

# **Intro. to Network Programming**

## **HW3**

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## **Due date**

**Sunday, May 24, 2020 by 11:55pm**



# Outline

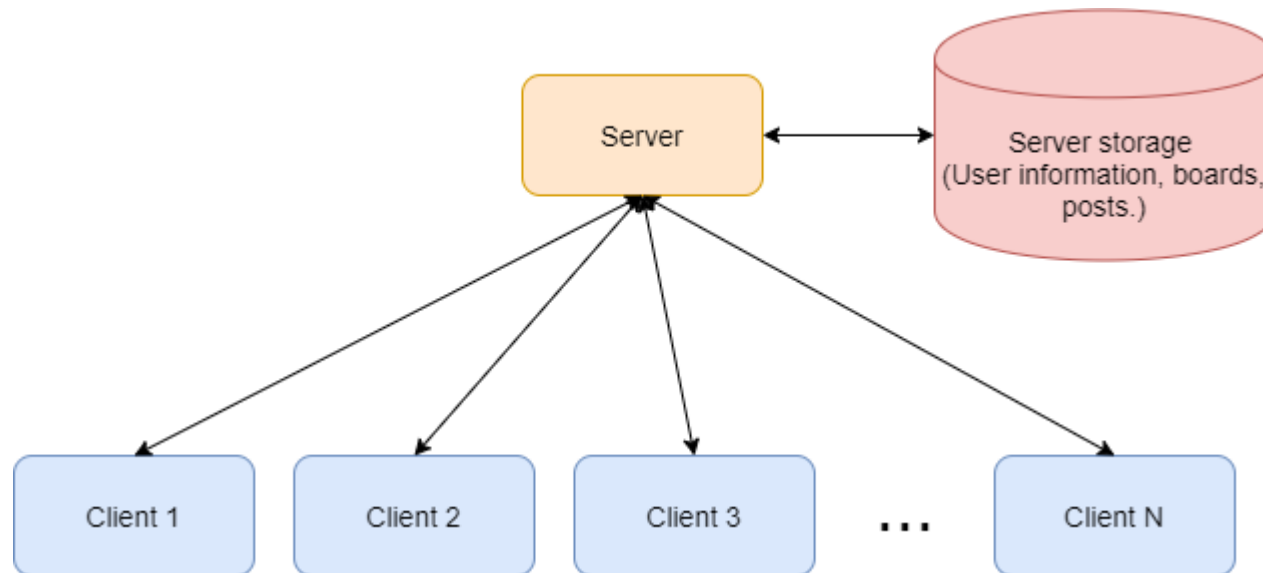
- Introduction
- Amazon S3
- Details of this homework

# Introduction

- What you have to do in this homework.
  1. Write a **client program** to connect to your server.
  2. Store **the content of the post on the client-side (Amazon S3)** instead of the server-side.
  3. Implement a simple **mail service**.

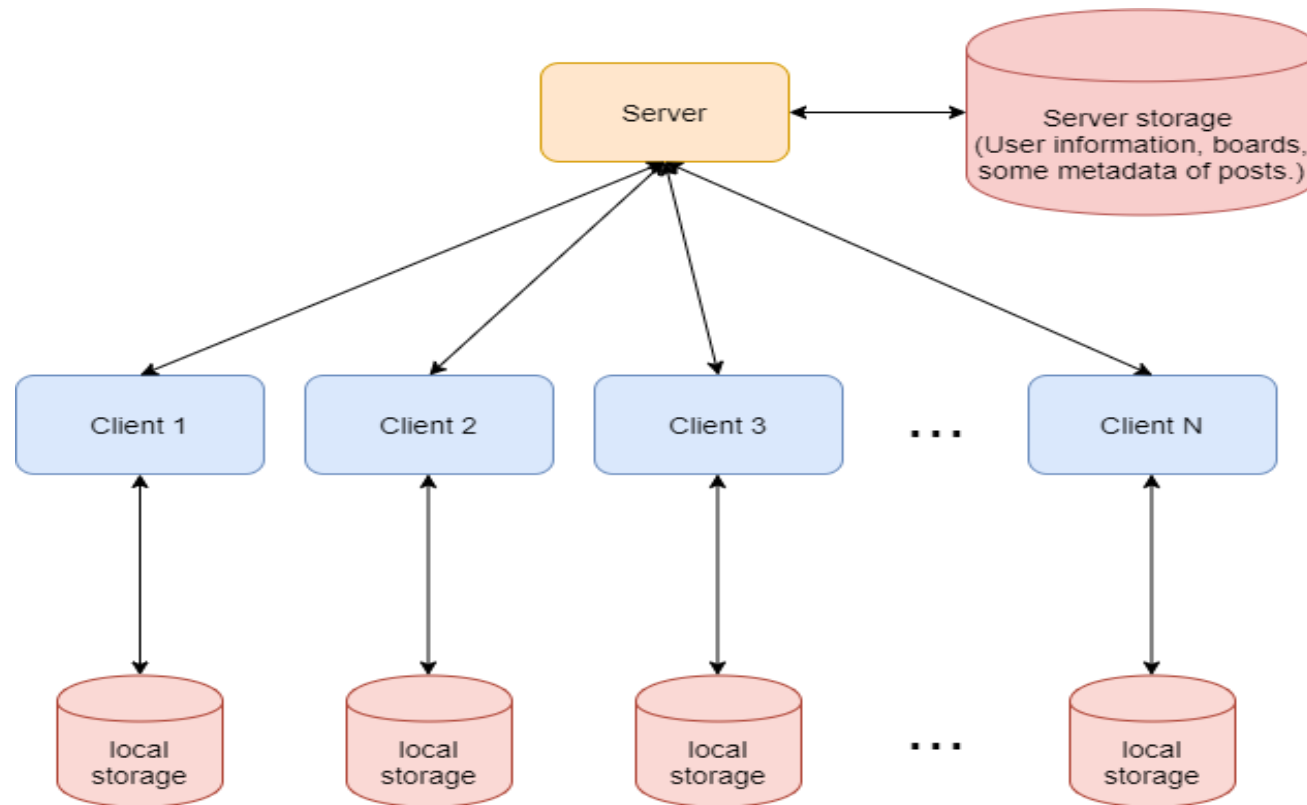
## Introduction (cont.)

- System architecture in the previous part. Client program only sends command to the server and gets the corresponding result from the server.



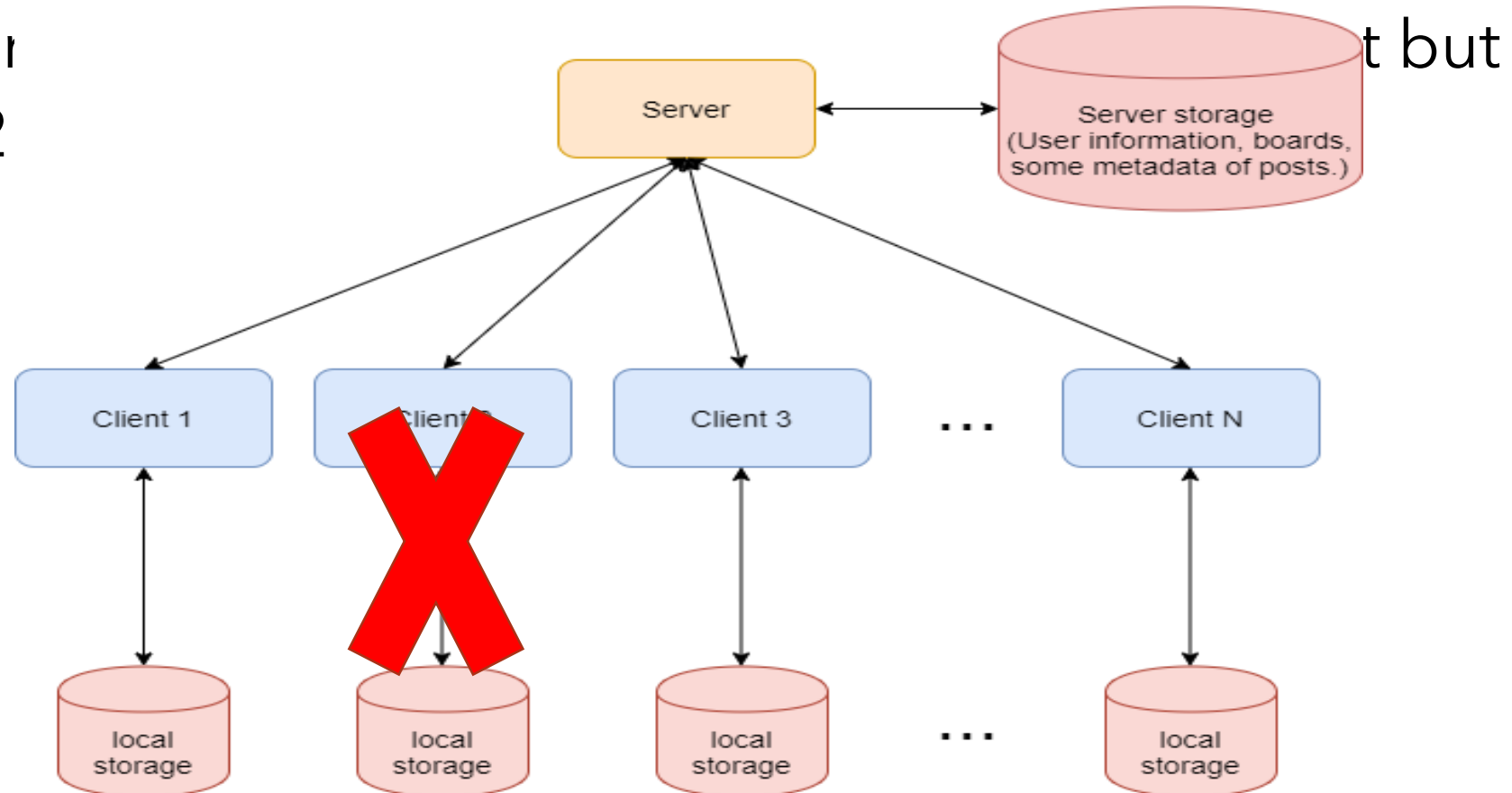
# Introduction (cont.)

- Change to the new system architecture.



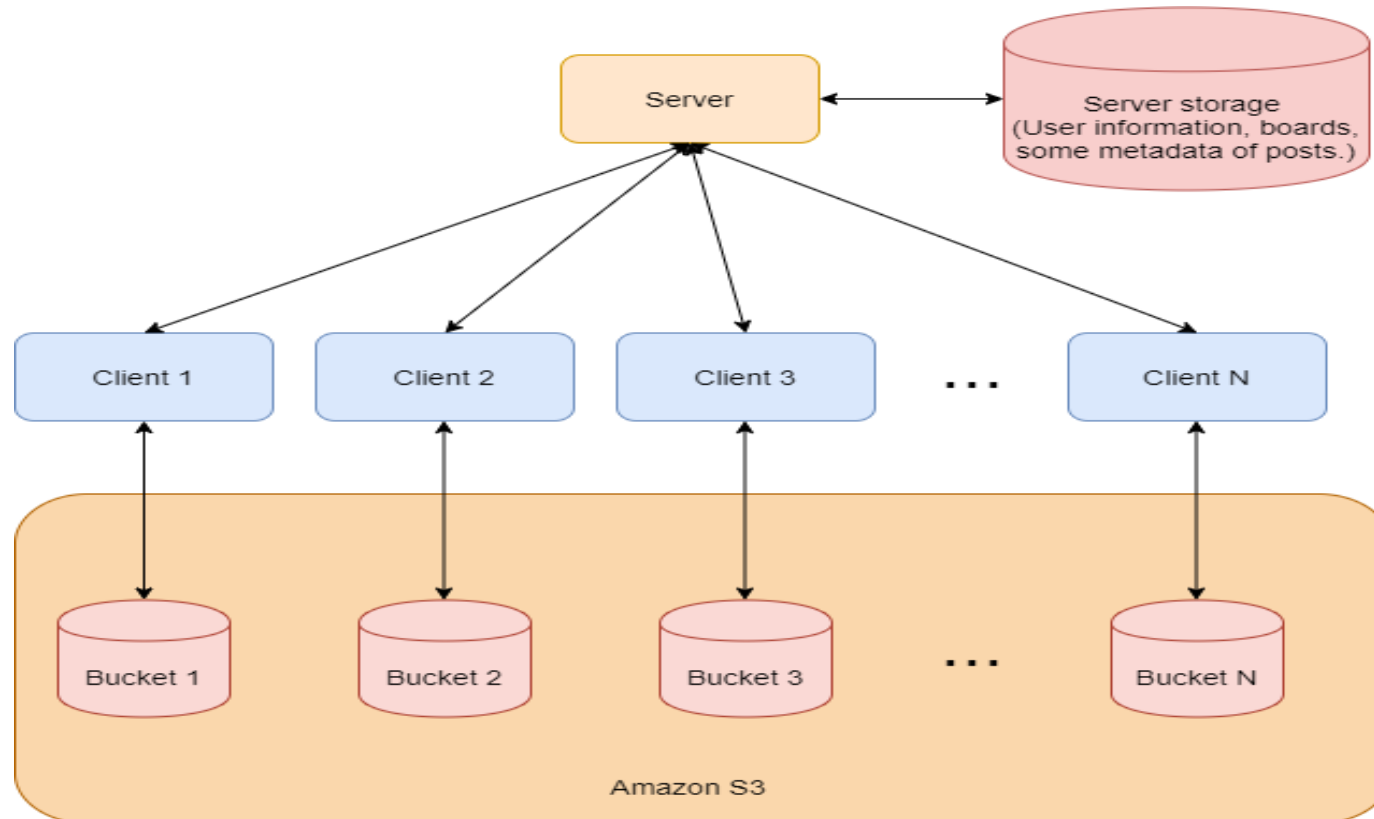
# Introduction (cont.)

- Problem  
client2



# Introduction (cont.)

- System architecture we will use in this homework

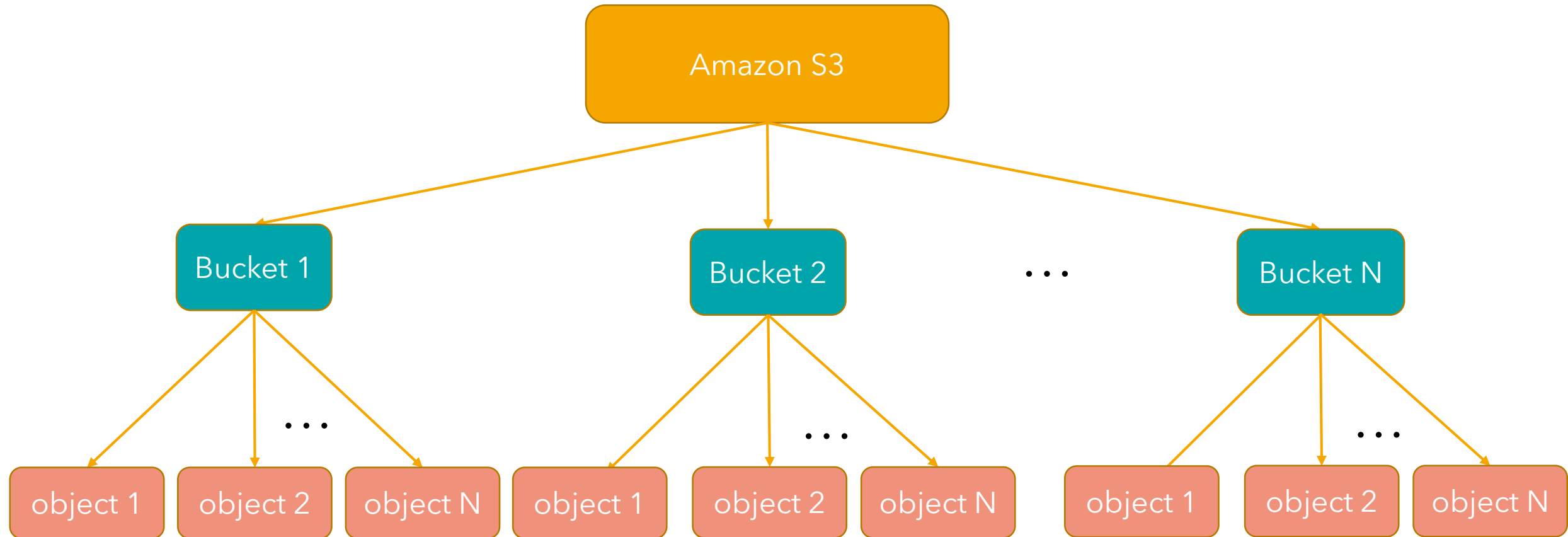




# Amazon S3

- Amazon Simple Storage Service (S3) is storage for the Internet.
- You can use Amazon S3 to store and retrieve any amount of data, at any time, from anywhere on the web.
- The Amazon S3 data model is a **flat** structure. There is no hierarchy of subbuckets or subfolders.

# Amazon S3 - Overview



# Amazon S3 - Bucket

- A bucket is a container for objects stored in Amazon S3.
- By default, you can create up to 100 buckets in each of your AWS accounts
- If you want to store data in Amazon S3, you have to create a bucket with a **unique** name first.
- Bucket names must be **unique** across all existing bucket names in Amazon S3.
- Bucket names must be **at least 3** and **no more than 63 characters long**.
- Bucket names must **not** contain **uppercase** characters or **underscores**.
- Bucket names must **start with a lowercase letter or number**.


# Amazon S3 - Object

- Objects are the fundamental entities stored in Amazon S3.
- Objects consist of object data and metadata.
- Each object within a bucket has its unique **key** (name of the object).
- Size of each object: **0 Byte - 5 TB**

# Amazon S3 - Object Key

- Unique identifier within a bucket. If you upload the same key name object without versioning-enabled, it will overwrite the original one.
- The following character sets are generally safe for use in key names.

Alphanumeric characters	<ul style="list-style-type: none"><li>• 0-9</li><li>• a-z</li><li>• A-Z</li></ul>
Special characters	<ul style="list-style-type: none"><li>• !</li><li>• -</li><li>• _</li><li>• .</li><li>• *</li><li>• '</li><li>• (</li><li>• )</li></ul>



# Amazon S3 – Bucket Policy

- Bucket policy is used to manage access permissions of all resources within a bucket to other AWS accounts or AWS Identity and Access Management (IAM) users.

# Amazon S3 – Bucket Policy

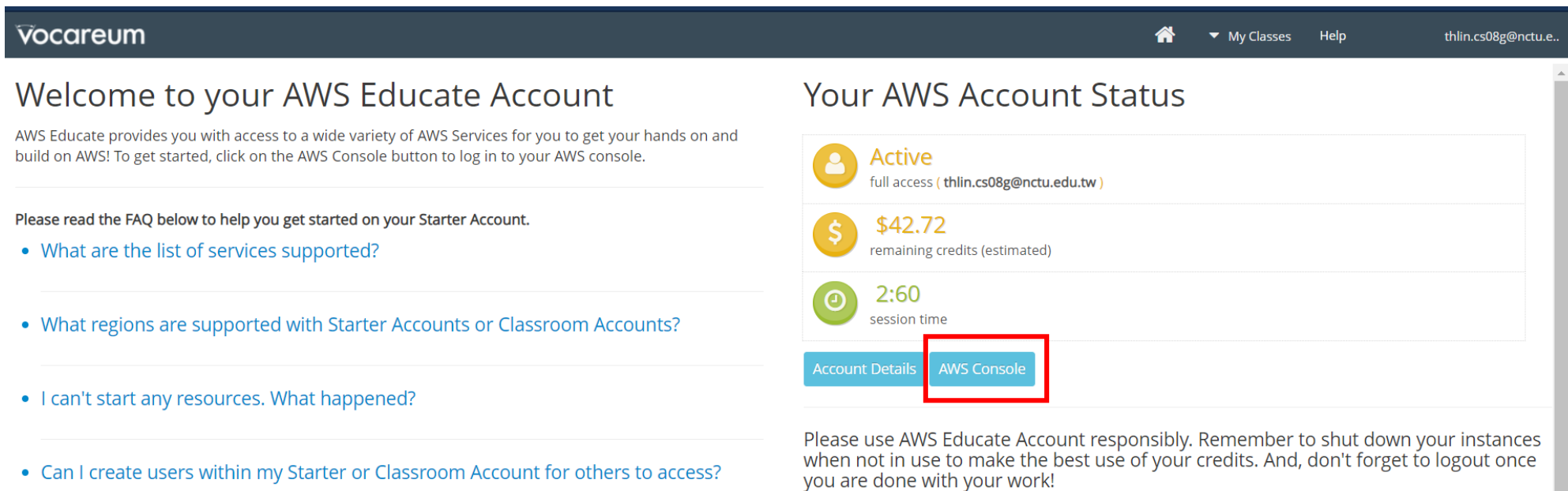
- Bucket Policy example – json format

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "PublicRead",
      "Effect": "Allow",
      "Principal": "*",
      "Action": ["s3:GetObject"],
      "Resource": ["arn:aws:s3:::examplebucket/*"]
    }
  ]
}
```

# Amazon S3 – Amazon S3 Console

- Login your AWS Educate -> Go to Intro. to Network Programming classroom, then you will see the page below.

## Click AWS Console



**Vocareum** My Classes Help thlin.cs08g@nctu.e..




### Welcome to your AWS Educate Account

AWS Educate provides you with access to a wide variety of AWS Services for you to get your hands on and build on AWS! To get started, click on the AWS Console button to log in to your AWS console.

Please read the FAQ below to help you get started on your Starter Account.

- [What are the list of services supported?](#)
- [What regions are supported with Starter Accounts or Classroom Accounts?](#)
- [I can't start any resources. What happened?](#)
- [Can I create users within my Starter or Classroom Account for others to access?](#)

### Your AWS Account Status

	<b>Active</b> full access ( <a href="#">thlin.cs08g@nctu.edu.tw</a> )
	<b>\$42.72</b> remaining credits (estimated)
	<b>2:60</b> session time

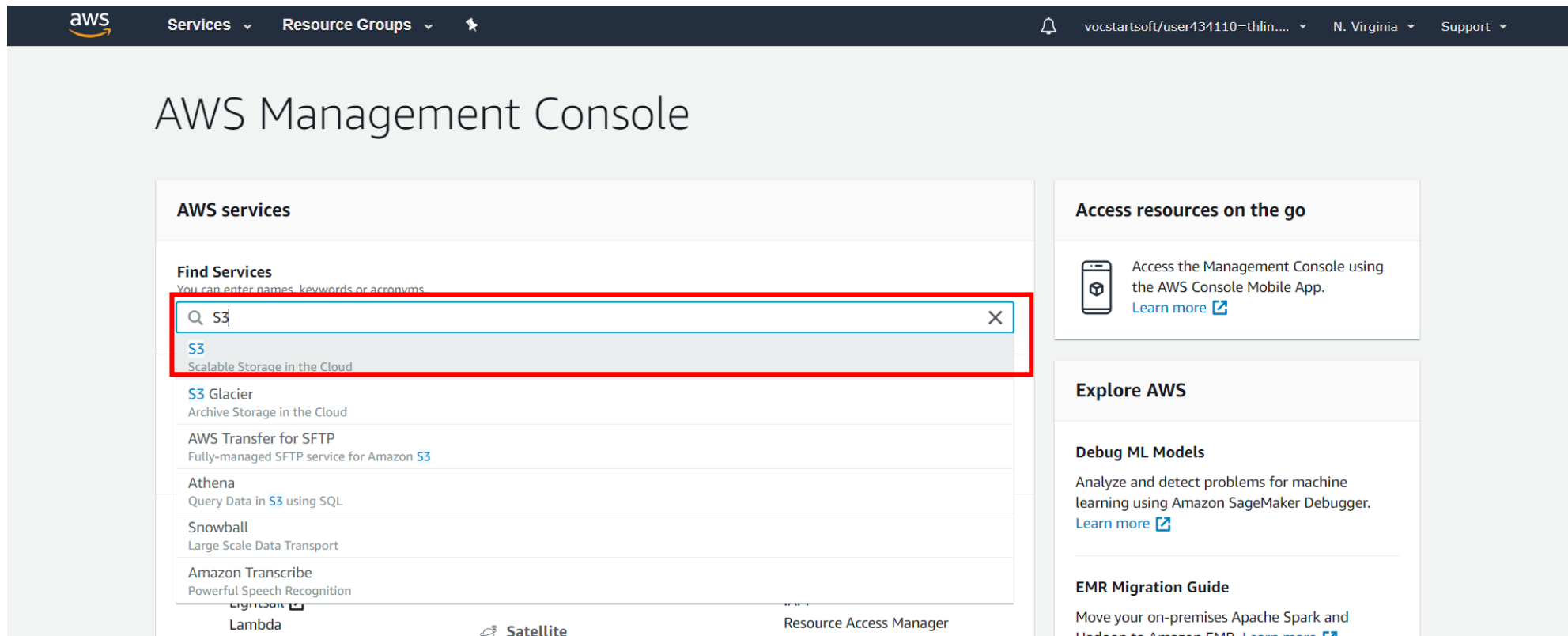
[Account Details](#) [AWS Console](#)

Please use AWS Educate Account responsibly. Remember to shut down your instances when not in use to make the best use of your credits. And, don't forget to logout once you are done with your work!



# Amazon S3 - Amazon S3 Console

## Select S3 Service



The screenshot displays the AWS Management Console interface. At the top, the navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The main heading is 'AWS Management Console'. Below this, the 'AWS services' section is active, showing a 'Find Services' search bar. The search bar contains the text 'S3' and is highlighted with a red rectangle. Below the search bar, a list of services is displayed, with 'S3' (Scalable Storage in the Cloud) highlighted in blue. Other visible services include S3 Glacier, AWS Transfer for SFTP, Athena, Snowball, and Amazon Transcribe. To the right of the search results, there are two sidebars. The first sidebar, 'Access resources on the go', promotes the AWS Console Mobile App. The second sidebar, 'Explore AWS', contains links for 'Debug ML Models' and 'EMR Migration Guide'.

aws Services Resource Groups

vocstartsoft/user434110=thlin.... N. Virginia Support

### AWS Management Console

#### AWS services

##### Find Services

You can enter names, keywords or acronyms.

Search: S3

- S3**  
Scalable Storage in the Cloud
- S3 Glacier  
Archive Storage in the Cloud
- AWS Transfer for SFTP  
Fully-managed SFTP service for Amazon S3
- Athena  
Query Data in S3 using SQL
- Snowball  
Large Scale Data Transport
- Amazon Transcribe  
Powerful Speech Recognition

#### Access resources on the go

Access the Management Console using the AWS Console Mobile App.  
[Learn more](#)

#### Explore AWS

##### Debug ML Models

Analyze and detect problems for machine learning using Amazon SageMaker Debugger.  
[Learn more](#)

##### EMR Migration Guide

Move your on-premises Apache Spark and Hadoop to Amazon EMR. [Learn more](#)

# Amazon S3 - Amazon S3 Console

You can manipulate your Amazon S3 and see its state here.

The screenshot displays the Amazon S3 console interface. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The left sidebar shows the 'Amazon S3' service with a list of features: 'Buckets' (highlighted in orange), 'Batch Operations', 'Access analyzer for S3', 'Block public access (account settings)', and 'Feature spotlight' (with a blue badge showing '2'). The main content area is titled 'Amazon S3' and shows 'Buckets (0)'. At the top right of this section are buttons for 'Copy ARN', 'Empty', 'Delete', and 'Create bucket'. Below these is a search bar with the placeholder text 'Find bucket by name'. A table header is visible with columns: 'Name', 'Region', 'Access', and 'Bucket created'. The table body is empty, displaying the message 'No buckets. You don't have any buckets.' with a 'Create bucket' button centered below it.

Amazon S3

Buckets (0)

Copy ARN Empty Delete Create bucket

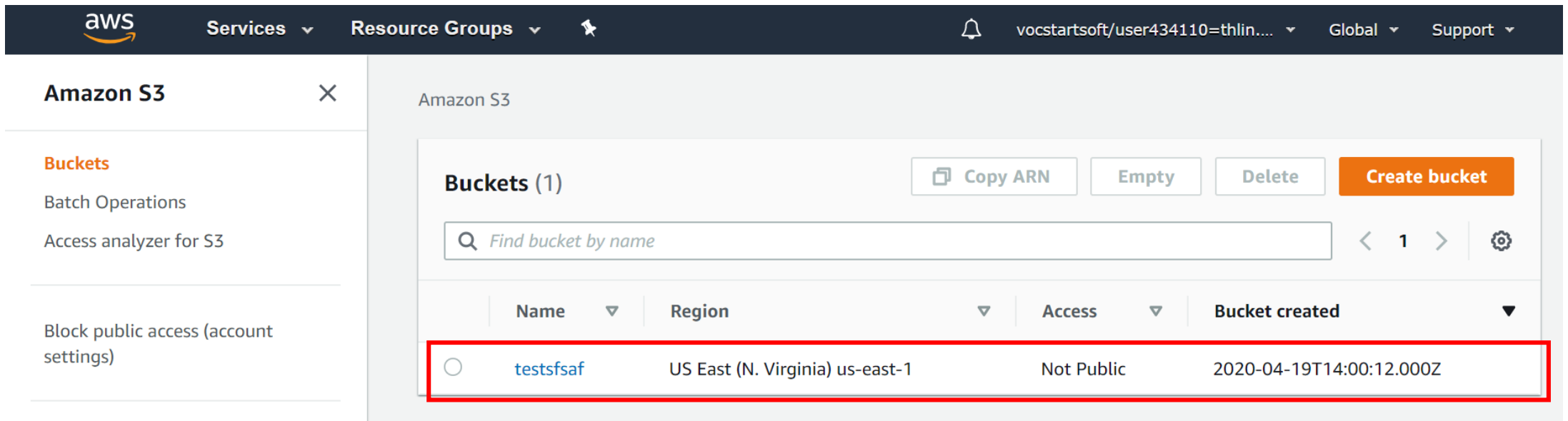
Find bucket by name

Name	Region	Access	Bucket created
No buckets You don't have any buckets.			

Create bucket

# Amazon S3 – Amazon S3 Console

- Example: create a bucket (testsfsaf)



The screenshot displays the Amazon S3 console interface. On the left, the 'Amazon S3' sidebar is visible with options like 'Buckets', 'Batch Operations', and 'Access analyzer for S3'. The main content area shows a list of buckets. A red rectangle highlights the first bucket in the list, which is 'testsfsaf'.

	Name	Region	Access	Bucket created
<input type="radio"/>	testsfsaf	US East (N. Virginia) us-east-1	Not Public	2020-04-19T14:00:12.000Z

# Amazon S3 – Amazon S3 Console

Example: create folder

**Note:** This is not a real folder. It's just an object with key "test/". Amazon S3 console infer logical hierarchy using key name prefixes and delimiters.

The screenshot shows the Amazon S3 console interface for a bucket named 'testsfaf'. The 'Properties' tab is selected. Below the tabs is a search bar. Below the search bar are buttons for 'Upload', 'Create folder', 'Download', and 'Actions'. The region is 'US East (N. Virginia)'. Below these buttons is a table showing the contents of the bucket. The table has columns for 'Name', 'Last modified', 'Size', and 'Storage class'. There is one entry in the table, 'test', which is highlighted with a red box.

<input type="checkbox"/>	Name ▼	Last modified ▼	Size ▼	Storage class ▼
<input type="checkbox"/>	test	--	--	--


# Amazon S3 – Amazon S3 API

- However, in this homework, we will manipulate Amazon S3 using AWS CLI or AWS SDK in the **client program**.
- If you want to use AWS SDK to make Amazon S3 API calls, you have to provide your AWS credential first.
- **How to set up authentication credential:**
  - Create a credential file at **~/.aws/credentials**. The content of this file is described as follows:

```
[default]
aws_access_key_id=<your access key>
aws_secret_access_key=<your secret access key>
aws_session_token=<your session token>
```

# Amazon S3 – Amazon S3 API

- You can get these key from your AWS Educate account. Log in your account and go to Intro. to Network Programming classroom. Then, you will see the following page.

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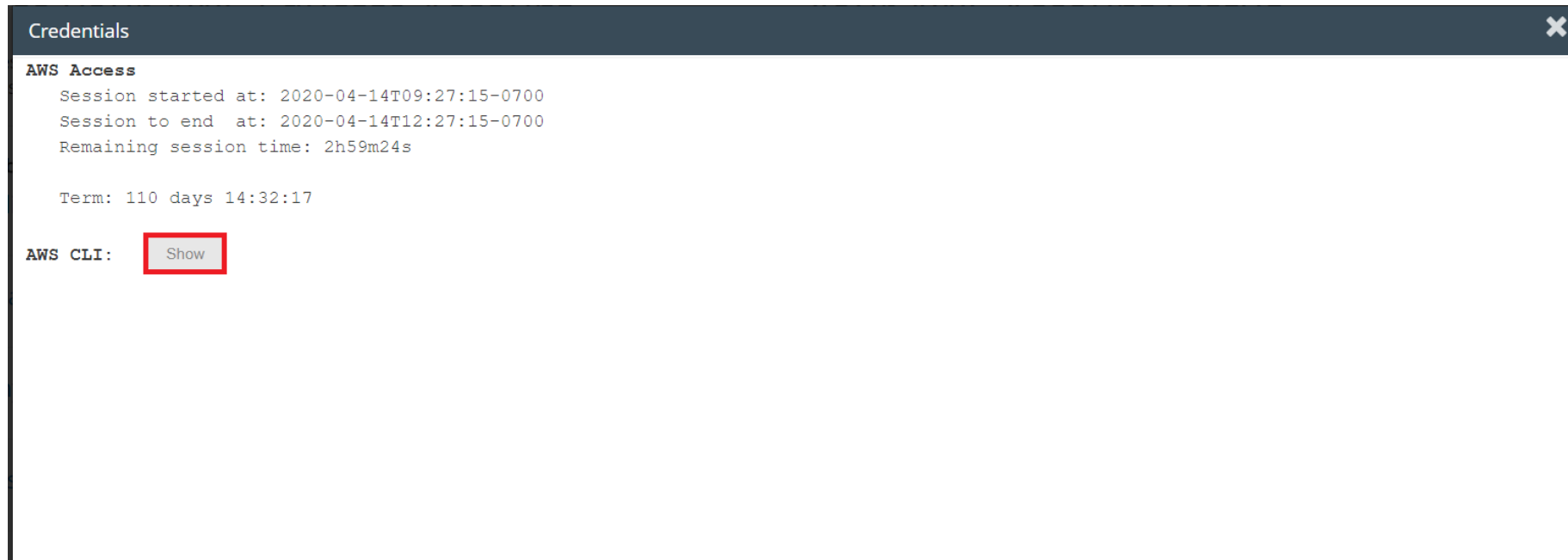
	<b>Active</b> full access ( <a href="#">thlin.cs08g@nctu.edu.tw</a> )
	<b>\$43.22</b> remaining credits (estimated)
	<b>2:60</b> session time

[Account Details](#)[AWS Console](#)

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# Amazon S3 - Amazon S3 API

- Click Show and copy those keys into ~/.aws/credentials
- **The credential we use here is temporary, so you have to copy and paste again when the credential expiration.**



# Amazon S3 – Amazon S3 API

- Actions you might use:
  - Create bucket
  - Delete bucket
  - Upload object
  - Get object
  - Delete object



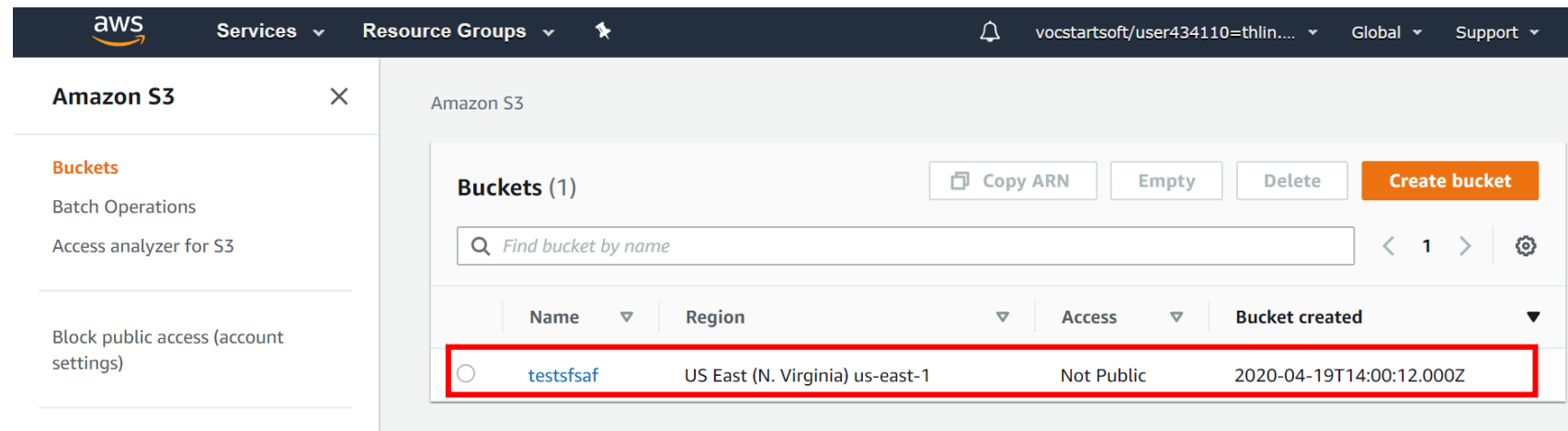
# Amazon S3 – Amazon S3 API

- Create bucket

```
import boto3
```

```
s3 = boto3.resource('s3')  
s3.create_bucket(Bucket='testsfsaf')
```

## Amazon S3 Console



The screenshot shows the Amazon S3 console interface. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', a user profile, 'Global', and 'Support'. The left sidebar shows 'Amazon S3' with a close button, and a list of options: 'Buckets', 'Batch Operations', 'Access analyzer for S3', and 'Block public access (account settings)'. The main content area is titled 'Amazon S3' and displays a table of buckets. The table has columns for 'Name', 'Region', 'Access', and 'Bucket created'. A single bucket named 'testsfsaf' is listed, with a red box highlighting its row. The bucket is located in 'US East (N. Virginia) us-east-1', is 'Not Public', and was created on '2020-04-19T14:00:12.000Z'. Above the table, there are buttons for 'Copy ARN', 'Empty', 'Delete', and 'Create bucket'. A search bar labeled 'Find bucket by name' and pagination controls are also visible.

	Name	Region	Access	Bucket created
<input type="radio"/>	testsfsaf	US East (N. Virginia) us-east-1	Not Public	2020-04-19T14:00:12.000Z

# Amazon S3 – Amazon S3 API

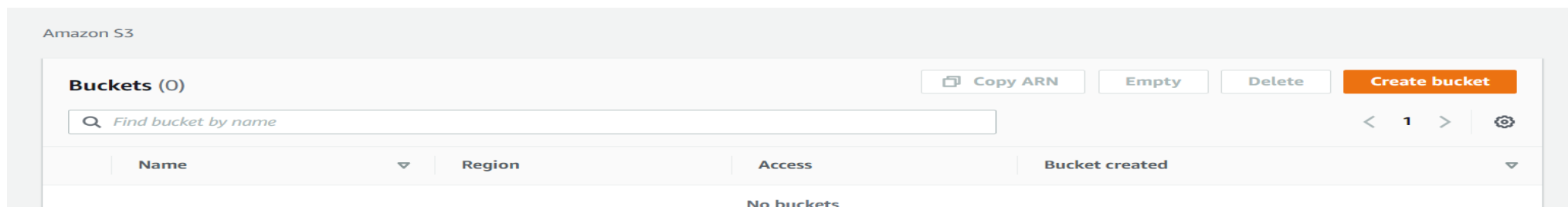
- Delete bucket

```
import boto3

s3 = boto3.resource('s3')
target_bucket = s3.Bucket('testfsaf')
target_bucket.delete()
```

- Note: The bucket must be **empty** when deleting.

Amazon S3 Console



# Amazon S3 – Amazon S3 API

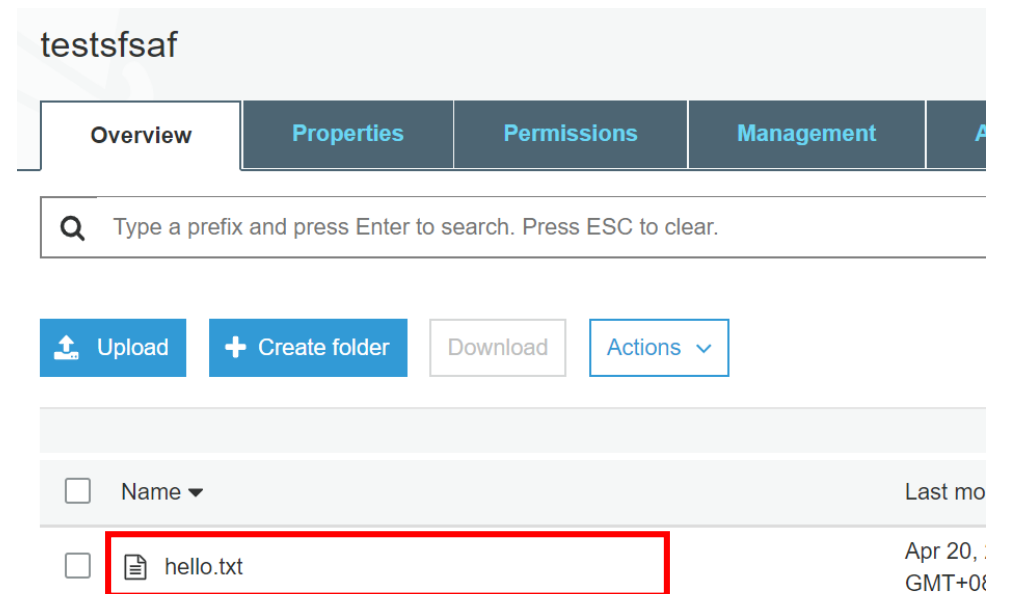
- Upload object

```
import boto3

s3 = boto3.resource('s3')
target_bucket = s3.Bucket('testsfaf')
target_bucket.upload_file('./tmp/hello.txt', 'hello.txt')
```

- First argument of upload\_file is the file you want to upload.
- Second argument is object key.

## Amazon S3 Console



The screenshot shows the Amazon S3 Console interface for a bucket named 'testsfaf'. The 'Properties' tab is selected. Below the tabs is a search bar with the placeholder text 'Type a prefix and press Enter to search. Press ESC to clear.' Below the search bar are four buttons: 'Upload', 'Create folder', 'Download', and 'Actions'. Below the buttons is a table listing the objects in the bucket. The table has two columns: 'Name' and 'Last modified'. The first row in the table is 'hello.txt', which is highlighted with a red box. The 'Last modified' column for this row shows 'Apr 20, 2024, 10:00:00 AM GMT+08:00'.

Name	Last modified
hello.txt	Apr 20, 2024, 10:00:00 AM GMT+08:00

# Amazon S3 - Amazon S3 API

- Get object

```
import boto3

s3 = boto3.resource('s3')
target_bucket = s3.Bucket('testsfsaf')
target_object = target_bucket.Object('hello.txt')
object_content = target_object.get()['Body'].read().decode() #get the content of hello.txt
```

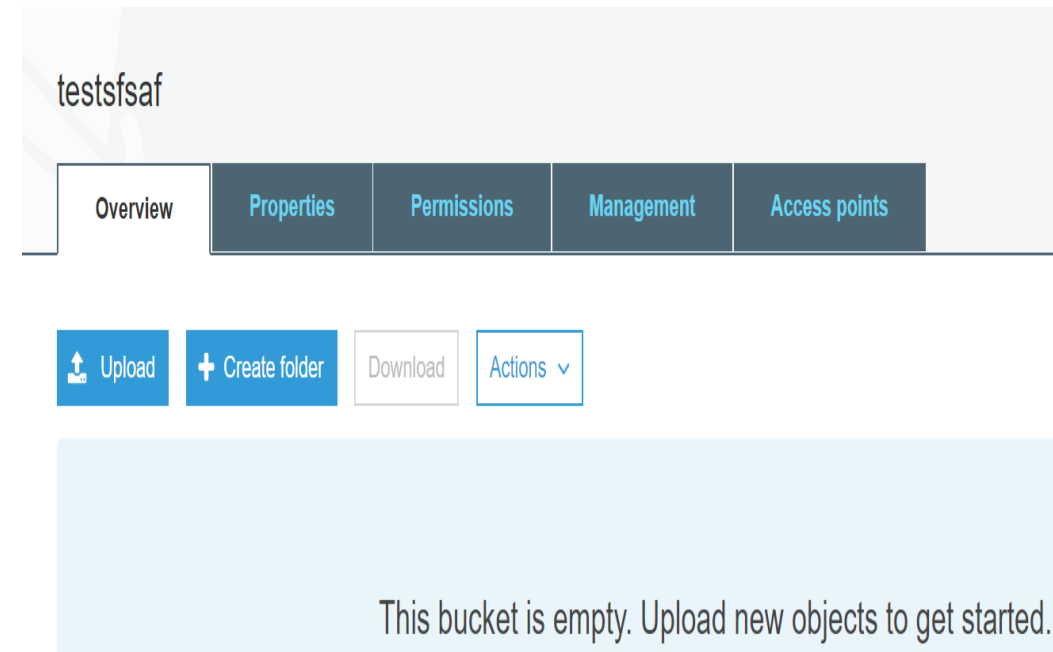
# Amazon S3 – Amazon S3 API

- Delete object

```
import boto3

s3 = boto3.resource('s3')
target_bucket = s3.Bucket('testfsaf')
target_object = target_bucket.Object('hello.txt')
target_object.delete()
```

## Amazon S3 Console



# Details of this homework

1. Your server and client program must be able to handle all commands in the previous part.
2. For some commands such as **whoami**, **exit**, **logout**, **create-board**, **list-board ##<key>** and **list-post <board-name> ##<key>**, your client program only sends the command to the server and gets the corresponding result from the server.
3. However, there are some commands that your **client program** will interact with **Amazon S3**.
4. Also, there are some **new commands** you have to implement for **simple mail service**.

**We will discuss the details of 3. and 4. by reading the requirements and scenario parts of the spec.**