# VPC Networking

### Objectives

* Explore the default VPC network
* Create an auto mode network with firewall rules
* Convert an auto mode network to a custom mode network
* Create custom mode VPC networks with firewall rules
* Create VM instances using Compute Engine
* Explore the connectivity for VM instances across VPC networks

## **Task 1. Explore the default network**

### View the subnets

Use this command to view the subnets in the default network

gcloud compute networks subnets list | grep default

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### View the routes

Use this command to view the routes in the VPC

gcloud compute routes list

### View the firewall rules

Use this command to view the firewall rules in the project

gcloud compute firewall-rules list

### Delete the Firewall rules

Use this command to delete the firewall rules in the project

gcloud compute firewall-rules /\*/

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### Delete the default network

Use this command to delete the default network.

gcloud compute networks delete default

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### Try to create a VM instance

If you try to create a VM, the command will fail because you do not have a VPC in the current project.

gcloud compute instances create my-vm --zone us-central1-b

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## **Task 2. Create an auto mode network**

### Create an auto mode VPC network with firewall rules

gcloud compute networks create mynetwork --subnet-mode=auto

gcloud compute firewall-rules create allow-icmp --network=mynetwork --direction=INGRESS --priority=65534 --source-ranges=0.0.0.0/0 --action=ALLOW --rules=icmp

gcloud compute firewall-rules create allow-internal --network=mynetwork --direction=INGRESS --priority=65534 --source-ranges=10.128.0.0/9 --action=ALLOW --rules=all

gcloud compute firewall-rules create allow-rdp --network=mynetwork --direction=INGRESS --priority=65534 --source-ranges=0.0.0.0/0 --action=ALLOW --rules=tcp:3389

gcloud compute firewall-rules create allow-ssh --network=mynetwork --direction=INGRESS --priority=65534 --source-ranges=0.0.0.0/0 --action=ALLOW --rules=tcp:22

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### Create a VM instance in us-central1

Use this command to create a VM instance in us-central1-c of machine type n1-standard-1

gcloud compute instances create mynet-us-vm --network=mynetwork --zone=us-central1-c --machine-type=n1-standard-1

To verify that the **Internal IP** for the new instance was assigned from the IP address range for the subnet in **us-central1** (10.128.0.0/20), run

gcloud compute instances list | grep mynet-us-vm

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### Create a VM instance in europe-west1

Use this command to create a VM instance in europe-west1-c of machine type n1-standard-1

gcloud compute instances create mynet-eu-vm --network=mynetwork --zone=europe-west1-c --machine-type=n1-standard-1

To verify that the Internal IP for the new instance was assigned from the IP address range for the subnet in europe-west1 (10.132.0.0/20), run

gcloud compute instances list | grep mynet-eu-vm

### Verify connectivity for the VM instances

SSHinto mynet-us-vm

gcloud compute ssh mynet-us-vm --zone=us-central1-c

To test connectivity to **mynet-eu-vm**'s internal IP, run the following command, replacing **mynet-eu-vm**'s internal IP

ping -c 3

Repeat the same test by running the following:

ping -c 3 mynet-eu-vm

To test connectivity to mynet-eu-vm's external IP, run the following command, replacing MYNET-EU-VM-EXTERNAL-IP with mynet-eu-vm's external IP

ping -c 3 MYNET-EU-VM-EXTERNAL-IP

### Convert the network to a custom mode network

To convert the network from an auto mode network to a custom mode network, run the following command

gcloud compute networks update mynetwork --switch-to-custom-subnet-mode

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## **Task 3. Create custom mode networks**

### Create the managementnet network

The following command creates a VPC network named managementnet

gcloud compute networks create managementnet --subnet-mode=custom

The following command creates a subnet named managementsubnet-us in the managementnet network

gcloud compute networks subnets create managementsubnet-us --range=10.130.0.0/20 --network=managementnet --region=us-central1

### Create the privatenet network

The following command creates a VPC network named privatenet

gcloud compute networks create privatenet --subnet-mode=custom

The following command creates two subnets in the privatenet network

gcloud compute networks subnets create privatesubnet-us --network=privatenet --region=us-central1 --range=172.16.0.0/24

gcloud compute networks subnets create privatesubnet-eu --network=privatenet --region=europe-west1 --range=172.20.0.0/20

This command lists the networks in the current project.

gcloud compute networks list

This command lists all the subnets in the current project and sorts them by network.

gcloud compute networks subnets list --sort-by=NETWORK

### Create the firewall rules for managementnet

This command creates a firewall rule to allow SSH, ICMP, and RDP ingress traffic to VM instances on the managementnet network.

gcloud compute firewall-rules create managementnet-allow-icmp-ssh-rdp --direction=INGRESS --priority=1000 --network=managementnet --action=ALLOW --rules=tcp:22,tcp:3389,icmp --source-ranges=0.0.0.0/0

### Create the firewall rules for privatenet

This command creates a firewall rule to allow SSH, ICMP, and RDP ingress traffic to VM instances on the privatenet network.

gcloud compute firewall-rules create privatenet-allow-icmp-ssh-rdp --direction=INGRESS --priority=1000 --network=privatenet --action=ALLOW --rules=icmp,tcp:22,tcp:3389 --source-ranges=0.0.0.0/0

To list all the firewall rules (sorted by VPC network), run the following command:

gcloud compute firewall-rules list --sort-by=NETWORK

To see a more comprehensive list, you can add the tag --format json

### Create the managementnet-us-vm instance

To create a VM instance in the managementsubnet-us subnet, run

gcloud compute instances create managementnet-us-vm --zone us-central1-c --machine-type=f1-micro --subnet=managementsubnet-us

### Create the privatenet-us-vm instance

To create a VM instance in the privatesubnet-us subnet, run

gcloud compute instances create privatenet-us-vm --zone=us-central1-c --machine-type=f1-micro --subnet=privatesubnet-us

To list all the VM instances (sorted by zone), run the following command:

gcloud compute instances list --sort-by=ZONE

## **Task 4. Explore the connectivity across networks**

To get the internal and external IP addresses of mynet-eu-vm, managementnet-us-vm, and privatenet-us-vm, run:

gcloud compute instances list

### Ping the external IP addresses

SSH into mynet-eu-vm and ping the external IP address of the three VMs

gcloud compute ssh mynet-us-vm --zone=us-central1-c

ping -c 3 MYNET-EU-VM-EXTERNAL-IP

ping -c 3 MANAGEMENTNET-US-VM-EXTERNAL-IP

ping -c 3 PRIVATENET-US-VM-EXTERNAL-IP

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### Ping the internal IP addresses

While still in the SSH shell of mynet-eu-vm, ping the internal IP address of the three VMs

ping -c 3 MYNET-EU-VM-INTERNAL-IP

ping -c 3 MANAGEMENTNET-US-VM-INTERNAL-IP

ping -c 3 PRIVATENET-US-VM-INTERNAL-IP