Assignment Name: **Week 03**
Student Name: **Sylvain S. Kamdem**
Due on: **April 29, 2023 at 8:00 PM Eastern Time**

TOPIC = AMAZON S3: S3 OBJECT AND STORAGE CLASSES, GLACIER, S3 LIFECYCLE, VERSIONING.

Knowledge Summary:

A. **Amazon Simple Storage Service (Amazon S3) -** A highly scalable, durable, and secure object storage service that can be used for a wide variety of use cases, such as backup and recovery, data archiving, and serving static website content.

Figure 1: Amazon S3 Use Cases

B. **Amazon S3 Bucket –** A directory in which people can store files (Objects)

Must have a **globally unique name** (across all regions all accounts)

Naming convention (*No uppercase, No underscore; 3-63 characters long; Not an IP; Must start with lowercase letter or number; Must NOT start with the prefix xn--; Must NOT end with the suffix -s3alias*).

C. **Amazon S3 Object –** A file stored in a bucket

Each object has a **key** (full path composed of **prefix** + **object name**)
eg: s3://bucket-name/**folder1/subfolder1/file1.txt**

Max. Object Size is **5TB (5000GB)**, **"multi-part upload"** must be used if uploading more than **5GB**

Objects can have **tags** and **version IDs** (if versioning is enabled).

D. **Amazon S3 Security –** It can be either **User-Based** (managed by **IAM Policies**) or Resource-Based {managed by **Bucket Policies** (allows cross account), **Object Access Control List** (finer grain, can be disabled) or **Bucket Access Control List** (less common, can be disabled)

Objects are encrypted in Amazon S3 using **encryption keys**

S3 Bucket Policies are JSON based policies and use S3 bucket for policy to:

- *Grant public access to the bucket*
- *Force objects to be encrypted at upload*
- *Grant access to another account (Cross Account)*

Note: An IAM principal can access an S3 object if

- The user IAM permissions **ALLOWS** it **OR** the resource policy **ALLOWS** it
- **AND** there's no explicit **DENY**

E. **Amazon S3 and Static Website Hosting -** S3 can host *static websites* and have them accessible on the Internet.

The website URL will be (depending on the region)

- http://bucket-name.s3-website-aws-region.amazonaws.com

OR

- http://bucket-name.s3-website.aws-region.amazonaws.com

A **403 Forbidden error** means the bucket policy might not allow public reads!

F. **Amazon S3 Versioning –** A feature that allows you to store multiple versions of an object in the same bucket. This can help you recover from accidental deletions or overwrites, and provide a history of changes to an object.

Notes:

- Any file that is not versioned prior to enabling versioning will have version "**null**"
- Suspending versioning does not delete the previous versions.

G. **Amazon S3 replication -** A feature that allows you to **automatically** and **asynchronously replicate objects** across different **S3 buckets** in different **AWS regions**. S3 replication works by creating a copy of an object in the source bucket and storing it in the destination bucket in a different region. It can help you improve the **durability**

and **availability** of your **data** and provide an **effective disaster recovery** solution. However, the cost is a major concern.

S3 replication supports several types of replication configurations, including:

- **Same-region replication (SRR)** - Replicates objects within the same region to improve data durability and availability.
- **Cross-region replication (CRR)** - Replicates objects to a different region for disaster recovery, compliance, or latency reasons.
- **Replication between AWS accounts** - Allows replication between S3 buckets owned by different AWS accounts for various use cases, such as data sharing or backup.

H. **S3 Object and Storage classes -** S3 stores data in objects, which consist of **data** and **metadata**. S3 provides several **storage classes**, each with different **performance** and **cost** characteristics, such as Standard, Infrequent Access, and One Zone-Infrequent Access.

	Standard	Intelligent-Tiering	Standard-IA	One Zone-IA	Glacier Instant Retrieval	Glacier Flexible Retrieval	Glacier Deep Archive
Durability	99.999999999% == (11 9's)						
Availability	99.99%	99.9%	99.9%	99.5%	99.9%	99.99%	99.99%
Availability SLA	99.9%	99%	99%	99%	99%	99.9%	99.9%
Availability Zones	>= 3	>= 3	>= 3	1	>= 3	>= 3	>= 3
Min. Storage Duration Charge	None	None	30 Days	30 Days	90 Days	90 Days	180 Days
Min. Billable Object Size	None	None	128 KB	128 KB	128 KB	40 KB	40 KB
Retrieval Fee	None	None	Per GB retrieved	Per GB retrieved	Per GB retrieved	Per GB retrieved	Per GB retrieved

	Standard	Intelligent-Tiering	Standard-IA	One Zone-IA	Glacier Instant Retrieval	Glacier Flexible Retrieval	Glacier Deep Archive
Storage Cost (per GB per month)	$0.023	$0.0025 - $0.023	%0.0125	$0.01	$0.004	$0.0036	$0.00099
Retrieval Cost (per 1000 request)	**GET:** $0.0004 **POST:** $0.005	**GET:** $0.0004 **POST:** $0.005	**GET:** $0.001 **POST:** $0.01	**GET:** $0.001 **POST:** $0.01	**GET:** $0.01 **POST:** $0.02	**GET:** $0.0004 **POST:** $0.03 **Expedited:** $10 **Standard:** $0.05 **Bulk:** free	**GET:** $0.0004 **POST:** $0.05 **Standard:** $0.10 **Bulk:** $0.025
Retrieval Time	Instantaneous					**Expedited** (1 – 5 mins) **Standard** (3 – 5 hours) Bulk (5 – 12 hours)	**Standard** (12 hours) **Bulk** (48 hours)
Monitoring Cost (pet 1000 objects)		$0.0025					

Figure 2: Storage Classes Comparison

I. **Glacier -** S3 Glacier is a **low-cost storage** service that provides **secure** and **durable storage** for **data archiving** and **long-term backup**.

Glacier provides three retrieval options: **expedited**, **standard**, and **bulk**.

J. **S3 Lifecycle -** S3 Lifecycle is a feature that allows you to **automatically transition** objects between **different storage classes** or **delete them** when they are **no longer needed**. This can help you **save costs** by moving data to **lower-cost storage classes** or **deleting data** that is no longer needed.

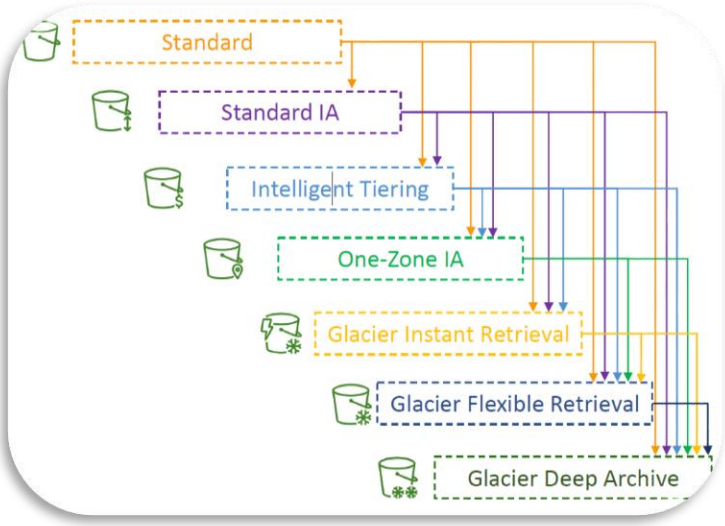

Figure 3: Moving between Storage Classes

Lab 1:

Task 1: Signing into IAM user account

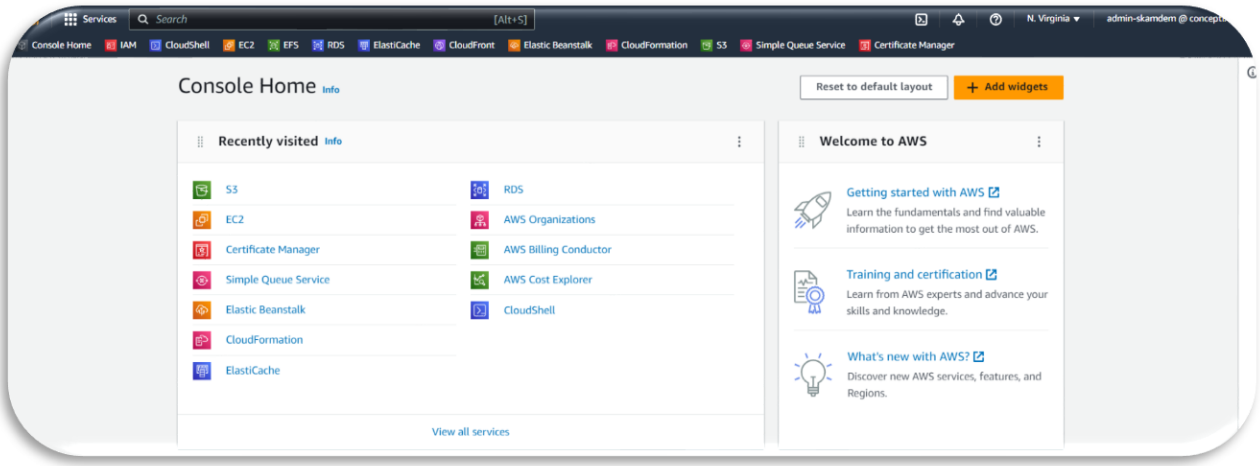

Figure 4: My IAM User Account

Task 2: Creating a S3 Bucket

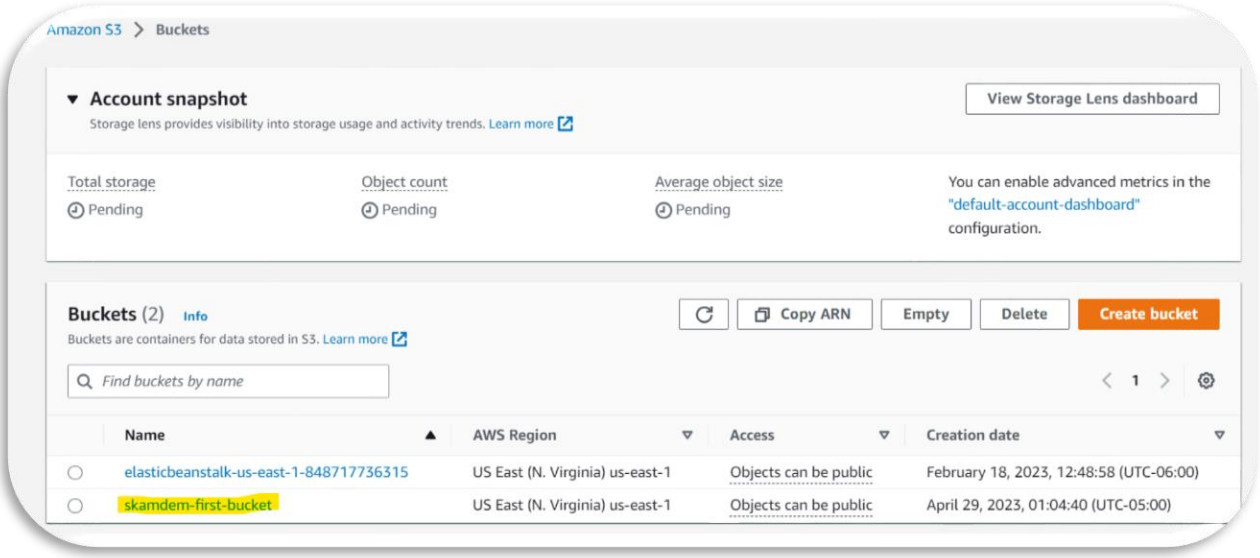

Figure 5: Creating my S3 bucket

Task 3: Let's upload an object to the created S3 Bucket

- After creating my bucket, my overall expectation after selecting it is that it will have no object stored inside.

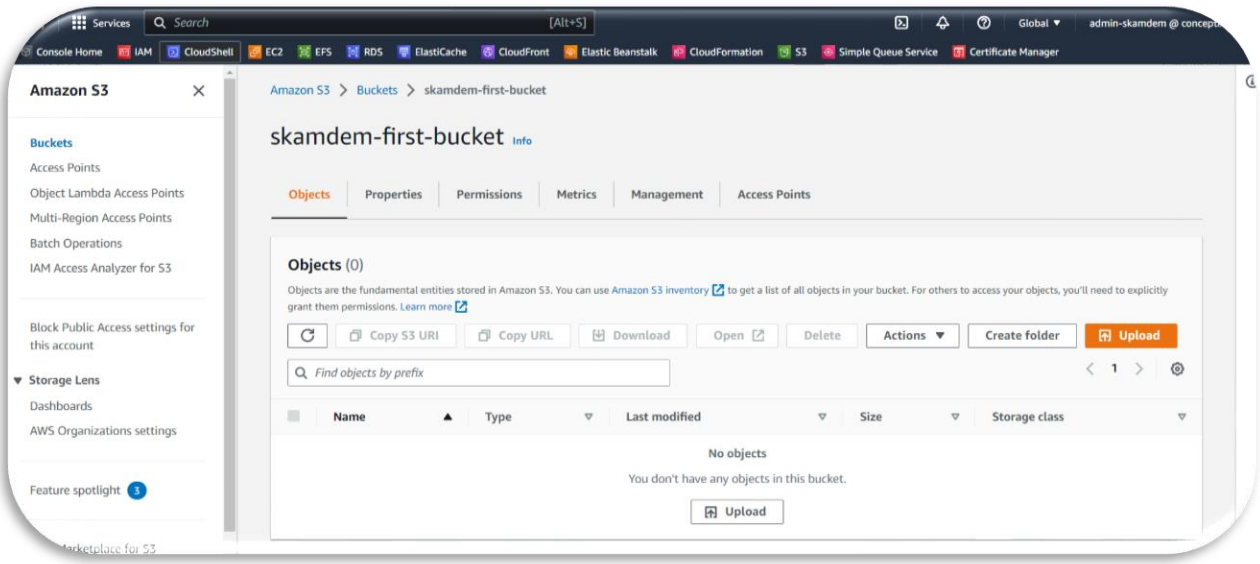

Figure 6: My Objects Tab (Empty)

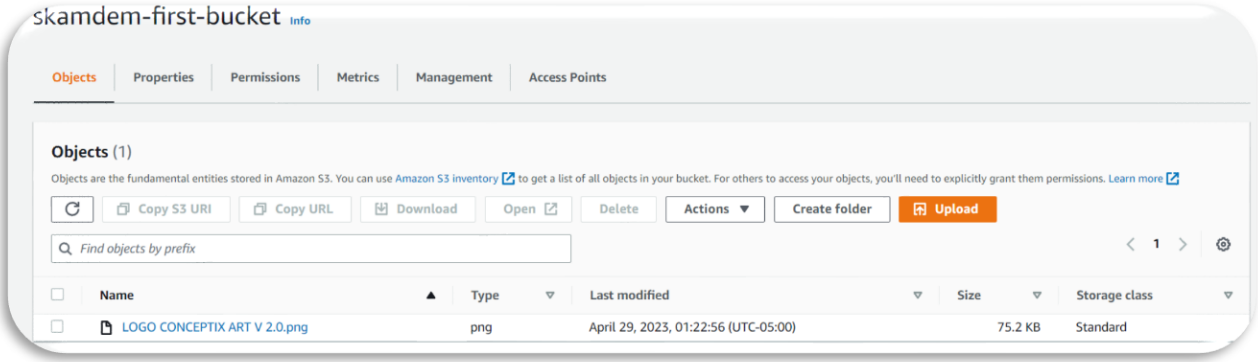

Figure 7: My Uploaded Object

Task 4: Let's change the bucket permissions

Figure 8: Access Denied To My Object

Figure 9: My Object is Publicly Accessible

Task 5: Let's create a S3 Bucket Policy

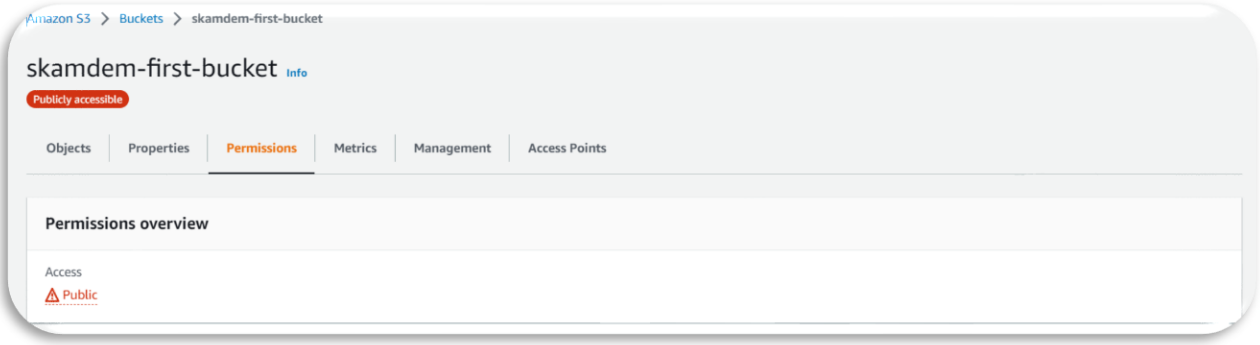

Figure 10: My Bucket is now Publicly Accessible

Task 6: Let's retrieve an object from our resource

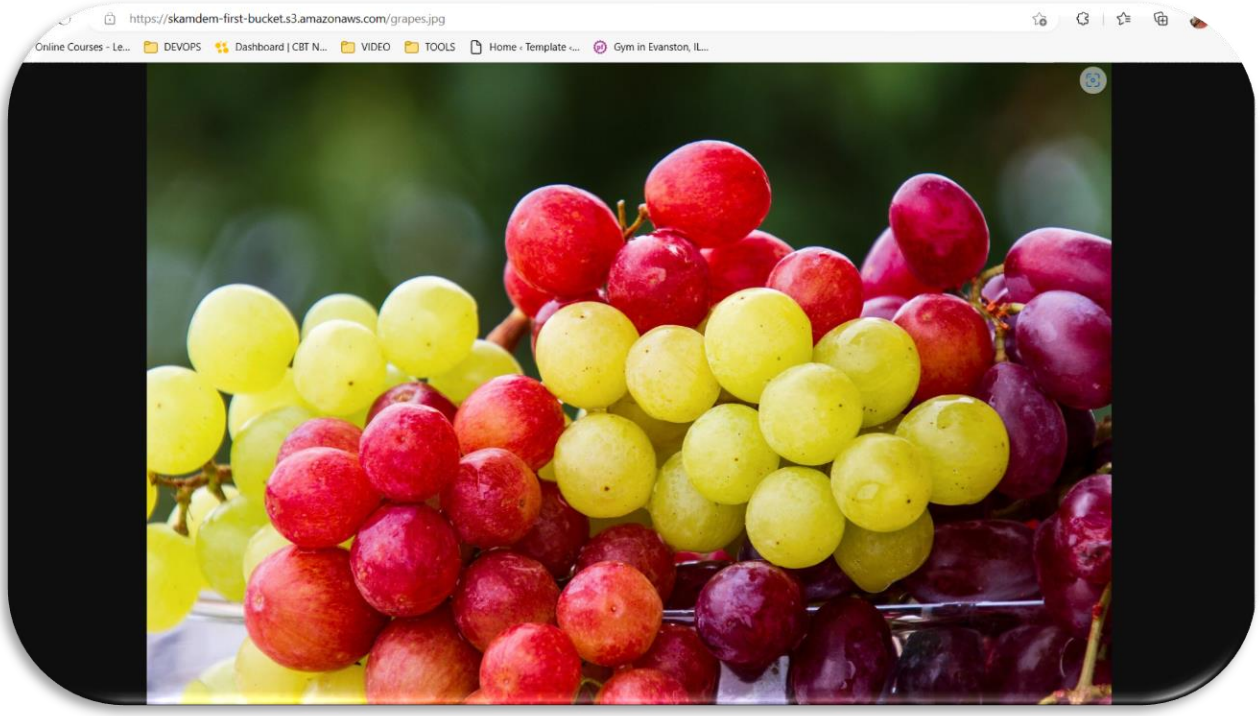

Figure 11: My Object Uploaded to My Public Bucket

Lab 2:

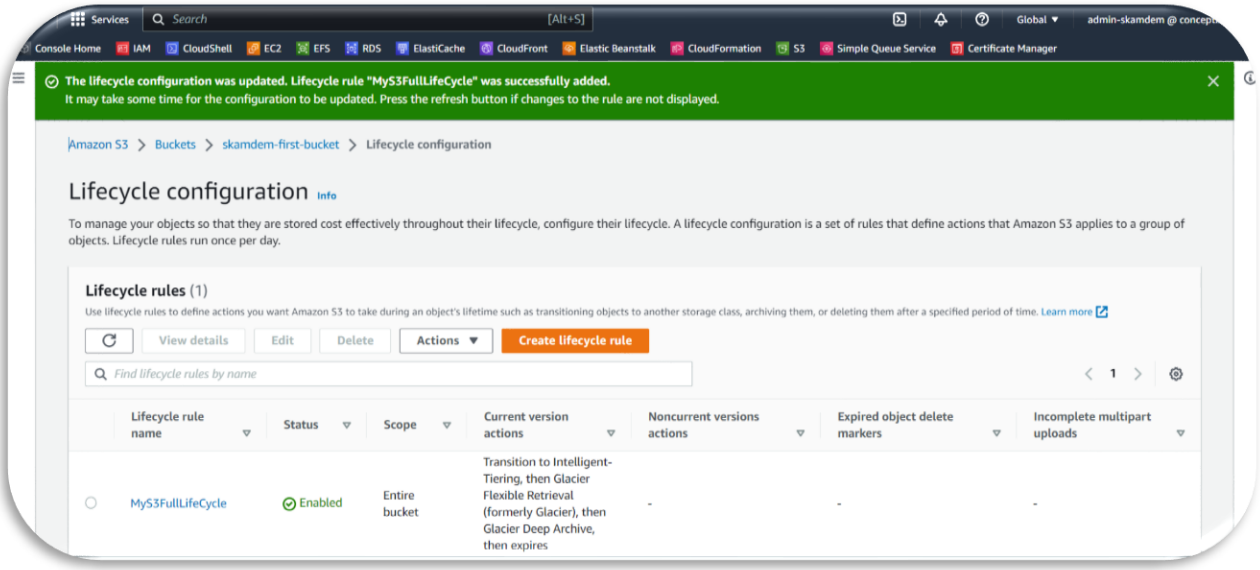

Figure 12: My Created Lifecycle Rule