Experiment No. 03

Title: OpenStack Networking

Batch: B–1 **Roll No.: 16010422234** **Experiment No.: 03**

Aim: Create a private network for OpenStack (IaaS)

Resources needed: OpenStack

Prerequisite: Knowledge of Client Server communication

Theory:

OpenStack is an open-source cloud computing platform that provides **Infrastructure-as-a-Service (IaaS)**. Its networking component, **Neutron**, allows users to create and manage virtual networks, enabling communication between instances and external networks.

OpenStack networking consists of the following key concepts:

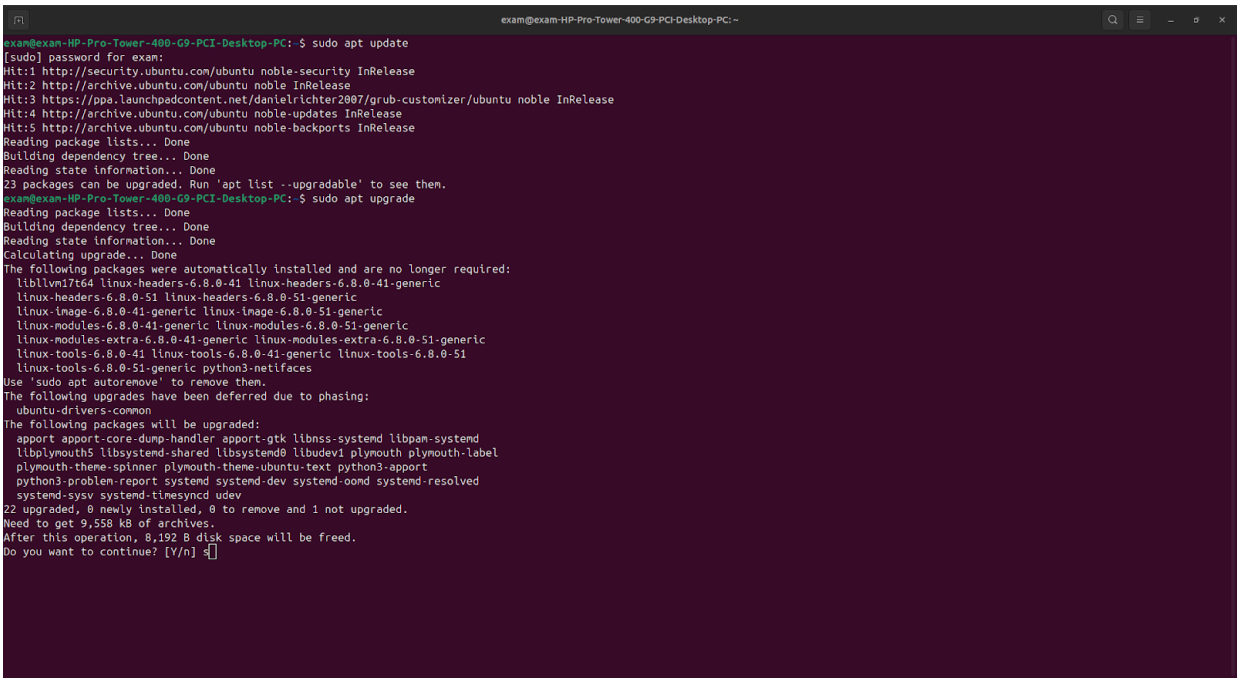
- **Networks:** Virtual networks that allow instances to communicate.
- **Subnets:** IP address pools assigned to networks.
- **Routers:** Used to connect private networks to external networks.
- **Floating IPs:** Public IPs assigned to instances for external access.
- **Security Groups:** Firewall rules to control traffic.

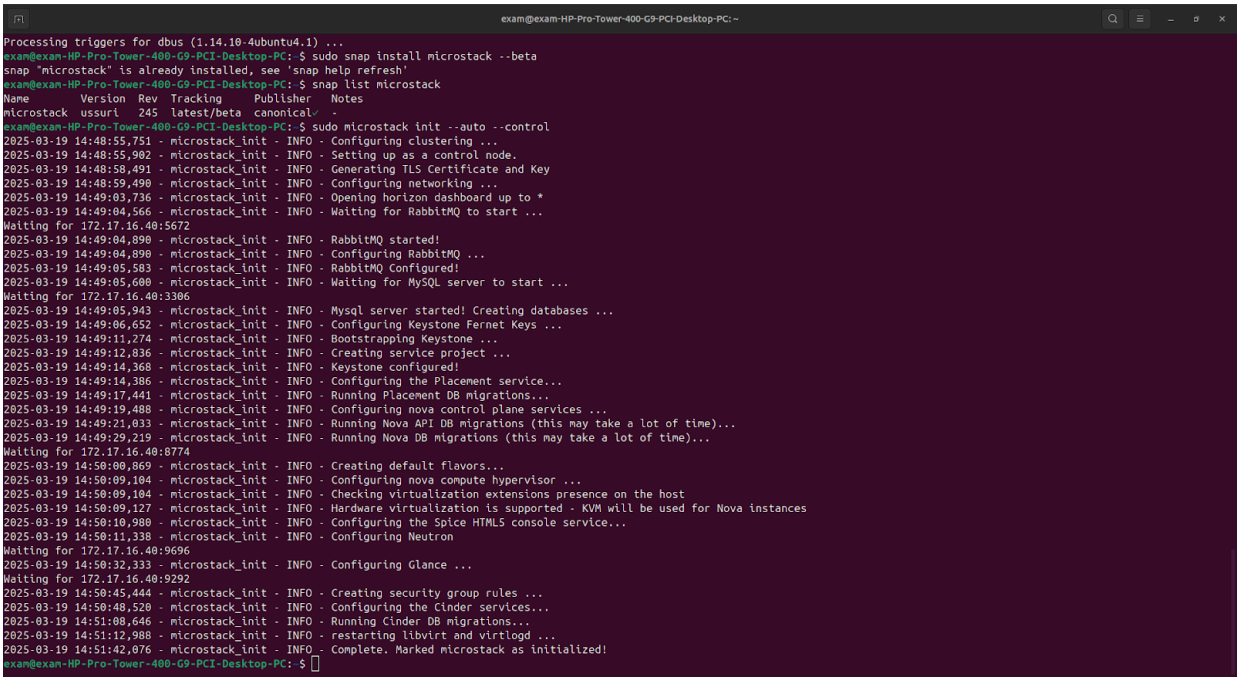
By creating a private network in OpenStack, users can ensure internal communication between instances while controlling access to external resources.

Procedure:

1. **Create a project**
2. **Create a User and Associate with Project**
3. **Upload a new image**
4. **Create a Private Network**
5. **Create a Route**
6. **Check network topology**

Result: (All steps with screenshots)



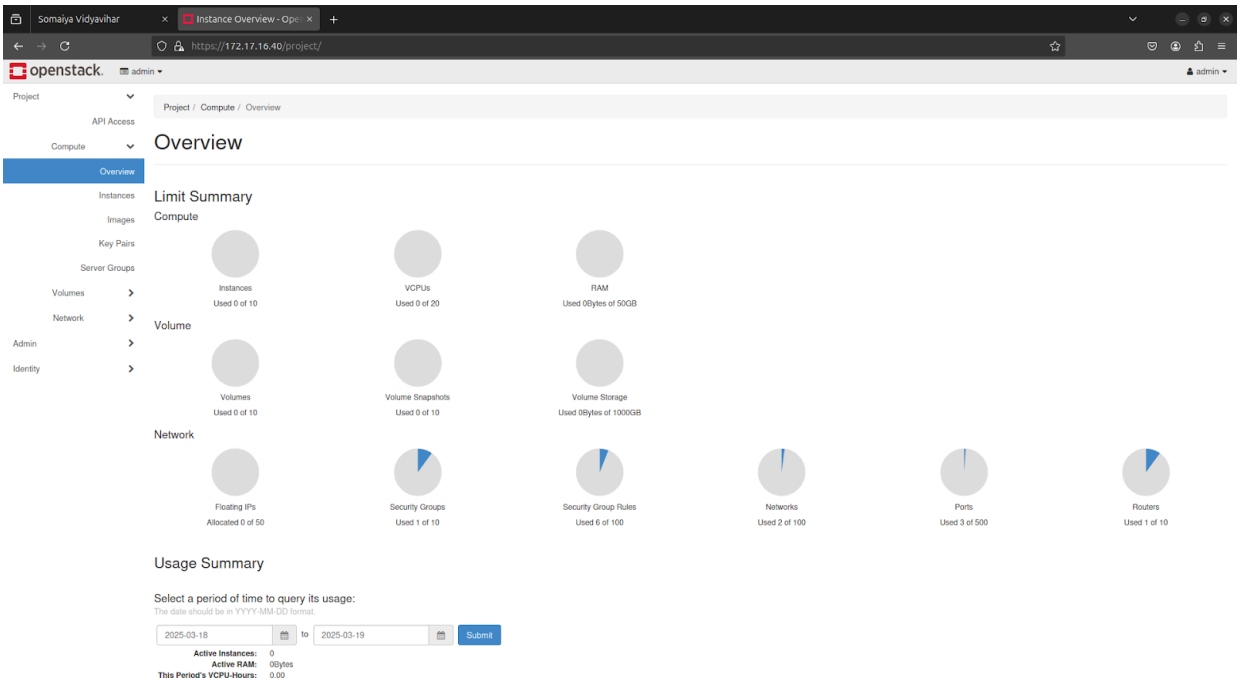


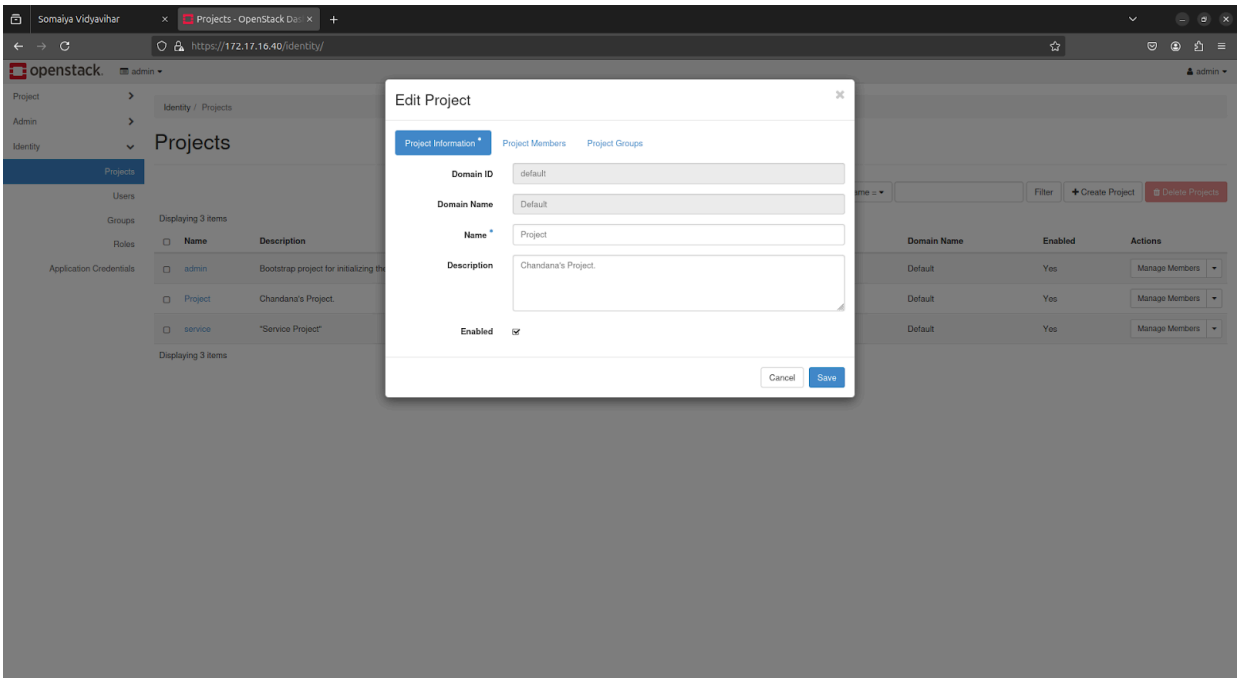
```
exam@exam-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~$ microstack.openstack --version
openstack 5.2.0
exam@exam-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~$ sudo snap get microstack config.credentials.keystone-password
o4J4xlqcNaid26FKDlCEU4ESnbo8NHGR
exam@exam-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
net-tools is already the newest version (2.10-0.1ubuntu4).
The following packages were automatically installed and are no longer required:
  libllvm17t64 linux-headers-6.8.0-41 linux-headers-6.8.0-41-generic linux-headers-6.8.0-51 linux-headers-6.8.0-51-generic linux-image-6.8.0-41-generic linux-image-6.8.0-51-generic
  linux-modules-6.8.0-41-generic linux-modules-6.8.0-51-generic linux-modules-extra-6.8.0-41-generic linux-modules-extra-6.8.0-51-generic linux-tools-6.8.0-41 linux-tools-6.8.0-41-generic
  linux-tools-6.8.0-51 linux-tools-6.8.0-51-generic python3-netifaces
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
exam@exam-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~$ ifconfig
br-ex: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.20.20.1  netmask 255.255.255.0  broadcast 0.0.0.0
        inet6 fe80::e4d8:eaff:feec:2145  prefixlen 64  scopeid 0x20<link>
        ether e6:d8:ea:ec:21:45  txqueuelen 1000  (Ethernet)
        RX packets 10  bytes 280 (280.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 96  bytes 14449 (14.4 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eno1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.16.40  netmask 255.255.254.0  broadcast 172.17.17.255
        inet6 fe80::36e3:e9c2:247e:aa76  prefixlen 64  scopeid 0x20<link>
        ether 28:c5:c8:7d:45:6e  txqueuelen 1000  (Ethernet)
        RX packets 98808  bytes 80967901 (80.9 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 28343  bytes 9342217 (9.3 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 19  memory 0x82280000-822a0000

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 101070  bytes 32932962 (32.9 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 101070  bytes 32932962 (32.9 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlp0s20f3: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
```

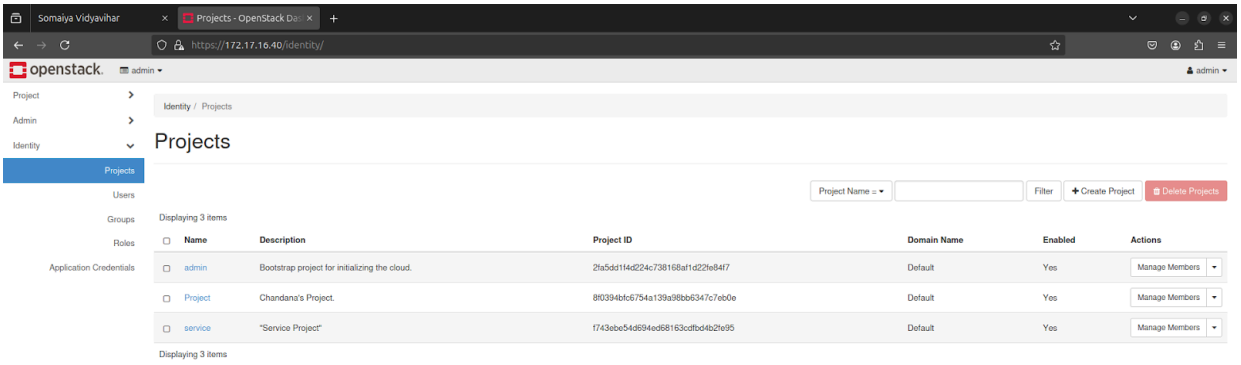
ID = admin

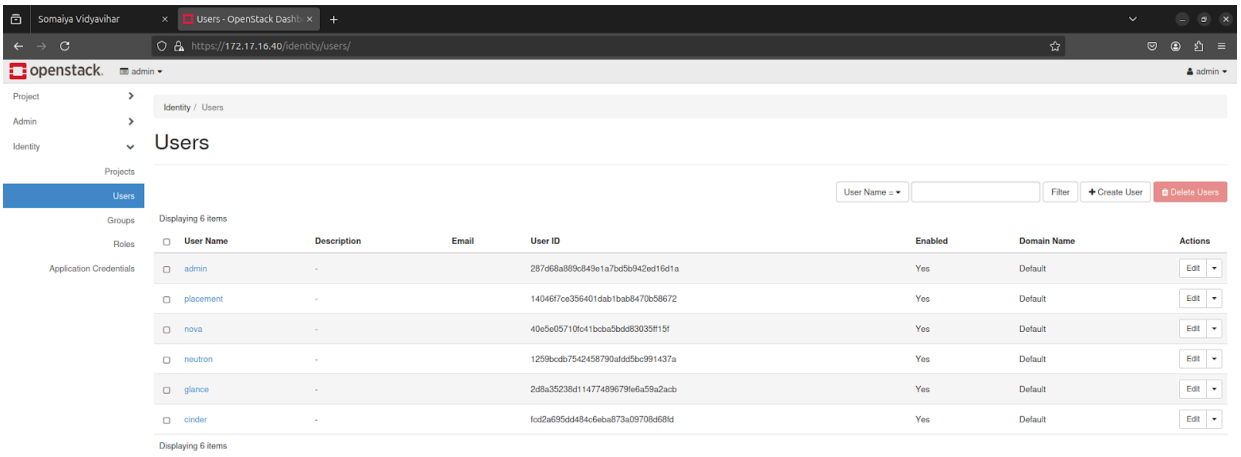
PASSWORD = o4J4xlqcNaid26FKDlCEU4ESnbo8NHGR

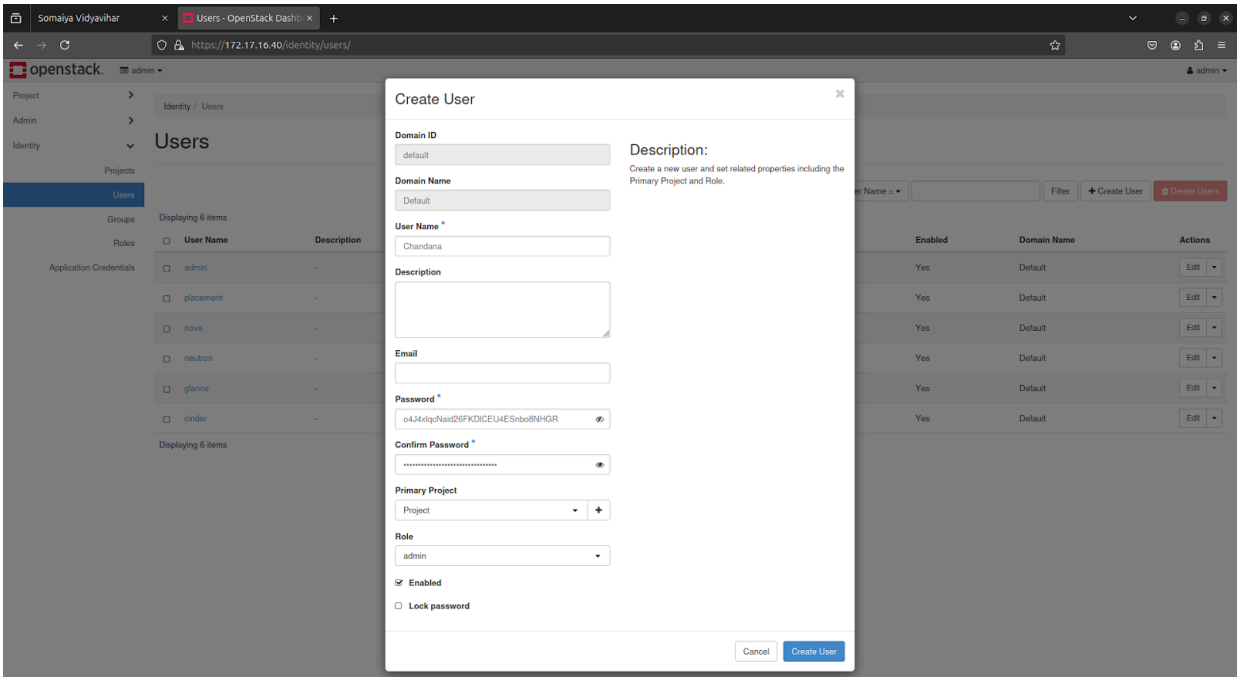
https://172.17.16.40/auth/login/?next=/project/

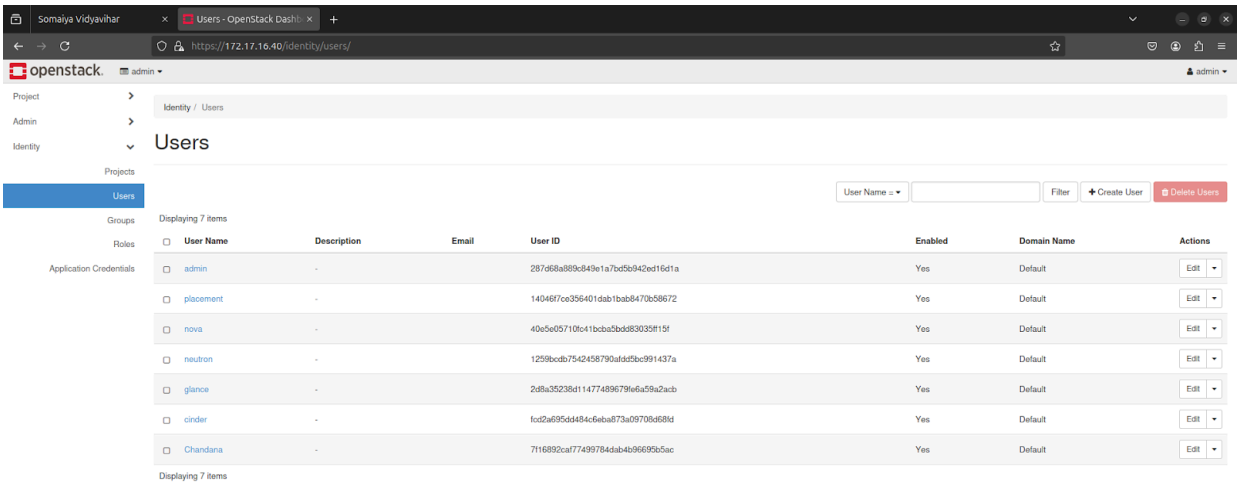


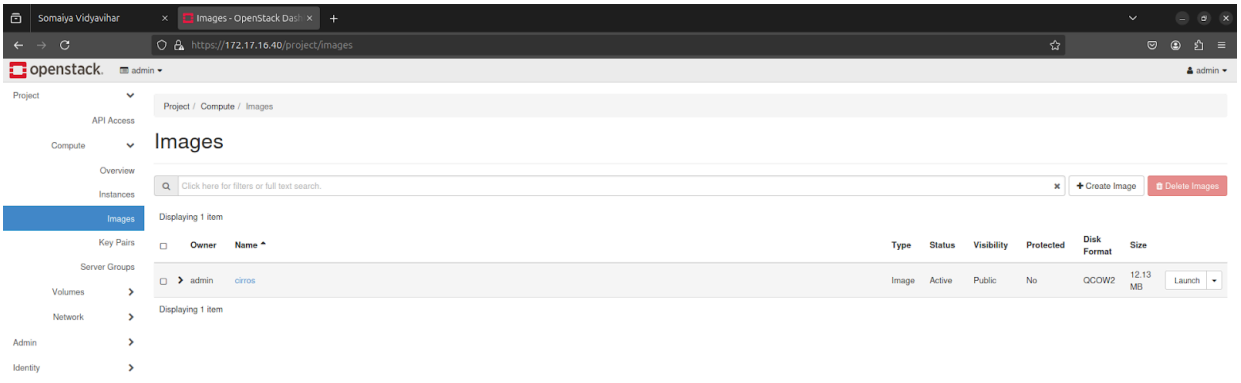

Somaiya Vidyavihar
Projects - OpenStack Da
https://172.17.16.40/identity/
openstack.
admin
Project
Admin
Identity
Projects
Users
Groups
Roles
Application Credentials
Identity / Projects
Projects
Displaying 3 items
Name
Description
admin
Bootstrap project for initializing th
Project
Chandana's Project.
service
"Service Project"
Displaying 3 items
Filter
+ Create Project
Delete Projects
Domain Name
Enabled
Actions
Default
Yes
Manage Members
Edit Project
Project Information *
Project Members
Project Groups
Domain ID
default
Domain Name
Default
Name *
Project
Description
Chandana's Project.
Enabled
Cancel
Save

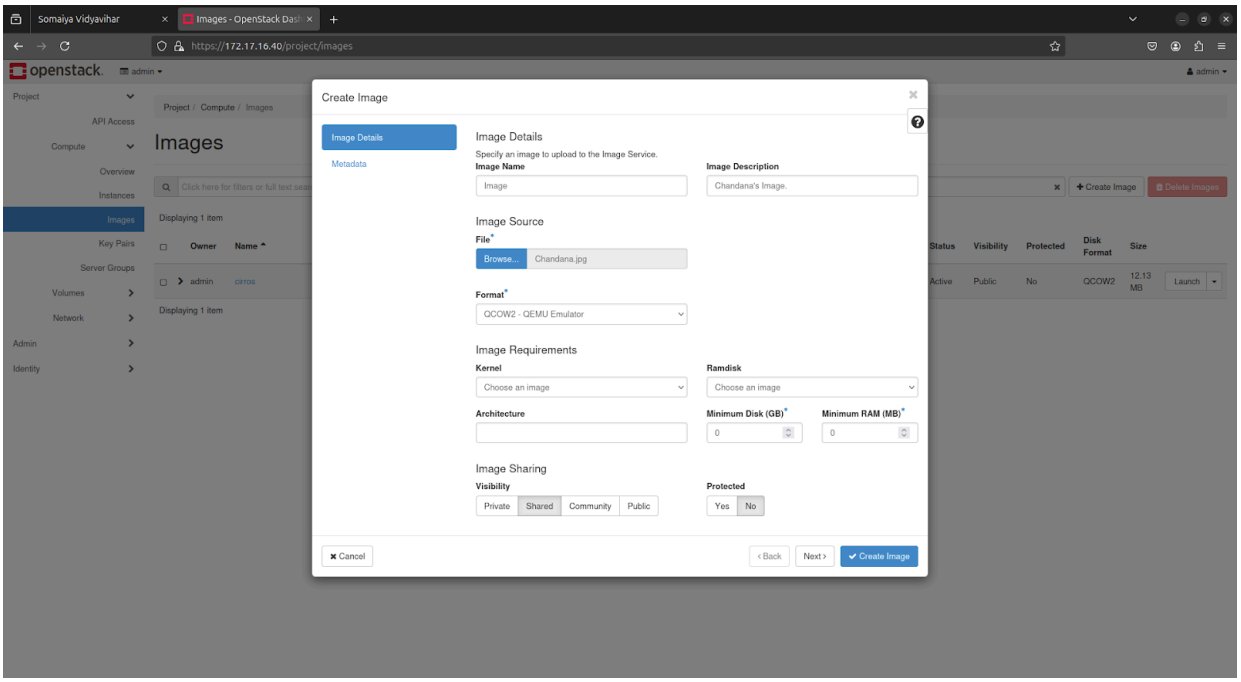

Somaiya Vidyavihar
Projects - OpenStack Da
https://172.17.16.40/identity/
openstack.
admin
Project
Admin
Identity
Projects
Users
Groups
Roles
Application Credentials
Identity / Projects
Projects
Project Name =
Filter
+ Create Project
Delete Projects
Displaying 3 items
Name
Description
Project ID
Domain Name
Enabled
Actions
admin
Bootstrap project for initializing the cloud.
2fa5dd1f4d224c738168af1d22fe84f7
Default
Yes
Manage Members
Project
Chandana's Project.
8f0394bfc6754a139a98bb6347c7eb0e
Default
Yes
Manage Members
service
"Service Project"
f743ebe54d894ed68163cdfbd4b2fe95
Default
Yes
Manage Members
Displaying 3 items


Somaiya Vidyavihar
Users - OpenStack Dashb
https://172.17.16.40/identity/users/
openstack.
admin
Project
Admin
Identity
Projects
Users
Groups
Roles
Application Credentials
Identity / Users
Users
User Name =
Filter
+ Create User
Delete Users
Displaying 6 items
User Name
Description
Email
User ID
Enabled
Domain Name
Actions
admin
287d68a889c849e1a7bd5b942ed16d1a
Yes
Default
Edit
placement
14046f7ce356401dab1bab8470b58672
nova
40e5e05710fc41bcba5bdd83035ff15f
neutron
1259bcdb7542458790afdd5bc991437a
glance
2d8a35238d11477489679fe6a59a2acb
cinder
fcd2a695dd484c6eba873a09708d68fd
Displaying 6 items


Somaiya Vidyavihar
Users - OpenStack Dashb
https://172.17.16.40/identity/users/
openstack.
admin
Create User
Domain ID
default
Domain Name
Default
User Name *
Chandana
Description
Email
Password *
o4J4xlqcNaid26FKDICEU4ESnbo8NHGR
Confirm Password *
Primary Project
Project
Role
admin
Enabled
Lock password
Description:
Create a new user and set related properties including the Primary Project and Role.
Cancel
Create User


Somaiya Vidyavihar
Users - OpenStack Dashb
https://172.17.16.40/identity/users/
openstack.
admin
Project
Admin
Identity
Projects
Users
Groups
Roles
Application Credentials
Identity / Users
Users
User Name =
Filter
+ Create User
Delete Users
Displaying 7 items
User Name
Description
Email
User ID
Enabled
Domain Name
Actions
admin
287d68a889c849e1a7bd5b942ed16d1a
Yes
Default
Edit
placement
14046f7ce356401dab1bab8470b58672
Yes
Default
Edit
nova
40e5e05710fc41bcba5bdd83035ff15f
Yes
Default
Edit
neutron
1259bcdb7542458790afdd5bc991437a
Yes
Default
Edit
glance
2d8a35238d11477489679fe6a59a2acb
Yes
Default
Edit
cinder
fcd2a695dd484c6eba873a09708d68fd
Yes
Default
Edit
Chandana
7f16892caf77499784dab4b96695b5ac
Yes
Default
Edit
Displaying 7 items


Somaiya Vidyavihar
Images - OpenStack Dash
https://172.17.16.40/project/images
openstack.
admin
Project
API Access
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Volumes
Network
Admin
Identity
Project / Compute / Images
Images
Click here for filters or full text search.
+ Create Image
Delete Images
Displaying 1 item
Owner
Name
Type
Status
Visibility
Protected
Disk Format
Size
admin
cirros
Image
Active
Public
No
QCOW2
12.13 MB
Launch
Displaying 1 item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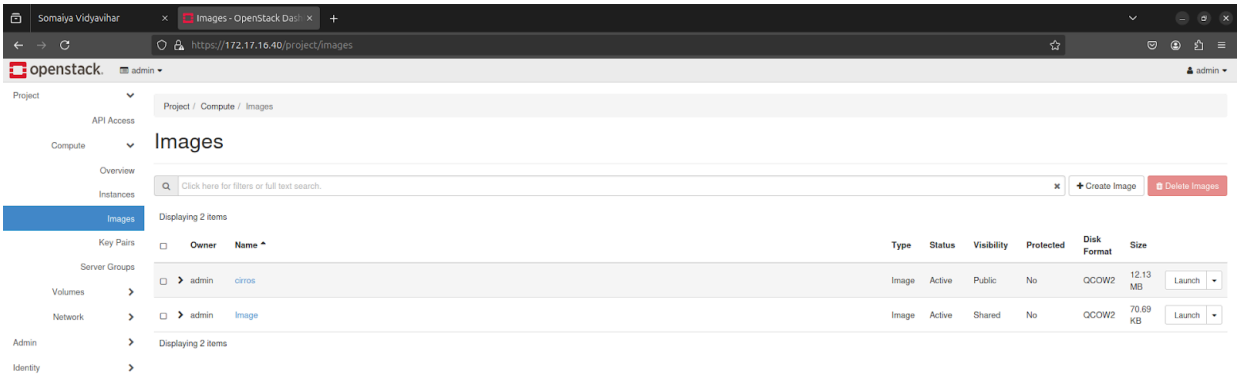
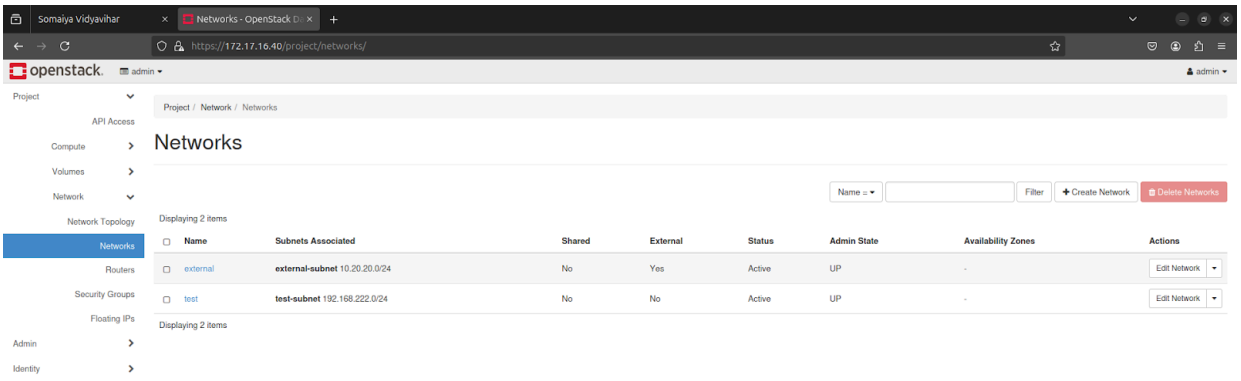
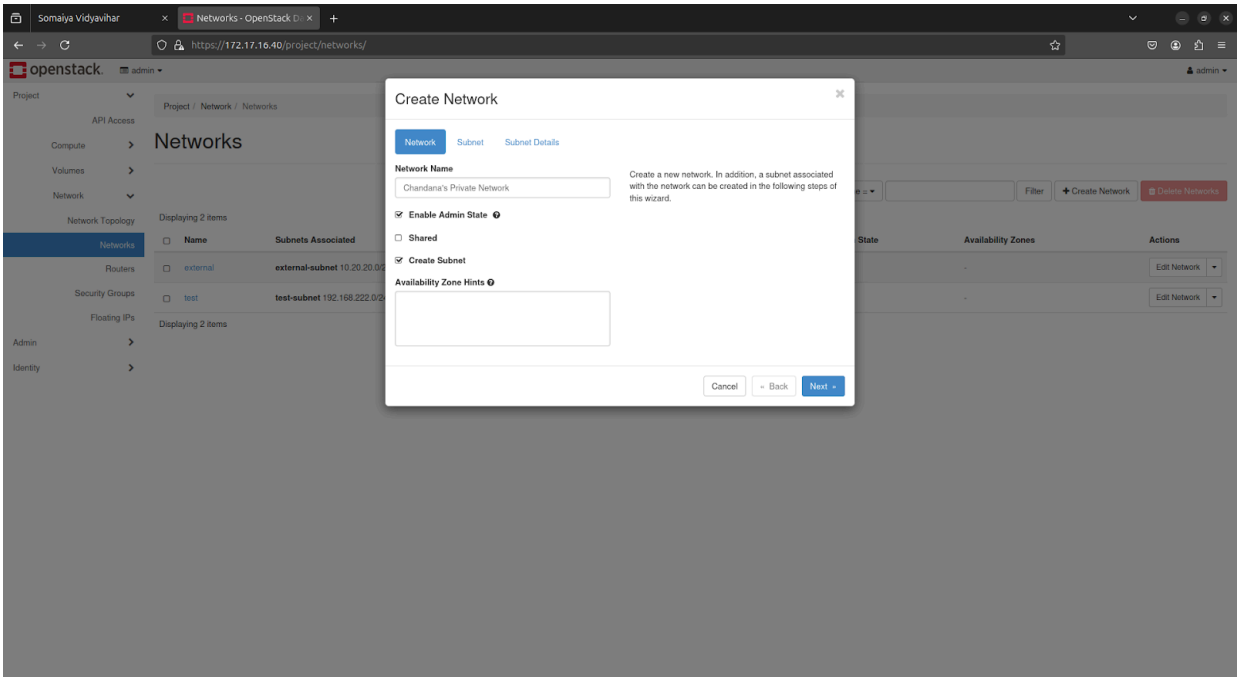
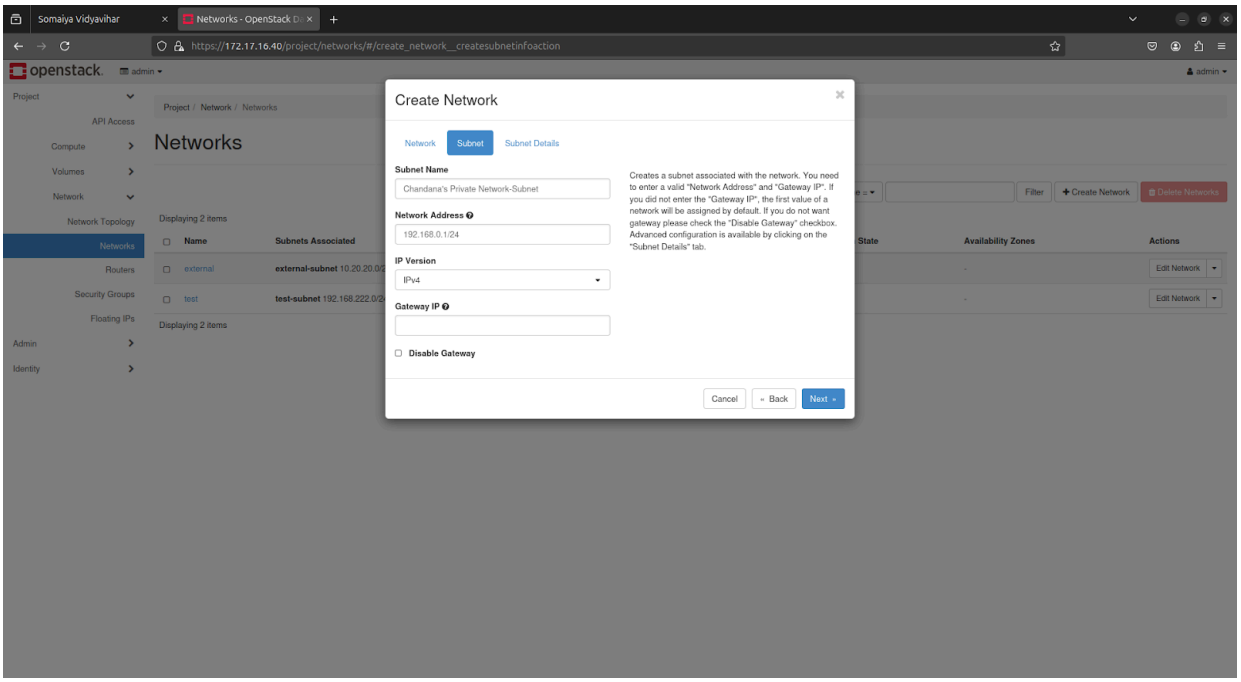
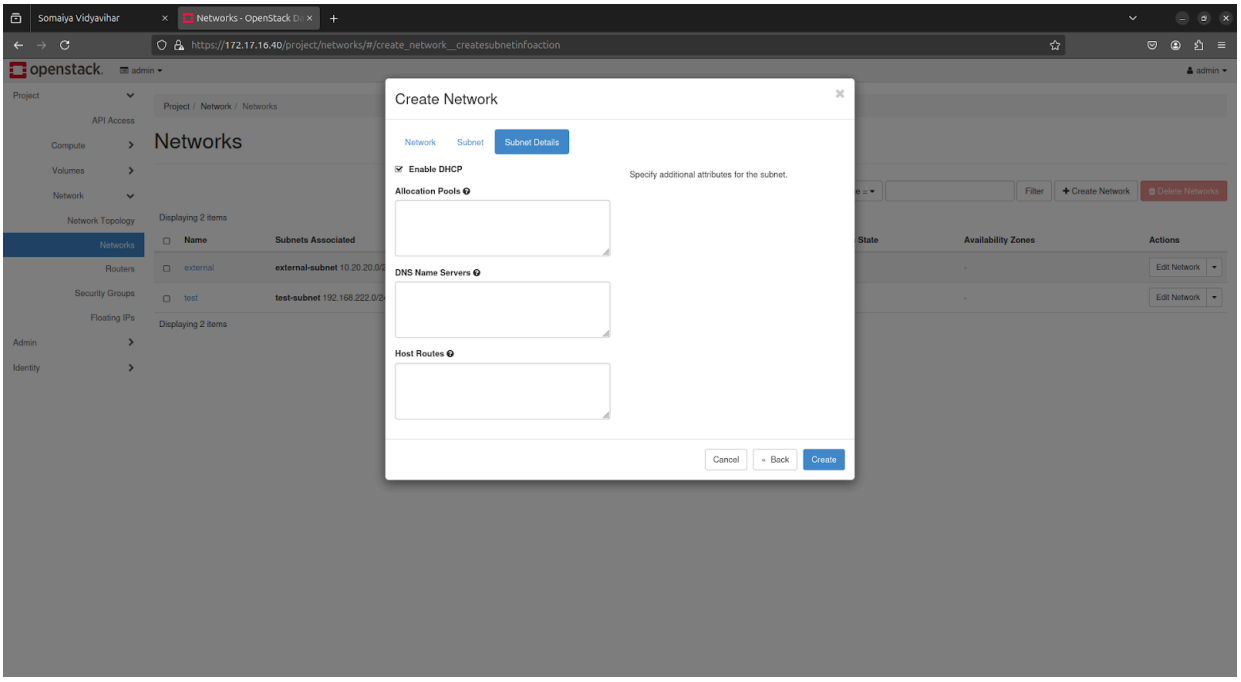
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Volumes
Network
Admin
Identity
Project / Compute / Images
Images
Displaying 1 item
Owner
Name
admin
cirros
Create Image
Image Details
Metadata
Image Details
Specify an image to upload to the Image Service.
Image Name
Image
Image Description
Chandana's Image.
Image Source
File*
Browse...
Chandana.jpg
Format*
QCOW2 - QEMU Emulator
Image Requirements
Kernel
Choose an image
Ramdisk
Choose an image
Architecture
Minimum Disk (GB)*
Minimum RAM (MB)*
Image Sharing
Visibility
Private
Shared
Community
Public
Protected
Yes
No
Cancel
Back
Next
Create Image
Status
Visibility
Protected
Disk Format
Size
Active
Public
No
QCOW2
12.13 MB
Launch
Create Image
Delete Images

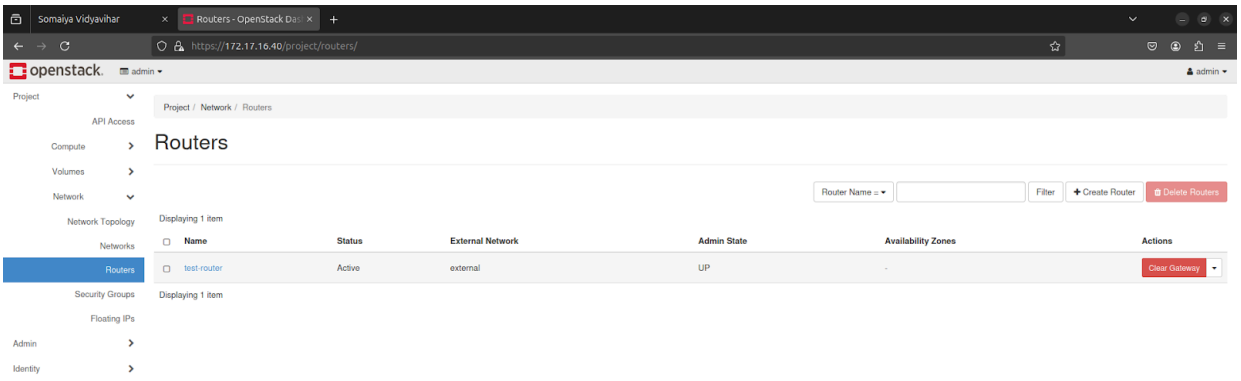

Somaiya Vidyavihar
Images - OpenStack Das
https://172.17.16.40/project/images
openstack.
admin
Project
API Access
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Volumes
Network
Admin
Identity
Project / Compute / Images
Images
Click here for filters or full text search.
Create Image
Delete Images
Displaying 2 items
Owner
Name
Type
Status
Visibility
Protected
Disk Format
Size
admin
cirros
Image
Active
Public
No
QCOW2
12.13 MB
Launch
admin
Image
Image
Active
Shared
No
QCOW2
70.69 KB
Launch
Displaying 2 items

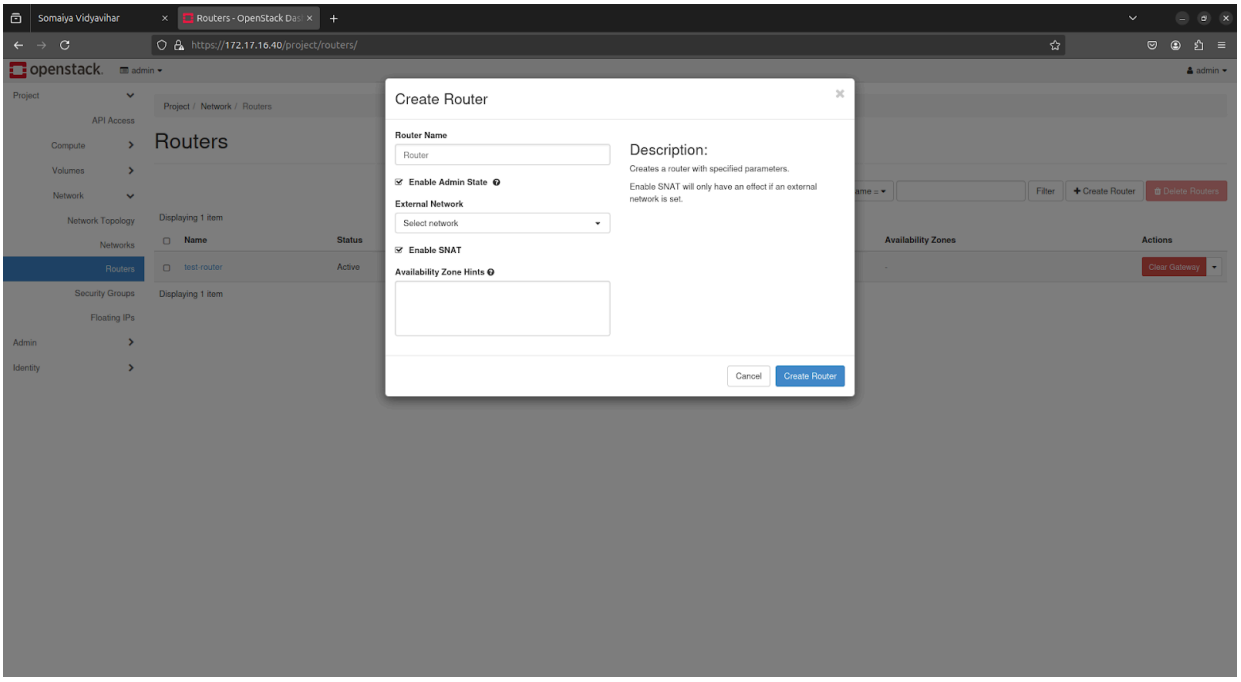

Somaiya Vidyavihar
Networks - OpenStack
https://172.17.16.40/project/networks/
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Networks
Networks
Name
Filter
Create Network
Delete Networks
Displaying 2 items
Name
Subnets Associated
Shared
External
Status
Admin State
Availability Zones
Actions
external
external-subnet 10.20.20.0/24
No
Yes
Active
UP
Edit Network
test
test-subnet 192.168.222.0/24
No
No
Active
UP
Edit Network
Displaying 2 items

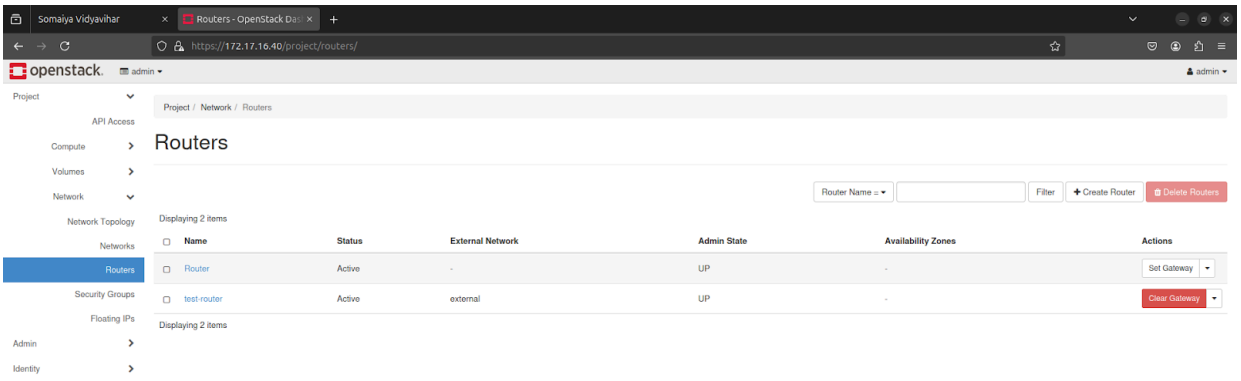

Somaiya Vidyavihar
Networks - OpenStack
https://172.17.16.40/project/networks/
openstack.
admin
Networks
Create Network
Network
Subnet
Subnet Details
Network Name
Chandana's Private Network
Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.
Enable Admin State
Shared
Create Subnet
Availability Zone Hints
Cancel
« Back
Next »

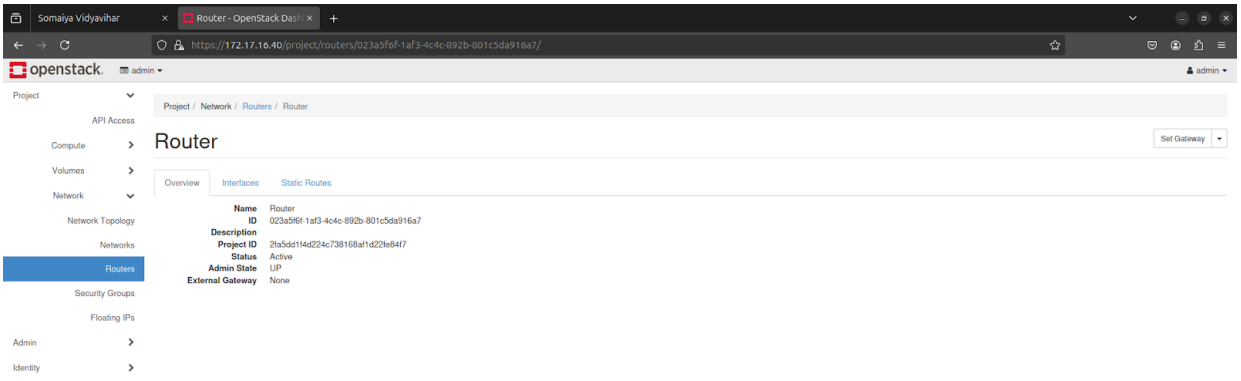

Somaiya Vidyavihar
Networks - OpenStack
https://172.17.16.40/project/networks/#/create_network__createsubnetinfoaction
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Networks
Networks
Displaying 2 items
Name
Subnets Associated
external
external-subnet 10.20.20.0/2
test
test-subnet 192.168.222.0/2
Filter
+ Create Network
Delete Networks
State
Availability Zones
Actions
Edit Network
Create Network
Network
Subnet
Subnet Details
Subnet Name
Chandana's Private Network-Subnet
Network Address
192.168.0.1/24
IP Version
IPv4
Gateway IP
Disable Gateway
Creates a subnet associated with the network. You need to enter a valid "Network Address" and "Gateway IP". If you did not enter the "Gateway IP", the first value of a network will be assigned by default. If you do not want gateway please check the "Disable Gateway" checkbox. Advanced configuration is available by clicking on the "Subnet Details" tab.
Cancel
« Back
Next »

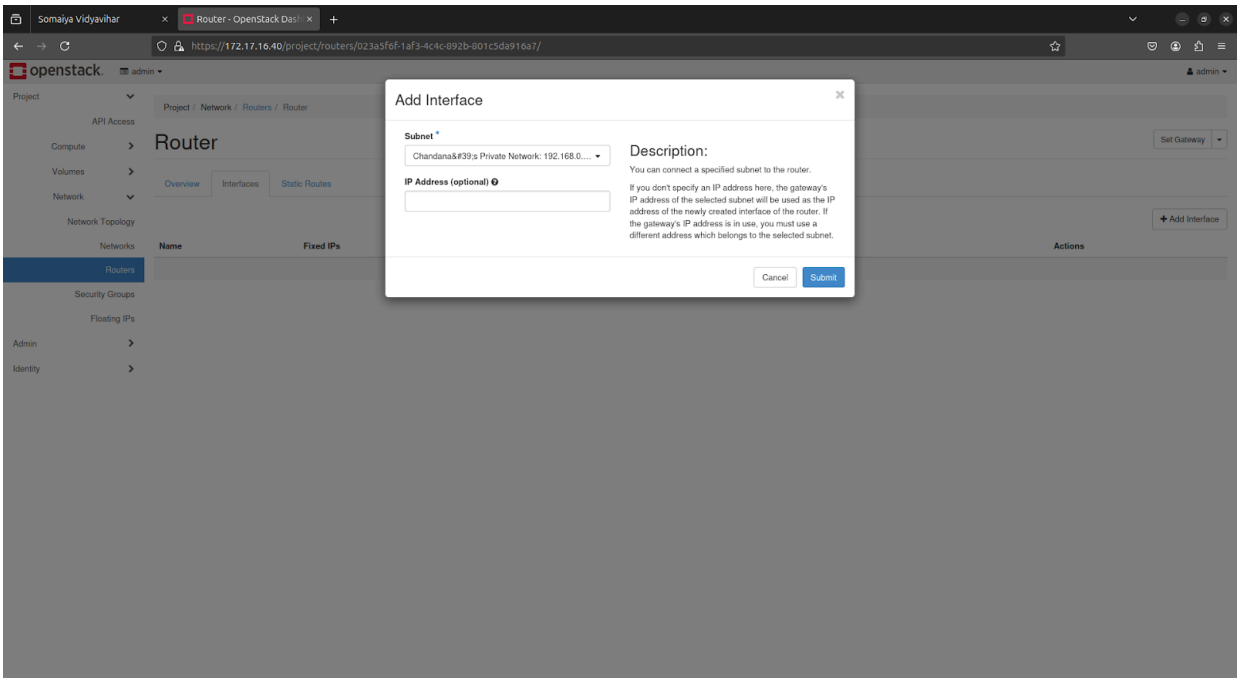

Somaiya Vidyavihar
Networks - OpenStack
https://172.17.16.40/project/networks/#/create_network__createsubnetinfoaction
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Networks
Networks
Displaying 2 items
Name
Subnets Associated
external
external-subnet 10.20.20.0/2
test
test-subnet 192.168.222.0/2
Filter
+ Create Network
Delete Networks
State
Availability Zones
Actions
Edit Network
Create Network
Network
Subnet
Subnet Details
Enable DHCP
Allocation Pools
DNS Name Servers
Host Routes
Specify additional attributes for the subnet.
Cancel
« Back
Create

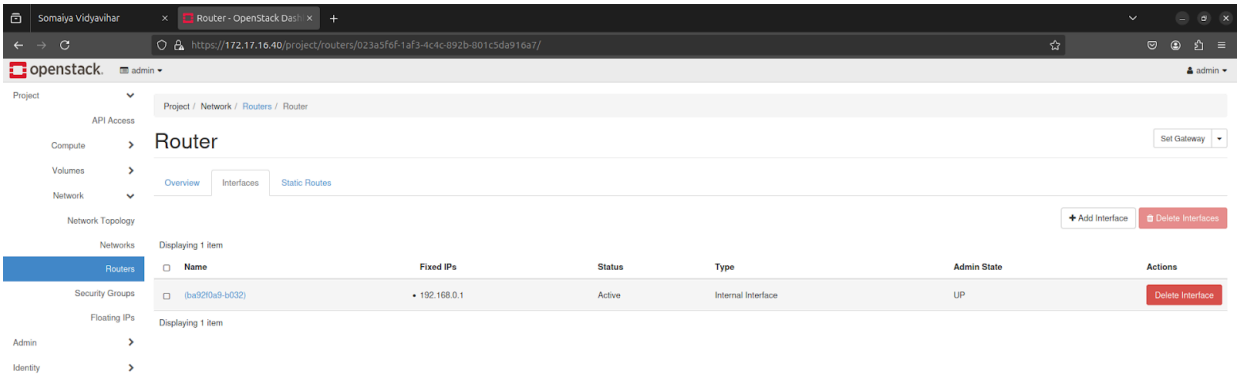

Somaiya Vidyavihar
Routers - OpenStack Das
https://172.17.16.40/project/routers/
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Routers
Routers
Router Name =
Filter
+ Create Router
Delete Routers
Displaying 1 item
Name
Status
External Network
Admin State
Availability Zones
Actions
test-router
Active
external
UP
Clear Gateway
Displaying 1 item


Somaiya Vidyavihar
Routers - OpenStack Das
https://172.17.16.40/project/routers/
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Routers
Routers
Displaying 1 item
Name
Status
Availability Zones
Actions
test-router
Active
Clear Gateway
Displaying 1 item
Create Router
Router Name
Router
Enable Admin State
External Network
Select network
Enable SNAT
Availability Zone Hints
Description:
Creates a router with specified parameters.
Enable SNAT will only have an effect if an external network is set.
Cancel
Create Router


Somaiya Vidyavihar
Routers - OpenStack Das
https://172.17.16.40/project/routers/
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Routers
Routers
Router Name =
Filter
+ Create Router
Delete Routers
Displaying 2 items
Name
Status
External Network
Admin State
Availability Zones
Actions
Router
Active
-
UP
-
Set Gateway
test-router
Active
external
UP
-
Clear Gateway
Displaying 2 items


Somaiya Vidyavihar
Router - OpenStack Das
https://172.17.16.40/project/routers/023a5f6f-1af3-4c4c-892b-801c5da916a7/
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Routers / Router
Router
Set Gateway
Overview
Interfaces
Static Routes
Name
Router
ID
023a5f6f-1af3-4c4c-892b-801c5da916a7
Description
Project ID
2fa5dd1f4d224c738168af1d22fe84f7
Status
Active
Admin State
UP
External Gateway
None


Somaiya Vidyavihar
Router - OpenStack Dash
https://172.17.16.40/project/routers/023a5f6f-1af3-4c4c-892b-801c5da916a7/
openstack.
admin
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Routers / Router
Router
Set Gateway
Overview
Interfaces
Static Routes
+ Add Interface
Name
Fixed IPs
Actions
Add Interface
Subnet *
Chandana's Private Network: 192.168.0....
IP Address (optional)
Description:
You can connect a specified subnet to the router.
If you don't specify an IP address here, the gateway's IP address of the selected subnet will be used as the IP address of the newly created interface of the router. If the gateway's IP address is in use, you must use a different address which belongs to the selected subnet.
Cancel
Submit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Admin
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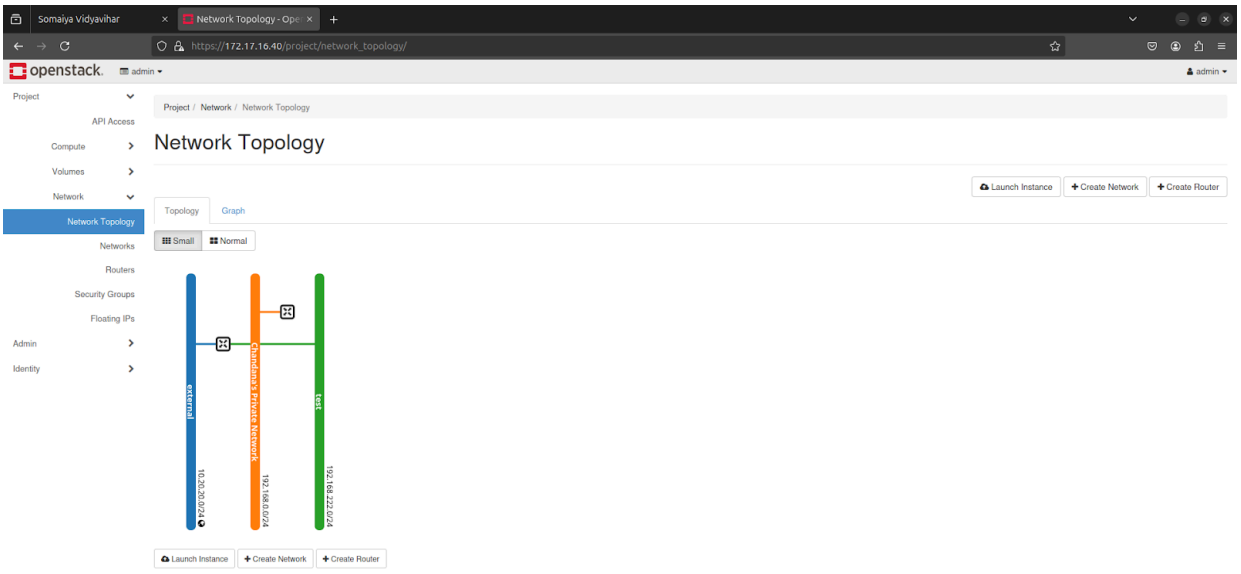
Project / Network / Routers / Router
Router
Set Gateway
Overview
Interfaces
Static Routes
+ Add Interface
Delete Interfaces
Displaying 1 item
Name
Fixed IPs
Status
Type
Admin State
Actions
(ba92f0a9-b032)
• 192.168.0.1
Active
Internal Interface
UP
Delete Interface
Displaying 1 item


Somaiya Vidyavihar
Network Topology - Ope
https://172.17.16.40/project/network_topology/
openstack.
admin
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API Access
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Volumes
Network
Network Topology
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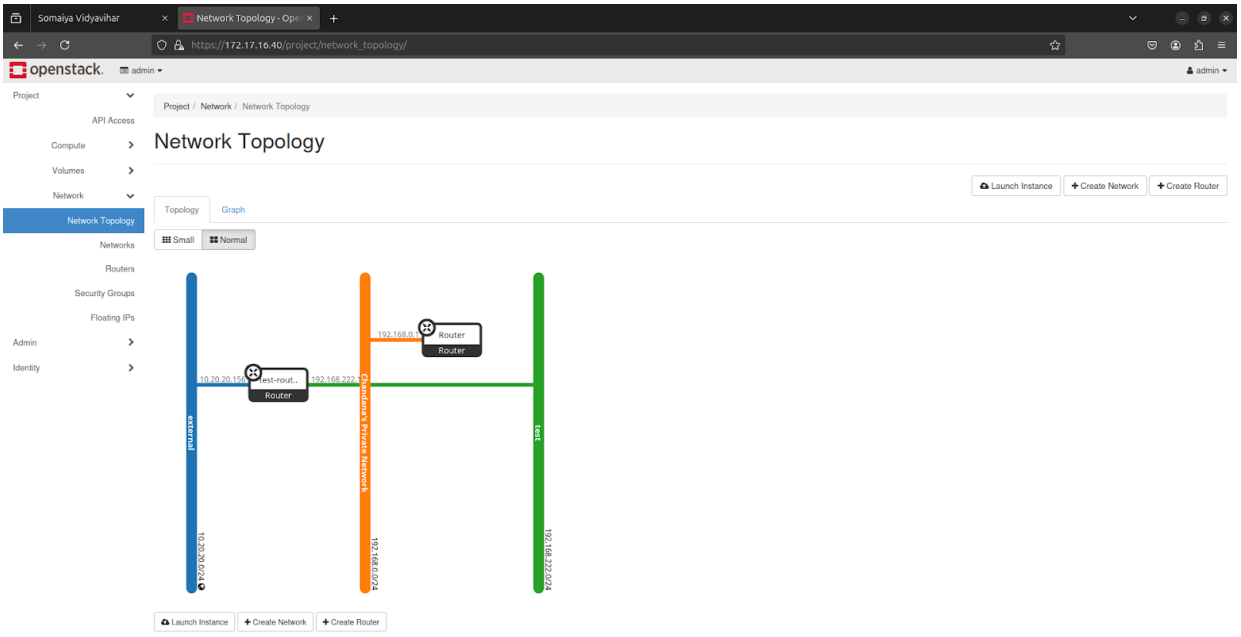
Routers
Security Groups
Floating IPs
Admin
Identity
Project / Network / Network Topology
Network Topology
Launch Instance
Create Network
Create Router
Topology
Graph
Small
Normal
external
Chandana's Private Network
test
10.20.20.0/24
192.168.0.0/24
192.168.222.0/24
Launch Instance
Create Network
Create Router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192.168.0.0/24
192.168.222.0/24
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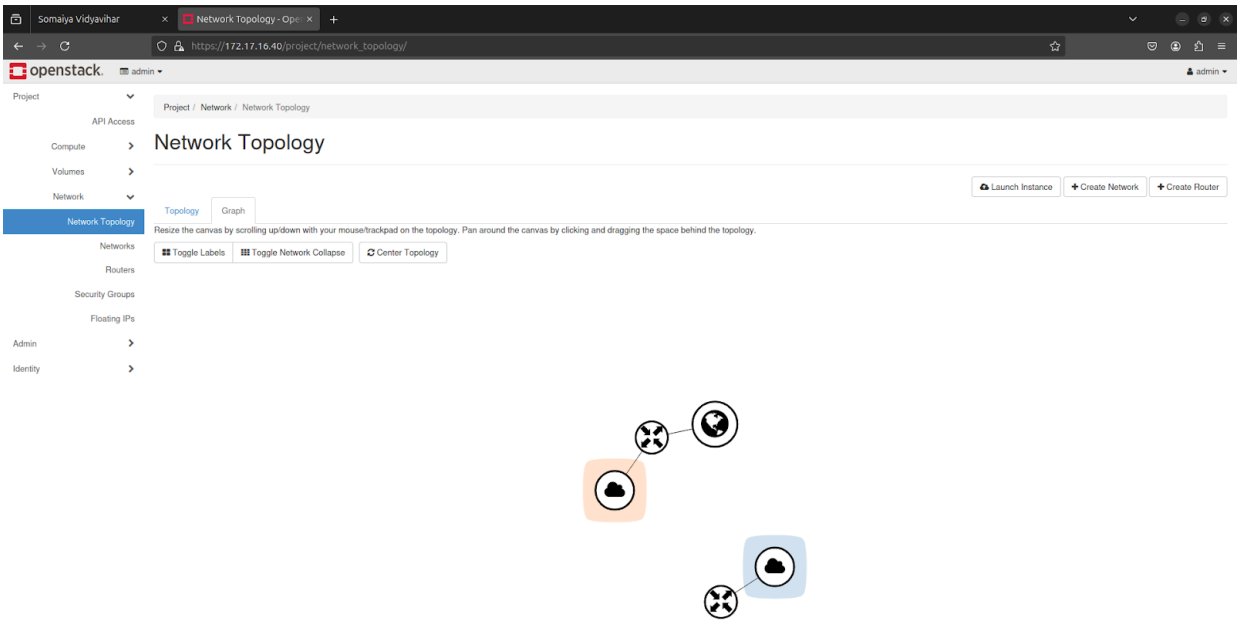
Create Network
Create Router



Questions:

1) **Explain architecture of OpenStack.**

OpenStack follows a modular architecture with multiple components handling different cloud services. Key components include:

1. **Horizon (Dashboard):** A web-based UI to manage OpenStack resources.
2. **Nova (Compute):** Manages virtual machine instances.
3. **Neutron (Networking):** Handles networking services like private and public networks.
4. **Glance (Image Service):** Manages disk images used for instance creation.
5. **Cinder (Block Storage):** Provides persistent block storage.
6. **Swift (Object Storage):** Stores unstructured data like images and backups.
7. **Keystone (Identity Service):** Handles authentication and user roles.
8. **Heat (Orchestration):** Automates resource deployment using templates.
9. **Ceilometer (Telemetry):** Collects usage and performance data.

All components interact via APIs and work together to provide Infrastructure-as-a-Service (IaaS), supporting scalable and flexible cloud environments.

Outcomes: CO3 — Analyze different cloud architectures and IOT cloud

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Conclusion: (Conclusion to be based on the objectives and outcomes achieved)

In this experiment, a private network was successfully created within OpenStack, following the steps of project creation, user association, image upload, and network configuration. The network topology was verified, ensuring proper connectivity. This experiment provided hands-on experience in managing OpenStack networking, reinforcing concepts of cloud architecture and client-server communication.

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of faculty in-charge with date

References:

1. Create a User and Project in OpenStack Horizon
https://openmetal.io/docs/manuals/operators-manual/day-1/horizon/create-user-project

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