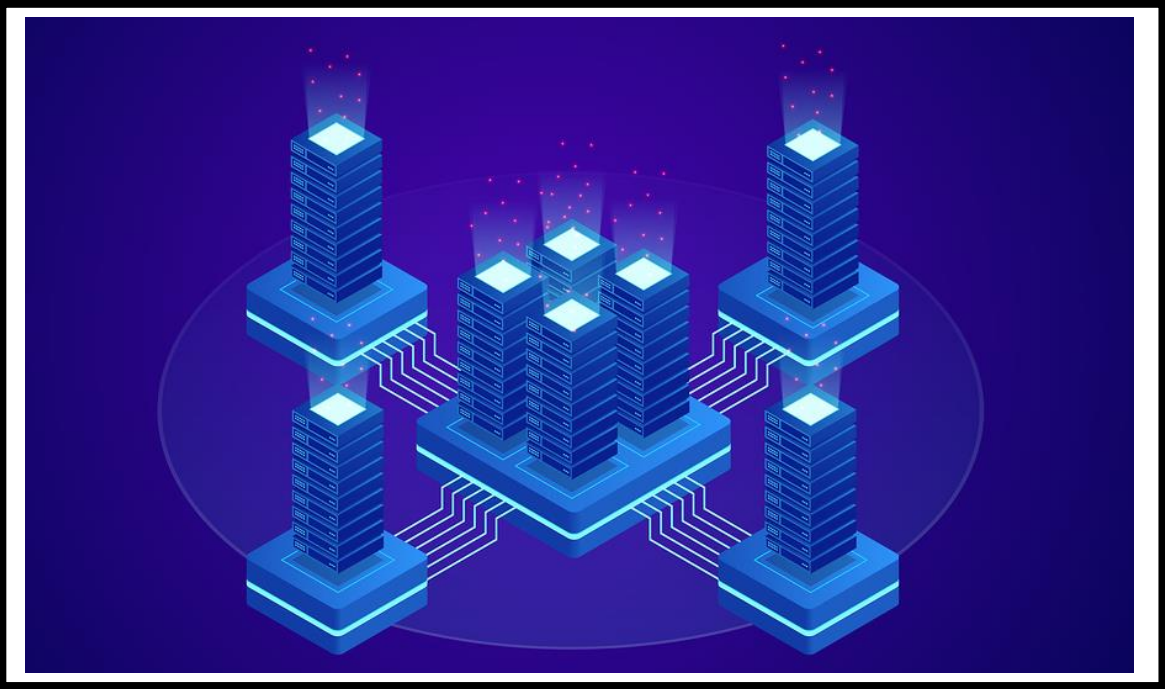

Virtual Machine Instance

In Google Cloud

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Introduction

The following Report aims at clarifying the use of Virtual Machines for businesses who want to take advantage of their capabilities and upgrade their Data Infrastructures and daily procedures. The suggested provider is Google Cloud.

What is a Virtual Machine Instance (VM Instance)

A Virtual Machine (VM) is a compute resource that uses software instead of a physical computer to run programs and deploy apps. One or more virtual guest machines run on a physical host machine. Each virtual machine runs its own operating system and functions separately from the other VMs, even when they are all running on the same host. This means that, for example, a MacOS virtual machine could run on a physical PC.

Virtual machines have historically been used for server virtualization, which enables IT teams to consolidate their computing resources and improve efficiency. Additionally, virtual machines can perform specific tasks considered too risky to carry out in a host environment, such as accessing virus-infected data or testing operating systems. Since the virtual machine is separated from the rest of the system, the software inside the virtual machine cannot tamper with the host computer.

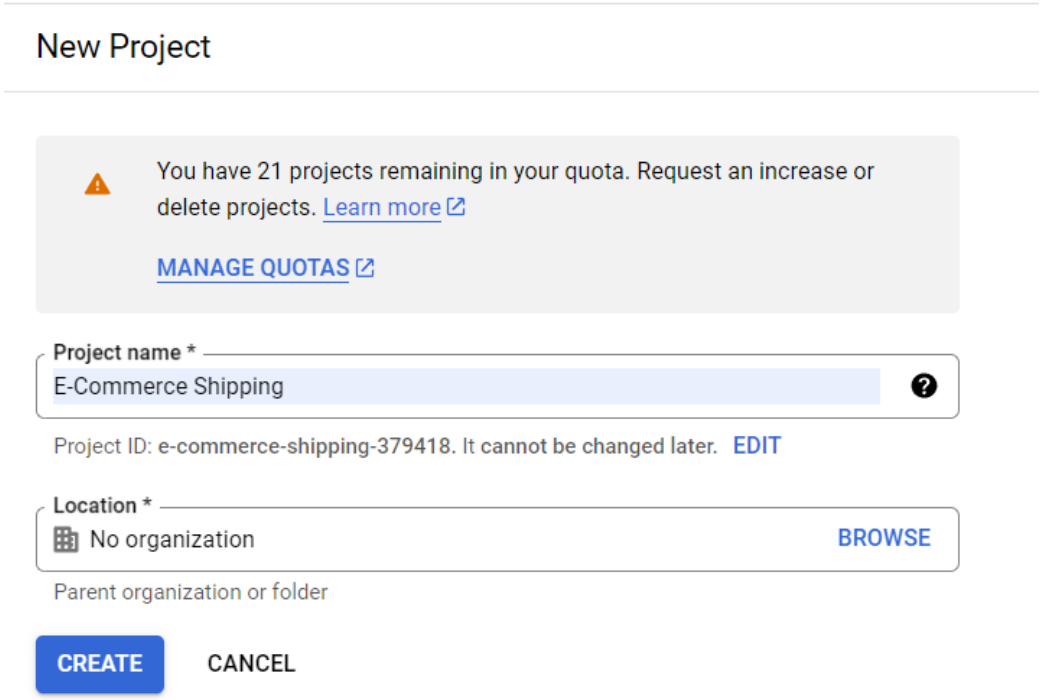
An instance is a virtual machine (VM) hosted on Google's infrastructure. You can create an instance or create a group of managed instances by using the Google Cloud console, the Google Cloud CLI, or the Compute Engine API.

Compute Engine instances can run the public images for Linux and Windows Server that Google provides as well as private custom images that you can create or import from your existing systems. You can choose the machine properties of your instances, such as the number of virtual CPUs and the amount of memory, by using a set of predefined machine types or by creating your own custom machine types. Each instance belongs to a Google Cloud console project, and a project can have one or more instances. When you create an instance in a project, you specify the zone, operating system, and machine type of that instance. When you delete an instance, it is removed from the project. To create and manage instances, you can use a variety of tools, including the Google Cloud console, the gcloud command-line tool, and the REST API. To configure applications on your instances, connect to the instance using Secure Shell (SSH) for Linux instances or Remote Desktop Protocol (RDP) for Windows Server instances.

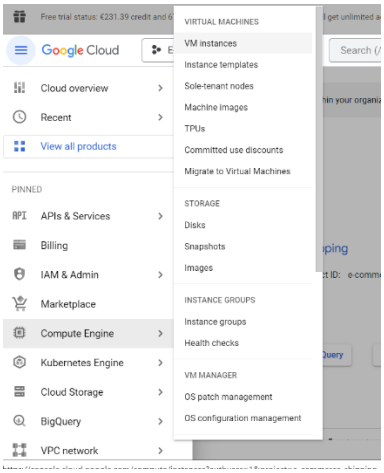
VM Instance Installation using Google Cloud

- Local OS: Windows 11
- VM Instance OS: Ubuntu

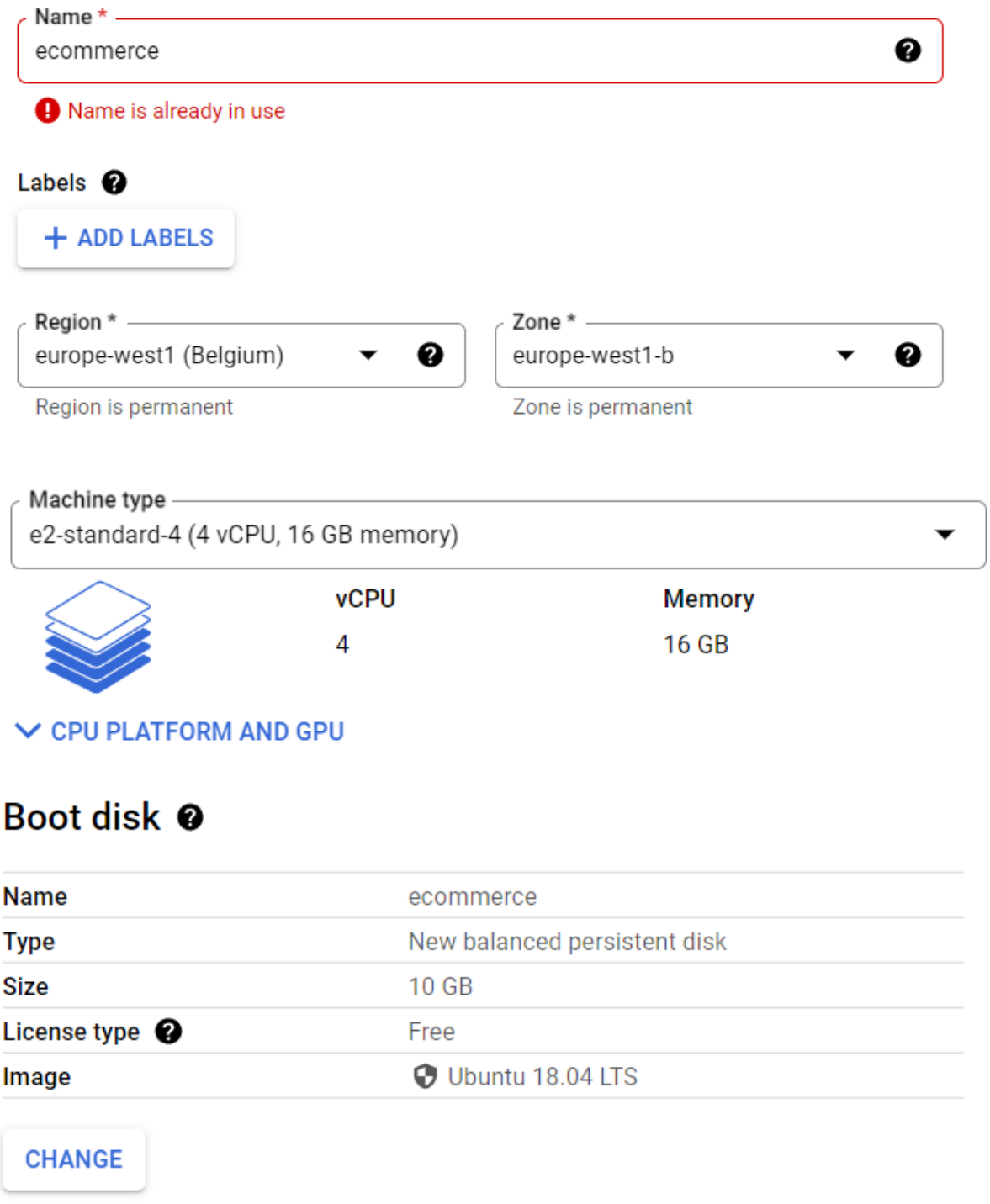
We visit the [Google Cloud webpage] and connect to our Google account. After that, we click on the Console. From there, we choose to create a new Project and we give it a name of our preference. Google offers 24 free projects to run per account as well as 300$ of free credits for 3 months for every new account.



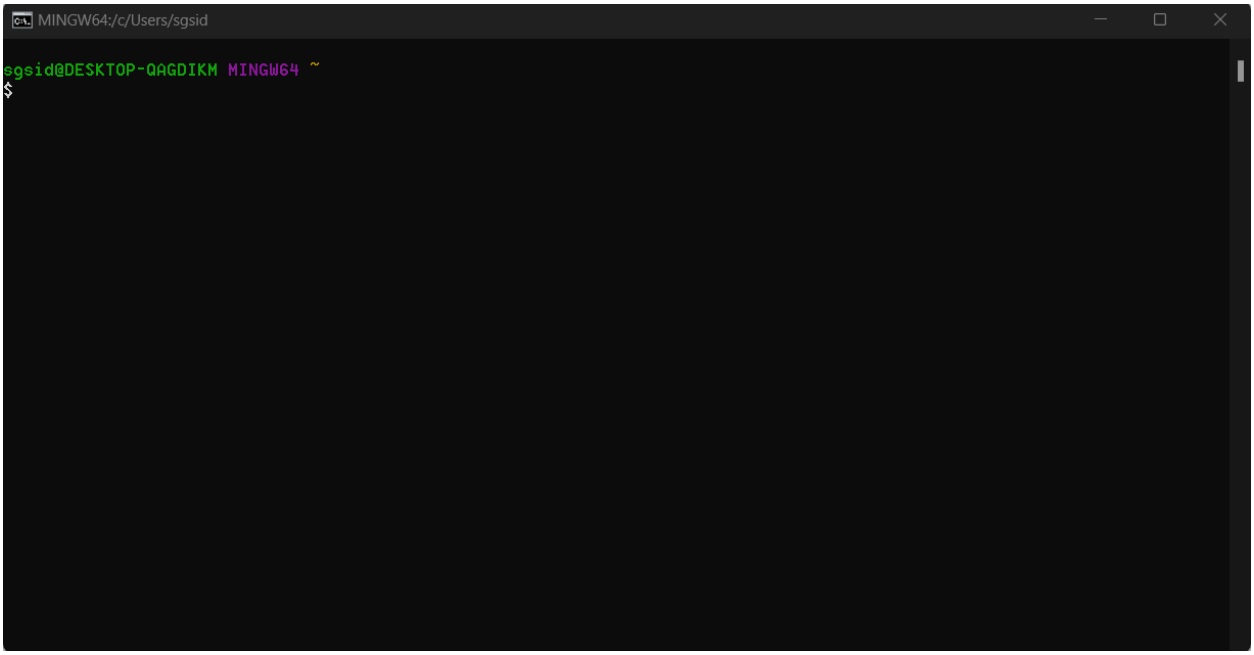
Moving forward, we go Compute Engine -> VM Instance from the menu on the left.



We choose to create a new instance and we give it the name of our choice. We could also choose the region we want the server we connect to be located for better connectivity, the machine type to use as of its CPU and RAM requirements as well as the disk storage and the operating system. Here, we choose the Belgium region, on a 4 vCPU and 8gb RAM machine of 10gb disk storage, running Ubuntu.



We continue on our terminal. Here, we use the GitBash terminal for windows offered by Git but you could use any other type of terminal in the operating system of your choice. Of course, some steps, paths and commands might vary depending on the operating system you are working with.



Firstly, we create a .ssh directory with the mkdir command. Here, we will store the ssh key. SSH keys are an authentication method used to gain access to an encrypted connection between systems and then ultimately use that connection to manage the remote system.

```
sgsid@DESKTOP-QAGDIKM MINGW64 ~
$ mkdir .ssh
```

In order to generate the key we use the following command:

`ssh-keygen -t rsa -f C:\Users\`*WINDOWS_USER*`\.ssh\`*KEY_FILENAME* `-C` *USERNAME* `-b 2048`

where WINDOWS_USER is your username on the windows machine, KEY_FILENAME is the name for your SSH key file and USERNAME is your username in the VM.

```
sgsid@DESKTOP-QAGDIKM MINGW64 ~/.ssh
$ ssh-keygen -t rsa -f C:\Users\sgsid\.ssh\gcp_1 -C stamatis -b 2048
```

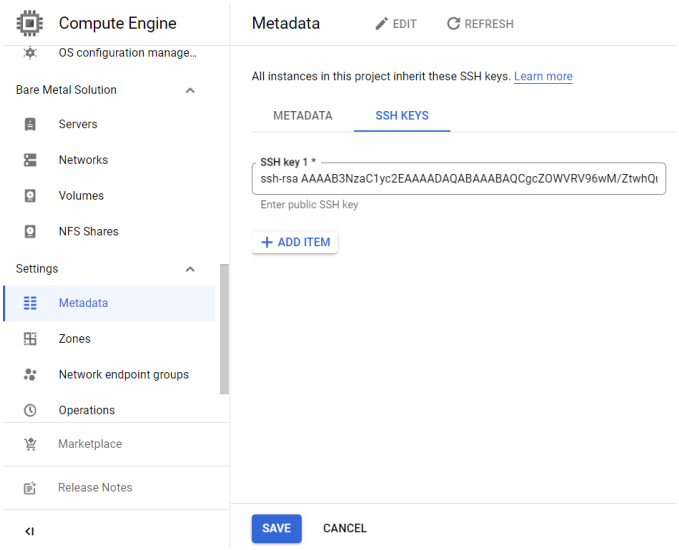
A private key file (gcp_1) and a public key file (gcp_1.pub) are generated inside the .ssh directory. Never share your private key file with anyone as it will provide someone with access to your VM instance. The one to be shared is the public key file gcp_1.pub where a hashed key is presented.

```
sgsid@DESKTOP-QAGDIKM MINGW64 ~/.ssh
$ ls
config  gcp_1  gcp_1.pub  gpc  gpc.pub  known_hosts  known_hosts.old
```

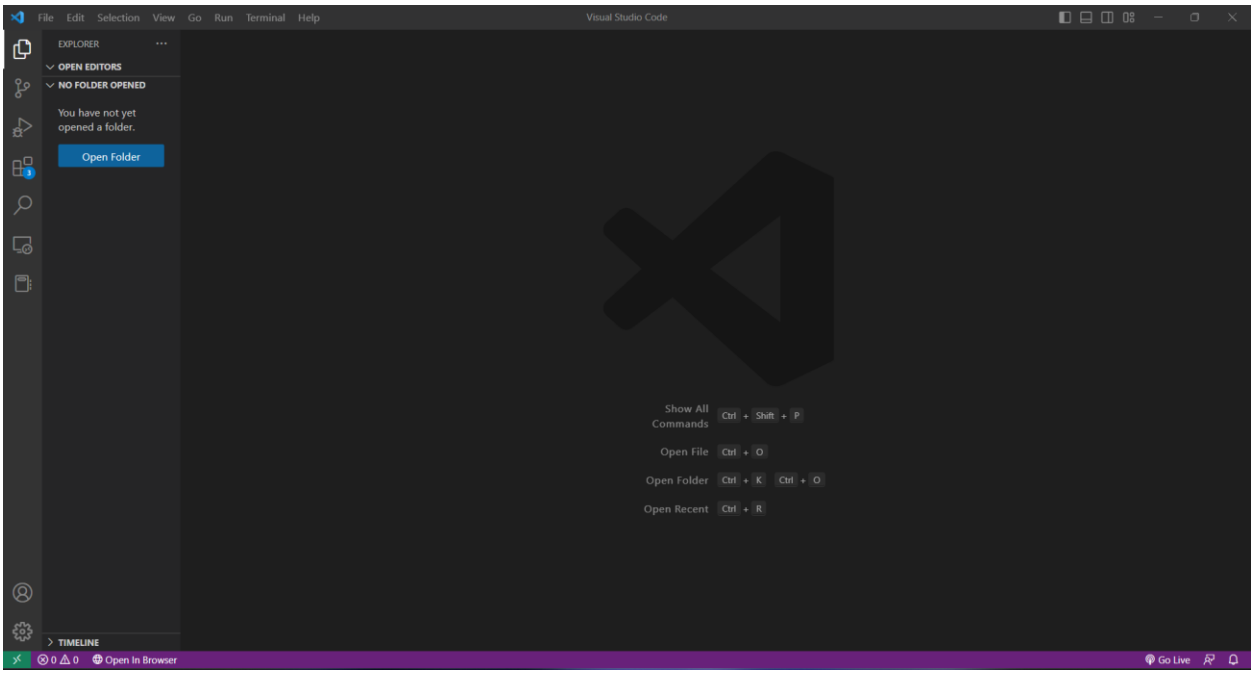
We open the public key file using the command cat and copy the public SSH key.

```
sgsid@DESKTOP-QAGDIKM MINGW64 ~/.ssh
$ cat gcp_1.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDoP16Hc5/FdrFiMhKD8tO7KEcYnPimnAq8KzjvjfibJ7Y7C
j1PyJvI/U6CEhuq5uPRPLesH1c07iYeyz47Ya4FrrkSnvE1xNw3qCQ+rOKYrbXKv6UCm8ZTIeYPU+Z8119dCm
OuPUVp6GyTBWKaT5QqPcsMrn+QIyY25JiODGUNoMDzQUGco53r1WYu83dnk3vynai3m7k61RO1JUdxqc4Ukm1
vFthOYokHuDYDt/UfN8/ stamatis
```

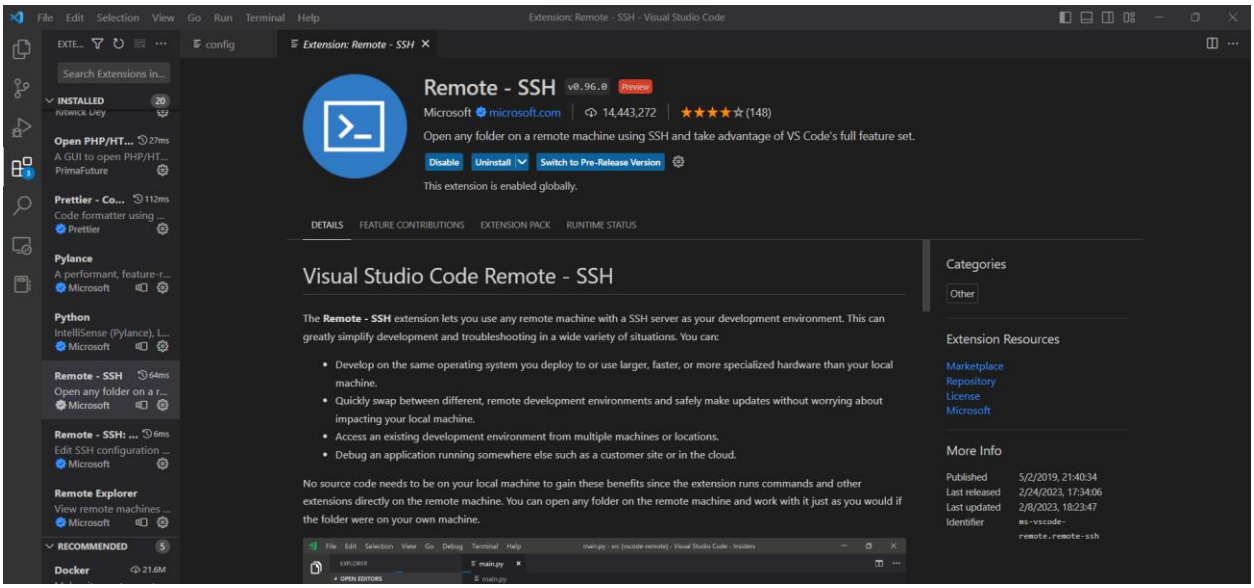
Next, we revisit our VM instance and this time we choose Metadata from the menu on the left. We choose the SSH KEYS option and add there our public SSH key we copied previously.



Now, we are ready to connect our local machine to the VM instance using the SSH network. To do so, we will use the code editor Visual Studio Code (VS).



We visit the extensions on the left and search for the Remote – SSH extension to install. The extension will help as configure the connection between our local machine and the virtual machine.

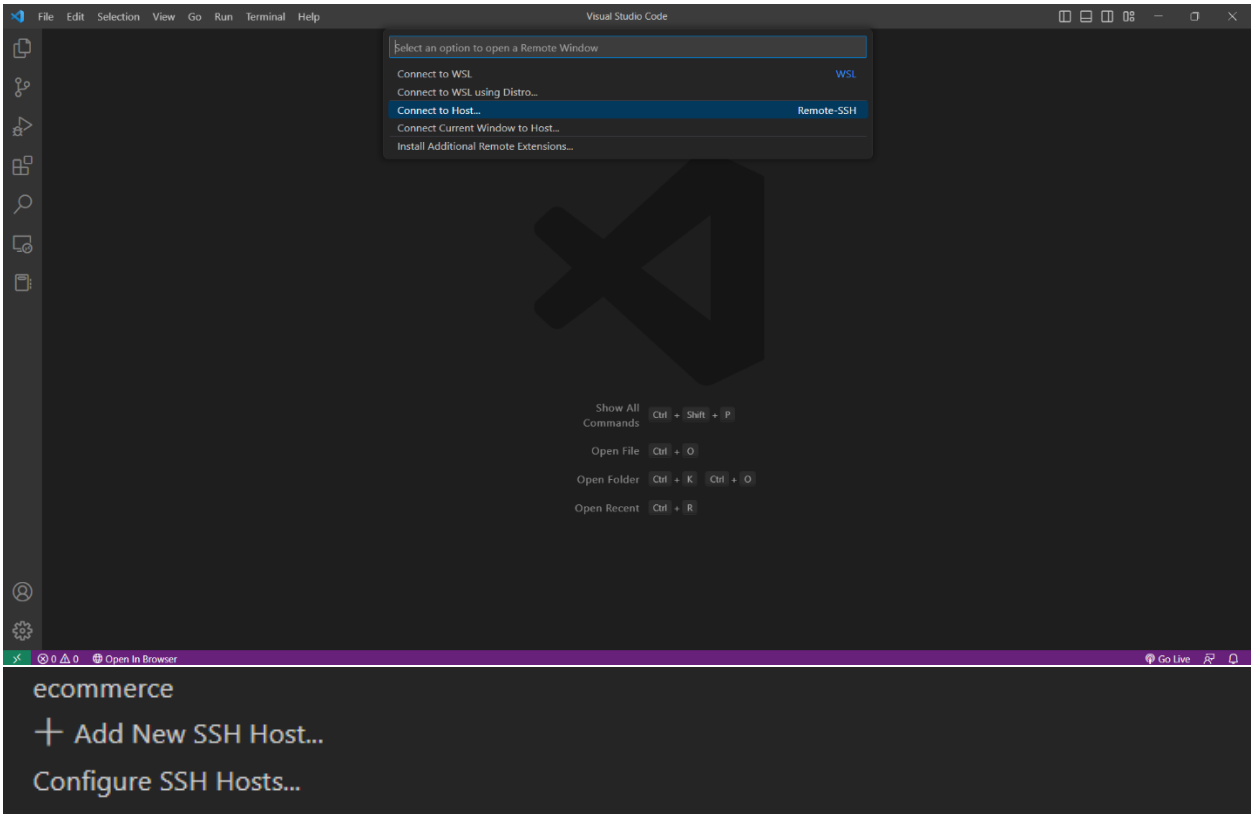


In order to configure we need a config directory that includes all the information needed. We create one via our terminal and open it with the command code.

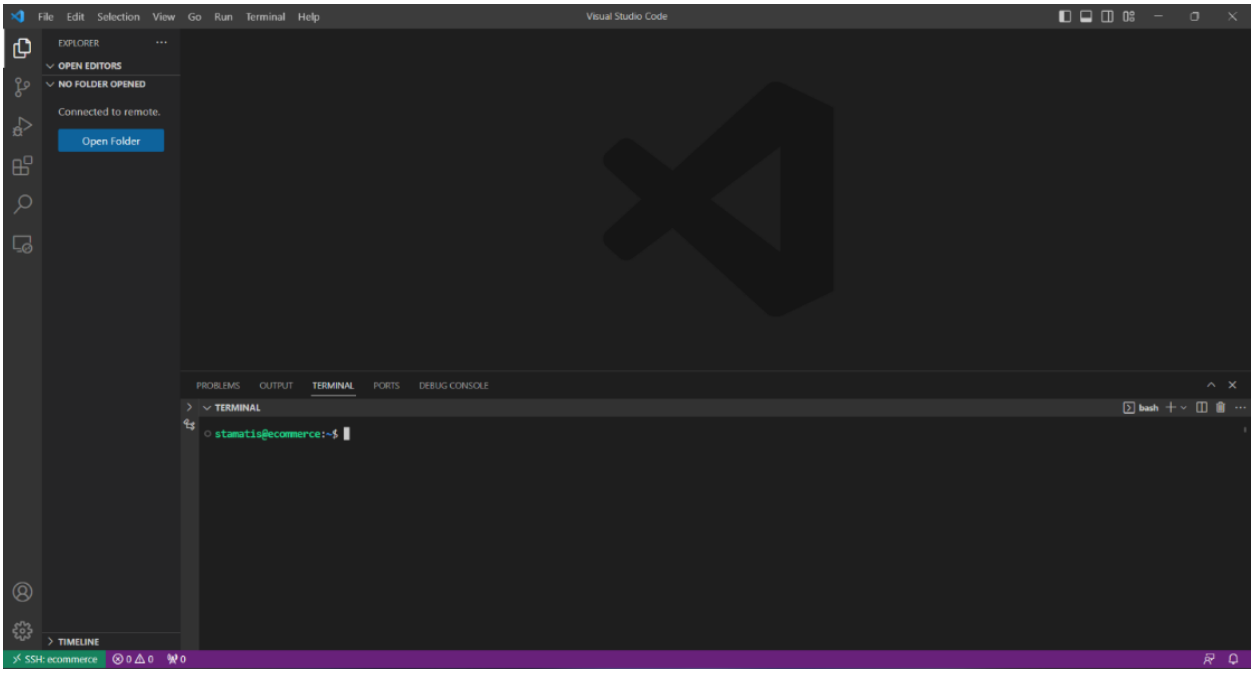
```
sgsid@DESKTOP-QAGDIKM MINGW64 ~/.ssh
$ mkdir config
sgsid@DESKTOP-QAGDIKM MINGW64 ~/.ssh
$ code config
```

The directory opens via our default code editor which must be set as Visual Studio Code. Set the info with the following structure where Host is the name of the VM, HostName the external IP address of the VM, User the username you use as user for the VM and IdentityFile the local path to your private SSH key. Save the file.

Continue by choosing the green icon on the bottom left of VS and choose “Connect to host” from the drop-down menu opening. Choose the name of your Host and connect.



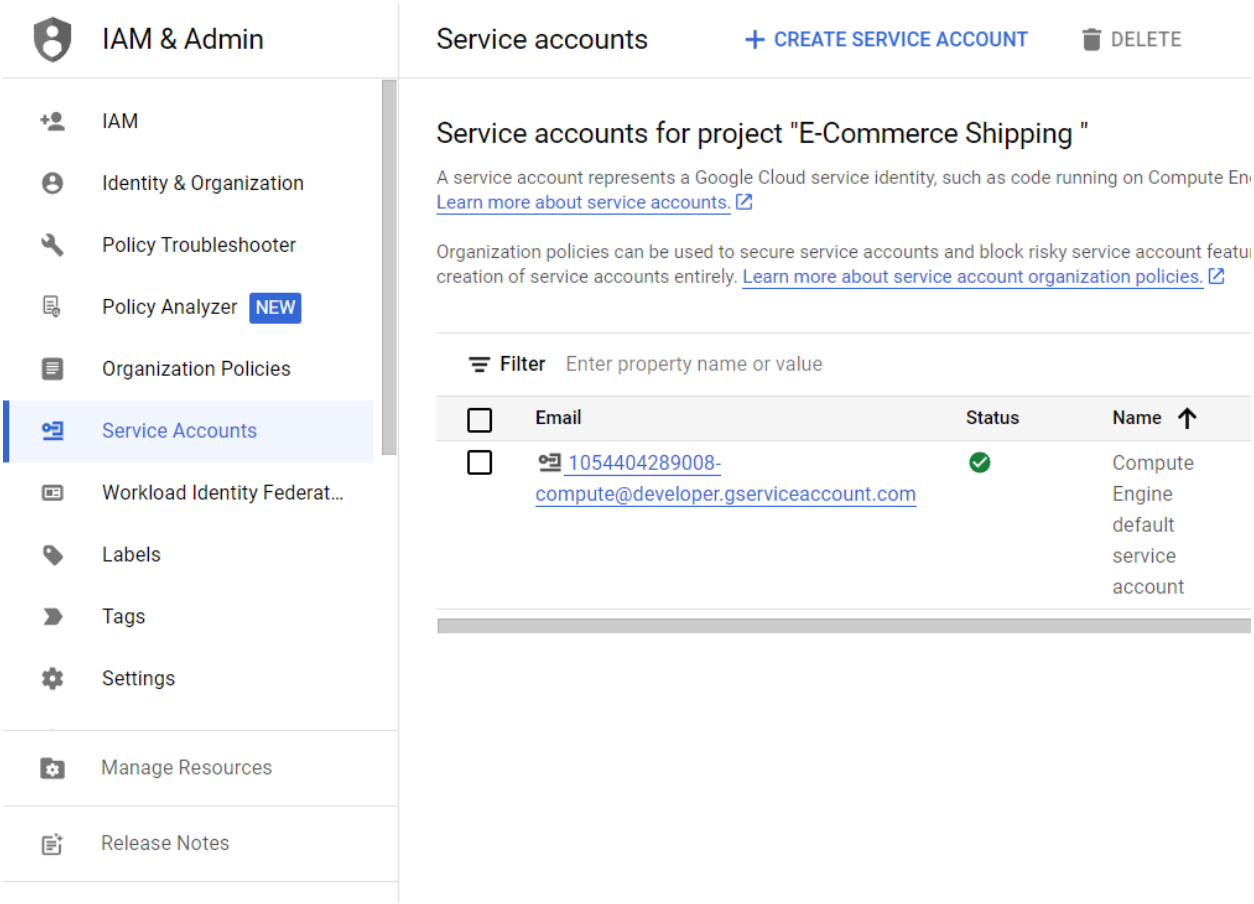
That’s it! You are connected to a Virtual Machine Instance of your preference provided by Google.



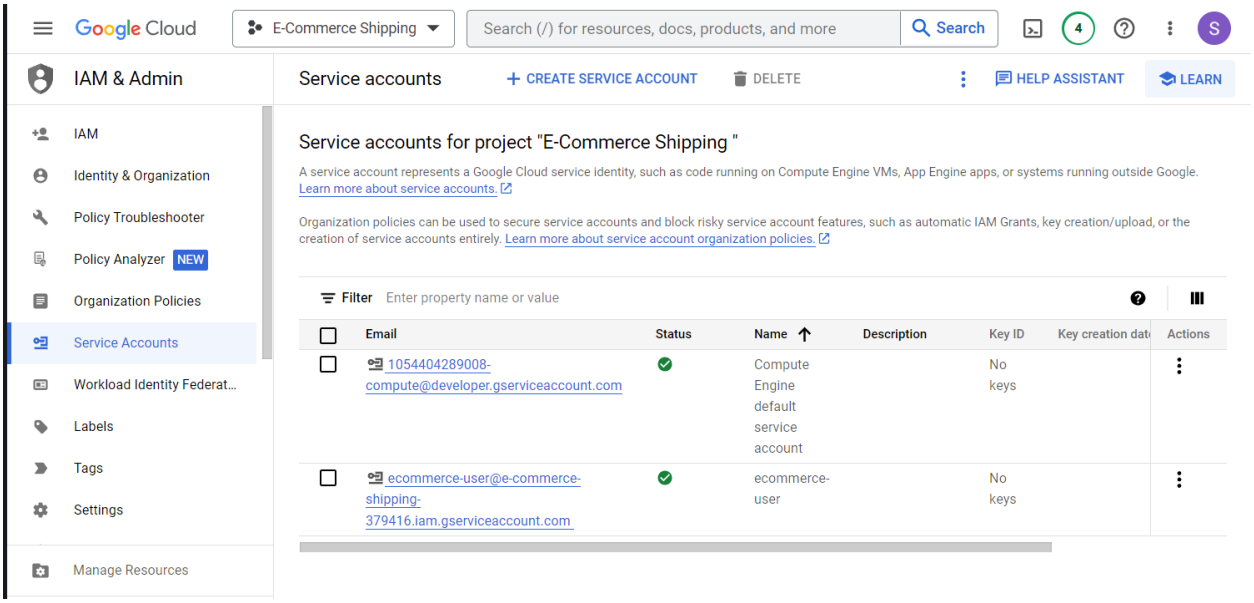
Creation of Google Cloud Service Account

The Service Account is a special type of Google account intended to represent a non-human user that needs to authenticate and be authorized to access data in Google APIs. Typically, service accounts are used in scenarios such as: Running workloads on virtual machines (VMs).

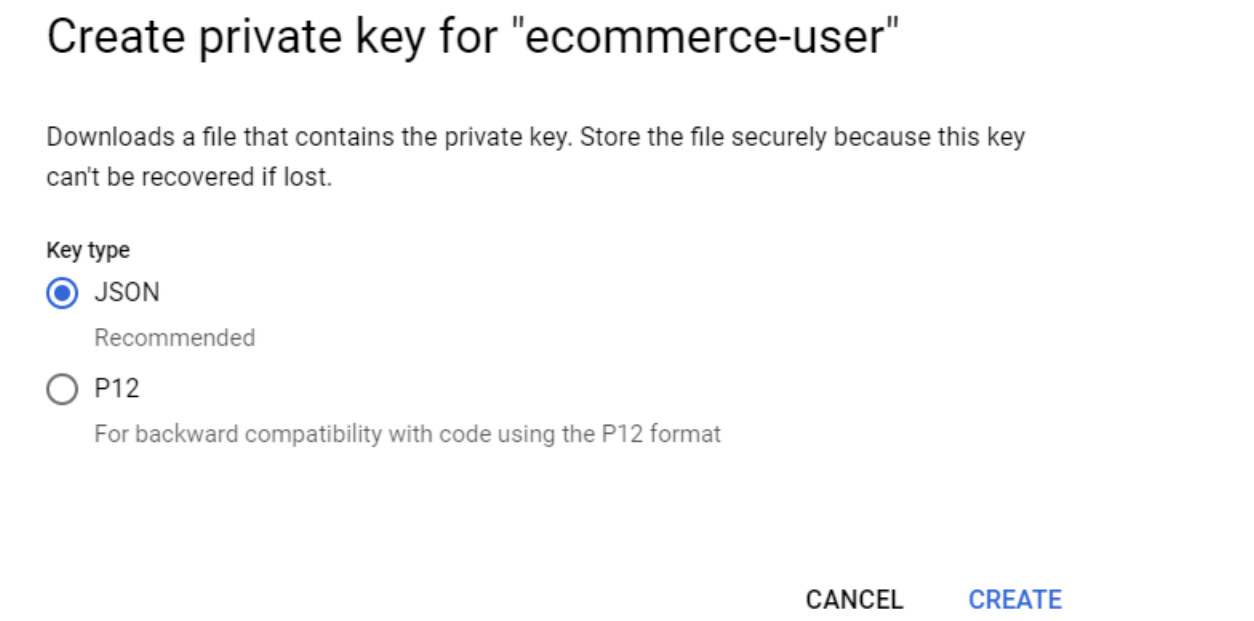
At first, we visit Google Cloud and choose the IAM & Admin -> Service Accounts -> CREATE SERVICE ACCOUNT from the menu on the left.



Set a name of your choice, the Role to Viewer and create your account. The new Service Account should be displayed in Service Accounts page.

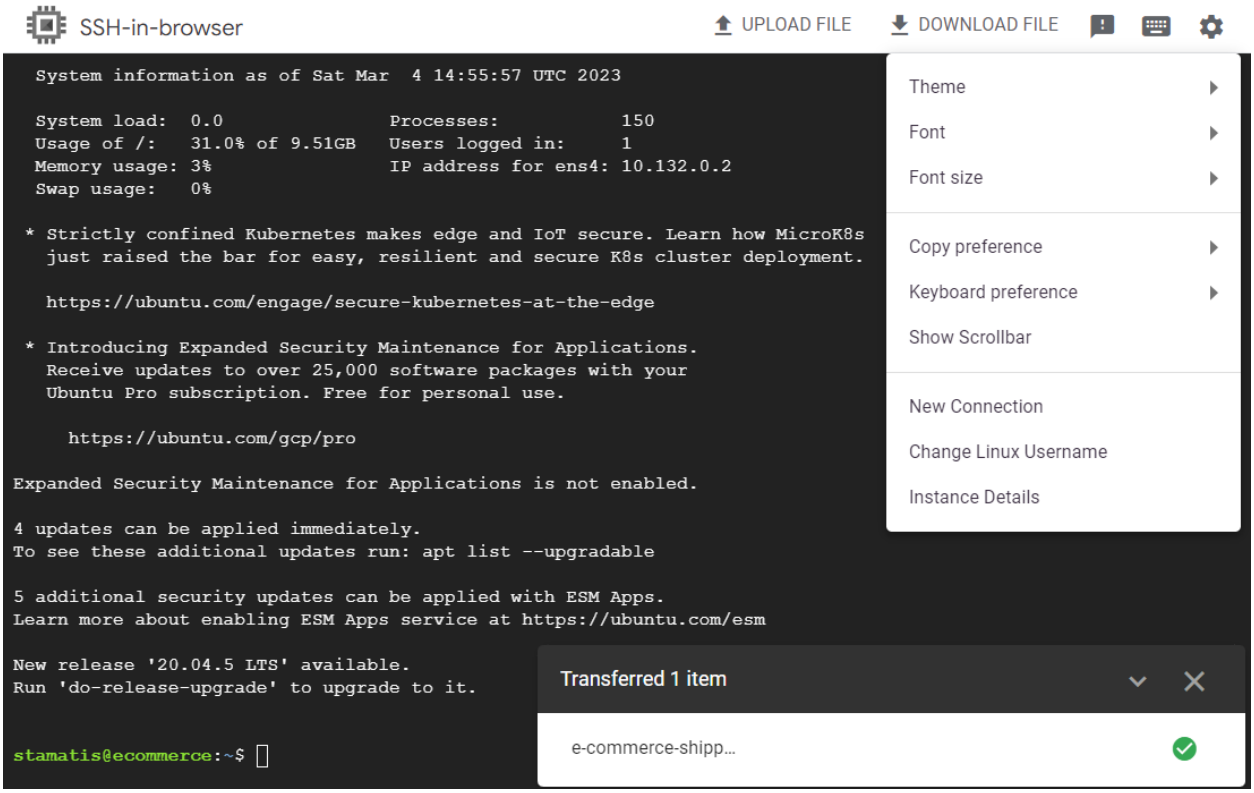


We click the 3 bullets on the right of the service account we just created and choose the option “Manage Keys”. From there, we choose ADD KEY -> Create new key and we set the key type to JSON. This way we download locally the private key needed to use this service account.



As we are using a VM instance, we need to move the JSON file from our local environment to the VM to use it there. To do so, we visit again the Google Cloud and the VM instances option. We click on the SSH button of our VM instance and a SSH-in-browser window pops up. In case that more than one user exist in our Linux instance, it is possible that the Linux username presented differs from the one we want to use. We can change it by clicking on the settings button at the top right corner and selecting “Change Linux Username”. There we type our preferred username so that the uploaded files are uploaded to the

correct user. We click on UPLOAD FILE and upload the JSON file which is located in our default folder for downloading files.



Back in our VM's terminal, we create a new directory called keys and move the private key there for organization reasons.

```
stamatis@ecommerce:~$ ls
e-commerce-shipping-379416-1deae3e0742f.json  keys  snap
stamatis@ecommerce:~$ mv e-commerce-shipping-379416-1deae3e0742f.json keys
stamatis@ecommerce:~$ ls
keys  snap
```

We will now use the Google Cloud Client to configure our connection to the service account. Our VM instance already includes Google Cloud Client and so there is no need to download it. By using the following command, we set the environment variable to point to our downloaded GCP auth-key and then we login to the service account.

```
stamatis@ecommerce:~$ export GOOGLE_APPLICATION_CREDENTIALS="keys/e-commerce-shipping-379416-1deae3e0742f.json"
stamatis@ecommerce:~$ gcloud auth application-default login
```

We then follow the instructions displayed and in the end, we should be connected to our service account.

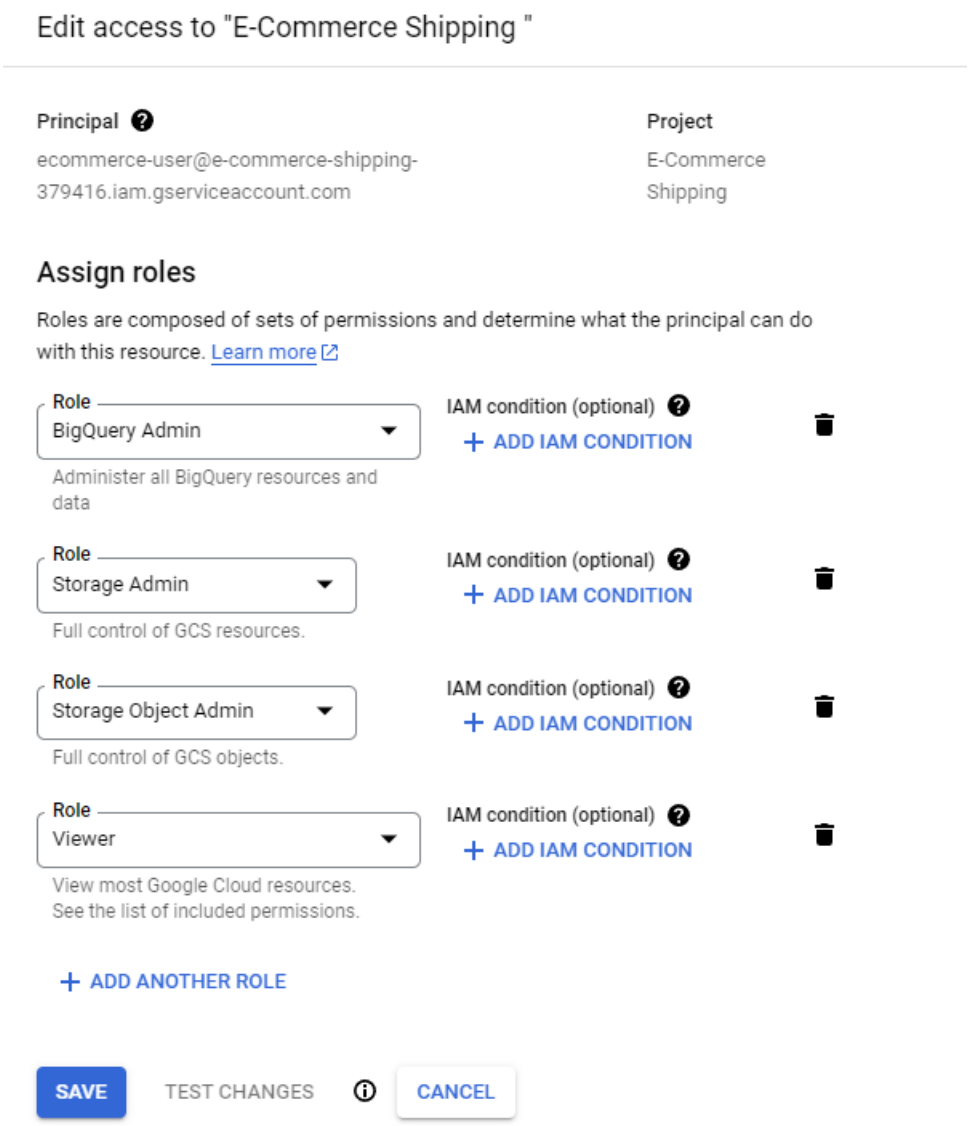
```
Credentials saved to file: [/home/stamatis/.config/gcloud/application_default_credentials.json]

These credentials will be used by any library that requests Application Default Credentials (ADC).

Quota project "e-commerce-shipping-379416" was added to ADC which can be used by Google client libraries for billing and quota. Note that some services may still bill the pro
ject owning the resource.
```

Back to Google Cloud, we are able to change the roles and authorization our user has in order to allow them have access to different services of the cloud. To do so, we visit our service account by going to IAM & Admin -> IAM and we choose the pencil button next to our service account. There, for example, we

choose to add 3 new roles, one for Storage Admin, one for Storage Object Admin and one for BigQuery Admin.



As a final step, we need to enable two APIs found here:

https://console.cloud.google.com/apis/library/iam.googleapis.com?project=ivory-lotus-374512

https://console.cloud.google.com/apis/library/iamcredentials.googleapis.com?project=ivory-lotus-374512

They manage identity and access control for Google Cloud Platform resources, including the creation of service accounts, which you can use to authenticate to Google and make API calls.

References

https://www.vmware.com/topics/glossary/content/virtual-machine.html

https://cloud.google.com/compute/docs/instances

https://cloud.google.com/iam/docs/service-account-overview