

# Cloud Computing Practical 3

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# 1 Introduction

The objective of this practical session is to provide experience with EC2 and S3 of the Amazon Cloud, AWS. In other words, you need to understand how all the modules fit together. It is important to explore the Amazon Cloud environment and make sure that you operate within the defined and desired boundaries.

## 2 Exercise 1

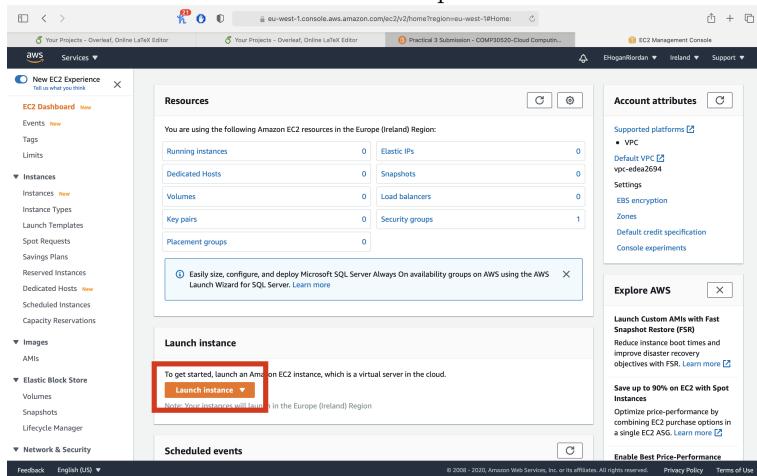
### 2.1 Description

Use Amazon EC2 for launching, connecting to, and using a Linux instance. An instance is a virtual server in the AWS cloud.

### 2.2 Launching an Instance

#### 2.2.1 Step 1

Press red button to start the launch process



## 2.2.2 Step 2

Choose what AMI to use. I like ubuntu so I went with it

The screenshot shows the 'Step 1: Choose an Amazon Machine Image (AMI)' page. It lists several AMI options:

- Red Hat Enterprise Linux 8 (HVM), SSD Volume Type - ami-084817100813bfff (64-bit x86) / ami-05dfcc21bf7c9b02 (64-bit Arm)
- Red Hat Enterprise Linux version 8 (HVM), EBS General Purpose (SSD) Volume Type
- SUSE Linux Enterprise Server 15 SP2 (HVM), SSD Volume Type - ami-051cbea0e7660063d (64-bit x86) / ami-01b2964747846dc1 (64-bit Arm)
- SUSE Linux Enterprise Server 15 Service Pack 2 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.
- Ubuntu Server 20.04 LTS (HVM), SSD Volume Type - ami-0658a495a537da8b (64-bit x86) / ami-03ec287fa560afcc0 (64-bit Arm)
- Ubuntu Server 20.04 LTS (HVM),EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).

A callout box highlights the 'Select' button for the 'Ubuntu Server 20.04 LTS (HVM), SSD Volume Type' entry, which is also circled in red. Below the list, there's a section for 'Amazon RDS' with a 'Launch a database using RDS' button.

## 2.2.3 Step 3

Choose free tier



General purpose	Compute optimized	Memory optimized	EBS only	Storage optimized	Low to Moderate	Price
12 micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes

## 2.2.4 Step 4

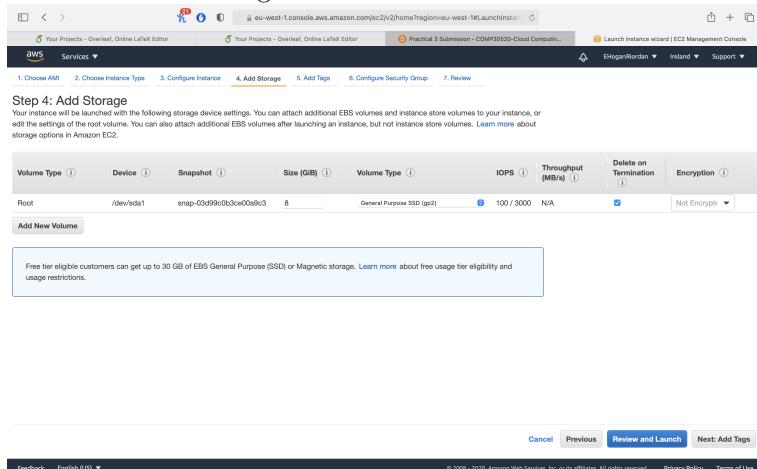
I didnt need to configure details

### Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

## 2.2.5 Step 5

Choose free tier storage



Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MiB/s)	Delete on Termination	Encryption
General Purpose SSD (gp2)	/dev/ida1	snap-03d99c0b3ce00a9c0	8	General Purpose SSD (gp2)	100	100 / 3000	N/A	Not Encrypted

A callout box at the bottom left of the table area states: 'Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.'

At the bottom right of the page, there are buttons for 'Cancel', 'Previous', 'Review and Launch', and 'Next: Add Tags'.

## 2.2.6 Step 6

### Set up security group

**Step 6: Configure Security Group**

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. Learn more about Amazon EC2 security groups.

**Assign a security group:**

- Select an existing security group
- Create a new security group

**Security group name:** launch-wizard-1

**Description:** launch-wizard-1 created 2020-10-15T15:28:06.615+01:00

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Custom 0.0.0.0/0	SSH FOR ADMIN

**Add Rule**

**Warning:**  
Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

## 2.2.7 Step 7

### Review the settings of the instance

**Step 7: Review Instance Launch**

**AMI Details**

- Ubuntu Server 20.04 LTS (HVM), SSD Volume Type - ami-06fdbaa495a537da8b
- Free tier eligible
- Root Device Type ebs Virtualization type hvm

**Instance Type**

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GiB)	EBS-Optimized Available	Network Performance
t2.micro	Variable	1	1	EBS only	-	Low to Moderate

**Security Groups**

Security group name: launch-wizard-1  
Description: launch-wizard-1 created 2020-10-15T15:28:06.615+01:00

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	0.0.0.0/0	SSH FOR ADMIN

**Instance Details**

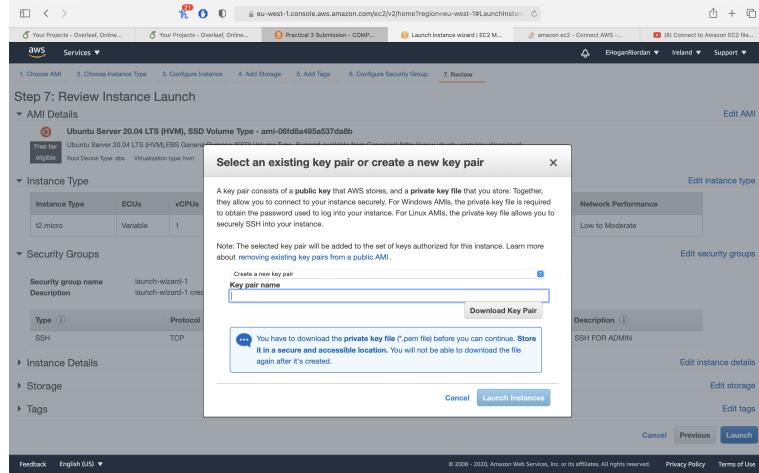
**Storage**

**Tags**

**Launch**

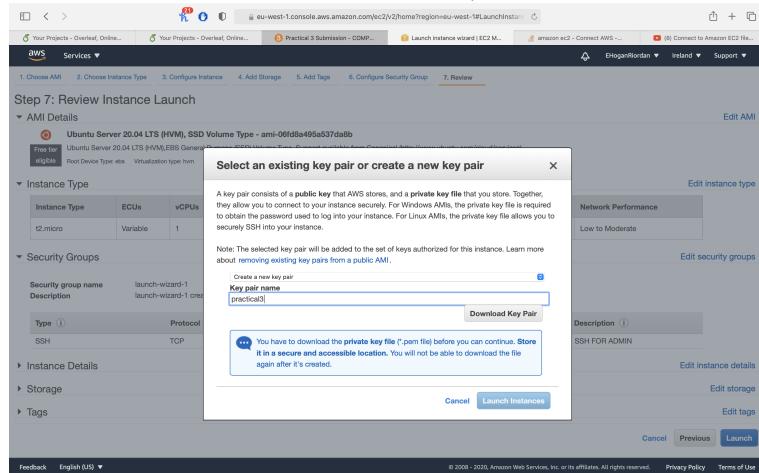
## 2.2.8 Step 8

Create a keypair for connecting to instance



## 2.2.9 Step 9

Name the keypair whatever you want. (I went with the most obvious)



## 2.2.10 Step 10

Wait for instance to launch

Name	Instance ID	Instance state	Instance type	Status check	Alarm Status	Availability zone	Pub
-	i-022829645bd40718a	Pending	t2.micro	-	No alarms	+ eu-west-1b	ec2-

### 2.2.11 Step 11

Instance launched successfully

Name	Instance ID	Instance state	Instance type	Status check	Alarm Status	Availability zone	Pub
-	i-022829645bd40718a	Running	t2.micro	-	No alarms	+ eu-west-1b	ec2-

## 2.3 Connect to Instance with SSH

### 2.3.1 Step 1

Look at the quickguide provided by amazon

The screenshot shows the AWS EC2 Instances page with a single instance listed: i-022829645bd40718a, which is running and has an t2.micro instance type. Below the instance table, there is a "Connect to Instance" section. This section includes a "Connect to Instance" button and three tabs: "EC2 Instance Connect", "Session Manager", and "SSH client". The "SSH client" tab is selected. It provides instructions for connecting via SSH, including steps to open an SSH client, locate the private key file (practical3.pem), run chmod 400 on it, and connect to the instance's public DNS (ec2-54-75-31-31.eu-west-1.compute.amazonaws.com). It also shows an example command: ssh -i "practical3.pem" ubuntu@ec2-54-75-31-31.eu-west-1.compute.amazonaws.com. A note at the bottom states: "Note: In most cases, the guessed user name is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI user name." At the bottom of the modal, there is a "Cancel" button.

### 2.3.2 Step 2

Check the .pem file is in your directory to connect to the instance

```
~/Downloads » ls  
practical3.pem
```

### 2.3.3 Step 3

Change the privilages of the .pem file so only you can access it

```
~/Downloads » chmod 400 practical3.pem
```

### 2.3.4 Step 3

Connect to the Instance

```
ssh -i " pemfile.pem" <instanceid>.<region>compute.amazonaws.com
```

```
~/Downloads » ssh -i "practical3.pem" ubuntu@ec2-54-75-31-31.eu-west-1.compute.amazonaws.com
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-1024-aws x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

 System information as of Thu Oct 15 14:36:44 UTC 2020

 System load: 0.02 Processes: 101
 Usage of /: 16.7% of 7.69GB Users logged in: 0
 Memory usage: 19% IPv4 address for eth0: 172.31.32.56
 Swap usage: 0%

 1 update can be installed immediately.
 0 of these updates are security updates.
 To see these additional updates run: apt list --upgradable

 The list of available updates is more than a week old.
 To check for new updates run: sudo apt update

 The programs included with the Ubuntu system are free software;
 the exact distribution terms for each program are described in the
 individual files in /usr/share/doc/*copyright.

 Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
 applicable law.

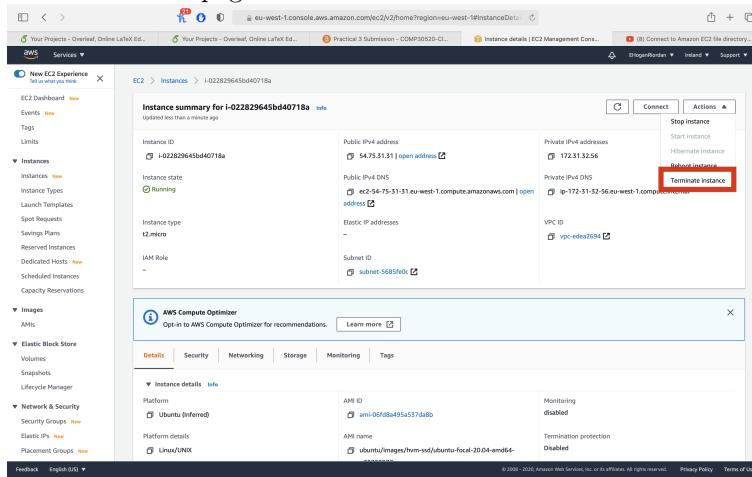
 To run a command as administrator (user "root"), use "sudo <command>".
 See "man sudo_root" for details.

ubuntu@ip-172-31-32-56:~$
```

## 2.4 Clean Up Your Instance

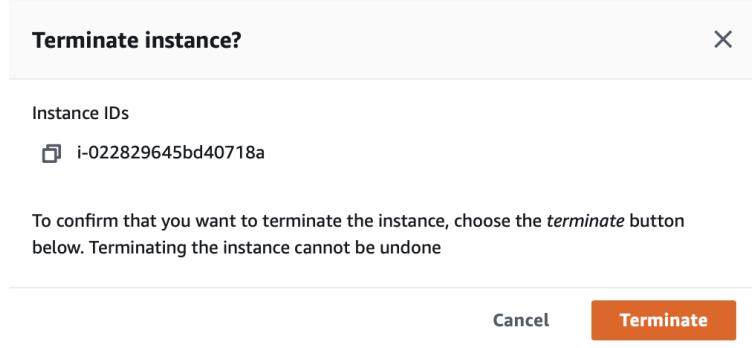
### 2.4.1 Step 1

On the instance page select actions then select terminate



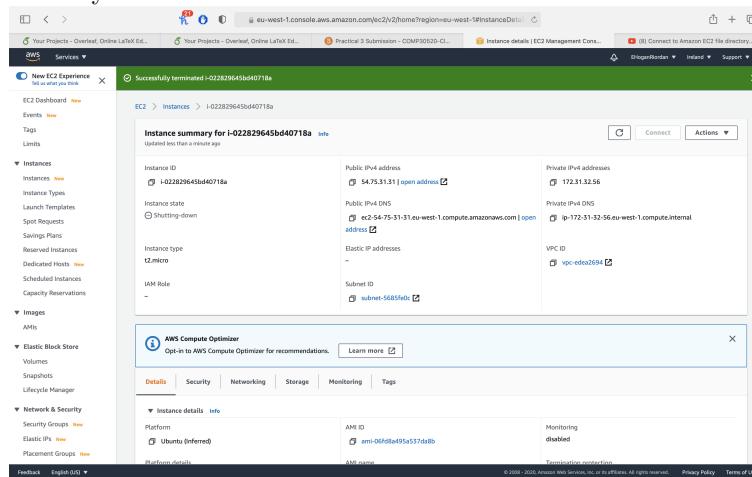
## 2.4.2 Step 2

Confirm Termination on the popup



## 2.4.3 Step 3

You will see a green banner notifying you that the Instance was deleted successfully



# 3 Exercise 2

## 3.1 Description

Use Amazon S3 to store and retrieve data on the web

## 3.2 Overview

To use the AWS CLI you need to generate a user and grant the user the Permissions shown Below

Add permissions to eoghan

Grant permissions

Use IAM policies to grant permissions. You can assign an existing policy or create a new one.

Filter policies ▾ Q s3 Showing 6 results

Policy name	Type	Used as
AmazonDMSRedshiftS3Role	AWS managed	None
AmazonS3FullAccess	AWS managed	None
AmazonS3OutputFullAccess	AWS managed	None
AmazonS3OutputReadOnlyAccess	AWS managed	None
AmazonS3ReadOnlyAccess	AWS managed	None
QuickSightAccessForS3StorageManagementAnalyticsReadOnly	AWS managed	None

Also I used the AWS CLI Config User guide[1]

To perform the S3 actions I used the AWS CLI Reference[2]

I Downlaoded the CLI with curl

```
~/Downloads » curl "https://awscli.amazonaws.com/AWSCLIV2.pkg" -o "AWSCLIV2.pkg"
sudo installer -pkg AWSCLIV2.pkg -target /
```

### 3.3 Create a Bucket

#### 3.3.1 Step 1 cli

When using the CLI it is only one step

```
~ » aws s3 mb s3://practical3testbucket
make_bucket: practical3testbucket
```

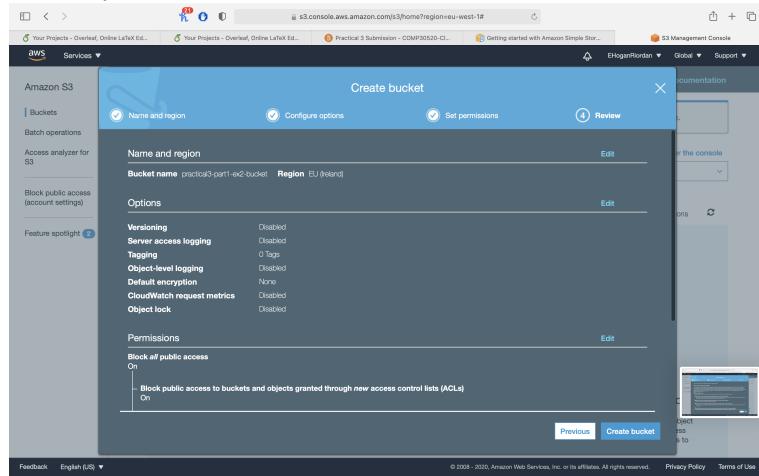
#### 3.3.2 Step 1 GUI

Click on the create Bucket button.

The screenshot shows the AWS S3 console interface. On the left, there's a sidebar with 'Amazon S3' and several navigation links like 'Buckets', 'Batch operations', 'Access analyzer for S3', 'Block public access (account settings)', and 'Feature spotlight'. The main area is titled 'Access S3-backed file shares on premises and reduce local storage costs using AWS Storage Gateway. Learn more' and contains a message: 'We've temporarily re-enabled the previous version of the S3 console while we continue to improve the new S3 console experience. Switch to the new console.' Below this is a search bar labeled 'Search for buckets' and a dropdown menu 'All access types'. A prominent red box highlights the blue '+ Create bucket' button. To the right, it says '0 Buckets' and '0 Regions'. At the bottom, there are three icons: 'Create a new bucket' (a bucket icon), 'Upload your data' (a bucket with an upload arrow icon), and 'Set up your permissions' (two user icons). A note below the first icon says: 'Buckets are globally unique containers for everything that you store in Amazon S3.' Another note below the second icon says: 'After you create a bucket, you can upload your objects (for example, your photo or video files).' A third note below the third icon says: 'By default, the permissions on an object are private, but you can set up access control policies to grant permissions to others.'

### 3.3.3 Step 2 GUI

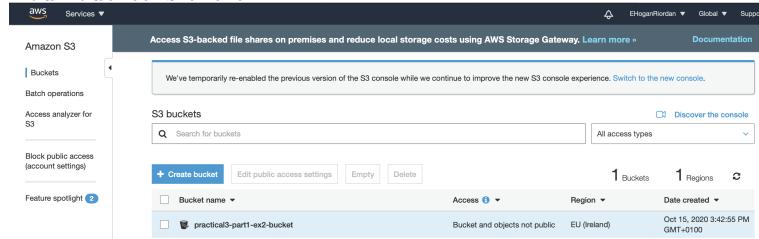
Review your Bucket



The screenshot shows the 'Create bucket' dialog box on the AWS S3 service console. The 'Name and region' tab is selected, showing a bucket name 'practical3-part1-ex2-bucket' and a region 'EU (Ireland)'. Below this, the 'Options' section displays various settings like Versioning, Server access logging, Tagging, Object-level logging, Default encryption, CloudWatch request metrics, and Object lock, all set to 'Disabled'. The 'Permissions' section shows 'Block all public access' is 'On'. At the bottom right of the dialog is a 'Create bucket' button.

### 3.3.4 Step 3 GUI

Your bucket is there!



The screenshot shows the main S3 buckets list page. A message at the top says 'We've temporarily re-enabled the previous version of the S3 console while we continue to improve the new S3 console experience. Switch to the new console.' Below this, the 'S3 buckets' section has a search bar and a dropdown for 'All access types'. It lists one bucket: 'practical3-part1-ex2-bucket'. The table includes columns for 'Bucket name', 'Access', 'Region', and 'Date created'. The bucket details show it has 'Bucket and objects not public' access, is in the 'EU (Ireland)' region, and was created on 'Oct 15, 2020 3:42:55 PM GMT+0100'.

## 3.4 Add an Object to a Bucket

### 3.4.1 Step 1 GUI

Select data to be uploaded

The screenshot shows the 'Upload' interface for AWS S3. At the top, there are four steps: 1) Select files (which is active), 2) Set permissions, 3) Set properties, and 4) Review. Below this, it says '3 Files Size: 50.5 KB Target path: practical3-part1-ex2-bucket'. A note at the top states: 'To upload a file larger than 160 GB, use the AWS CLI, AWS SDK, or Amazon S3 REST API. Learn more' with a link. There is a '+ Add more files' button. Below the files listed are 'heart.csv', 'imdb\_1000.csv', and 'smoker.csv', each with a delete icon. At the bottom are 'Upload' and 'Next' buttons.

### 3.4.2 Step 2 GUI

Review data to be uploaded

The screenshot shows the 'Upload' interface for AWS S3, Step 2. It has the same four-step navigation bar at the top. Below it, it says 'Files' with '3 Files' and 'Size: 50.5 KB'. Under 'Permissions', it shows '1 grantees'. Under 'Properties', it shows 'Encryption: No', 'Storage class: Standard', and 'Metadata' and 'Tag' sections. At the bottom are 'Previous' and 'Upload' buttons.

### 3.4.3 Step 3 GUI

You can see the data is there

Name	Last modified	Size	Storage class
heart.csv	Oct 15, 2020 3:44:19 PM GMT+0100	11.1 KB	Standard
imdb_1000.csv	Oct 15, 2020 3:44:19 PM GMT+0100	34.9 KB	Standard
smoker.csv	Oct 15, 2020 3:44:19 PM GMT+0100	4.6 KB	Standard

### 3.4.4 Step 1 CLI

To add data using the CLI is simple we just upload and its there

```
- » aws s3 cp Desktop/Predictive\ Analytics/R.nosync/Data s3://practical3testbucket --recursive
upload: Desktop/Predictive Analytics/R.nosync/Data/.DS_Store to s3://practical3testbucket/.DS_Store
upload: Desktop/Predictive Analytics/R.nosync/Data/smoker.csv to s3://practical3testbucket/smoker.csv
upload: Desktop/Predictive Analytics/R.nosync/Data/heart.csv to s3://practical3testbucket/heart.csv
upload: Desktop/Predictive Analytics/R.nosync/Data/imdb_1000.csv to s3://practical3testbucket/imdb_1000
```

We can check its there

```
~ » aws s3 ls s3://practical3testbucket
2020-10-15 16:20:01      6148 .DS_Store
2020-10-15 16:20:01     11328 heart.csv
2020-10-15 16:20:01    35756 imdb_1000.csv
2020-10-15 16:20:01    4667 smoker.csv
```

## 3.5 View an Object

### 3.5.1 Step 1 GUI

```
- » aws s3 cp Desktop/Predictive\ Analytics/R.nosync/Data s3://practical3testbucket --recursive
upload: Desktop/Predictive Analytics/R.nosync/Data/.DS_Store to s3://practical3testbucket/.DS_Store
upload: Desktop/Predictive Analytics/R.nosync/Data/smoker.csv to s3://practical3testbucket/smoker.csv
upload: Desktop/Predictive Analytics/R.nosync/Data/heart.csv to s3://practical3testbucket/heart.csv
upload: Desktop/Predictive Analytics/R.nosync/Data/imdb_1000.csv to s3://practical3testbucket/imdb_1000
```

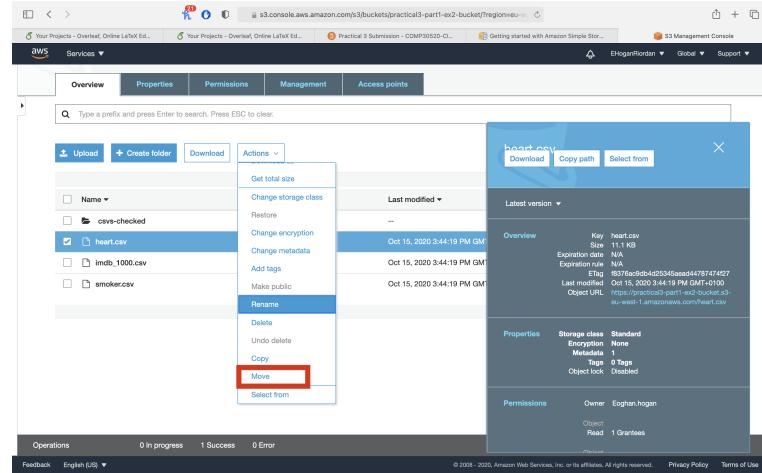
### 3.5.2 Step 1 CLI

```
~ » aws s3 ls s3://practical3testbucket/tmp/
2020-10-15 16:21:41      11328 heart.csv
```

## 3.6 Move an Object

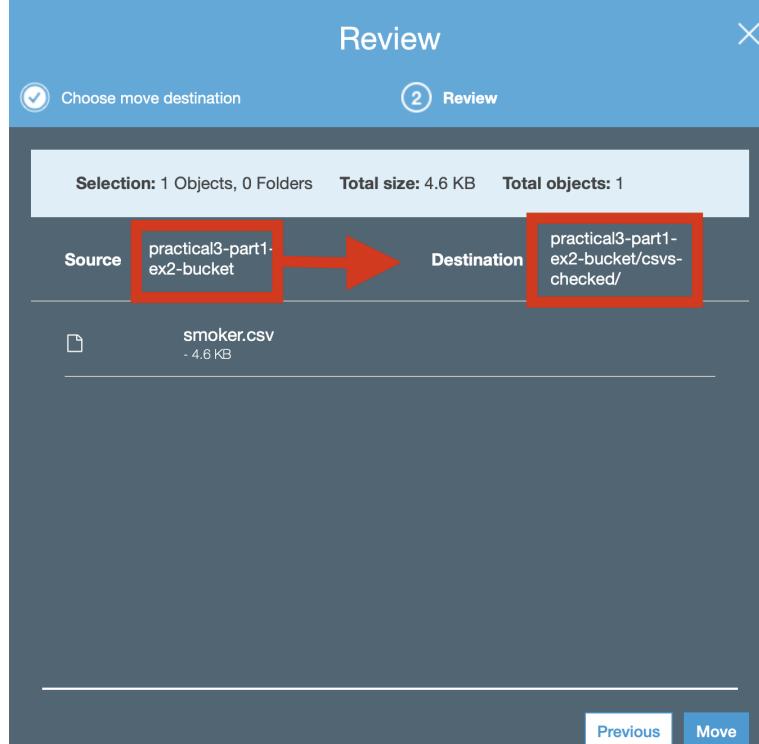
### 3.6.1 Step 1 GUI

Select object and then action and then "Move"



### 3.6.2 Step 2 GUI

I have outlined the Movement



### 3.6.3 Step 3 GUI

on this page we see the contents of the folder and that the item was moved

The screenshot shows the 'Overview' page of the 'practical3-part1-ex2-bucket' in the AWS S3 console. The 'csvs-checked' folder is selected. The file 'smoker.csv' is listed with the following details:

Name	Last modified	Size	Storage class
smoker.csv	Oct 15, 2020 3:47:51 PM GMT-0100	4.6 KB	Standard

At the bottom of the page, there is a summary of operations: 0 In progress, 4 Success, 0 Error.

### 3.6.4 Step 1 GUI

To move an item is just a simple command. and it creates the new folder in place

```
-> aws s3 mv s3://practical3testbucket/heart.csv s3://practical3testbucket/tmp/heart.csv  
move: s3://practical3testbucket/heart.csv to s3://practical3testbucket/tmp/heart.csv
```

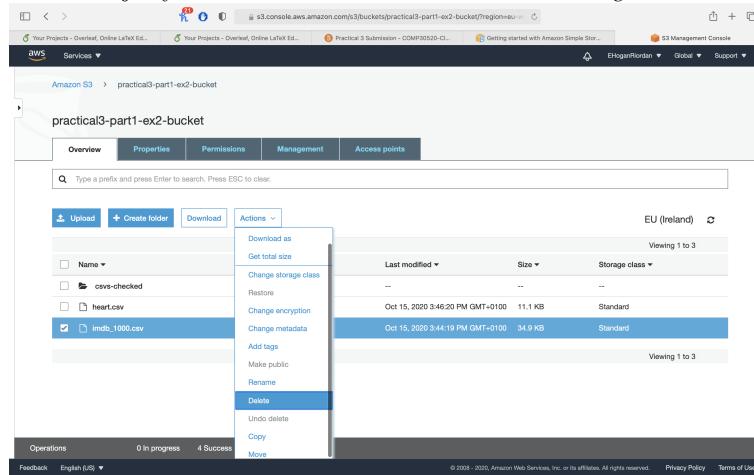
New Folder can be seen in "ls" output

```
~ » aws s3 ls s3://practical3testbucket  
                           PRE tmp/  
2020-10-15 16:20:01      6148 .DS_Store  
2020-10-15 16:20:01      35756 imdb_1000.csv  
2020-10-15 16:20:01      4667 smoker.csv
```

## 3.7 Delete an Object and Bucket

### 3.7.1 Delete Object - Step 1 GUI

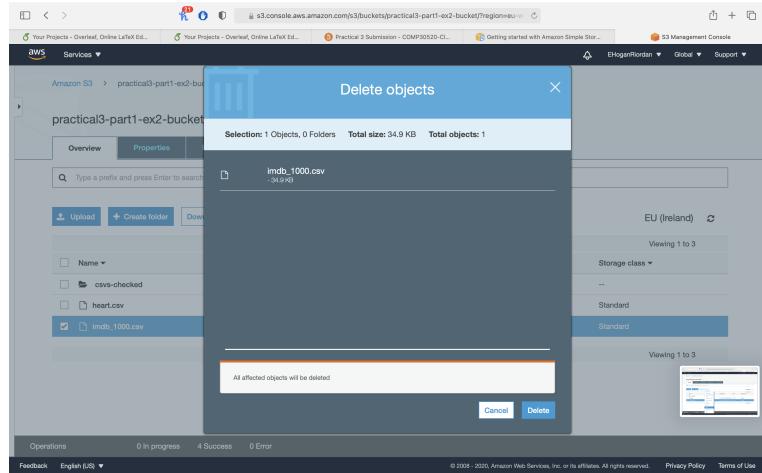
Select Objet you wish to Delete and choose action -i delete



The screenshot shows the AWS S3 Management Console. In the left sidebar, under 'Amazon S3 > practical3-part1-ex2-bucket', there's a list of objects: 'csv-checked', 'heart.csv', and 'imdb\_1000.csv'. The 'imdb\_1000.csv' file is selected. A context menu is open over this file, with the 'Actions' tab selected. The 'Delete' option is highlighted with a blue background and white text. Other options in the menu include 'Upload', 'Create folder', 'Download', 'Download as', 'Get total size', 'Change storage class', 'Restore', 'Change encryption', 'Change metadata', 'Add tags', 'Make public', 'Rename', 'Undo delete', 'Copy', and 'Move'. At the bottom of the page, there are buttons for 'Feedback', 'English (US)', and links to 'Privacy Policy' and 'Terms of Use'.

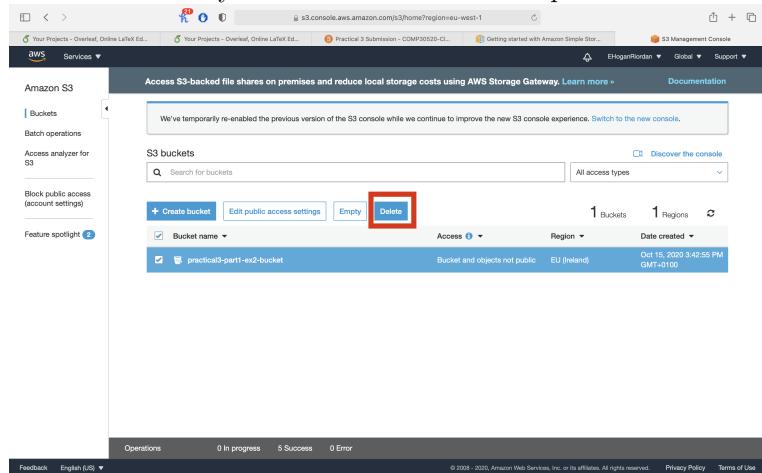
### 3.7.2 Delete Object - Step 2 GUI

Confirm the deletion



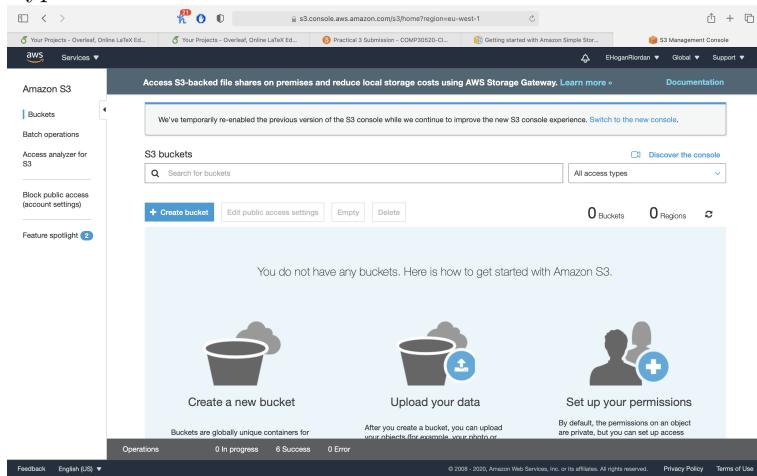
### 3.7.3 Delete Bucket - Step 1 GUI

Chose the bucket you wish to delete and then press delete



### 3.7.4 Delete Bucket - Step 2 GUI

Type in the bucket name to confirm



The screenshot shows the AWS S3 service page. On the left, there's a sidebar with options like 'Buckets', 'Batch operation', 'Access analyzer for S3', 'Block public access (account settings)', and 'Feature spotlight'. The main area has a banner at the top stating 'Access S3-backed file shares on premises and reduce local storage costs using AWS Storage Gateway. Learn more'. Below this is a search bar for 'S3 buckets' and a 'Discover the console' link. A message says 'We've temporarily re-enabled the previous version of the S3 console while we continue to improve the new S3 console experience. Switch to the new console.' There are three large buttons: '+ Create bucket', 'Edit public access settings', and 'Empty'. Below these are statistics: '0 Buckets' and '0 Regions'. The central part of the screen says 'You do not have any buckets. Here is how to get started with Amazon S3.' It features three icons: a bucket with a cloud above it labeled 'Create a new bucket', a bucket with a download arrow labeled 'Upload your data', and two people with a plus sign labeled 'Set up your permissions'. A note below says 'Buckets are globally unique containers for After you create a bucket, you can upload your objects (for example, your photo or video) to it.' Another note says 'By default, the permissions on an object are private, but you can set up access control rules for them.' At the bottom, there are links for 'Feedback', 'English (US)', 'Privacy Policy', and 'Terms of Use'.

### 3.7.5 Delete Object - CLI

To delete an object with the CLI simply use the "rm" command

```
~ » aws s3 rm s3://practical3testbucket/imbd_1000.csv
delete: s3://practical3testbucket/imbd_1000.csv
```

### 3.7.6 Delete Bucket - CLI

To delete a Bucket with the CLI use the "rb" command. if there are objects inside the bucket still use "--force" flag to Delete everything

```
~ » aws s3 rb --force s3://practical3testbucket
delete: s3://practical3testbucket/smoker.csv
delete: s3://practical3testbucket/.DS_Store
delete: s3://practical3testbucket/imbd_1000.csv
delete: s3://practical3testbucket/tmp/heart.csv
remove_bucket: practical3testbucket
```

## References

- [1] Amazon AWS CLI Configuration User Guide, Main Page, <https://docs.aws.amazon.com/cli/latest/userguide/cli-configure-files.html>
- [2] Amazon AWS CLI Reference, <https://docs.aws.amazon.com/cli/latest/index.html>