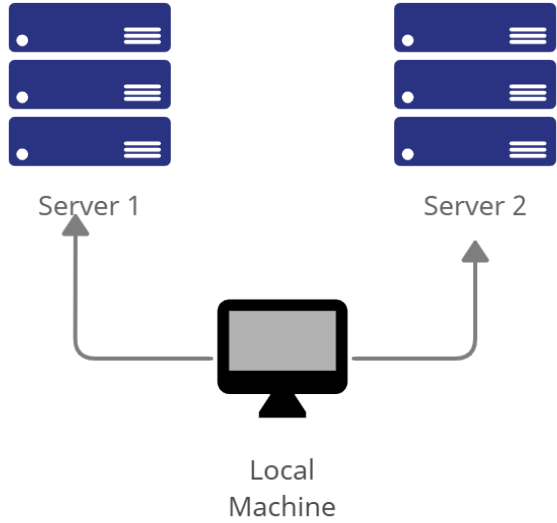| Name: Darroca, Josiah Miguel B.	Date Performed: Aug 14, 2023
Course/Section:CPE-232 CPE31S4	Date Submitted: Aug 15, 2023
Instructor: Engr. Jonathan Taylar	Semester and SY: 1st Sem 2023-2024

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

Server 1   Server 2

Local
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 (controlnode1)

   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

File Edit View Search Term

GNU nano 2.9.3

controlnode1
127.0.0.1   server1

2.3 Type 127.0.0.1 workstation for the Local Machine

File Edit View Search Terminal Help

GNU nano 2.9.3

managenode
127.0.0.1   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.

managenode

joshxh@managenode: ~

File Edit View Search Terminal Help

```
se all 5.7.3+dfsg-1.8ubuntu3.8 [223 kB]
Get:522 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libsnmp30
amd64 5.7.3+dfsg-1.8ubuntu3.8 [925 kB]
Get:523 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libssh-4 a
md64 0.8.0~20170825.94fa1e38-1ubuntu0.7 [170 kB]
Get:524 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libu2f-ude
v all 1.1.4-1ubuntu0.1 [3,884 B]
Get:525 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libvncclie
nt1 amd64 0.9.11+dfsg-1ubuntu1.4 [55.4 kB]
Get:526 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libwayland
-egl1-mesa amd64 20.0.8-0ubuntu1~18.04.1 [6,444 B]
Get:527 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libwebpmux
3 amd64 0.6.1-2ubuntu0.18.04.2 [19.6 kB]
Get:528 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxatrack
er2 amd64 20.0.8-0ubuntu1~18.04.1 [1,549 kB]
Get:529 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-ren
der0 amd64 1.13-2~ubuntu18.04 [14.7 kB]
Get:530 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-sha
pe0 amd64 1.13-2~ubuntu18.04 [5,972 B]
Get:531 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-xv0
 amd64 1.13-2~ubuntu18.04 [9,168 B]
Get:532 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 linux-firm
ware all 1.173.21 [74.8 MB]
96% [532 linux-firmware 74.1 MB/74.8 MB 99%]                    885 kB/s 18s
```

controlnode1

File Edit View Search Terminal Help

```
se all 5.7.3+dfsg-1.8ubuntu3.8 [223 kB]
Get:522 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libsnmp30
amd64 5.7.3+dfsg-1.8ubuntu3.8 [925 kB]
Get:523 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libssh-4 a
md64 0.8.0~20170825.94fa1e38-1ubuntu0.7 [170 kB]
Get:524 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libu2f-ude
v all 1.1.4-1ubuntu0.1 [3,884 B]
Get:525 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libvncclie
nt1 amd64 0.9.11+dfsg-1ubuntu1.4 [55.4 kB]
Get:526 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libwayland
-egl1-mesa amd64 20.0.8-0ubuntu1~18.04.1 [6,444 B]
Get:527 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libwebpmux
3 amd64 0.6.1-2ubuntu0.18.04.2 [19.6 kB]
Get:528 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxatrack
er2 amd64 20.0.8-0ubuntu1~18.04.1 [1,549 kB]
Get:529 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-ren
der0 amd64 1.13-2~ubuntu18.04 [14.7 kB]
Get:530 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-sha
pe0 amd64 1.13-2~ubuntu18.04 [5,972 B]
Get:531 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxcb-xv0
 amd64 1.13-2~ubuntu18.04 [9,168 B]
Get:532 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 linux-firm
ware all 1.173.21 [74.8 MB]
86% [532 linux-firmware 5,888 kB/74.8 MB 8%]          15.2 kB/s 1h 32min 27s
```

controlnode2

File Edit View Search Terminal Help

```
2 amd64 2.2.0+dfsg1-0ubuntu0.18.04.4 [316 kB]
Get:476 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libfreerdp
2-2 amd64 2.2.0+dfsg1-0ubuntu0.18.04.4 [523 kB]
Get:477 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libfreerdp
-client2-2 amd64 2.2.0+dfsg1-0ubuntu0.18.04.4 [251 kB]
Get:478 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libfwup1 a
md64 12-3bionic2 [19.7 kB]
Get:479 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libxpm4 am
d64 1:3.5.12-1ubuntu0.18.04.2 [34.8 kB]
Get:480 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libgd3 amd
64 2.2.5-4ubuntu0.5 [119 kB]
Get:481 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libgtk-3-b
in amd64 3.22.30-1ubuntu4 [57.4 kB]
Get:482 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libhttp-da
emon-perl all 6.01-1ubuntu0.1 [15.9 kB]
Get:483 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libwww-per
l all 6.31-1ubuntu0.1 [137 kB]
Get:484 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libnet-ssl
eay-perl amd64 1.84-1ubuntu0.2 [283 kB]
Get:485 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libio-sock
et-ssl-perl all 2.060-3~ubuntu18.04.1 [173 kB]
Get:486 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 liblouis-d
ata all 3.5.0-1ubuntu0.5 [1,259 kB]
71% [486 liblouis-data 871 kB/1,259 kB 69%]           69.9 kB/s 42min 49s
```

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

```
joshxh@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] Y
Get:1 http://ph.archive.ubuntu.com/ubuntu bionic-updates/main amd64 ncurses-term
 all 6.1-1ubuntu1.18.04.1 [248 kB]
5% [1 ncurses-term 36.3 kB/248 kB 15%]
```

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*

```
joshxh@managenode:~$ sudo service ssh start
joshxh@managenode:~$ sudo systemcli status ssh
sudo: systemcli: command not found
joshxh@managenode:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enab
   Active: active (running) since Tue 2023-08-15 16:55:13 PST; 4min 29s ago
 Main PID: 19267 (sshd)
    Tasks: 1 (limit: 2286)
   CGroup: /system.slice/ssh.service
           └─19267 /usr/sbin/sshd -D

Aug 15 16:55:13 managenode systemd[1]: Starting OpenBSD Secure Shell server...
Aug 15 16:55:13 managenode sshd[19267]: Server listening on 0.0.0.0 port 22.
Aug 15 16:55:13 managenode sshd[19267]: Server listening on :: port 22.
Aug 15 16:55:13 managenode systemd[1]: Started OpenBSD Secure Shell server.
lines 1-12/12 (END)
```

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

```
joshxh@managenode:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

   4.2 *sudo ufw enable*

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

4.3 *sudo ufw status*

```
joshxh@managenode:~$ sudo ufw status
Status: active

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

joshxh@managenode:~$
```

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: 192.168.117.4

    ```
         link/ether 08:00:27
         inet 192.168.117.4/
      enp0s8
            valid_lft 555sec
         inet6 fe80::a528:99
            valid_lft foreve
    joshxh@controlnode1:~$
    ```

    1.2 Server 2 IP address: 192.168.117.5

    ```
         link/ether 08:00:27:
         inet 192.168.117.5/2
      enp0s8
            valid_lft 531sec
         inet6 fe80::8614:c69
            valid_lft forever
    joshxh@controlnode2:~$
    ```

    1.3 Server 3 IP address: 192.168.117.3

    ```
         link/ether 08:00:27:d2:49:
         inet 192.168.117.3/24 brd
      enp0s8
            valid_lft 480sec prefer
         inet6 fe80::1b0b:92dc:4f1b
            valid_lft forever prefe
    joshxh@managenode:~$
    ```

2. Make sure that they can ping each other.

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

```
joshxh@managenode:~$ ping 192.168.117.4
PING 192.168.117.4 (192.168.117.4) 56(84) bytes of data.
64 bytes from 192.168.117.4: icmp_seq=1 ttl=64 time=1.56 ms
64 bytes from 192.168.117.4: icmp_seq=2 ttl=64 time=0.433 ms
64 bytes from 192.168.117.4: icmp_seq=3 ttl=64 time=0.563 ms
64 bytes from 192.168.117.4: icmp_seq=4 ttl=64 time=0.637 ms
64 bytes from 192.168.117.4: icmp_seq=5 ttl=64 time=0.466 ms
64 bytes from 192.168.117.4: icmp_seq=6 ttl=64 time=0.442 ms
64 bytes from 192.168.117.4: icmp_seq=7 ttl=64 time=0.517 ms
64 bytes from 192.168.117.4: icmp_seq=8 ttl=64 time=1.08 ms
64 bytes from 192.168.117.4: icmp_seq=9 ttl=64 time=0.610 ms
64 bytes from 192.168.117.4: icmp_seq=10 ttl=64 time=0.990 ms
64 bytes from 192.168.117.4: icmp_seq=11 ttl=64 time=0.518 ms
64 bytes from 192.168.117.4: icmp_seq=12 ttl=64 time=0.699 ms
64 bytes from 192.168.117.4: icmp_seq=13 ttl=64 time=0.648 ms
64 bytes from 192.168.117.4: icmp_seq=14 ttl=64 time=0.465 ms
64 bytes from 192.168.117.4: icmp_seq=15 ttl=64 time=0.549 ms
```

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

```
                              joshxh@managenode: ~
File  Edit  View  Search  Terminal  Help
joshxh@managenode:~$ sudo nano /etc/hostname
[sudo] password for joshxh:
joshxh@managenode:~$ ping 192.168.117.5
PING 192.168.117.5 (192.168.117.5) 56(84) bytes of data.
64 bytes from 192.168.117.5: icmp_seq=1 ttl=64 time=1.07 ms
64 bytes from 192.168.117.5: icmp_seq=2 ttl=64 time=1.08 ms
64 bytes from 192.168.117.5: icmp_seq=3 ttl=64 time=0.535 ms
64 bytes from 192.168.117.5: icmp_seq=4 ttl=64 time=1.30 ms
64 bytes from 192.168.117.5: icmp_seq=5 ttl=64 time=0.929 ms
```

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

```
joshxh@controlnode1:~$ ping 192.168.117.5
PING 192.168.117.5 (192.168.117.5) 56(84) bytes of data.
64 bytes from 192.168.117.5: icmp_seq=1 ttl=64 time=1.10 ms
64 bytes from 192.168.117.5: icmp_seq=2 ttl=64 time=0.369 ms
64 bytes from 192.168.117.5: icmp_seq=3 ttl=64 time=1.11 ms
64 bytes from 192.168.117.5: icmp_seq=4 ttl=64 time=1.41 ms
64 bytes from 192.168.117.5: icmp_seq=5 ttl=64 time=1.13 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 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*

joshxh@controlnode1: ~

File Edit View Search Terminal Help

```
joshxh@managenode:~$ ssh joshxh@192.168.117.4
joshxh@192.168.117.4'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.
*** 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
```

```
joshxh@controlnode1:~$
```

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

```
joshxh@controlnode1:~$ logout
Connection to 192.168.117.4 closed.
joshxh@managenode:~$
```

3. Do the same for Server 2.


```
joshxh@controlnode2: ~

File  Edit  View  Search  Terminal  Help
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.
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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.

joshxh@controlnode2:~$
```

```
joshxh@controlnode2:~$ logout
Connection to 192.168.117.5 closed.
joshxh@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.

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.

```
                            joshxh@controlnode2: ~

File  Edit  View  Search  Terminal  Help
joshxh@managenode:~$ ssh joshxh@controlnode2
joshxh@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

New release '20.04.6 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Your Hardware Enablement Stack (HWE) is supported until April 2023.
*** System restart required ***
Last login: Tue Aug 15 17:38:21 2023 from 192.168.117.3
joshxh@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 using the IP by using SSH commands first using the IP Address of the server that we want to use. After that we can attempt to connect to that server by only using its name. However, it will ask for permission again and after that we can freely connect to the server by only providing its password.

2. How secured is SSH?

   ● SSH is secured just by its same itself which is Secured Shell. The main reason why this type of shell is secure is because it is strict when someone wants to connect, asking them for several pieces of information such as the password of the server that they want to connect to. Another thing is that sensitive information like passwords are encrypted in a way to protect your information. Additional information about this shell is that it is the type of network protocol that encrypts all its traffic and provides its users with particular roles such as administrators, etc. All in all, using SSH is a must if you want your information and work to be more secure amidst all the traffic that is piling up inside the system.

Conclusion:

In this hands-on activity, I have learned how to create and configure Virtual Machines in Microsoft Azure and VirtualBox. I have also managed to set-up a virtual network and test connectivity of VMs. While performing this activity, I have learned how to clone desktops in VirtualBox and how to connect them. Through the tasks that we are required to finish, we have checked if those desktops are really connected to each other. Gladly, they are all connected together and I was able to access both server1 and server2 while using the Local machine or the managenode desktop. All in all, this activity helped me understand more about System Administrations and I hope to learn more in the future.