

# GURU NANAK DEV ENGINEERING COLLEGE

Department of Information Technology

Batch 2018-2022

Semester – 8<sup>th</sup>

## Cloud Practical Lab file



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## Practical 1:

### Install VirtualBox/VMware workstation with different flavours of Linux or windows OS on top of Linux/ Windows

#### Step 1- Download VMware Workstation Player

First of all, you need to download from VMware from <https://my.vmware.com>

#### Step 2- Run the installer

Start the installer by double clicking it. Then, you will see a splash screen. It will prepare the system for installation and then the installation wizard opens.

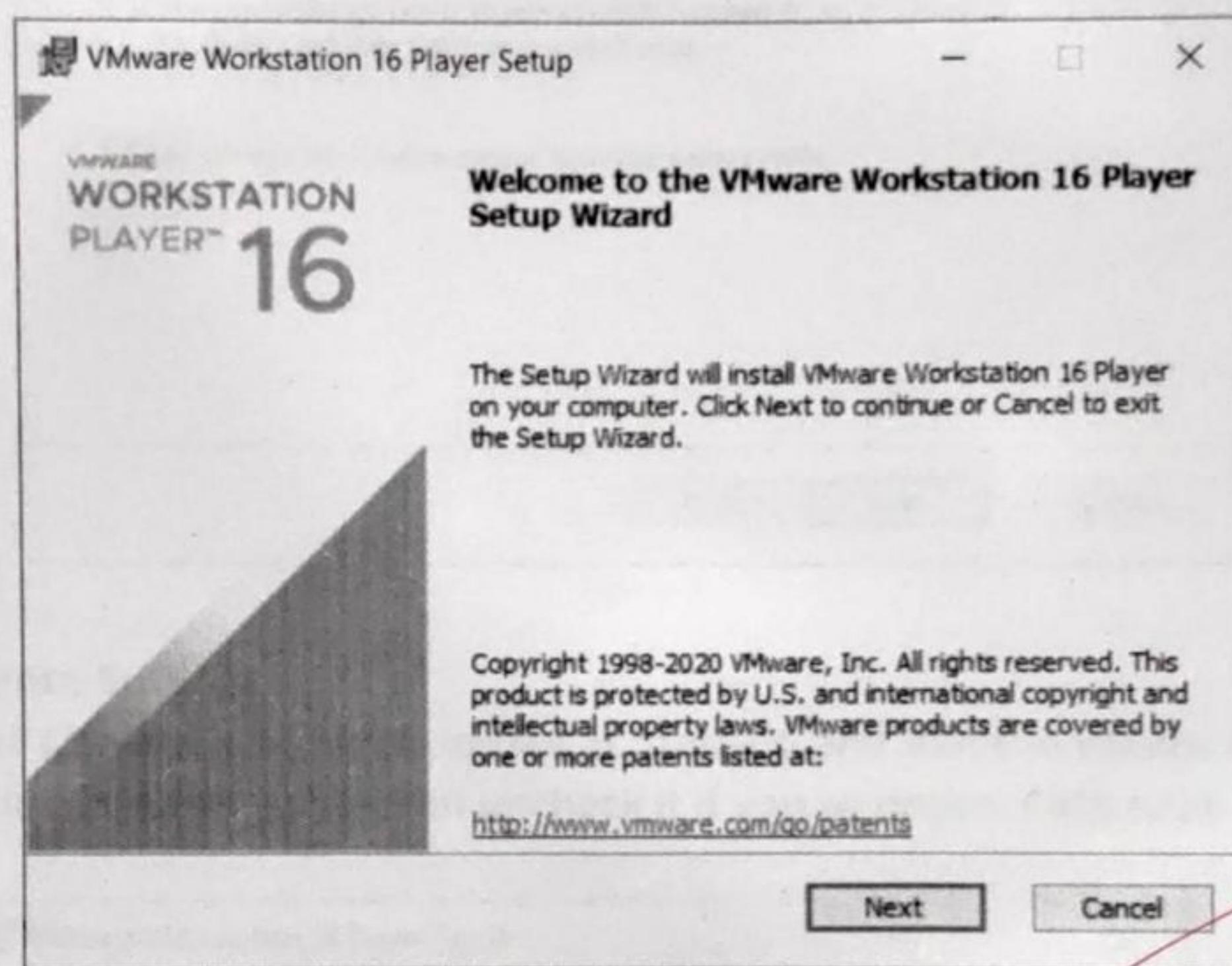


Figure 1

Click next and accept the license terms and click next again to move on to the next screen.

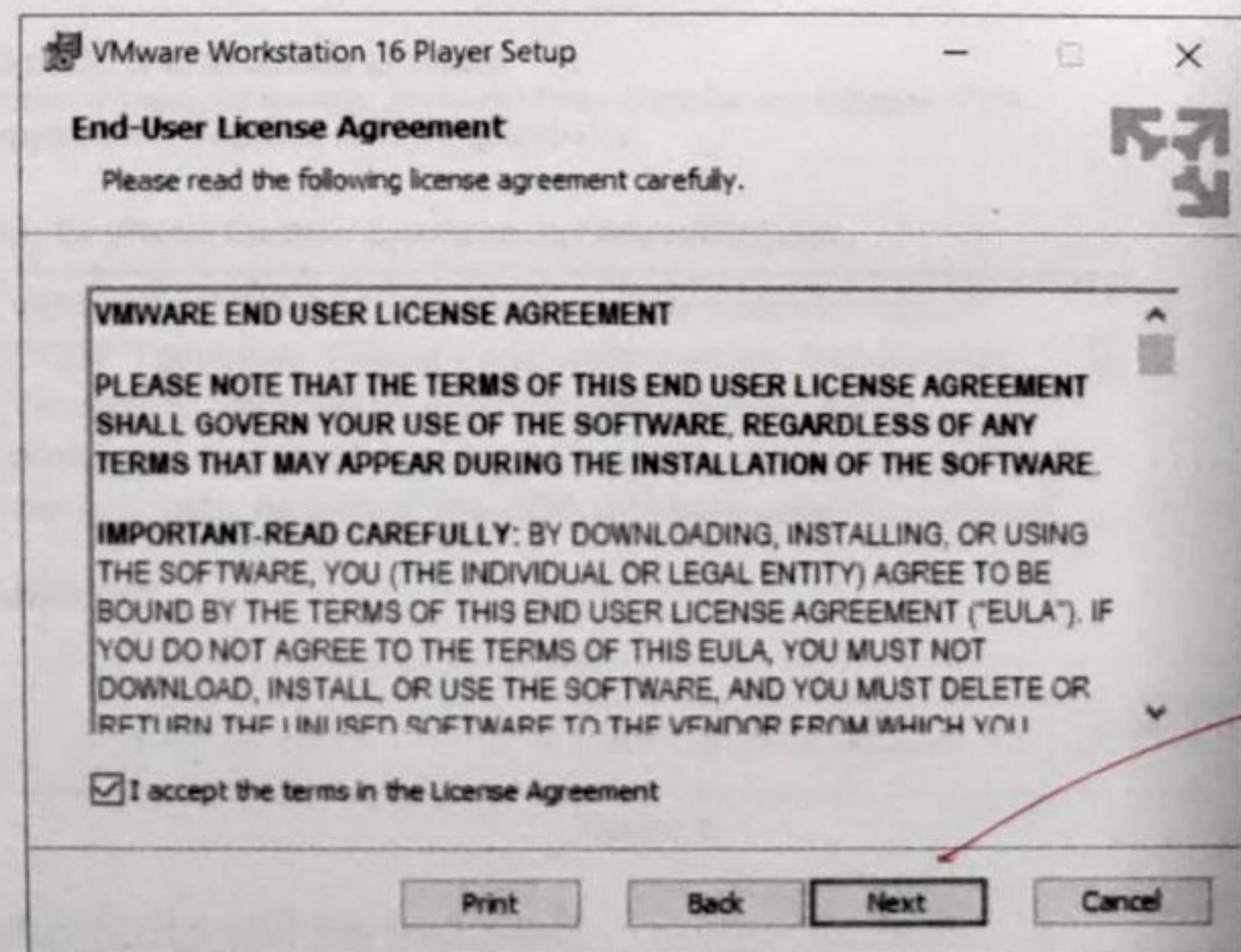


Figure 2

### **Step 3 – Custom setup**

Enhanced Keyboard driver and Installation directory In this dialog box, please select the folder in which you want to install the application. I leave it as it is. Also check the box Enhanced Keyboard Drivers option. Click next.

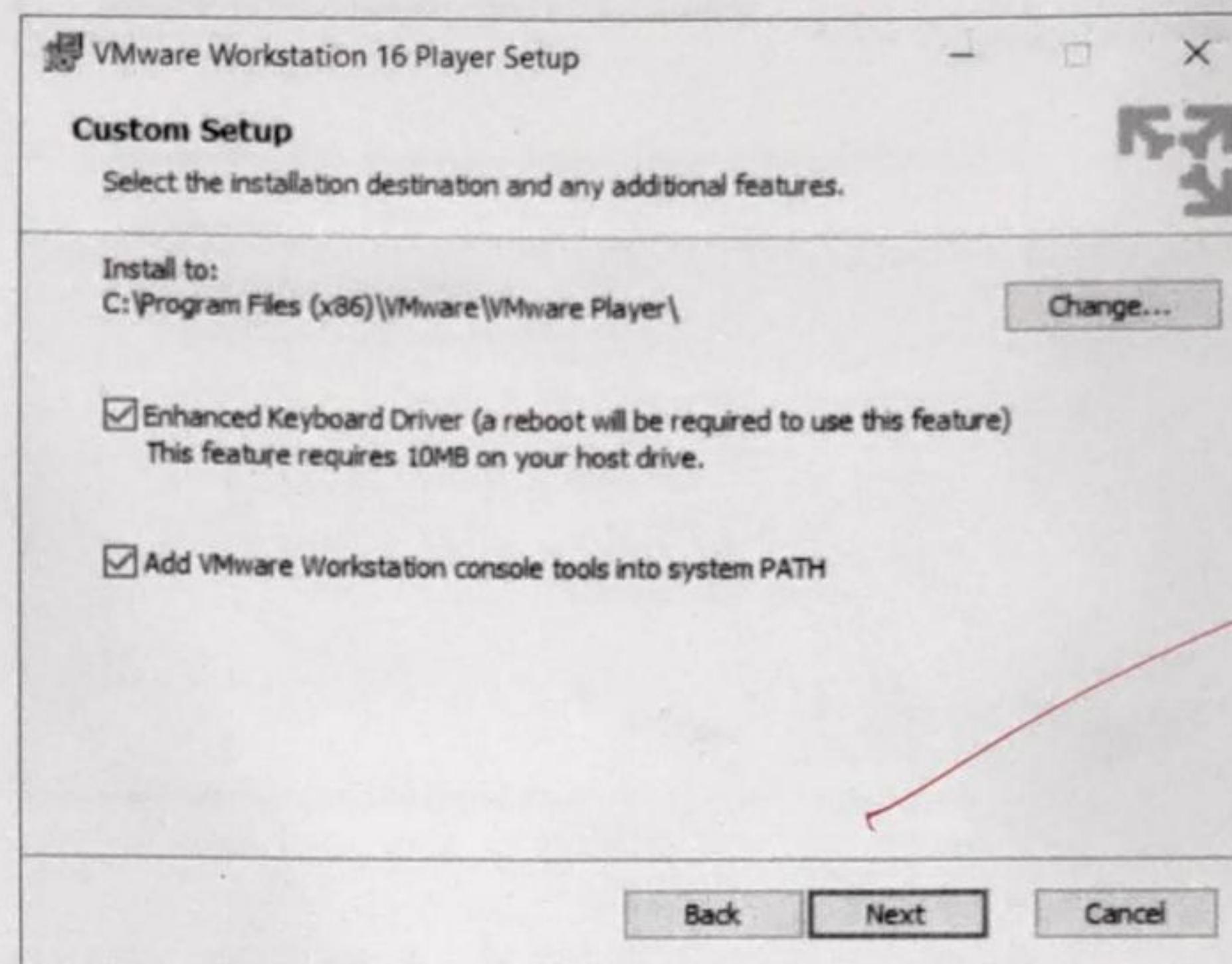


Figure 3

### **Step 4 – User Experience Settings**

Check the options for Check the product update at Start-up and Join the VMware Customer Program. I normally leave it as it is. You can uncheck it if you so desire. Click next.

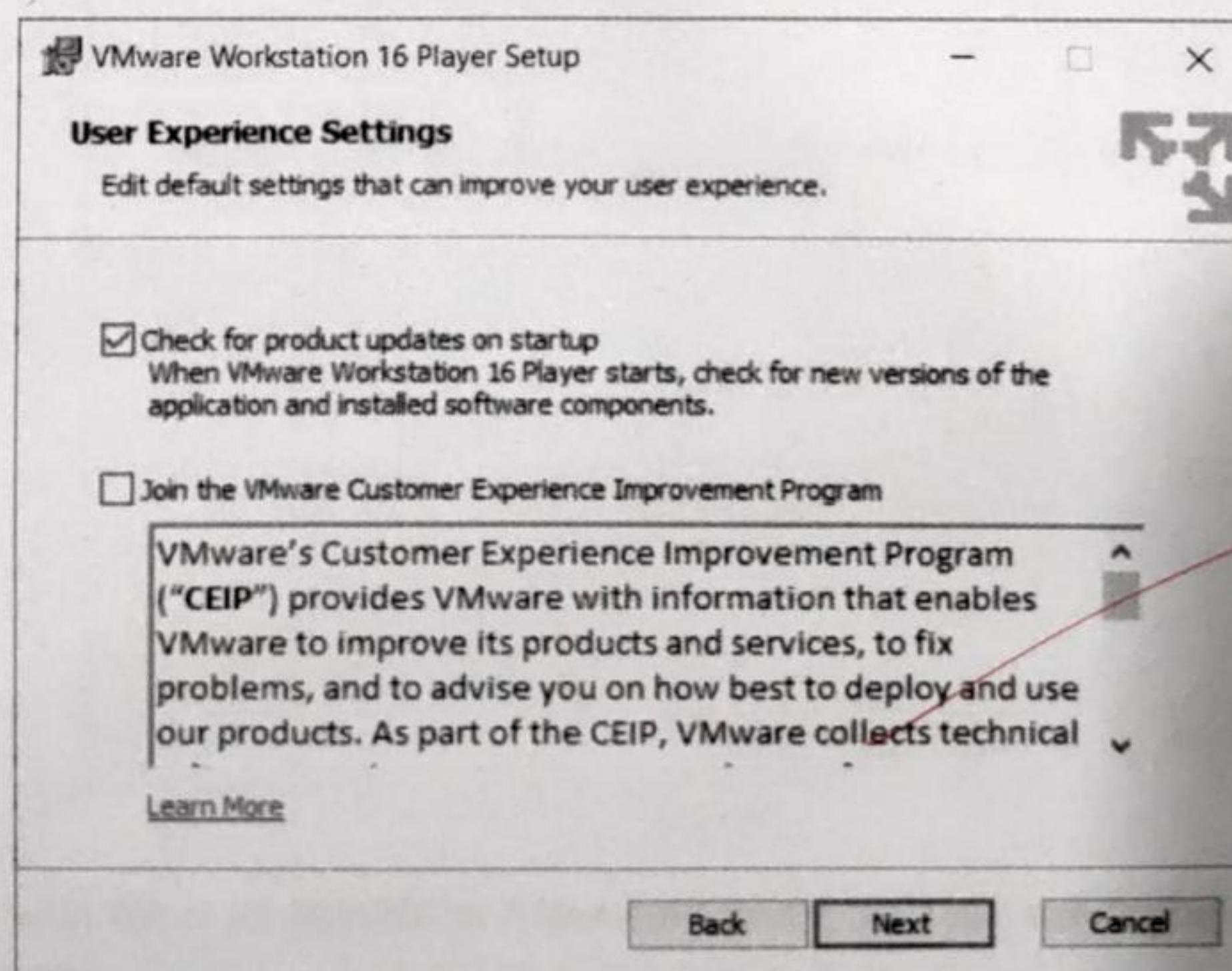


Figure 4

### **Step 5 - Select where the shortcuts will be installed**

Check the box where the shortcut to run the application will be created. I leave it as it is.

Click on next.

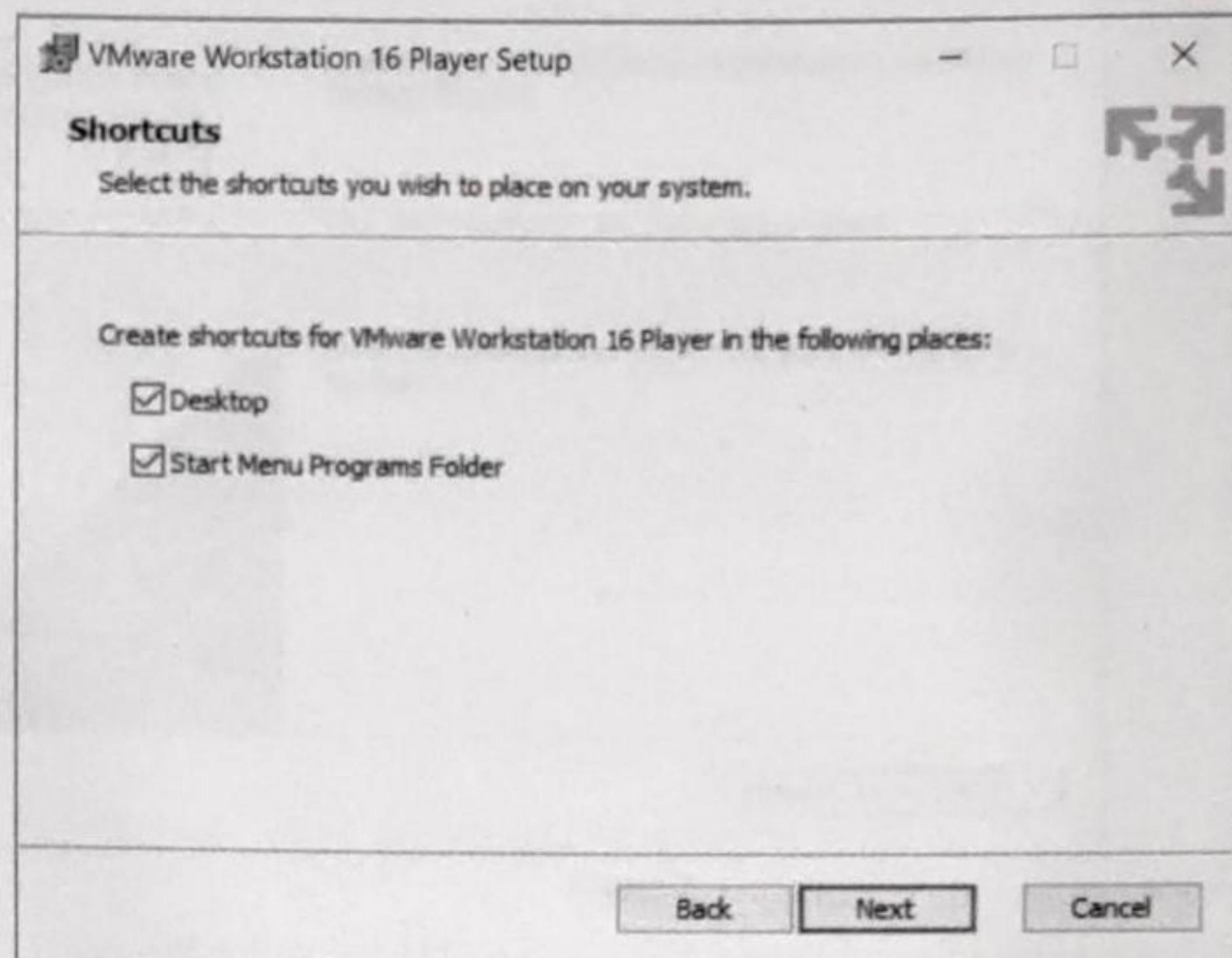


Figure 5

### Step 6 - Ready to install

Now the installation wizard is ready to install. Click on install to begin the installation.

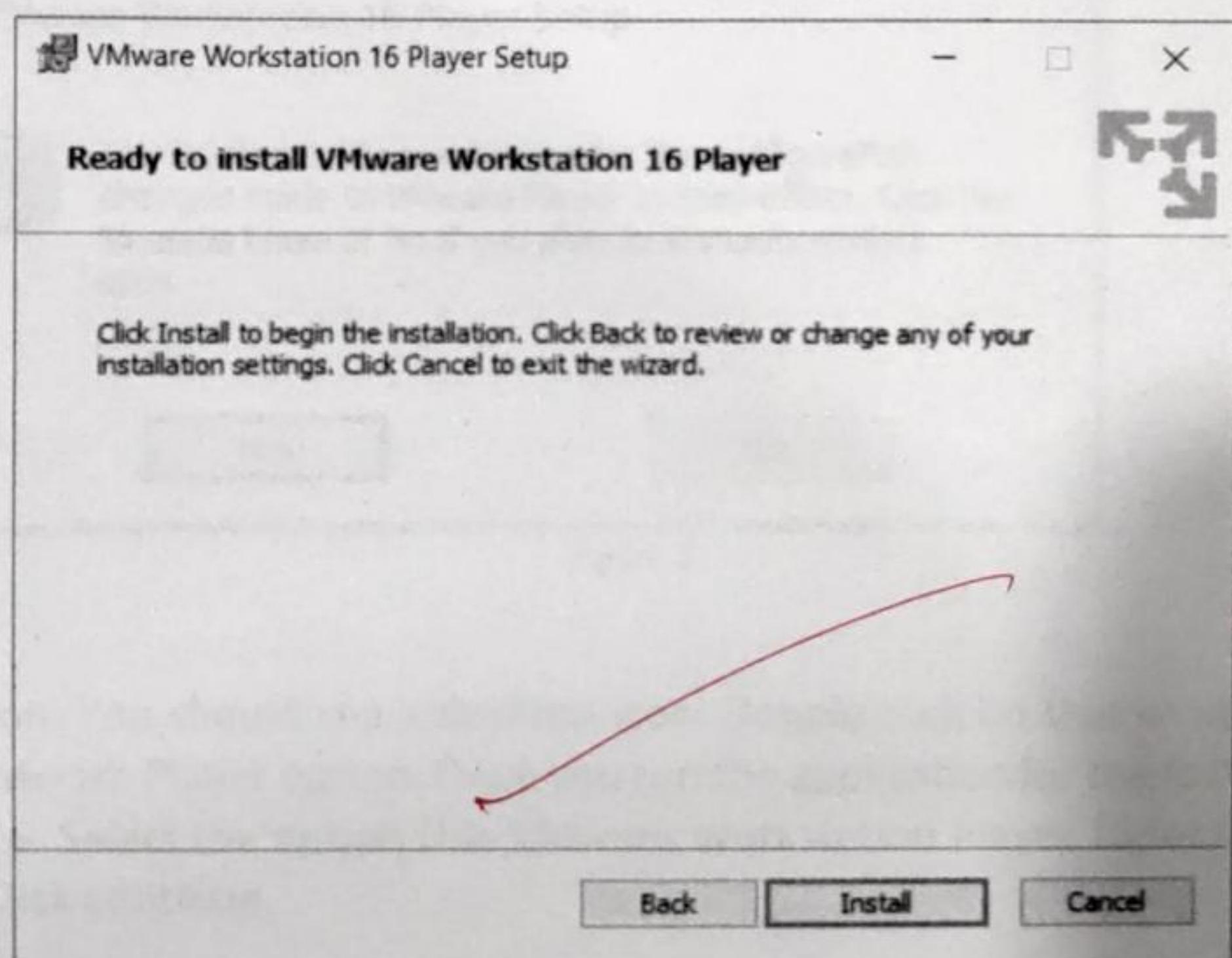


Figure 6

Installation begins, wait for it to complete. After sometime, you will see installation complete message. You are done.

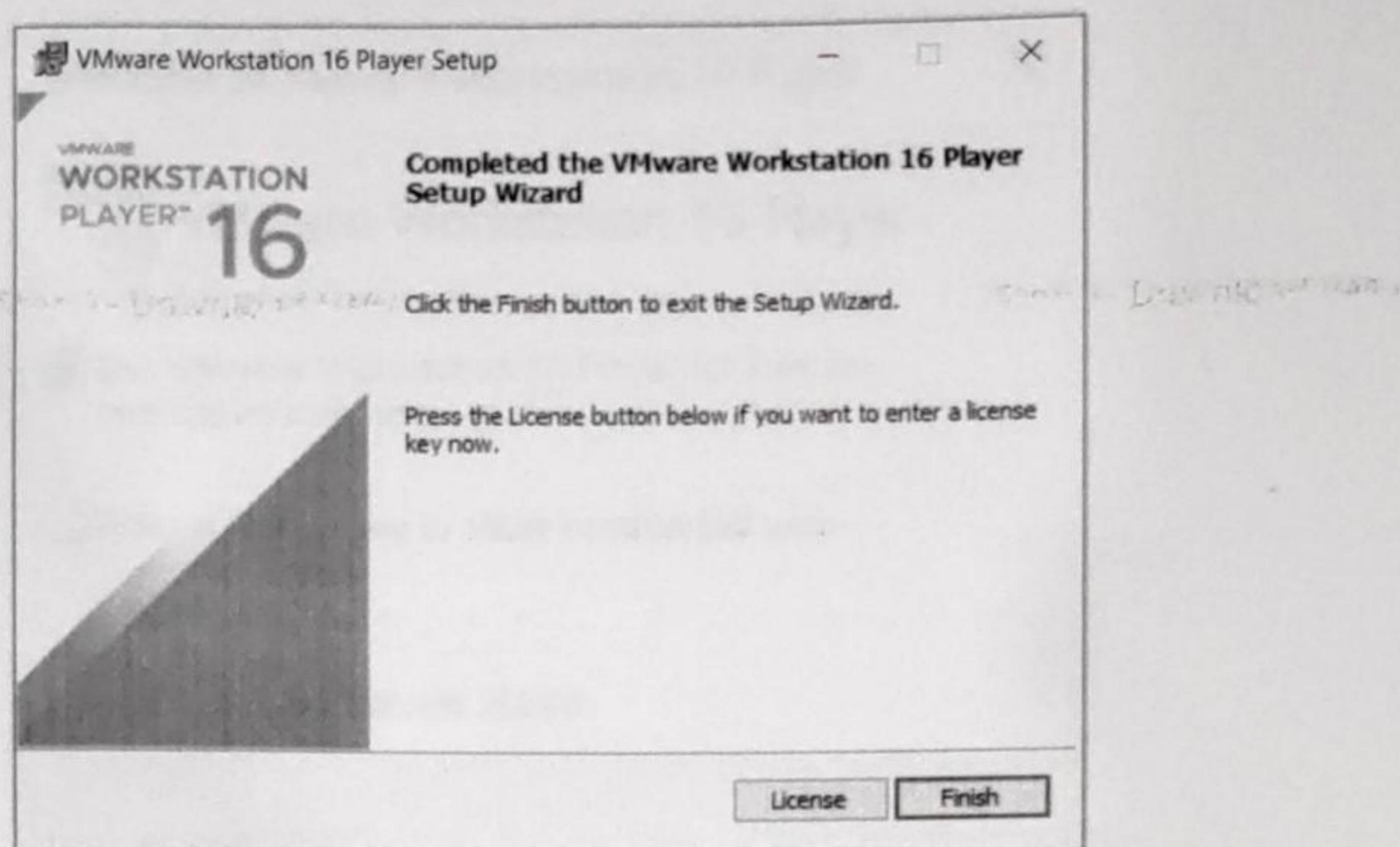


Figure 7

Click on Finish to Complete the installation. You will be asked to restart your system. Click on Yes to restart. Click No, if you want to restart later. But you must restart before using the application, else some features will not work properly.

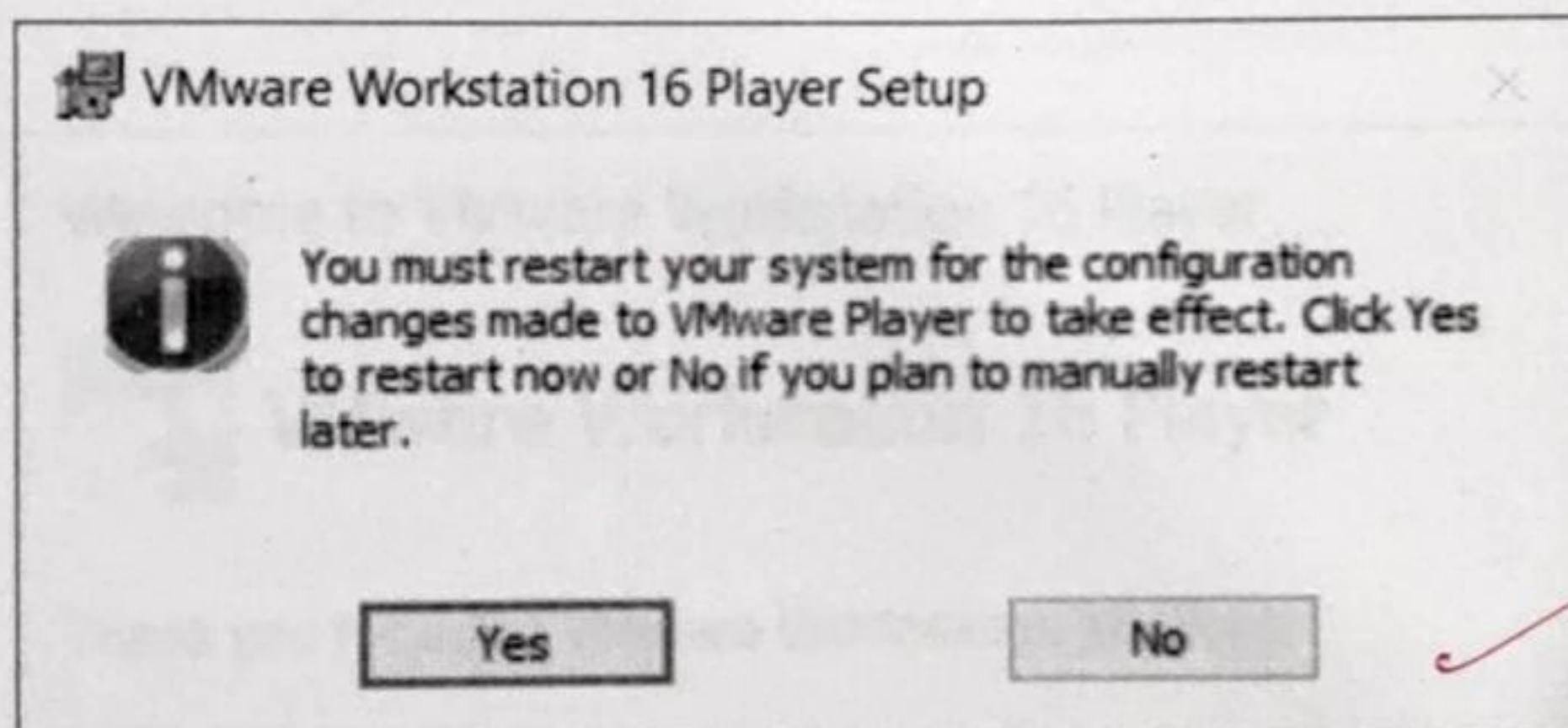


Figure 8

#### Step 7 - License

Now Run the application. You should see a desktop icon. Double click on that or use the start menu to navigate to VMware Player option. Once you run the application for the first time, you will be asked for licence. Select the option Use VMware Workstation Player 16 for free for non commercial use. Click continue.



Figure 9

Click on Finish.

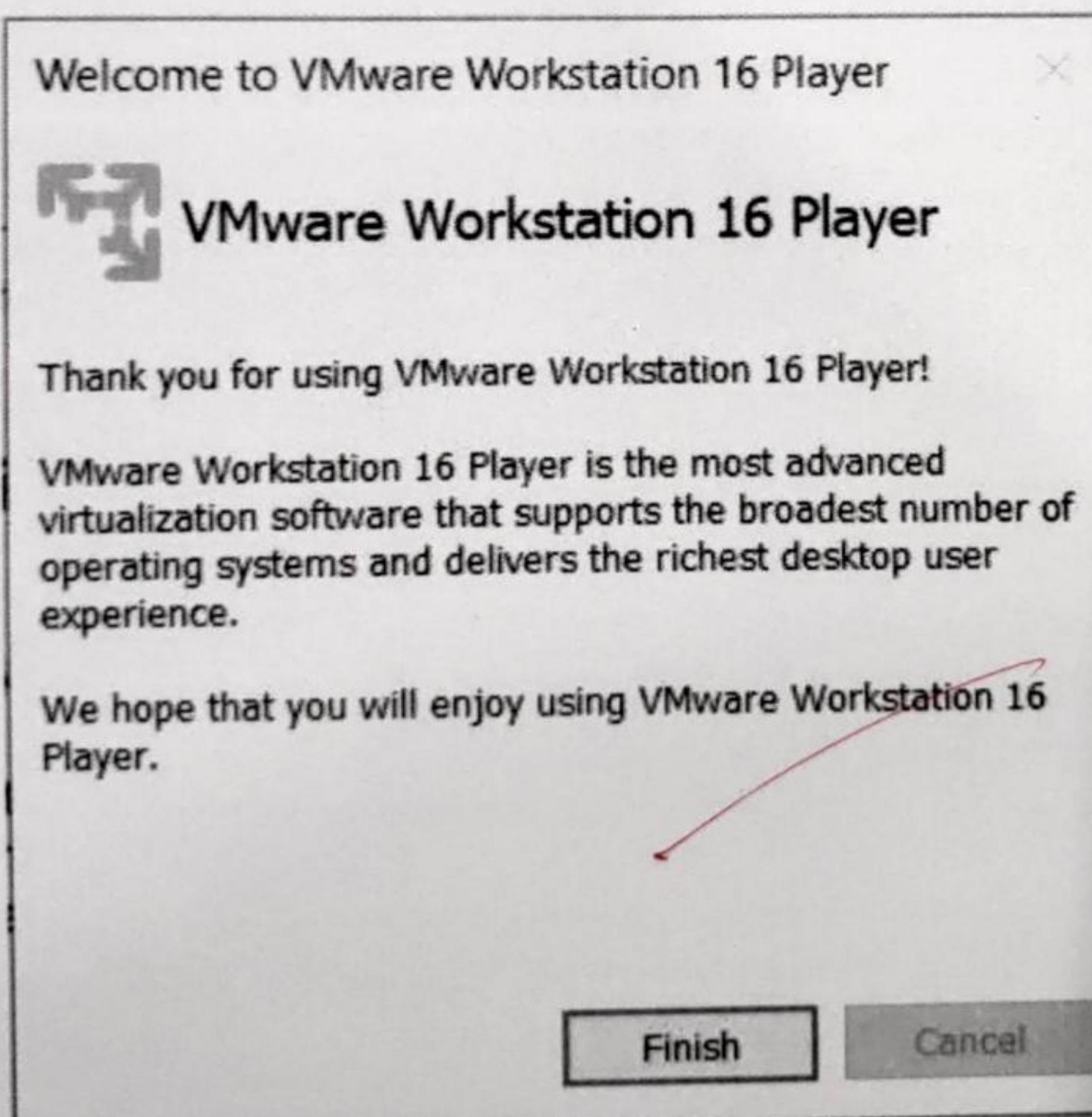


Figure 10

Now you will see VMware Workstation Player 16 ready to be used for free for non-commercial purpose.

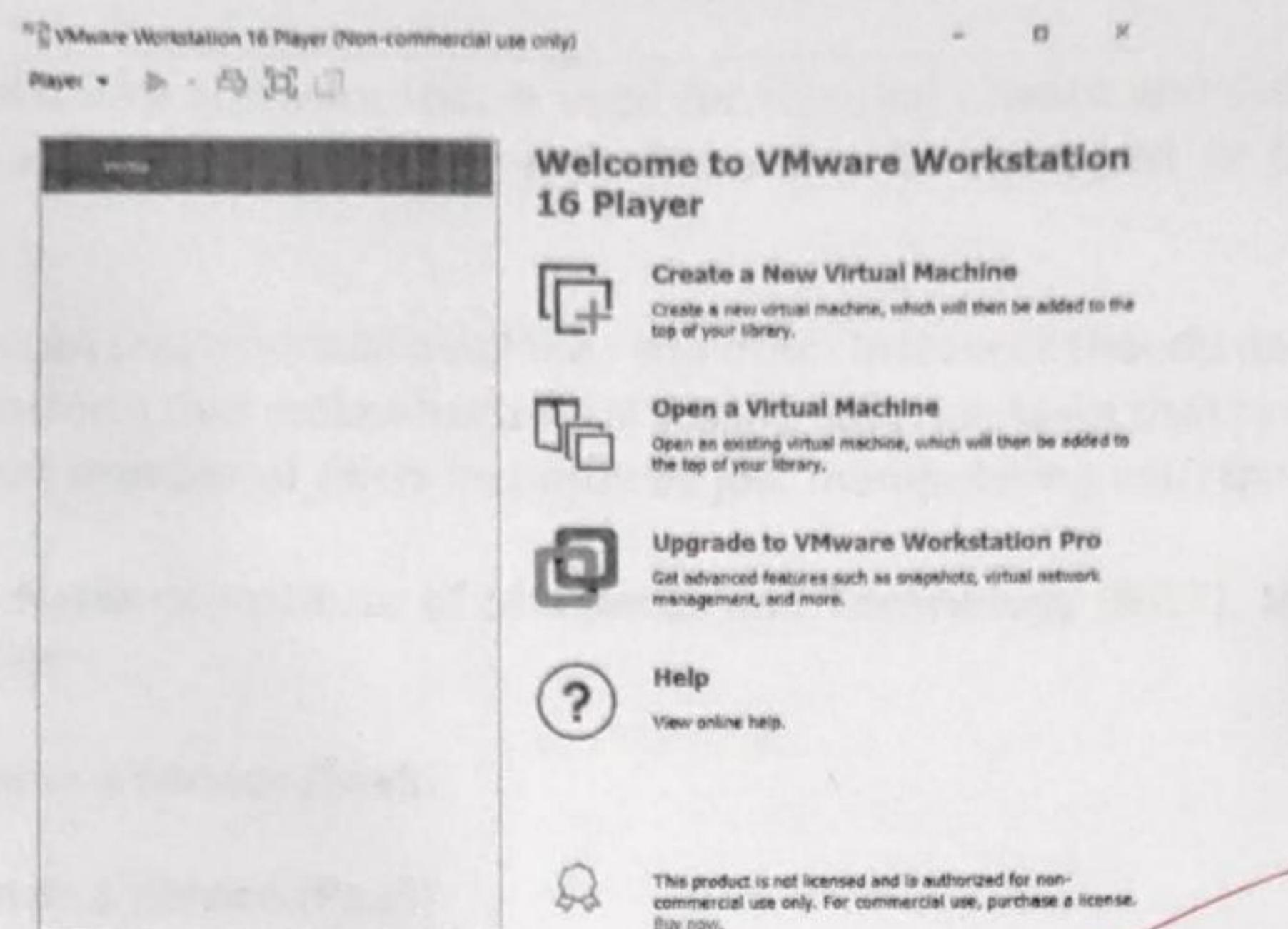


Figure 11

## Practical 2: Introduction to OpenStack and it's components

OpenStack is an open-source software that is used for creating private and public clouds. It is intended to control resources in a datacentre and has a dashboard to be managed or it can be done through the OpenStack API.

With OpenStack users can create virtual machines and other instances that do different things in the cloud environment. It is a platform that makes horizontal scaling easy, i.e. tasks that run at the same time can easily be available to different number of users instantly by just manipulating with the instances.

According to the National Institute of Standards and Technology (NIST), the cloud can come in three different service models:

- Cloud Software as a Service (SaaS)
- Cloud Platform as a Service (PaaS)
- Cloud Infrastructure as a Service (IaaS)

OpenStack allows users to quickly create new VM or instance upon which other cloud components can run, thus providing infrastructure. That puts OpenStack in the Cloud Infrastructure as a Service category. That infrastructure runs a “platform”, so the users can develop and deliver applications to the end users.

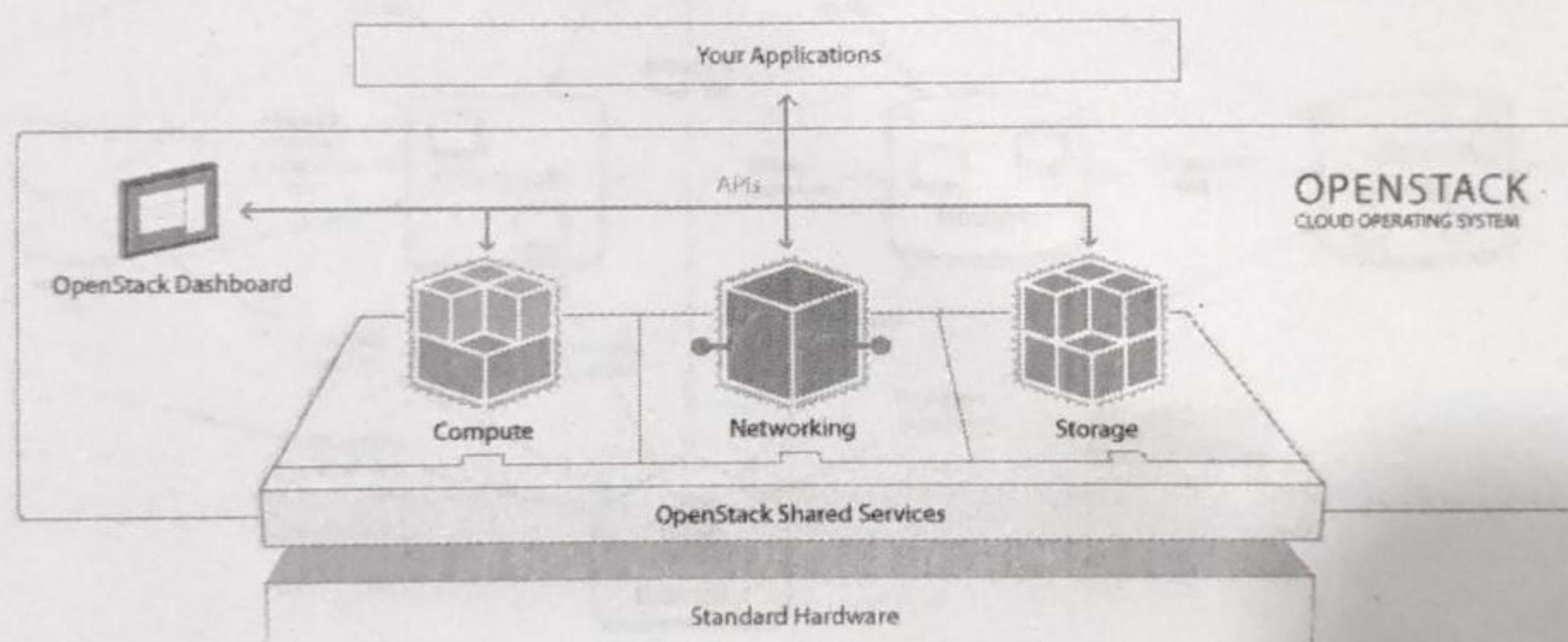


Figure 12

Open-Stack Components As an open-source software, it has a community that collaborates and it has defined nine components that are part of the “core” of OpenStack. The community maintains these components and they are distributed as a part of any OpenStack system.

1. Nova This is the primary computing engine behind OpenStack. This allows deploying and managing virtual machines and other instances to handle computing tasks.
2. Swift The storage system for objects and files is referred to as Swift. In the traditional storage systems, files are referred to a location on the disk drive, whereas in OpenStack Swift files are referred to by a unique identifier and the Swift is in charge where to store

the files.

The scaling is therefore made easier because the developers don't have the worry about the capacity on a single system behind the software. This makes the system in charge of the best way to make data backup in case of network or hardware problems.

3. Cinder This is the respective component to the traditional computer access to specific disc locations. It is a block storage component that enables the cloud system to access data with higher speed in situations when it is an important feature.
4. Neutron is the networking component of OpenStack. It makes all the components communicate with each other smoothly, quickly and efficiently.
5. Horizon This is the OpenStack dashboard. It's the graphical interface to OpenStack and the first component that users starting with OpenStack will see.

There is an OpenStack API that allows developers to access all the components individually, but the dashboard is the management platform for the system administrators to have a know what is going on in the cloud.

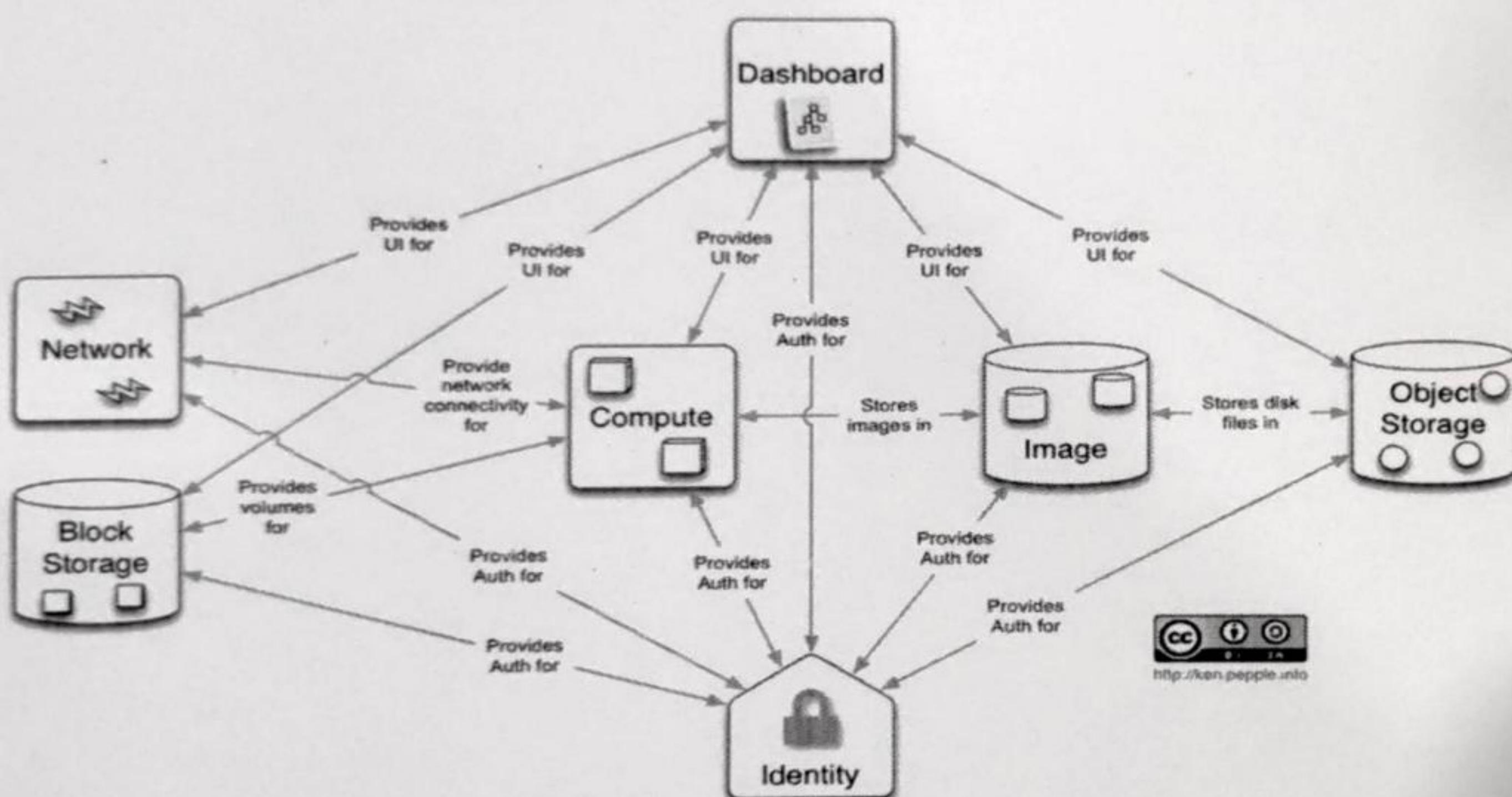


Figure 13: Architecture of openstack with components

6. Keystone This is the component that provides identity services for OpenStack. Basically, this is a centralized list of all the users and their permissions for the services they use in the OpenStack cloud.
7. Glance It is a component that provides image services or virtual copies of the harddisks. Glance allows these images to be used as templates when deploying new virtual machine instances.

8. Ceilometer provides data measurement services, thus enabling the cloud to offer billing services to individual users of the cloud. It measures system usage by each user for each of the components of the cloud and makes reporting available.
9. Heat is the orchestration component of OpenStack, which allows developers to store the requirements of a cloud application in a file that defines what resources are necessary for that application. In this way, it helps to manage the infrastructure needed for a cloud service to run.

This is the component which allows developers to keep the requirements of the cloud applications of the resources in a file. It improves the management of the infrastructure needed for a cloud service to run.

P.G.J  
19/5/22

## **Practical 3: Installation of Open-Stack using Micro-Stack**

What is OpenStack?

OpenStack is a collection of open-source projects designed to work together to form the basis of a cloud. OpenStack can be used for both private and public clouds.

What is Micro Stack?

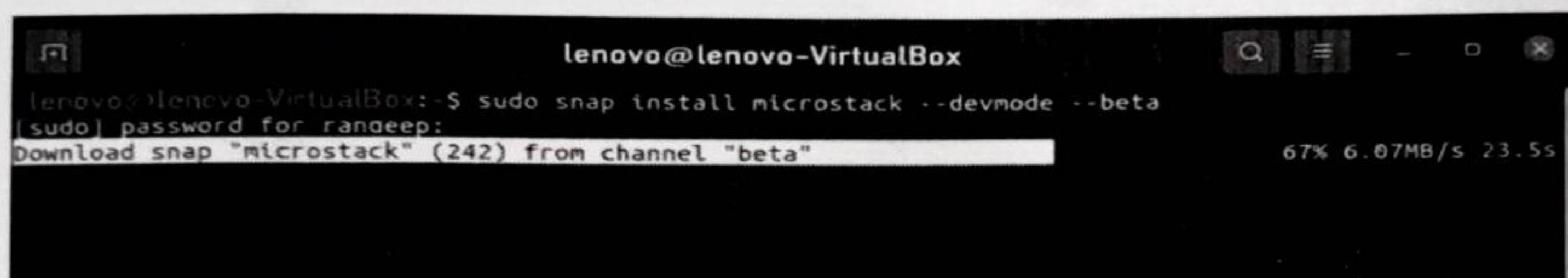
Micro Stack provides a single or multi-node OpenStack deployment which can run directly on your workstation. Although made for developers to prototype and test, it is also suitable for edge, IoT, and appliances. Micro Stack is an OpenStack in a snap which means that all OpenStack services and supporting libraries are packaged together in a single package which can be easily installed, upgraded or removed. MicroStack includes all key OpenStack components: Keystone, Nova, Neutron, Glance, and Cinder.

### **Step 1 - Install Micro-Stack**

Install MicroStack from the beta channel:

```
sudo snap install microstack --devmode --beta
```

When the installation process has finished you should see the following message on the terminal: micro stack (beta) ussuri from Canonical installed.



```
lenovo@lenovo-VirtualBox:~$ sudo snap install microstack --devmode --beta
[sudo] password for randeep:
Download snap "microstack" (242) from channel "beta"
67% 6.07MB/s 23.5s
```

Figure 14

### **Step 2 - Initialise Micro-Stack**

MicroStack needs to be initialised, so that networks and databases get configured. To do this, run:

```
sudo microstack init --auto --control
```

Once this completes (15 - 20 minutes) your OpenStack cloud will be up and running.

```
microstack (beta) ussuri from Canonical installed
lenovo@lenovo-VirtualBox:~$ sudo microstack init --auto --control
2021-12-13 16:53:08,247 - microstack_init - INFO - Configuring clustering ...
2021-12-13 16:53:08,423 - microstack_init - INFO - Setting up as a control node.
```

### **Step 3 - Interact with Open-Stack Web UI**

To interact with your cloud via the web UI visit <http://10.20.20.1/>. The password for the admin user can be obtained in this way: `sudo snap get microstack config.credentials.keystone-password`

```
2021-12-13 17:01:42,915 - microstack_init - INFO - Configuring the Cinder services...
2021-12-13 17:03:06,539 - microstack_init - INFO - Running Cinder DB migrations...
2021-12-13 17:03:23,069 - microstack_init - INFO - restarting libvirt and virtlogd ...
2021-12-13 17:03:36,732 - microstack_init - INFO - Complete. Marked microstack as initialized!
lenovo@lenovo-VirtualBox:~$ sudo snap get microstack config.credentials.keystone-password
nkpeTcuG3As5MwkkwPdoSgYiBo8FbtvR
lenovo@lenovo-VirtualBox:~$
```

Figure 15

Sample output:

**nkpeTcuG3As5MwkkwPdoSgYiBo8FbtvR**

Type the credentials and press the “Sign In” button:

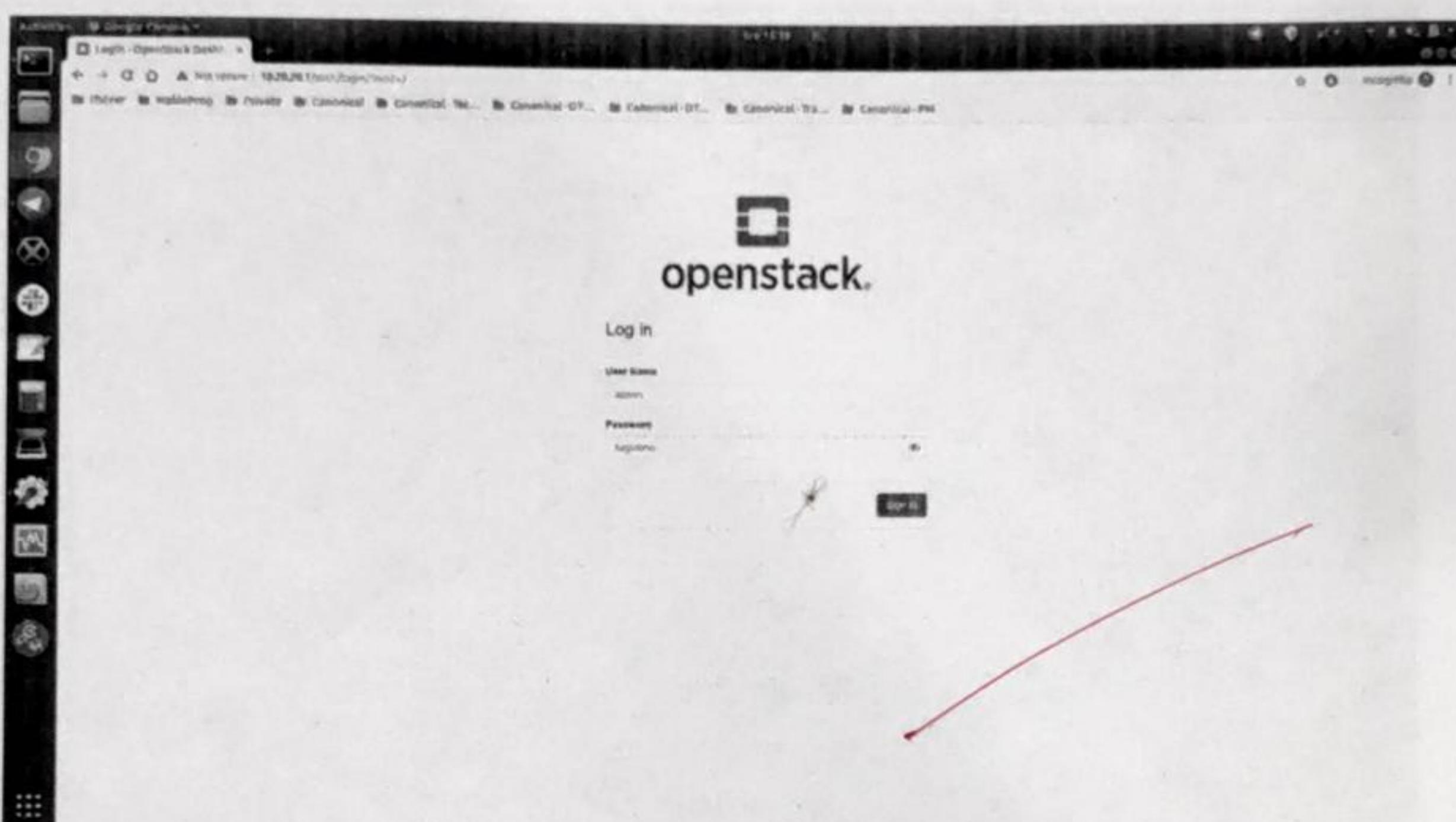


Figure 16

If everything goes fine you should see the landing page:

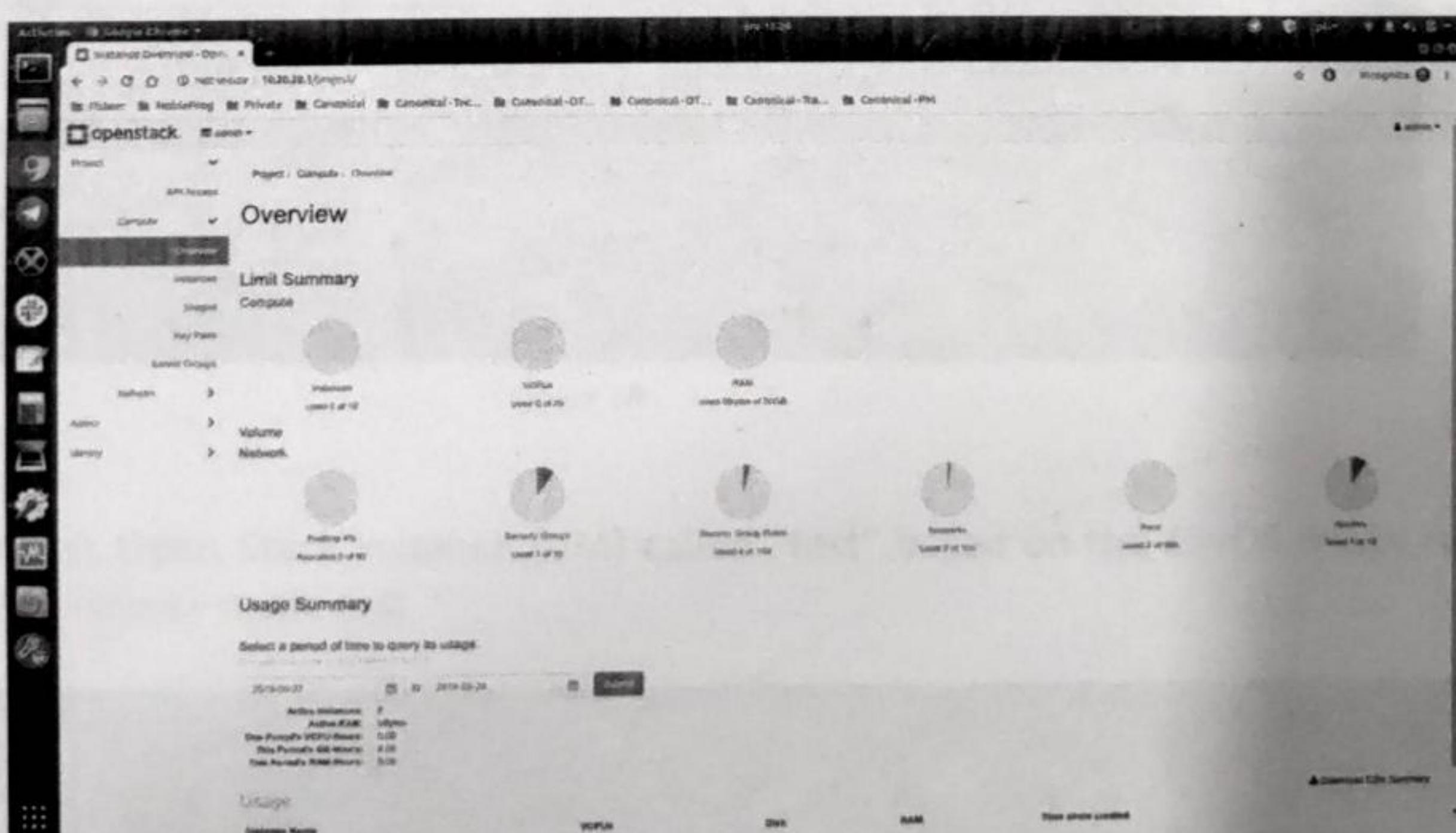


Figure 17

You can now start playing with your OpenStack installation (i.e., create additional users, launch instances, etc.).

## CLI

You can also interact with your OpenStack cloud via the CLI by using the `microstack openstack` command. The syntax is identical to the client delivered by the `python-openstackclient` package.

For example, to list available OpenStack endpoints

run: `microstack openstackcatalog list`

You can run `microstack openstack --help` to get a list of available subcommands and their required syntax.

### Step 4 - Launch and access a VM

Name	Type	Endpoints
neutron	network	microstack internal: https://10.0.2.15:9696 microstack public: https://10.0.2.15:9696 microstack admin: https://10.0.2.15:9696
glance	image	microstack internal: https://10.0.2.15:9292 microstack public: https://10.0.2.15:9292 microstack admin: https://10.0.2.15:9292
cinderv2	volumev2	microstack public: https://10.0.2.15:8776/v2/2c28aa81710c4f448ae450e2ac08cb2f microstack internal: https://10.0.2.15:8776/v2/2c28aa81710c4f448ae450e2ac08cb2f microstack admin: https://10.0.2.15:8776/v2/2c28aa81710c4f448ae450e2ac08cb2f
nova	compute	microstack internal: https://10.0.2.15:8774/v2.1 microstack public: https://10.0.2.15:8774/v2.1 microstack admin: https://10.0.2.15:8774/v2.1
placement	placement	microstack internal: https://10.0.2.15:8778 microstack admin: https://10.0.2.15:8778 microstack public: https://10.0.2.15:8778
keystone	identity	microstack admin: https://10.0.2.15:5000/v3/ microstack internal: https://10.0.2.15:5000/v3/ microstack public: https://10.0.2.15:5000/v3/

Figure 18

### Test launch

To launch your first Open Stack instance (VM) called "test" based on the CirrOS image, run the following:  
`microstack launch cirros --name test`

```
lenovo@lenovo-VirtualBox:~$ microstack launch cirros --name test
Launching server ...
Allocating floating ip ...
Server test launched! (status is BUILD)
Access it with `ssh -i /home/randeep/snap/microstack/common/.ssh/id_microstack cirros@10.20.20.127
You can also visit the OpenStack dashboard at https://10.20.20.1:443
```

Figure 19

Note that the IP address of the instance may be different in your environment. In order to connect to the instance run the command from the output:

```
'ssh -i /home/ubuntu/snap/microstack/common/.ssh/id microstack cirros@10.20.20.123'
```

Now that you are connected to the instance you can use normal Linux commands. Note that the CirrOS image provides a minimalist operating system! For example: \$ uptime 14:51:42 up 4 min, 1 users, load average: 0.00, 0.00, 0.00

```
lenovo@lenovo-VirtualBox:~$ ssh -i /home/randeep/snap/microstack/common/.ssh/id_microstack cirros@10.20.20.127
The authenticity of host '10.20.20.127 (10.20.20.127)' can't be established.
ECDSA key fingerprint is SHA256:sy4EURNUbDhZBz8+Y95bod6EdBxFSER7Xz5OqpIHSEc.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
```

Figure 20

To disconnect from the instance, type exit (or Ctrl-d).

You can also view the instance from the web UI. Go to <http://10.20.20.1> and click on the “Instances” tab on the left:

The screenshot shows the OpenStack web interface with the title bar "Instances - OpenStack Dashboard". Below the title bar is a navigation bar with links for "Project", "Compute", and "Instances". The main content area is titled "Instances" and displays a table of running instances. The table has columns for Instance ID (dropdown), Filter (button), Launch Instance (button), and Delete (button). The table shows one item: "test" (Instance Name), "cirros" (Image Name), "192.168.222.9, 10.20.20.183" (IP Address), "m1.tiny" (Flavor), "microstack" (Key Pair), "Active" (Status), "nova" (Availability Zone), "None" (Task), "Running" (Power State), and "3m" (Age). A red arrow points from the text "Availability Zone" in the table header to the "Availability Zone" column in the table data.

Instance ID =	Filter	Launch Instance	Delete						
Displaying 1 item									
Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Age
test	cirros	192.168.222.9, 10.20.20.183	m1.tiny	microstack	Active	nova	None	Running	3m

Figure 21

The screenshot shows an OpenStack instance overview page with the following details:

- Active Instances:** 1
- Active RAM:** 512MB
- This Period's VCPU-Hours:** 0.03
- This Period's GB-Hours:** 0.03
- This Period's RAM-Hours:** 17.02

**Usage**

Displaying 1 item

Instance Name	VCPUs	Disk	RAM	Age
test	1	1GB	512MB	2 minutes

Displaying 1 item

[Download CSV Summary](#)

Figure 22

HfY  
19/5/22

## Practical 4: Creating and launching basic virtual machine.

1. Go to Project Compute Instances.

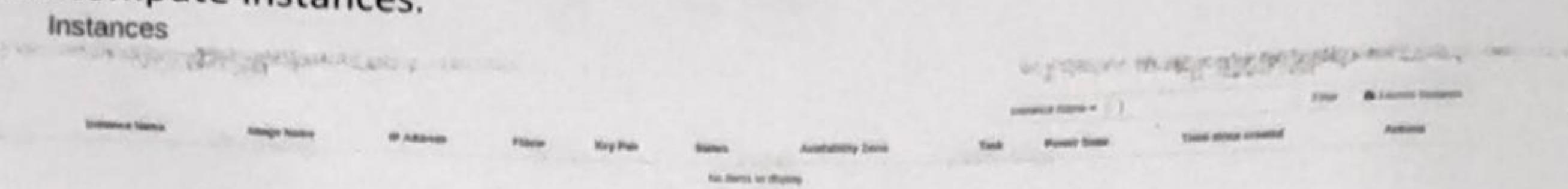


Figure 23

2. Click "Launch Instance".

Insert the name of the Instance (e.g., "vm01") and click Next button.

The screenshot shows the 'Launch Instance' wizard. The first step, 'Details', is selected. It includes fields for Source (set to 'Image'), Instance Name (set to 'vm01'), Availability Zone (set to 'nova'), Count (set to '1'), and a progress bar indicating '17%'. On the right, there's a summary of current usage: 6 Current Usage, 1 Added, and 34 Remaining. At the bottom are 'Cancel', 'Back', 'Next >', and a large 'Launch instance' button.

Figure 24

3. Select Instance Boot Source (eg. "Image"), and choose desired image (eg. "Ubuntu 16.04 LTS") by clicking on arrow. If you do not need to have the systemdisk bigger than the size defined in a chosen flavor, we recommend setting "Create New Volume" feature to "No" state.

Instance source is the template used to create an instance. You can use an image, a snapshot of an instance (image snapshot), a volume or a volume snapshot (if enabled). You can also choose to use persistent storage by creating a new volume.

#### Select Boot Source

<input type="button" value="Image"/>	<input type="button" value="Create New Volume"/> <input type="button" value="Yes"/> <input type="button" value="No"/>																																		
Allocated																																			
Name	Updated	Size	Type	Visibility																															
Select an item from Available items below																																			
<b>▼ Available (16)</b> <div style="display: flex; justify-content: space-between; align-items: center;"> <span><input type="button" value="Q"/> Click here for filters.</span> <span>Select one</span> <span><input type="button" value="X"/></span> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Name</th> <th>Updated</th> <th>Size</th> <th>Type</th> <th>Visibility</th> <th></th> </tr> </thead> <tbody> <tr> <td>&gt; Ubuntu 20.04 LTS</td> <td>10/20/20 9:37 AM</td> <td>2.94 GB</td> <td>raw</td> <td>Public</td> <td><input type="button" value="▲"/></td> </tr> <tr> <td>&gt; Ubuntu 18.04 LTS</td> <td>10/16/20 6:21 AM</td> <td>3.17 GB</td> <td>raw</td> <td>Public</td> <td><input type="button" value="▲"/></td> </tr> <tr> <td>&gt; Ubuntu 16.04 LTS</td> <td>8/7/20 3:46 PM</td> <td>2.69 GB</td> <td>raw</td> <td>Public</td> <td><input type="button" value="▲"/></td> </tr> <tr> <td>&gt; Ubuntu 18.04 + QGIS</td> <td>8/7/20 12:36 AM</td> <td>15.20 GB</td> <td>raw</td> <td>Public</td> <td><input type="button" value="▲"/></td> </tr> </tbody> </table>						Name	Updated	Size	Type	Visibility		> Ubuntu 20.04 LTS	10/20/20 9:37 AM	2.94 GB	raw	Public	<input type="button" value="▲"/>	> Ubuntu 18.04 LTS	10/16/20 6:21 AM	3.17 GB	raw	Public	<input type="button" value="▲"/>	> Ubuntu 16.04 LTS	8/7/20 3:46 PM	2.69 GB	raw	Public	<input type="button" value="▲"/>	> Ubuntu 18.04 + QGIS	8/7/20 12:36 AM	15.20 GB	raw	Public	<input type="button" value="▲"/>
Name	Updated	Size	Type	Visibility																															
> Ubuntu 20.04 LTS	10/20/20 9:37 AM	2.94 GB	raw	Public	<input type="button" value="▲"/>																														
> Ubuntu 18.04 LTS	10/16/20 6:21 AM	3.17 GB	raw	Public	<input type="button" value="▲"/>																														
> Ubuntu 16.04 LTS	8/7/20 3:46 PM	2.69 GB	raw	Public	<input type="button" value="▲"/>																														
> Ubuntu 18.04 + QGIS	8/7/20 12:36 AM	15.20 GB	raw	Public	<input type="button" value="▲"/>																														

Figure 25

#### 4. Choose Flavour (e.g. eo1.xsmall).

Flavors manage the sizing for the compute, memory and storage capacity of the instance.

Allocated

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public	
> eo1.xsmall	1	1 GB	8 GB	8 GB	0 GB	Yes	<input type="button" value="▼"/>
<b>▼ Available (22)</b>							
<input type="button" value="Q"/> Click here for filters.	Select one	<input type="button" value="X"/>					
Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public	
> ds.large.nvme	40	125 GB	64 GB	64 GB	0 GB	Yes	<input type="button" value="▲"/>
> eo1.small	2	2 GB	16 GB	16 GB	0 GB	Yes	<input type="button" value="▲"/>
> eo1.xmedium	1	2 GB	8 GB	8 GB	0 GB	Yes	<input type="button" value="▲"/>
> eo1.medium	2	4 GB	16 GB	16 GB	0 GB	Yes	<input type="button" value="▲"/>
> eo1.large	4	8 GB	32 GB	32 GB	0 GB	Yes	<input type="button" value="▲"/>

Figure 26

#### 5. Click "Networks" and then choose desired networks.

Networks provide the communication channels for instances in the cloud.

Allocated (2)

Select networks from those listed below.

Network	Subnets Associated	Shared	Admin State	Status
1 > private_network_09064	private_subnet_09064	No	Up	Active
2 > eodata	eodata	Yes	Up	Active

Available (0)

Select at least one network

Click here for filters.

Network	Subnets Associated	Shared	Admin State	Status
No available items				

Figure 27

6. Open "Security Groups" After that, choose "allow ping ssh rdp" and "default".

Select the security groups to launch the instance in.

Allocated (2)

Name

Description

> default

Default security group

> allow\_ping\_ssh\_rdp

Available (0)

Select one or more

Q

Click here for filters.

Name

Description

No available items

Figure 28

7. Choose or generate SSH keypair (HOW TO CREATE KEY-PAIR IN OPENSSTACK DASHBOARD?) for your VM. Next, launch your instance by clicking on blue button.

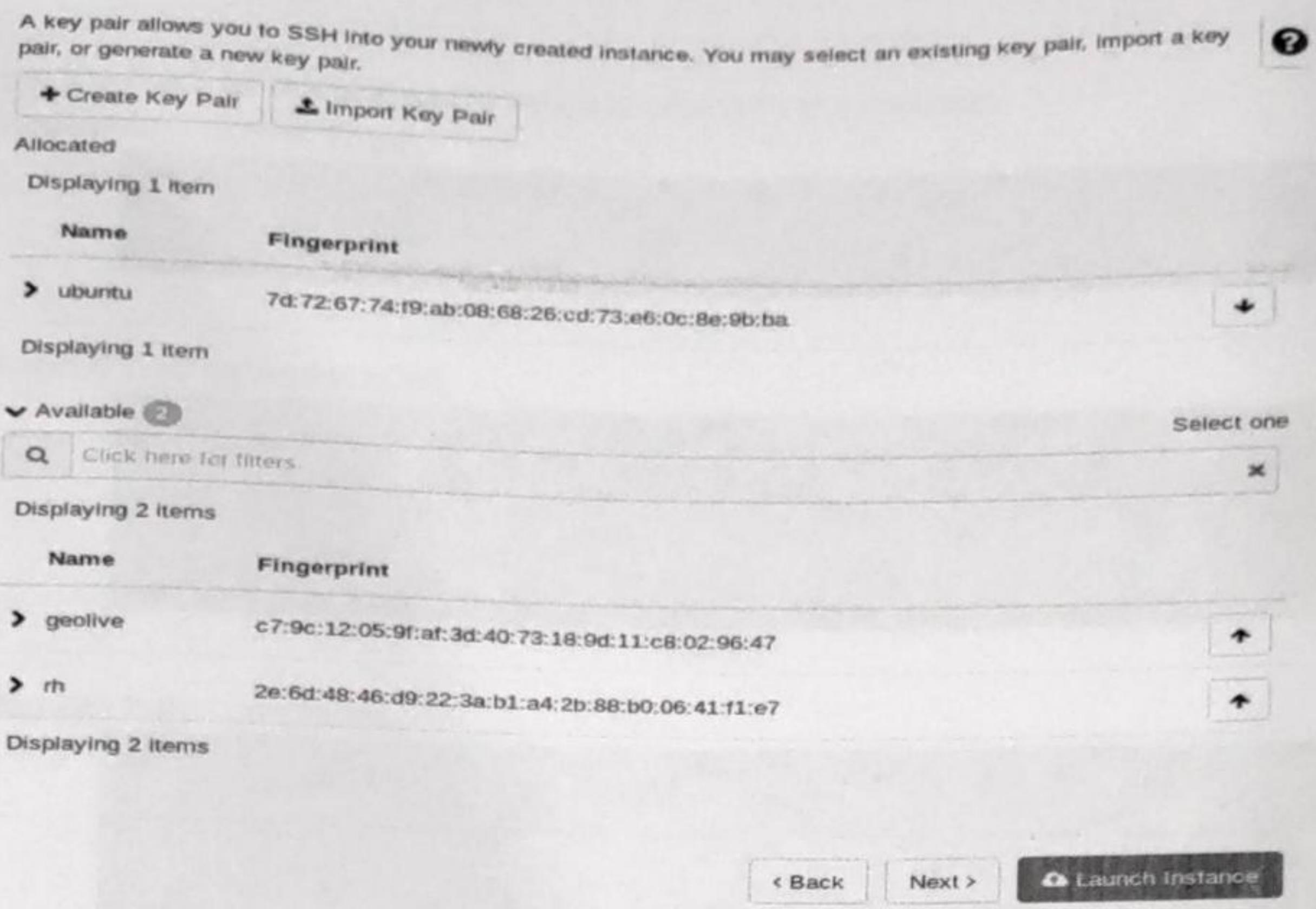


Figure 29

You will see "Instances" menu with your newly created VM.

<input type="checkbox"/> Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State
<input type="checkbox"/> vm01	Ubuntu 18.04 LTS	10.111.0.142 private_network_09064 192.168.0.8	vol.xsmail	ubuntu	Active	a nova	None	Running

Figure 30

8. Open the drop-down menu and choose "Console".

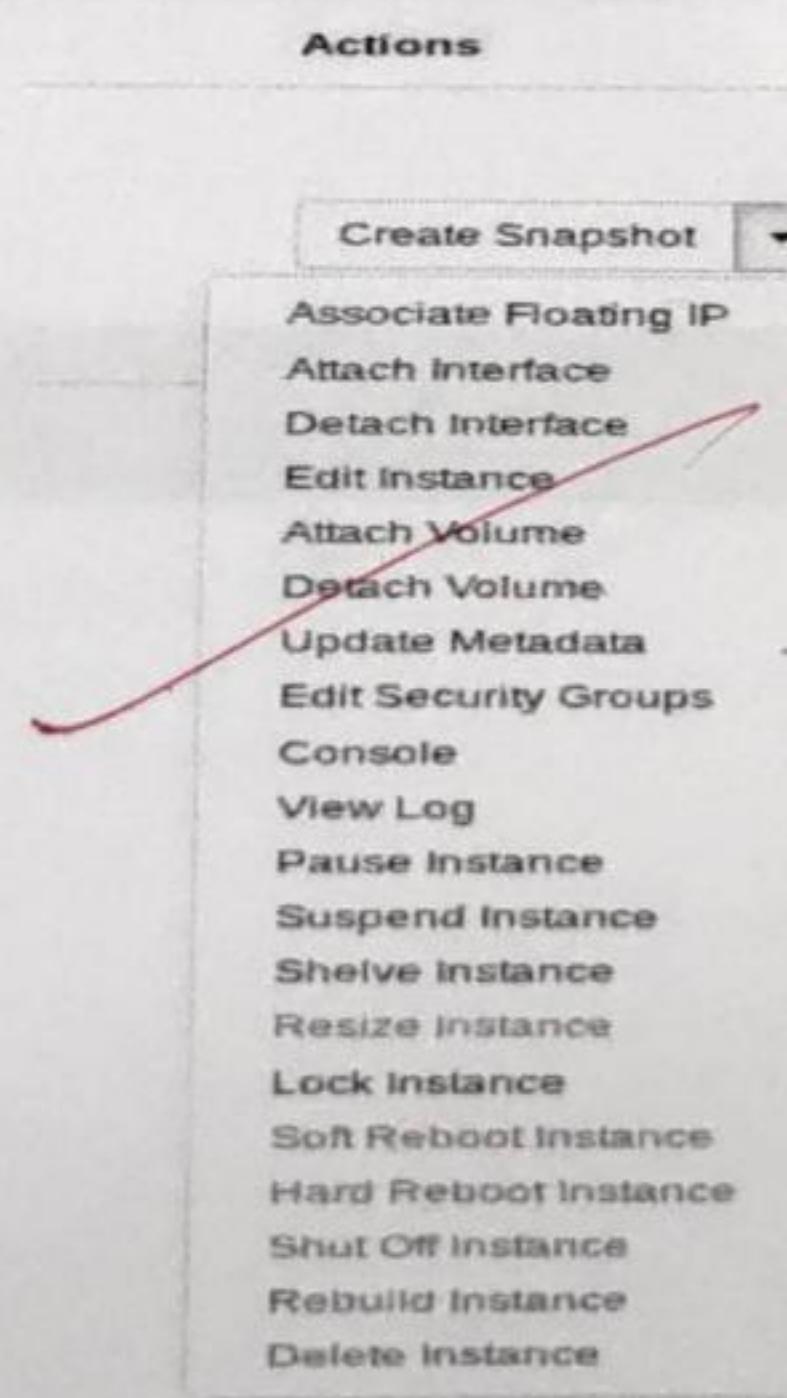


Figure 31

9. Click on the black terminal area (to activate access to the console).  
Type: eoconsole and hit Enter.

```
Ubuntu 16.04.6 LTS vm01 tty1
vm01 login: eoconsole
```

Figure 32

10. Insert and retype new password.

```
Ubuntu 16.04.6 LTS vm01 tty1
vm01 login: eoconsole
you are required to change your password immediately (root enforced)
Enter new UNIX password:
Retype new UNIX password:
```

Figure 33

11. Now you can type commands.

```
Ubuntu 16.04.6 LTS vm01 tty1
vm01 login: eoconsole
you are required to change your password immediately (root enforced)
Enter new UNIX password:
Retype new UNIX password:
Welcome to Ubuntu 16.04.6 LTS (GNU/Linux 4.4.0-165-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

0 packages can be updated.
0 updates are security updates.

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

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

eoconsole@vm01:~$ _
```

Figure 34

12. After you finish, type "exit".

```
eoconsole@vm01:~$ exit
```

Figure 35

This will close the session.

## Practical 5: Creating and Managing Images and Templates.

The cloud operator assigns roles to users. Roles determine who can upload and manage images. The operator might restrict image upload and management to only cloud administrators or operators.

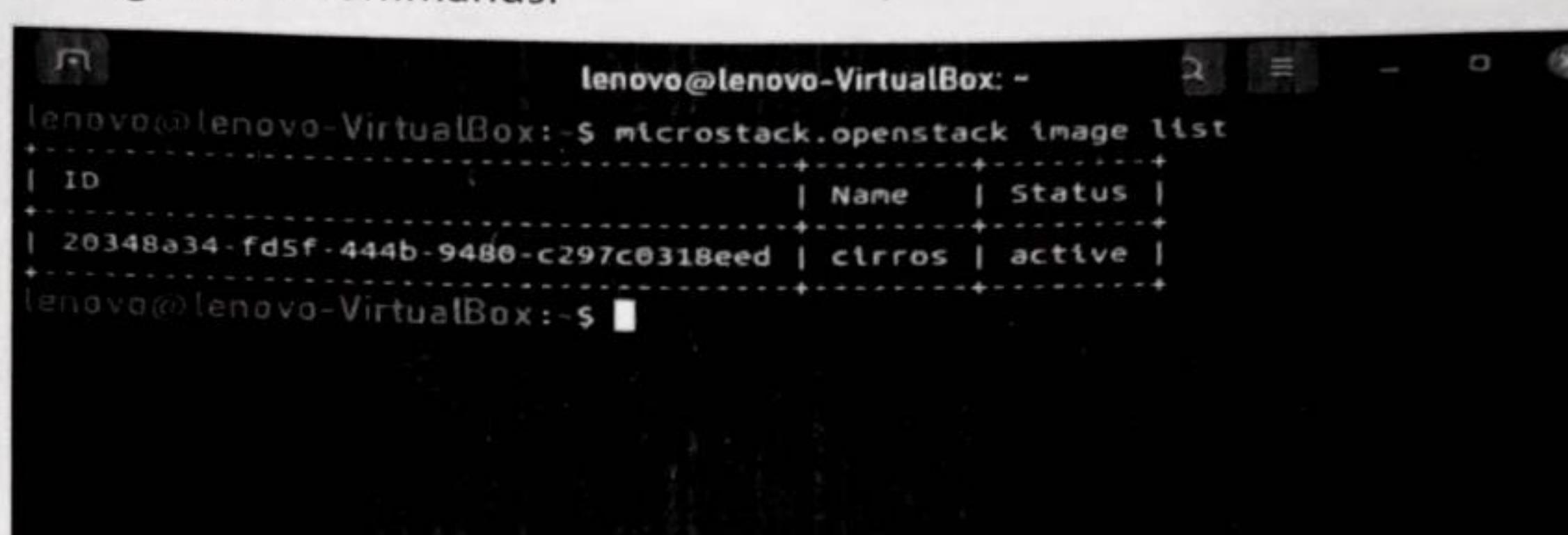
You can upload images through the openstack image create command or the Image service API. You can use the openstack client for the image management. It provides mechanisms to list and delete images, set and delete image metadata, and create images of a running instance or snapshot and backup types.

After you upload an image, you cannot change it.

### Manage images

#### 1. List or get details for images (glance)

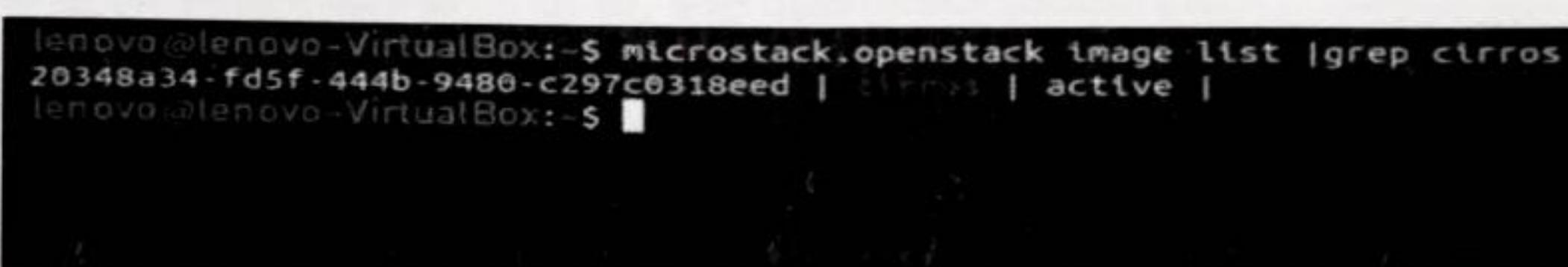
To get a list of images and to get further details about a single image, useopenstack image list and openstack image show commands.



```
lenovo@lenovo-VirtualBox:~$ microstack openstack image list
+-----+-----+
| ID      | Name   | Status |
+-----+-----+
| 20348a34-fd5f-444b-9480-c297c0318eed | cirros | active |
+-----+-----+
lenovo@lenovo-VirtualBox:~$
```

Figure 36

When viewing a list of images, you can also use grep to filter the list, as follows:



```
lenovo@lenovo-VirtualBox:~$ microstack openstack image list | grep cirros
20348a34-fd5f-444b-9480-c297c0318eed | cirros | active |
lenovo@lenovo-VirtualBox:~$
```

Figure 37

#### 2. Create or update an image (glance)

To create an image, use openstack image create

+-----+-----+	
Field	Value
container_format	bare
created_at	2021-12-13T15:36:34Z
disk_format	raw
file	/v2/images/2f2f6e63-856d-448e-a078-1e5cd1e0d6a1/file
id	2f2f6e63-856d-448e-a078-1e5cd1e0d6a1
min_disk	0
min_ram	0
name	randeep
owner	2c28aa81710c4f448ae450e2ac08cb2f

Figure 38

To update an image by name or ID, use openstack image set:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack image set
```

Figure 39

The following list explains the optional arguments that you can use with the create and set commands to modify image properties. For more information, refer to the OpenStack Image command reference.

The following example shows the command that you would use to upload a CentOS 6.3 image in qcow2 format and configure it for public access:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack image create --disk-format qcow2 --container-format b  
re\--public -f ./centos63.qcow2 centos63-image  
usage: openstack image create [-h] [-f {json,shell,table,value,yaml}] [-c COLUMN] [--noindent]  
[--prefix PREFIX] [--max-width <integer>] [--fit-width] [--print-empty]  
[--id <id>] [--container-format <container-format>]  
[--disk-format <disk-format>] [--min-disk <disk-gb>]  
[--min-ram <ram-mb>] [--file <file> | --volume <volume>] [--force]  
[--sign-key-path <sign-key-path>] [--sign-cert-id <sign-cert-id>]  
[--protected | --unprotected]  
[--public | --private | --community | --shared] [--property <key=value>]  
[--tag <tag>] [--project <project>] [--project-domain <project-domain>]  
<image-name>  
openstack image create: error: argument --container-format: invalid choice: 'bare--public' (choose from  
'ami', 'ari', 'aki', 'bare', 'docker', 'ova', 'ovf')  
lenovo@lenovo-VirtualBox:~$
```

Figure 40

The following example shows how to update an existing image with properties that describe the disk bus, the CD-ROM bus, and the VIF model:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack image set \
--property hw_disk_bus=scsi \
--property hw_disk_cdrom=ide \
--property hw_vif_model=e1000 \
16-x86-openstack-sda
```

Figure 41

### 3. Create an image from ISO image

You can upload ISO images to the Image service (glance). You can subsequently boot an ISO image using Compute.

In the Image service, run the following command:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack create ISO_IMAGE --file IMAGE
so \
--disk-format iso --container-format bare
```

Figure 42

Optionally, to confirm the upload in Image service, run:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack image list
+-----+-----+-----+
| ID      | Name    | Status |
+-----+-----+-----+
| 20348a34-fd5f-444b-9480-c297c0318eed | cirros  | active |
| 2f2f6e63-856d-448e-a078-1e5cd1e0d6a1 | randeep | queued |
+-----+-----+-----+
```

Figure 43

## Practical 6: Creating and Managing Networks.

### Create networks

1. List the extensions of the system:

microstack.openstack extension list -c Alias -c Name	
Extensions list not supported by Identity API	
Name	Alias
Multinic	NVN
DiskConfig	OS-DCF
ExtendedAvailabilityZone	OS-EXT-AZ
ImageSize	OS-EXT-IMG-
ZE	
ExtendedIps	

Figure 44

2. Create a network:

microstack.openstack network create net1	
Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2021-12-13T15:57:25Z
description	

Figure 45

3. Create a network with specified provider network type.

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2021-12-13T15:59:22Z
description	

*Figure 46*

## Create Subnets

- #### 1. Create a subnet:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack subnet create net1 --network net1 --subnet-range 192.168.2.0/24
+-----+
| Field | Value |
+-----+
| allocation_pools | 192.168.2.2-192.168.2.254 |
| cidr | 192.168.2.0/24 |
| created_at | 2021-12-13T16:02:05Z |
| description | |
| dns_nameservers | |
| dns_publish_fixed_ip | None |
| enable_dhcp | True |
```

*Figure 47*

## Create routers

- ## 1. Create a router:

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2021-12-13T16:04:13Z
description	
external_gateway_info	null
Flavor ID	None

Figure 48

- Link the router to the external provider network:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack router set --external-gateway external-router
```

Figure 49

Replace ROUTER with the unique identifier of the router, replace NETWORK with the unique identifier of the external provider network.

- Link the router to the external provider network:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack router add --external-interface external external-router
```

Figure 50

## Create ports

- Create a port with specified IP address:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack router add --external-interface external external-router
```

Figure 51

- Create a port without specified IP address:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack port create net1
```

Figure 52

- Query ports with specified fixed IP addresses:

```
lenovo@lenovo-VirtualBox:~$ microstack.openstack port list --fixed-ips ip_address=192.168.2.1 ip_address=192.168.2.40
```

Figure 53

## Practical 7: Creating and Managing Users

List users

1. List all users:

ID	Name
9ffb2e93d9d342b4bb5e5f82817313b1	admin
f3b91a0c88724bc974a47ec543c3976	placement
9606141db0ef4a6195ee5323f5fd7b61	nova
472db715260146d294f6c98409d00e2d	neutron
6ba5ad72da444f7092b50e78549682a9	glance
a2a7d8748f404bfe8527912cab1a79cc	cinder

Figure 54

2. Create a user:

To create a user, you must specify a name. Optionally, you can specify a project ID, password, and email address. It is recommended that you include the project ID and password because the user cannot log in to the dashboard without this information.

Field	Value
default_project_id	81524b7dcc304deaab469f82df4b1026
domain_id	default
email	randeepkaur3002@gmail.com
enabled	True
id	b6693d0086cb4172b4a753869360c771
name	randeep
options	{}
password_expires_at	None

Figure 55

3. Update a user:

You can update the name, email address, and enabled status for a user.

To temporarily disable a user account:

```
lenovo@lenovo-VirtualBox: $ microstack.openstack user set
```

Figure 56

To enable a disabled user account:

```
lenovo@lenovo-VirtualBox: $ microstack.openstack user set
```

Figure 57

To change the name and description for a user account:

```
lenovo@lenovo-VirtualBox: $ microstack.openstack user set
```

Figure 58

4. Delete a user:

Delete a specified user account:

```
lenovo@lenovo-VirtualBox: $ microstack.openstack user delete
```

```
lenovo@lenovo-VirtualBox: $ microstack.openstack role assignment list
```

5. Assigning role to user:

```
lenovo@lenovo-VirtualBox: $ microstack.openstack role assignment list
```

Figure 60

## Practical 8: Connecting to virtual machine/server from local computer

### Key components of Openstack:

OpenStack architecture involves the following set of services:

Service	Code name	Description
Compute	Nova	Acts as the system controller; allows the provisioning and management of virtual machines (VMs) using the disk images available on OpenStack
Object storage	Swift	Provides an object storage and reading service
Block storage	Cinder	Provides permanent block storage to the running VMs; those volumes can easily be plugged and unplugged from the instances
Network management	Neutron	Enables connectivity between the VMs through virtual networks
Authentication	Keystone	Enables authentication of the OpenStack users to allow them to use certain services
Image service	Glance	Allows disk image storage and retrieval; these images will be used by OpenStack compute service when provisioning the VMs
Billing service	Ceilometer	Monitors and measures the use of cloud resources (use of VMs, network traffic) for billing or benchmarking
Cloud template	Heat	Enables several cloud composite applications to be launched and managed, allowing the user to automate a cloud deployment from configuration text files
Dashboard	Horizon	Provides a user interface to configure and deploy all the services previously described; from this interface, the user is able to create, run and manage instances, their resources and their connectivity

Figure 61

### Architecture of Openstack:

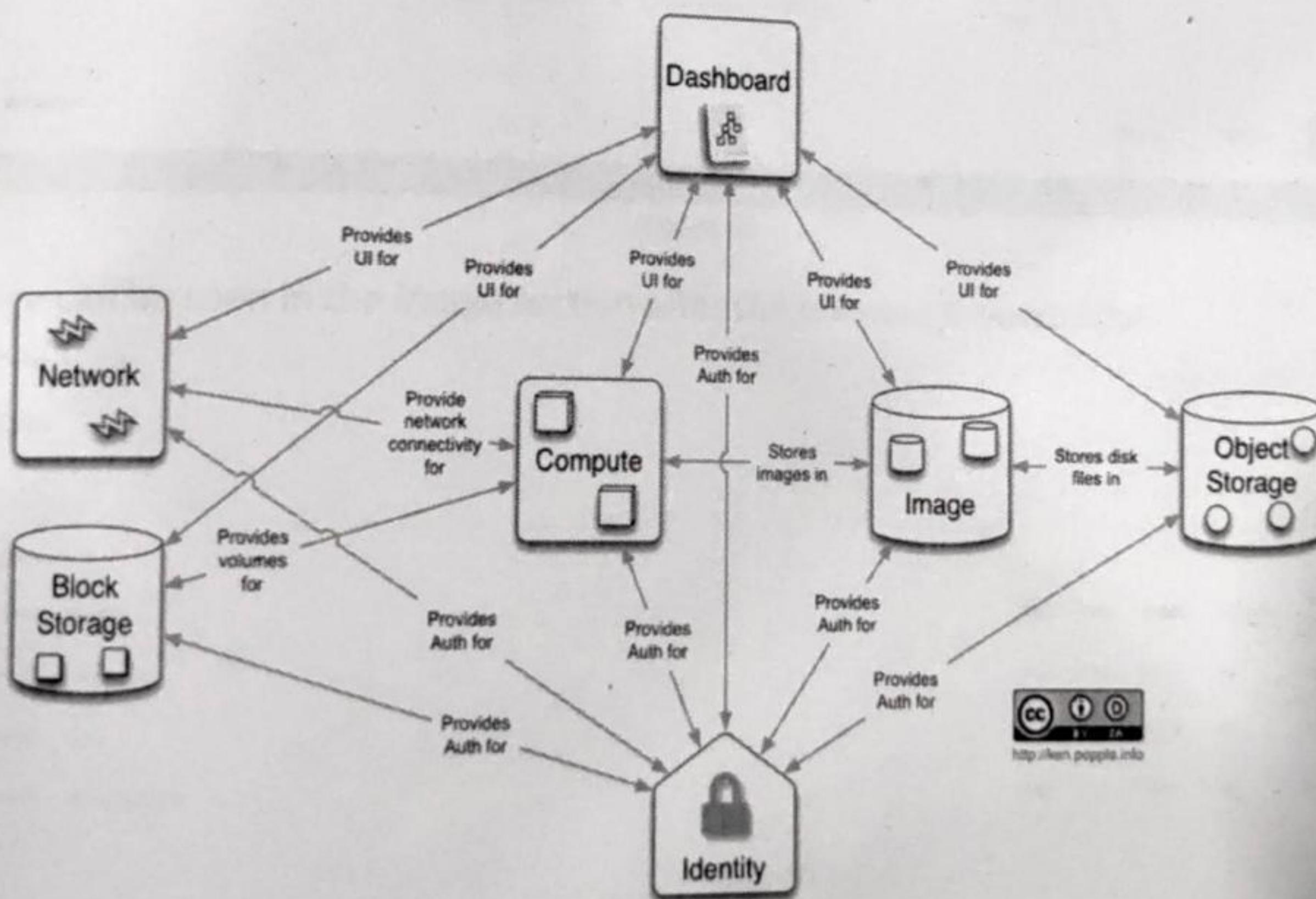


Figure 62

### Step 1: Create Images

1. Download the ubuntu (or what where image you want to create) .img file. Use the command file for file format.

```
lenovo@lenovo-VirtualBox:~$ cd Desktop
lenovo@lenovo-VirtualBox:~/Desktop$ ls
ubuntu-20.04-server-cloudimg-amd64.img
lenovo@lenovo-VirtualBox:~/Desktop$ file ubuntu-20.04-server-cloudimg-amd64.img
ubuntu-20.04-server-cloudimg-amd64.img: cannot open 'ubuntu-20.04-server-cloudimg-amd64
```

Figure 63

2. Click on Image option. Now click on create image option. Give the image name, browse the .img file and choose the image format.

The screenshot shows a 'Create Image' dialog box. At the top left is a 'Create Image' button. Below it is a 'Image Details' tab, which is selected, showing a 'Metadata' section. In the 'Image Name' field, 'ubuntu' is entered. To the right is an 'Image Description' field with a placeholder 'Description'. Under 'Image Source', there is a 'File\*' field containing 'ubuntu-20.04-server-cloudimg-amd64.img' and a 'Browse...' button. A 'Format\*' dropdown menu is set to 'QCOW2 - QEMU Emulator'. The 'Image Requirements' section includes fields for 'Kernel' (with a dropdown menu 'Choose an image'), 'Architecture' (empty field), 'Ramdisk' (with a dropdown menu 'Choose an image'), 'Minimum Disk (GB)\*' (set to 0), and 'Minimum RAM (MB)\*' (set to 0). The 'Image Sharing' section has a 'Visibility' dropdown with options 'Private', 'Shared', 'Community', and 'Public', where 'Shared' is selected. There is also a 'Protected' section with 'Yes' and 'No' buttons, where 'No' is selected. At the bottom are 'Cancel', 'Back', 'Next >', and 'Create Image' buttons.

Figure 64

3. Image can be seen in the image section after the creation is successful.

Owner		Name	Type	Status	Visibility	Protected	Disk Format	Size	
admin		osda	Image	Active	Public	No	QCOW2	12.13 MB	Launch
admin		ubuntu	Image	Active	Shared	No	QCOW2	541.83 MB	Launch
admin		Ubuntu_20.04_LTS	Image	Active	Public	No	QCOW2	541.83 MB	Launch

Figure 65

## Step 2: Creating the network

1. Use the ip add to configure static IP Addresses in Linux, you need to update or edit the network configuration file to assign a Static IP Address to a system.

```
lenovo@lenovo-VirtualBox:~/Desktop$ ip add
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback brd 00:00:00:00:00:00 state UP group default qlen 1000
        inet 127.0.0.1/8 brd 00:00:00:00:00:00 scope host lo
            valid_lft forever preferred_lft forever
        inet6 ::1/128 brd 00:00:00:00:00:00 scope host
            valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:45:f9:32 brd ff:ff:ff:ff:ff:ff
        inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
            valid_lft 78072sec preferred_lft 78072sec
        inet6 fe80::5c1d:500e:7cb6:3a2f/64 brd ff:ff:ff:ff:ff:ff scope link noprefixroute
            valid_lft forever preferred_lft forever
3: ovs-system: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 02:84:fd:38:72:54 brd ff:ff:ff:ff:ff:ff
4: br-ex: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether 12:1f:36:04:84:4f brd ff:ff:ff:ff:ff:ff
        inet 10.20.20.1/24 brd 10.20.20.255 scope global br-ex
            valid_lft forever preferred_lft forever
        inet6 fe80::101f:36ff:fe04:844f/64 brd ff:ff:ff:ff:ff:ff scope link
            valid_lft forever preferred_lft forever
5: br-int: <BROADCAST,MULTICAST> mtu 1442 qdisc noop state DOWN group default qlen 1000
```

Figure 66

2. Create network public network.

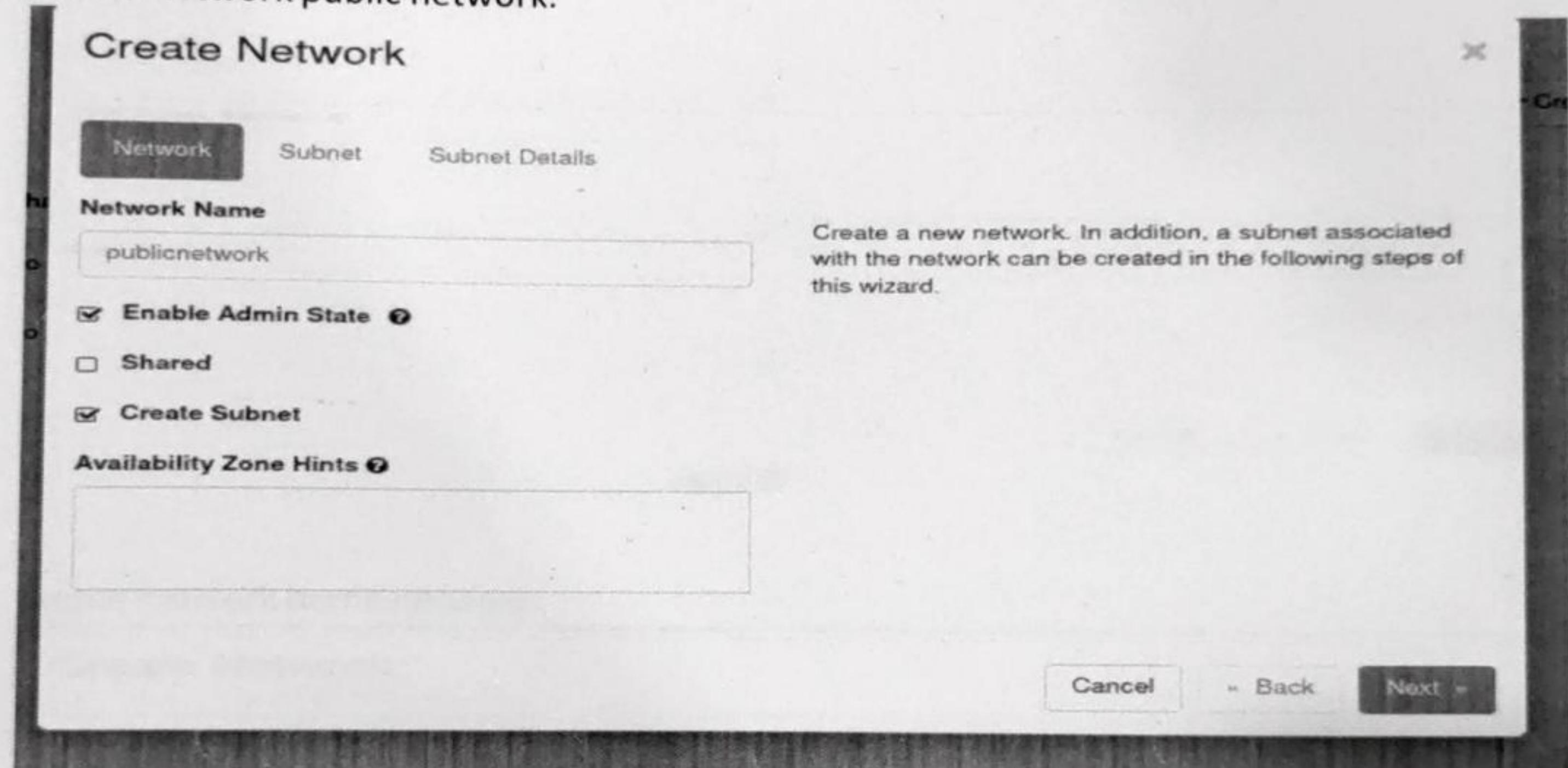


Figure 67

Giving the Ip address 10.0.2.0/24 and subnet name.

**Create Network**

Network Subnet **Subnet Details**

**Subnet Name**  
pubsub

**Network Address** 10.0.2.0/24

**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 >**

Figure 68

Disable the DHCP and click on create.

**Create Network**

Network Subnet **Subnet Details**

**Enable DHCP**

**Allocation Pools**

**DNS Name Servers**

**Host Routes**

Specify additional attributes for the subnet.

**Cancel** **- Back** **Create**

Figure 69

### 3. Create network home network.

**Create Network**

Network Subnet **Subnet Details**

**Network Name** home-lab

**Enable Admin State**

**Shared**

**Create Subnet**

**Availability Zone Hints**

Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.

**Cancel** **- Back** **Next >**

Figure 70

Giving the Ip address 10.20.20.0/24 and subnet name.

Create Network

Network Subnet Subnet Details

**Subnet Name**  
pubsub

**Network Address** 10.20.20.0/24

**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

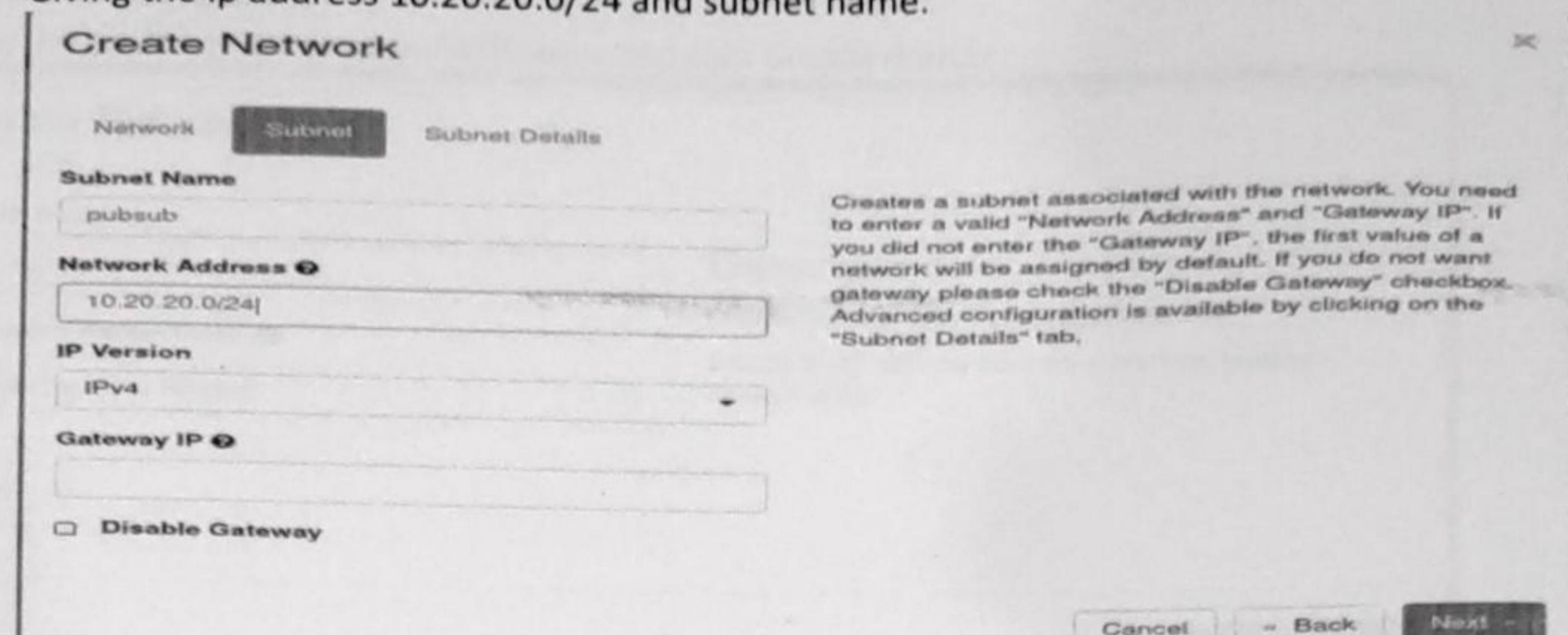


Figure 71

Enable the DHCP and click on create.

Create Network

Network Subnet Subnet Details

Enable DHCP

Specify additional attributes for the subnet.

**Allocation Pools**

**DNS Name Servers**

**Host Routes**

Cancel Back Create

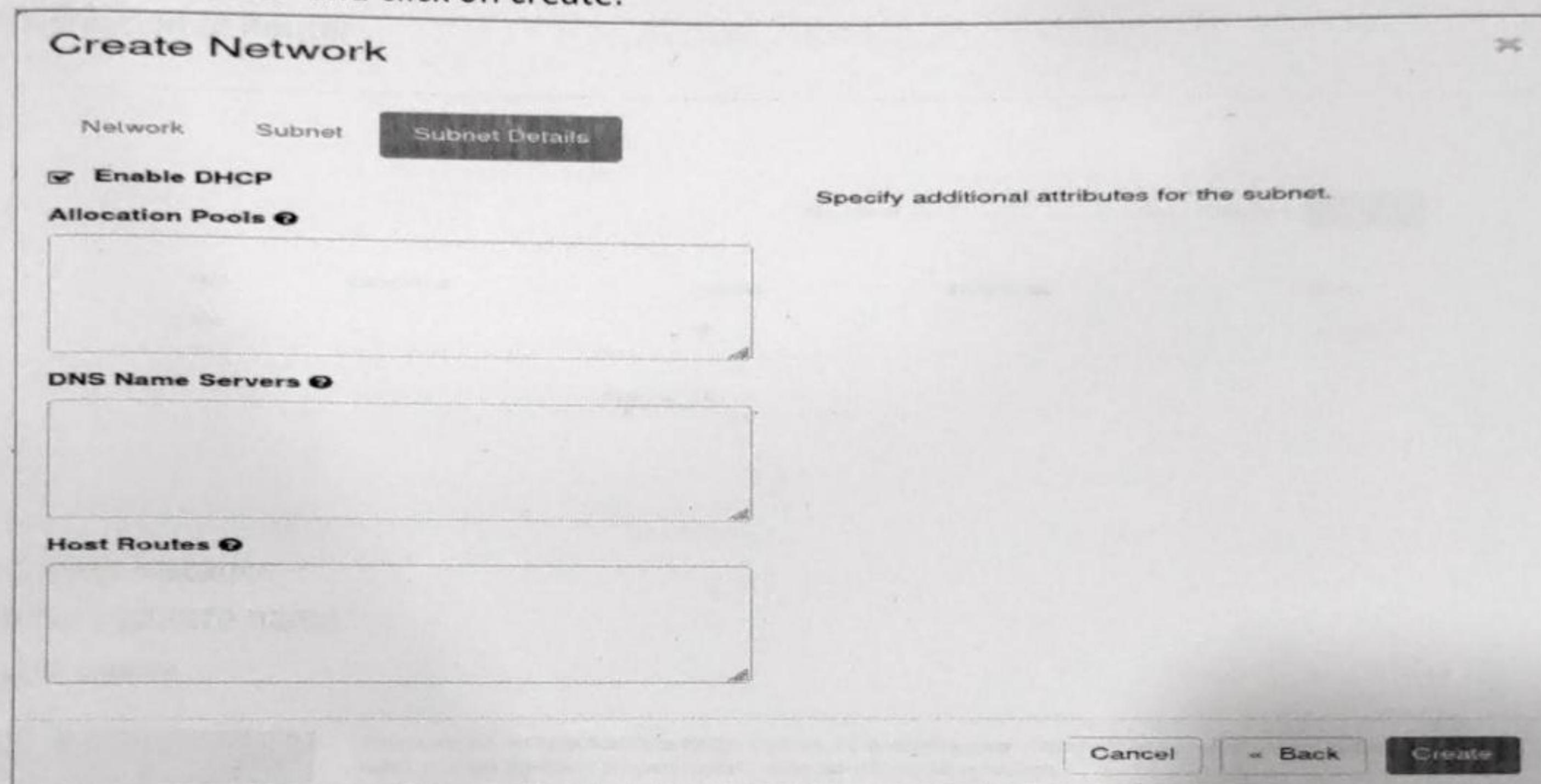


Figure 72

Final Image of the Networks.

Project / Network / Networks

## Networks

Name	Subnets Associated	Shared	External	Status	Admin State	Availability Zones	Actions
pubnetwork	pubsub 10.20.20.0/24	No	No	Active	UP	-	<a href="#">Edit Network</a>
home-lab	homesub 10.20.20.0/24	No	No	Active	UP	-	<a href="#">Edit Network</a>

Displaying 2 items

Filter [+ Create Network](#) [View Details](#)

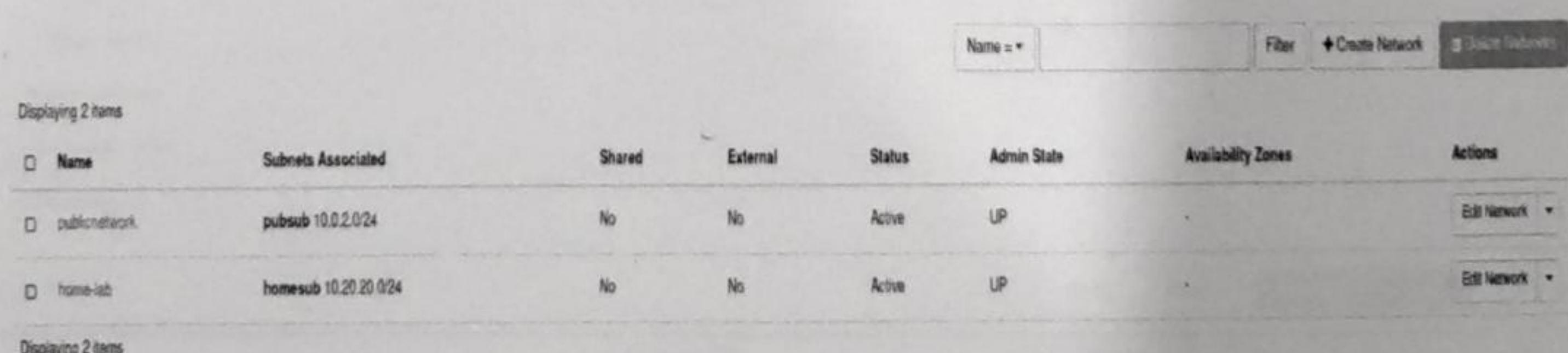


Figure 73

### Step 3: Create the Router

Create the router with name publicRouter and click Create Router.

The dialog box has a title 'Create Router'. It contains a 'Router Name' field with 'publicRouter' typed in. A checked checkbox labeled 'Enable Admin State' is present. A large empty text area labeled 'Availability Zone Hints' is below. To the right, a 'Description:' section defines the creation of a router with specified parameters and notes about SNAT. At the bottom are 'Cancel' and 'Create Router' buttons.

Figure 74

### After the creation of Router .

A table titled 'Routers' showing one item. The columns are 'Name', 'Status', 'External Network', 'Admin State', 'Availability Zones', and 'Actions'. The single row shows 'publicRouter', 'Active', 'None', 'UP', 'nova', and a 'Set Gateway' button. The top navigation bar includes 'Project / Network / Routers', search, filter, and create buttons.

Name	Status	External Network	Admin State	Availability Zones	Actions
publicRouter	Active	None	UP	nova	<button>Set Gateway</button>

Figure 75

### Step 4: Create instance

#### 1. Give the instance name .

The 'Launch Instance' dialog has a 'Details' tab selected. It includes fields for 'Source', 'Flavor \*' (vm01), 'Networks \*', 'Network Ports', 'Security Groups' (nova), 'Key Pair', 'Configuration', 'Server Groups', 'Scheduler Hints', and 'Metadata'. On the right, there's a note about providing an initial hostname, availability zone, and instance count. A progress bar shows '20%' completion. A legend indicates '1 Current Usage', '1 Added', and '8 Remaining' instances. At the bottom are 'Cancel', 'Next >', and 'Launch Instance' buttons.

Figure 76

#### 2. Select the image to be used.

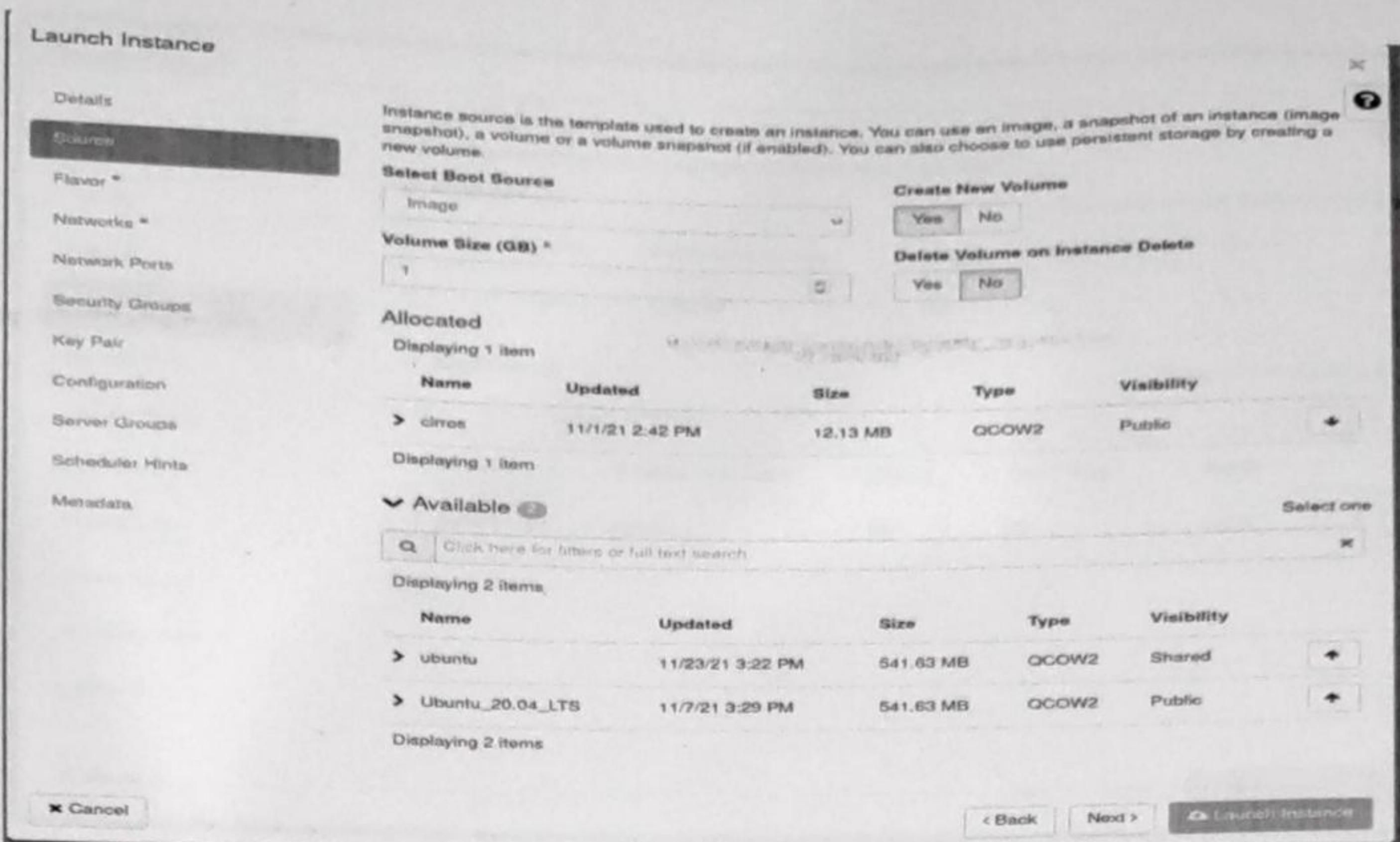


Figure 77

### 3. Select the Flavour of the instance.

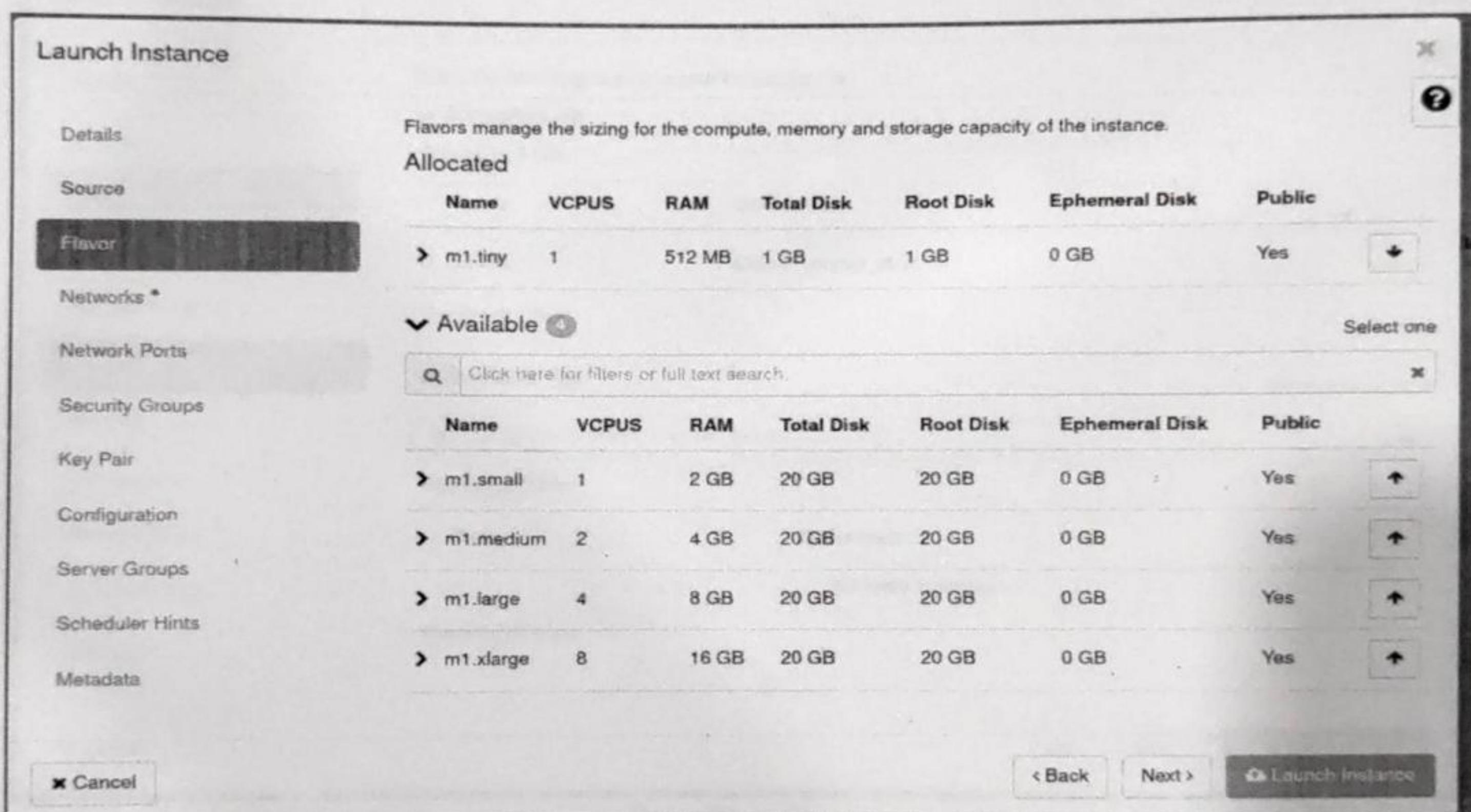


Figure 78

### 4. Select the Network of the instance you want to attach with.

**Launch Instance**

Details *	Networks provide the communication channels for instances in the cloud.				
Source	<b>Allocated</b> 1				
Flavor *	Select networks from those listed below.				
<b>Networks</b>	<b>Network</b>	<b>Subnets Associated</b>	<b>Shared</b>	<b>Admin State</b>	<b>Status</b>
	1 home-lab homesub	No	Up	Active	
<b>Available</b> 0	Select at least one network				
<input type="text"/> Click here for filters or full text search.					
<b>Network Ports</b>	<b>Network</b>	<b>Subnets Associated</b>	<b>Shared</b>	<b>Admin State</b>	<b>Status</b>
	publicnetwork pubsub	No	Up	Active	
<b>Security Groups</b>					
<b>Key Pair</b>					
<b>Configuration</b>					
<b>Server Groups</b>					
<b>Scheduler Hints</b>					
<b>Metadata</b>					

**< Cancel** **Next >** **Launch Instance**

Figure 79

## 5. Select the Security Group.

**Launch Instance**

Details	Select the security groups to launch the instance in.	
Source	<b>Allocated</b> 1	
Flavor	<b>Name</b>	<b>Description</b>
<b>Networks</b>	default	Default security group
<b>Network Ports</b>	Displaying 1 item	
<b>Security Groups</b>	<b>Available</b> 0	
Select one or more		
<b>Key Pair</b>	<input type="text"/> Click here for filters or full text search.	
<b>Configuration</b>	Displaying 0 items	
<b>Server Groups</b>	<b>Name</b>	<b>Description</b>
<b>Scheduler Hints</b>	No items to display.	
<b>Metadata</b>	Displaying 0 items	

**< Back** **Next >** **Launch Instance**

Figure 80

## 6. Select the Keypair as microstack and click on Launch Instance.

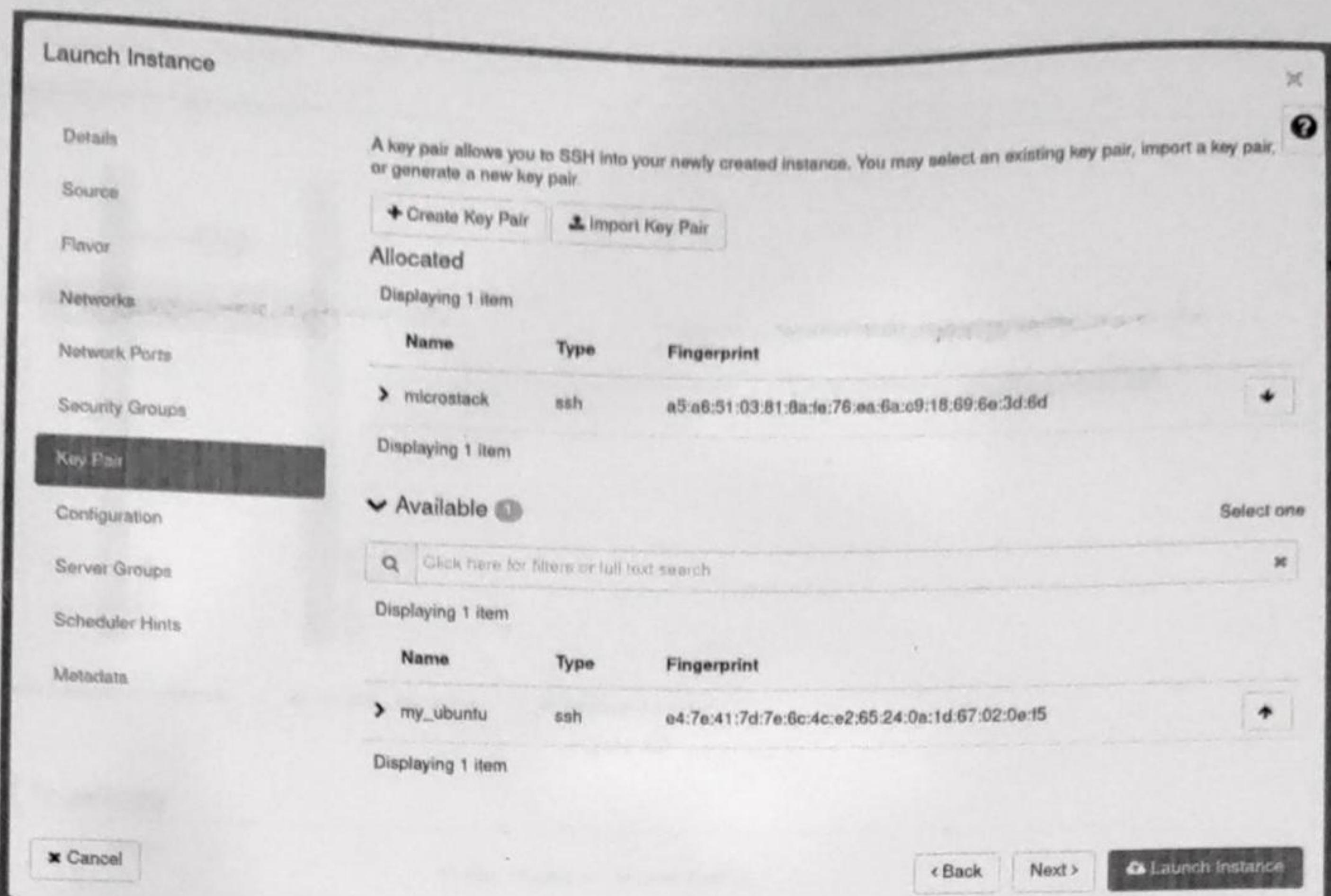


Figure 81

## Step 5:Viewing the Network Topology

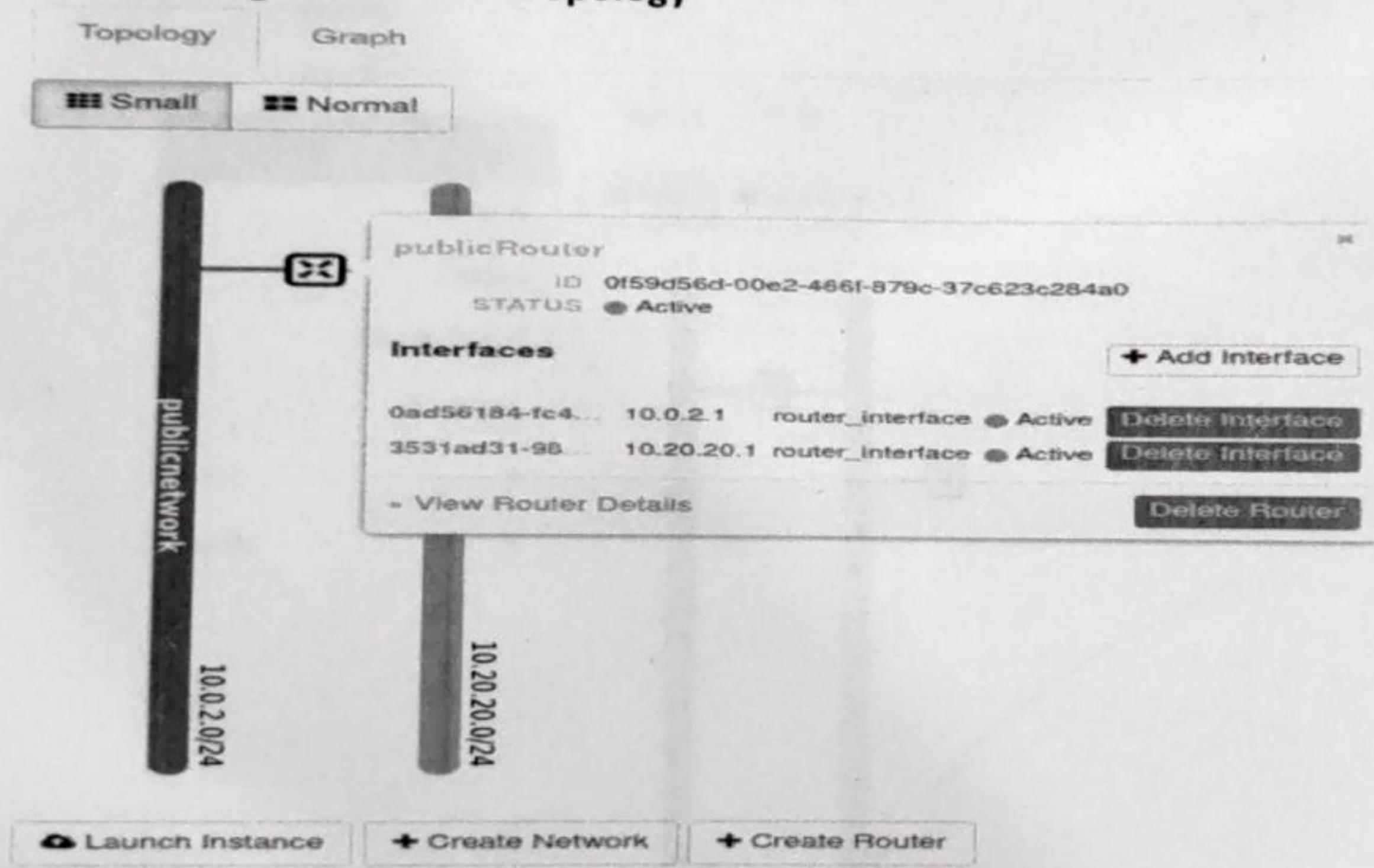


Figure 82

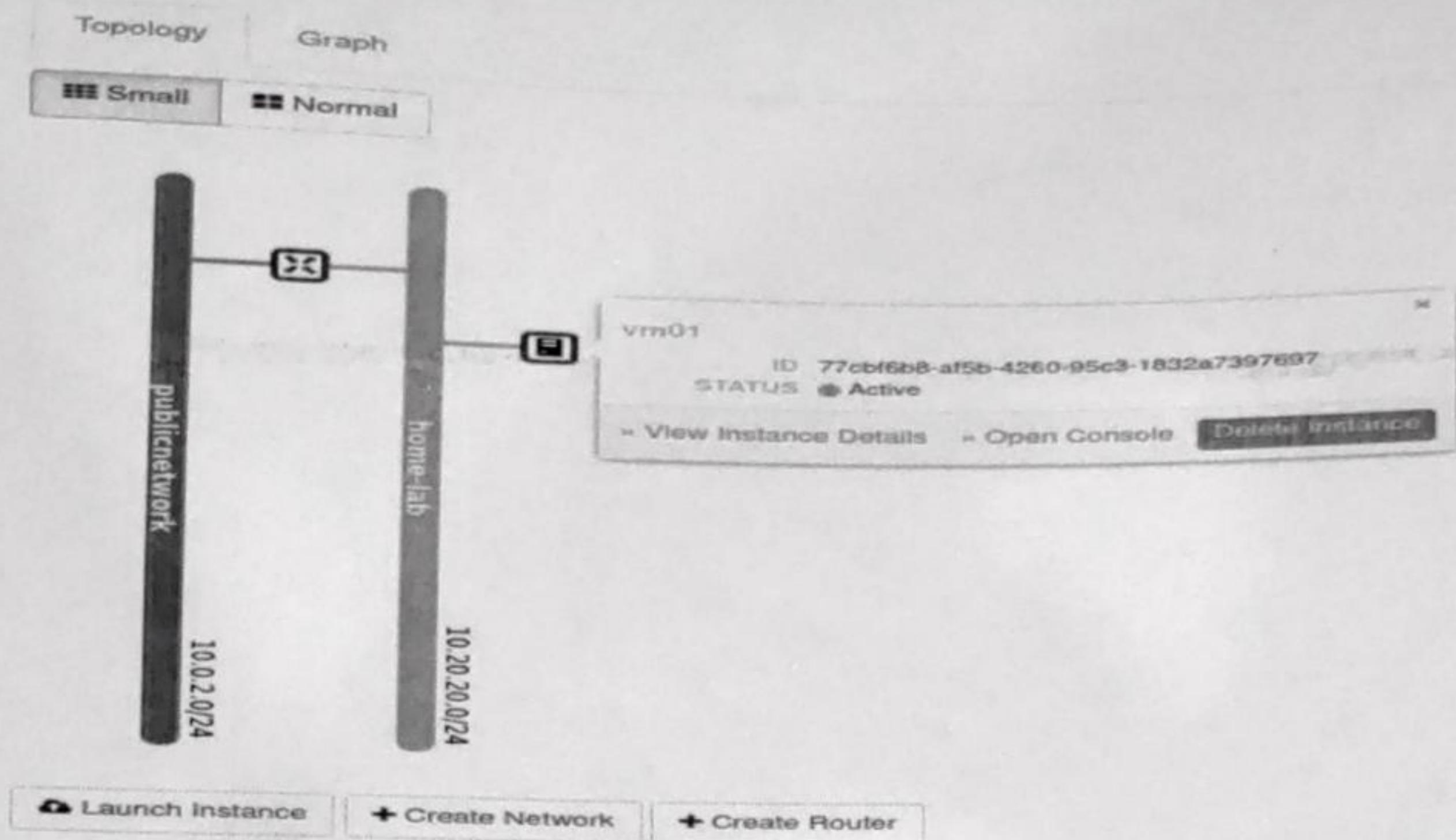


Figure 83

## Final Topology

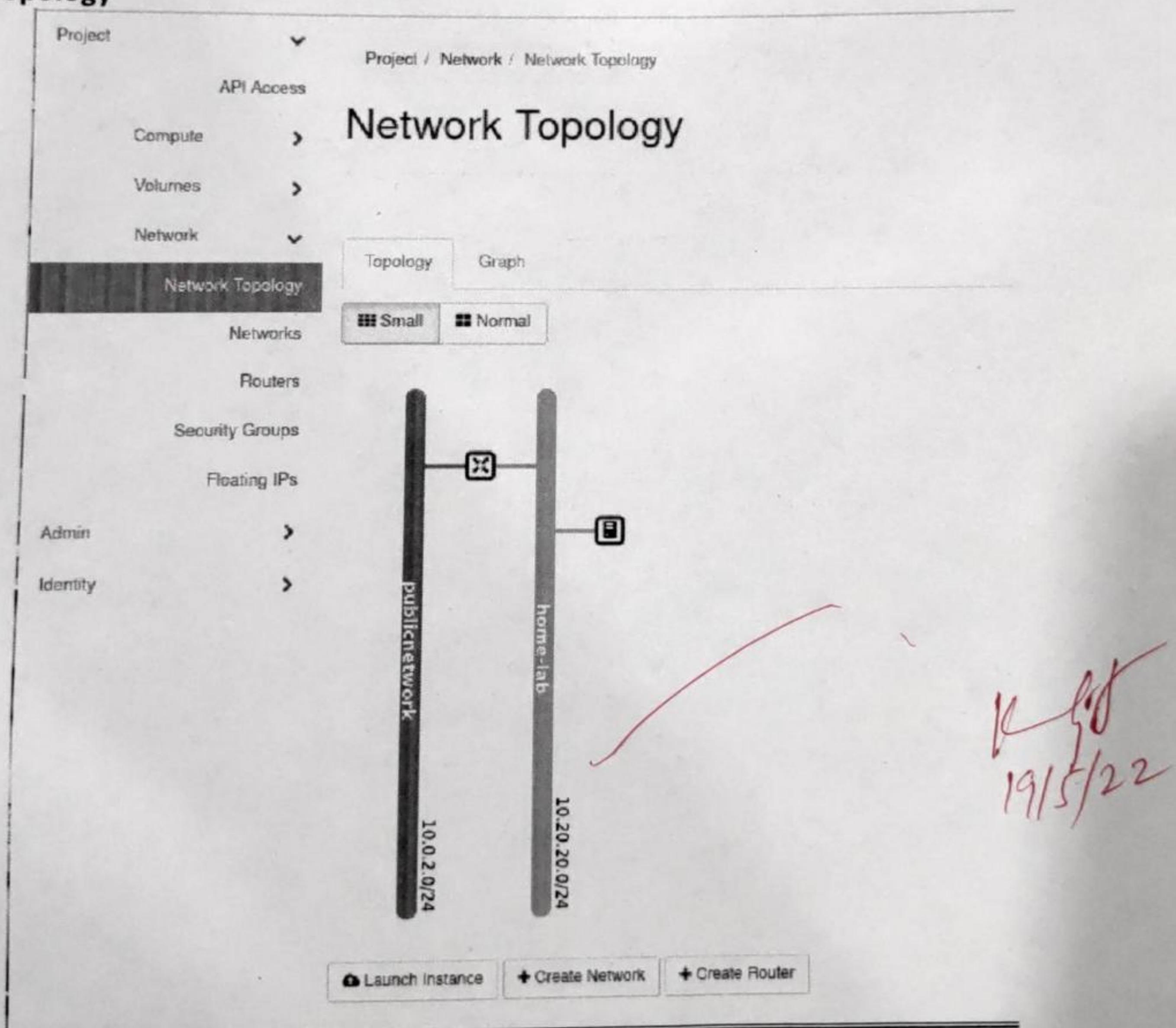


Figure 84