

Assignment 2, Cloud Computing

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Topic: Exploring Google Cloud Services

Objectives

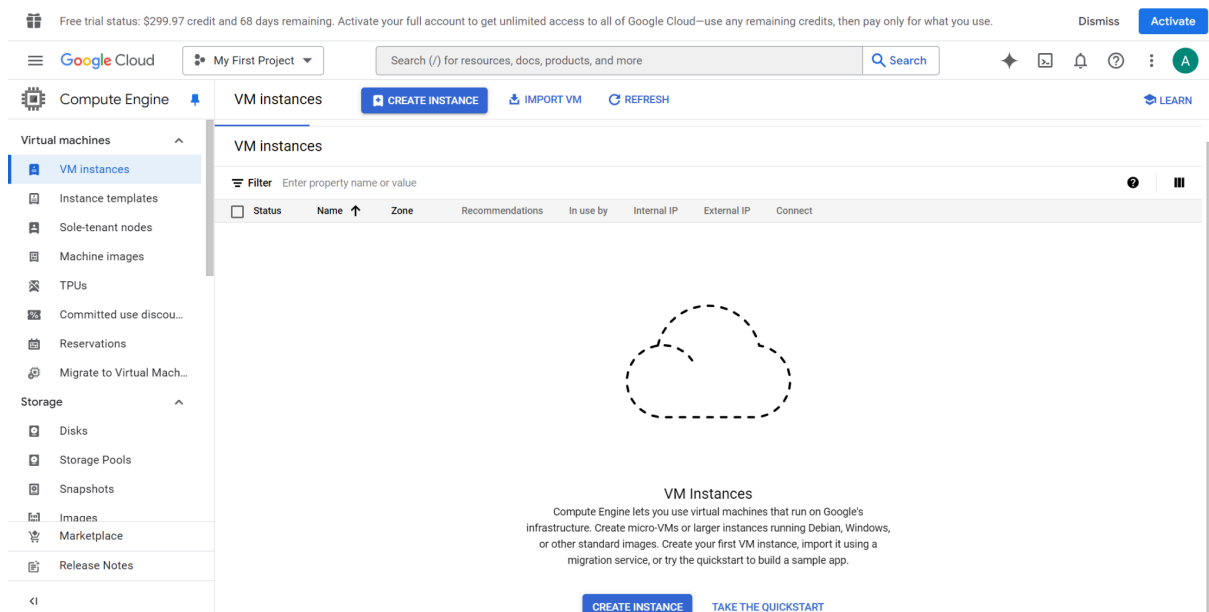
To adjust existing network interface configurations, including changing IP addresses and subnet assignments. To verify that the VM instance maintains connectivity to external networks and can communicate with other resources within the Google Cloud environment. To enhance the networking capabilities of a Virtual Machine (VM) instance by adding one or more secondary network interfaces

1. Virtual Machines in Google Cloud

- **Create a Virtual Machine (VM) Instance**
 - Use the Google Cloud Console to create a VM instance.
 - Select an appropriate machine type, operating system, and region.
 - Configure the firewall to allow SSH traffic.

Steps:

Creating VM instance



Free trial status: \$299.97 credit and 68 days remaining. Activate your full account to get unlimited access to all of Google Cloud—use any remaining credits, then pay only for what you use.

Dismiss

Activate

☰

Google Cloud

My Project

Search (/) for resources, docs, products, and more

Search

✦

🔍

🔔

?

⋮

👤

←

Create an instance

CREATE VM FROM...

EQUIVALENT CODE

⌵

New VM instance

Create a single VM instance from scratch

New VM instance from template

Create a single VM instance from an existing template

New VM instance from machine image

Create a single VM instance from an existing machine image

Marketplace

Deploy a ready-to-go solution onto a VM instance

Name *

Instance-20241015-aiua

?

MANAGE TAGS AND LABELS

Region *

us-central1 (Iowa)

?

Zone *

us-central1-a

?

Region is permanent

Zone is permanent

Monthly estimate

\$7.11

That's about \$0.01 hourly

Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 1 GB memory	\$6.11
10 GB balanced persistent disk	\$1.00
Total	\$7.11

[Compute Engine pricing](#)

↗ LESS

Machine configuration

NEW: Google Axion virtual machines in Preview

Try Google Axion Arm-based Processors. Sign up for early access now

SIGN UP

General purpose

Compute optimized

Memory optimized

Storage optimized

GPUs

Machine types for common workloads, optimized for cost and flexibility

Series	Description	vCPUs	Memory	Platform
<input checked="" type="radio"/> C4	Consistently high performance	2 - 192	4 - 1,498 GB	Intel Emerald Rapids
<input type="radio"/> N4	Flexible & cost-optimized	2 - 80	4 - 640 GB	Intel Emerald Rapids
<input type="radio"/> C3	Consistently high performance	4 - 192	8 - 1,536 GB	Intel Sapphire Rapids

CREATE

CANCEL

EQUIVALENT CODE

Add tags and firewall rules to allow specific network traffic from the Internet

- ☒ Allow HTTP traffic
- ☒ Allow HTTPS traffic
- ☐ Allow Load Balancer Health Checks

- Use the SSH option from the Cloud Console to connect to your VM.
- Install a web server (e.g., Apache or Nginx) on the VM.
- Create a simple HTML page to serve as a test.

VM instances

CREATE INSTANCE

IMPORT VM

REFRESH

INSTANCES

OBSERVABILITY

INSTANCE SCHEDULES

VM instances

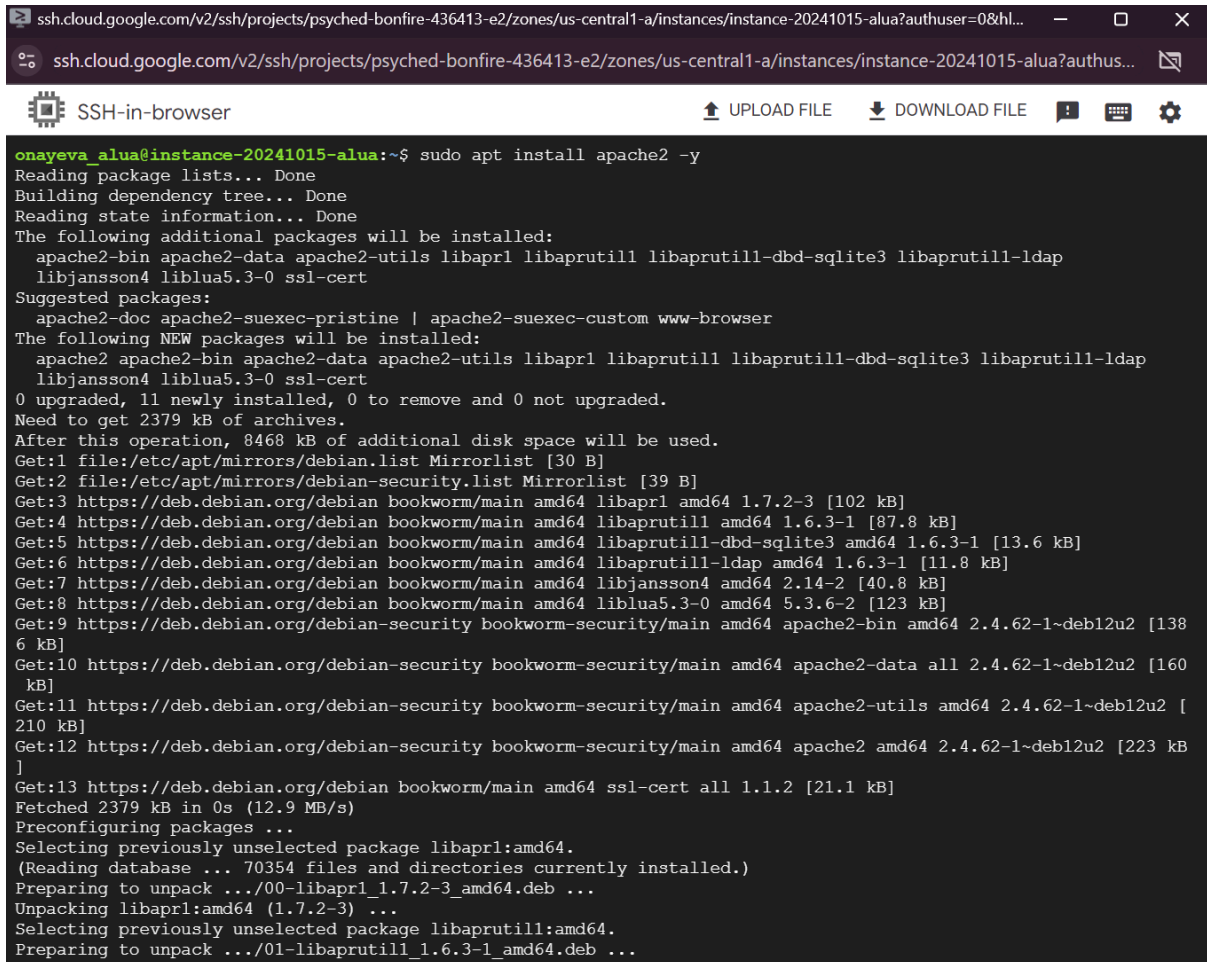
Filter

Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	✓	instance-20241015-alua	us-central1-a			10.128.0.6 (nic0)	104.154.81.36 (nic0)	SSH

Installing apache

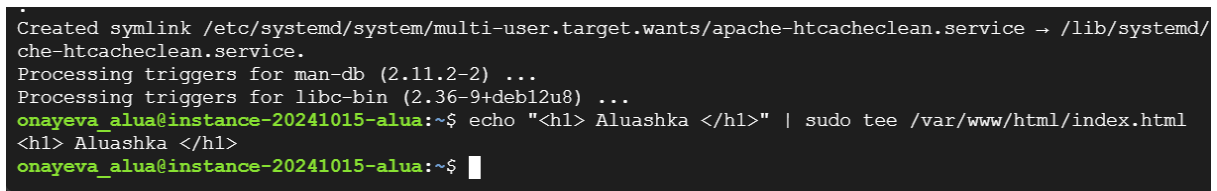
sudo apt install apache2 -y



```
onayeva_alua@instance-20241015-alua:~$ sudo apt install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap
  libjansson4 liblua5.3-0 ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap
  libjansson4 liblua5.3-0 ssl-cert
0 upgraded, 11 newly installed, 0 to remove and 0 not upgraded.
Need to get 2379 kB of archives.
After this operation, 8468 kB of additional disk space will be used.
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:2 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Get:3 https://deb.debian.org/debian bookworm/main amd64 libapr1 amd64 1.7.2-3 [102 kB]
Get:4 https://deb.debian.org/debian bookworm/main amd64 libaprutil1 amd64 1.6.3-1 [87.8 kB]
Get:5 https://deb.debian.org/debian bookworm/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.3-1 [13.6 kB]
Get:6 https://deb.debian.org/debian bookworm/main amd64 libaprutil1-ldap amd64 1.6.3-1 [11.8 kB]
Get:7 https://deb.debian.org/debian bookworm/main amd64 libjansson4 amd64 2.14-2 [40.8 kB]
Get:8 https://deb.debian.org/debian bookworm/main amd64 liblua5.3-0 amd64 5.3.6-2 [123 kB]
Get:9 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2-bin amd64 2.4.62-1~deb12u2 [138
6 kB]
Get:10 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2-data all 2.4.62-1~deb12u2 [160
kB]
Get:11 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2-utils amd64 2.4.62-1~deb12u2 [
210 kB]
Get:12 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2 amd64 2.4.62-1~deb12u2 [223 kB
]
Get:13 https://deb.debian.org/debian bookworm/main amd64 ssl-cert all 1.1.2 [21.1 kB]
Fetched 2379 kB in 0s (12.9 MB/s)
Preconfiguring packages ...
Selecting previously unselected package libapr1:amd64.
(Reading database ... 70354 files and directories currently installed.)
Preparing to unpack .../00-libapr1_1.7.2-3_amd64.deb ...
Unpacking libapr1:amd64 (1.7.2-3) ...
Selecting previously unselected package libaprutil1:amd64.
Preparing to unpack .../01-libaprutil1_1.6.3-1_amd64.deb ...
```

We use **Apache** if we need something easy to set up, especially for dynamic sites like those using PHP, or if we're working with older systems. **Nginx** is better if we're dealing with high traffic and want faster handling of static files.

HTML text:



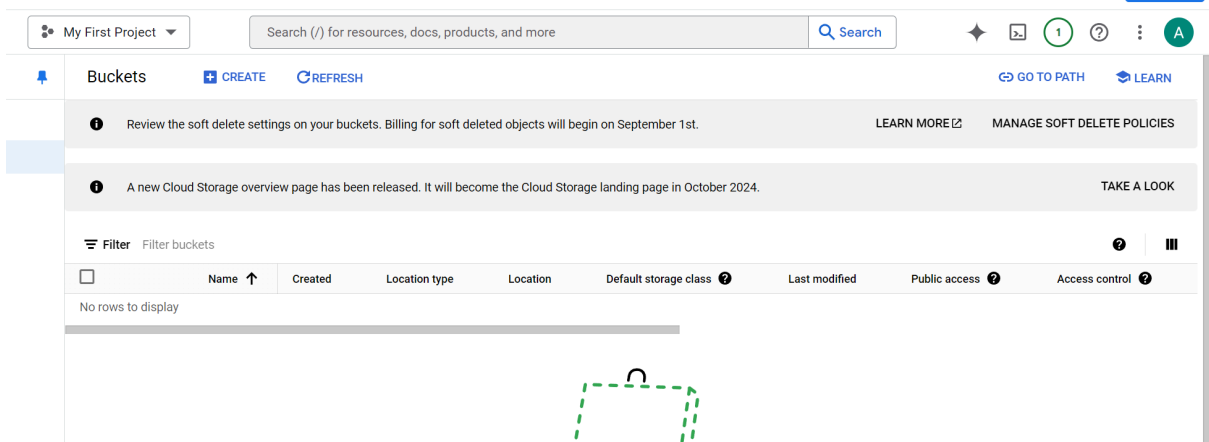
```
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/
che-htcacheclean.service.
Processing triggers for man-db (2.11.2-2) ...
Processing triggers for libc-bin (2.36-9+deb12u8) ...
onayeva_alua@instance-20241015-alua:~$ echo "<h1> Aluashka </h1>" | sudo tee /var/www/html/index.html
<h1> Aluashka </h1>
onayeva_alua@instance-20241015-alua:~$
```

2. Storage Solutions in Google Cloud

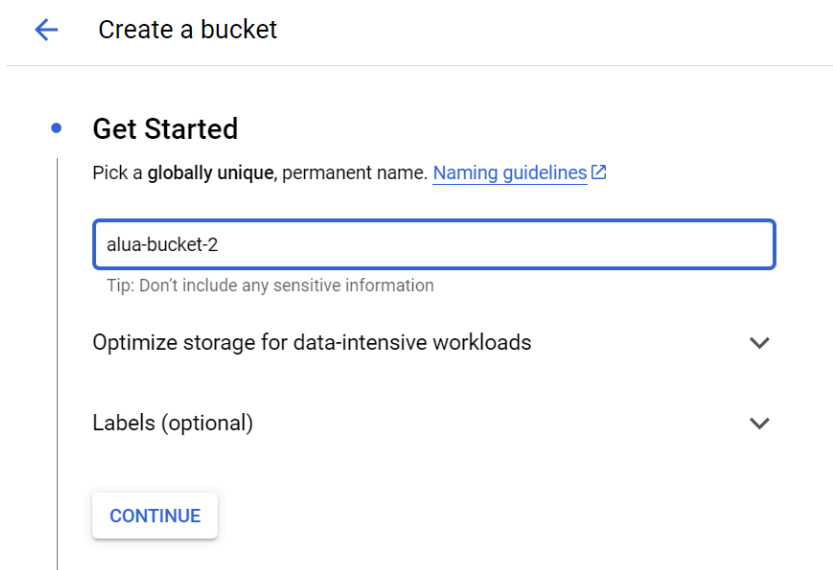
- **Create a Cloud Storage Bucket**
 - Use the Google Cloud Console to create a Cloud Storage bucket.
 - Set the bucket's access controls (public/private).
 - Upload a sample file (e.g., image or document) to the bucket.

Steps:

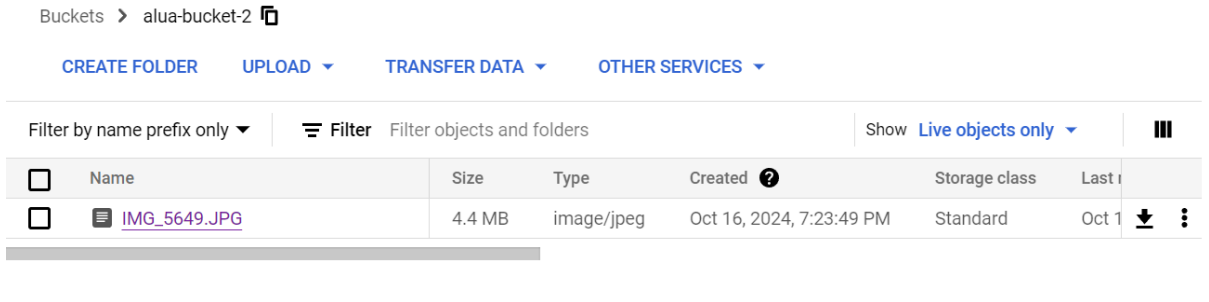
I go to **Cloud Storage** and press create button



Naming bucket



Uploaded image into the bucket



- **Implement Object Lifecycle Management**

- Set up a lifecycle rule for your bucket to automatically delete objects after a certain period (e.g., 30 days).

Steps:

So I go to 'Lifecycle' Tab and create new rule.

📁 **alua-bucket-2**

Location	Storage class	Public access	Protection
us (multiple regions in United States)	Standard	Not public	Soft Delete

OBJECTS CONFIGURATION PERMISSIONS PROTECTION **LIFECYCLE**

i After you add or edit a rule, it may take up to 24 hours to take effect.

Lifecycle rules let you apply actions to a bucket's objects when certain conditions are met — for example, switching objects to colder storage classes when they reach or pass a certain age. [Learn more](#)

If an object meets the conditions for multiple rules:

- Deletion takes precedence over a change in storage class.
- Changing objects to colder storage classes takes precedence over changing to warmer ones (ex. objects will switch to the Archive storage class instead of Coldline if there are rules for both).

Rules [ADD A RULE](#) DELETE ALL

Action	Object condition	Works with
You haven't added any lifecycle rules to this bucket.		

In conditions I am setting age as 30 days for the bucket.

! Select object conditions

This rule will apply the action to current and future objects or multi-part uploads that meet all the selected conditions below. [Learn more](#)

Set Rule Scopes

Use prefix and suffix rule scopes to filter objects by their paths. You can specify up to 50 prefix and 50 suffix matches per bucket, across all rules.

- ☐ Object name matches prefix
- ☐ Object name matches suffix

Set Conditions

- ☒ Age ?

30 days

Age is counted from when an object was uploaded to the current bucket, even if it moved from another

Lifecycle Management is used for backups in cases of accidents or cost optimization to delete objects after a certain period of time, ensuring unneeded or old data is removed.

3. Networking in Google Cloud

- **Set Up a Virtual Private Cloud (VPC)**
 - Create a new VPC network with subnets.
 - Configure firewall rules to allow traffic between your VM and the internet.

Steps:

Creating VPC after **alua-vpc**

← Create a VPC network

Name *
alua-vpc ?
Lowercase letters, numbers, hyphens allowed

And adding Subnets to it

^ New subnet ?

Name *
alua-subnet-1 ?
Lowercase letters, numbers, hyphens allowed

Description

Region *
asia-east1 ?

IP stack type
☒ IPv4 (single-stack)
☐ IPv4 and IPv6 (dual-stack) ?

IPv4 range *
10.0.0.0/24 ?
E.g. 10.0.0.0/24

CREATE SECONDARY IPV4 RANGE

We should note that even if we are choosing different regions, their subnet ranges should be different.

In the second subnet I am choosing 10.0.1.0/24

^

New subnet

Name *

alua-subnet-2

?

Lowercase letters, numbers, hyphens allowed

Description

Region *

asia-east1

▼

?

IP stack type

☒ IPv4 (single-stack)

☐ IPv4 and IPv6 (dual-stack)

?

IPv4 range *

10.0.1.0/24

?

E.g. 10.0.0.0/24

CREATE SECONDARY IPV4 RANGE

VPC is created

VPC networks							
<div><div>Filter</div><div>Enter property name or value</div></div>							
Name <div>↑</div>	Subnets	MTU <div>?</div>	Mode	IPv6 ULA range	Gateways	Firewall rules	Global dynamic routing
alua-vpc	2	1460	Custom			0	Off
default	42	1460	Auto			6	Off

In order to create Firewall rule, I choose 'Firewalls' tab

alua-vpc

<

OVERVIEW

SUBNETS

STATIC INTERNAL IP ADDRESSES

FIREWALLS

ADD FIREWALL RULE

DELETE

Filter

Enter property name or value

<input type="checkbox"/>	Name	Enforcement order <div>↑</div>	Type	Deployment scope	Rule
No results to display					

Create a firewall rule

Firewall rules control incoming or outgoing traffic to an instance. By default, incoming traffic from outside your network is blocked. [Learn more](#)

Name *

allow-internet-connect



Lowercase letters, numbers, hyphens allowed

Description

Logs

Turning on firewall logs can generate a large number of logs which can increase costs in Logging. [Learn more](#)

☐ On

☒ Off

Network *

alua-vpc



To allow SSH, am using port 22

☒ Specified protocols and ports

☐ TCP

Ports

E.g. 20, 50-60

☐ UDP

Ports

E.g. all

☐ SCTP

Ports

E.g. 20, 50-60

☒ Other

Protocols *

22

Separate multiple protocols by commas, e.g. ah, icmp

- **Connect VM to VPC**

- Ensure the VM created in the previous section is connected to the new VPC.
- Use the VM to ping an external server to verify connectivity.

Steps:

First of all, I need to stop VM instance

VM instances

Filter Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	✓	instance-20241015-alsa	us-central1-a			10.128.0.6 (nic0)	104.154.81.36 (nic0)	SSH

Related actions

🔍 Explore Backup and DR **NEW**

Back up your VMs and set up disaster recovery

📄 View billing report

View and manage your Compute Engine billing

📊 Monitor VMs

View outlier VMs across metrics like CPU and network

🔧 Set up firewall rules

Control traffic to and from a VM instance

🔄 Patch management

Schedule patch updates and view patch compliance on VM instances

⚖️ Load balance between VMs

Set up Load Balancing for your application as your traffic and users grow

- Start / Resume
- Stop
- Suspend
- Reset
- Delete
- Create a group based on this VM **PREVIEW**
- View network details
- Create new machine image
- View logs
- View monitoring

VM is stopped

VM instances

Filter Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recc
<input type="checkbox"/>	⏸	instance-20241015-alsa	us-central1-a	

Go to the instance, and press Edit and go to Network Interfaces

So I can use the default one or use created VPC

Network interfaces ?

Network interface is permanent

^ Edit network interface

Network *

default

▼

?

Subnetwork *

default IPv4 (10.128.0.0/20)

▼

?

i

To use IPv6, you need an IPv6 subnet range. [LEARN MORE](#)

⚠

You can change either IP Stack type or Network and Subnetwork in a single edit. Save and edit again if you need to change both settings.

IP stack type

☒ IPv4 (single-stack)

☐ IPv4 and IPv6 (dual-stack)

So I need to note that one of the VPC subnets and VM region's need to be the same, that's why I created third subnet

alua-vpc

<

OVERVIEW

SUBNETS

STATIC INTERNAL IP ADDRESSES

FIREW

Subnets

+

ADD SUBNET

≡

MANAGE FLOW LOGS

Filter

Enter property name or value

<input type="checkbox"/>	Name ↑	Region	Stack Type	Primary IPv4 range	Seco
<input type="checkbox"/>	alua-subnet-1	asia-east1	IPv4	10.0.0.0/24	
<input type="checkbox"/>	alua-subnet-2	asia-east1	IPv4	10.0.1.0/24	
<input type="checkbox"/>	alua-subnet-3	us-central1	IPv4 and IPv6	10.0.2.0/24	

And now I can choose my VPC, previously I had an error choosing Subnetwork (there were no available ones).

Network interfaces ?

Network interface is permanent

⌵

Edit network interface

Network *

alua-vpc

▼

?

Subnetwork *

alua-subnet-3 IPv4 (10.0.2.0/24) IPv6 External (2600:1900:4001:b83... ▼

?

ⓘ

To use IPv6, you need an IPv6 subnet range. [LEARN MORE](#)

⚠

You can change either IP Stack type or Network and Subnetwork in a single edit. Save and edit again if you need to change both settings.

IP stack type

☒ IPv4 (single-stack)

☐ IPv4 and IPv6 (dual-stack)

IP stack type

- ☒ IPv4 (single-stack)
- ☐ IPv4 and IPv6 (dual-stack)

Primary internal IPv4 address

Ephemeral (Custom)

▼

?

Custom ephemeral IP address *

10.0.2.0/24

! Enter a single address within subnet range 10.0.2.0/24

Alias IP ranges

[+ ADD IP RANGE](#)

External IPv4 address

Ephemeral

▼

?

so i enter 10.0.2.2

Custom ephemeral IP address *

10.0.2.2

And after changing, I am starting VM instance

I faced this kind of error.

Connection via Cloud Identity-Aware Proxy Failed

Code: 4003

Reason: failed to connect to backend

Connection to VM is refused.

Please ensure that:

- VM has a [firewall rule](#) that allows TCP ingress traffic from the IP range 35.235.240.0/20, port: 22
- SSH daemon on target VM is up and running

You may be able to connect without using the Cloud Identity-Aware Proxy.

[Retry](#) [Retry without Cloud Identity-Aware Proxy](#) [Troubleshoot](#)

Created a new Firewall rule with above requirements, but it didn't work so now I connect to the serial console.

`gcloud compute ssh alua@instance-20241510 --zone=us-central1-a`

The screenshot shows the Google Cloud Platform console. On the left, the 'Compute Engine' sidebar is open, showing 'Virtual machines' and 'VM instances'. The main area displays a list of VM instances for 'instance-20241015-alua'. Below this, a 'Serial port 1' window is open, showing a terminal output. The terminal output includes several warning messages about SSH key generation and a final error message: 'ERROR: (gcloud.compute.ssh) SSH key generation aborted by user.' The terminal also shows the command 'gcloud compute ssh alua@instance-20241015-alua --zone=us-central1-a' being executed.

But at the end, it didn't work out, so I connect to the default VPC, instead of VPC previously created by me and going to SSH terminal

and I am pinging external server

ping 8.8.8.8

As we can now it's connected

SSH-in-browser

UPLOAD FILE

DOWNLOAD FILE

```
Linux instance-20241016-alua2 6.1.0-26-cloud-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.1.112-1 (2024-09-30) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
onayeva_alua@instance-20241016-alua2:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=118 time=3.05 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=118 time=0.338 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=118 time=0.386 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=118 time=0.299 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=118 time=0.313 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=118 time=0.354 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=118 time=0.461 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=118 time=0.287 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=118 time=0.418 ms
64 bytes from 8.8.8.8: icmp_seq=10 ttl=118 time=0.294 ms
64 bytes from 8.8.8.8: icmp_seq=11 ttl=118 time=0.314 ms
64 bytes from 8.8.8.8: icmp_seq=12 ttl=118 time=0.317 ms
64 bytes from 8.8.8.8: icmp_seq=13 ttl=118 time=0.377 ms
```