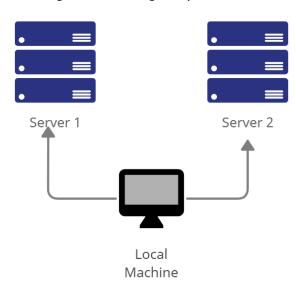|	Date Performed: 08/18/2022
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Course/Section: CPE31S23	**Date Submitted:08/18/2022**
Instructor: Engr. Jonathan Taylar	**Semester and SY: 1st semester 2022**
Activity 1: Configure Network using Virtual Machines	

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

```
jhermitano@jhermitano-VirtualBox:~$ sudo nano /etc/hostname
[sudo] password for jhermitano:
```

al Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *cap*

```
  GNU nano 6.2                      /etc/hostname *
Server1
```

    1.2 Use server2 for Server 2

```
  GNU nano 6.2                      /etc/hostname
Server2
```

    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

al Machine reports that the guest OS supports **mouse pointer integration**. This means that you do not need to *capture* the

```
  GNU nano 6.2                      /etc/hosts
127.0.0.1          localhost
127.0.0.1          jhermitano-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
```

    2.2 Type 127.0.0.1 server 2 for Server 2

```
  GNU nano 6.2                                    /etc/hosts *
127.0.0.1          localhost
127.0.0.1          jhermitano-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
```

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.

```
jhermitano@jhermitano-VirtualBox:~$ sudo apt update
Hit:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:2 http://ph.archive.ubuntu.com/ubuntu jammy InRelease
Hit:3 http://ph.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 http://ph.archive.ubuntu.com/ubuntu jammy-backports InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
20 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

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

```
jhermitano@jhermitano-VirtualBox:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere 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 751 kB of archives.
After this operation, 6,046 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ph.archive.ubuntu.com/ubuntu jammy/main amd64 openssh-sftp-server
amd64 1:8.9p1-3 [38.8 kB]
Get:2 http://ph.archive.ubuntu.com/ubuntu jammy/main amd64 openssh-server amd64
 1:8.9p1-3 [434 kB]
Get:3 http://ph.archive.ubuntu.com/ubuntu jammy/main amd64 ncurses-term all 6.3
-2 [267 kB]
Get:4 http://ph.archive.ubuntu.com/ubuntu jammy/main amd64 ssh-import-id all 5.
11-0ubuntu1 [10.1 kB]
Fetched 751 kB in 2s (443 kB/s)
```

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*

```
jhermitano@jhermitano-VirtualBox:~$ sudo service ssh start
jhermitano@jhermitano-VirtualBox:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: >
     Active: active (running) since Thu 2022-08-18 10:49:00 PST; 8min ago
       Docs: man:sshd(8)
             man:sshd_config(5)
   Main PID: 15997 (sshd)
      Tasks: 1 (limit: 2291)
     Memory: 1.7M
        CPU: 24ms
     CGroup: /system.slice/ssh.service
             └─15997 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Aug 18 10:49:00 jhermitano-VirtualBox systemd[1]: Starting OpenBSD Secure Shel>
Aug 18 10:49:00 jhermitano-VirtualBox sshd[15997]: Server listening on 0.0.0.0>
Aug 18 10:49:00 jhermitano-VirtualBox sshd[15997]: Server listening on :: port>
Aug 18 10:49:00 jhermitano-VirtualBox systemd[1]: Started OpenBSD Secure Shell>
lines 1-16/16 (END)
```

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

```
jhermitano@jhermitano-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
jhermitano@jhermitano-VirtualBox:~$ sudo ufw enable
Firewall is active and enabled on system startup
jhermitano@jhermitano-VirtualBox:~$ 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: 192.168.56.104

```
jhermitano@Server1:~$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:1d:12:d6 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
       valid_lft 86362sec preferred_lft 86362sec
    inet6 fe80::94c8:8e6e:a353:6217/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:7e:8d:9b brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.104/24 brd 192.168.56.255 scope global dynamic noprefixrout
e enp0s8
       valid_lft 561sec preferred_lft 561sec
    inet6 fe80::27a6:611a:f016:adf6/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

1.2 Server 2 IP address: 192.168.56.105

```
jhermitano@jhermitano-VirtualBox:~$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:eb:53:3e brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
       valid_lft 85735sec preferred_lft 85735sec
    inet6 fe80::8138:abc4:2915:e1e2/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:b5:32:19 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.105/24 brd 192.168.56.255 scope global dynamic noprefixrout
e enp0s8
       valid_lft 534sec preferred_lft 534sec
    inet6 fe80::c628:a66d:b209:9928/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
jhermitano@jhermitano-VirtualBox:~$
```

1.3 Server 3 IP address: 192.168.56.____

2. Make sure that they can ping each other.

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

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

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

```
jhermitano@Server1:~$ ping 192.168.56.105
PING 192.168.56.105 (192.168.56.105) 56(84) bytes of data.
64 bytes from 192.168.56.105: icmp_seq=1 ttl=64 time=0.706 ms
64 bytes from 192.168.56.105: icmp_seq=2 ttl=64 time=0.288 ms
64 bytes from 192.168.56.105: icmp_seq=3 ttl=64 time=1.00 ms
64 bytes from 192.168.56.105: icmp_seq=4 ttl=64 time=0.453 ms
64 bytes from 192.168.56.105: icmp_seq=5 ttl=64 time=0.322 ms
64 bytes from 192.168.56.105: icmp_seq=6 ttl=64 time=1.12 ms
64 bytes from 192.168.56.105: icmp_seq=7 ttl=64 time=0.389 ms
64 bytes from 192.168.56.105: icmp_seq=8 ttl=64 time=0.369 ms
64 bytes from 192.168.56.105: icmp_seq=9 ttl=64 time=0.959 ms
64 bytes from 192.168.56.105: icmp_seq=10 ttl=64 time=1.04 ms
64 bytes from 192.168.56.105: icmp_seq=11 ttl=64 time=1.07 ms
64 bytes from 192.168.56.105: icmp_seq=12 ttl=64 time=0.993 ms
64 bytes from 192.168.56.105: icmp_seq=13 ttl=64 time=0.887 ms
64 bytes from 192.168.56.105: icmp_seq=14 ttl=64 time=0.958 ms
64 bytes from 192.168.56.105: icmp_seq=15 ttl=64 time=1.06 ms
64 bytes from 192.168.56.105: icmp_seq=16 ttl=64 time=0.968 ms
64 bytes from 192.168.56.105: icmp_seq=17 ttl=64 time=0.987 ms
64 bytes from 192.168.56.105: icmp_seq=18 ttl=64 time=0.919 ms
64 bytes from 192.168.56.105: icmp_seq=19 ttl=64 time=0.901 ms
64 bytes from 192.168.56.105: icmp_seq=20 ttl=64 time=0.895 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*

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

```
TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ ssh jhermitano@192.168.56.104
The authenticity of host '192.168.56.104 (192.168.56.104)' can't be established.
ED25519 key fingerprint is SHA256:gb2bWOumV9fWScLHPUH9CaXsiWFZYhAsB+Yo66wdxdk.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.104' (ED25519) to the list of known hosts.
jhermitano@192.168.56.104's password:
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.0-46-generic x86_64)

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

0 updates can be applied immediately.


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.

jhermitano@Server1:~$ |
```

3. Do the same for Server 2.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ ssh jhermitano@192.168.56.105
The authenticity of host '192.168.56.105 (192.168.56.105)' can't be established.
ED25519 key fingerprint is SHA256:kzvipUaMnOWnA8MaHoHii63iJsuG9DKJDNfjhtousFQ.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.56.105' (ED25519) to the list of known hosts
.
jhermitano@192.168.56.105's password:
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.0-43-generic x86_64)

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

0 updates can be applied immediately.

*** System restart required ***

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

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

jhermitano@jhermitano-VirtualBox:~$ |
```

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.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ ssh jhermitano@Server1
The authenticity of host 'server1 (192.168.56.104)' can't be established.
ED25519 key fingerprint is SHA256:gb2bWOumV9fWScLHPUH9CaXsiWFZYhAsB+Yo66wdxdk.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: 192.168.56.104
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'server1' (ED25519) to the list of known hosts.
jhermitano@server1's password:
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.0-46-generic x86_64)

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

0 updates can be applied immediately.

Last login: Thu Aug 18 11:16:59 2022 from 192.168.56.1
jhermitano@Server1:~$ |
```

Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?

    In this activity, I used both of my servers hsotname and ip address by installing the openssh server on my system.

2. How secured is SSH?

    It is secured because it requires you to enter your password everytime you want to connect to another server.