

Name:	Date Performed:
Course/Section:	Date Submitted:
Instructor:	Semester and SY:

Activity 1: Configure Network using Virtual Machines

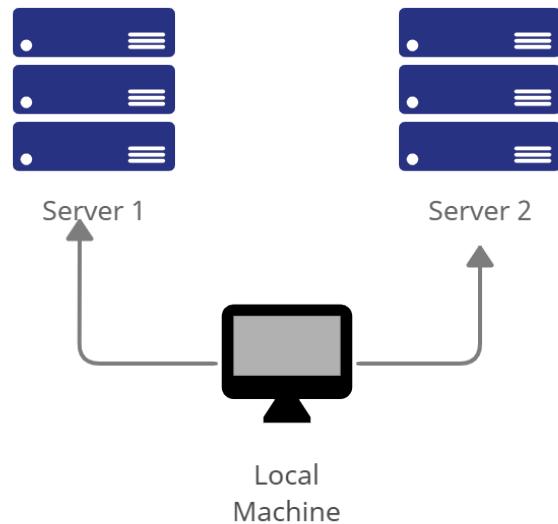
1. Objectives:

- 1.1. Create and configure Virtual Machines in Microsoft Azure or VirtualBox
- 1.2. Set-up a Virtual Network and Test Connectivity of VMs

2. Discussion:

Network Topology:

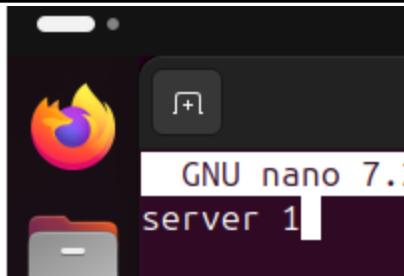
Assume that you have created the following network topology in Virtual Machines, **provide screenshots for each task**. (Note: *it is assumed that you have the prior knowledge of cloning and*



creating snapshots in a virtual machine).

Task 1: Do the following on Server 1, Server 2, and Local Machine. In editing the file using nano command, press control + O to write out (save the file). Press enter when asked for the name of the file. Press control + X to end.

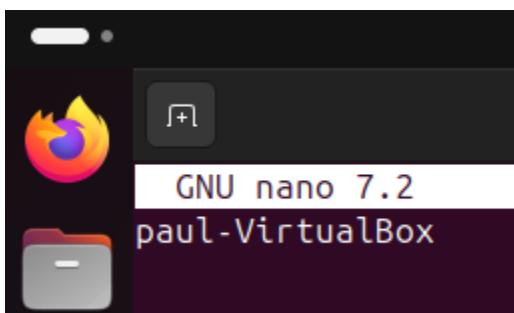
1. Change the hostname using the command ***sudo nano /etc/hostname***
 - 1.1 Use server1 for Server 1



1.2 Use server2 for Server 2

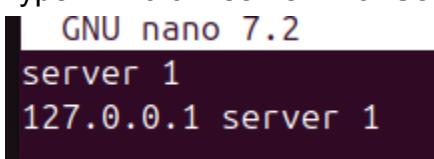


1.3 Use workstation for the Local Machine

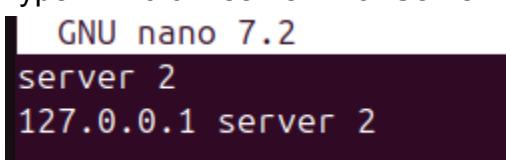


2. Edit the hosts using the command *sudo nano /etc/hosts*. Edit the second line.

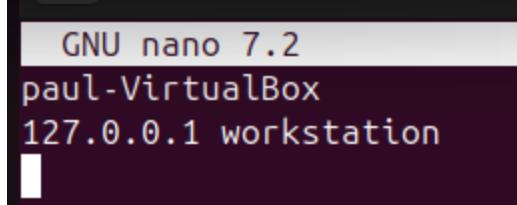
2.1 Type 127.0.0.1 server 1 for Server 1



2.2 Type 127.0.0.1 server 2 for Server 2

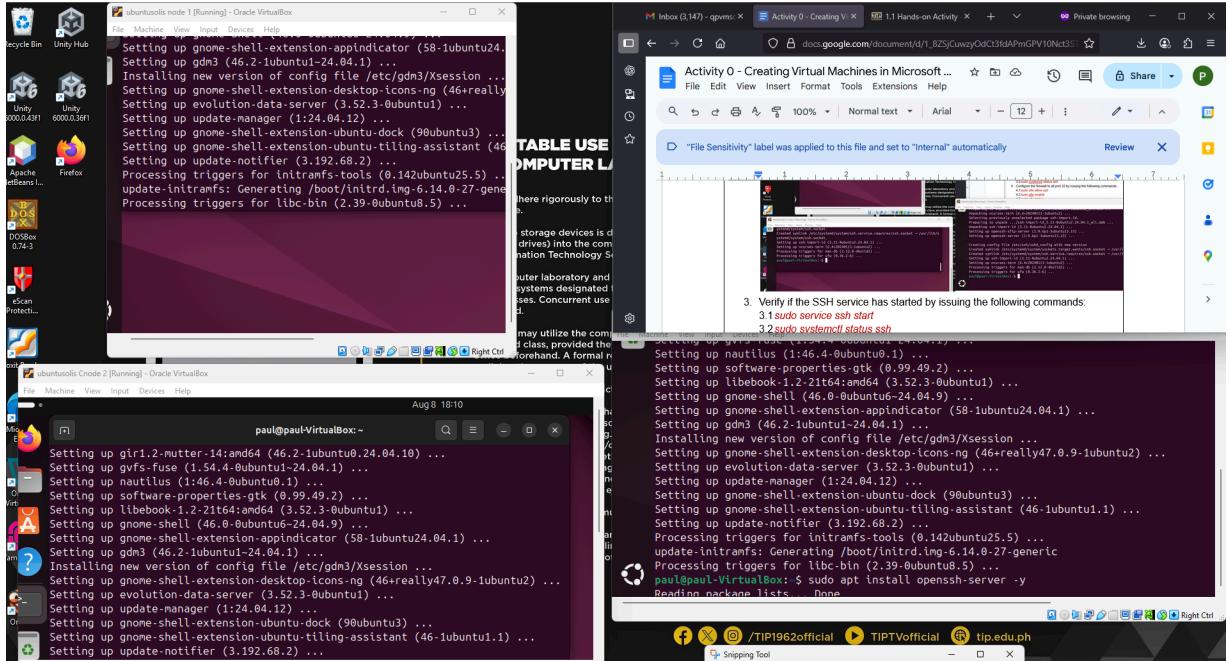


2.3 Type 127.0.0.1 workstation for the Local Machine

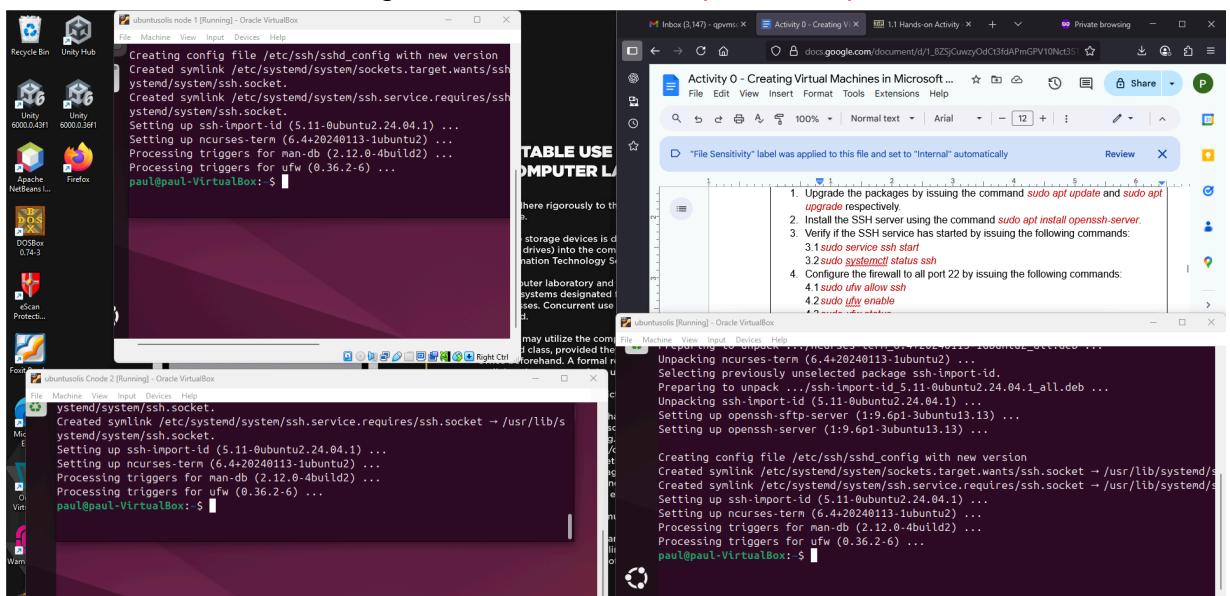


Task 2: Configure SSH on Server 1, Server 2, and Local Machine. Do the following:

1. Upgrade the packages by issuing the command `sudo apt update` and `sudo apt upgrade` respectively.

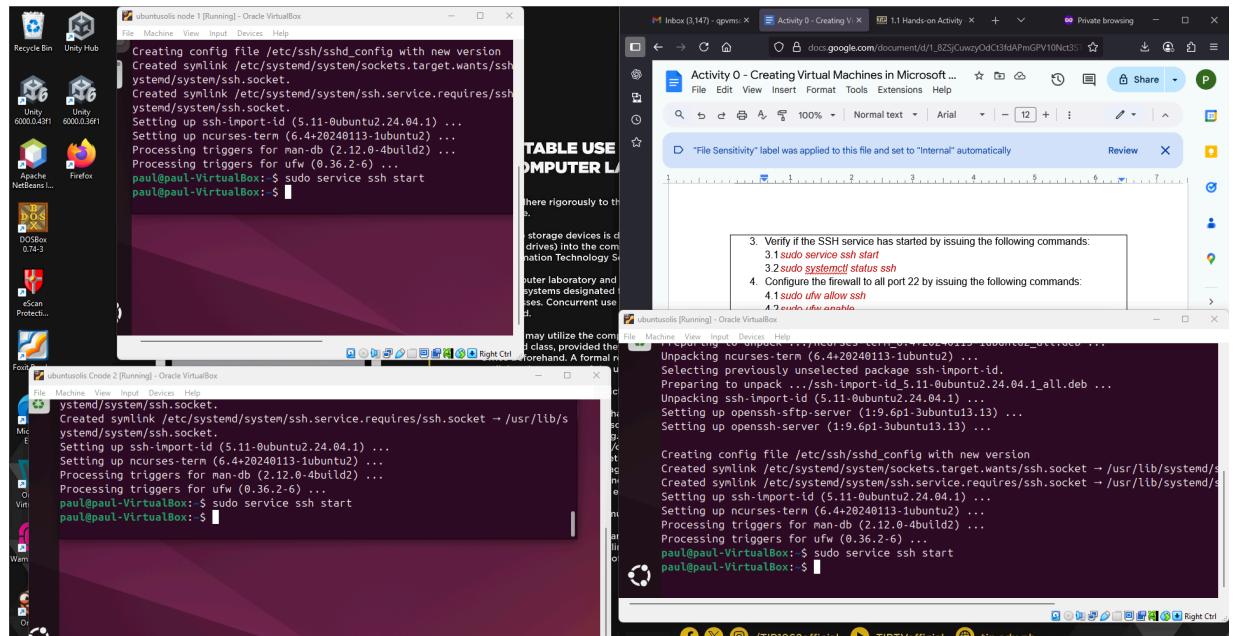


2. Install the SSH server using the command `sudo apt install openssh-server`.



3. Verify if the SSH service has started by issuing the following commands:

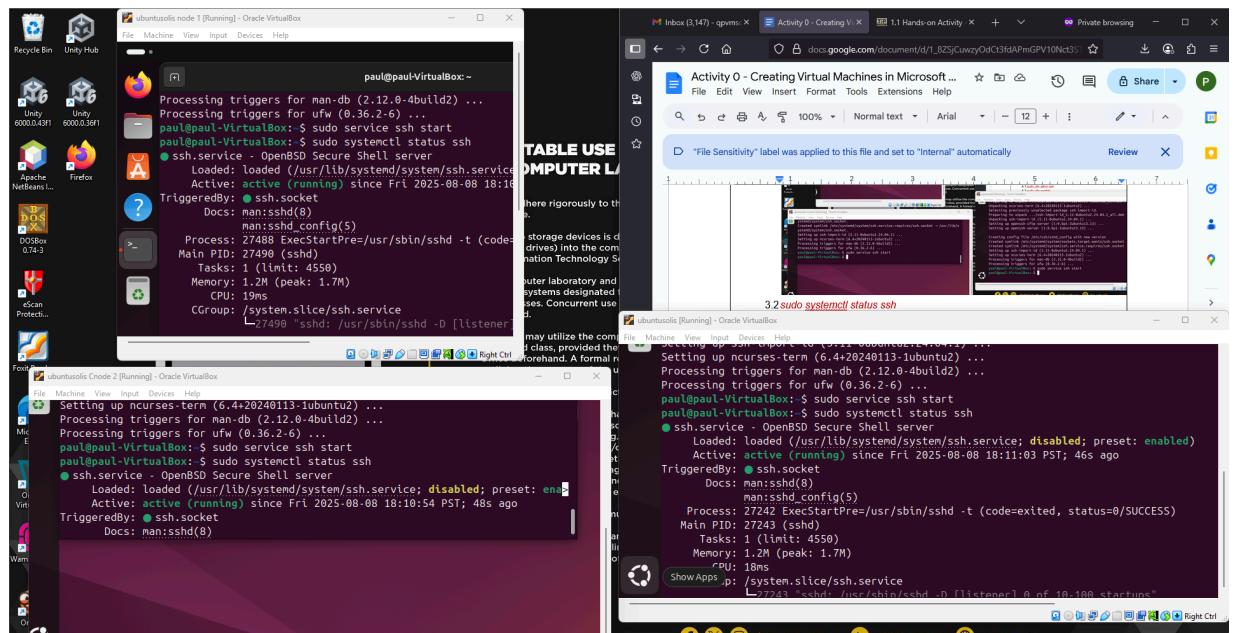
3.1 `sudo service ssh start`



```
ubuntu@node1:~$ sudo service ssh start
Creating config file /etc/ssh/sshd_config with new version
Created symlink /etc/systemd/system/sockets.target.wants/ssh
systemd/system/ssh.socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh
systemd/system/ssh.socket.
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
paul@paul-VirtualBox:~$ sudo service ssh start
paul@paul-VirtualBox:~$ 
```

```
ubuntu@node2:~$ sudo service ssh start
Creating config file /etc/ssh/sshd_config with new version
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/
systemd/system/ssh.socket.
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
paul@paul-VirtualBox:~$ sudo service ssh start
paul@paul-VirtualBox:~$ 
```

3.2 `sudo systemctl status ssh`



```
paul@paul-VirtualBox:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/usr/lib/systemd/system/ssh.service)
   Active: active (running) since Fri 2025-08-08 18:18:16 PDT; 48s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
  Process: 27488 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
 Main PID: 27490 (sshd)
    Tasks: 1 (limit: 4550)
   Memory: 1.2M (peak: 1.7M)
      CPU: 19ms
      CGroup: /system.slice/ssh.service
             └─27490 sshd: /usr/sbin/sshd -D [listener]

Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
paul@paul-VirtualBox:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; disabled; preset: enabled)
   Active: active (running) since Fri 2025-08-08 18:10:54 PDT; 48s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
  Process: 27242 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
 Main PID: 27243 (sshd)
    Tasks: 1 (limit: 4550)
   Memory: 1.2M (peak: 1.7M)
      CPU: 19ms
      CGroup: /system.slice/ssh.service
             └─27243 sshd: /usr/sbin/sshd -D [listener] 8 of 10 100% starting
```

4. Configure the firewall to all port 22 by issuing the following commands:

4.1 `sudo ufw allow ssh`

The screenshot shows a Linux desktop environment with several windows open:

- Terminal 1 (Ubuntu 12.04):** Shows the command `sudo ufw allow ssh` being run and its output.
- Terminal 2 (Ubuntu 12.04):** Shows the command `sudo ufw enable` being run and its output.
- Terminal 3 (Ubuntu 12.04):** Shows the command `sudo ufw status` being run and its output.
- Browser Window:** Displays a Google Docs page titled "Activity 0 - Creating Virtual Machines in Microsoft..." with a section labeled "4.3 sudo ufw status".

```

ubuntu@node 1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
CGroup: /system.slice/ssh.service
└─27490 "sshd: /usr/sbin/sshd -D [listener]"
Aug 08 18:10:46 server1 systemd[1]: Starting ssh.service
Aug 08 18:10:46 server1 sshd[27490]: Server listening on 0.0.0.0 port 22.
Aug 08 18:10:46 server1 sshd[27490]: Server listening on :: port 22.
Aug 08 18:10:46 server1 systemd[1]: Started ssh.service
[lines 1-18/18 (END)]
paul@paul-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
paul@paul-VirtualBox:~$ 

ubuntu@node 2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
CGroup: /system.slice/ssh.service
└─27243 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"
Process: 27242 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
Main PID: 27243 (sshd)
Tasks: 1 (limit: 4550)
Memory: 1.2M (peak: 1.7M)
CPU: 10ms
CGroup: /system.slice/ssh.service
└─27243 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Aug 08 18:11:03 paul-VirtualBox sshd[27243]: Server listening on 0.0.0.0 port 22.
Aug 08 18:11:03 paul-VirtualBox sshd[27243]: Server listening on :: port 22.
Aug 08 18:11:03 paul-VirtualBox systemd[1]: Started ssh.service - OpenBSD Secure Shell s
paul@paul-VirtualBox:~$ 
paul@paul-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
paul@paul-VirtualBox:~$ 

Activity 0 - Creating Virtual Machines in Microsoft...
File Edit View Insert Format Tools Extensions Help
Review X
4.1 sudo ufw allow ssh
4.2 sudo ufw enable
4.3 sudo ufw status

```

4.2 sudo ufw enable

The screenshot shows a Linux desktop environment with several windows open:

- Terminal 1 (Ubuntu 12.04):** Shows the command `sudo ufw enable` being run and its output.
- Terminal 2 (Ubuntu 12.04):** Shows the command `sudo ufw status` being run and its output.
- Terminal 3 (Ubuntu 12.04):** Shows the command `sudo ufw status` being run and its output.
- Browser Window:** Displays a Google Docs page titled "Activity 0 - Creating Virtual Machines in Microsoft..." with a section labeled "4.2 sudo ufw enable".

```

ubuntu@node 1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
CGroup: /system.slice/ssh.service
└─27490 "sshd: /usr/sbin/sshd -D [listener]"
Aug 08 18:10:46 server1 systemd[1]: Starting ssh.service
Aug 08 18:10:46 server1 sshd[27490]: Server listening on 0.0.0.0 port 22.
Aug 08 18:10:46 server1 sshd[27490]: Server listening on :: port 22.
Aug 08 18:10:46 server1 systemd[1]: Started ssh.service
[lines 1-18/18 (END)]
paul@paul-VirtualBox:~$ sudo ufw enable
Firewall is active and enabled on system startup
paul@paul-VirtualBox:~$ 

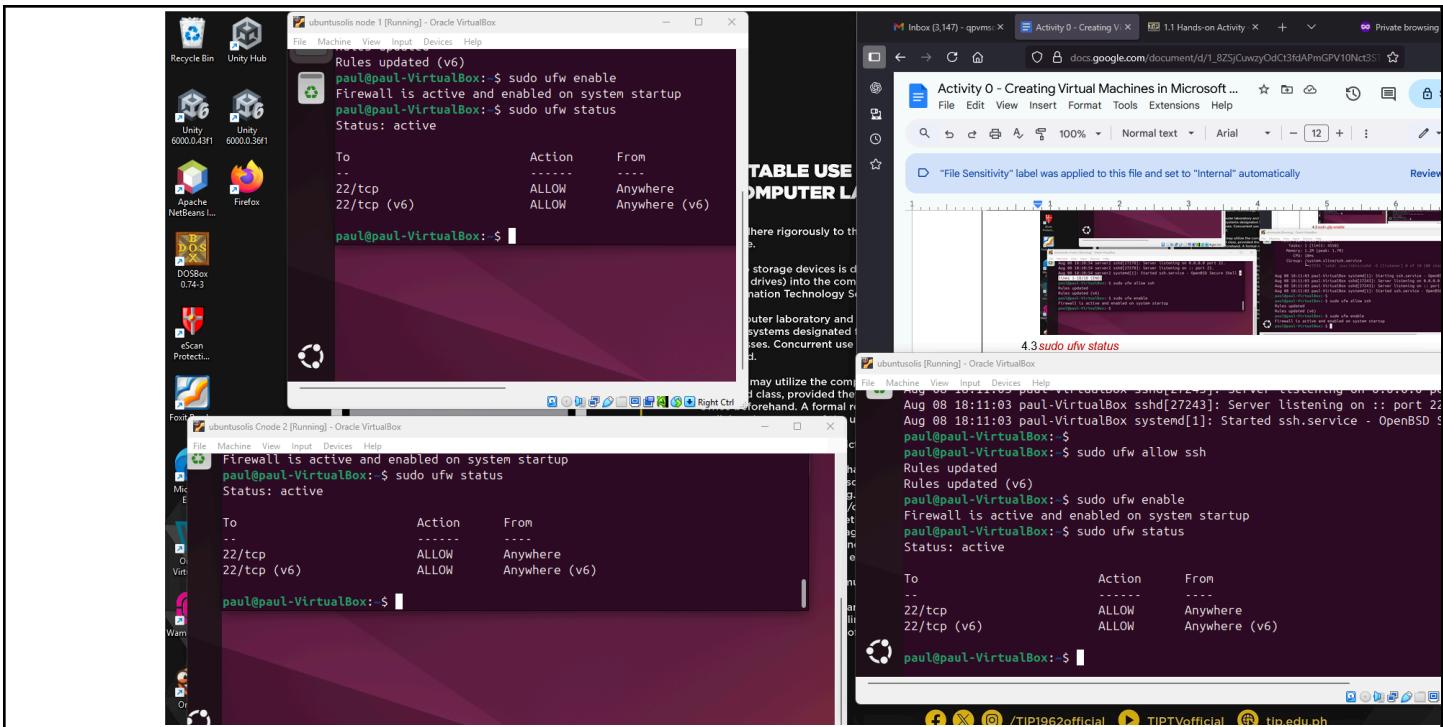
ubuntu@node 2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
CGroup: /system.slice/ssh.service
└─27243 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"
Process: 27242 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
Main PID: 27243 (sshd)
Tasks: 1 (limit: 4550)
Memory: 1.2M (peak: 1.7M)
CPU: 10ms
CGroup: /system.slice/ssh.service
└─27243 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Aug 08 18:11:03 paul-VirtualBox sshd[27243]: Server listening on 0.0.0.0 port 22.
Aug 08 18:11:03 paul-VirtualBox sshd[27243]: Server listening on :: port 22.
Aug 08 18:11:03 paul-VirtualBox systemd[1]: Started ssh.service - OpenBSD Secure Shell s
paul@paul-VirtualBox:~$ 
paul@paul-VirtualBox:~$ sudo ufw enable
Rules updated
Rules updated (v6)
paul@paul-VirtualBox:~$ 

Activity 0 - Creating Virtual Machines in Microsoft...
File Edit View Insert Format Tools Extensions Help
Review X
4.2 sudo ufw enable

```

4.3 sudo ufw status



Task 3: Verify network settings on Server 1, Server 2, and Local Machine. On each device, do the following:

1. Record the ip address of Server 1, Server 2, and Local Machine. Issue the command ***ifconfig*** and check network settings. Note that the ip addresses of all the machines are in this network 192.168.56.XX.
 - 1.1 Server 1 IP address: 192.168.56.111
 - 1.2 Server 2 IP address: 192.168.56.112
 - 1.3 Server 3 IP address: 192.168.56.110
2. Make sure that they can ping each other.
 - 2.1 Connectivity test for Local Machine 1 to Server 1: Successful
 - 2.2 Connectivity test for Local Machine 1 to Server 2: Successful
 - 2.3 Connectivity test for Server 1 to Server 2: 2. 168. 56. 11Successful

Task 4: Verify SSH connectivity on Server 1, Server 2, and Local Machine.

1. On the Local Machine, issue the following commands:
 - 1.1 ***ssh username@ip_address_server1*** for example, ***ssh jvtaylor@192.168.56.120***

```
ubuntusolis [Running] - Oracle VirtualBox
File Machine View Input Devices Help
--- 192.168.56.112 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3055ms
rtt min/avg/max/mdev = 0.402/0.628/1.070/0.263 ms
paul@paul-VirtualBox:~$ ssh paul@192.168.56.111
The authenticity of host '192.168.56.111 (192.168.56.111)' can't be established.
ED25519 key fingerprint is SHA256:NTVZlQIVKq0D10ukr1qA+eCQs/T1kaAXuYOIsClQZ8U.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.111' (ED25519) to the list of known hosts.
paul@192.168.56.111's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-27-generic x86_64)

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

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

paul@paul-VirtualBox:~$ Expanded Security Maintenance for Applications is not enabled.
```

1.2 Enter the password for server 1 when prompted

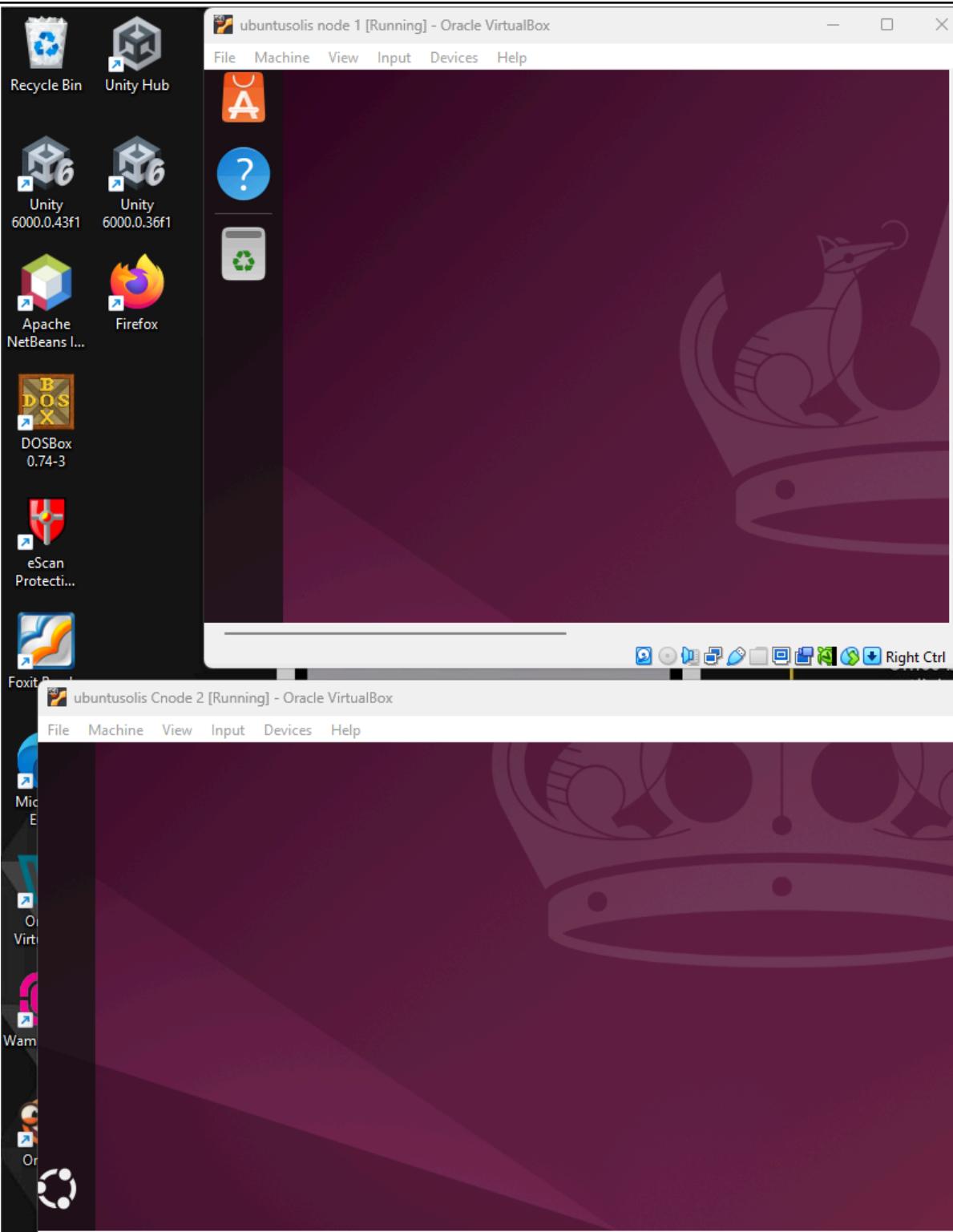
1.3 Verify that you are in server 1. The user should be in this format user@server1. For example, *jvtaylor@server1*

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

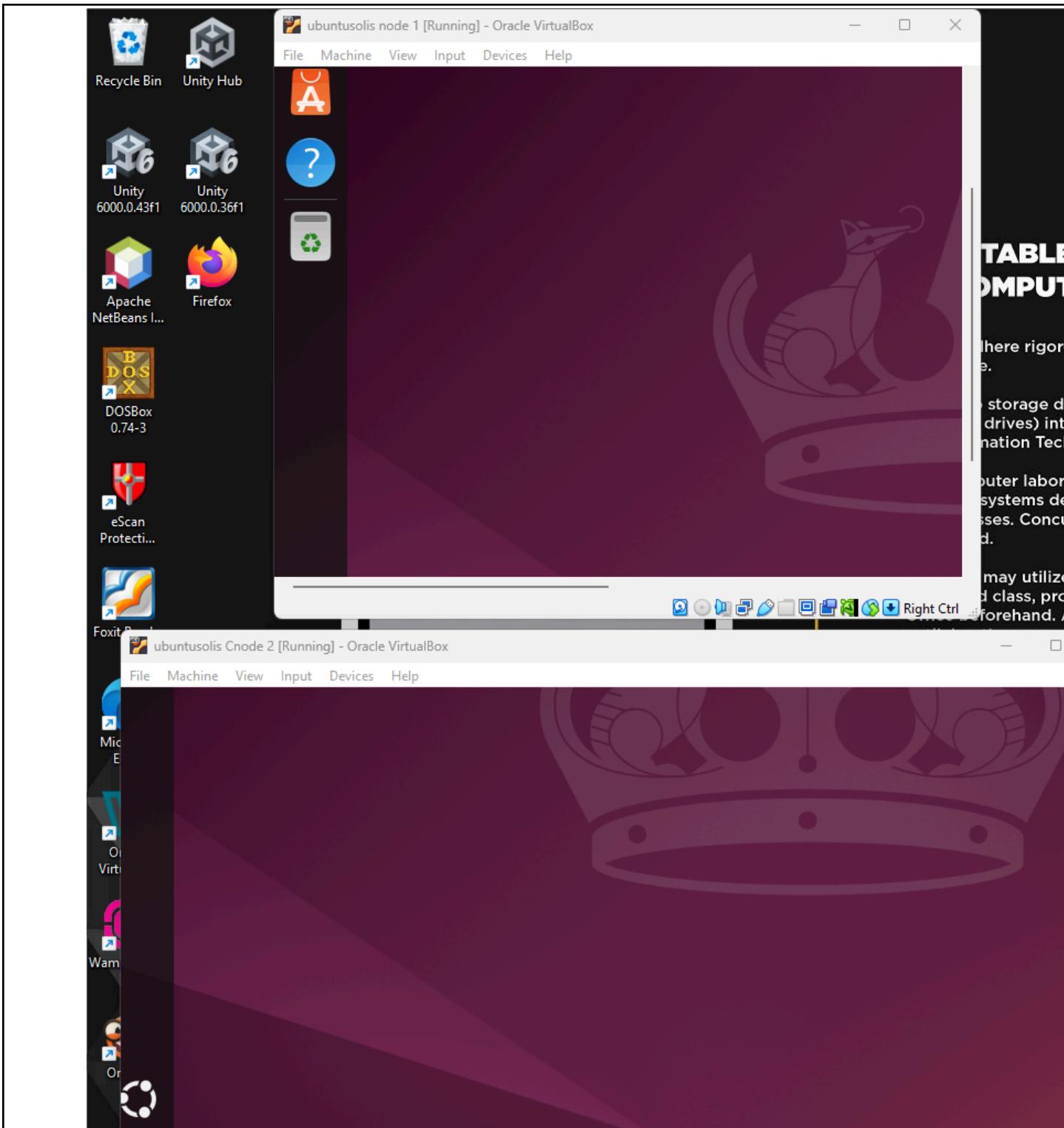
```
paul@server1:~$ touch sysad
paul@server1:~$
```

```
^C
--- 192.168.56.112 ping statistics ---
19 packets transmitted, 19 received, 0% packet loss, t
rtt min/avg/max/mdev = 0.384/0.512/0.995/0.144 ms
paul@paul-VirtualBox:~$ ls
Desktop    Downloads  Pictures  snap    Templates
Documents  Music      Public    sysad   Videos
paul@paul-VirtualBox:~$
```

2. Logout of Server 1 by issuing the command *control + D*.



3. Do the same for Server 2.



4. Edit the hosts of the Local Machine by issuing the command `sudo nano /etc/hosts`. Below all texts type the following:
 - 4.1 **IP_address server 1** (provide the ip address of server 1 followed by the hostname)
 - 4.2 **IP_address server 2** (provide the ip address of server 2 followed by the hostname)

4.3 Save the file and exit.

```
# The following lines are desirable for IPv6 capable hosts
::1      ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
192.168.56.111 server1
192.168.56.112 server2
```

- On the local machine, verify that you can do the SSH command but this time, use the hostname instead of typing the IP address of the servers. For example, try to do **ssh jvtaylor@server1**. Enter the password when prompted. Verify that you have entered Server 1. Do the same for Server 2.

Activity 0 - Creating Virtual Machines in Microsoft Azure()

"File Sensitivity" label was applied to this file and set to "Internal" automatically

5. On the local machine, verify that you can do the SSH command but this time, use the hostname instead of typing the IP address of the servers. For example, try to do **ssh jvtaylor@server1**. Enter the password when prompted. Verify that you have entered Server 1. Do the same for Server 2.

Reflections:
Answer the following:

paul@server1:~\$ hostnamectl

Static hostname: server1
Icon name: computer-vm
Chassis: vm
Machine ID: 374d49500d6946ed8f2f399723e0bfcf
Boot ID: 3bf982ef5fba4e9aa460209841db508a
Virtualization: oracle
Operating System: Ubuntu 24.04.3 LTS
Kernel: Linux 6.14.0-27-generic
Architecture: x86-64
Hardware Vendor: innoteck GmbH
Hardware Model: VirtualBox
Firmware Version: VirtualBox
Firmware Date: Fri 2006-12-01
Firmware Age: 18y 8month 1w

paul@server1:~\$ ls

Desktop Downloads Music Public sysad Videos
Documents hi Pictures snap Templates

paul@server1:~\$

paul@server2:~\$ ls

Desktop Downloads Music Public Templates
Documents me Pictures snap Videos

paul@server2:~\$

Inbox (3,147) - qpvmx: Activity 0 - Creating V... - 1.1 Hands-on Activity

docs.google.com/document/d/1_8ZSjCuwyOdCt3fdAPmGPV1

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

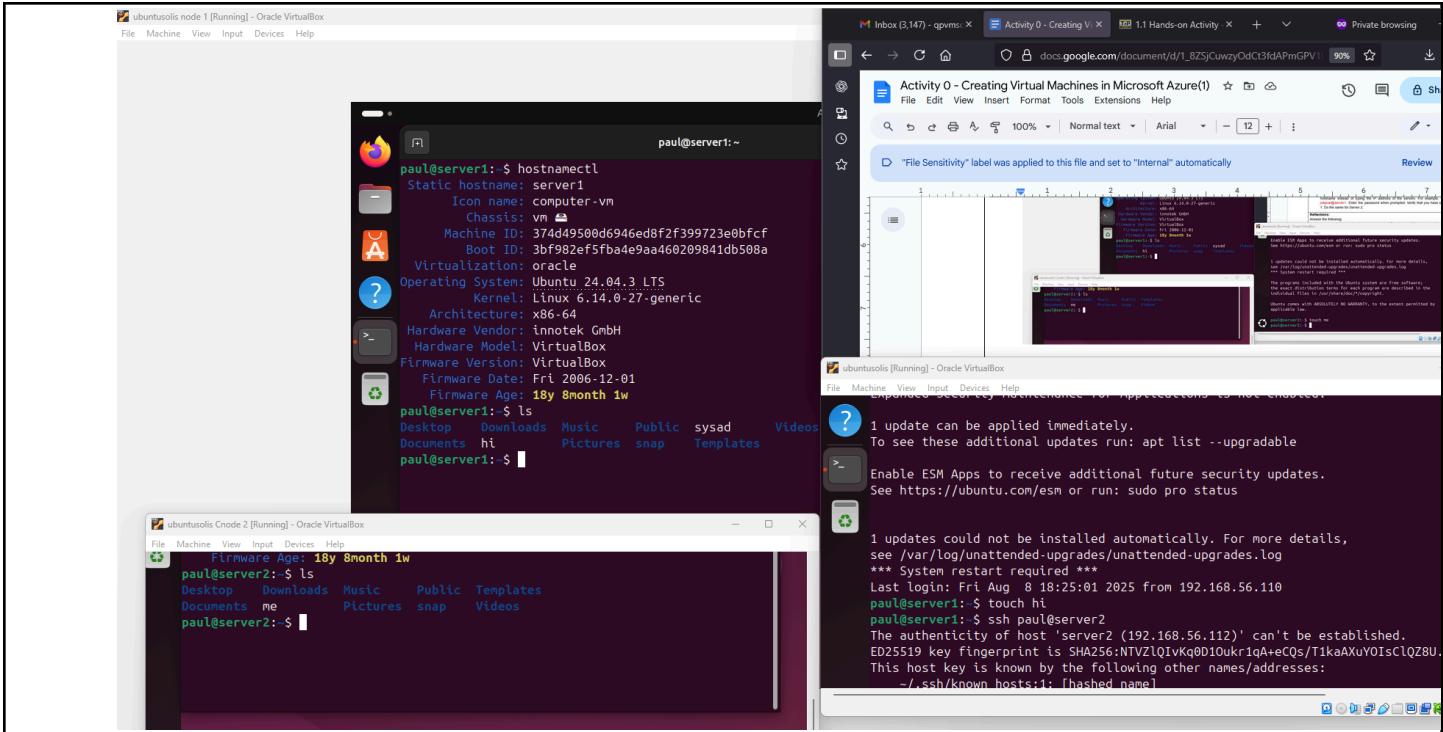
1 updates could not be installed automatically. For more details, see /var/log/unattended-upgrades/unattended-upgrades.log
*** System restart required ***

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.

paul@server2:~\$ touch me

paul@server2:~\$



Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
because we enter the ip address of the server in /etc/hosts file.
2. How secured is SSH?

Very secure