Assignment 2

Name – Sati, Ankit Date – 2/20/2022

Section – 001

SID – as14128

Total in points (Maximum 100 points)–

Professors Comments –

Affirmation of Independent Effort – Ankit Sati

Step 1 - Making an Azure Student account.

- ➔ Post setting up the Aws account there are only a small key difference in the Microsoft Azure account.
- ➔ We have to setup the storage and server instances as done in the amazon accounts.

a. Before that we need to take care of a few dependencies.
   - Python 3.7 (As this will be used in the future for the ArchNav)

```
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ sudo apt install python3-pip
[sudo] password for ankit:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  bridge-utils dns-root-data dnsmasq-base libidn11 ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libexpat1-dev libpython3-dev libpython3.8 libpython3.8-dev libpython3.8-minimal libpython3.8-stdlib python-pip-whl
  python3-dev python3-wheel python3.8 python3.8-dev python3.8-minimal zlib1g-dev
Suggested packages:
Unpacking python3.8-dev (3.8.10-0ubuntu1~20.04.2) ...
Selecting previously unselected package python3-dev.
Preparing to unpack .../11-python3-dev_3.8.2-0ubuntu2_amd64.deb ...
Unpacking python3-dev (3.8.2-0ubuntu2) ...
Selecting previously unselected package python3-wheel.
Preparing to unpack .../12-python3-wheel_0.34.2-1_all.deb ...
Unpacking python3-wheel (0.34.2-1) ...
Selecting previously unselected package python3-pip.
Preparing to unpack .../13-python3-pip_20.0.2-5ubuntu1.6_all.deb ...
Unpacking python3-pip (20.0.2-5ubuntu1.6) ...
Setting up libpython3.8-minimal:amd64 (3.8.10-0ubuntu1~20.04.2) ...
Setting up python3-wheel (0.34.2-1) ...
Setting up libexpat1-dev:amd64 (2.2.9-1build1) ...
Setting up zlib1g-dev:amd64 (1:1.2.11.dfsg-2ubuntu1.2) ...
Setting up python3.8-minimal (3.8.10-0ubuntu1~20.04.2) ...
Setting up python-pip-whl (20.0.2-5ubuntu1.6) ...
Setting up libpython3.8-stdlib:amd64 (3.8.10-0ubuntu1~20.04.2) ...
Setting up python3.8 (3.8.10-0ubuntu1~20.04.2) ...
```

b. Post this we need to install the JupyterLabs and set the appropriate path.

```
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ pip install jupyterlab
Collecting jupyterlab
  Downloading jupyterlab-3.2.9-py3-none-any.whl (8.5 MB)
     |████████████████████████████████| 8.5 MB 6.6 MB/s
Collecting jupyterlab-server~=2.3
  Downloading jupyterlab_server-2.10.3-py3-none-any.whl (61 kB)
     |████████████████████████████████| 61 kB 7.3 MB/s
Requirement already satisfied: jinja2>=2.1 in /usr/lib/python3/dist-packages (from jupyterlab) (2.10.1)
Collecting nbclassic~=0.2
  Downloading nbclassic-0.3.5-py3-none-any.whl (25 kB)
Collecting tornado>=6.1.0
  Downloading tornado-6.1-cp38-cp38-manylinux2010_x86_64.whl (427 kB)
     |████████████████████████████████| 427 kB 10.4 MB/s
Collecting jupyter-server~=1.4
  Downloading jupyter_server-1.13.5-py3-none-any.whl (397 kB)
     |████████████████████████████████| 397 kB 11.7 MB/s
Collecting packaging
  Downloading packaging-21.3-py3-none-any.whl (40 kB)
     |████████████████████████████████| 40 kB 7.1 MB/s
Collecting jupyter-core
```

c. We should have the Docker on our machine and it should be up and running.

```
To get more help with docker, check out our guides at https://docs.docker.com/go/guides/

ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ docker --version
Docker version 20.10.12, build e91ed57
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ service docker status
 * Docker is running
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$
```

d. Post this, as mentioned in the assignment, we need to run the command (docker run -i -t -p 8888:8888 dbgannon/tutorial).

```
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ service docker status
 * Docker is running
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ docker run -i -t -p 8888:8888 dbgannon/tutorial
cp: omitting directory '/tutorial_notebooks/graph'
/home/jovyan/work
total 16
drwxr-xr-x 1 jovyan users 4096 Feb 18 06:27 .
drwxr-xr-x 1 jovyan users 4096 Jul  8  2017 ..
drwxr-xr-x 2 jovyan users 4096 Feb 18 06:27 notebooks
[I 06:27:29.522 NotebookApp] Writing notebook server cookie secret to /home/jovyan/.local/share/jupyter/runtime/notebook
_cookie_secret
[I 06:27:30.200 NotebookApp] JupyterLab alpha preview extension loaded from /opt/conda/lib/python3.5/site-packages/jupyt
erlab
[I 06:27:30.209 NotebookApp] Serving notebooks from local directory: /home/jovyan/work
[I 06:27:30.209 NotebookApp] 0 active kernels
[I 06:27:30.209 NotebookApp] The Jupyter Notebook is running at: https://[all ip addresses on your system]:8888/
[I 06:27:30.209 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
```

e. Finally, just for the deployment purposes we need to get the kubectl instance up and running with the docker daemons already started.

➔ Now lets get started with setting up the Azure account.
Subscription type – Azure account
Payment – Pay as you go

Account information.

Subscription ID
5c3b1518-756b-449a-a9cb-424eb50a0f71
Directory
nyu.edu (nyu.edu)
Status
Disabled
Parent management group
7b331012-87a1-4a16-8b0f-a4605b1f3d7f

Step 2 and 3 – SSH

SSH pair key
resource group as14128

Connection Key - HostName=as141286.azure-devices.net;DeviceId=myEdgeDevice;SharedAccessKey=DUQ43decm2Rqt8D5u01ZEVDDZ52gq7elK8qdiUKkwBs=

The CSV file- https://github.com/domoritz/random-csv

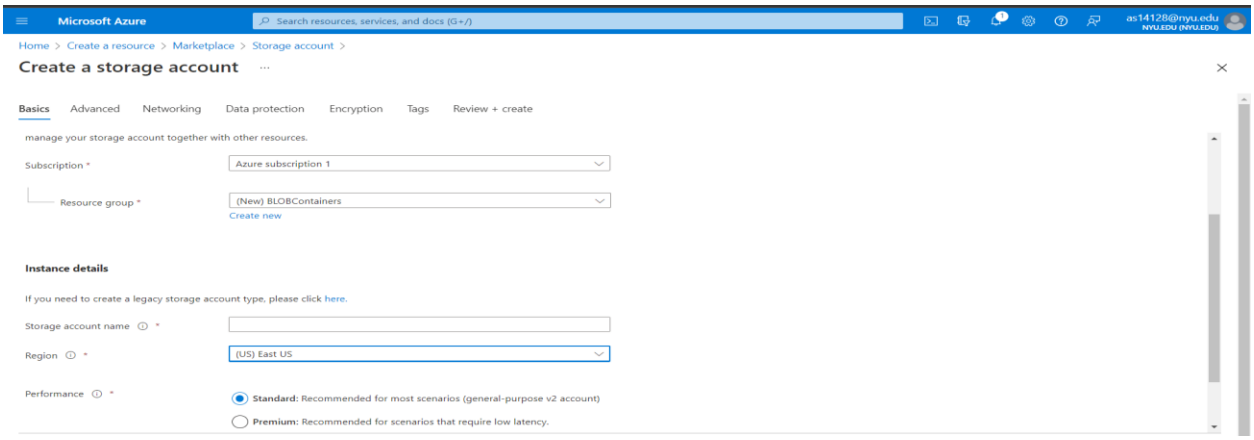
Step 4 – Creating a storage account with BLOB and tables.

Creating the BLOB containers to import the CSV file.

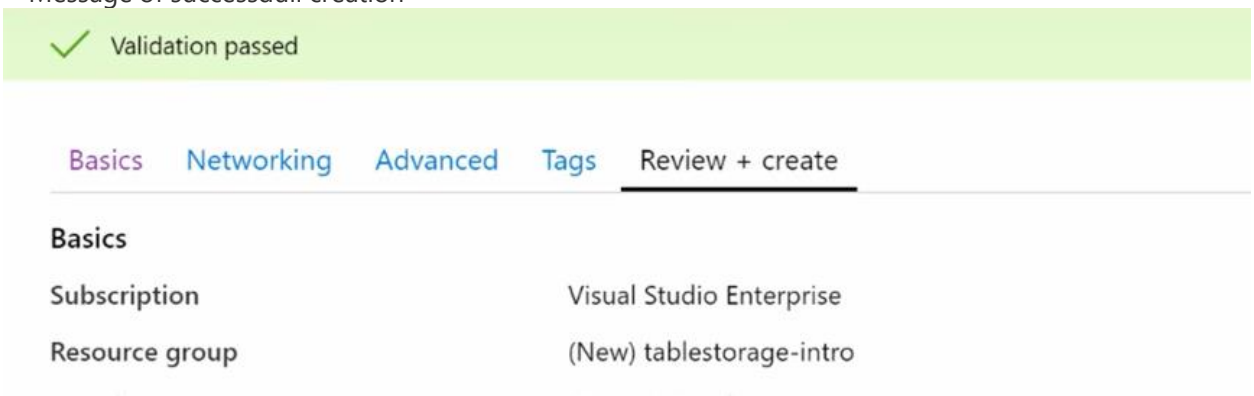
- First step is to create the file in the blob containers.
- In my case I used the same containers that I had on docker and imported the CSV file onto them.
- Post this data was ready to be exported to Azure.

Creating the BLOB containers to import the CSV file.

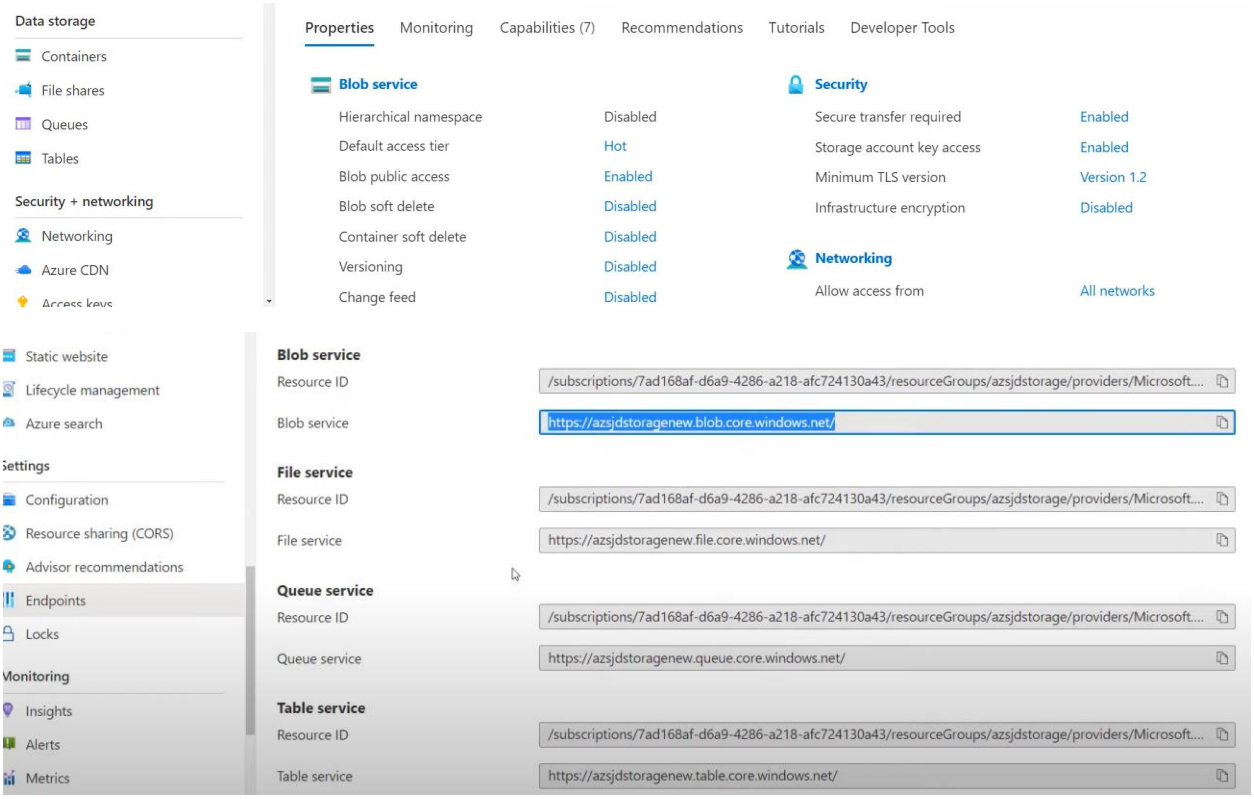
- Setting up the BLOB in a new storage account.
- In my case I had made the cheapest account that was possible and hence uploaded a very small csv file to capture the data in the BLOB containers.



- Message of successdull creation



BLOB Container properties.



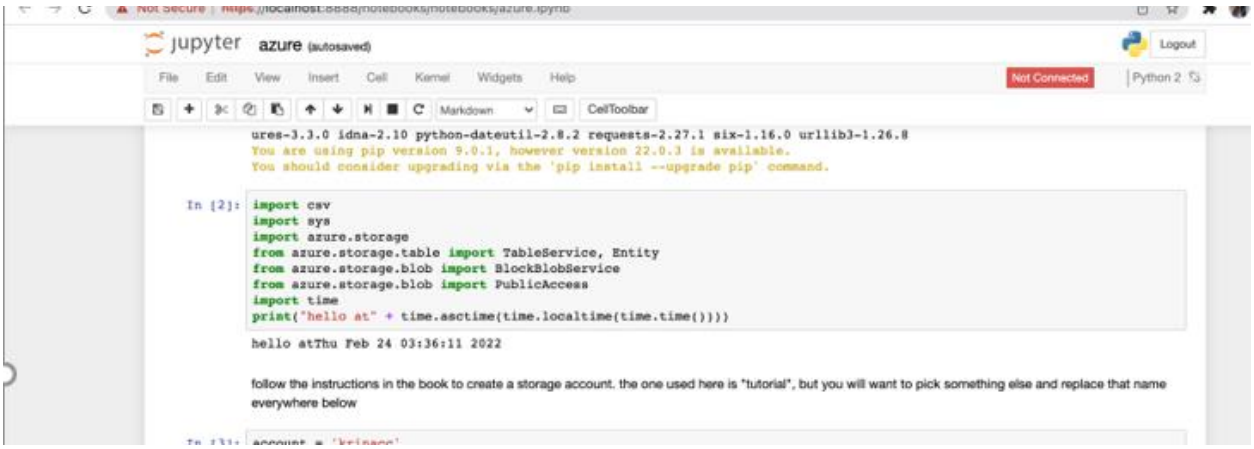
Step 5 and 6– Creating a table with the URL links to each of the BLOB and visualizing the data to azure.

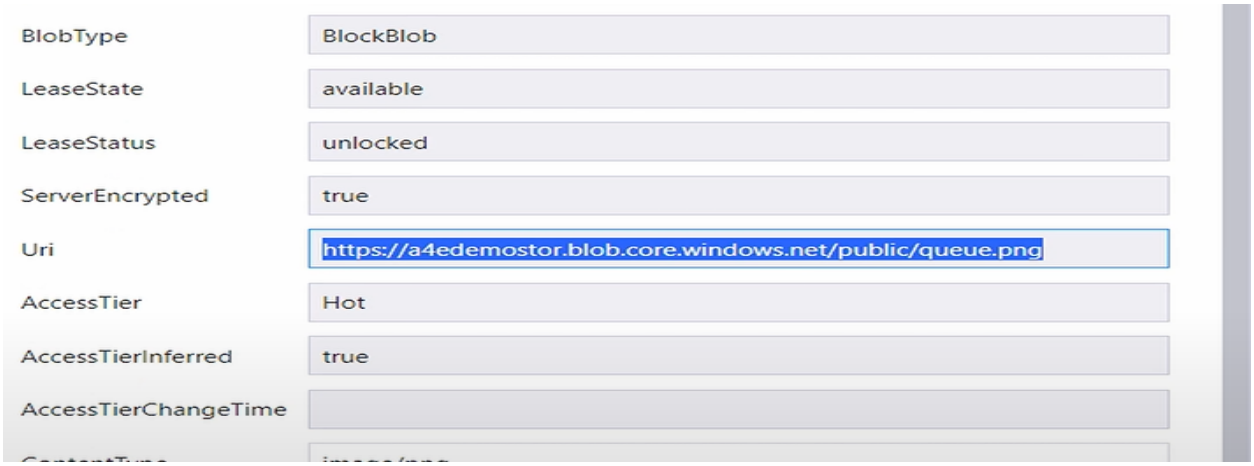
https://docs.microsoft.com/en-us/azure/cosmos-db/graph/graph-visualization-partners

Post this we need to push the same amount of files as well as the structure of the BLOB containers should be similar to those in which the CSV files were stored locally.

Note – I have left the file sharer and queues unperformed as they are not required for this assignment.

Adding the URL to the CSV



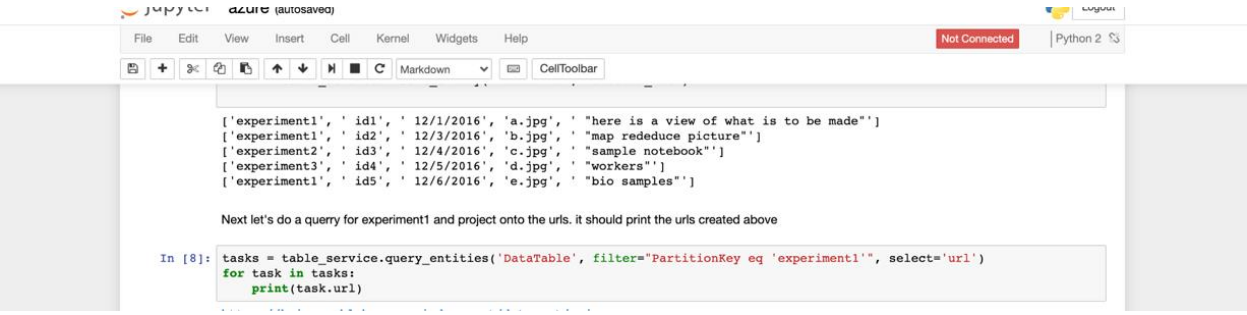


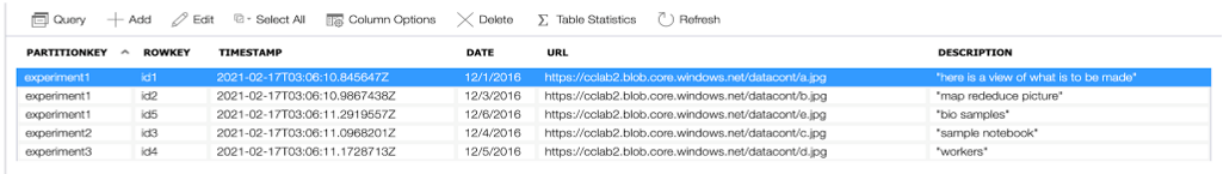
Now, Once the URL to each of the csv file is added, we need to create a new container for a new CSV file.

Once that is done we need to repeat the same steps as above to create and add new URL so that we can reach the same BLOB Containers.

Tables

Uploading data

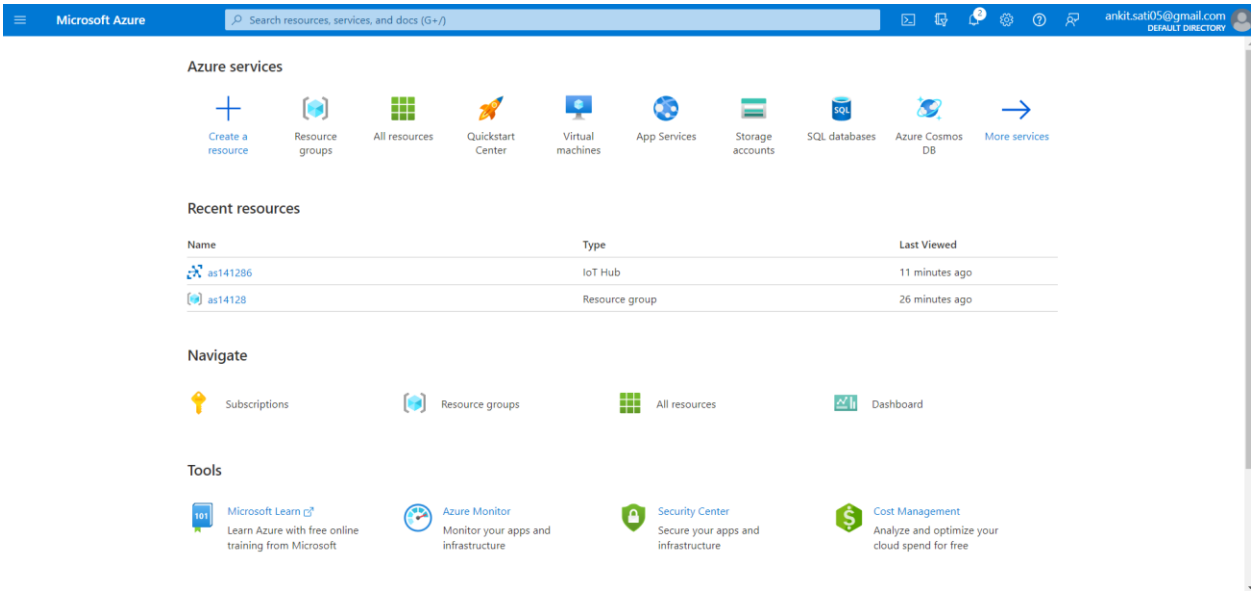




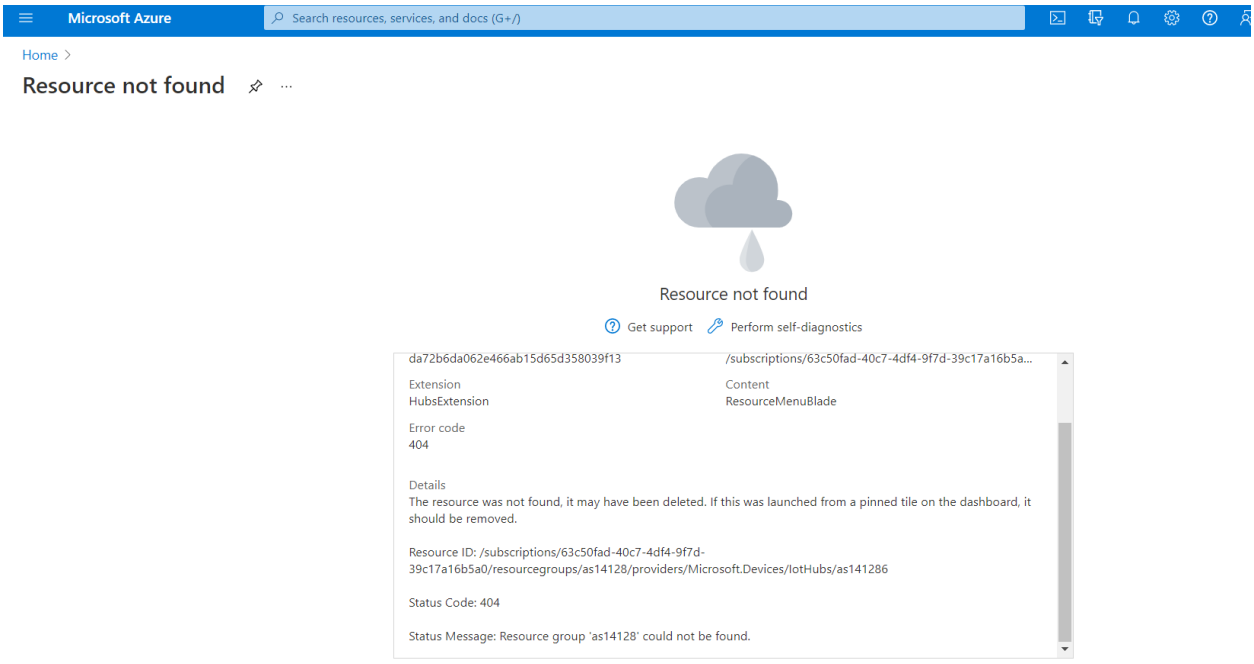
PARTITIONKEY	ROWKEY	TIMESTAMP	DATE	URL	DESCRIPTION
experiment1	id1	2021-02-17T03:06:10.845647Z	12/1/2016	https://cclab2.blob.core.windows.net/datacont/a.jpg	"here is a view of what is to be made"
experiment1	id2	2021-02-17T03:06:10.9867438Z	12/3/2016	https://cclab2.blob.core.windows.net/datacont/b.jpg	"map rededuce picture"
experiment1	id5	2021-02-17T03:06:11.2919557Z	12/6/2016	https://cclab2.blob.core.windows.net/datacont/e.jpg	"bio samples"
experiment2	id3	2021-02-17T03:06:11.0968201Z	12/4/2016	https://cclab2.blob.core.windows.net/datacont/c.jpg	"sample notebook"
experiment3	id4	2021-02-17T03:06:11.1728713Z	12/5/2016	https://cclab2.blob.core.windows.net/datacont/d.jpg	"workers"

FINAL PART _ CLEANING UP THE RESOURCES

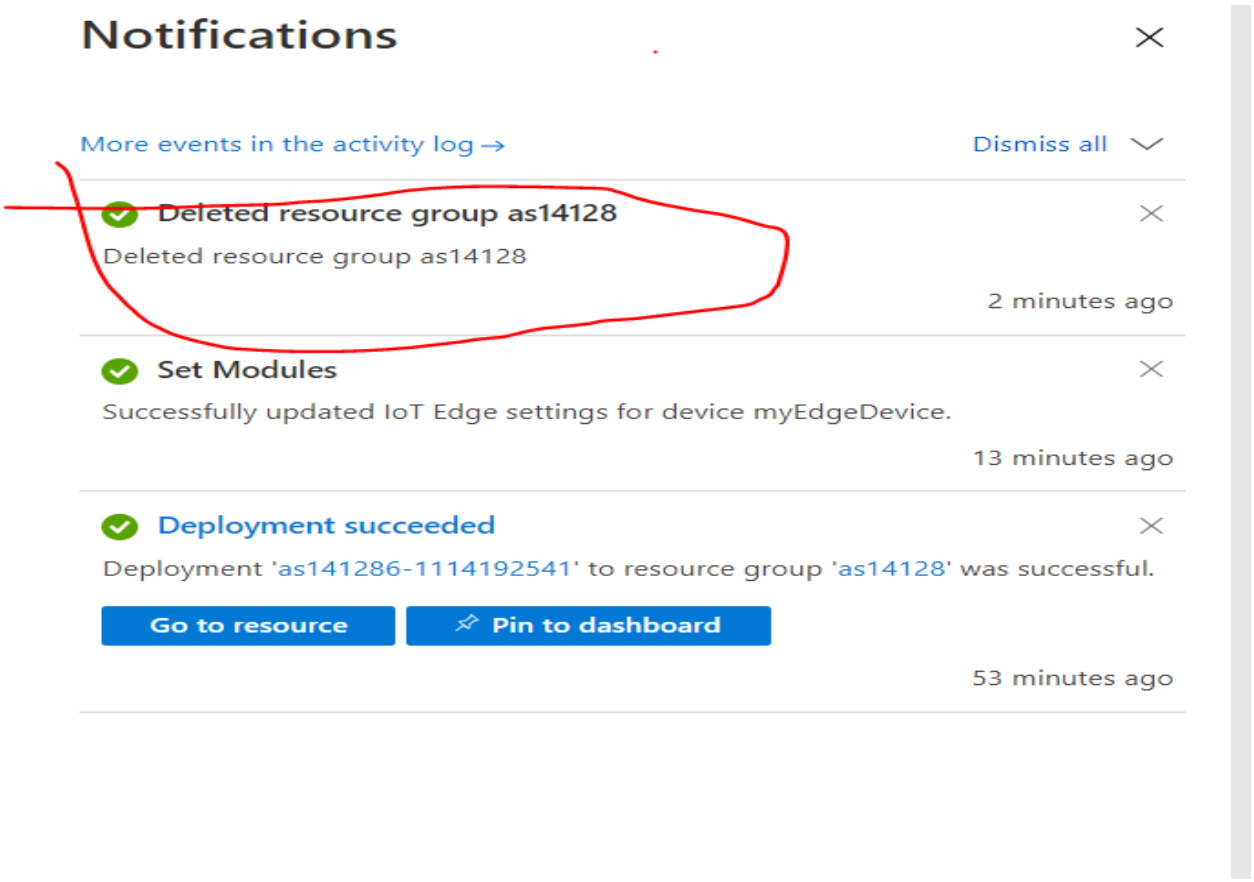
Final screenshot before deletion



Post Deletion



Activity log snippet



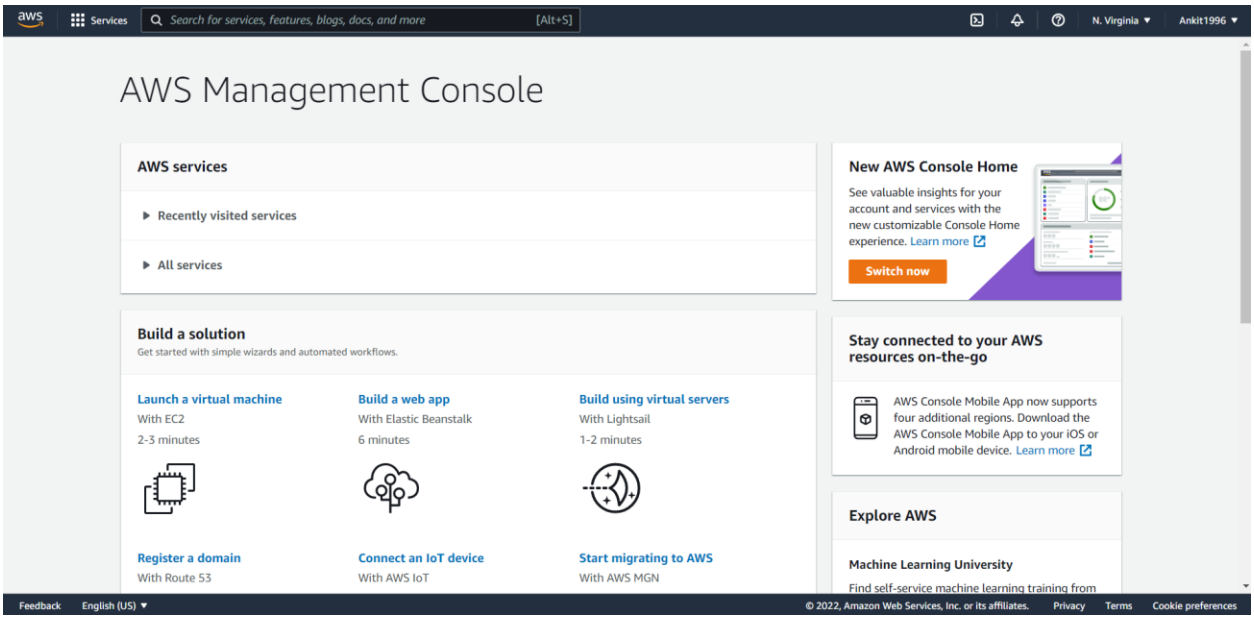
Again repeating the same steps on AWS.

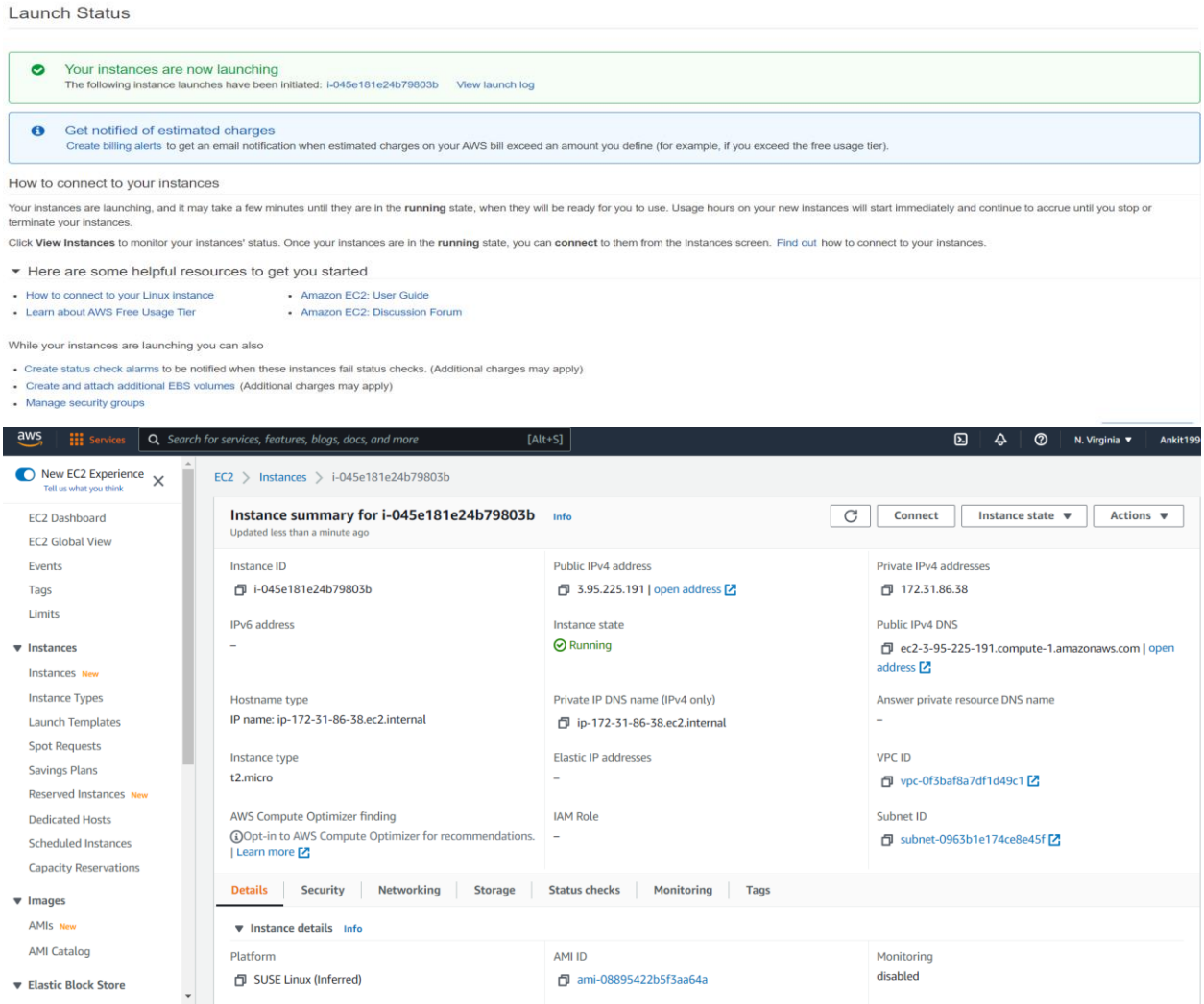
1. Setting up the AWS account with the required instances.

Required instances.

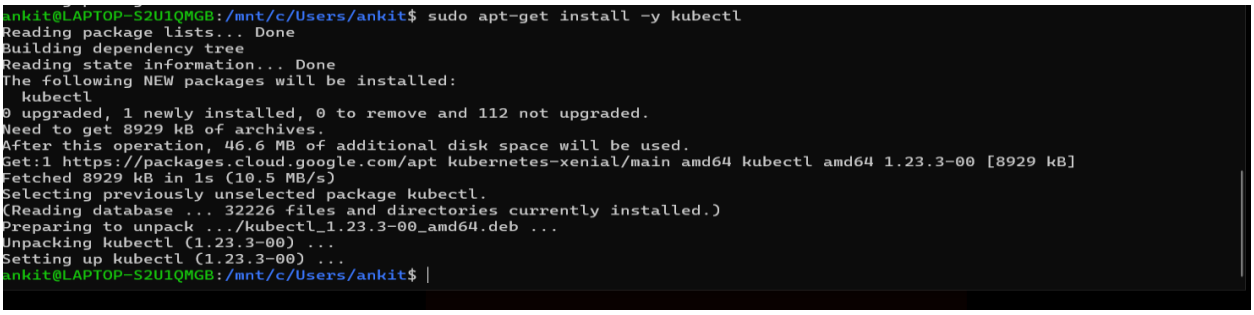
- ➔ EC2(**Compute server**) – This is basically a **regular server** instance that is used to deploy and the required resources over the VM as per the choices made by the users.
  - This is used to deploy the VM.
  - Manage resources over those VM's.
  - Finally to migrate services and monitor volumes.
- ➔ S3(**Storage utility**) – This is a basic protocol that acts like a storage bucket.
  - The prime feature of this protocol is to deal with the data as per service request.
  - We need this to store the data in the **data buckets** which are later used to store and move the data across volumes created.

Initial account setup.

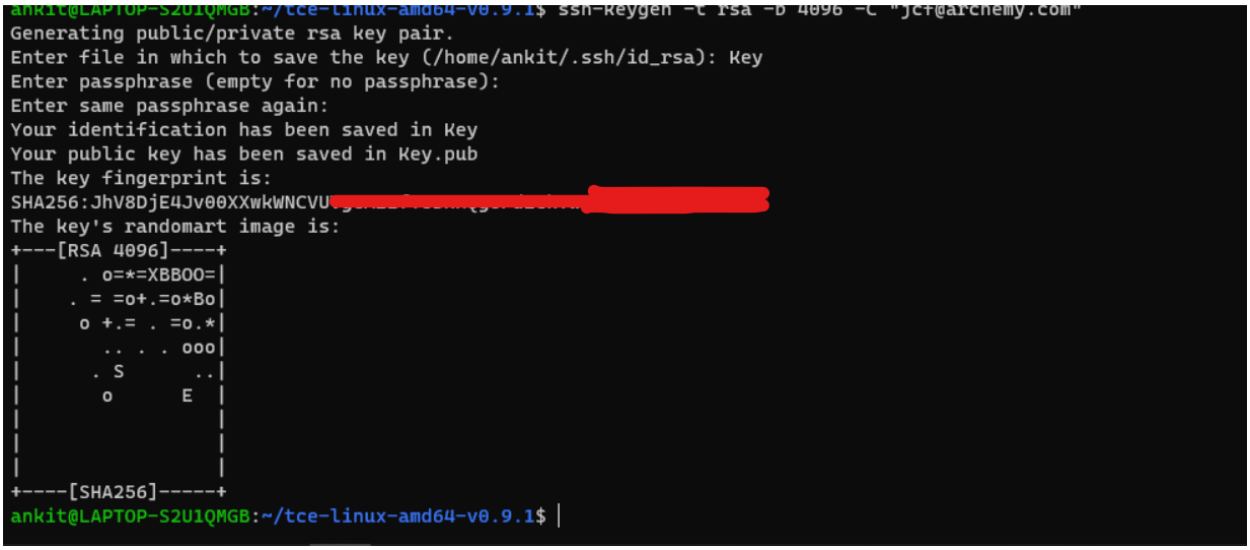

aws
Services
Search for services, features, blogs, docs, and more
[Alt+S]
N. Virginia
Ankit1996
AWS Management Console
AWS services
Recently visited services
All services
New AWS Console Home
See valuable insights for your account and services with the new customizable Console Home experience. Learn more
Switch now
Build a solution
Get started with simple wizards and automated workflows.
Launch a virtual machine
With EC2
2-3 minutes
Build a web app
With Elastic Beanstalk
6 minutes
Build using virtual servers
With Lightsail
1-2 minutes
Register a domain
With Route 53
Connect an IoT device
With AWS IoT
Start migrating to AWS
With AWS MGN
Stay connected to your AWS resources on-the-go
AWS Console Mobile App now supports four additional regions. Download the AWS Console Mobile App to your iOS or Android mobile device. Learn more
Explore AWS
Machine Learning University
Find self-service machine learning training from
Feedback
English (US)
© 2022, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences

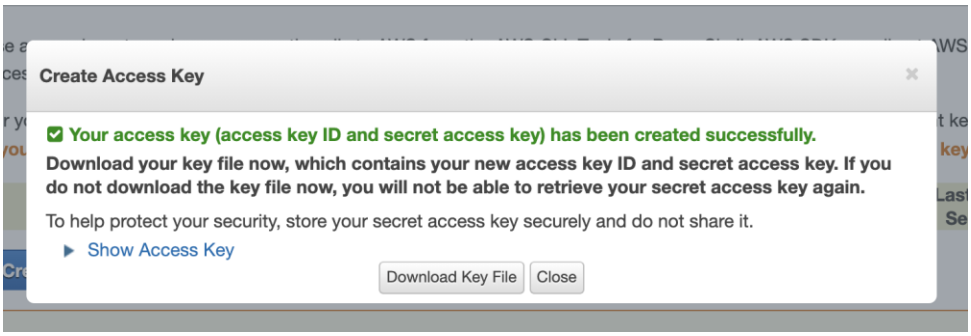

Launch Status
Your instances are now launching
The following instance launches have been initiated: i-045e181e24b79803b
View launch log
Get notified of estimated charges
Create billing alerts to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).
How to connect to your instances
Your instances are launching, and it may take a few minutes until they are in the running state, when they will be ready for you to use. Usage hours on your new instances will start immediately and continue to accrue until you stop or terminate your instances.
Click View Instances to monitor your instances' status. Once your instances are in the running state, you can connect to them from the Instances screen. Find out how to connect to your instances.
Here are some helpful resources to get you started
How to connect to your Linux instance
Learn about AWS Free Usage Tier
Amazon EC2: User Guide
Amazon EC2: Discussion Forum
While your instances are launching you can also
Create status check alarms to be notified when these instances fail status checks. (Additional charges may apply)
Create and attach additional EBS volumes (Additional charges may apply)
Manage security groups
aws
Services
Search for services, features, blogs, docs, and more
[Alt+S]
N. Virginia
New EC2 Experience
Tell us what you think
EC2 Dashboard
EC2 Global View
Events
Tags
Limits
Instances
Instances New
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances New
Dedicated Hosts
Scheduled Instances
Capacity Reservations
Images
AMIs New
AMI Catalog
Elastic Block Store
EC2 > Instances > i-045e181e24b79803b
Instance summary for i-045e181e24b79803b
Info
Updated less than a minute ago
Connect
Instance state
Actions
Instance ID
i-045e181e24b79803b
Public IPv4 address
3.95.225.191 | open address
Private IPv4 addresses
172.31.86.38
IPv6 address
–
Instance state
Running
Public IPv4 DNS
ec2-3-95-225-191.compute-1.amazonaws.com | open address
Hostname type
IP name: ip-172-31-86-38.ec2.internal
Private IP DNS name (IPv4 only)
ip-172-31-86-38.ec2.internal
Answer private resource DNS name
–
Instance type
t2.micro
Elastic IP addresses
–
VPC ID
vpc-0f3baf8a7df1d49c1
AWS Compute Optimizer finding
Opt-in to AWS Compute Optimizer for recommendations. | Learn more
IAM Role
–
Subnet ID
subnet-0963b1e174ce8e45f
Details
Security
Networking
Storage
Status checks
Monitoring
Tags
Instance details Info
Platform
SUSE Linux (Inferred)
AMI ID
ami-08895422b5f3aa64a
Monitoring
disabled

2. Step 2 and 3 – SSH into the instance that we have created.



➔ Saving the required keys as mentioned in the assignment.
Key.pub identification
Type – RSA 4096
Key – Screenshot attached (Blurred the actual key for privacy)





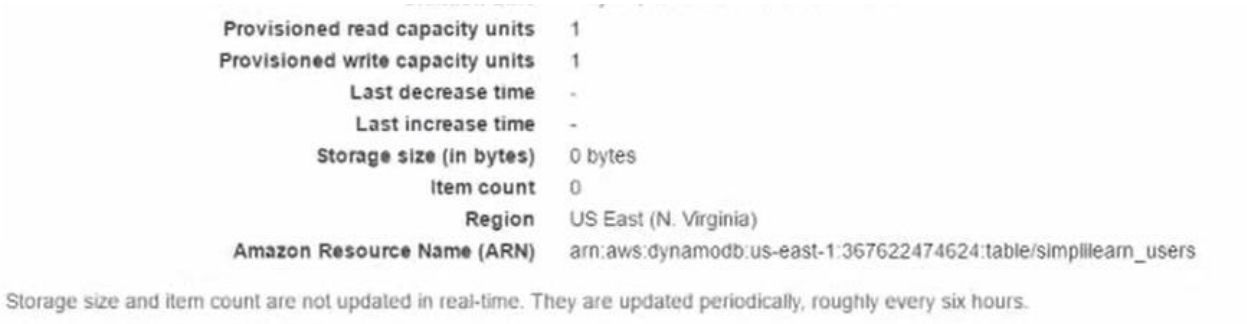
➔ The final build needs to be created on the GUI first.
➔ Post that we need to setup the EC2 instance and the S3 storage bucket
➔ Finally, we can **ssh** into the created instance.

- **Screenshot of the final build**

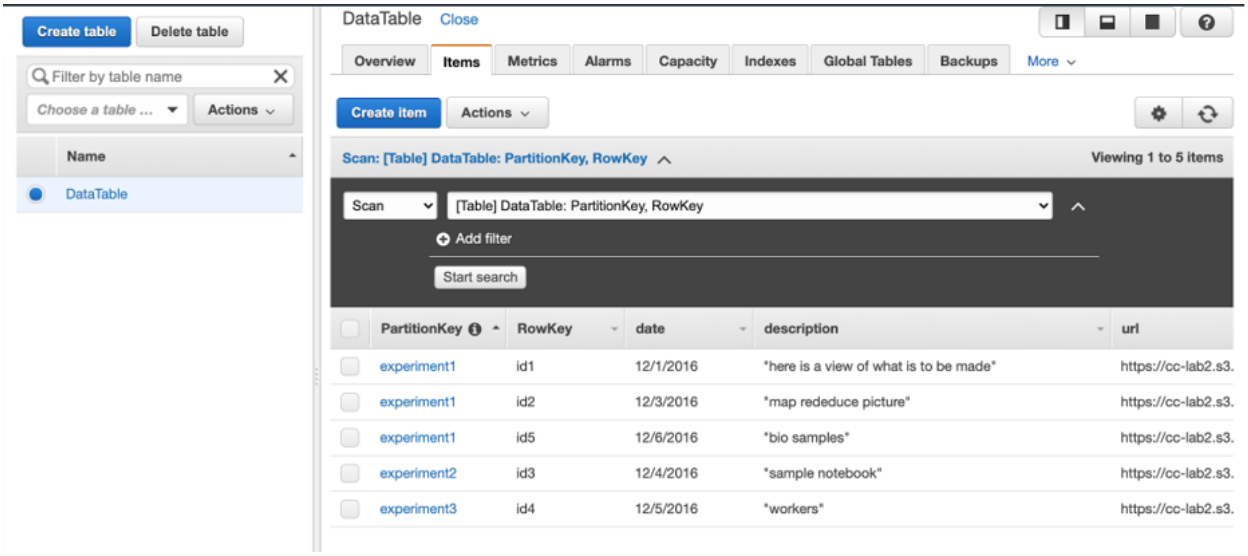
```
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$ sudo apt-get install -y kubectl
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  kubectl
0 upgraded, 1 newly installed, 0 to remove and 112 not upgraded.
Need to get 8929 kB of archives.
After this operation, 46.6 MB of additional disk space will be used.
Get:1 https://packages.cloud.google.com/apt kubernetes-xenial/main amd64 kubectl amd64 1.23.3-00 [8929 kB]
Fetched 8929 kB in 1s (10.5 MB/s)
Selecting previously unselected package kubectl.
(Reading database ... 32226 files and directories currently installed.)
Preparing to unpack .../kubectl_1.23.3-00_amd64.deb ...
Unpacking kubectl (1.23.3-00) ...
Setting up kubectl (1.23.3-00) ...
ankit@LAPTOP-S2U1QMGB:/mnt/c/Users/ankit$
```

The CSV file- https://github.com/domoritz/random-csv

Step 4 – NoSQL DB in AWS

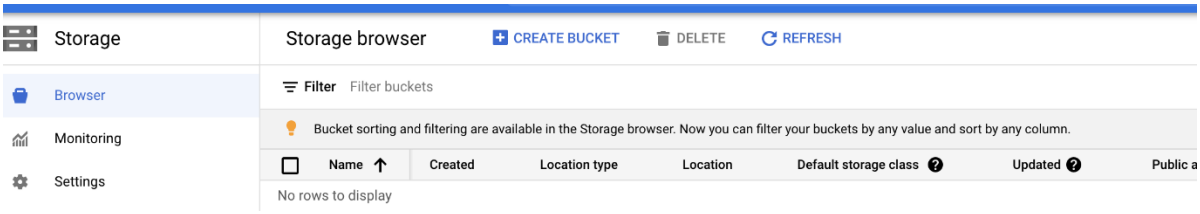


After running the notebook, go to aws console and go to dynamodb from there. Click on tables and under that click on DataTable and click on items tab to view the contents of the table.

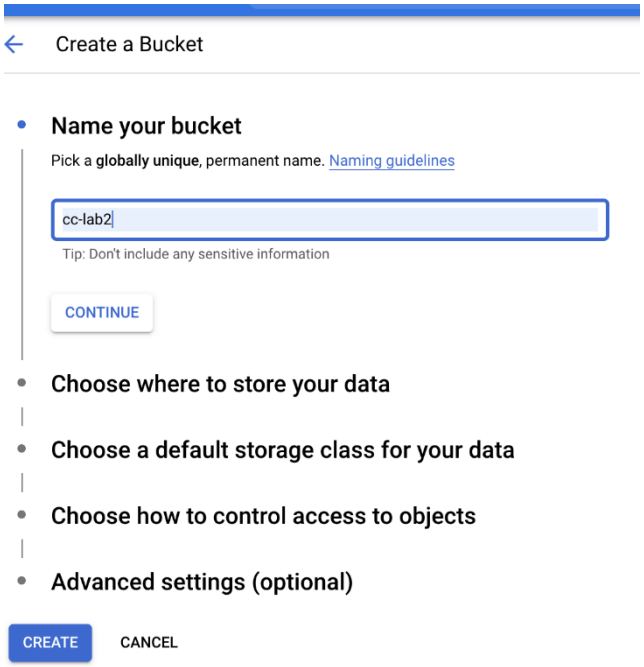


GCP

Login to GCP account and go to Storage from the navigation panel.



Click on create bucket and give a valid name.



Once the bucket is created, it should be visible

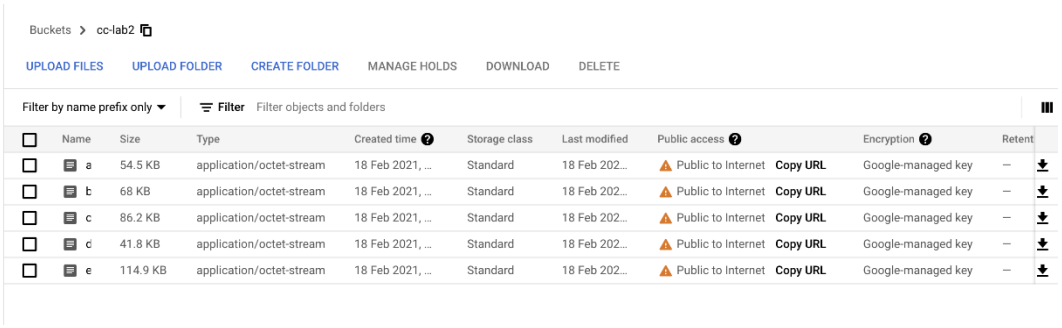
Once done, go to terminal and run the following command:

docker run -i -t -p 8888:8888 dbgannon/tutorial

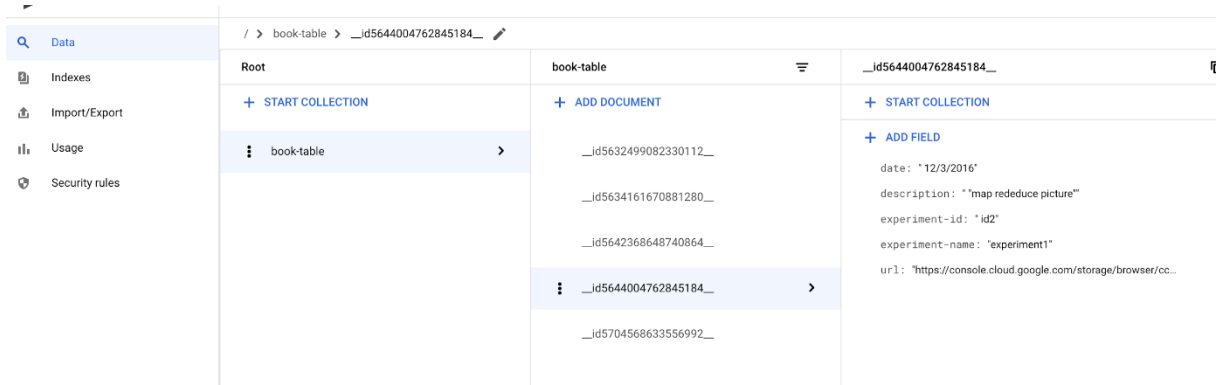
After this go to local host link and run the python notebook called gcloud.ipynb after making necessary edits related to bucket name and file paths.

```
In [22]: client = storage.Client()

In [23]: from gcloud import datastore
         clientds = datastore.Client()

In [29]: import csv

In [53]: bucket = client.bucket('cc-lab2')
         key = clientds.key('book-table')

In [55]: with open('/datadir/experiments.csv','rt') as csvfile:
             csvf = csv.reader(csvfile, delimiter=',', quotechar='|')
             for item in csvf:
                 print(item)
                 blob = bucket.blob(item[3])
                 data = open("/datadir/"+item[3], 'rb')
                 blob.upload_from_file(data)
                 blob.make_public()
                 url = "https://console.cloud.google.com/storage/browser/cc-lab2/"+item[3]
                 entity = datastore.Entity(key=key)
                 entity['experiment-name'] = item[0]
                 entity['experiment-id'] = item[1]
                 entity['date'] = item[2]
                 entity['description'] = item[4]
                 entity['url'] = url
```

Once the above steps are executed, go to GCP again and go to storage to see the uploaded objects.

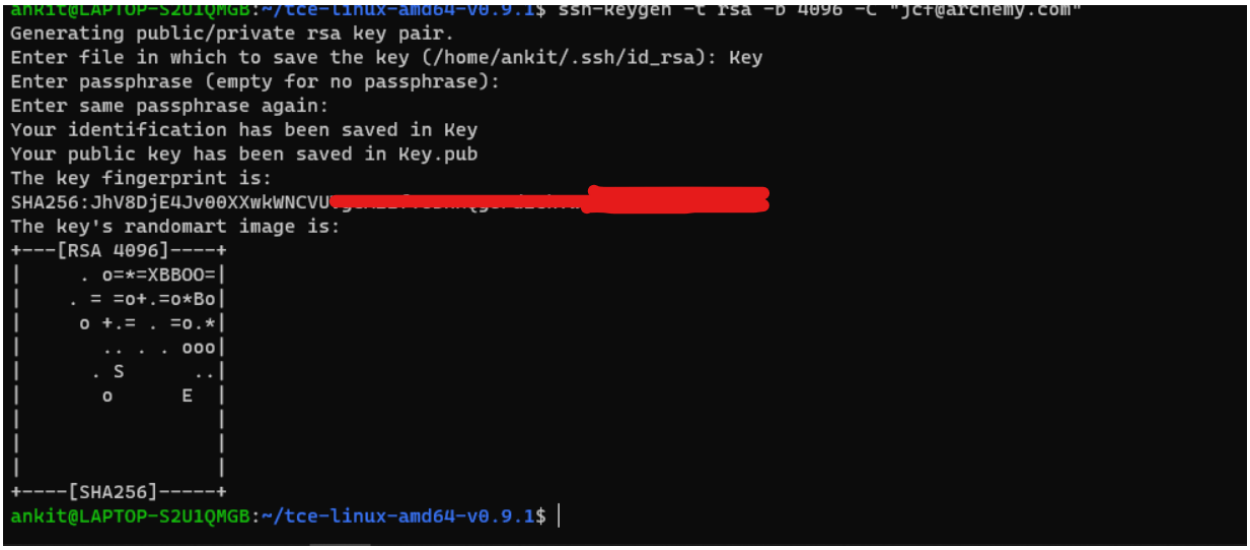


Check the datastore to have a look at created table

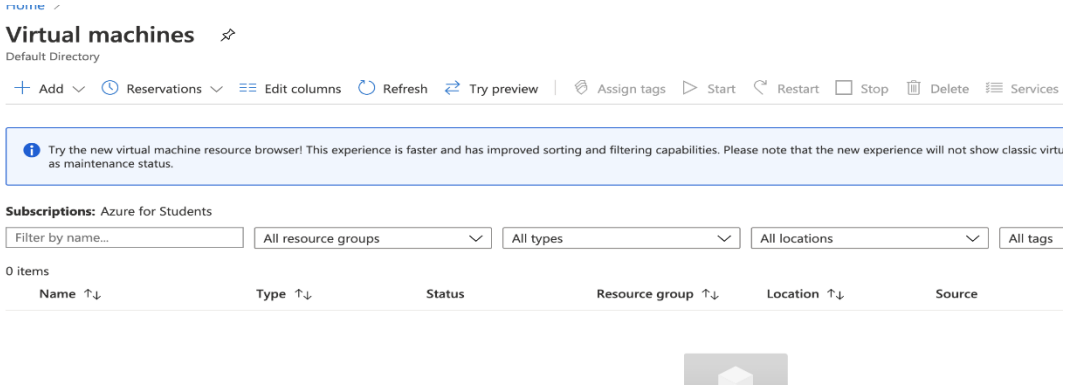


PART 2

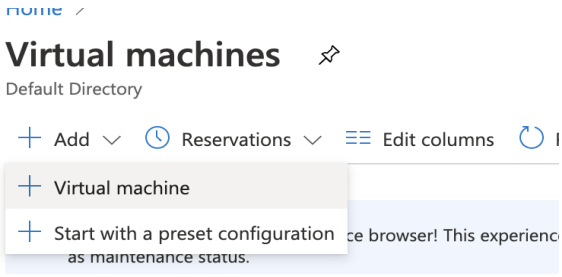
Generate ssh key using ssh-key gen and following interactive instructions as follows:



Go to azure portal and go to virtual machines from the navigation menu



Click on Add button and after that click on Virtual machine,

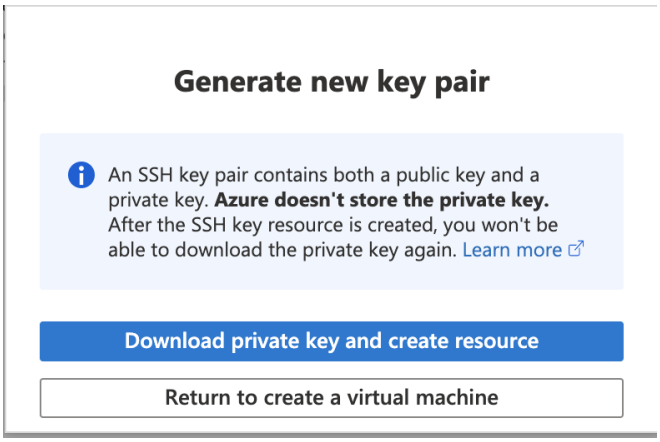


Enter necessary details on the creation page and then click on Review + create

After validation is passed, click on create

It will prompt to download the generated key pairs, download it.

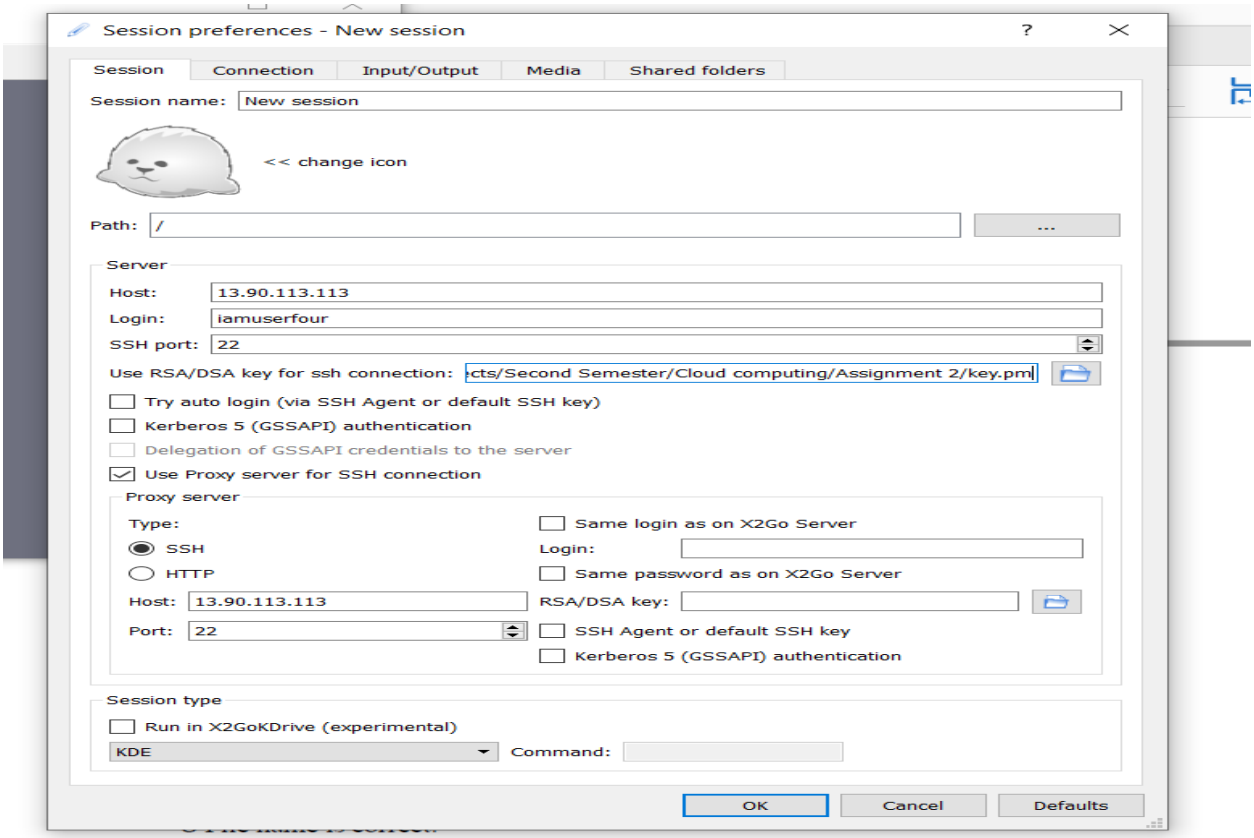
Once the download is completed, click on “Go to resource”

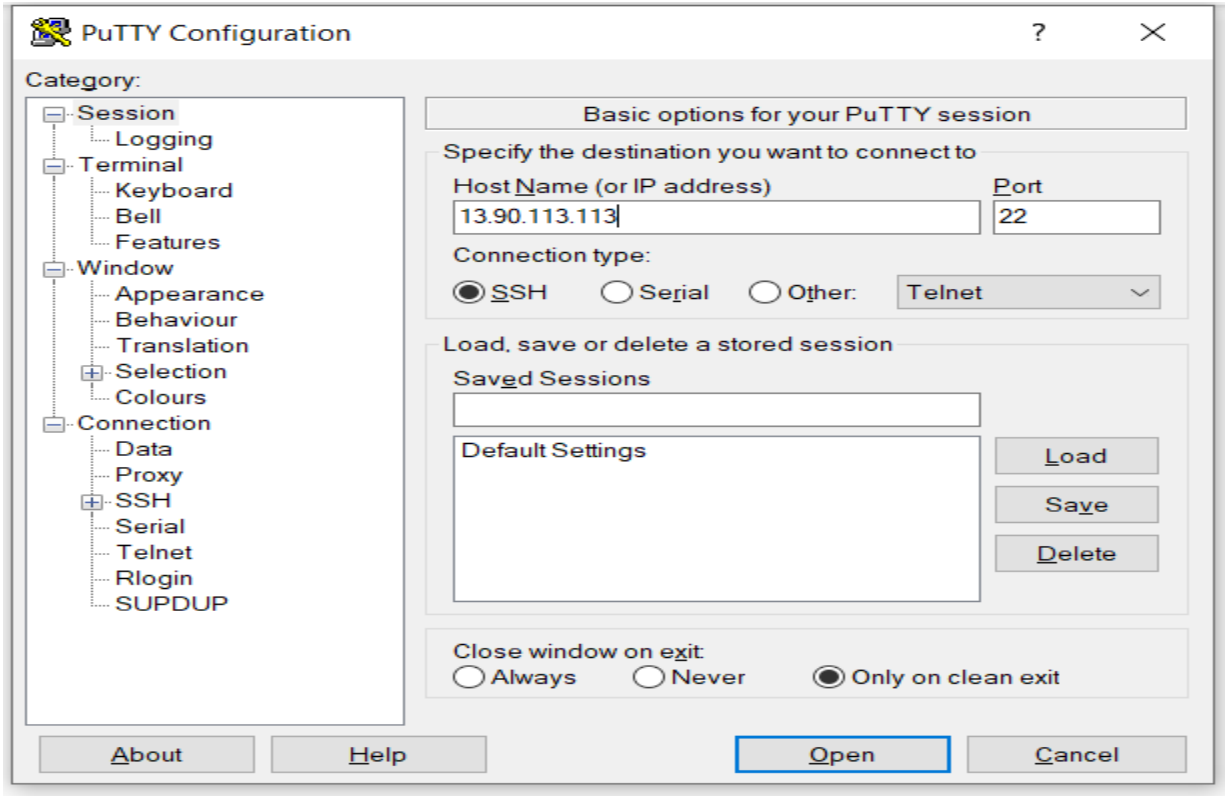


Notice the public IP address of the VM. In order to ssh to this vm, open the terminal and type the command as shown in figure.

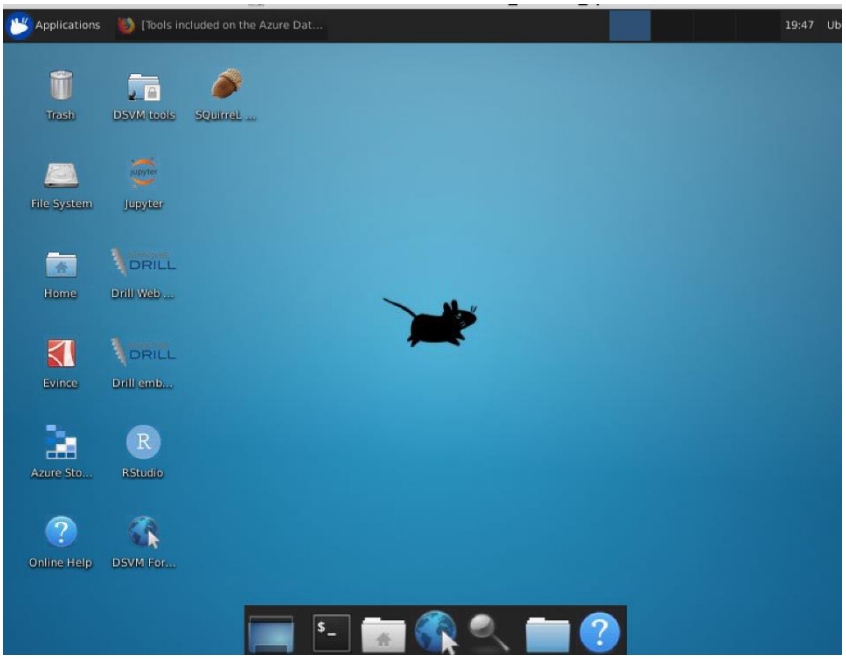
```
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.11.0-1028-azure x86_64)

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

  System information as of Fri Feb 25 00:56:23 UTC 2022

  System load:  0.06              Processes:             130
  Usage of /:   4.8% of 28.90GB   Users logged in:       0
  Memory usage: 3%                IPv4 address for eth0: 10.0.0.4
  Swap usage:   0%

1 update can be applied immediately.
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.
```

Download the **x2go** client software as well the **Putty** client for ssh.





Start the session, a window will appear as below:



Enter the username and password of the virtual machine in order to login to jupyter hub

Once done, jupyter notebooks should be visible