Virtual Private Networks (VPN)

In this lab, you establish VPN tunnels between two networks in separate regions such that a VM in one network can ping a VM in the other network over its internal IP address.

Objectives

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

- Create VPN gateways in each network
- Create VPN tunnels between the gateways
- Verify VPN connectivity

Before you click the Start Lab button

Read these instructions. Labs are timed and you cannot pause them. The timer, which starts when you click Start Lab, shows how long Cloud resources will be made available to you.

This Qwiklabs hands-on lab lets you do the lab activities yourself in a real cloud environment, not in a simulation or demo environment. It does so by giving you new, temporary credentials that you use to sign in and access the Google Cloud Platform for the duration of the lab.

What you need

To complete this lab, you need:

- Access to a standard internet browser (Chrome browser recommended).

- Time to complete the lab.
  Note: If you already have your own personal GCP account or project, do not use it for this lab.

Task 1: Explore the networks and instances

Two custom networks with VM instances have been configured for you. For the purposes of the lab, both networks are VPC networks within a GCP project. However, in a real-world application, one of these networks might be in a different GCP project, on-premises, or in a different cloud.

Explore the networks

Verify that **vpn-network-1** and **vpn-network-2** have been created with subnets in separate regions.

1. In the GCP Console, on the **Navigation menu** (≡), click **VPC network** > **VPC networks**.

- Note the **vpn-network-1** network and its **subnet-a** in **us-central1**.
- Note the **vpn-network-2** network and its **subnet-b** in **europe-west1**.

Explore the firewall rules

1. In the navigation pane, click **Firewall rules**.

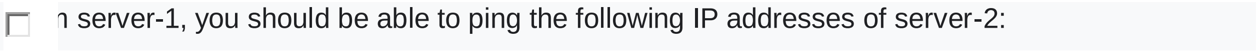
- Note the **network-1-allow-ssh** and **network-1-allow-icmp** rules for **vpn-network-1**.
- Note the **network-2-allow-ssh** and **network-2-allow-icmp** rules for **vpn-network-2**.

These firewall rules allow **SSH** and **ICMP** traffic from anywhere.

Explore the instances and their connectivity

Currently, the VPN connection between the two networks is not established. Explore the connectivity options between the instances in the networks.

1. In the GCP Console, on the **Navigation menu** (≡), click **Compute Engine** > **VM instances**.
2. Click **Columns**, and select **Network**.



n server-1, you should be able to ping the following IP addresses of server-2:

ernal IP address

Internal IP address

Submit

3. Note the external and internal IP addresses for **server-2**.
4. For **server-1**, click **SSH** to launch a terminal and connect.
5. To test connectivity to server-2's external IP address, run the following command, replacing server-2's external IP address with the value noted earlier:

```
ping -c 3 <Enter server-2's external IP address here>
```

This works because the VM instances can communicate over the internet.

6. To test connectivity to server-2's internal IP address, run the following command, replacing server-2's internal IP address with the value noted earlier:

```
ping -c 3 <Enter server-2's internal IP address here>
```

You should see 100% packet loss when pinging the internal IP address because you don't have VPN connectivity yet.

7. Exit the SSH terminal.

Let's try the same from **server-2**.

8. Note the external and internal IP addresses for **server-1**.
9. For **server-2**, click **SSH** to launch a terminal and connect.
10. To test connectivity to server-1's external IP address, run the following command, replacing server-1's external IP address with the value noted earlier:

```
ping -c 3 <Enter server-1's external IP address here>
```

11. To test connectivity to server-1's internal IP address, run the following command, replacing server-1's internal IP address with the value noted earlier:

```
ping -c 3 <Enter server-1's internal IP address here>
```

You should see similar results.

12. Exit the SSH terminal.

Why are we testing both **server-1** to **server-2** and **server-2** to **server-1**?

For the purposes of this lab, the path from subnet-a to subnet-b is not the same as the path from subnet-b to subnet-a. You are using one tunnel to pass traffic in each direction. And if both tunnels are not established, you won't be able to ping the remote server on its internal IP address. The ping might reach the remote server, but the response can't be returned.

This makes it much easier to debug the lab during class. In practice, a single tunnel could be used with symmetric configuration. However, it is more common to have multiple tunnels or multiple gateways and VPNs for production work, because a single tunnel could be a single point of failure.

Task 2: Create the VPN gateways and tunnels

Establish private communication between the two VM instances by creating VPN gateways and tunnels between the two networks.

Reserve two static IP addresses

Reserve one static IP address for each VPN gateway.

1. In the GCP Console, on the **Navigation menu** (≡), click **VPC network** > **External IP addresses**.
2. Click **Reserve static address**.
3. Specify the following, and leave the remaining settings as their defaults:

Property	**Value (type value or select option as specified)**
Name	vpn-1-static-ip
IP version	IPv4
Region	us-central1

4. Click **Reserve**.

Repeat the same for **vpn-2-static-ip**.

5. Click **Reserve static address**.
6. Specify the following, and leave the remaining settings as their defaults:

Property	**Value (type value or select option as specified)**
Name	vpn-2-static-ip

IP version	IPv4
Region	europe-west1

7. Click **Reserve**.

Note both IP addresses for the next step. They will be referred to us `[VPN-1-STATIC-IP]` and `[VPN-2-STATIC-IP]`.

Create the vpn-1 gateway and tunnel1to2

1. In the GCP Console, on the **Navigation menu** (☰), click **Hybrid Connectivity** > **VPN**.
2. Click **Create VPN Connection**.
3. If asked, select **Classic VPN**, and then click **Continue**.
4. Specify the following in the **VPN gateway** section, and leave the remaining settings as their defaults:

Property	Value (type value or select option as specified)
Name	vpn-1
Network	vpn-network-1
Region	us-central1
IP address	vpn-1-static-ip

5. Specify the following in the **Tunnels** section, and leave the remaining settings as their defaults:

Property	Value (type value or select option as specified)
Name	tunnelt1to2
Remote peer IP address	[VPN-2-STATIC-IP]
IKE pre-shared key	gcprocks
Routing options	Route-based
Remote network IP ranges	10.1.3.0/24

Make sure to replace `[VPN-2-STATIC-IP]` with your reserved IP address for **europe-west1**.

6. Click **command line**.

The **gcloud command line** window shows the gcloud commands to create the **VPN gateway** and **VPN tunnels** and it illustrates that three forwarding rules are also created.

7. Click **Close**.
8. Click **Create**.

Click Check my progress to verify the objective.

Create the 'vpn-1' gateway and tunnel

Check my progress

Create the vpn-2 gateway and tunnel2to1

1. Click **VPN setup wizard**.
2. If asked, select **Classic VPN**, and then click **Continue**.
3. Specify the following in the **VPN gateway** section, and leave the remaining settings as their defaults:

Property	Value (type value or select option as specified)
Name	vpn-2
Network	vpn-network-2
Region	europe-west1
IP address	vpn-2-static-ip

4. Specify the following in the **Tunnels** section, and leave the remaining settings as their defaults:

Property	Value (type value or select option as specified)
Name	tunnelt2to1
Remote peer IP address	[VPN-1-STATIC-IP]
IKE pre-shared key	gcprocks
Routing options	Route-based
Remote network IP ranges	10.5.4.0/24

Make sure to replace `[VPN-1-STATIC-IP]` with your reserved IP address for **us-central1**.

5. Click **Create**.
6. Click **Cloud VPN Tunnels**.

Click Check my progress to verify the objective.

Create the 'vpn-2' gateway and tunnel

Check my progress

Wait for the **VPN tunnels status** to change to **Established** for both tunnels before continuing.

Click Check my progress to verify the objective.

Tunnel establishment

Check my progress

Task 3: Verify VPN connectivity

□ n server-1, you should be able to ping the following IP addresses of server-2:

□ ernal IP address

Internal IP address

Submit

Verify server-1 to server-2 connectivity

1. In the GCP Console, on the **Navigation menu**, click **Compute Engine** > **VM instances**.
2. For **server-1**, click **SSH** to launch a terminal and connect.
3. To test connectivity to **server-2**'s internal IP address, run the following command:

```
ping -c 3 <insert server-2's internal IP address here>
```

4. Exit the **server-1** SSH terminal.
5. For **server-2**, click **SSH** to launch a terminal and connect.
6. To test connectivity to **server-1**'s internal IP address, run the following command:

```
ping -c 3 <insert server-1's internal IP address here>
```

Task 4: Review

In this lab, you configured a VPN connection between two networks with subnets in different regions. Then you verified the VPN connection by pinging VMs in different networks using their internal IP addresses.

You configured the VPN gateways and tunnels using the GCP Console. However, this approach obfuscated the creation of forwarding rules, which you explored with the command line button in the Console. This can help in troubleshooting a configuration.

End your lab