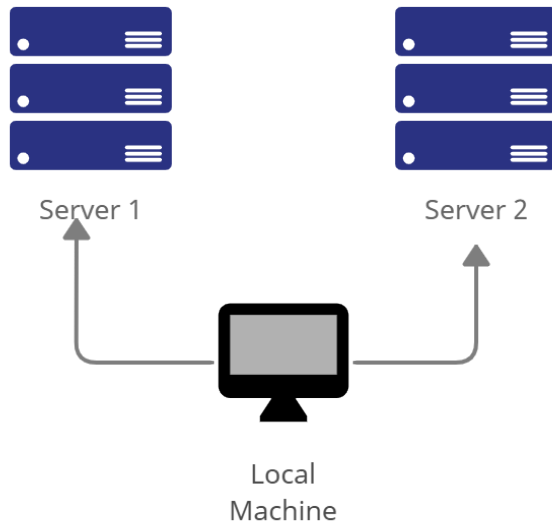
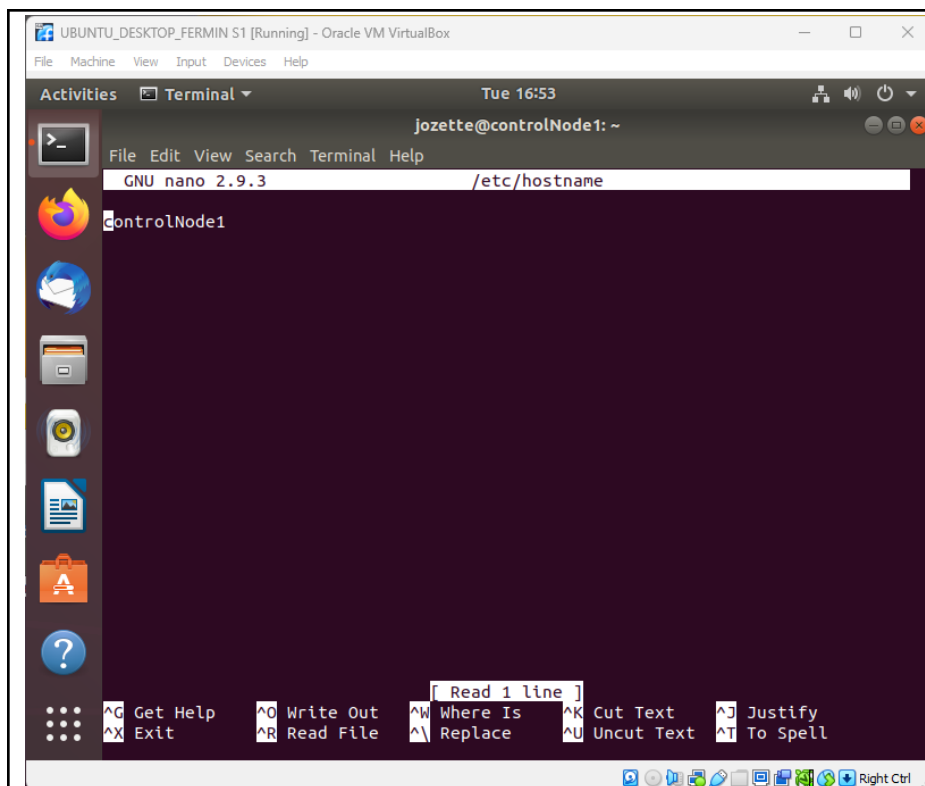
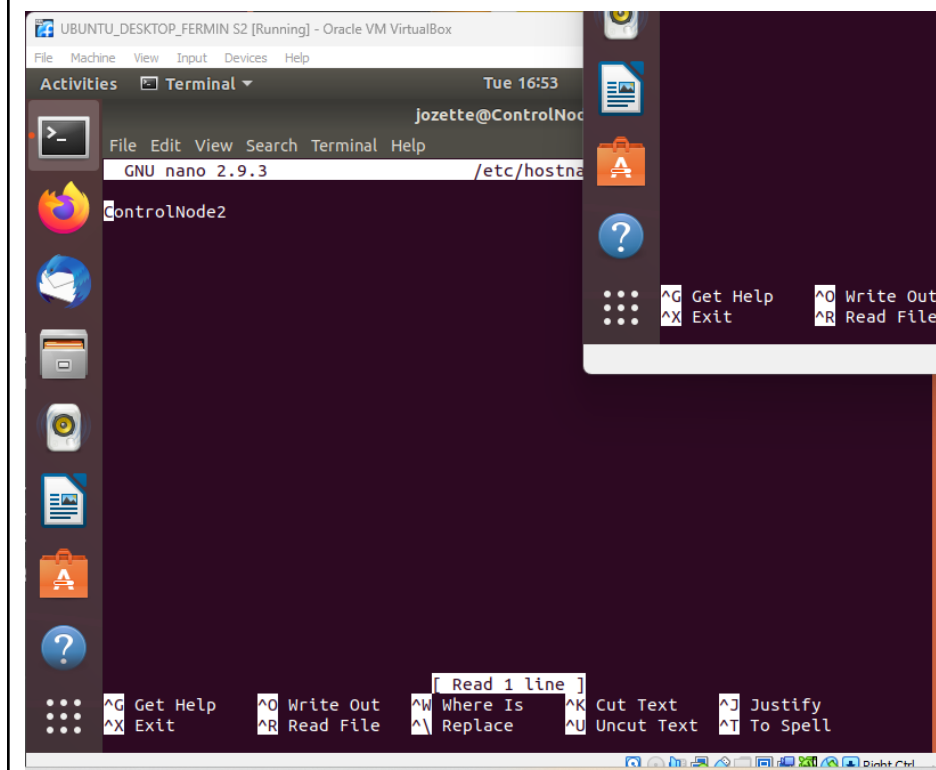


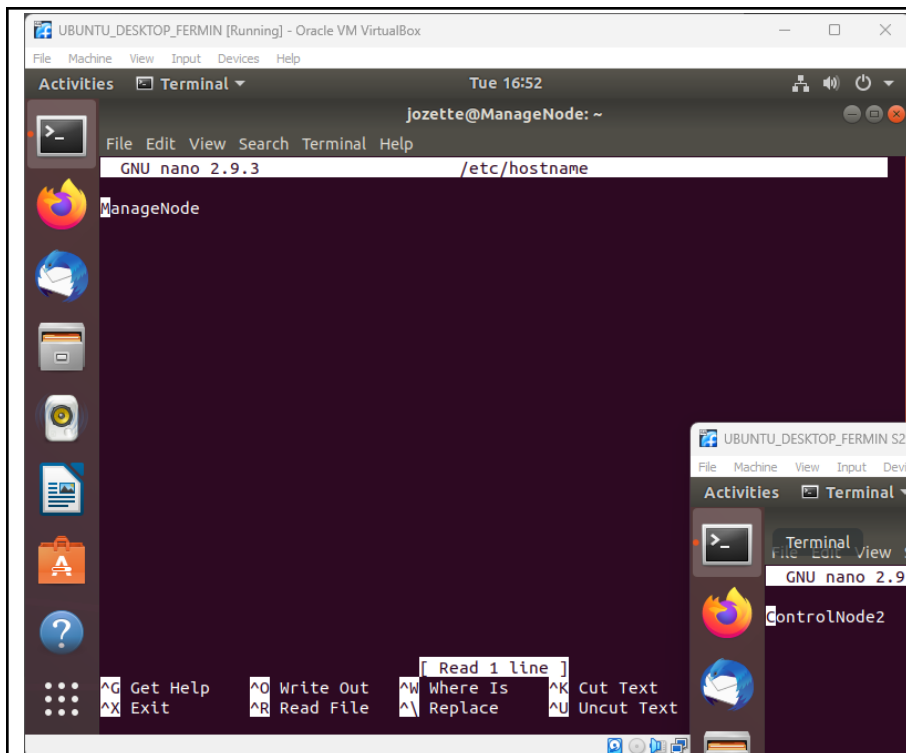
Name: JOZETTE FERMIN	Date Performed: august 14, 2023
Course/Section: august 15, 2023	Date Submitted: august 15, 2023
Instructor: Engr. Jonathan Taylar	Semester and SY: 1st sem 2023 - 2024
Activity 1: Configure Network using Virtual Machines	
1. Objectives: 1.1. Create and configure Virtual Machines in 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, <i>provide screenshots for each task</i> . (Note: <i>it is assumed that you have the prior knowledge of cloning and creating snapshots in a virtual machine</i>).	
 <pre> graph TD LocalMachine[Local Machine] --> Server1[Server 1] LocalMachine --> Server2[Server 2] </pre> <p>The diagram illustrates a network topology. At the bottom center is a computer icon labeled "Local Machine". Two lines extend upwards from the Local Machine, each ending in an arrow pointing to a stack of three server icons. The left stack is labeled "Server 1" and the right stack is labeled "Server 2".</p>	
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. <ol style="list-style-type: none"> Change the hostname using the command <i>sudo nano /etc/hostname</i> <ol style="list-style-type: none"> Use server1 for Server 1 	



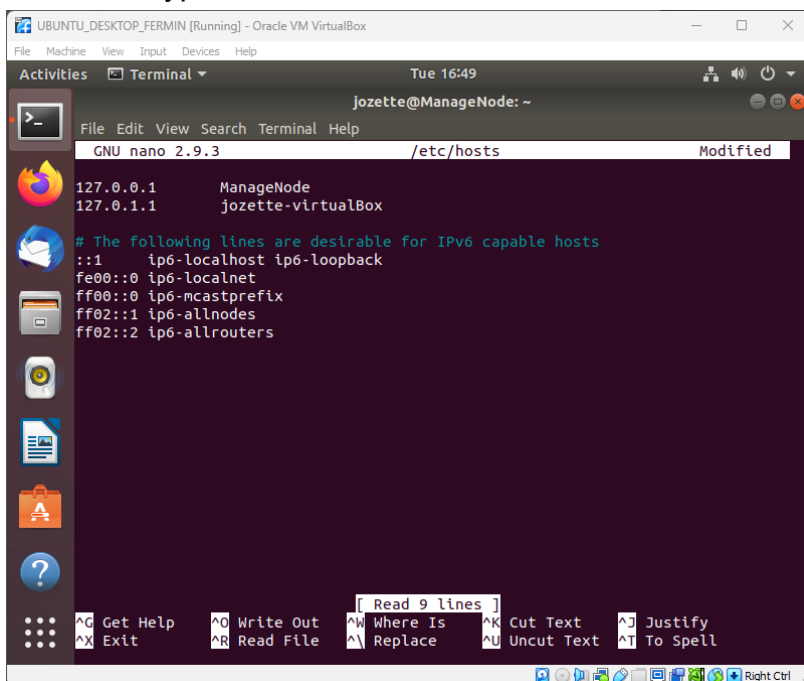
1.2 Use server2 for Server 2



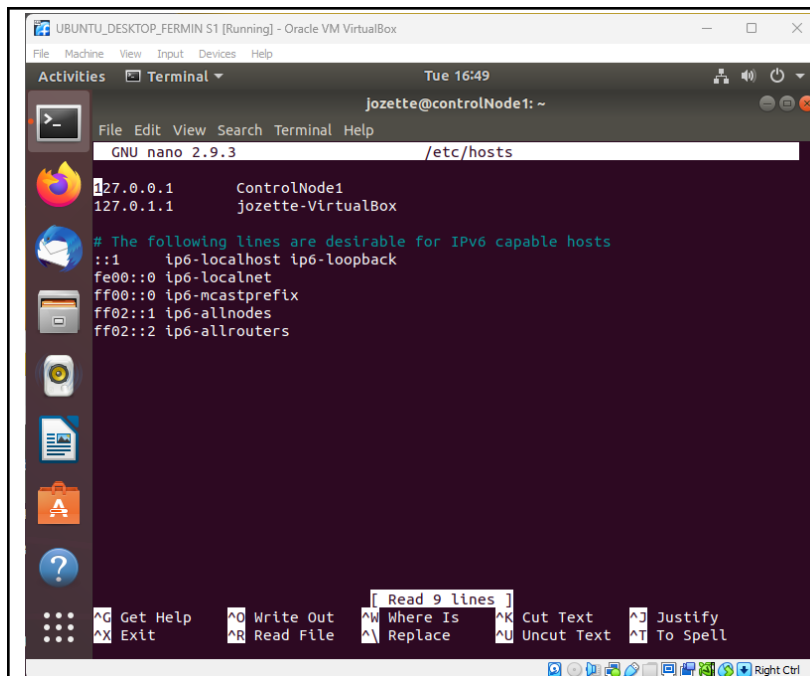
1.3 Use workstation for the Local Machine



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

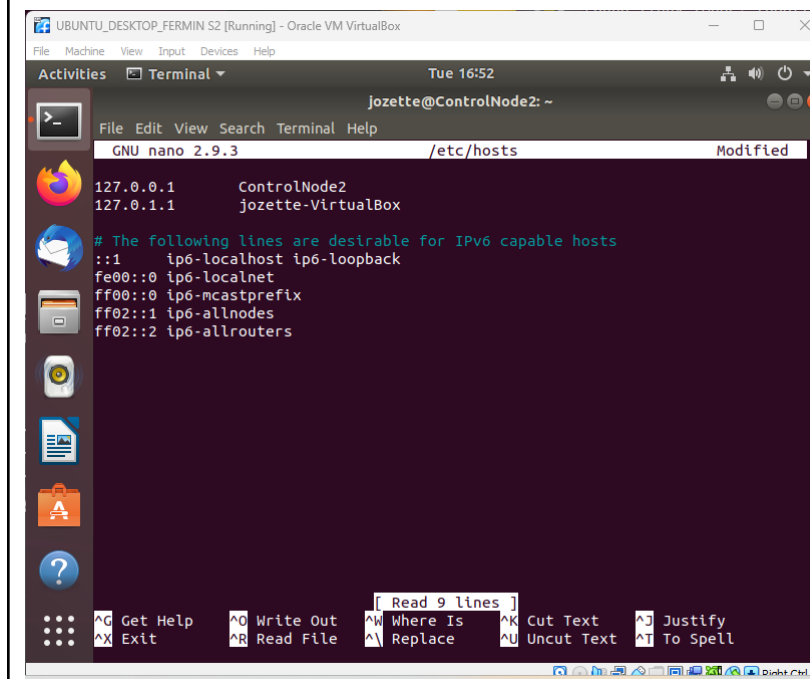


- 2.2 Type 127.0.0.1 server 2 for Server 2



```
UBUNTU_DESKTOP_FERMIN S1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 16:49
Jozette@controlNode1: ~
GNU nano 2.9.3 /etc/hosts
127.0.0.1 ControlNode1
127.0.1.1 jozette-VirtualBox
# 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
[ Read 9 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify
^X Exit ^R Read File ^_ Replace ^U Uncut Text ^T To Spell
```

2.3 Type 127.0.0.1 workstation for the Local Machine



```
UBUNTU_DESKTOP_FERMIN S2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 16:52
Jozette@ControlNode2: ~
GNU nano 2.9.3 /etc/hosts Modified
127.0.0.1 ControlNode2
127.0.1.1 jozette-VirtualBox
# 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
[ Read 9 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify
^X Exit ^R Read File ^_ Replace ^U Uncut Text ^T To Spell
```

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

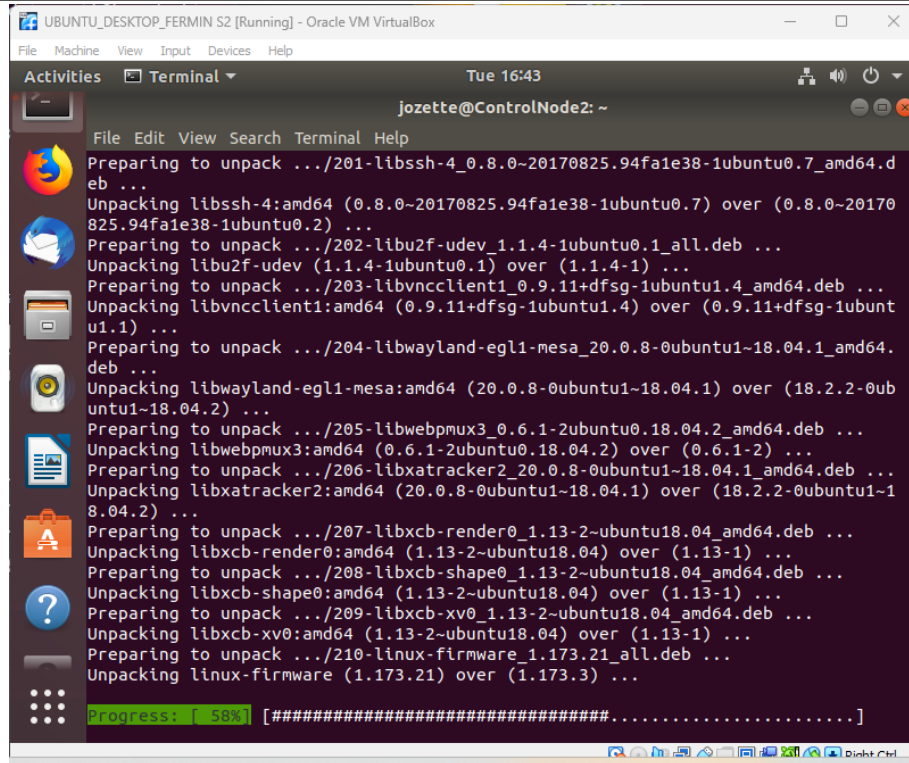
1. Upgrade the packages by issuing the command *sudo apt update* and *sudo apt upgrade* respectively.

```
UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 16:41
Jozette@ManageNode: ~
File Edit View Search Terminal Help
Preparing to unpack .../242-shotwell-common_0.28.4-0ubuntu2_all.deb ...
Unpacking shotwell-common (0.28.4-0ubuntu2) over (0.28.4-0ubuntu1) ...
Preparing to unpack .../243-spice-vdagent_0.17.0-1ubuntu2.2_amd64.deb ...
Unpacking spice-vdagent (0.17.0-1ubuntu2.2) over (0.17.0-1ubuntu2) ...
Preparing to unpack .../244-thermald_1.7.0-Subuntu5_amd64.deb ...
Unpacking thermald (1.7.0-Subuntu5) over (1.7.0-Subuntu2) ...
Preparing to unpack .../245-ubuntu-settings_18.04.7_all.deb ...
Unpacking ubuntu-settings (18.04.7) over (18.04.6) ...
Preparing to unpack .../246-ubuntu-desktop_1.417.5_amd64.deb ...
Unpacking ubuntu-desktop (1.417.5) over (1.417) ...
Preparing to unpack .../247-ubuntu-report_1.3.2_amd64.deb ...
Unpacking ubuntu-report (1.3.2) over (1.3.0-18.04) ...
Preparing to unpack .../248-ubuntu-software_3.28.1-0ubuntu4.18.04.15_all.deb ...
Unpacking ubuntu-software (3.28.1-0ubuntu4.18.04.15) over (3.28.1-0ubuntu4.18.04.8) ...
Preparing to unpack .../249-ubuntu-web-launchers_18.04.7_all.deb ...
Unpacking ubuntu-web-launchers (18.04.7) over (18.04.6) ...
Preparing to unpack .../250-unattended-upgrades_1.1ubuntu1.18.04.14_all.deb ...
Unpacking unattended-upgrades (1.1ubuntu1.18.04.14) over (1.1ubuntu1.18.04.8) ...
Preparing to unpack .../251-upower_0.99.7-2ubuntu0.18.04.1_amd64.deb ...
Unpacking upower (0.99.7-2ubuntu0.18.04.1) over (0.99.7-2) ...
Preparing to unpack .../252-usb-creator-gtk_0.3.5ubuntu18.04.2_amd64.deb ...
Unpacking usb-creator-gtk (0.3.5ubuntu18.04.2) over (0.3.5) ...
Preparing to unpack .../253-usb-creator-common_0.3.5ubuntu18.04.2_amd64.deb ...
Progress: [ 62%] [#####.....]
```

ManageNode

```
UBUNTU_DESKTOP_FERMIN S1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 16:42
Jozette@controlNode1: ~
File Edit View Search Terminal Help
Setting up login (1:4.5-1ubuntu2.5) ...
(Reading database ... 125096 files and directories currently installed.)
Preparing to unpack .../ncurses-bin_6.1-1ubuntu1.18.04.1_amd64.deb ...
Unpacking ncurses-bin (6.1-1ubuntu1.18.04.1) over (6.1-1ubuntu1.18.04) ...
Setting up ncurses-bin (6.1-1ubuntu1.18.04.1) ...
(Reading database ... 125096 files and directories currently installed.)
Preparing to unpack .../ncurses-base_6.1-1ubuntu1.18.04.1_all.deb ...
Unpacking ncurses-base (6.1-1ubuntu1.18.04.1) over (6.1-1ubuntu1.18.04) ...
Setting up ncurses-base (6.1-1ubuntu1.18.04.1) ...
(Reading database ... 125096 files and directories currently installed.)
Preparing to unpack .../apparmor_2.12-4ubuntu5.3_amd64.deb ...
Unpacking apparmor (2.12-4ubuntu5.3) over (2.12-4ubuntu5.1) ...
Preparing to unpack .../passwd_1:3a4.5-1ubuntu2.5_amd64.deb ...
Unpacking passwd (1:4.5-1ubuntu2.5) over (1:4.5-1ubuntu1) ...
Setting up passwd (1:4.5-1ubuntu2.5) ...
(Reading database ... 125096 files and directories currently installed.)
Preparing to unpack .../libssl1.0.0_1.0.2n-1ubuntu5.13_amd64.deb ...
Unpacking libssl1.0.0:amd64 (1.0.2n-1ubuntu5.13) over (1.0.2n-1ubuntu5.2) ...
Preparing to unpack .../openssh-client_1:7.6p1-4ubuntu0.7_amd64.deb ...
Unpacking openssh-client (1:7.6p1-4ubuntu0.7) over (1:7.6p1-4ubuntu0.2) ...
Preparing to unpack .../squashfs-tools_1:3a4.3-6ubuntu0.18.04.4_amd64.deb ...
Unpacking squashfs-tools (1:4.3-6ubuntu0.18.04.4) over (1:4.3-6ubuntu0.18.04.1) ...
Preparing to unpack .../snapd_2.58+18.04.1_amd64.deb ...
Unpacking snapd (2.58+18.04.1) over (2.37.1.1+18.04) ...
Progress: [ 37%] [#####.....]
```

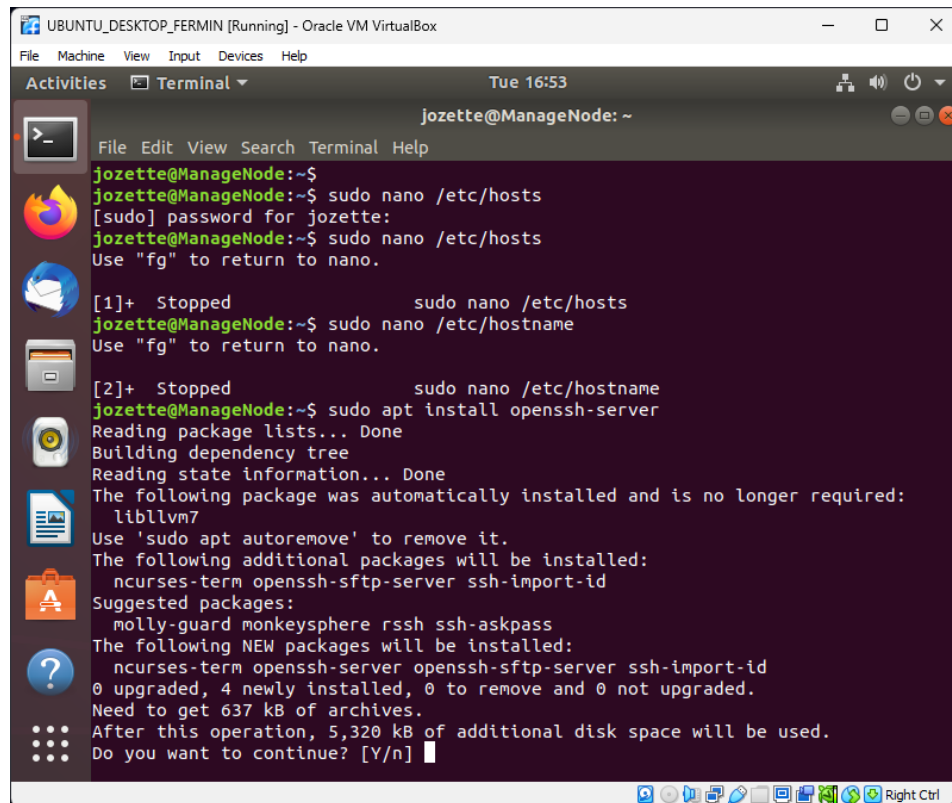
ControlNode1



```
UBUNTU_DESKTOP_FERMIN S2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Tue 16:43
jozette@ControlNode2: ~
File Edit View Search Terminal Help
Preparing to unpack .../201-libssh-4_0.8.0-20170825.94fa1e38-1ubuntu0.7_amd64.d
eb ...
Unpacking libssh-4:amd64 (0.8.0-20170825.94fa1e38-1ubuntu0.7) over (0.8.0-20170
825.94fa1e38-1ubuntu0.2) ...
Preparing to unpack .../202-libu2f-udev_1.1.4-1ubuntu0.1_all.deb ...
Unpacking libu2f-udev (1.1.4-1ubuntu0.1) over (1.1.4-1) ...
Preparing to unpack .../203-libvncclient1_0.9.11+dfsg-1ubuntu1.4_amd64.deb ...
Unpacking libvncclient1:amd64 (0.9.11+dfsg-1ubuntu1.4) over (0.9.11+dfsg-1ubunt
u1.1) ...
Preparing to unpack .../204-libwayland-egl1-mesa_20.0.8-0ubuntu1-18.04.1_amd64.
deb ...
Unpacking libwayland-egl1-mesa:amd64 (20.0.8-0ubuntu1-18.04.1) over (18.2.2-0ub
untu1-18.04.2) ...
Preparing to unpack .../205-libwebp-mux3_0.6.1-2ubuntu0.18.04.2_amd64.deb ...
Unpacking libwebp-mux3:amd64 (0.6.1-2ubuntu0.18.04.2) over (0.6.1-2) ...
Preparing to unpack .../206-libxatracker2_20.0.8-0ubuntu1-18.04.1_amd64.deb ...
Unpacking libxatracker2:amd64 (20.0.8-0ubuntu1-18.04.1) over (18.2.2-0ubuntu1-1
8.04.2) ...
Preparing to unpack .../207-libxcb-render0_1.13-2-ubuntu18.04_amd64.deb ...
Unpacking libxcb-render0:amd64 (1.13-2-ubuntu18.04) over (1.13-1) ...
Preparing to unpack .../208-libxcb-shape0_1.13-2-ubuntu18.04_amd64.deb ...
Unpacking libxcb-shape0:amd64 (1.13-2-ubuntu18.04) over (1.13-1) ...
Preparing to unpack .../209-libxcb-xv0_1.13-2-ubuntu18.04_amd64.deb ...
Unpacking libxcb-xv0:amd64 (1.13-2-ubuntu18.04) over (1.13-1) ...
Preparing to unpack .../210-linux-firmware_1.173.21_all.deb ...
Unpacking linux-firmware (1.173.21) over (1.173.3) ...
Progress: [ 58%] [#####.....]
```

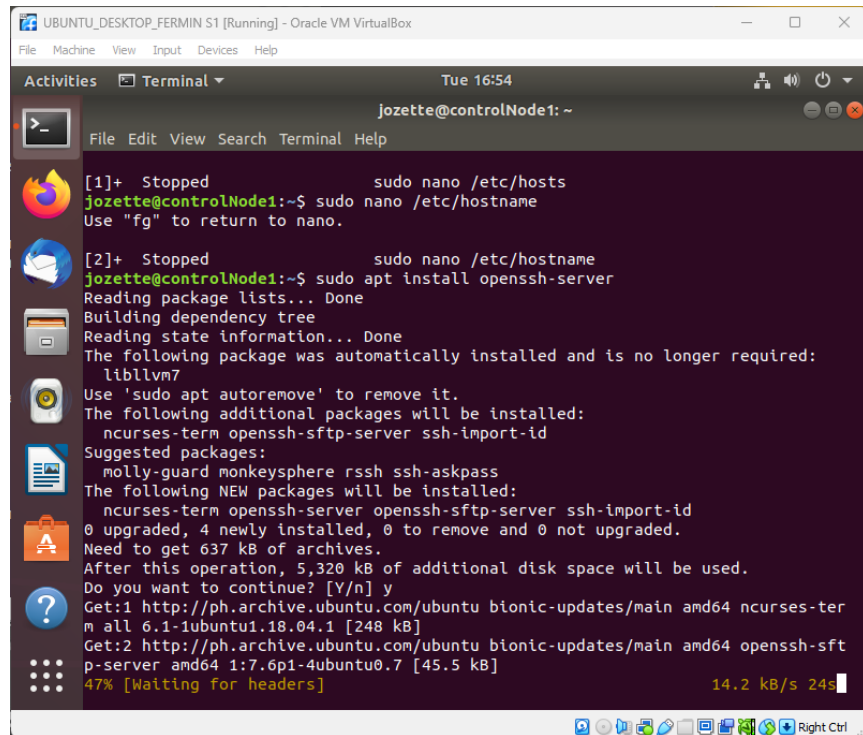
ControlNode2

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



```
UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Tue 16:53
jozette@ManageNode: ~
File Edit View Search Terminal Help
jozette@ManageNode:~$
jozette@ManageNode:~$ sudo nano /etc/hosts
[sudo] password for jozette:
jozette@ManageNode:~$ sudo nano /etc/hosts
Use "fg" to return to nano.
[1]+ Stopped sudo nano /etc/hosts
jozette@ManageNode:~$ sudo nano /etc/hostname
Use "fg" to return to nano.
[2]+ Stopped sudo nano /etc/hostname
jozette@ManageNode:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  libllvm7
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere rssh ssh-askpass
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
0 upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 637 kB of archives.
After this operation, 5,320 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

ManageNode

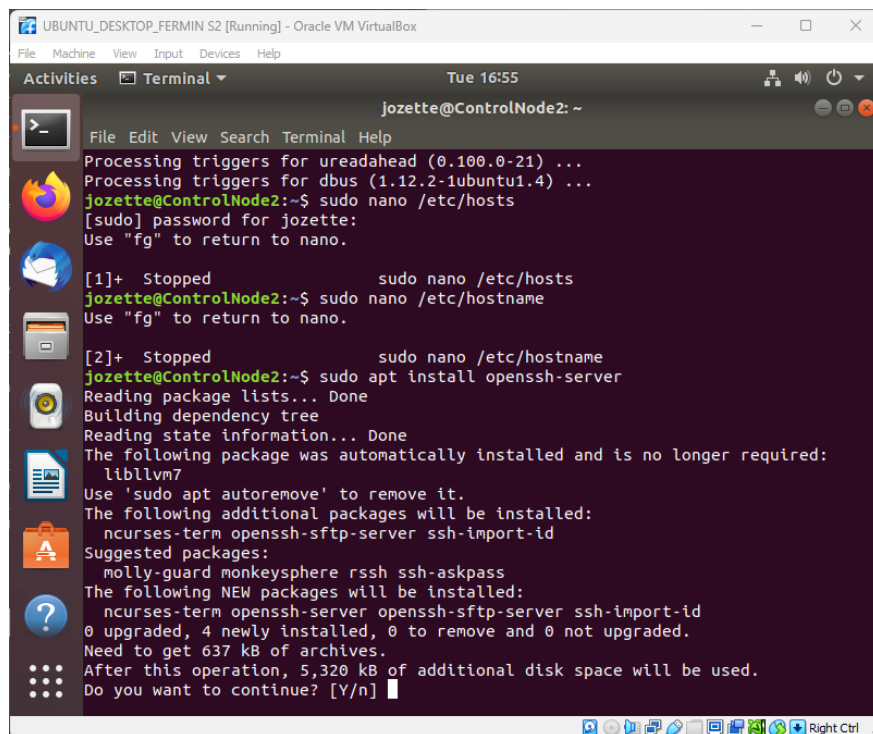


```
UBUNTU_DESKTOP_FERMIN S1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 16:54
jozette@controlNode1: ~
File Edit View Search Terminal Help

[1]+ Stopped sudo nano /etc/hosts
jozette@controlNode1:~$ sudo nano /etc/hostname
Use "fg" to return to nano.

[2]+ Stopped sudo nano /etc/hostname
jozette@controlNode1:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  liblvm7
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere rssh ssh-askpass
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
0 upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 637 kB of archives.
After this operation, 5,320 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 ncurses-ter
m all 6.1-1ubuntu1.18.04.1 [248 kB]
Get:2 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 openssh-sft
p-server amd64 1:7.6p1-4ubuntu0.7 [45.5 kB]
14.2 kB/s 24s
```

ControlNode1



```
UBUNTU_DESKTOP_FERMIN S2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 16:55
jozette@ControlNode2: ~
File Edit View Search Terminal Help

Processing triggers for ureadahead (0.100.0-21) ...
Processing triggers for dbus (1.12.2-1ubuntu1.4) ...
jozette@ControlNode2:~$ sudo nano /etc/hosts
[sudo] password for jozette:
Use "fg" to return to nano.

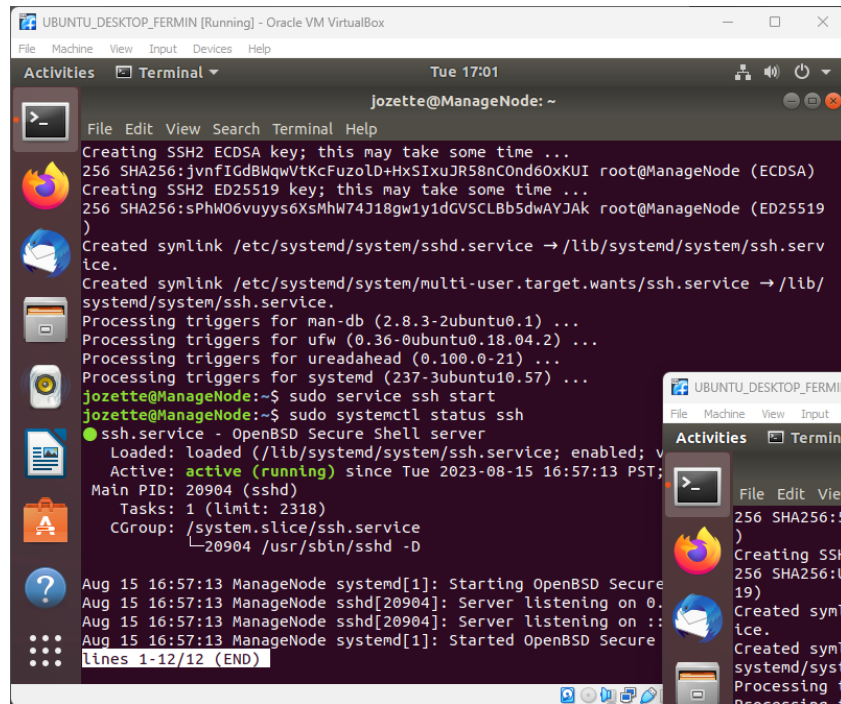
[1]+ Stopped sudo nano /etc/hosts
jozette@ControlNode2:~$ sudo nano /etc/hostname
Use "fg" to return to nano.

[2]+ Stopped sudo nano /etc/hostname
jozette@ControlNode2:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  liblvm7
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere rssh ssh-askpass
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
0 upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 637 kB of archives.
After this operation, 5,320 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

ControlNode2

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

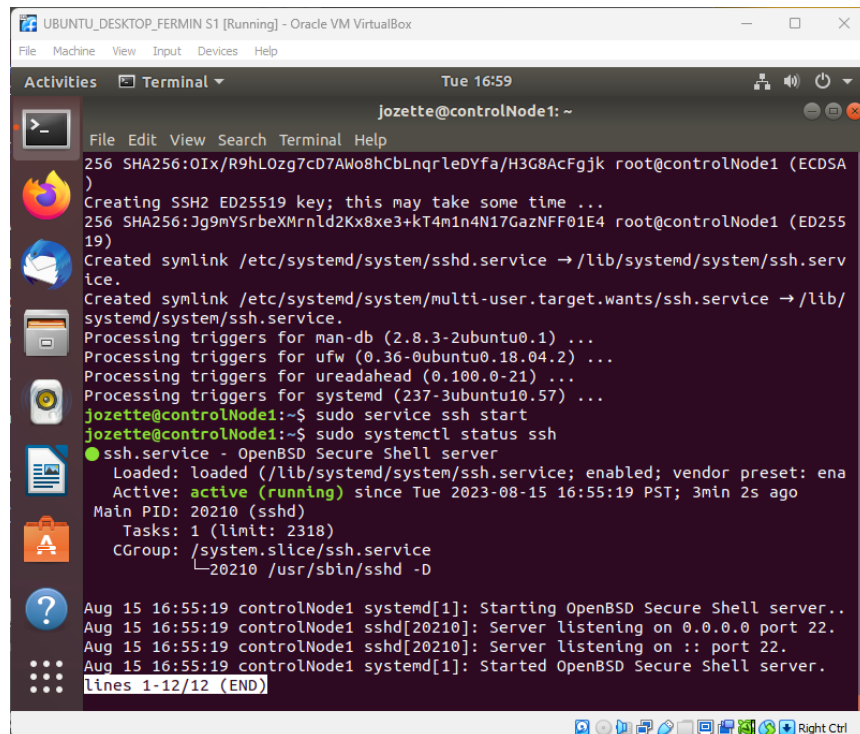
3.2 *sudo systemctl status ssh*



The terminal window on ManageNode shows the following commands and output:

```
jozette@ManageNode: ~  
File Edit View Search Terminal Help  
Creating SSH2 ECDSA key; this may take some time ...  
256 SHA256:jvnfIGdBWqWtKcFuzoLD+HxSIxuJR58nC0nd60xKUI root@ManageNode (ECDSA)  
Creating SSH2 ED25519 key; this may take some time ...  
256 SHA256:sPhW06vuyys6XsMhW74J18gw1y1dGV5CLBb5dwAYJAK root@ManageNode (ED25519)  
Created symlink /etc/systemd/system/ssh.service → /lib/systemd/system/ssh.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /lib/systemd/system/ssh.service.  
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...  
Processing triggers for ufw (0.36-0ubuntu0.18.04.2) ...  
Processing triggers for ureadahead (0.100.0-21) ...  
Processing triggers for systemd (237-3ubuntu10.57) ...  
jozette@ManageNode:~$ sudo service ssh start  
jozette@ManageNode:~$ 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 2023-08-15 16:57:13 PST; 1min 2s ago  
     Main PID: 20904 (sshd)  
       Tasks: 1 (limit: 2318)  
      CGroup: /system.slice/ssh.service  
              └─20904 /usr/sbin/sshd -D  
  
Aug 15 16:57:13 ManageNode systemd[1]: Starting OpenBSD Secure Shell server: sshd.  
Aug 15 16:57:13 ManageNode sshd[20904]: Server listening on 0.0.0.0 port 22.  
Aug 15 16:57:13 ManageNode sshd[20904]: Server listening on :: port 22.  
Aug 15 16:57:13 ManageNode systemd[1]: Started OpenBSD Secure Shell server: sshd.  
lines 1-12/12 (END)
```

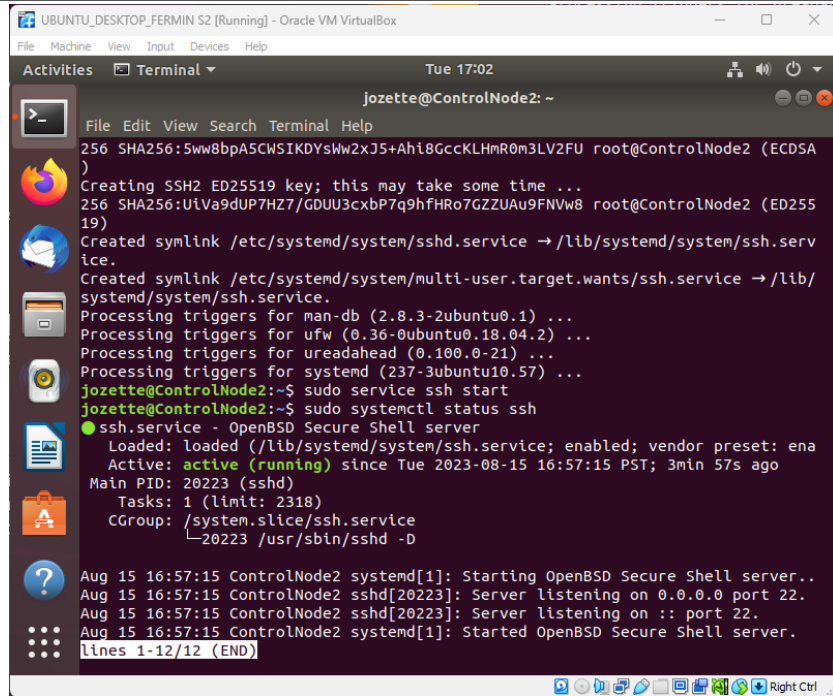
ManageNode



The terminal window on ControlNode1 shows the following commands and output:

```
jozette@controlNode1: ~  
File Edit View Search Terminal Help  
256 SHA256:0Ix/R9hLOzg7cD7AW08hCbLnqrleDYfa/H3G8AcFgjk root@controlNode1 (ECDSA)  
Creating SSH2 ED25519 key; this may take some time ...  
256 SHA256:Jg9mYSrbeXMrnld2Kx8xe3+kT4m1n4N17GazNFF01E4 root@controlNode1 (ED25519)  
Created symlink /etc/systemd/system/ssh.service → /lib/systemd/system/ssh.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /lib/systemd/system/ssh.service.  
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...  
Processing triggers for ufw (0.36-0ubuntu0.18.04.2) ...  
Processing triggers for ureadahead (0.100.0-21) ...  
Processing triggers for systemd (237-3ubuntu10.57) ...  
jozette@controlNode1:~$ sudo service ssh start  
jozette@controlNode1:~$ 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 2023-08-15 16:55:19 PST; 3min 2s ago  
     Main PID: 20210 (sshd)  
       Tasks: 1 (limit: 2318)  
      CGroup: /system.slice/ssh.service  
              └─20210 /usr/sbin/sshd -D  
  
Aug 15 16:55:19 controlNode1 systemd[1]: Starting OpenBSD Secure Shell server: sshd.  
Aug 15 16:55:19 controlNode1 sshd[20210]: Server listening on 0.0.0.0 port 22.  
Aug 15 16:55:19 controlNode1 sshd[20210]: Server listening on :: port 22.  
Aug 15 16:55:19 controlNode1 systemd[1]: Started OpenBSD Secure Shell server: sshd.  
lines 1-12/12 (END)
```

ControlNode1



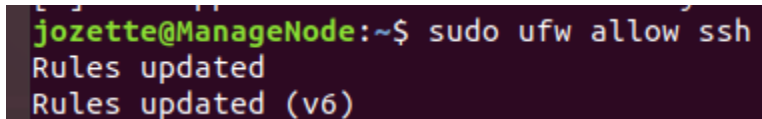
```
UBUNTU_DESKTOP_FERMIN S2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 17:02
jozette@ControlNode2: ~
File Edit View Search Terminal Help
256 SHA256:5ww8bpA5CWSIKDYsWw2xJ5+AhI8GccKLHmR0m3LV2FU root@ControlNode2 (ECDSA)
Creating SSH2 ED25519 key; this may take some time ...
256 SHA256:UiVa9dUP7HZ7/GDUU3cxbP7q9hFHRo7GZZUau9FNVw8 root@ControlNode2 (ED25519)
Created symlink /etc/systemd/system/ssh.service → /lib/systemd/system/ssh.service.
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /lib/systemd/system/ssh.service.
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for ufw (0.36-0ubuntu0.18.04.2) ...
Processing triggers for ureadahead (0.100.0-21) ...
Processing triggers for systemd (237-3ubuntu10.57) ...
jozette@ControlNode2:~$ sudo service ssh start
jozette@ControlNode2:~$ 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 2023-08-15 16:57:15 PST; 3min 57s ago
     Main PID: 20223 (sshd)
       Tasks: 1 (limit: 2318)
      CGroup: /system.slice/ssh.service
              └─20223 /usr/sbin/sshd -D

Aug 15 16:57:15 ControlNode2 systemd[1]: Starting OpenBSD Secure Shell server..
Aug 15 16:57:15 ControlNode2 sshd[20223]: Server listening on 0.0.0.0 port 22.
Aug 15 16:57:15 ControlNode2 sshd[20223]: Server listening on :: port 22.
Aug 15 16:57:15 ControlNode2 systemd[1]: Started OpenBSD Secure Shell server.
Lines 1-12/12 (END)
```

ControlNode2

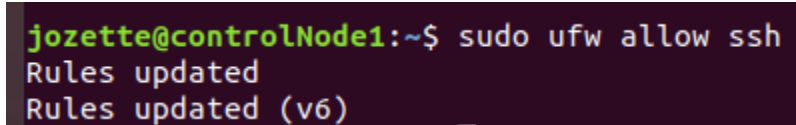
4. Configure the firewall to all port 22 by issuing the following commands:

4.1 *sudo ufw allow ssh*



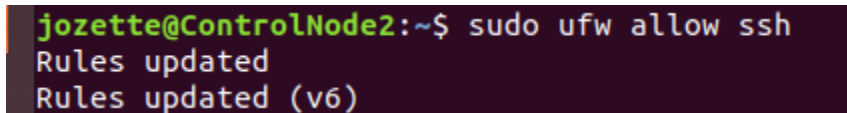
```
jozette@ManageNode:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

ManageNode



```
jozette@controlNode1:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

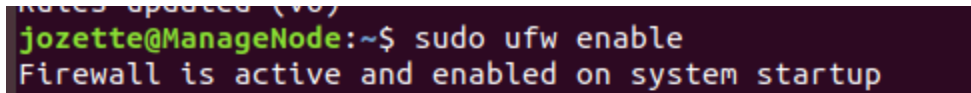
ControlNode1



```
jozette@ControlNode2:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

ControlNode2

4.2 *sudo ufw enable*



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

ManageNode

```
jozette@controlNode1:~$ sudo ufw enable
sFirewall is active and enabled on system startup
```

ControlNode1

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

ControlNode2

4.3 *sudo ufw status*

```
jozette@ManageNode:~$ sudo ufw status
Status: active

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

ManageNode

```
jozette@controlNode1:~$ sudo ufw status
Status: active

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

ControlNode1

```
jozette@ControlNode2:~$ sudo ufw status
Status: active

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

ControlNode2

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: 192.168.56.1

```
jozette@ManageNode:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.1 netmask 0.0.0.0 broadcast 255.255.255.255
```

1.2 Server 2 IP address: 192.168.56.2

```
jozette@controlNode1:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.2 netmask 0.0.0.0 broadcast 255.255.255.255
```

1.3 Server 3 IP address: 192.168.56.3

```
jozette@ControlNode2:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.3 netmask 0.0.0.0 broadcast 255.255.255.255
```

2. Make sure that they can ping each other.

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

```
jozette@ManageNode:~$ 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=1.25 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.447 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=1.59 ms
64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=0.494 ms
64 bytes from 192.168.56.102: icmp_seq=5 ttl=64 time=0.487 ms
```

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

```
jozette@ManageNode:~$ ping 192.168.56.103
PING 192.168.56.103 (192.168.56.103) 56(84) bytes of data.
64 bytes from 192.168.56.103: icmp_seq=1 ttl=64 time=1.09 ms
64 bytes from 192.168.56.103: icmp_seq=2 ttl=64 time=0.594 ms
64 bytes from 192.168.56.103: icmp_seq=3 ttl=64 time=2.15 ms
64 bytes from 192.168.56.103: icmp_seq=4 ttl=64 time=0.565 ms
64 bytes from 192.168.56.103: icmp_seq=5 ttl=64 time=0.746 ms
```

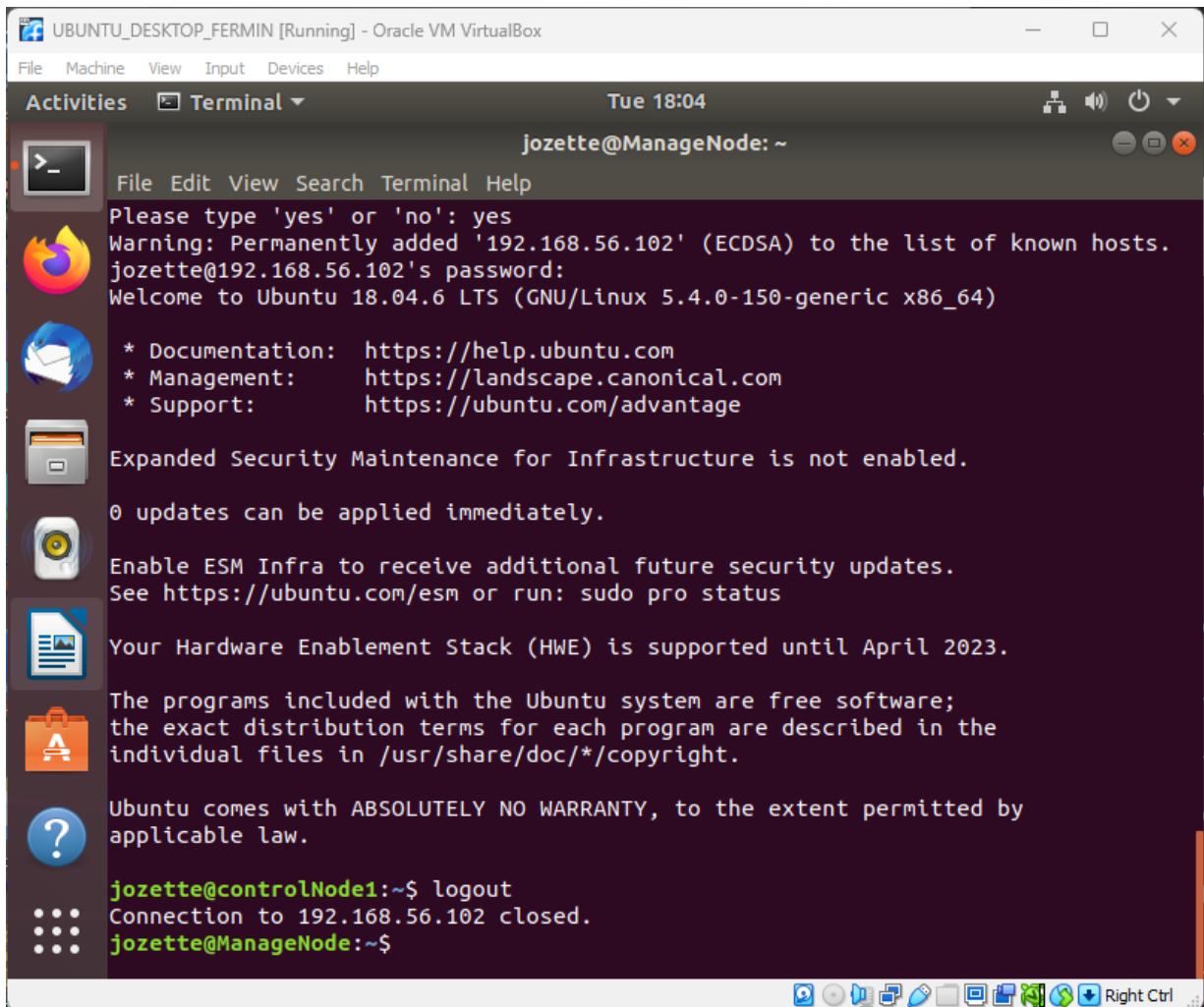
2.3 Connectivity test for Server 1 to Server 2: ☐ Successful ☐ Not Successful

```
jozette@controlNode1:~$ ping 192.168.56.103
PING 192.168.56.103 (192.168.56.103) 56(84) bytes of data.
64 bytes from 192.168.56.103: icmp_seq=1 ttl=64 time=1.65 ms
64 bytes from 192.168.56.103: icmp_seq=2 ttl=64 time=1.87 ms
64 bytes from 192.168.56.103: icmp_seq=3 ttl=64 time=1.32 ms
64 bytes from 192.168.56.103: icmp_seq=4 ttl=64 time=0.877 ms
64 bytes from 192.168.56.103: icmp_seq=5 ttl=64 time=1.53 ms
```

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*
- 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*
2. Logout of Server 1 by issuing the command *control + D*.
3. Do the same for Server 2.



The screenshot shows a terminal window titled "UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox". The terminal output is as follows:

```
File Edit View Search Terminal Help
Tue 18:04
jozette@ManageNode: ~
Please type 'yes' or 'no': yes
Warning: Permanently added '192.168.56.102' (ECDSA) to the list of known hosts.
jozette@192.168.56.102's password:
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 5.4.0-150-generic x86_64)

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

Expanded Security Maintenance for Infrastructure is not enabled.

0 updates can be applied immediately.

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

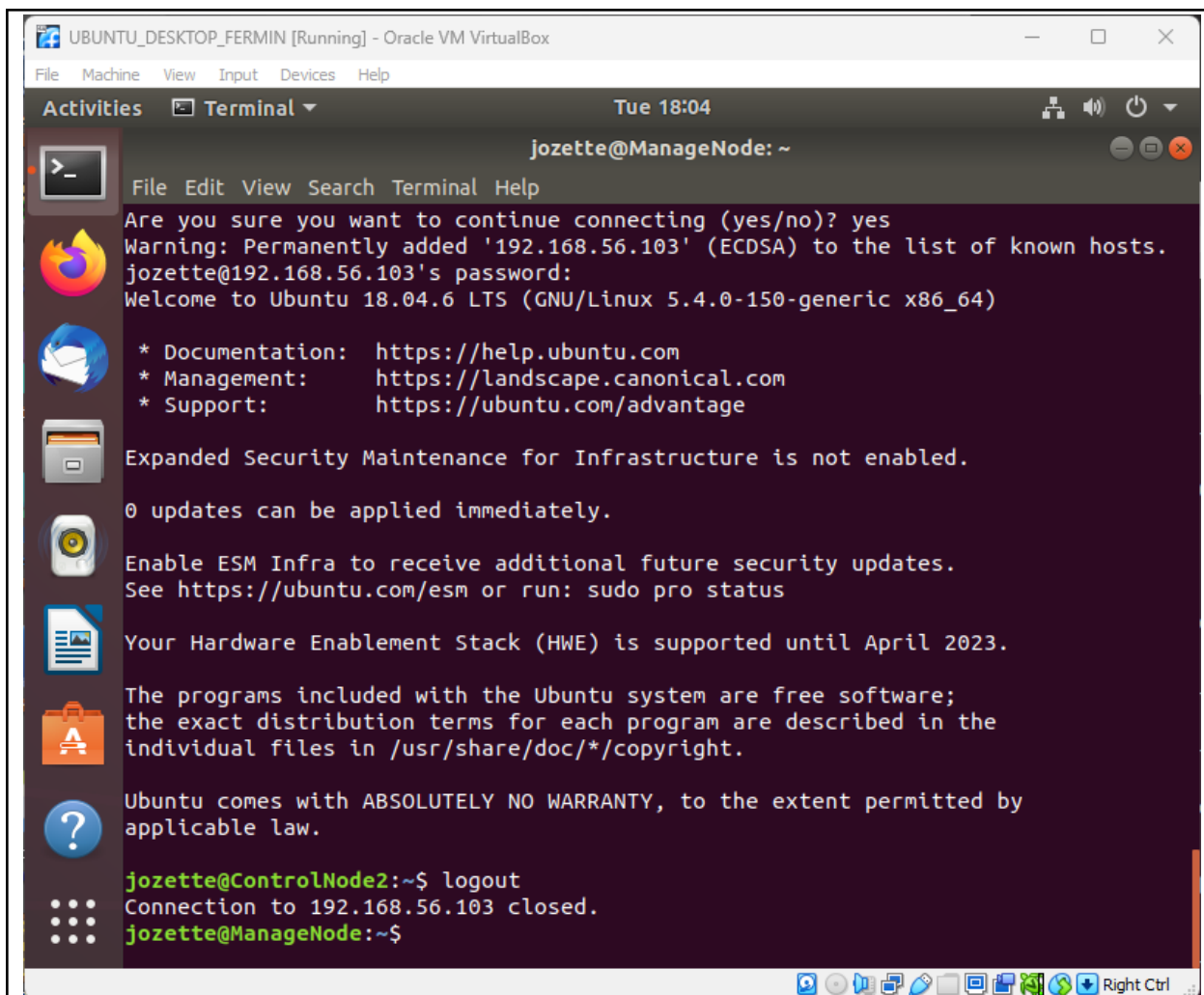
Your Hardware Enablement Stack (HWE) is supported until April 2023.

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.

jozette@controlNode1:~$ logout
Connection to 192.168.56.102 closed.
jozette@ManageNode:~$
```

controlNode1



```
UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 18:04
jozette@ManageNode: ~
File Edit View Search Terminal Help
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.56.103' (ECDSA) to the list of known hosts.
jozette@192.168.56.103's password:
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 5.4.0-150-generic x86_64)

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

Expanded Security Maintenance for Infrastructure is not enabled.

0 updates can be applied immediately.

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

Your Hardware Enablement Stack (HWE) is supported until April 2023.

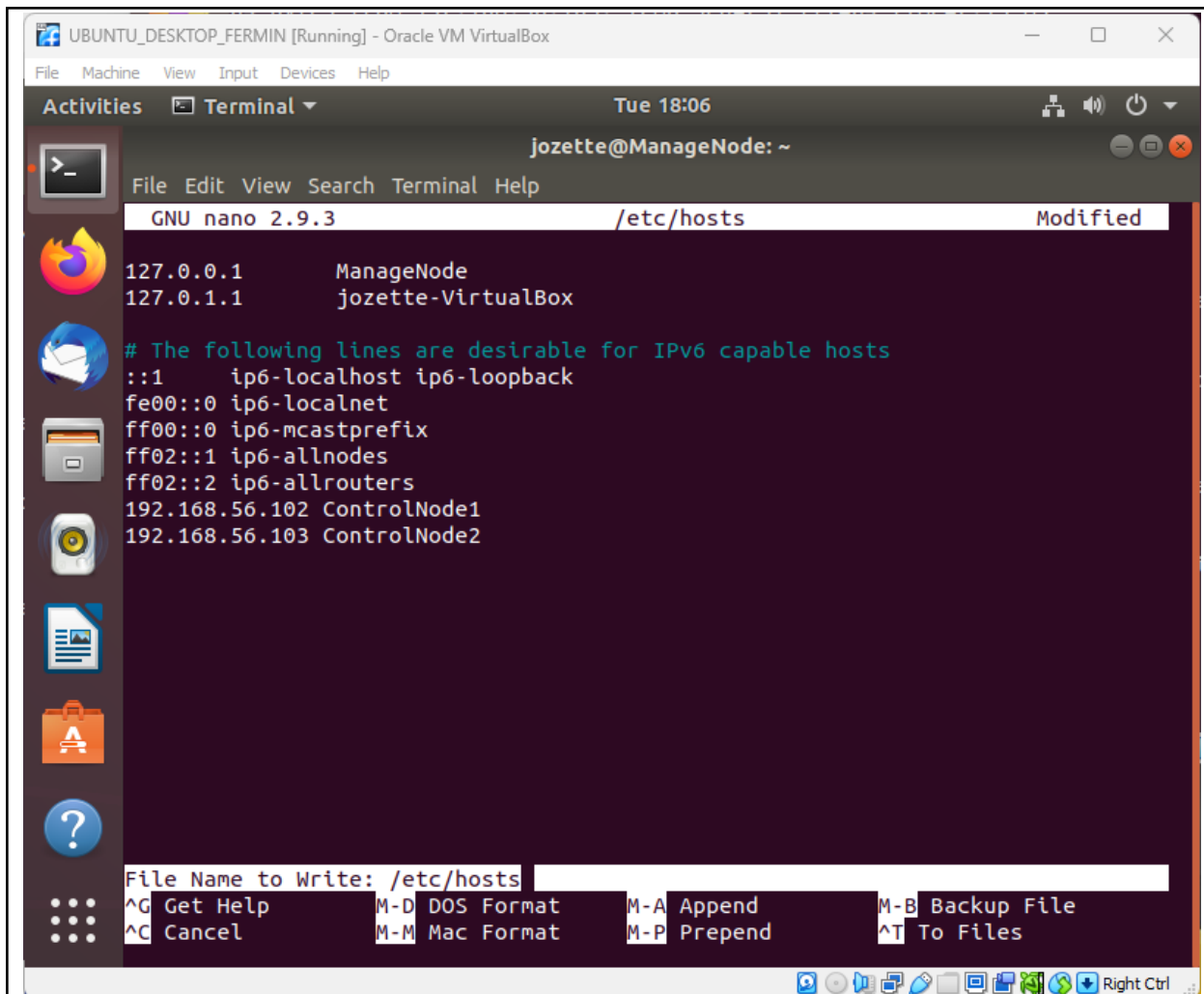
The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

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

jozette@ControlNode2:~$ logout
Connection to 192.168.56.103 closed.
jozette@ManageNode:~$
```

controlNode2

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.



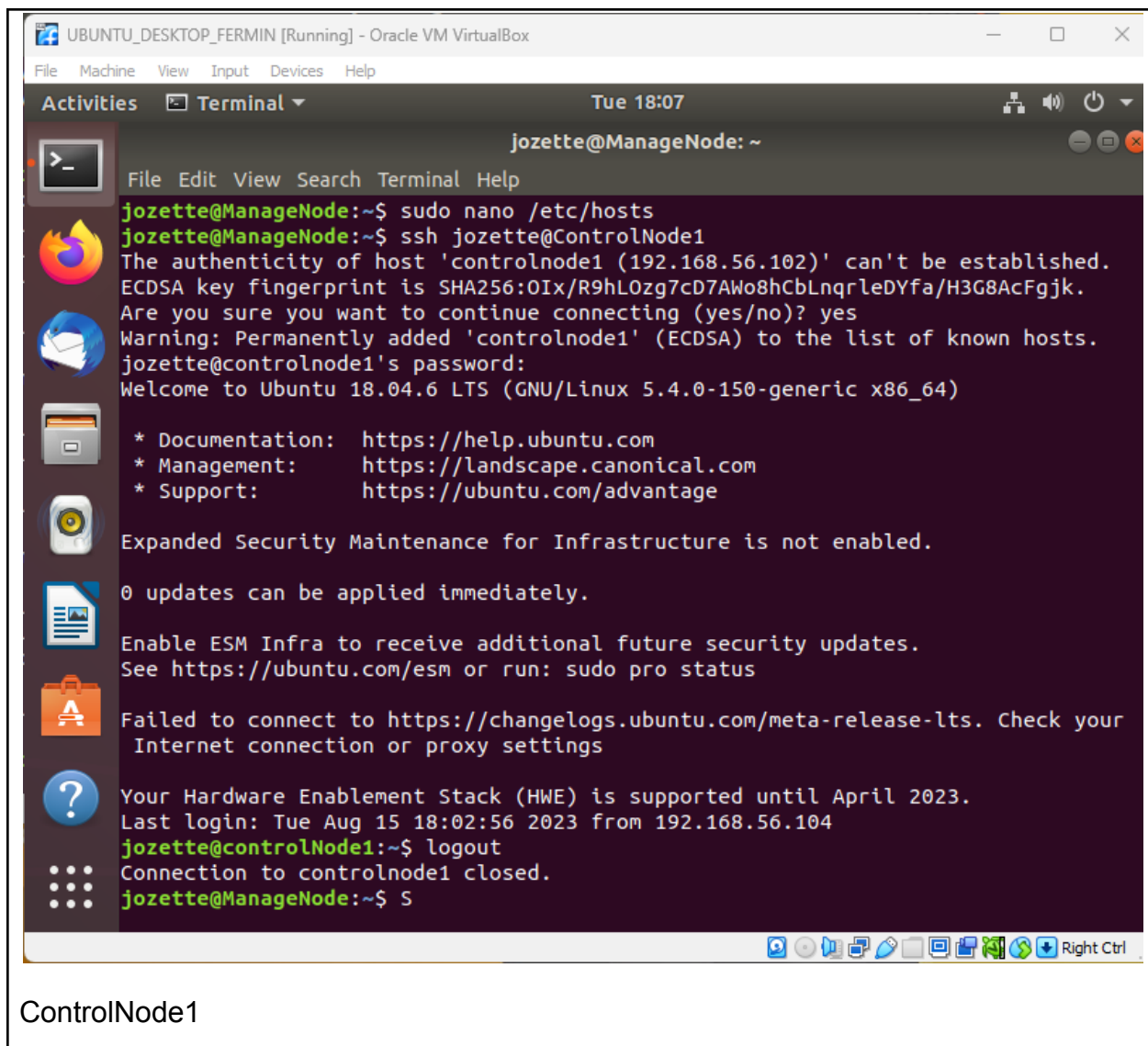
The screenshot shows a VirtualBox window titled 'UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox'. Inside, the Ubuntu desktop environment is visible. The 'Terminal' application is open, showing the user 'jozette@ManageNode: ~'. The nano text editor is editing the file '/etc/hosts'. The content of the file is as follows:

```
GNU nano 2.9.3 /etc/hosts Modified
127.0.0.1    ManageNode
127.0.1.1    jozette-VirtualBox

# 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
192.168.56.102 ControlNode1
192.168.56.103 ControlNode2
```

The nano editor's status bar at the bottom shows the file name to write as '/etc/hosts' and a list of keyboard shortcuts: ^G Get Help, ^C Cancel, M-D DOS Format, M-M Mac Format, M-A Append, M-P Prepend, M-B Backup File, and ^T To Files.

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.



```
UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Tue 18:07
jozette@ManageNode: ~
File Edit View Search Terminal Help
jozette@ManageNode:~$ sudo nano /etc/hosts
jozette@ManageNode:~$ ssh jozette@ControlNode1
The authenticity of host 'controlnode1 (192.168.56.102)' can't be established.
ECDSA key fingerprint is SHA256:0Ix/R9hL0zg7cD7AWo8hCbLnqrleDYfa/H3G8AcFgjk.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'controlnode1' (ECDSA) to the list of known hosts.
jozette@controlnode1's password:
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 5.4.0-150-generic x86_64)

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

Expanded Security Maintenance for Infrastructure is not enabled.

0 updates can be applied immediately.

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

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your
Internet connection or proxy settings

Your Hardware Enablement Stack (HWE) is supported until April 2023.
Last login: Tue Aug 15 18:02:56 2023 from 192.168.56.104
jozette@controlNode1:~$ logout
Connection to controlnode1 closed.
jozette@ManageNode:~$ s
```

ControlNode1

The screenshot shows a terminal window titled "UBUNTU_DESKTOP_FERMIN [Running] - Oracle VM VirtualBox". The terminal is running on a system named "jozette@ManageNode". The user has executed the command `ssh jozette@ControlNode2`. The terminal output shows the SSH connection process, including the warning about the host's authenticity and the user's confirmation to continue. The user is then prompted for a password. After logging in, the user runs `logout` on the ControlNode2, and the connection is closed. The terminal also displays system messages about security updates and hardware enablement.

```
File Edit View Search Terminal Help
Tue 18:08
jozette@ManageNode: ~
Connection to controlnode1 closed.
jozette@ManageNode:~$ ssh jozette@ControlNode2
The authenticity of host 'controlnode2 (192.168.56.103)' can't be established.
ECDSA key fingerprint is SHA256:5ww8bpA5CWSIKDYsWw2xJ5+Ahi8GccKLHmR0m3LV2FU.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'controlnode2' (ECDSA) to the list of known hosts.
jozette@controlnode2's password:
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 5.4.0-150-generic x86_64)

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

Expanded Security Maintenance for Infrastructure is not enabled.

0 updates can be applied immediately.

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

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your
Internet connection or proxy settings

Your Hardware Enablement Stack (HWE) is supported until April 2023.
Last login: Tue Aug 15 18:04:44 2023 from 192.168.56.104
jozette@ControlNode2:~$ logout
Connection to controlnode2 closed.
jozette@ManageNode:~$
```

ControlNode2

Reflections:

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 IP address in SSH commands because You can just use the hostname command, to make it easier. Now that you have your hostname, add . local to it. This works because it's on your local network.
2. How secured is SSH?

SSH traffic is secured because it's entirely encrypted. Users' actions are private whether they are sharing a file, browsing the web, or executing a command. While a standard user ID and password can be used to access SSH, public key pairs are more frequently used to authenticate hosts to one another.

Conclusion:

In this hands-on activity I learned how to create and configure networks using a local machine with 2 different servers in ubuntu on virtual box. I also learned why hostnames are able to be used instead of ip addresses in ssh commands. I also learned how secure SSH is. Overall, this hands-on activity is very helpful in learning how to configure a network.