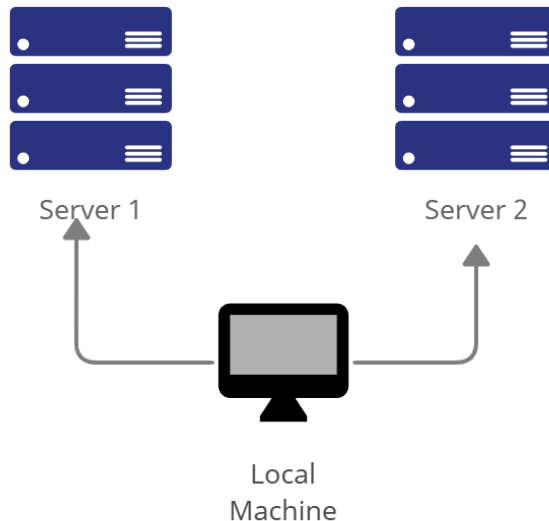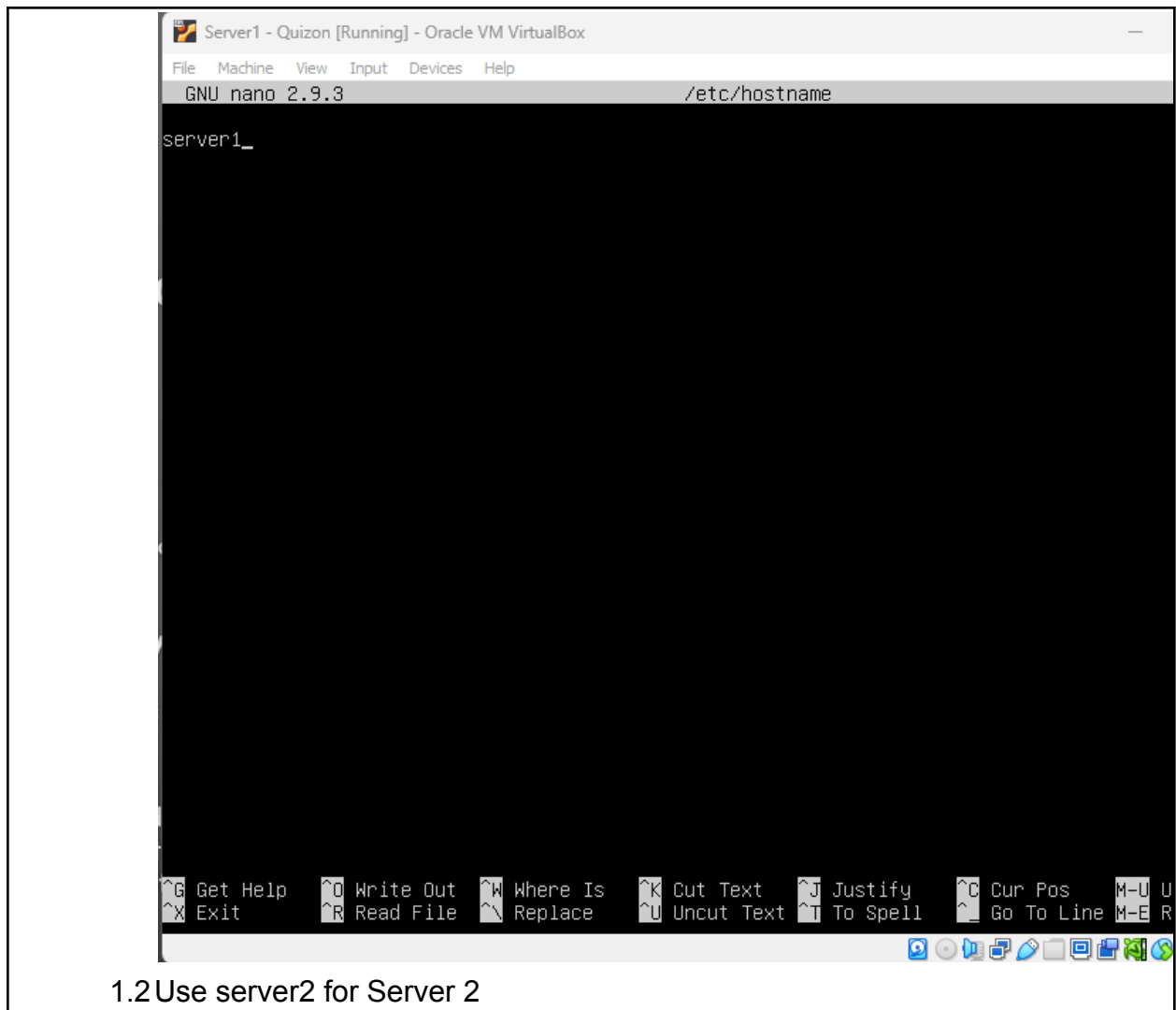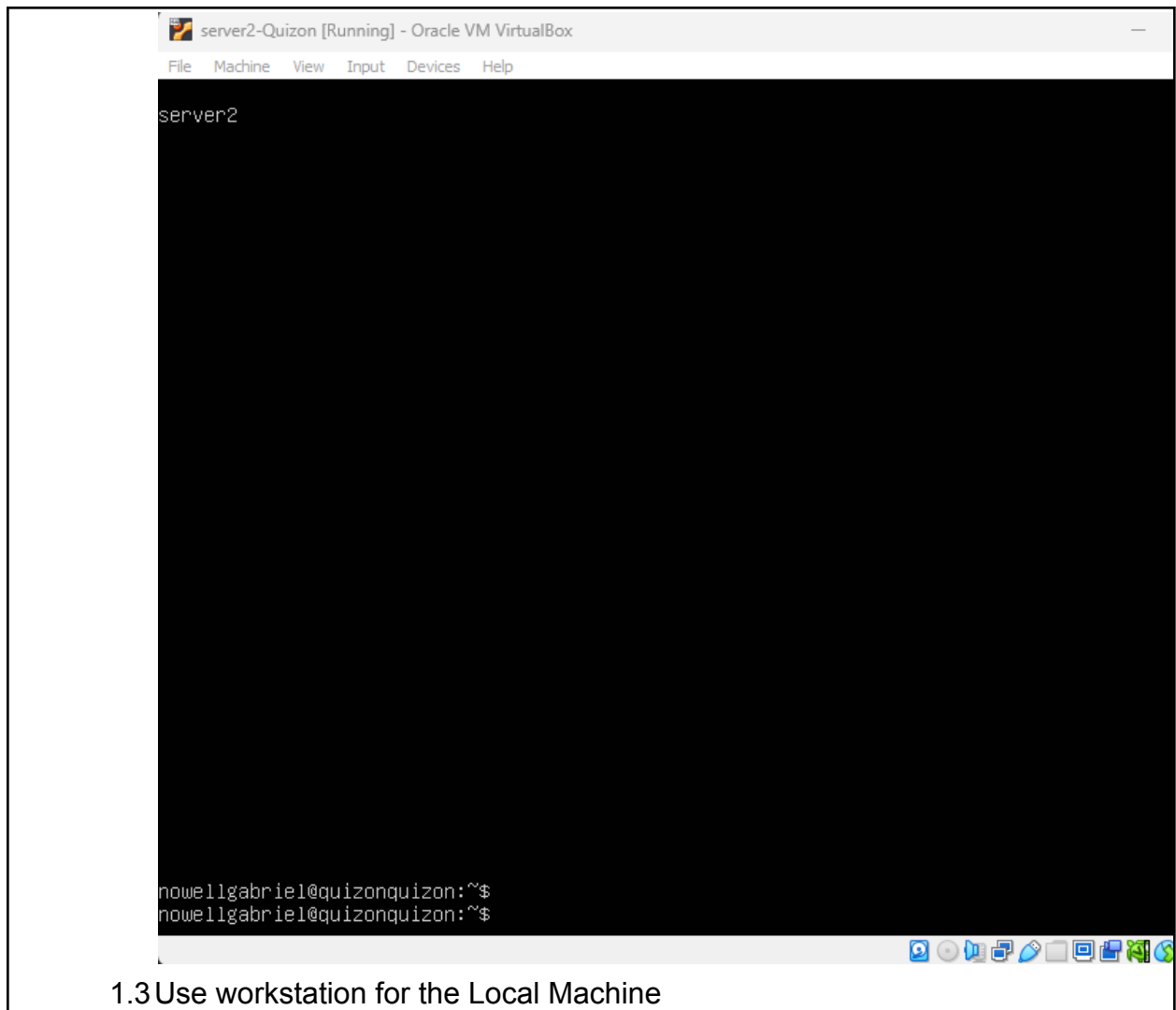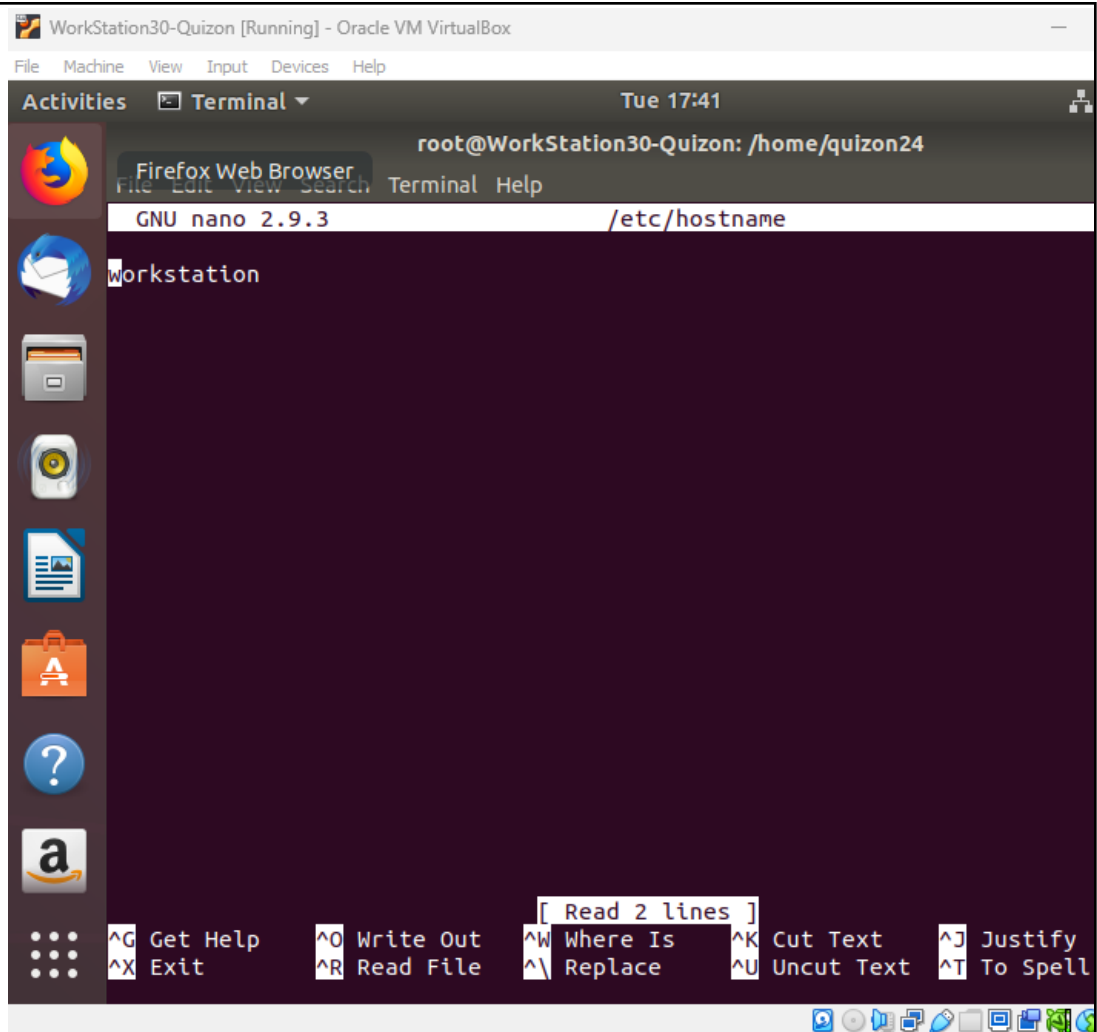| Name: Quizon, Nowell Gabriel C.	Date Performed: 08/22/2023
Course/Section: CPE31S5	Date Submitted: 08/23/2023
Instructor: Engr. Roman Richard	Semester and SY: 1st and 2023-2024

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

GNU nano 2.9.3   /etc/hostname

server1_

^G Get Help   ^O Write Out   ^W Where Is   ^K Cut Text   ^J Justify   ^C Cur Pos   M-U U
^X Exit   ^R Read File   ^\ Replace   ^U Uncut Text   ^T To Spell   ^_ Go To Line   M-E R

1.2 Use server2 for Server 2

server2-Quizon [Running] - Oracle VM VirtualBox

File   Machine   View   Input   Devices   Help

server2

nowellgabriel@quizonquizon:~$
nowellgabriel@quizonquizon:~$
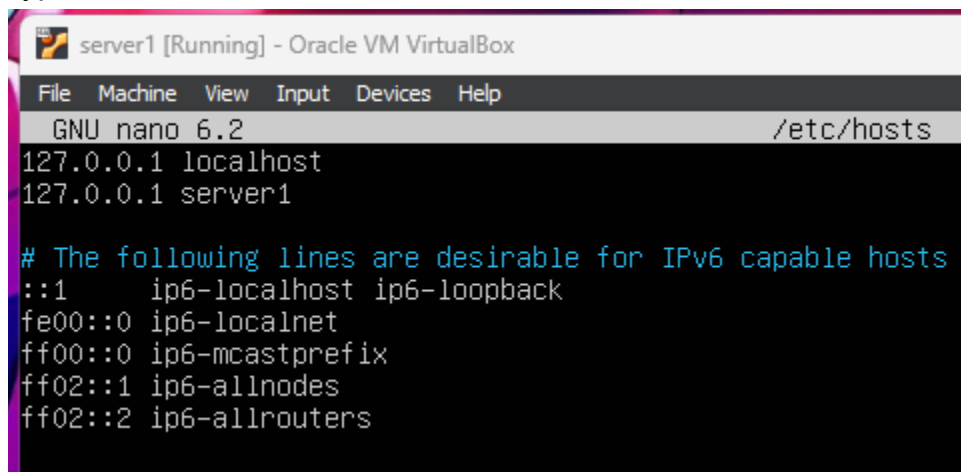
1.3 Use workstation for the Local Machine

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.
   server1:
   update

```
Get:13 http://security.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [1,317 kB]
Get:14 http://security.ubuntu.com/ubuntu bionic-security/restricted Translation-en [182 kB]
Get:15 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [1,303 kB]
Get:16 http://security.ubuntu.com/ubuntu bionic-security/universe Translation-en [308 kB]
Get:17 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [19.8 kB]
Get:18 http://security.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [3,928 B]
Get:19 http://archive.ubuntu.com/ubuntu bionic/restricted Sources [5,324 B]
Get:20 http://archive.ubuntu.com/ubuntu bionic/main Translation-en [516 kB]
Get:21 http://archive.ubuntu.com/ubuntu bionic/restricted amd64 Packages [9,184 B]
Get:22 http://archive.ubuntu.com/ubuntu bionic/restricted Translation-en [3,584 B]
Get:23 http://archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8,570 kB]
Get:24 http://archive.ubuntu.com/ubuntu bionic/universe Translation-en [4,941 kB]
Get:25 http://archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:26 http://archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:27 http://archive.ubuntu.com/ubuntu bionic-updates/main Sources [546 kB]
Get:28 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Sources [35.3 kB]
Get:29 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Sources [18.9 kB]
Get:30 http://archive.ubuntu.com/ubuntu bionic-updates/universe Sources [512 kB]
Get:31 http://archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [553 kB]
Get:32 http://archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [1,347 kB]
Get:33 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Translation-en [187 kB]
Get:34 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1,914 kB]
Get:35 http://archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [420 kB]
Get:36 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [25.6 kB]
Get:37 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [6,088 B]
Get:38 http://archive.ubuntu.com/ubuntu bionic-backports/main Sources [10.5 kB]
Get:39 http://archive.ubuntu.com/ubuntu bionic-backports/universe Sources [6,600 B]
Get:40 http://archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [53.3 kB]
Get:41 http://archive.ubuntu.com/ubuntu bionic-backports/main Translation-en [14.6 kB]
Get:42 http://archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [18.2 kB]
Get:43 http://archive.ubuntu.com/ubuntu bionic-backports/universe Translation-en [8,668 B]
Fetched 34.6 MB in 34s (1,015 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
317 packages can be upgraded. Run 'apt list --upgradable' to see them.
nowellgabriel@quizonserver1:~$
```
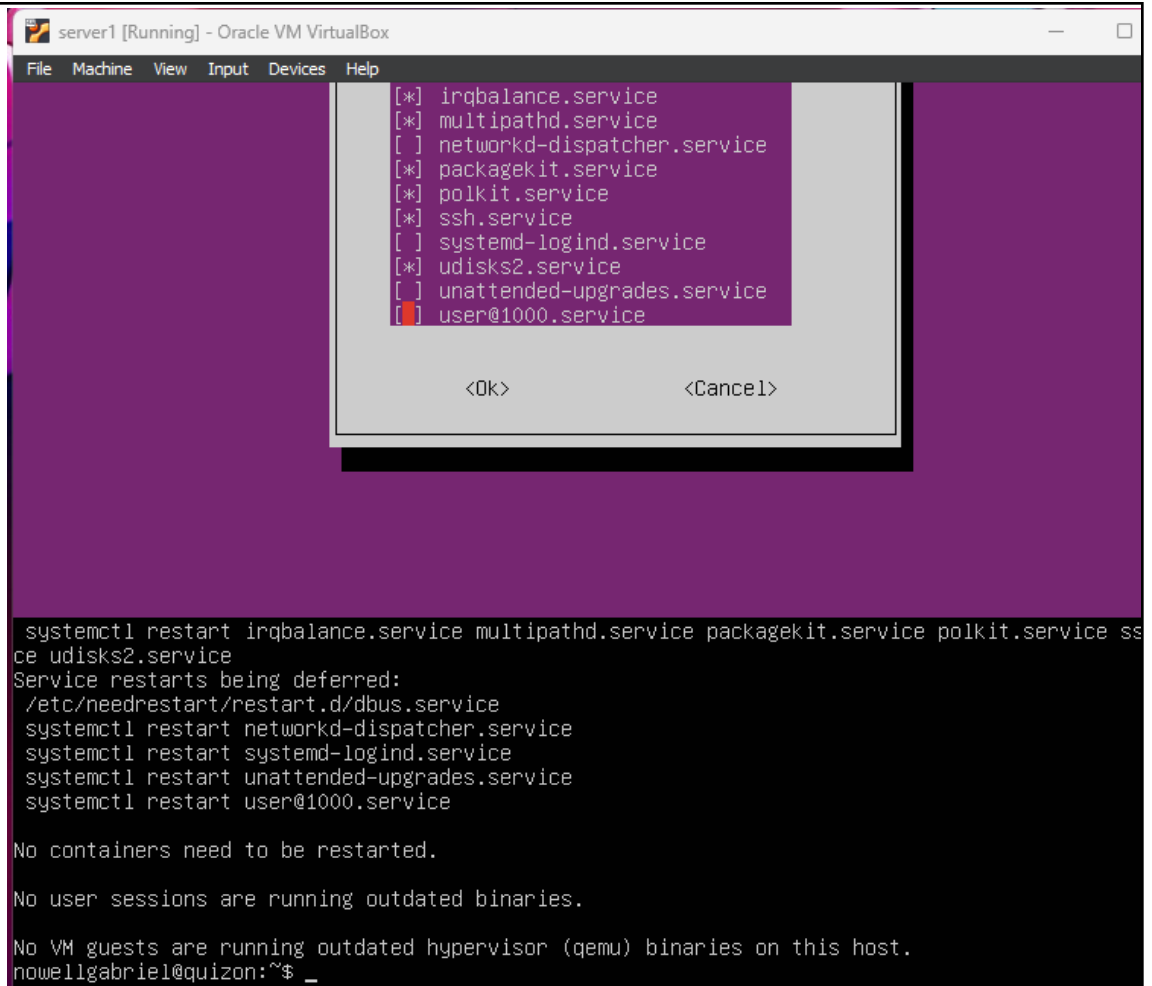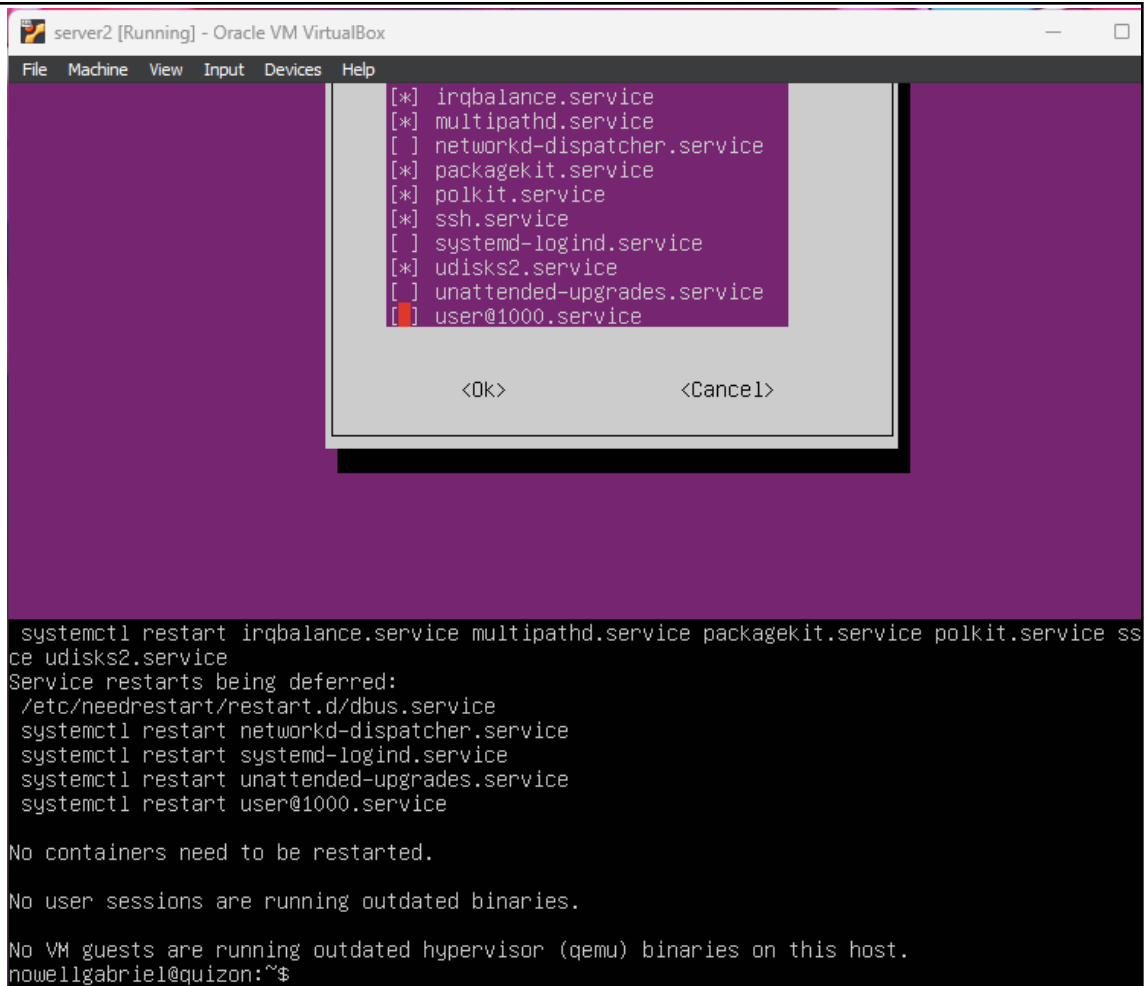
upgrade

server2:
update

```
server2-Quizon [Running] - Oracle VM VirtualBox                           —    □    ×

File   Machine   View   Input   Devices   Help

Get:13 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [1,303 kB]
Get:14 http://archive.ubuntu.com/ubuntu bionic/multiverse Sources [181 kB]
Get:15 http://archive.ubuntu.com/ubuntu bionic/main Sources [829 kB]
Get:16 http://security.ubuntu.com/ubuntu bionic-security/universe Translation-en [308 kB]
Get:17 http://archive.ubuntu.com/ubuntu bionic/restricted Sources [5,324 B]
Get:18 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [19.8 kB]
Get:19 http://archive.ubuntu.com/ubuntu bionic/main Translation-en [516 kB]
Get:20 http://security.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [3,928 B]
Get:21 http://archive.ubuntu.com/ubuntu bionic/restricted amd64 Packages [9,184 B]
Get:22 http://archive.ubuntu.com/ubuntu bionic/restricted Translation-en [3,584 B]
Get:23 http://archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8,570 kB]
Get:24 http://archive.ubuntu.com/ubuntu bionic/universe Translation-en [4,941 kB]
Get:25 http://archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:26 http://archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:27 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Sources [18.9 kB]
Get:28 http://archive.ubuntu.com/ubuntu bionic-updates/main Sources [546 kB]
Get:29 http://archive.ubuntu.com/ubuntu bionic-updates/universe Sources [512 kB]
Get:30 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Sources [35.3 kB]
Get:31 http://archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [553 kB]
Get:32 http://archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [1,347 kB]
Get:33 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Translation-en [187 kB]
Get:34 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1,914 kB]
Get:35 http://archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [420 kB]
Get:36 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [25.6 kB]
Get:37 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [6,088 B]
Get:38 http://archive.ubuntu.com/ubuntu bionic-backports/universe Sources [6,600 B]
Get:39 http://archive.ubuntu.com/ubuntu bionic-backports/main Sources [10.5 kB]
Get:40 http://archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [53.3 kB]
Get:41 http://archive.ubuntu.com/ubuntu bionic-backports/main Translation-en [14.6 kB]
Get:42 http://archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [18.2 kB]
Get:43 http://archive.ubuntu.com/ubuntu bionic-backports/universe Translation-en [8,668 B]
Fetched 34.6 MB in 29s (1,173 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
317 packages can be upgraded. Run 'apt list --upgradable' to see them.
nowellgabriel@quizonquizon:~$
```

upgrade

File   Machine   View   Input   Devices   Help

```
[*] irqbalance.service
[*] multipathd.service
[ ] networkd-dispatcher.service
[*] packagekit.service
[*] polkit.service
[*] ssh.service
[ ] systemd-logind.service
[*] udisks2.service
[ ] unattended-upgrades.service
[ ] user@1000.service


        <Ok>              <Cancel>
```

```
 systemctl restart irqbalance.service multipathd.service packagekit.service polkit.service ss
ce udisks2.service
Service restarts being deferred:
 /etc/needrestart/restart.d/dbus.service
 systemctl restart networkd-dispatcher.service
 systemctl restart systemd-logind.service
 systemctl restart unattended-upgrades.service
 systemctl restart user@1000.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
nowellgabriel@quizon:~$
```

Local Machine:
update

upgrade

2. Install the SSH server using the command *sudo apt install openssh-server*.
   server1:


```
nowellgabriel@quizon:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:8.9p1-3ubuntu0.3).
openssh-server set to manually installed.
The following packages were automatically installed and are no longer required:
  libflashrom1 libftdi1-2
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

server2:

```
nowellgabriel@quizon:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:8.9p1-3ubuntu0.3).
openssh-server set to manually installed.
The following packages were automatically installed and are no longer required:
  libflashrom1 libftdi1-2
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

workstation:

3. Verify if the SSH service has started by issuing the following commands:
    3.1 *sudo service ssh start*
    server1:

```
nowellgabriel@quizon:~$ sudo service ssh start
nowellgabriel@quizon:~$
```

server2:

```
nowellgabriel@quizon:~$ sudo service ssh start
nowellgabriel@quizon:~$
```

workstation:
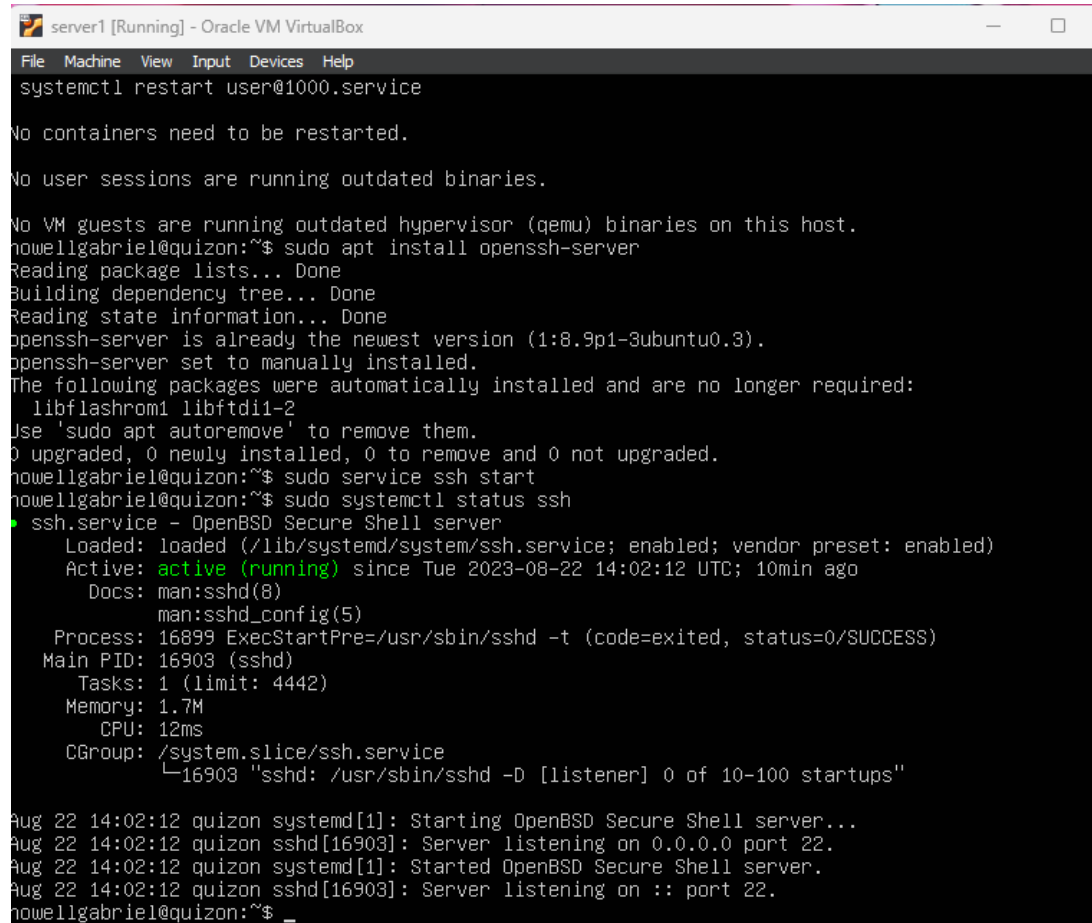
```
root@LocalMachine:/home/quizon24# sudo service ssh start
root@LocalMachine:/home/quizon24#
```

3.2 *sudo systemctl status ssh*
server1:


```
server1 [Running] - Oracle VM VirtualBox                                    —    □
File  Machine  View  Input  Devices  Help
systemctl restart user@1000.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
howellgabriel@quizon:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:8.9p1-3ubuntu0.3).
openssh-server set to manually installed.
The following packages were automatically installed and are no longer required:
  libflashrom1 libftdi1-2
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
howellgabriel@quizon:~$ sudo service ssh start
howellgabriel@quizon:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2023-08-22 14:02:12 UTC; 10min ago
       Docs: man:sshd(8)
             man:sshd_config(5)
    Process: 16899 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
   Main PID: 16903 (sshd)
      Tasks: 1 (limit: 4442)
     Memory: 1.7M
        CPU: 12ms
     CGroup: /system.slice/ssh.service
             └─16903 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Aug 22 14:02:12 quizon systemd[1]: Starting OpenBSD Secure Shell server...
Aug 22 14:02:12 quizon sshd[16903]: Server listening on 0.0.0.0 port 22.
Aug 22 14:02:12 quizon systemd[1]: Started OpenBSD Secure Shell server.
Aug 22 14:02:12 quizon sshd[16903]: Server listening on :: port 22.
howellgabriel@quizon:~$ _
```
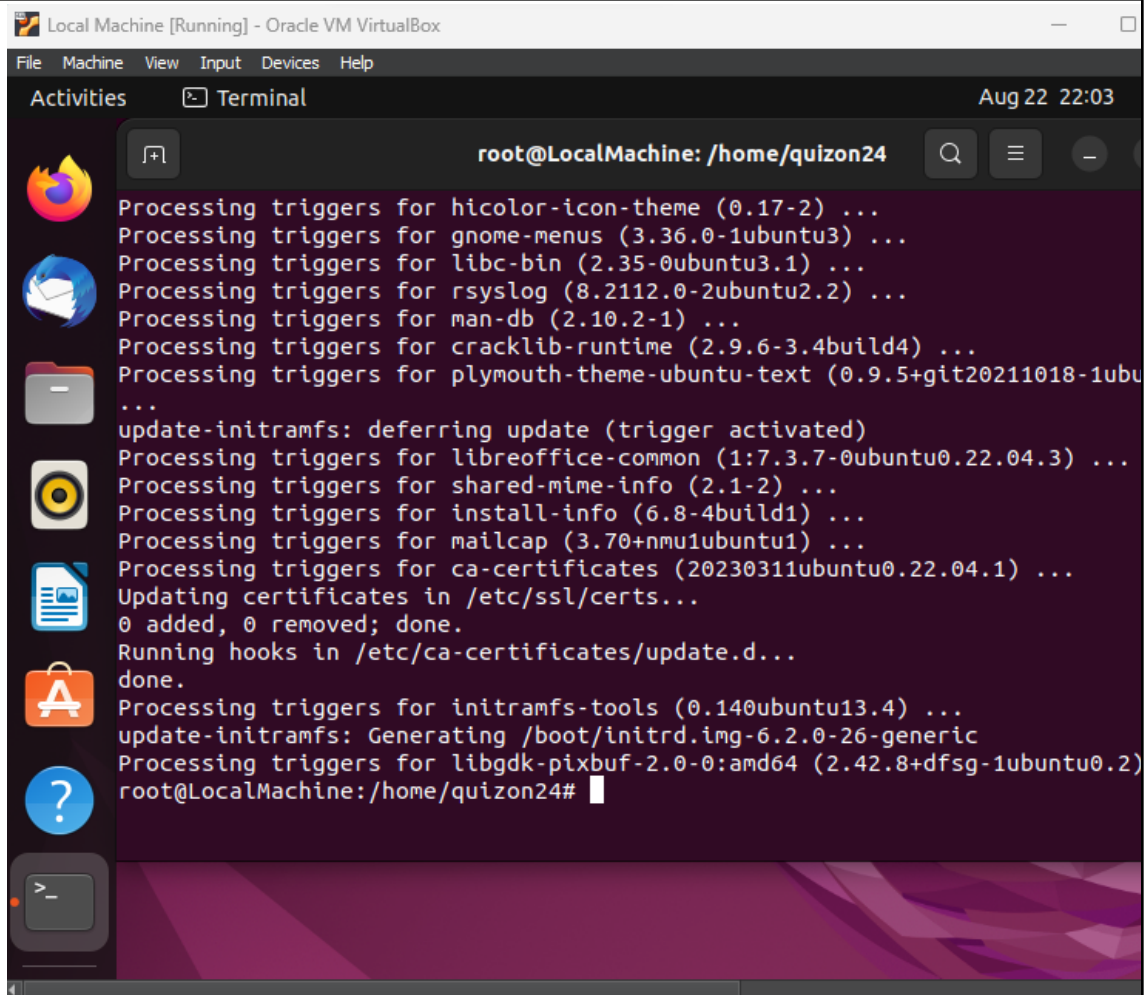
server2:

```
server2 [Running] - Oracle VM VirtualBox

File  Machine  View  Input  Devices  Help
No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
nowellgabriel@quizon:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:8.9p1-3ubuntu0.3).
openssh-server set to manually installed.
The following packages were automatically installed and are no longer required:
  libflashrom1 libftdi1-2
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
nowellgabriel@quizon:~$ sudo server ssh start
sudo: server: command not found
nowellgabriel@quizon:~$ sudo service ssh start
nowellgabriel@quizon:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2023-08-22 14:02:26 UTC; 10min ago
       Docs: man:sshd(8)
             man:sshd_config(5)
    Process: 16921 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
   Main PID: 16930 (sshd)
      Tasks: 1 (limit: 4442)
     Memory: 1.7M
        CPU: 12ms
     CGroup: /system.slice/ssh.service
             └─16930 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Aug 22 14:02:26 quizon systemd[1]: Starting OpenBSD Secure Shell server...
Aug 22 14:02:26 quizon sshd[16930]: Server listening on 0.0.0.0 port 22.
Aug 22 14:02:26 quizon sshd[16930]: Server listening on :: port 22.
Aug 22 14:02:26 quizon systemd[1]: Started OpenBSD Secure Shell server.
nowellgabriel@quizon:~$
```

workstation:

```
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: e
     Active: active (running) since Tue 2023-08-22 22:06:33 +08; 6min ago
       Docs: man:sshd(8)
             man:sshd_config(5)
   Main PID: 39348 (sshd)
      Tasks: 1 (limit: 4478)
     Memory: 1.7M
        CPU: 13ms
     CGroup: /system.slice/ssh.service
             └─39348 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Aug 22 22:06:33 LocalMachine systemd[1]: Starting OpenBSD Secure Shell server..
Aug 22 22:06:33 LocalMachine sshd[39348]: Server listening on 0.0.0.0 port 22.
Aug 22 22:06:33 LocalMachine sshd[39348]: Server listening on :: port 22.
Aug 22 22:06:33 LocalMachine systemd[1]: Started OpenBSD Secure Shell server.
```

4. Configure the firewall to all port 22 by issuing the following commands:
   4.1 *sudo ufw allow ssh*
   server1:

```
nowellgabriel@quizon:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

server2:

```
nowellgabriel@quizon:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

workstation:

```
root@LocalMachine:/home/quizon24# sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

4.2 *sudo ufw enable*

server1:

```
nowellgabriel@quizon:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

server2:

```
nowellgabriel@quizon:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

workstation:

```
root@LocalMachine:/home/quizon24# sudo ufw enable
Firewall is active and enabled on system startup
```

4.3 *sudo ufw status*

server1:

```
nowellgabriel@quizon:~$ sudo ufw status
Status: active

To                         Action        From
--                         ------        ----
22/tcp                     ALLOW         Anywhere
22/tcp (v6)                ALLOW         Anywhere (v6)
```

server2:

```
nowellgabriel@quizon:~$ sudo ufw status
Status: active

To                         Action        From
--                         ------        ----
22/tcp                     ALLOW         Anywhere
22/tcp (v6)                ALLOW         Anywhere (v6)
```

workstation:

```
root@LocalMachine:/home/quizon24# sudo ufw status
Status: active

To                         Action      From
--                         ------      ----
22/tcp                     ALLOW       Anywhere
22/tcp (v6)                ALLOW       Anywhere (v6)
```

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.<u>102</u>

   ```
   nowellgabriel@server1:~$ ifconfig
   enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
           inet 192.168.56.102  netmask 255.255.255.0  broadcast 192.168.56.255
           inet6 fe80::a00:27ff:fe8f:8d46  prefixlen 64  scopeid 0x20<link>
           ether 08:00:27:8f:8d:46  txqueuelen 1000  (Ethernet)
           RX packets 10  bytes 4085 (4.0 KB)
           RX errors 0  dropped 0  overruns 0  frame 0
           TX packets 10  bytes 1334 (1.3 KB)
           TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

   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 80  bytes 5920 (5.9 KB)
           RX errors 0  dropped 0  overruns 0  frame 0
           TX packets 80  bytes 5920 (5.9 KB)
           TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
   ```

   1.2 Server 2 IP address: 192.168.56.<u>101</u>

   ```
   nowellgabriel@server2:~$ ifconfig
   enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
           inet 192.168.56.101  netmask 255.255.255.0  broadcast 192.168.56.255
           inet6 fe80::a00:27ff:fe6e:2c58  prefixlen 64  scopeid 0x20<link>
           ether 08:00:27:6e:2c:58  txqueuelen 1000  (Ethernet)
           RX packets 11  bytes 2630 (2.6 KB)
           RX errors 0  dropped 0  overruns 0  frame 0
           TX packets 13  bytes 1544 (1.5 KB)
           TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

   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 720  bytes 51360 (51.3 KB)
           RX errors 0  dropped 0  overruns 0  frame 0
           TX packets 720  bytes 51360 (51.3 KB)
           TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
   ```

   1.3 Server 3 IP address: 192.168.56.<u>103</u>

```
quizon24@workstation:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::e34:34a:319f:9b96  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:de:82:4b  txqueuelen 1000  (Ethernet)
        RX packets 244  bytes 164046 (164.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 214  bytes 34716 (34.7 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.56.103  netmask 255.255.255.0  broadcast 192.168.56.255
        inet6 fe80::997c:7dcd:8716:8dc5  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:3e:ae:02  txqueuelen 1000  (Ethernet)
        RX packets 14  bytes 3667 (3.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 38  bytes 5294 (5.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

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 162  bytes 16043 (16.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 162  bytes 16043 (16.0 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

2. Make sure that they can ping each other.

   2.1 Connectivity test for Local Machine 1 to Server 1: ☐ **Successful** ☐ Not Successful

```
quizon24@workstation:~$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data.
64 bytes from 192.168.56.102: icmp_seq=1 ttl=64 time=0.320 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.388 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=0.348 ms
64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=0.440 ms
64 bytes from 192.168.56.102: icmp_seq=5 ttl=64 time=0.429 ms
64 bytes from 192.168.56.102: icmp_seq=6 ttl=64 time=0.483 ms
64 bytes from 192.168.56.102: icmp_seq=7 ttl=64 time=0.362 ms
^Z
[2]+  Stopped                 ping 192.168.56.102
```

   2.2 Connectivity test for Local Machine 1 to Server 2: ☐ **Successful** ☐ Not Successful

```
quizon24@workstation:~$ ping 192.168.56.101
PING 192.168.56.101 (192.168.56.101) 56(84) bytes of data.
64 bytes from 192.168.56.101: icmp_seq=1 ttl=64 time=0.339 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=0.440 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.358 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=0.321 ms
64 bytes from 192.168.56.101: icmp_seq=5 ttl=64 time=0.432 ms
64 bytes from 192.168.56.101: icmp_seq=6 ttl=64 time=0.345 ms
64 bytes from 192.168.56.101: icmp_seq=7 ttl=64 time=0.798 ms
^Z
[1]+  Stopped                 ping 192.168.56.101
```

2.3 Connectivity test for Server 1 to Server 2: ☐ Successful ☐ Not Successful

```
nowellgabriel@server1:~$ ping 192.168.56.101
PING 192.168.56.101 (192.168.56.101) 56(84) bytes of data.
64 bytes from 192.168.56.101: icmp_seq=1 ttl=64 time=0.685 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=0.339 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.973 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=0.366 ms
64 bytes from 192.168.56.101: icmp_seq=5 ttl=64 time=0.334 ms
64 bytes from 192.168.56.101: icmp_seq=6 ttl=64 time=0.391 ms
64 bytes from 192.168.56.101: icmp_seq=7 ttl=64 time=0.260 ms
64 bytes from 192.168.56.101: icmp_seq=8 ttl=64 time=0.316 ms
^Z
[1]+  Stopped                 ping 192.168.56.101
```

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 jvtaylar@192.168.56.120 server1:*

```
quizon24@workstation:~$ ssh nowellgabriel@192.168.56.102
The authenticity of host '192.168.56.102 (192.168.56.102)' can't b
e established.
ED25519 key fingerprint is SHA256:XQj87MhdjmBqVRCBvkqkUMUu8mjLm+gr
v3wM91Mz68c.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint]
)? yes
Warning: Permanently added '192.168.56.102' (ED25519) to the list
of known hosts.
nowellgabriel@192.168.56.102's password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-79-generic x86_64)

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

  System information as of Wed Aug 23 01:55:48 AM UTC 2023

  System load:   0.01220703125      Processes:              114
  Usage of /:    44.7% of 11.21GB    Users logged in:        1
  Memory usage: 6%                   IPv4 address for enp0s3: 192.16
8.56.102
  Swap usage:    0%


Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

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

server2:

```
nowellgabriel@server1:~$ ssh nowellgabriel@192.168.56.101
The authenticity of host '192.168.56.101 (192.168.56.101)' can't b
e established.
ED25519 key fingerprint is SHA256:EHk3VvXabx6/6cxztJ100Z9Wan++fD1u
axrQTfOxIEg.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint]
)? yes
Warning: Permanently added '192.168.56.101' (ED25519) to the list
of known hosts.
nowellgabriel@192.168.56.101's password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-79-generic x86_64)

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

  System information as of Wed Aug 23 01:57:31 AM UTC 2023

  System load:  0.0                Processes:                113
  Usage of /:   44.5% of 11.21GB   Users logged in:          1
  Memory usage: 6%                 IPv4 address for enp0s3: 192.16
8.56.101
  Swap usage:   0%

 * Strictly confined Kubernetes makes edge and IoT secure. Learn h
ow MicroK8s
   just raised the bar for easy, resilient and secure K8s cluster
deployment.

   https://ubuntu.com/engage/secure-kubernetes-at-the-edge
```

localmachine:

```
nowellgabriel@server2:~$ ssh quizon24@192.168.56.103
The authenticity of host '192.168.56.103 (192.168.56.103)' can't b
e established.
ED25519 key fingerprint is SHA256:6DlBHZX2E8aUjVUmN6XsS/l3av9EMzYR
AT3Sb3/Di4U.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint]
)? yes
Warning: Permanently added '192.168.56.103' (ED25519) to the list
of known hosts.
quizon24@192.168.56.103's password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-26-generic x86_64)

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

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

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


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
```

1.2 Enter the password for server 1 when prompted

```
quizon24@workstation:~$ ssh nowellgabriel@192.168.56.102
nowellgabriel@192.168.56.102's password:
```

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

```
nowellgabriel@server1:~$
```

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

```
nowellgabriel@server1:~$
logout
Connection to 192.168.56.102 closed.
quizon24@workstation:~$ 
```

3. Do the same for Server 2.

```
quizon24@workstation:~$ ssh nowellgabriel@192.168.56.101
The authenticity of host '192.168.56.101 (192.168.56.101)' can't b
e established.
ED25519 key fingerprint is SHA256:EHk3VvXabx6/6cxztJ100Z9Wan++fD1u
axrQTfOxIEg.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint]
)? yes\
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '192.168.56.101' (ED25519) to the list
of known hosts.
nowellgabriel@192.168.56.101's password:
```

```
nowellgabriel@server2:~$ 
```

```
nowellgabriel@server2:~$ 
logout
Connection to 192.168.56.101 closed.
quizon24@workstation:~$ 
```

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)

```
root@workstation: /home/quizon24

  GNU nano 6.2                    /etc/hosts
127.0.0.1        localhost
127.0.0.1        workstation
192.168.56.102   server1
```

4.2 IP_address server 2 (provide the ip address of server 2 followed by the hostname)

```
root@workstation: /home/quizon24

  GNU nano 6.2                    /etc/hosts
127.0.0.1        localhost
127.0.0.1        workstation
192.168.56.102   server1
192.168.56.101   server2
```

4.3 Save the file and exit.

```
         root@workstation: /home/quizon24        Q   ≡   _   □   ×

  GNU nano 6.2                      /etc/hosts
127.0.0.1        localhost
127.0.0.1        workstation
192.168.56.102   server1
192.168.56.101   server2

# 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




File Name to Write: /etc/hosts
^G Help          M-D DOS Format   M-A Append      M-B Backup File
^C Cancel        M-M Mac Format   M-P Prepend     ^T Browse
```

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 jvtaylar@server1*. Enter the password when prompted. Verify that you have entered Server 1. Do the same for Server 2.

   server1:

```
quizon24@workstation:~$ ssh nowellgabriel@server1
The authenticity of host 'server1 (192.168.56.102)' can't be estab
lished.
ED25519 key fingerprint is SHA256:XQj87MhdjmBqVRCBvkqkUMUu8mjLm+gr
v3wM91Mz68c.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint]
)? yes
Warning: Permanently added 'server1' (ED25519) to the list of know
n hosts.
nowellgabriel@server1's password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-79-generic x86_64)

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

  System information as of Wed Aug 23 02:20:32 AM UTC 2023

  System load:  0.0                  Processes:             119
  Usage of /:   44.7% of 11.21GB     Users logged in:       1
  Memory usage: 6%                   IPv4 address for enp0s3: 192.16
8.56.102
  Swap usage:   0%
```

```
Last login: Wed Aug 23 02:02:50 2023 from 192.168.56.103
nowellgabriel@server1:~$
```

server2:

```
quizon24@workstation:~$ ssh nowellgabriel@server2
The authenticity of host 'server2 (192.168.56.101)' can't be estab
lished.
ED25519 key fingerprint is SHA256:EHk3VvXabx6/6cxztJ100Z9Wan++fD1u
axrQTfOxIEg.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:4: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint]
)? yes
Warning: Permanently added 'server2' (ED25519) to the list of know
n hosts.
nowellgabriel@server2's password:
Permission denied, please try again.
nowellgabriel@server2's password:
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-79-generic x86_64)

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

  System information as of Wed Aug 23 02:22:35 AM UTC 2023

  System load:  0.0                    Processes:               117
  Usage of /:   44.5% of 11.21GB       Users logged in:         1
  Memory usage: 6%                     IPv4 address for enp0s3: 192.16
8.56.101
  Swap usage:   0%
```

```
Last login: Wed Aug 23 02:06:32 2023 from 192.168.56.103
nowellgabriel@server2:~$
```

Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
   I think this because of the edits done on the */etc/hosts* file. We assigned the host name on the IP addresses of the 2 servers; that's why it was possible to use the hostname for the SSH commands.
2. How secured is SSH?

   All connection from client to server which includes file transfers, authentication, outputs, and commands are encrypted that's how secured SSH is.