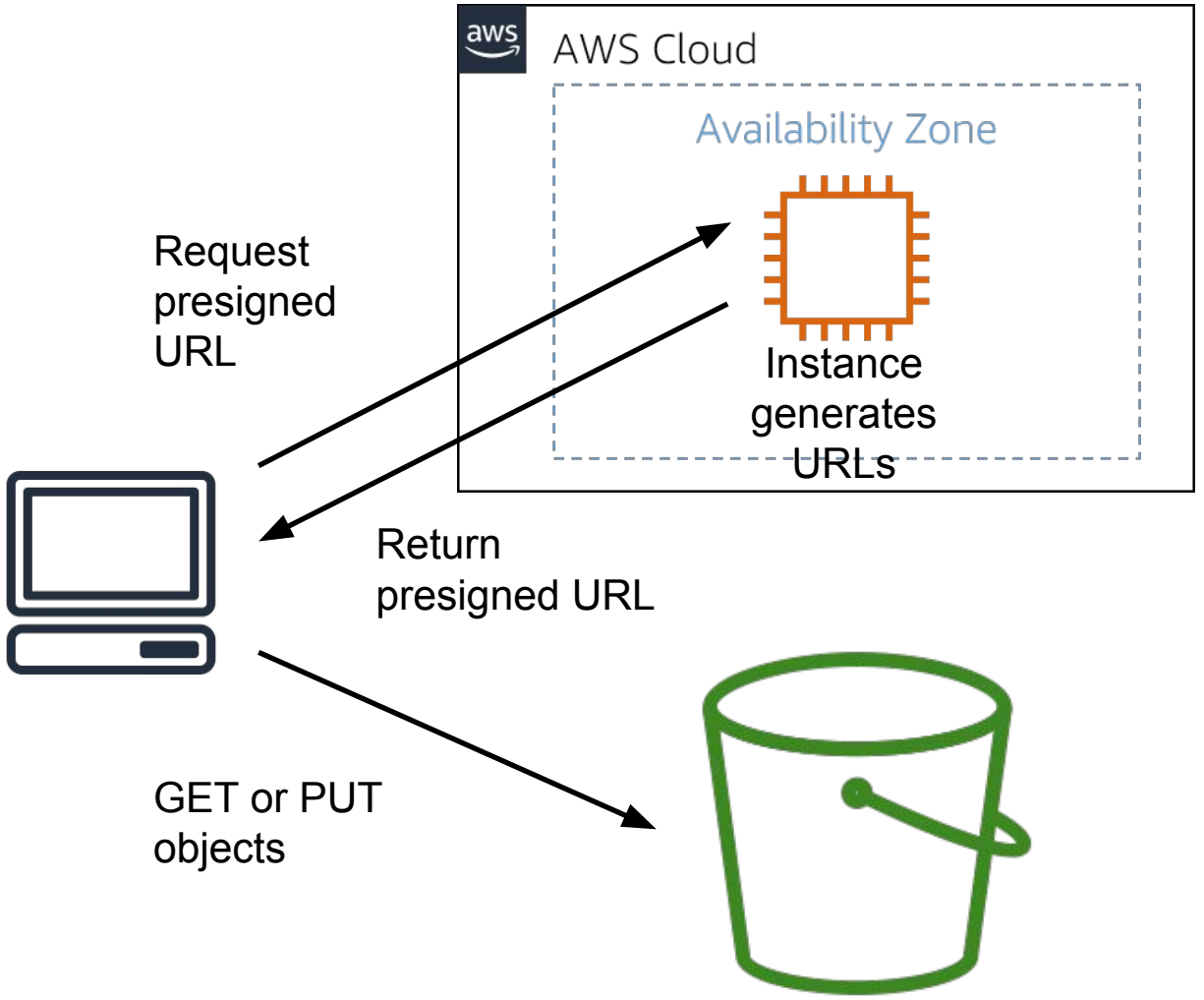
Presigned URLs

- Provide access to PUT or GET objects without granting permissions to perform any other actions
- Use the permissions of the user who creates the URL
- Provide security credentials, a bucket name, an object key, an HTTP method, and an expiration date and time
- Are only valid until the expiration time (maximum of 1 week)



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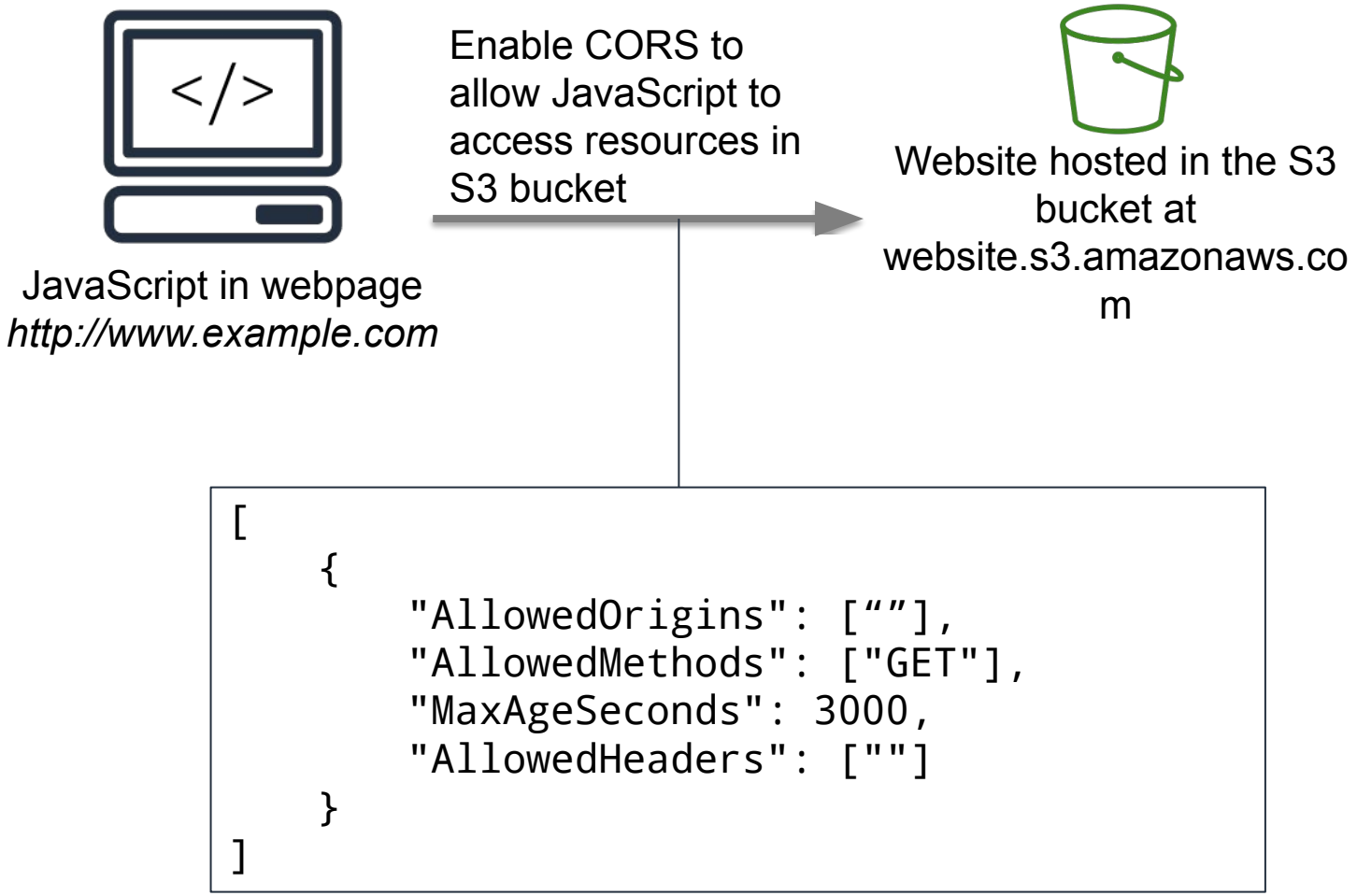
Cross-origin resource sharing (CORS)

Cross-origin resource sharing (CORS) defines a way for client web applications that are loaded in one domain to interact with resources that are in a different domain.



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Section 5 key takeaways

- S3 buckets can be encrypted.
- Amazon S3 has two types of policies for bucket access:
  - Identity-based policies
  - Resource-based policies

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Lab 3.1: Working with Amazon S3

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Lab: Tasks

1. Connecting to the AWS Cloud9 IDE and configuring the environment
2. Creating an S3 bucket by using the AWS CLI
3. Setting a bucket policy on the bucket by using the SDK for Python
4. Uploading objects to the bucket to create the website
5. Testing access to the website
6. Analyzing the website code

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~ 60 minutes

Begin Lab 3.1: Working with Amazon S3

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Lab debrief: Key takeaways

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Module 3: Developing Storage Solutions

Module wrap-up

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Module summary

In summary, in this module, you learned how to do the following:

- Describe how Amazon S3 can be used as a storage solution
- Identify features and components of Amazon S3
- Describe two ways to protect data in Amazon S3
- Describe the function of S3 object operations
- Explain how to manage access to Amazon S3 resources
- Develop with Amazon S3 by using the AWS SDKs

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Complete the knowledge check

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Sample exam question

Company salespeople upload their sales figures daily. A solutions architect needs a durable storage solution for these documents that also protects against users accidentally deleting important documents.

Which action will protect against unintended user actions?

A. Store data in an EBS volume and create snapshots once a week.
B. Store data in an S3 bucket and enable versioning.
C. Store data in two S3 buckets in different AWS Regions.
D. Store data on EC2 instance storage.

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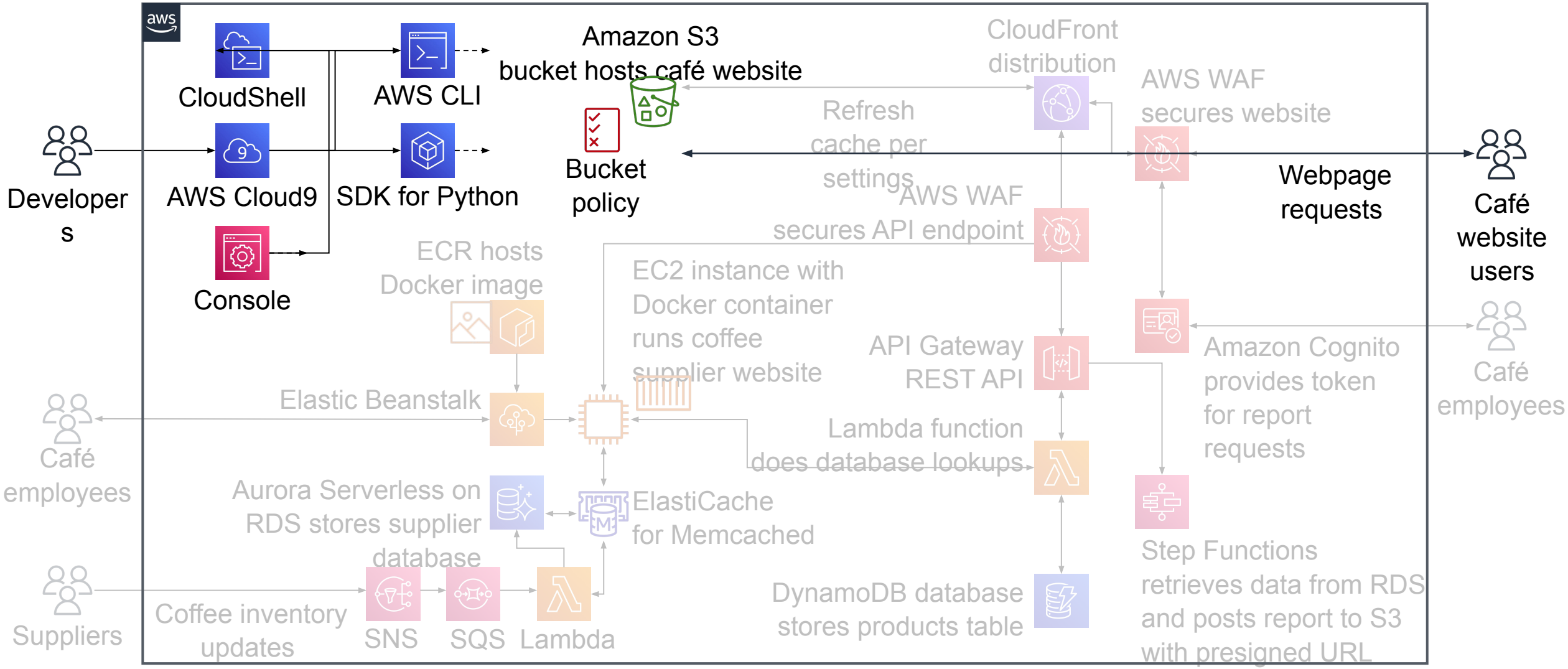
Amazon S3 as part of developing a cloud application



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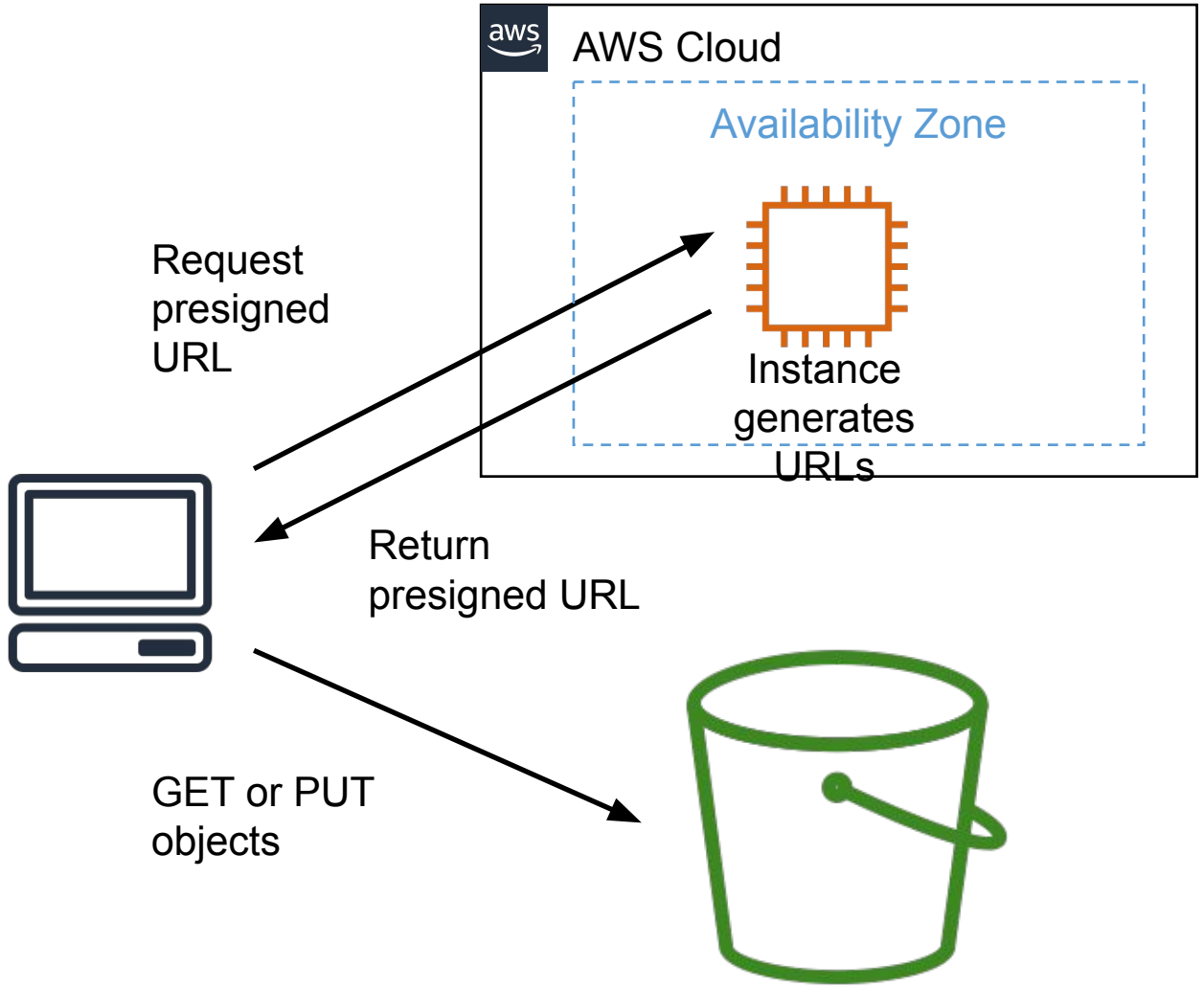

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