As a cloud professional who is already familiar with AWS, you know that designing a multi-tier architecture includes the compute layer. In general, your compute layer designs include virtual machines (VM). Some of the considerations involved in configuring virtual machine include the following:

How can you create and deploy VMs using a graphic interface?
How can you connect to VMs securely?
How can you enable communication between your instances?
In AWS, your organization deploys VMs, called Elastic Compute Cloud instances, programmatically through the AWS Command Line Interface (AWS CLI) and the AWS Software Development Kit (SDK). VM instances can also be deployed with the AWS Management Console.

To interact with your Elastic Compute Cloud (EC2) instances, you use a key pair to securely connect through Secure Shell (SSH) in Linux instances or to decrypt the administrator password in Windows instances. Alternatively, for instances where a key pair may pose a security risk, you use the AWS Systems Manager Session Manager to manage your EC2 instances through an interactive browser-based shell.

To enable communication between instances, a simple pattern is to place them inside of the same VPC using the proper definitions in route tables to allow traffic between subnets.


Now you will explore how to create a similar architecture in Google Cloud.

In this lab, you will create virtual machines (VMs) and connect to them. You will also create connections between the instances.

In this lab, you will learn how to perform the following tasks:

Create a Compute Engine virtual machine using the Google Cloud console.
Create a Compute Engine virtual machine using the gcloud command-line interface.
Connect between the two instances.

Create a virtual machine using the Cloud console

```
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$ gcloud config set compute/zone us-central1-a
Updated property [compute/zone].
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$ gcloud compute instances create "my-vm-1"--machine-type "n1-standard-1" --image-project "debian-cloud" --image-family "debi
an-10" --subnet "default"
Created [https://www.googleapis.com/compute/v1/projects/qwiklabs-gcp-01-361500184bf4/zones/us-central1-a/instances/my-vm-1--machine-type].
Created [https://www.googleapis.com/compute/v1/projects/qwiklabs-gcp-01-361500184bf4/zones/us-central1-a/instances/n1-standard-1].
NAME: my-vm-1--machine-type
ZONE: us-central1-a
MACHINE_TYPE: n1-standard-1
PREEMPTIBLE:
INTERNAL_IP: 10.128.0.6
EXTERNAL_IP: 34.30.79.199
STATUS: RUNNING

NAME: n1-standard-1
ZONE: us-central1-a
MACHINE_TYPE: n1-standard-1
PREEMPTIBLE:
INTERNAL_IP: 10.128.0.5
EXTERNAL_IP: 34.31.26.235
STATUS: RUNNING
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$
```

Create a virtual machine using the gcloud command line
To display a list of all the zones in the region
gcloud compute zones list | grep us-central1

```
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$ gcloud compute zones list | grep us-central1
NAME: us-central1-c
REGION: us-central1
NAME: us-central1-a
REGION: us-central1
NAME: us-central1-f
REGION: us-central1
NAME: us-central1-b
REGION: us-central1
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$
```

gcloud config set compute/zone us-central1-b

```
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$ gcloud config set compute/zone us-central1-b
WARNING: us-central1-b is not a valid zone. Run `gcloud compute zones list` to get all zones.
Are you sure you wish to set property [compute/zone] to us-central1-b?

Do you want to continue (Y/n)?  Y

Updated property [compute/zone].
```

To create a VM instance called my-vm-2 in that zone, execute this command:
gcloud compute instances create "my-vm-2" \
--machine-type "n1-standard-1" \
--image-project "debian-cloud" \
--image-family "debian-10" \
--subnet "default"

```
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$ gcloud config set compute/zone us-central1-b
Updated property [compute/zone].
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$ gcloud compute instances create "my-vm-2"--machine-type "n1-standard-1" --image-project "debian-cloud" --image-family "debi
an-10" --subnet "default"
Created [https://www.googleapis.com/compute/v1/projects/qwiklabs-gcp-01-361500184bf4/zones/us-central1-b/instances/my-vm-2--machine-type].
Created [https://www.googleapis.com/compute/v1/projects/qwiklabs-gcp-01-361500184bf4/zones/us-central1-b/instances/n1-standard-1].
NAME: my-vm-2--machine-type
ZONE: us-central1-b
MACHINE_TYPE: n1-standard-1
PREEMPTIBLE:
INTERNAL_IP: 10.128.0.4
EXTERNAL_IP: 104.154.143.134
STATUS: RUNNING

NAME: n1-standard-1
ZONE: us-central1-b
MACHINE_TYPE: n1-standard-1
PREEMPTIBLE:
INTERNAL_IP: 10.128.0.3
EXTERNAL_IP: 34.28.29.87
STATUS: RUNNING
student_01_b5ba9d686e83@cloudshell:~ (qwiklabs-gcp-01-361500184bf4)$
```

Exit

Task 4. Connect between VM instances
In the Navigation menu, click Compute Engine > VM instances.

You will see the two VM instances you created, each in a different zone.

Notice that the Internal IP addresses of these two instances share the first three bytes in common. They reside on the same subnet in their Google Cloud VPC even though they are in different zones.

| Status | Name | Zone | Recommendations | In use by | Internal IP |
|---|---|---|---|---|---|
| ✓ | instance-1 | us-central1-a | | | 10.128.0.2 (nic0) |
| ✓ | my-vm-1 | us-central1-b | | | 10.128.0.8 (nic0) |
| ✓ | my-vm-1--machine-type | us-central1-a | | | 10.128.0.6 (nic0) |
| ✓ | my-vm-2 | us-central1-a | | | 10.128.0.7 (nic0) |

To open a command prompt on the my-vm-2 instance, click SSH in its row in the VM instances list.

Use the ping command to confirm that my-vm-2 can reach my-vm-1 over the network:

ping my-vm-1.us-central1-a

At the command prompt on my-vm-1, install the Nginx web server:
sudo apt-get install nginx-light -y
Use the nano text editor to add a custom message to the homepage of the web server
sudo nano /var/www/html/index.nginx-debian.html
Hi from YOUR_NAME

Confirm that the web server is serving your new page
curl http://localhost/

To confirm that my-vm-2 can reach the web server on my-vm-1, at the command prompt on my-vm-2, execute this command:
curl http://my-vm-1.us-central1-a/

In the Navigation menu, click Compute Engine > VM instances.

Copy the External IP address for my-vm-1 and paste it into the address bar of a new browser tab.

You will see your web server's home page, including your custom text.

Note: If you forgot to click Allow HTTP traffic when you created the my-vm-1 VM instance, your attempt to reach your web server's home page will fail. You can add a firewall rule to allow inbound traffic to your instances, although this topic is out of scope for this course.