Cloud Computing

Agenda

- What is Cloud Computing
- GCP
- Create a VM on the Cloud

Cloud Computing

- What is Cloud Computing?

- Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale.

- You typically pay only for cloud services you use, helping you lower your operating costs, run your infrastructure more efficiently, and scale as your business needs change.

Types of Cloud Services

Public clouds:
Public clouds are owned and operated by a third-party cloud service providers. All hardware, software, and other supporting infrastructure is owned and managed by the cloud provider.

Private clouds:
A private cloud is one in which the services and infrastructure are maintained on a private network, usually business or organization. It can be physically located on the company's on-site datacenter. Some may pay third-party service providers to host their private cloud.

Types of Cloud Services

Infrastructure as a Service (IaaS):

Rent IT infrastructure—servers and virtual machines (VMs), storage, networks, operating systems—from a cloud provider on a pay-as-you-go basis

Platform as a Service (PaaS):

Platform as a service refers to cloud computing services that supply an on-demand environment for developing, testing, delivering, and managing software applications. PaaS is designed to make it easier for developers to quickly create web or mobile apps, without worrying about setting up or managing the underlying infrastructure of servers, storage, network, and databases needed for development.
e.g. DataBricks, MapReduce

Software as a Service (SaaS):

Delivering software applications over the Internet, on demand and typically on a subscription basis. With SaaS, cloud providers host and manage the software application and underlying infrastructure, and handle any maintenance, like software upgrades and security patching.
e.g. Email, GitHub

Cloud Computing - GCP

Featured products

Compute Engine

Scalable, high-performance VMs.

Cloud Run

Run stateless containers on a fully managed environment or on Anthos.

Anthos

Modernize existing apps and build new apps rapidly in hybrid and multi-cloud environments.

Vision AI

Derive insights from images, text, and more with AutoML Vision and Vision API.

Cloud Storage

Object storage with global edge-caching.

Cloud SQL

MySQL, PostgreSQL, and SQL Server database services.

BigQuery

A fully managed, highly scalable data warehouse with built-in ML.

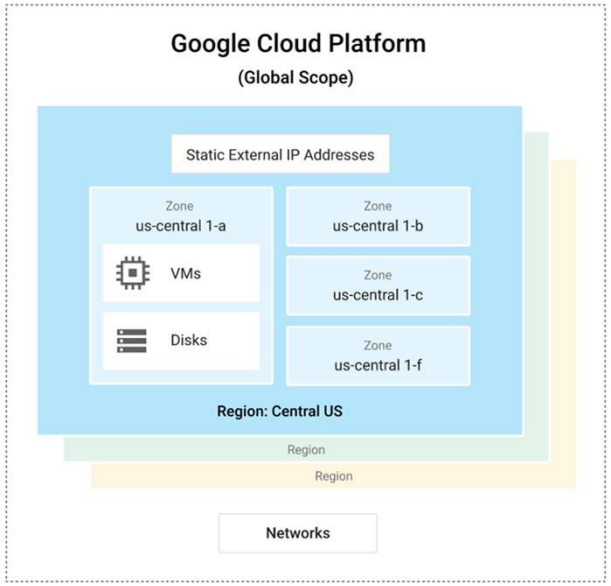
Security key enforcement

Enforce the use of security keys to help prevent account takeovers.

Cloud Computing – GCP Create a VM in the Cloud

GCP resources

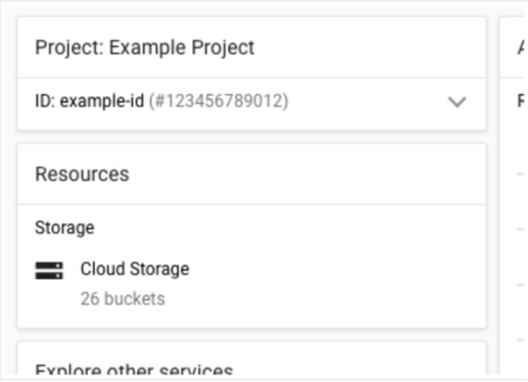
GCP consists of a set of physical assets, such as computers and hard disk drives, and virtual resources, such as virtual machines (VMs), that are contained in Google's data centers around the globe. Each data center location is in a global *region*. Regions include Central US, Western Europe, and East Asia. Each region is a collection of *zones*



Cloud Computing – GCP Create a VM in the Cloud

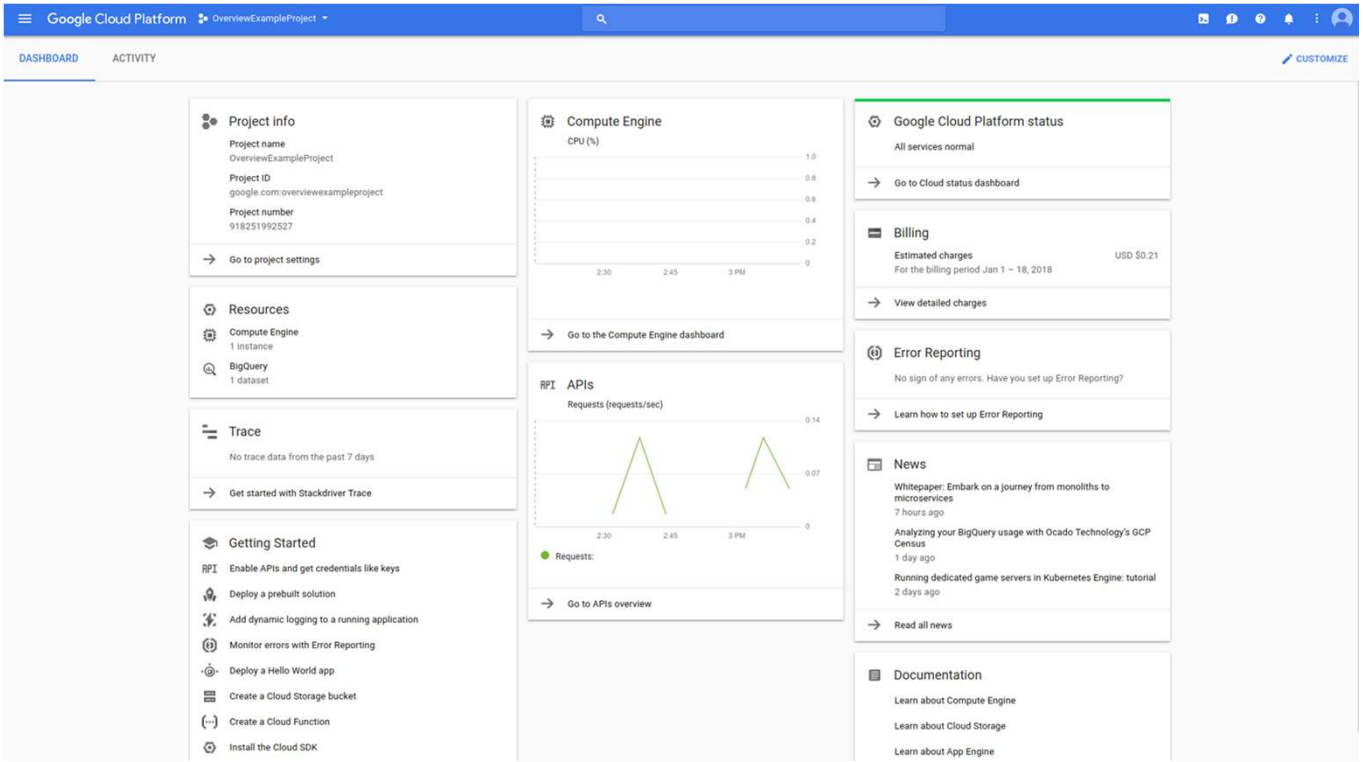
Accessing resources through services
In cloud computing, what you might be used to thinking of as software and hardware products, become *services*. These services provide access to the underlying resources.

Projects
Any GCP resources that you allocate and use must belong to a project. You can think of a project as the organizing entity for what you're building. A project is made up of the settings, permissions, and other metadata that describe your applications.



Cloud Computing – GCP Create a VM in the Cloud

The Google Cloud Console provides a web-based, graphical user interface that you can use to manage your GCP projects and resources.



Cloud Computing – Compute Engine

Compute Engine lets you create and run virtual machines on Google infrastructure.

Demo – Create a VM
https://cloud.google.com/compute/docs/quickstart-linux

Creating a VM with GPU
https://cloud.google.com/compute/docs/gpus/add-gpus

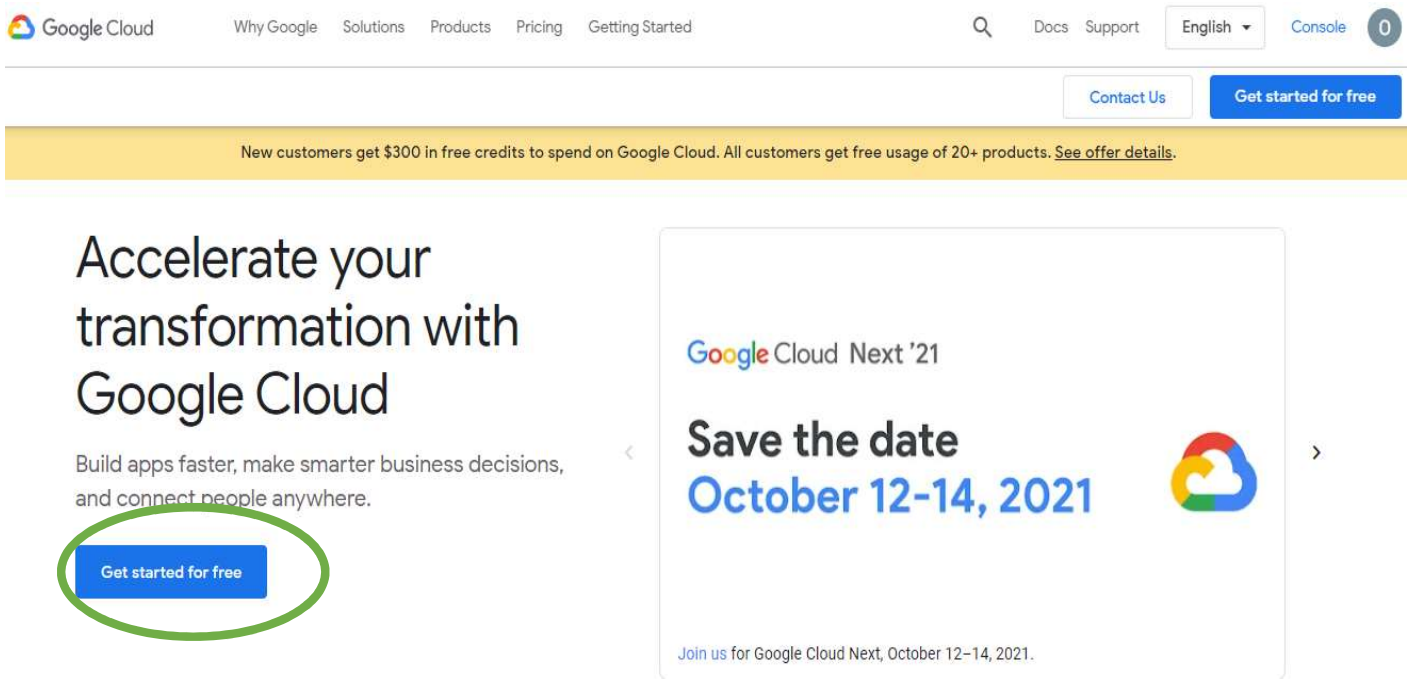
Install Anaconda

wget https://repo.continuum.io/archive/Anaconda3-2019.10-Linux-x86_64.sh

bash Anaconda3-2019.10-Linux-x86_64.sh

Demo

https://cloud.google.com/

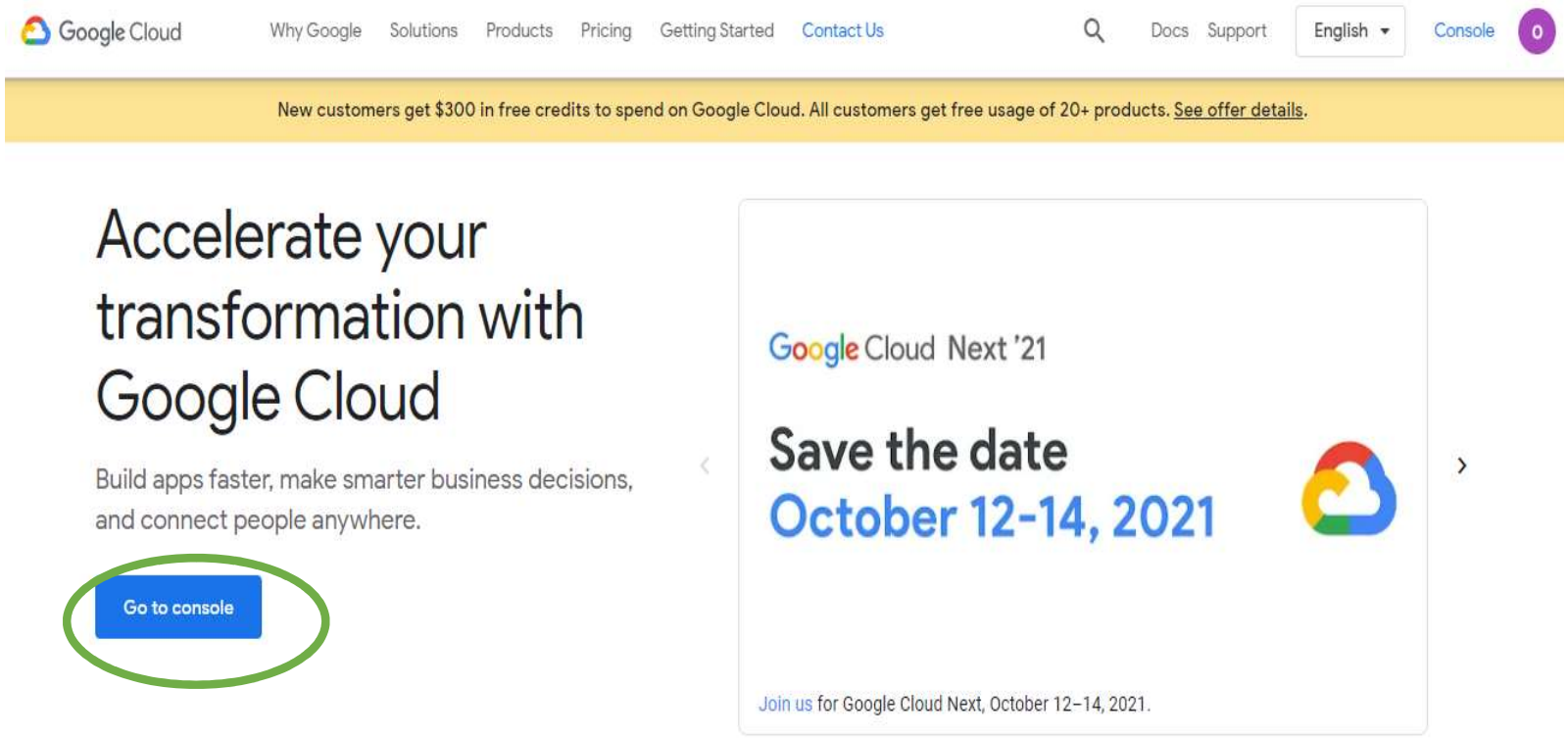


Click **Get started for free** to create google cloud account

Demo

Once register, go to https://cloud.google.com/

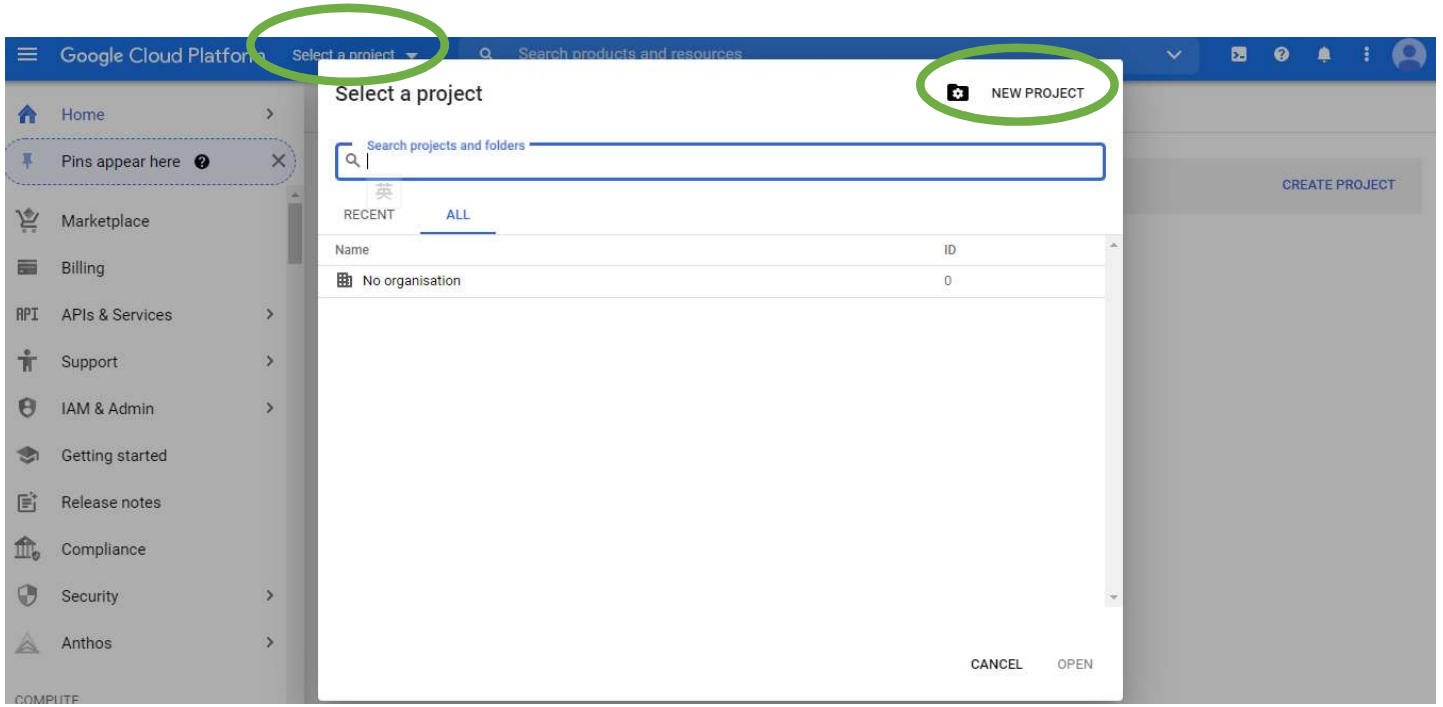
it will change to **Go to Console**



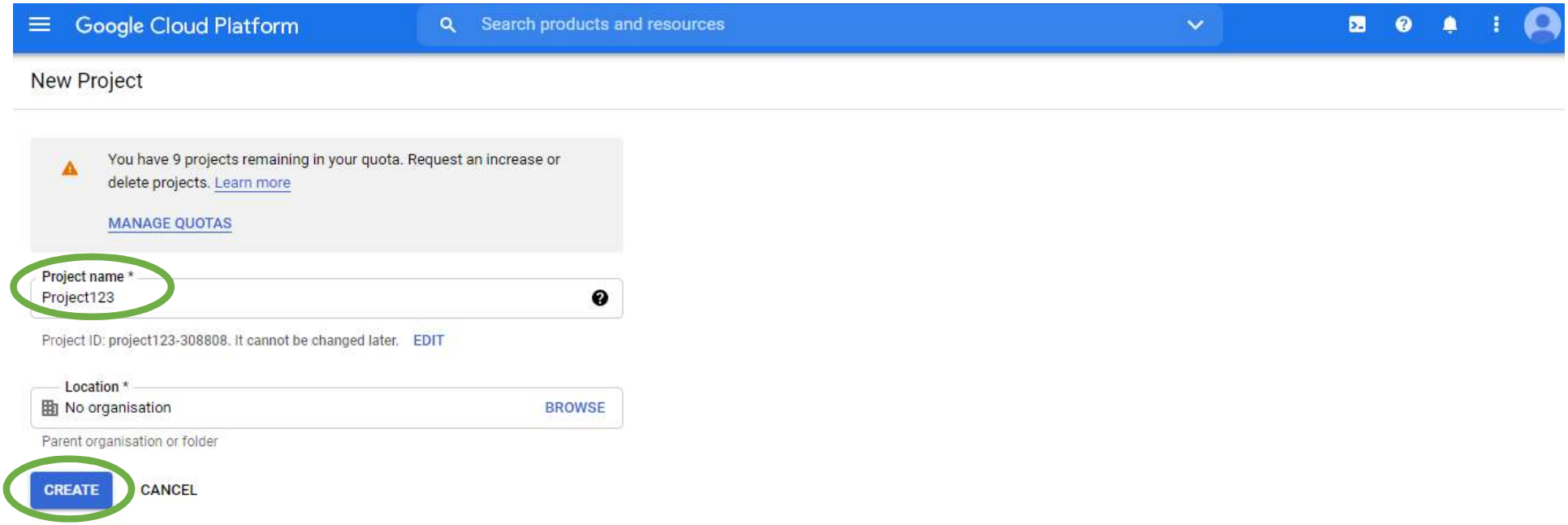
Click **Go to Console**

Demo

Click **Select a project** next to GCP
Then, click New project in the popup

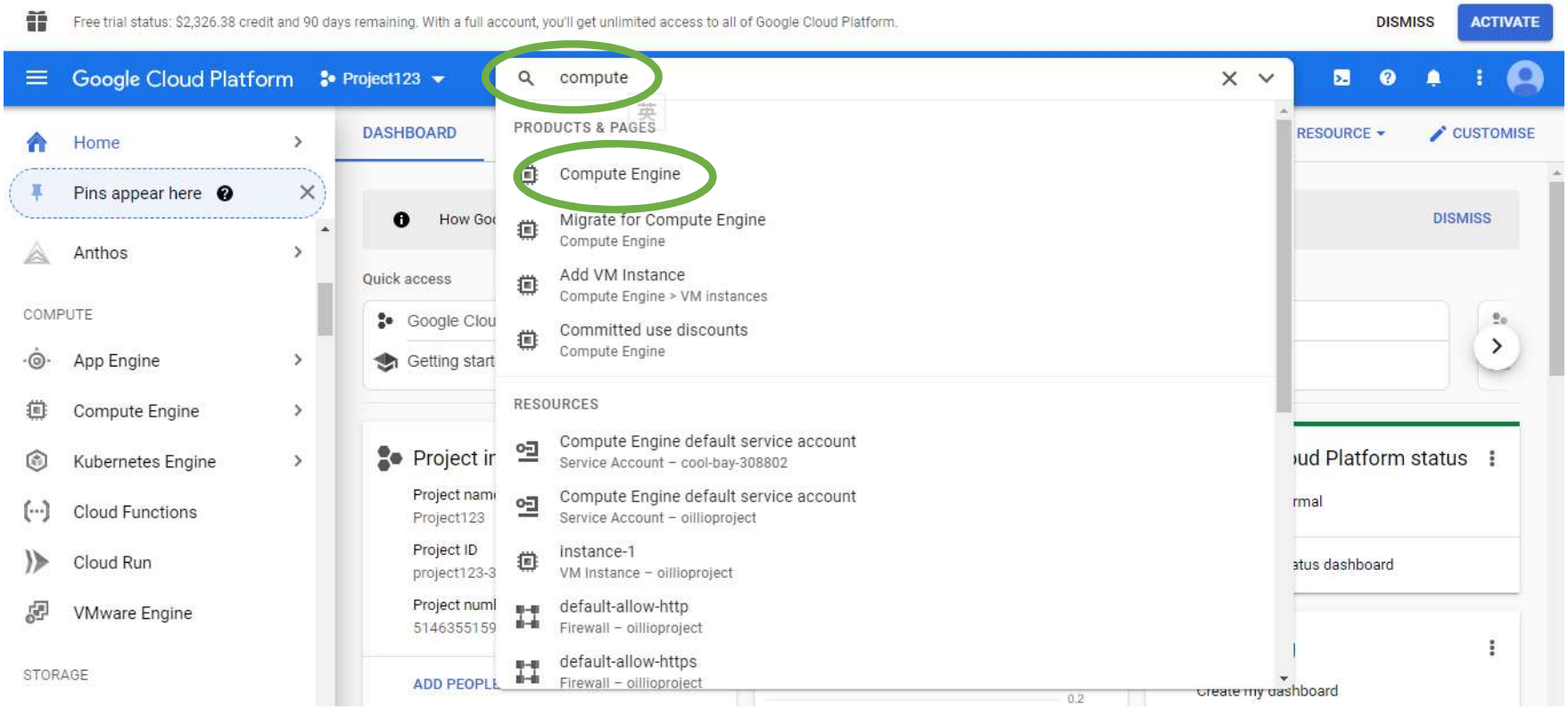


Demo – Create a project



Input Project name and click **Create**

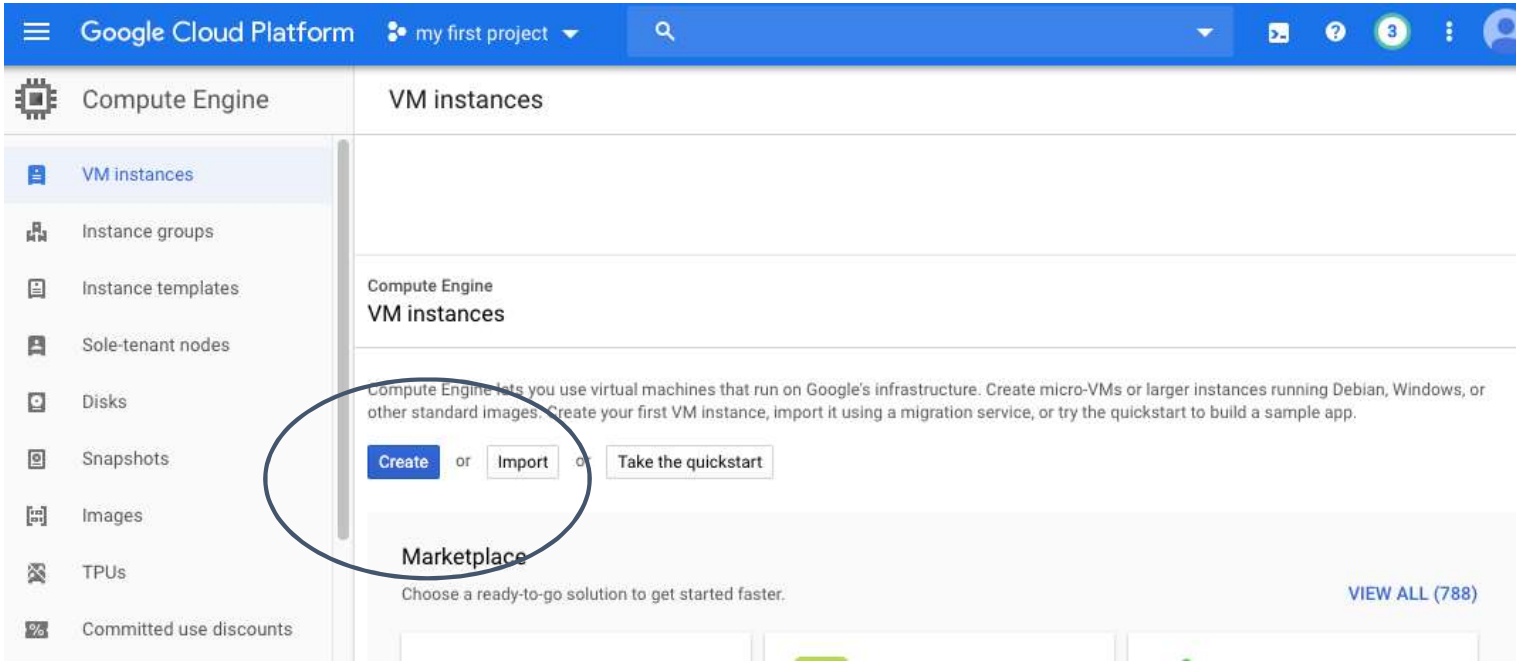
Demo



Search for “Compute” and select **Compute Engine**

Demo – Create VM instance

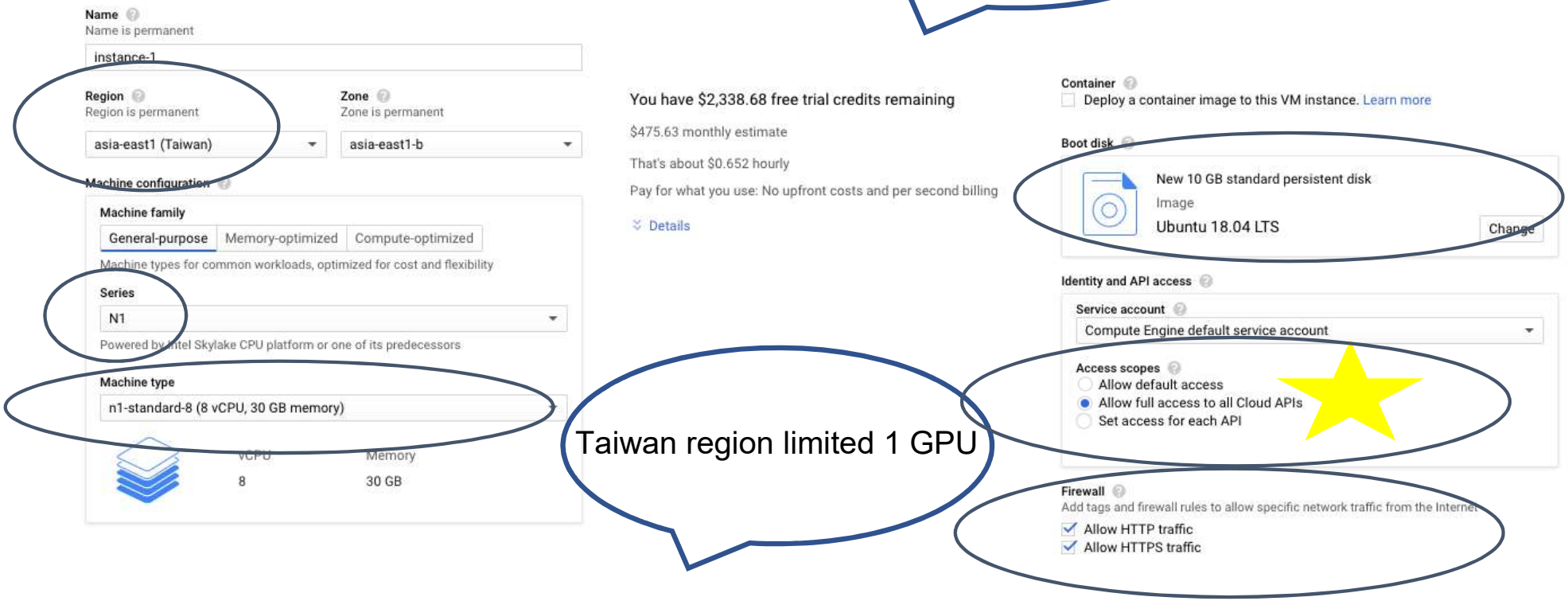
(It takes few minutes to load..)



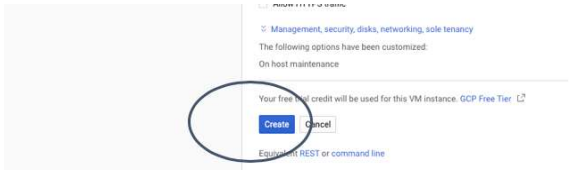
Click **Create**

Demo - VM instance Setting

You can check your cost of the setting.



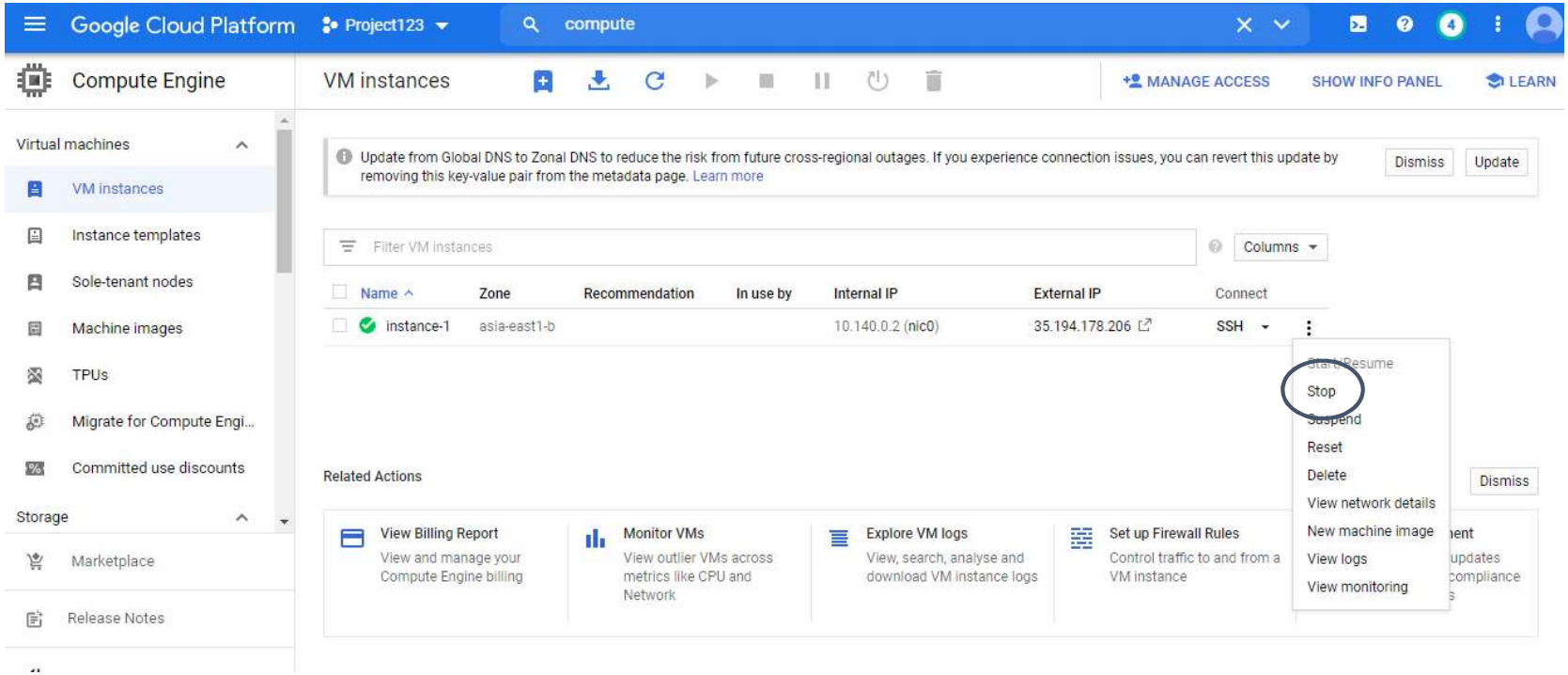
Taiwan region limited 1 GPU



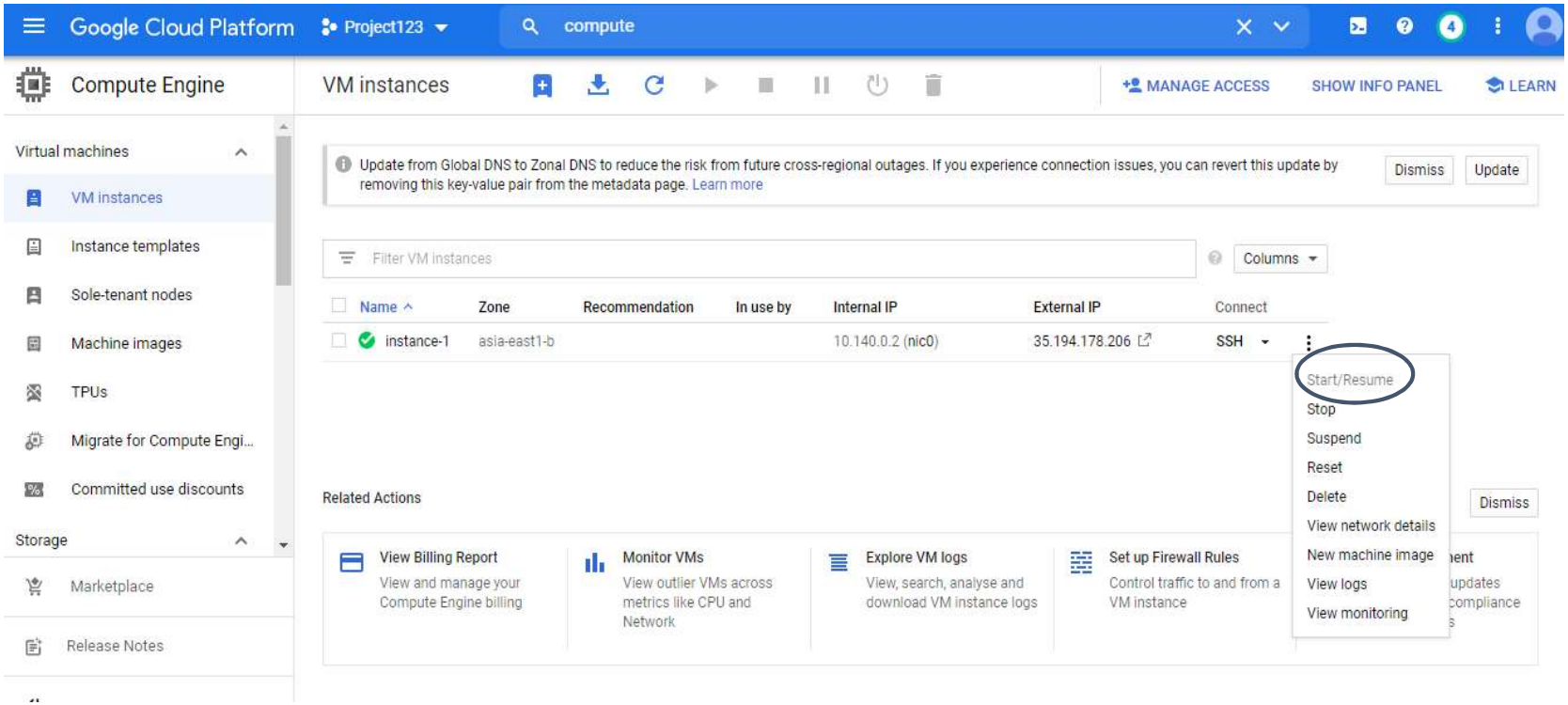
(It takes few minutes to create VM instance)

Demo – Stopping VM

IMPORTANT : DON'T FORGET TO STOP YOUR VM INSTANCE AFTER YOU ARE DONE BY CLICKING ON THE THREE DOTS ON THE IMAGE ABOVE AND SELECTING STOP. OTHERWISE VM WILL KEEP CHARGING YOU ON AN HOURLY BASIS.



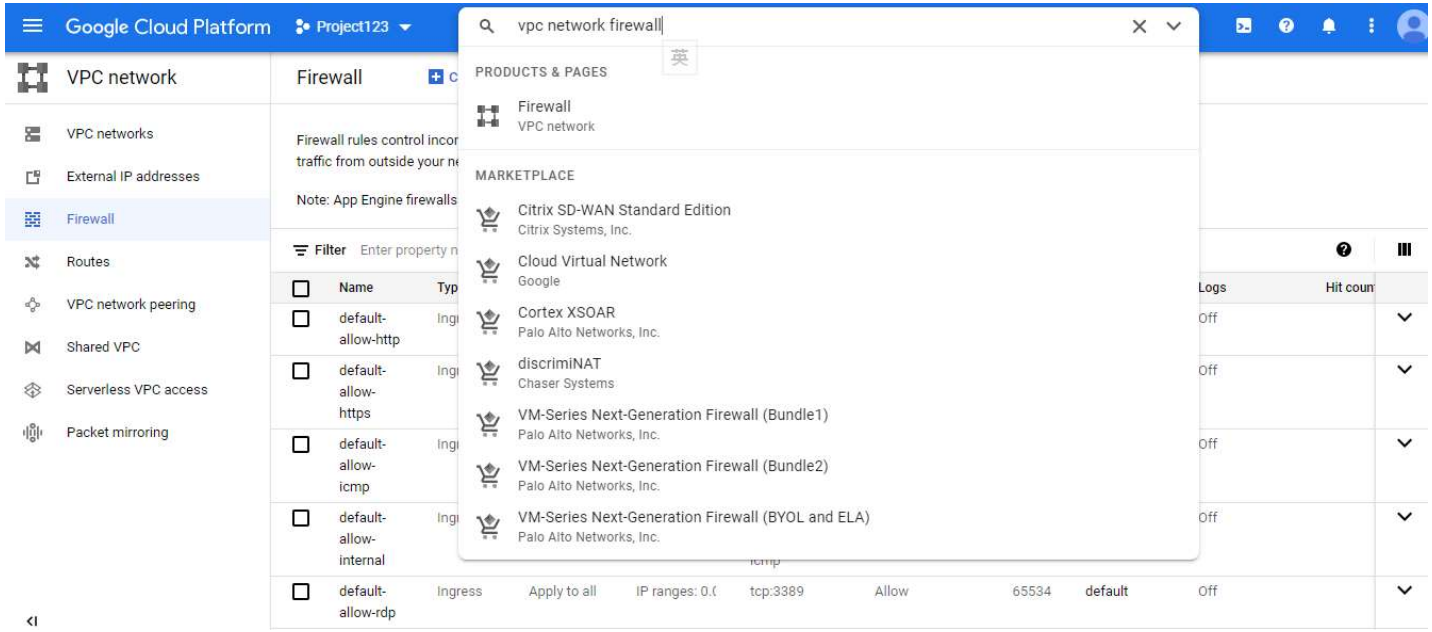
Demo – Not Stopping VM Yet



Click **Start/Resume** to start the VM

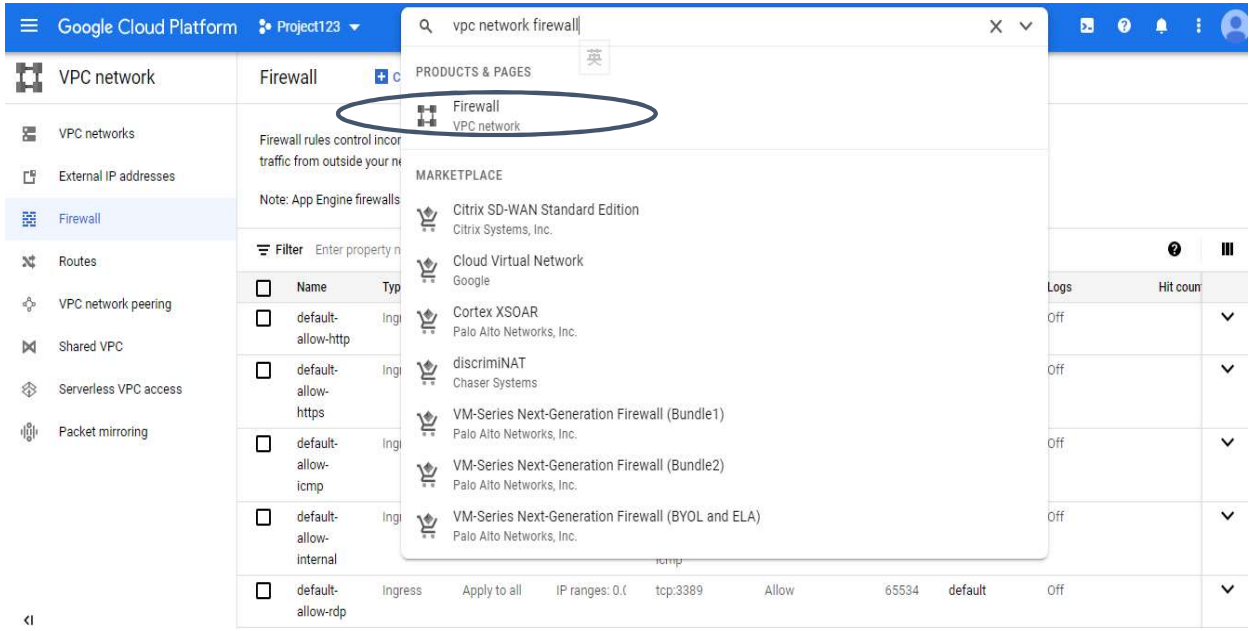
Demo – Create a firewall rule

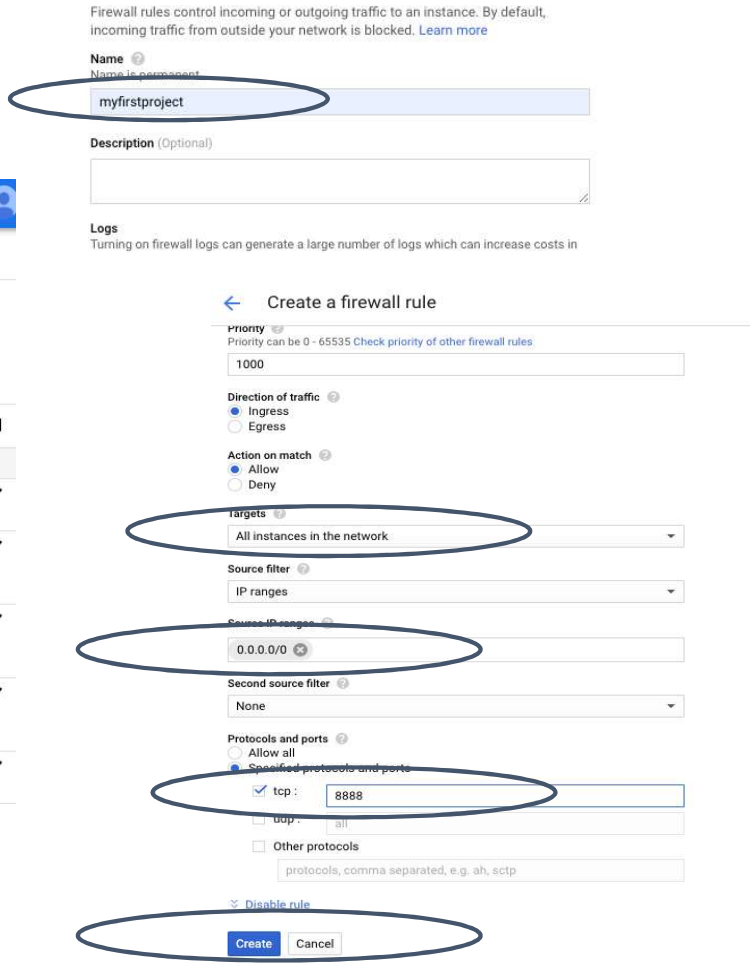
(Search **VPC Network Firewall** to select **Firewall**)



Demo – Create a firewall rule

(Search VPC Network Firewall to select Firewall rules)

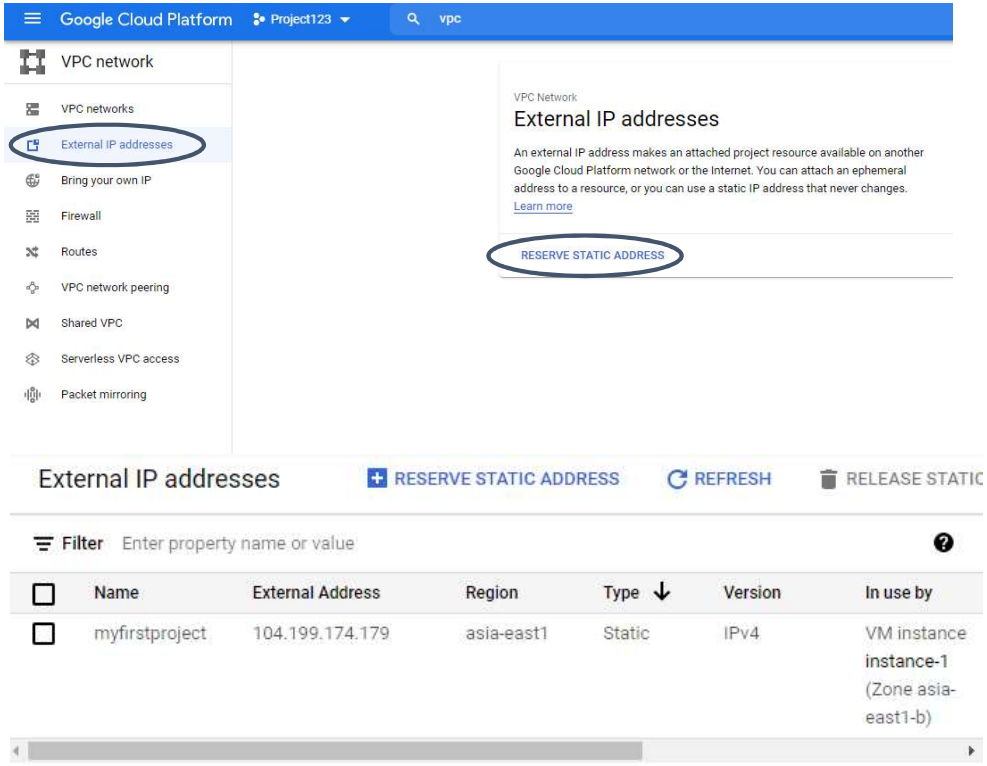


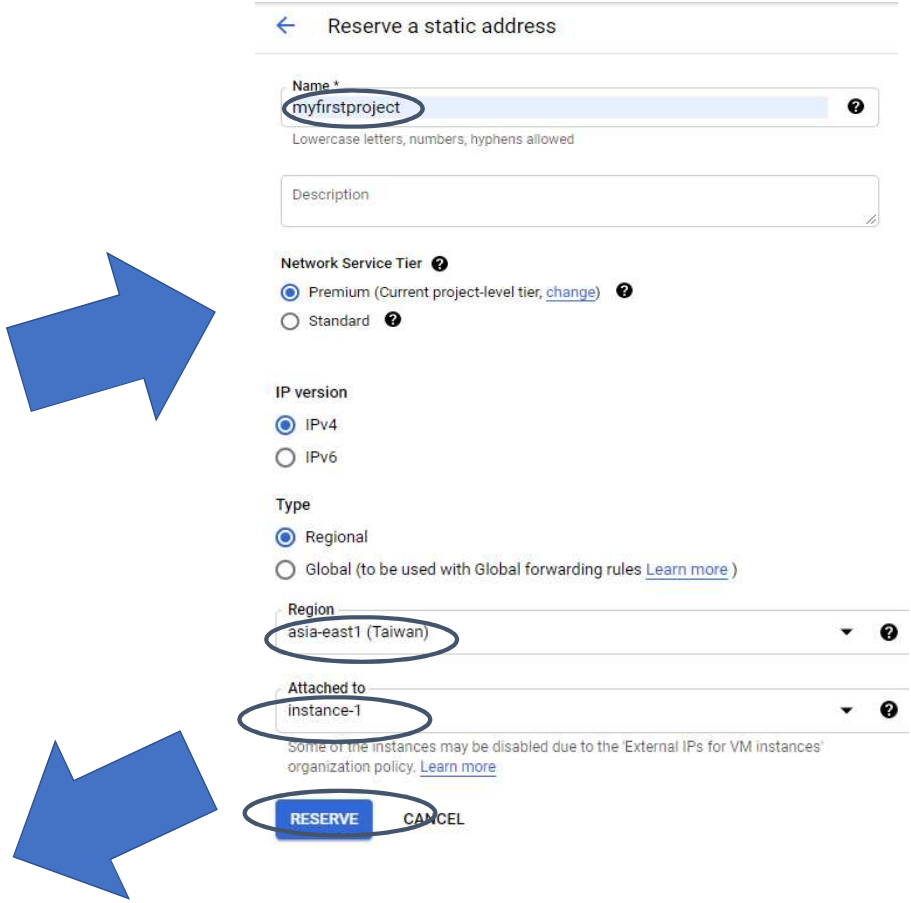


(It takes few minutes to create VM instance)
Then, click Create Firewall Rule
Follow the setting in the right to create firewall rule

Demo - External IP addresses

Select External IP address
Then Reserve Static Address

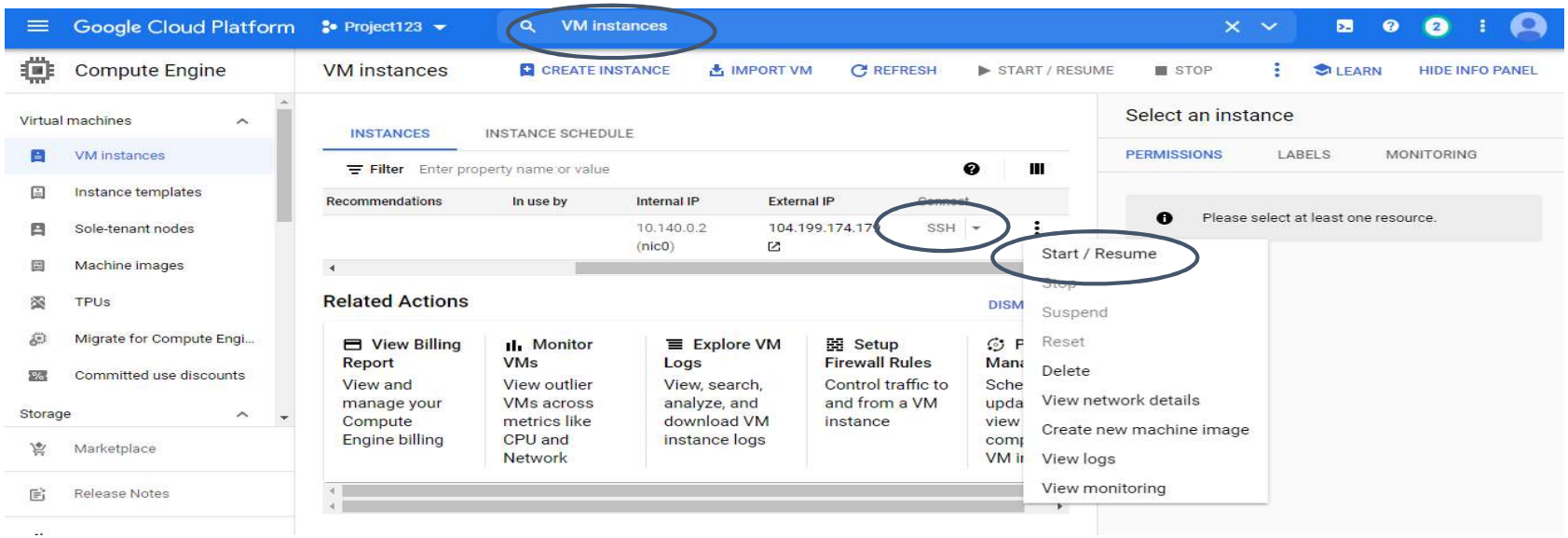




Input Name
Select Asia-East and Instance 1 and
Click Reserve

Demo – Start VM and install Anaconda

Select for VM instance
Scroll the right of Instances, we can get 3 dots
Click Start/Resume
Then SSH will be turned on, and we click SSH, then VM will be pop-out.

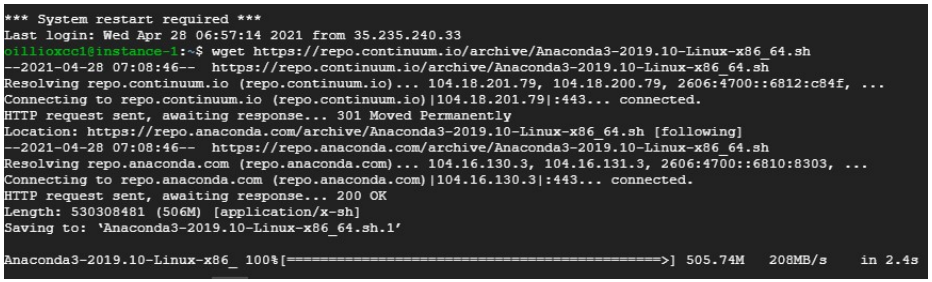


Demo – Start VM and install Anaconda

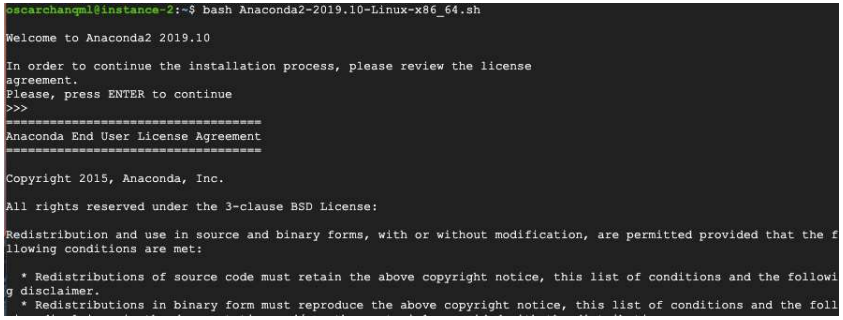
Copy and paste the following one by one in the VM Prompt to install Anaconda

wget https://repo.continuum.io/archive/Anaconda3-2019.10-Linux-x86_64.sh
bash Anaconda3-2019.10-Linux-x86_64.sh
source ~/.bashrc
jupyter notebook --ip=0.0.0.0 --port=8888 --no-browser &

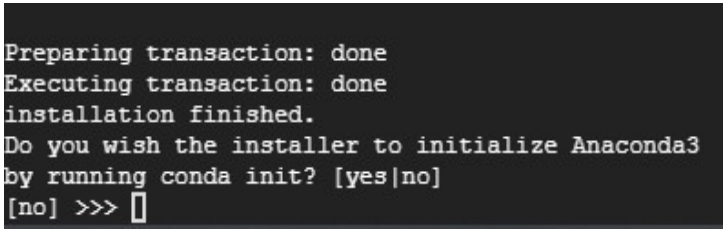
1. wget https://repo.continuum.io/archive/Anaconda3-2019.10-Linux-x86_64.sh



2. bash Anaconda3-2019.10-Linux-x86_64.sh



Keep Clicking Enter
then
Type Yes
then
Press Enter 2 times



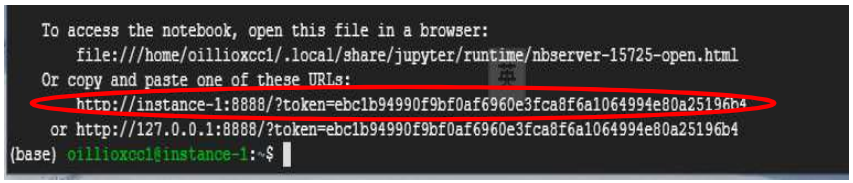
Type Yes

3. source ~/.bashrc

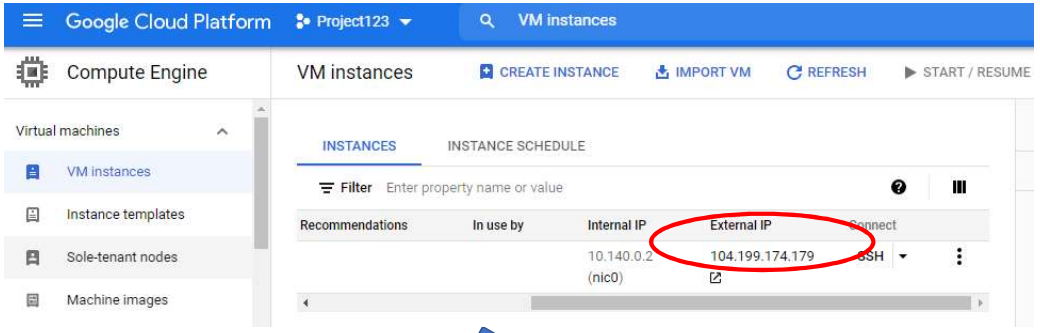
Demo – Open Jupyter Notebook

4. Type
jupyter notebook --ip=0.0.0.0 --port=8888 --no-browser &

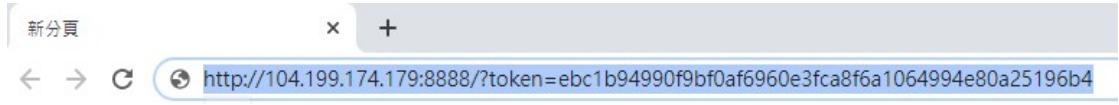
Copy the link from VM



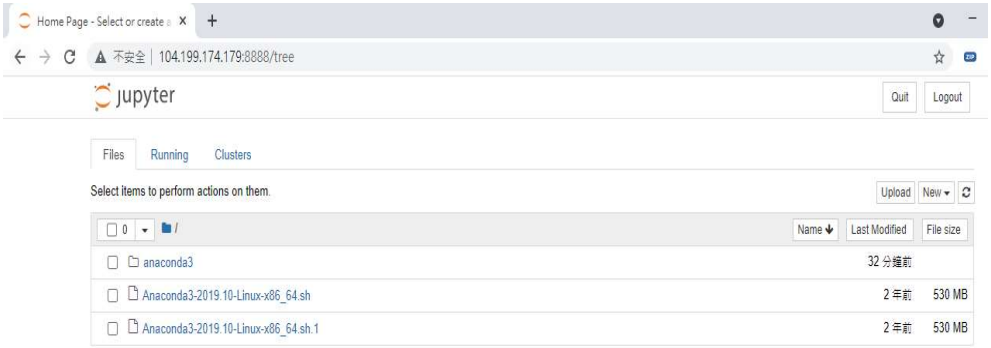
Go back to google cloud VM instance to find your External IP



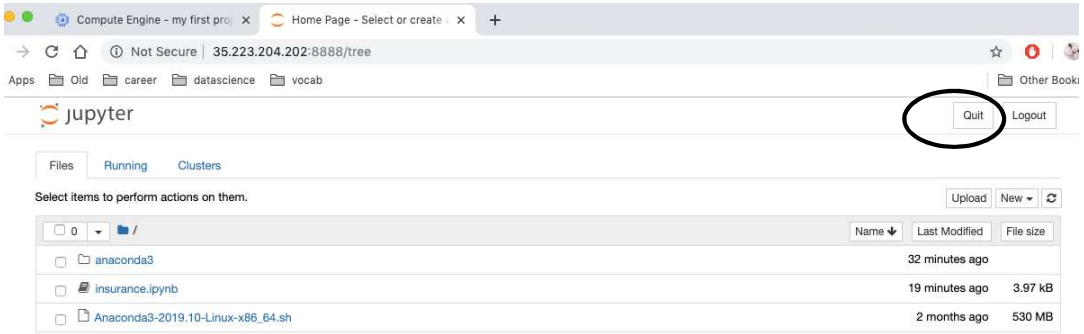
Copy the url from VM and replace instance-1 with your External IP in google cloud



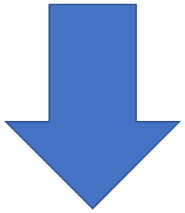
Then, we can use Jupyter Notebook in VM.



Demo – Close jupyter notebook



Click Quit to quit the jupyter notebook



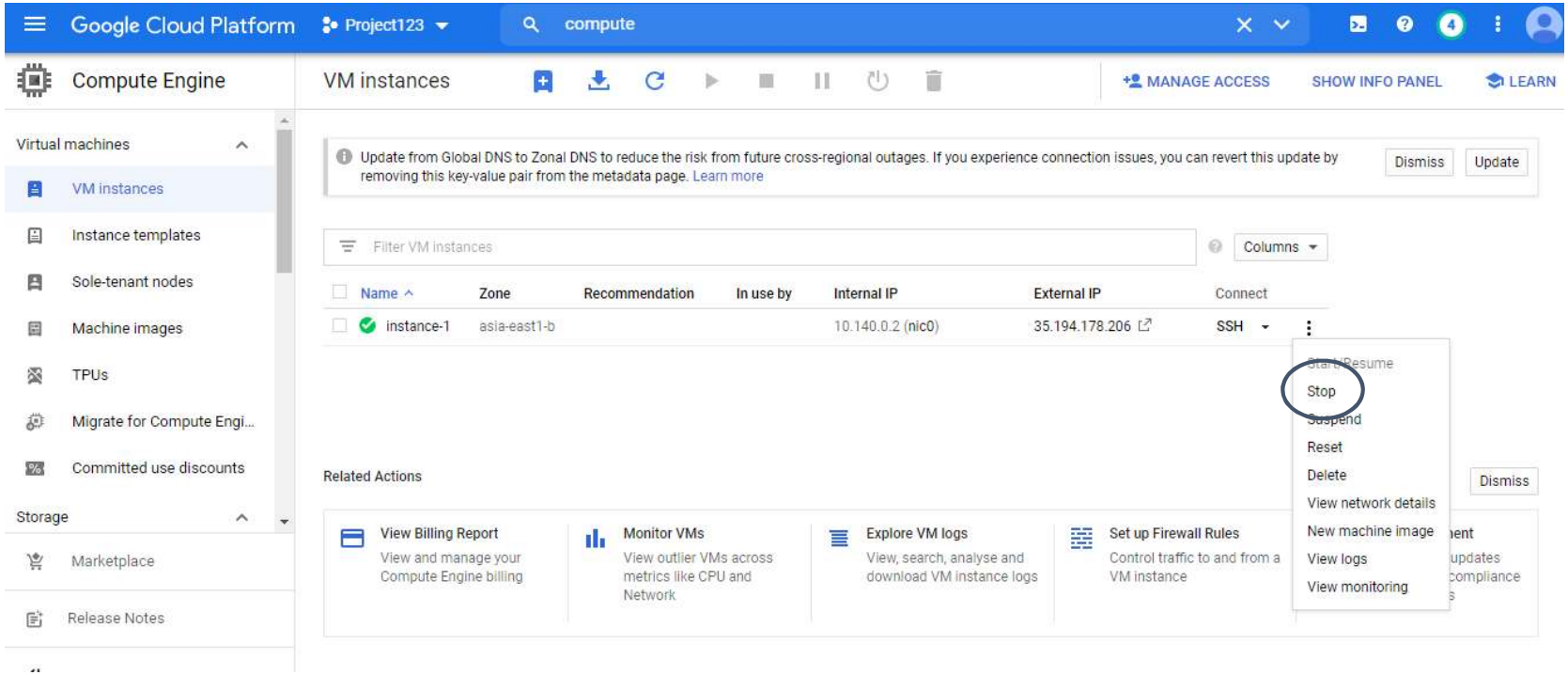
```
C 08:41:26.798 NotebookApp]

    To access the notebook, open this file in a browser:
        file:///home/oscarchangml/.local/share/jupyter/runtime/nbserver-5949-open.html
    Or copy and paste one of these URLs:
        http://instance-1:8888/?token=eeb4040c2509f4f68e7e369cf7f7f5a7f757807fae6f3c9e
     or http://127.0.0.1:8888/?token=eeb4040c2509f4f68e7e369cf7f7f5a7f757807fae6f3c9e
I 08:41:41.647 NotebookApp] 302 GET /?token=eeb4040c2509f4f68e7e369cf7f7f5a7f757807fae6f3c9e (42.200.145.1) 0.71ms
I 08:42:18.072 NotebookApp] Shutting down on /api/shutdown request.
I 08:42:18.073 NotebookApp] Shutting down 0 kernels
^C
[1]+  Done                    jupyter notebook --ip=0.0.0.0 --port=8888 --no-browser
(base) oscarchangml@instance-1:~$
```

Control C

Demo – Stopping VM

IMPORTANT : DON'T FORGET TO STOP YOUR VM INSTANCE AFTER YOU ARE DONE BY CLICKING ON THE THREE DOTS ON THE IMAGE ABOVE AND SELECTING STOP. OTHERWISE VM WILL KEEP CHARGING YOU ON AN HOURLY BASIS.



Cloud Storage

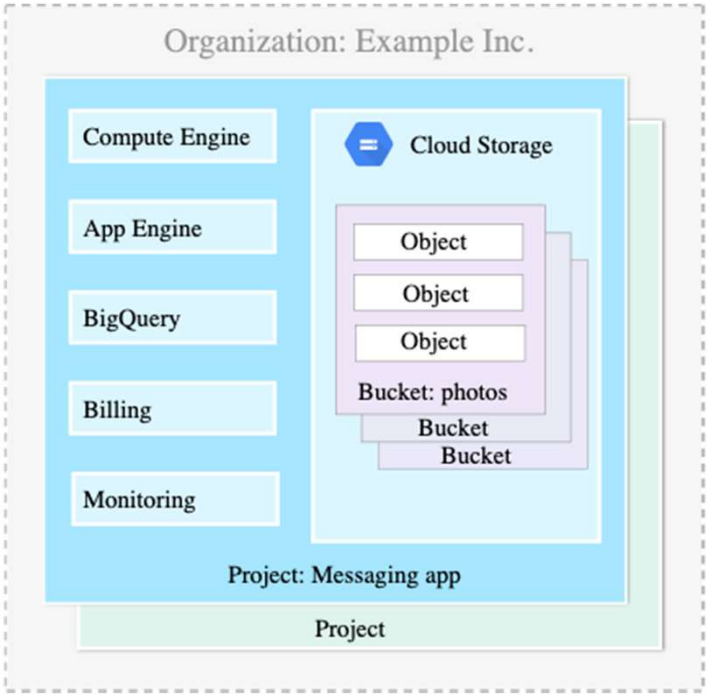
Agenda

- What is Cloud Storage
- Create a Storage bucket on the Cloud

Cloud Storage

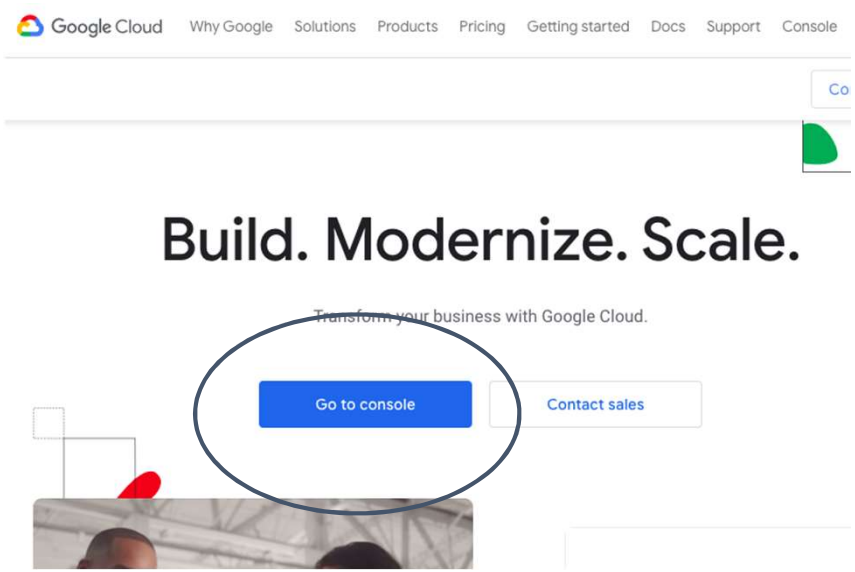
Cloud Storage is a service for storing your objects in Google Cloud

After you create a project, you can create Cloud Storage buckets, upload objects to your buckets, and download objects from your buckets.

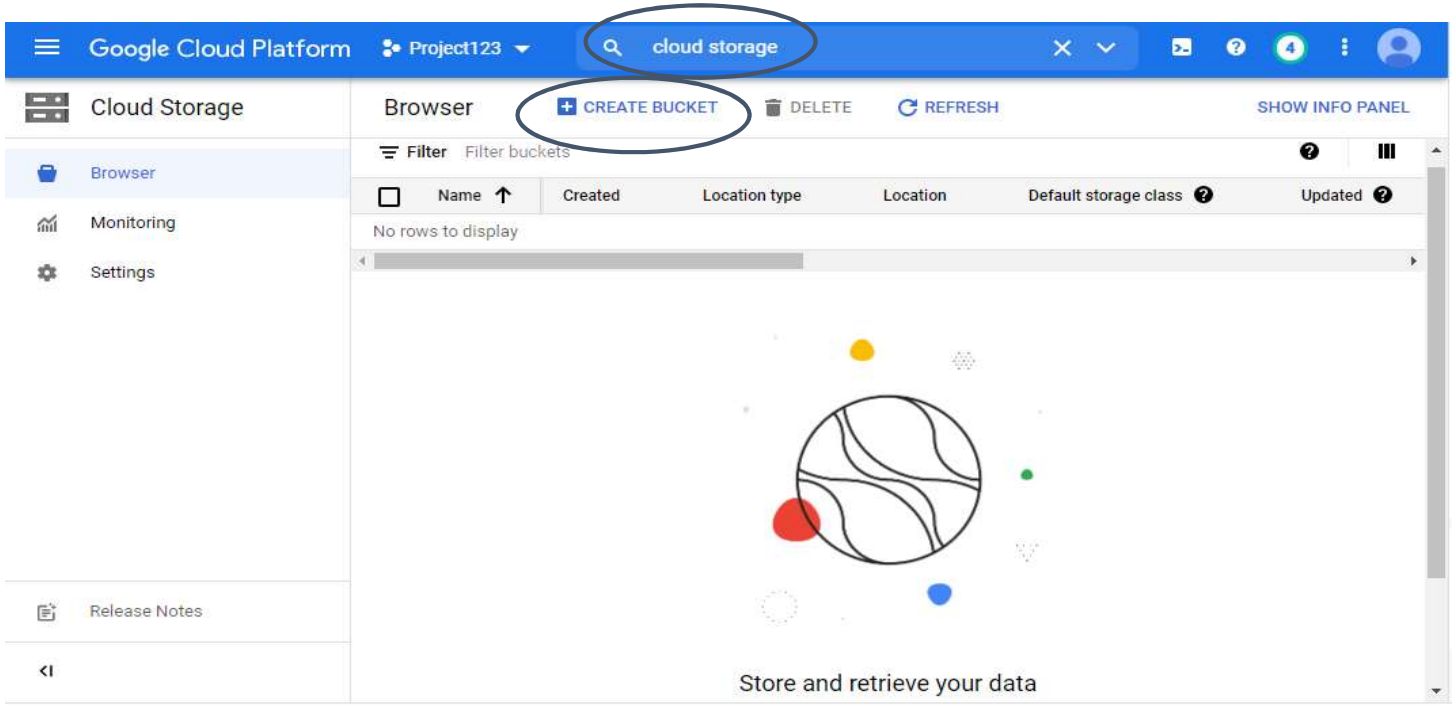


Demo

https://cloud.google.com/

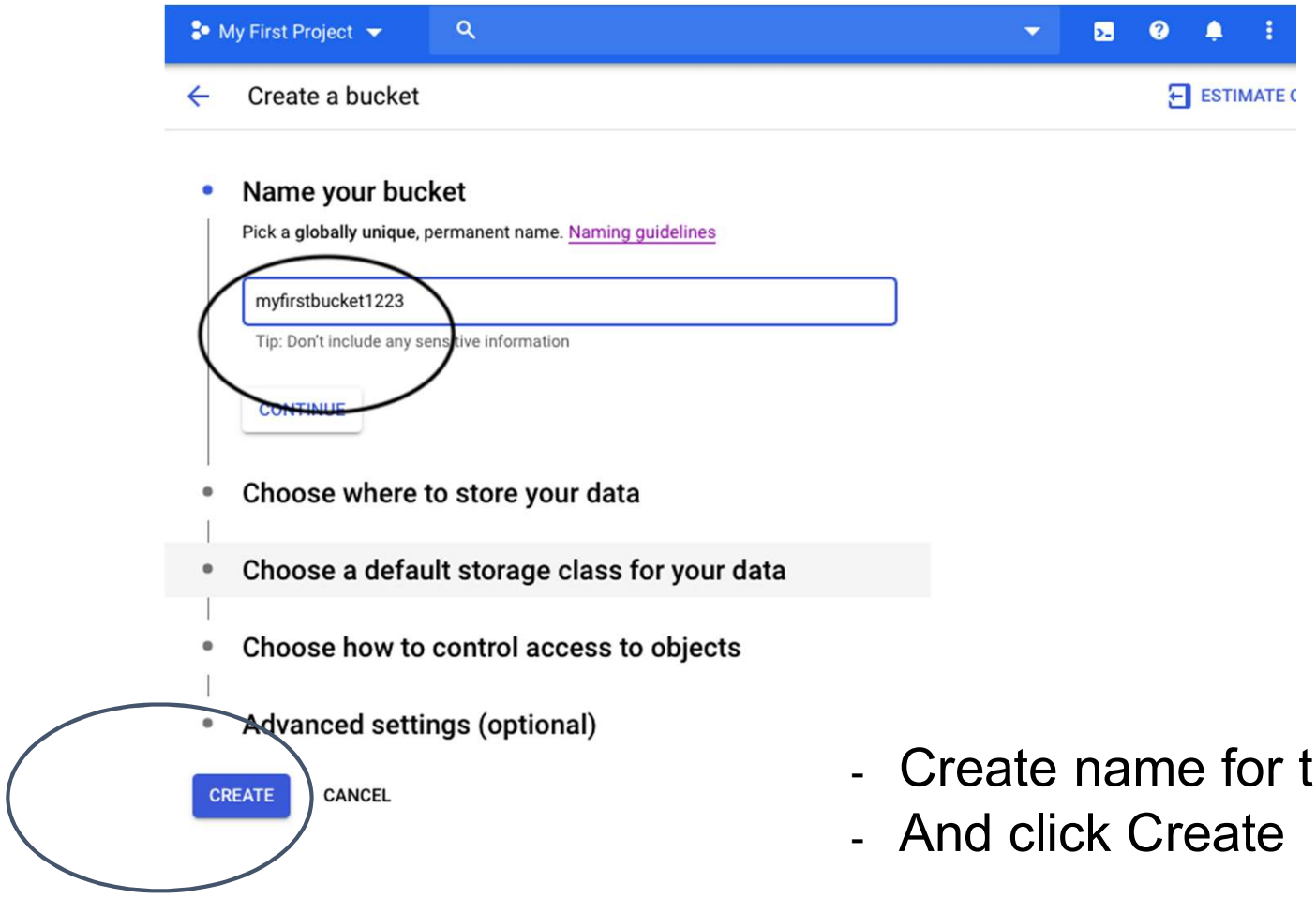


Demo - Cloud Storage



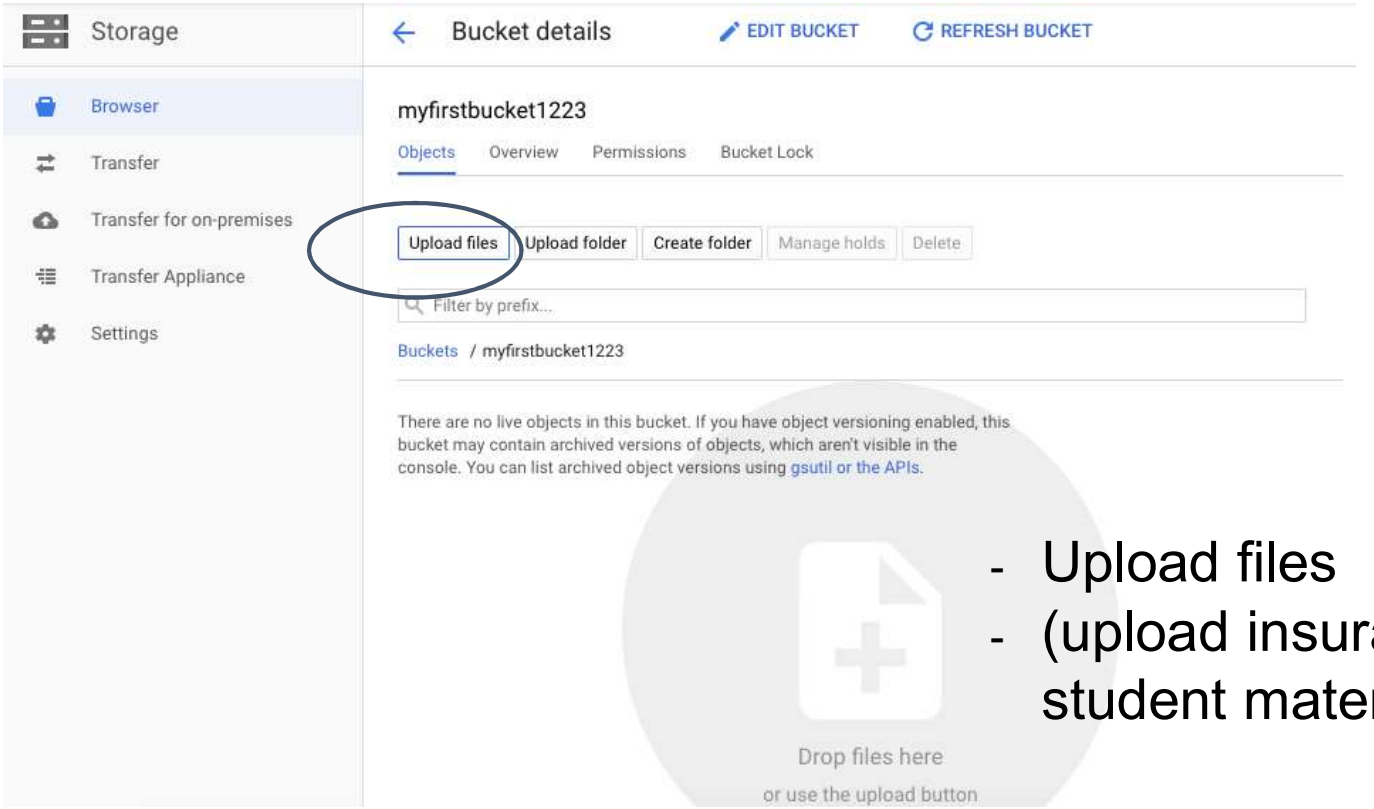
- Search for Cloud Storage
- In the page of Cloud Storage, click Create Bucket

Demo – Create a bucket



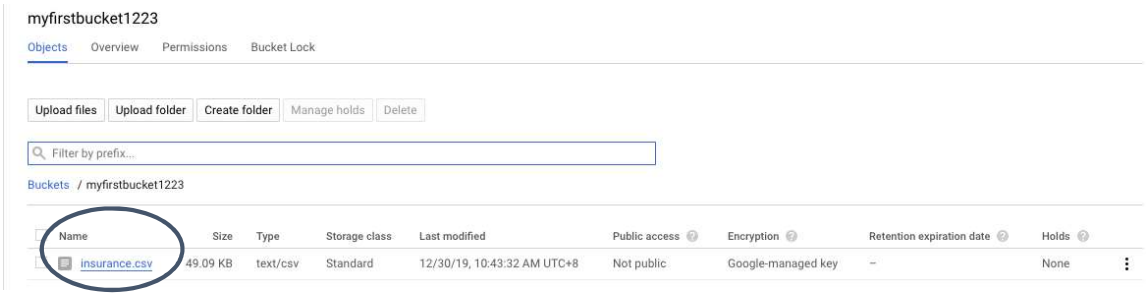
- Create name for the bucket
- And click Create

Demo – Upload a file

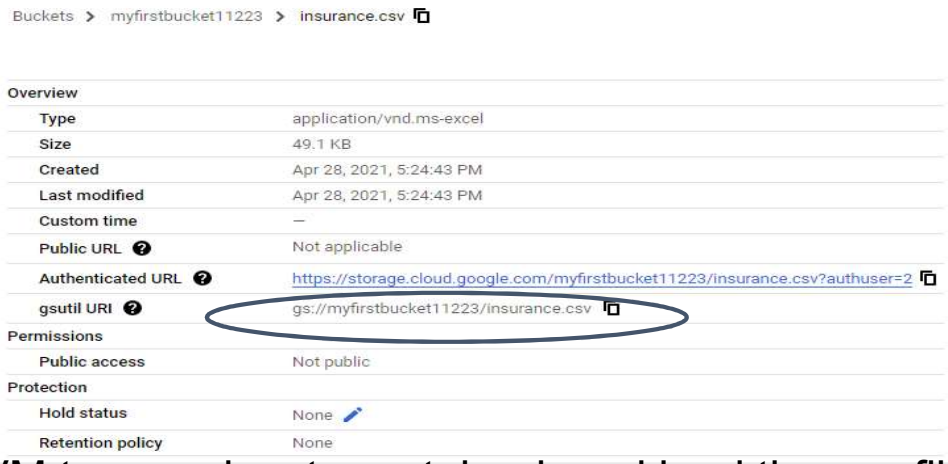


- Upload files
- (upload insurance.csv in today's student material in share drive)

Demo – File metadata



URL



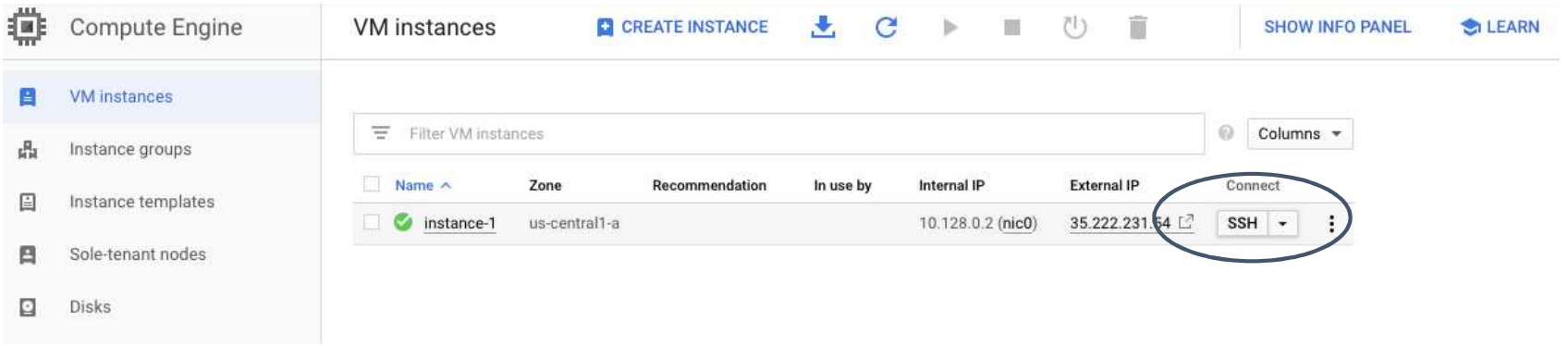
We will use VM to open jupyter notebook and load the csv file in cloud to pandas

Cloud Computing & Storage

Agenda

- Access the VM and open jupyter notebook on the cloud

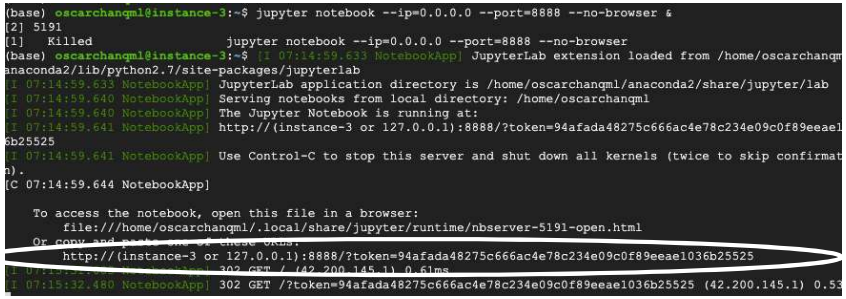
Demo – Access the VM

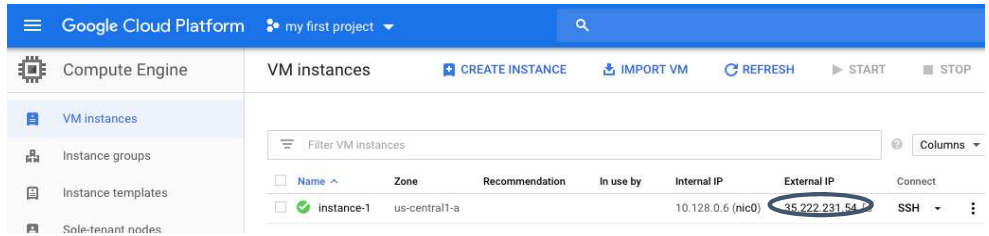


Start the VM Instance, and click SSH

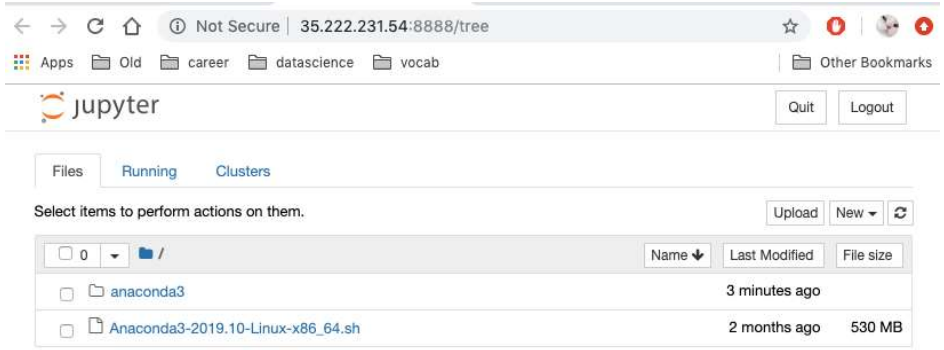
Demo – Open Jupyter Notebook

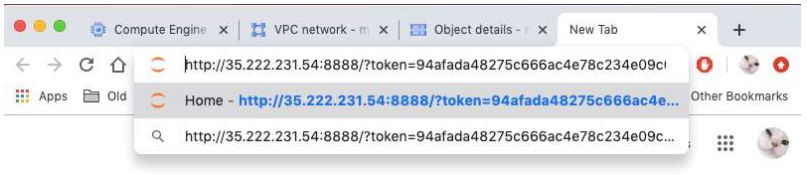
jupyter notebook --ip=0.0.0.0 --port=8888 --no-browser &





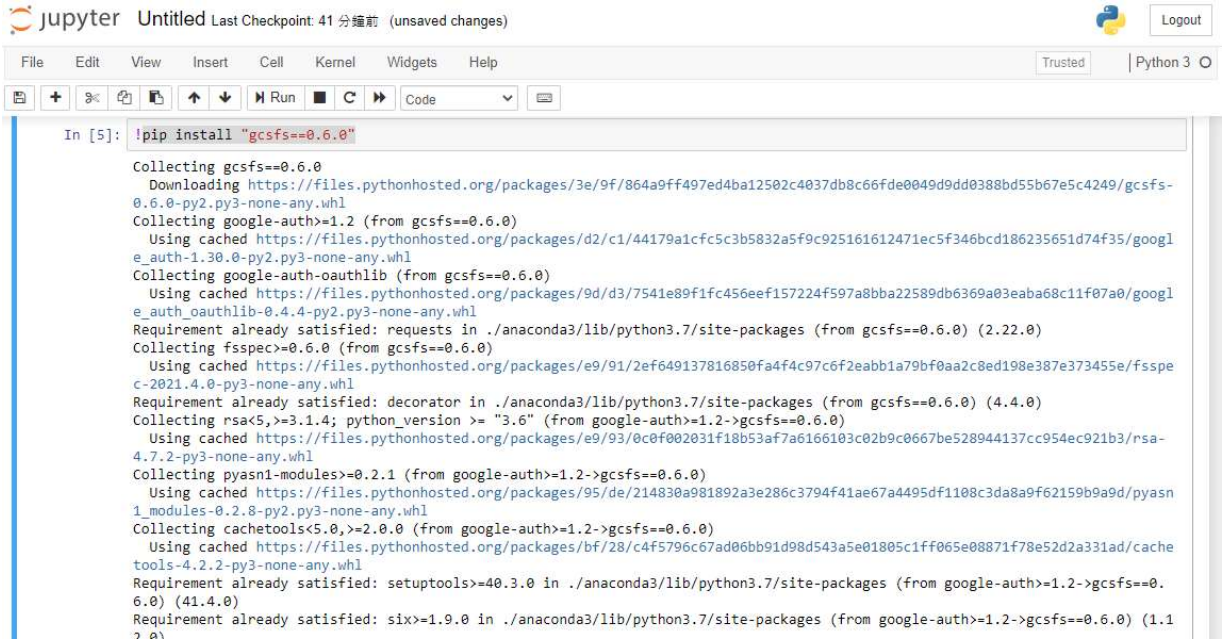
External IP:8888/?token=94afada48275c666ac4e78c234e09c0f89eeae1036b25525



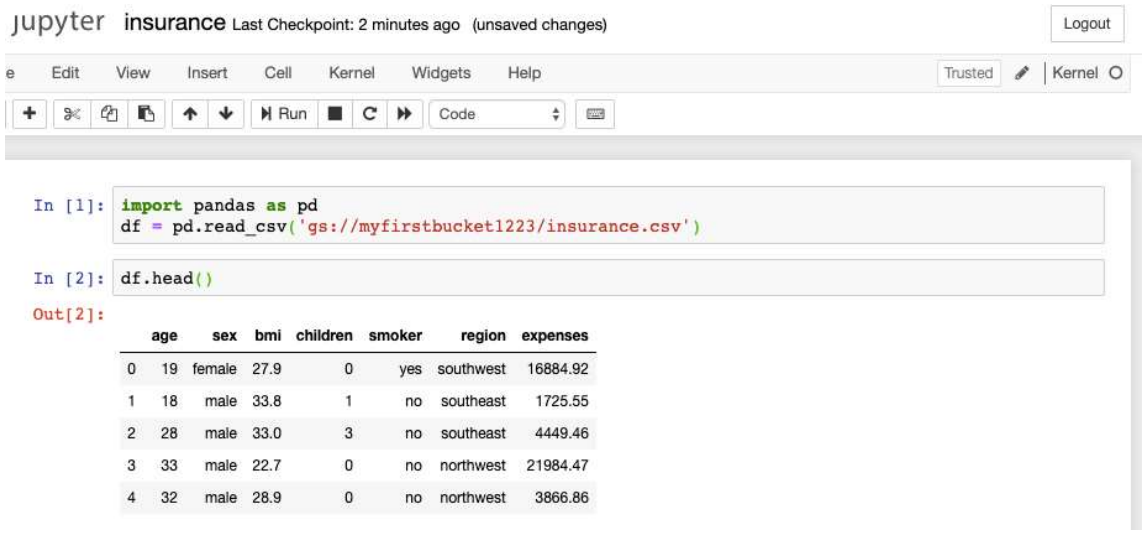


Demo – Install gcsfs

pip install "gcsfs==0.6.0"



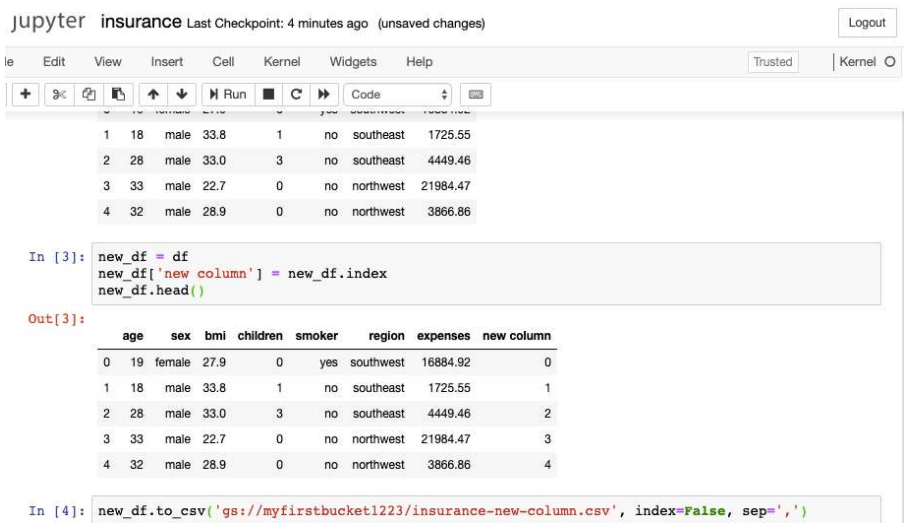
Demo – Open csv by pandas

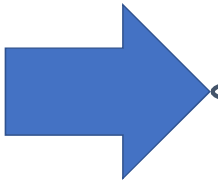


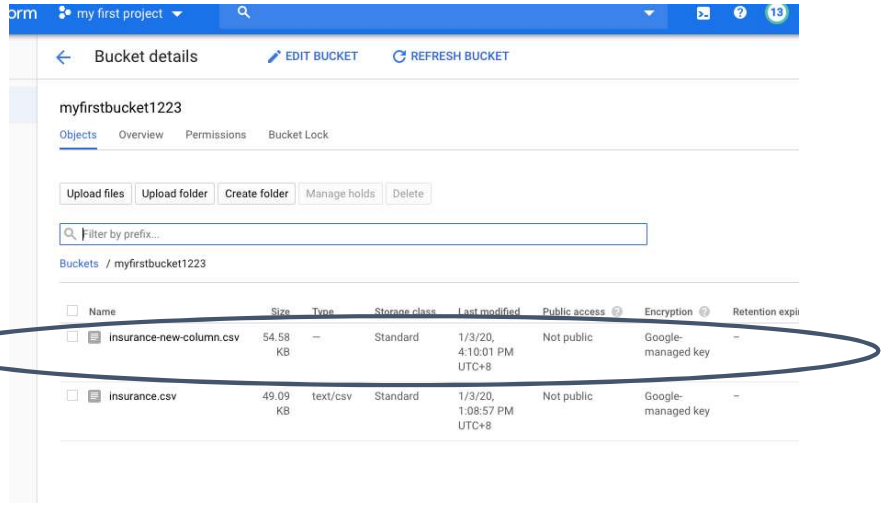
	age	sex	bmi	children	smoker	region	expenses
0	19	female	27.9	0	yes	southwest	16884.92
1	18	male	33.8	1	no	southeast	1725.55
2	28	male	33.0	3	no	southeast	4449.46
3	33	male	22.7	0	no	northwest	21984.47
4	32	male	28.9	0	no	northwest	3866.86

```
import pandas as pd
df = pd.read_csv([URL see p.36])
```

Demo – Output csv by pandas







[your output df].to_csv('gs://[your bucket name]/[filename].csv', index=False, sep=',')

Ex.1

- Put other csv to the storage bucket and open it in the VM
- Do data visualization and model on the data set
- Output your new preprocessed df to bucket