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Course/Section: CPE31S4	**Date Submitted:** August 15, 2023
Instructor: Dr. Jonathan Taylar	**Semester and SY:** 3rd Year 1st Semester

Activity 1: Configure Network using Virtual Machines

1. **Objectives:**

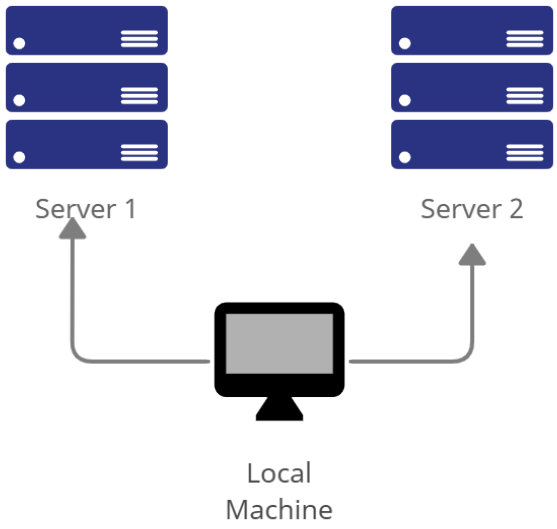
1.1. Create and configure Virtual Machines in Microsoft Azure or VirtualBox

1.2. Set-up a Virtual Network and Test Connectivity of VMs

2. **Discussion:**

Network Topology:

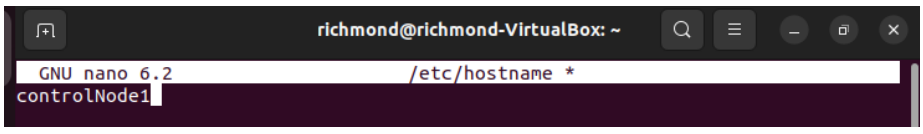
Assume that you have created the following network topology in Virtual Machines, *provide screenshots for each task*. (Note: *it is assumed that you have the prior knowledge of cloning and creating snapshots in a virtual machine*).

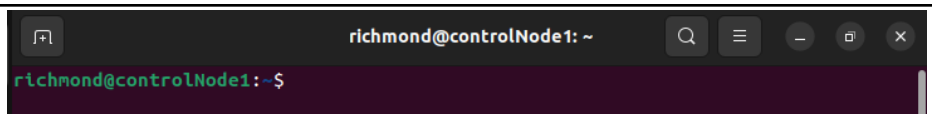


Task 1: Do the following on Server 1, Server 2, and Local Machine. In editing the file using nano command, press control + O to write out (save the file). Press enter when asked for the name of the file. Press control + X to end.

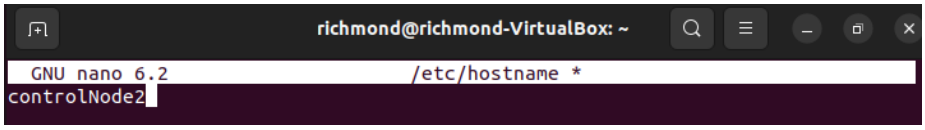
1. Change the hostname using the command *sudo nano /etc/hostname*

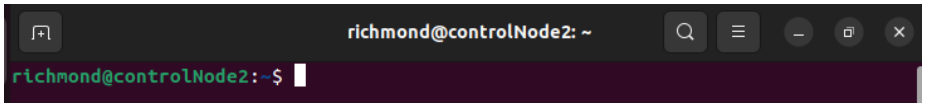
1.1 Use server1 for Server 1



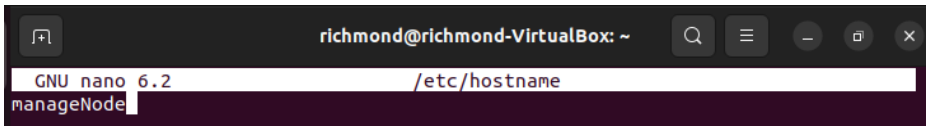


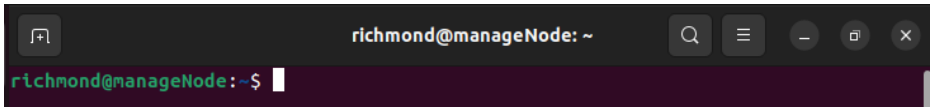
1.2 Use server2 for Server 2





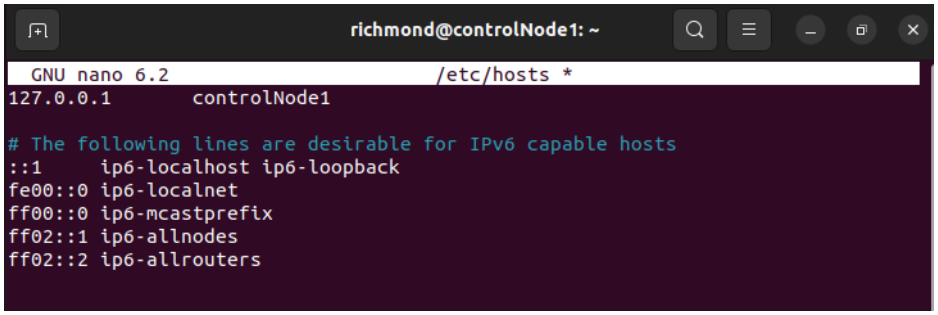
1.3 Use workstation for the Local Machine



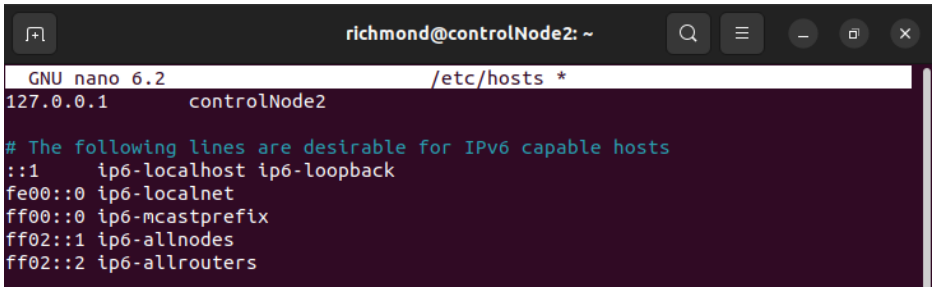


2. Edit the hosts using the command *sudo nano /etc/hosts*. Edit the second line.

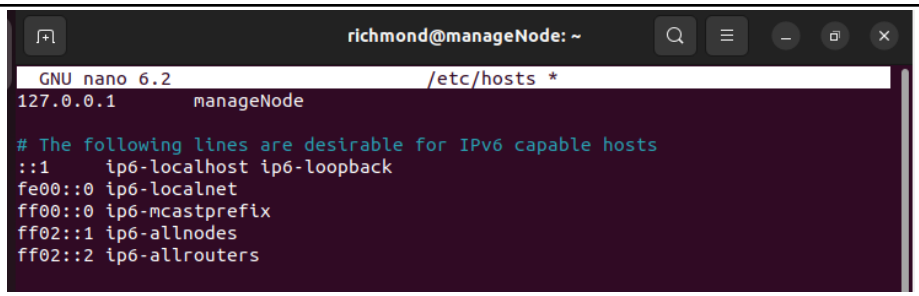
2.1 Type 127.0.0.1 server 1 for Server 1



2.2 Type 127.0.0.1 server 2 for Server 2

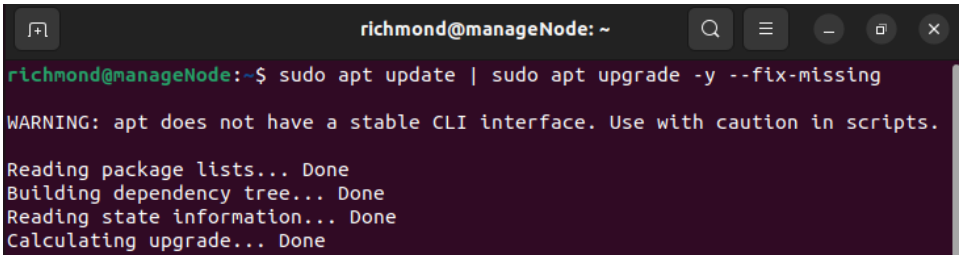


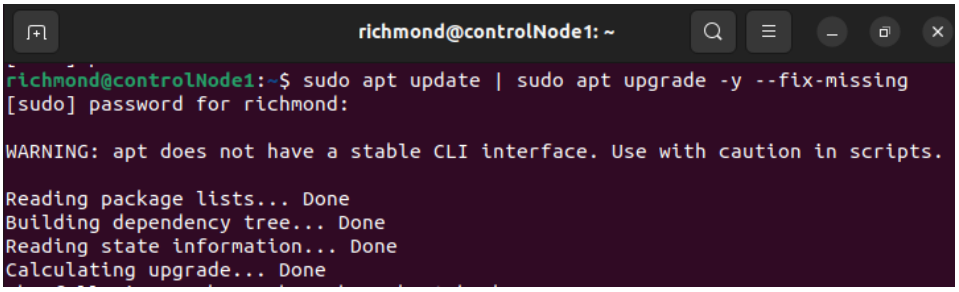
2.3 Type 127.0.0.1 workstation for the Local Machine

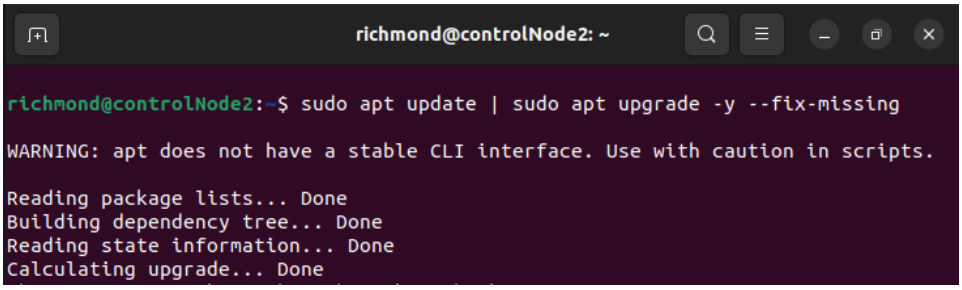


Task 2: Configure SSH on Server 1, Server 2, and Local Machine. Do the following:

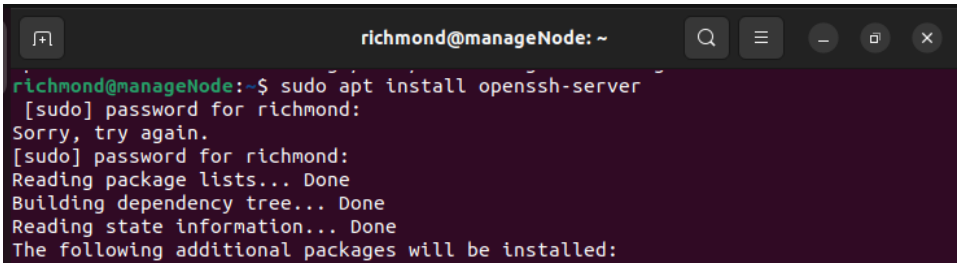
1. Upgrade the packages by issuing the command *sudo apt update* and *sudo apt upgrade* respectively. \

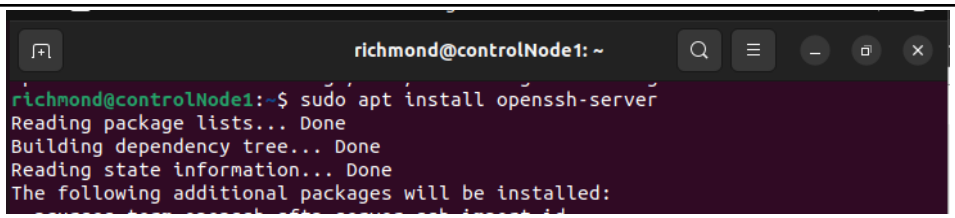


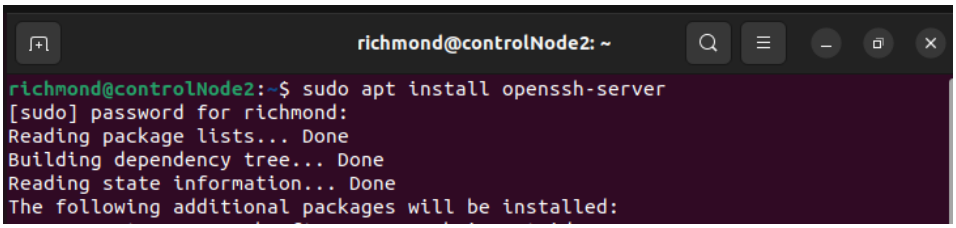




2. Install the SSH server using the command *sudo apt install openssh-server*.

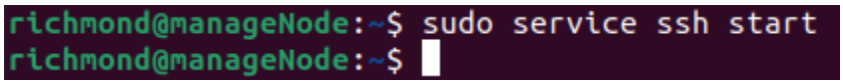


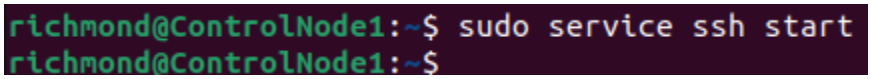


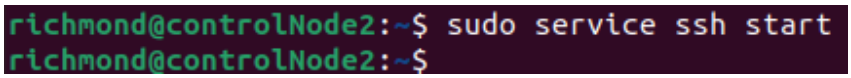


3. Verify if the SSH service has started by issuing the following commands:

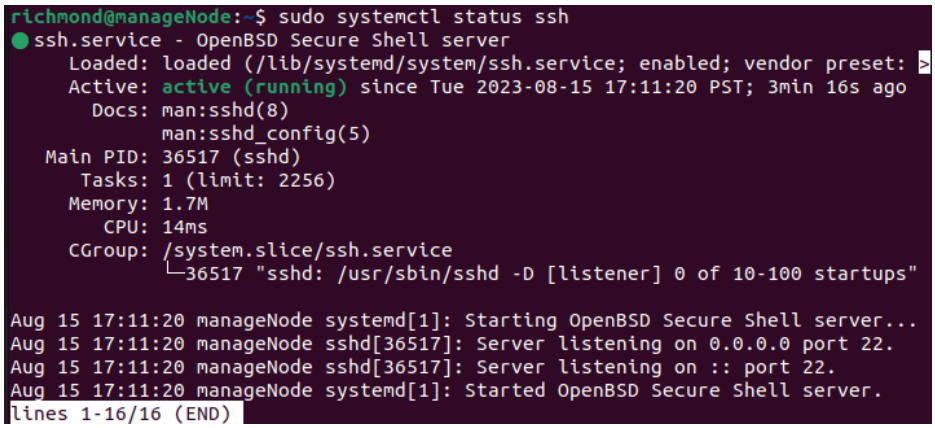
3.1 *sudo service ssh start*

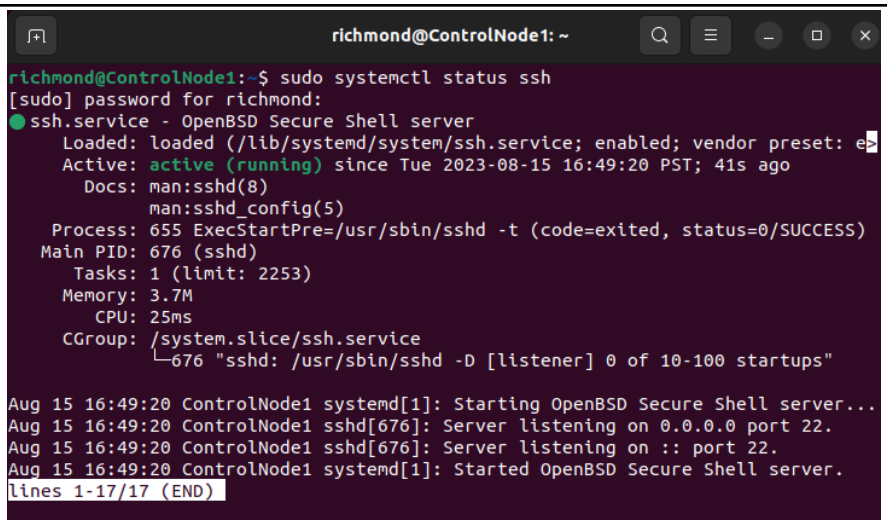


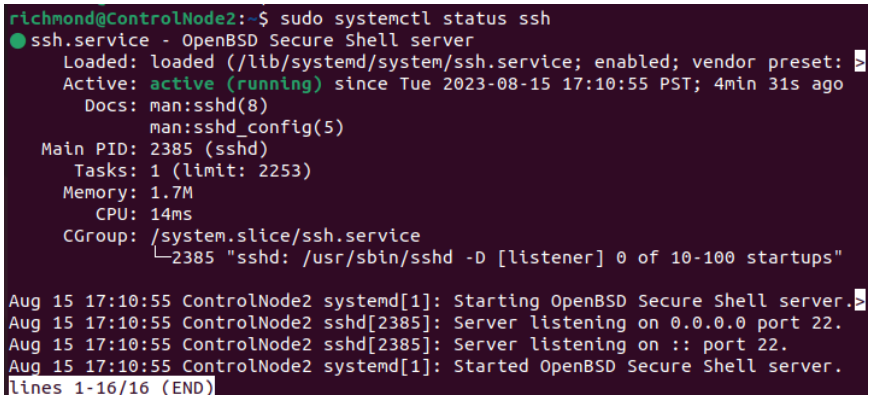




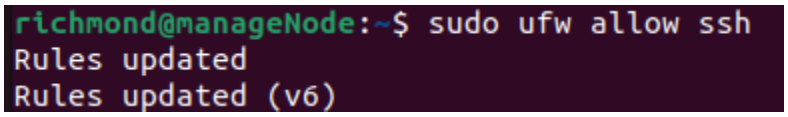
3.2 *sudo systemctl status ssh*

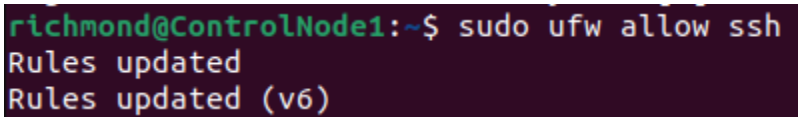


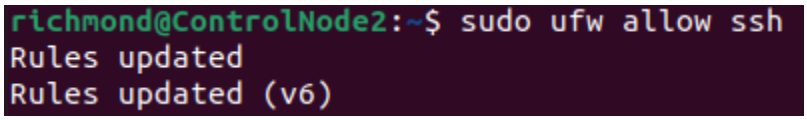




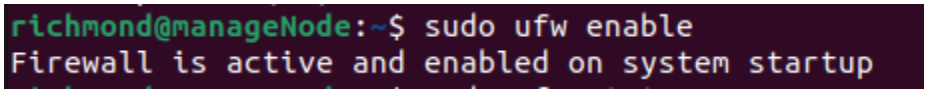
4. Configure the firewall to all port 22 by issuing the following commands:
   4.1 *sudo ufw allow ssh*

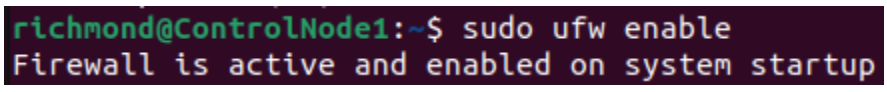






   4.2 *sudo ufw enable*





```
richmond@ControlNode2:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

4.3 *sudo ufw status*

```
richmond@manageNode:~$ sudo ufw status
Status: active

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

```
richmond@ControlNode1:~$ sudo ufw status
Status: active

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

```
richmond@ControlNode2:~$ 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: net-tools

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.___

   `192.168.56.108`

   1.2 Server 2 IP address: 192.168.56.___

   `192.168.56.109`

   1.3 Server 3 IP address: 192.168.56.___

   `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 ☐ Not Successful

```
richmond@manageNode:~$ ping 192.168.56.108
PING 192.168.56.108 (192.168.56.108) 56(84) bytes of data.
64 bytes from 192.168.56.108: icmp_seq=1 ttl=64 time=0.029 ms
64 bytes from 192.168.56.108: icmp_seq=2 ttl=64 time=0.030 ms
64 bytes from 192.168.56.108: icmp_seq=3 ttl=64 time=0.059 ms
```

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

```
richmond@manageNode:~$ ping 192.168.56.109
PING 192.168.56.109 (192.168.56.109) 56(84) bytes of data.
64 bytes from 192.168.56.109: icmp_seq=1 ttl=64 time=0.896 ms
64 bytes from 192.168.56.109: icmp_seq=2 ttl=64 time=0.744 ms
64 bytes from 192.168.56.109: icmp_seq=3 ttl=64 time=1.77 ms
^Z
[2]+  Stopped                 ping 192.168.56.109
```

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

```
richmond@ControlNode1:~$ ping 192.168.56.110
PING 192.168.56.110 (192.168.56.110) 56(84) bytes of data.
64 bytes from 192.168.56.110: icmp_seq=1 ttl=64 time=1.14 ms
64 bytes from 192.168.56.110: icmp_seq=2 ttl=64 time=2.04 ms
64 bytes from 192.168.56.110: icmp_seq=3 ttl=64 time=0.858 ms
64 bytes from 192.168.56.110: icmp_seq=4 ttl=64 time=0.691 ms
^Z
[1]+  Stopped                 ping 192.168.56.110
```

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*

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, *jvtaylar@server1*

```
richmond@manageNode:~$ ssh richmond@192.168.56.109
The authenticity of host '192.168.56.109 (192.168.56.109)' can't be established
.
ED25519 key fingerprint is SHA256:hEwbfcG/PXhxYvSAOWRArkpPiNZvJmTeKeKx9F0N8SI.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.109' (ED25519) to the list of known host
s.
```

```
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.

richmond@ControlNode1:~$
```

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

```
richmond@ControlNode1:~$
logout
Connection to 192.168.56.109 closed.
```

3. Do the same for Server 2.

```
richmond@manageNode:~$ ssh richmond@192.168.56.110
The authenticity of host '192.168.56.110 (192.168.56.110)' can't be established
.
ED25519 key fingerprint is SHA256:/tLCTTuhXJZv9v28e6JwsNQBxTFBmiwMX+tMWXGQWPM.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.110' (ED25519) to the list of known host
s.
```

```
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.

richmond@ControlNode2:~$
```

```
richmond@ControlNode2:~$
logout
Connection to 192.168.56.110 closed.
richmond@manageNode:~$
```

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.

```
  GNU nano 6.2                          /etc/hosts *
127.0.0.1       manageNode
192.168.56.109  controlNode1
192.168.56.110  controlNode2
```

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.

```
richmond@manageNode:~$ ssh richmond@controlNode1
The authenticity of host 'controlnode1 (192.168.56.109)' can't be established.
ED25519 key fingerprint is SHA256:hEwbfcG/PXhxYvSAOWRArkpPiNZvJmTeKeKx9F0N8SI.
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 'controlnode1' (ED25519) to the list of known hosts.
richmond@controlnode1'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.

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

Last login: Tue Aug 15 17:26:24 2023 from 192.168.56.108
```

```
richmond@manageNode:~$ ssh richmond@controlNode2
The authenticity of host 'controlnode2 (192.168.56.110)' can't be established.
ED25519 key fingerprint is SHA256:/tLCTTuhXJZv9v28e6JwsNQBxTFBmiwMX+tMWXGQWPM.
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 'controlnode2' (ED25519) to the list of known hosts.
richmond@controlnode2'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.

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

Last login: Tue Aug 15 17:28:41 2023 from 192.168.56.108
```

Reflections:

In this activity, I learned how to clone the virtual machines ang make a host and client servers in the virtual machines. Due to its systematic process, I get confused sometimes on what is happening in my work but overall I still manage to finish the task and setup the servers that can ping anyone in the same network.

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
   - We are able to use the hostname instead of the ip address by configuring it into the nano command where we have to set up the ip address of the hostname to simply switch into servers using the hostnames.
2. How secured is SSH?
   - it is highly secured as it has a remote login where the user must enter the password first to access the server. It uses encryption and authentication via public key cryptography.