Name: Maxine Audrey D. Pulao	**Date Performed: August 16 2022**
Course/Section: CPE22s2	**Date Submitted: August 22 2022**
Instructor: Dr. Jonathan Taylar	**Semester and SY: !st sem (2022-2013**

Activity 1: Configure Network using Virtual Machines

1. **Objectives:**

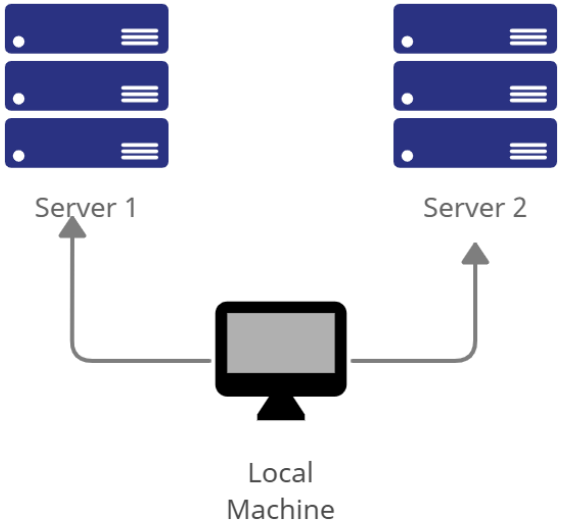
1.1. Create and configure Virtual Machines in Microsoft Azure or VirtualBox

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

2. **Discussion:**

Network Topology:

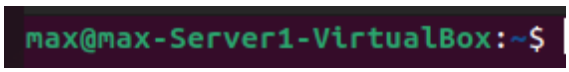
Assume that you have created the following network topology in Virtual Machines, *provide screenshots for each task*. (Note: *it is assumed that you have the prior knowledge of cloning and creating snapshots in a virtual machine*).



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.

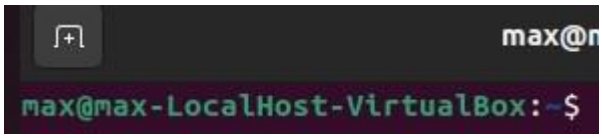
1. Change the hostname using the command *sudo nano /etc/hostname*

1.1 Use server1 for Server 1



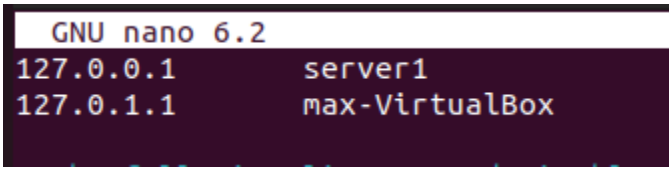
1.2 Use server2 for Server 2

1.3 Use workstation for the Local Machine

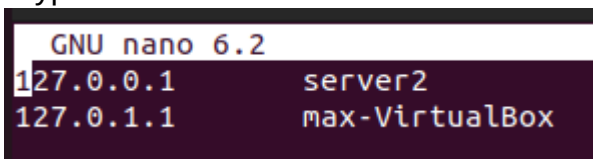


2. Edit the hosts using the command *sudo nano /etc/hosts*. Edit the second line.

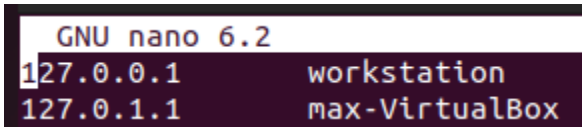
2.1 Type 127.0.0.1 server 1 for Server 1



2.2 Type 127.0.0.1 server 2 for Server 2



2.3 Type 127.0.0.1 workstation for the Local Machine

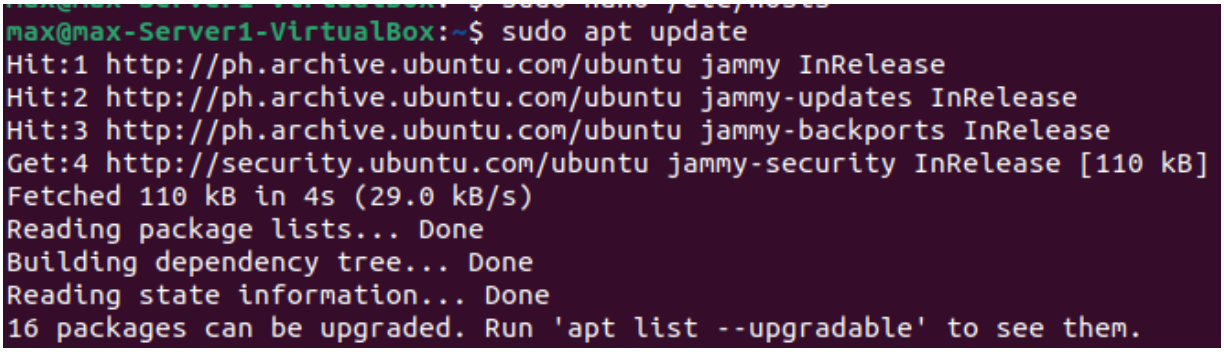


Task 2: Configure SSH on Server 1, Server 2, and Local Machine. Do the following:

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

Sudo apt update screenshots

Server1-



Server2-

```
max@max-Server2-VirtualBox:~$ sudo apt update
Hit:1 http://ph.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Hit:3 http://ph.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 http://ph.archive.ubuntu.com/ubuntu jammy-backports InRelease
Fetched 110 kB in 3s (38.5 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
16 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Local Host-

```
max@max-LocalHost-VirtualBox:~$ sudo apt update
Hit:1 http://ph.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Hit:3 http://ph.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 http://ph.archive.ubuntu.com/ubuntu jammy-backports InRelease
Fetched 110 kB in 3s (37.5 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
16 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Sudo apt upgrade screenshots

Server1-

```
max@max-Server1-VirtualBox:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages have been kept back:
  python3-software-properties software-properties-
  software-properties-gtk
The following packages will be upgraded:
  apt apt-utils gir1.2-gtk-4.0 gir1.2-javascriptco
```

Server2-

```
max@max-Server2-VirtualBox:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages have been kept back:
  python3-software-properties software-properties
  software-properties-gtk
```

Local Host-

```
max@max-LocalHost-VirtualBox:~$ sudo apt upgrade
Reading package lists... Done
dependency tree... Done
tate information... Done
Calculating upgrade... Done
The following packages have been kept back:
  python3-software-properties software-properties-co
  software-properties-gtk
The following packages will be upgraded:
```

Terminal

2. Install the SSH server using the command *sudo apt install openssh-server*.
   Server1-

```
max@max-Server1-VirtualBox:~$ sudo apt install openssh-server
[sudo] password for max:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

Server 2-

```
max@max-Server2-VirtualBox:~$ sudo apt install openssh-server
[sudo] password for max:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

Local host-

```
max@max-LocalHost-VirtualBox:~$ sudo apt install openssh-server
[sudo] password for max:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

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

server1

```
max@max-Server1-VirtualBox:~$ sudo service ssh start
max@max-Server1-VirtualBox:~$
```

server2

```
max@max-Server2-VirtualBox:~$ sudo service ssh start
max@max-Server2-VirtualBox:~$
```

local host

```
max@max-LocalHost-VirtualBox:~$ sudo service ssh start
max@max-LocalHost-VirtualBox:~$
```

3.2 *sudo systemctl status ssh*
server1

server2

local host

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

```
max@max-Server1-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

server2

```
max@max-Server2-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

local host

```
max@max-LocalHost-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

4.2 *sudo ufw enable*
server1

```
max@max-Server1-VirtualBox:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

server2

```
max@max-Server2-VirtualBox:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

local host

```
max@max-LocalHost-VirtualBox:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

4.3 *sudo ufw status*

server1

```
max@max-Server1-VirtualBox:~$ sudo ufw status
Status: active

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

server2

```
max@max-Server2-VirtualBox:~$ sudo ufw status
Status: active

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

local host

```
max@max-LocalHost-VirtualBox:~$ sudo ufw status
Status: active

Trash
                           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: 192.168.56.101

```
max@max-Server1-VirtualBox:~$ 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::41f1:d7f1:f175:32ff  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:de:e0:9b  txqueuelen 1000  (Ethernet)
        RX packets 125223  bytes 183253368 (183.2 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 56453  bytes 3400024 (3.4 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: 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::9ef1:be74:a32d:2283  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:86:f6:61  txqueuelen 1000  (Ethernet)
        RX packets 169  bytes 26191 (26.1 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 119  bytes 15849 (15.8 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 384  bytes 71950 (71.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 384  bytes 71950 (71.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

1.2 Server 2 IP address: 192.168.56.102

```
max@max-Server2-VirtualBox:~$ 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::324a:5754:dbcf:a05f  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:c6:90:4e  txqueuelen 1000  (Ethernet)
        RX packets 125370  bytes 183471728 (183.4 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 57091  bytes 3439115 (3.4 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: 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::7d0b:8998:b85d:7d08  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:01:b1:fe  txqueuelen 1000  (Ethernet)
        RX packets 114  bytes 19083 (19.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 133  bytes 17264 (17.2 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 439  bytes 79600 (79.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 439  bytes 79600 (79.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

1.3 Server 3 IP address: 192.168.56.103

```
max@max-LocalHost-VirtualBox:~$ 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::faa9:649e:fc11:c77e  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:cf:4a:0b  txqueuelen 1000  (Ethernet)
        RX packets 125357  bytes 183470579 (183.4 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 56875  bytes 3425835 (3.4 MB)
        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::f4dd:bbf5:12aa:9392  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:a9:a1:43  txqueuelen 1000  (Ethernet)
        RX packets 58  bytes 11827 (11.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 131  bytes 16985 (16.9 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 406  bytes 75864 (75.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 406  bytes 75864 (75.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
Show Applications
```

2. Make sure that they can ping each other.

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

```
^C
--- 192.168.56.102 ping statistics ---
16 packets transmitted, 16 received, 0% packet loss, time 15340ms
rtt min/avg/max/mdev = 0.409/0.653/0.852/0.146 ms
max@max-VirtualBox:~$
```

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

```
max@max-VirtualBox:~$ 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=0.741 ms
64 bytes from 192.168.56.103: icmp_seq=3 ttl=64 time=0.393 ms
64 bytes from 192.168.56.103: icmp_seq=4 ttl=64 time=0.403 ms
64 bytes from 192.168.56.103: icmp_seq=5 ttl=64 time=0.823 ms
^C
--- 192.168.56.103 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4062ms
rtt min/avg/max/mdev = 0.393/0.690/1.092/0.265 ms
```

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

```
max@max-VirtualBox:~$ 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=0.727 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=0.253 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.440 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=0.572 ms
^C
--- 192.168.56.101 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3056ms
rtt min/avg/max/mdev = 0.253/0.498/0.727/0.174 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

Server1-

```
max@max-LocalHost-VirtualBox:~/Desktop$ ssh max@192.168.56.101
The authenticity of host '192.168.56.101 (192.168.56.101)' can't be established
.
ED25519 key fingerprint is SHA256:cbzhYiKcqyIbl4IpmIbRaAksuBxd4bxkk5fcX6J2tGw.
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 host
s.
max@192.168.56.101'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.

Show Applications Aug 16 11:53:40 2022 from 192.168.56.101
```

Server2-

```
max@max-Server1-VirtualBox:~/Desktop$ ssh max@192.168.56.102
The authenticity of host '192.168.56.102 (192.168.56.102)' can't be established
.
ED25519 key fingerprint is SHA256:FTkWBm6/PhyEE+dpu47qPD7M6MqXZdSoOf/dGTYCWXA.
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 host
s.
max@192.168.56.102'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: Tue Aug 16 11:55:55 2022 from 192.168.56.102
```

Local Host-

```
max@max-Server2-VirtualBox:~/Desktop$ ssh max@192.168.56.103
LibreOffice Writer of host '192.168.56.103 (192.168.56.103)' can't be established
.
ED25519 key fingerprint is SHA256:FmiCsC5YiMnYynrrjByXhapfOgeIypP5ewIYSQog76g.
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 host
s.
max@192.168.56.103'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: Tue Aug 16 11:57:22 2022 from 192.168.56.103
max@max-LocalHost-VirtualBox:~$
```

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

```
max@max-Server1-VirtualBox:~$
logout
Connection to 192.168.56.101 closed.
```

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

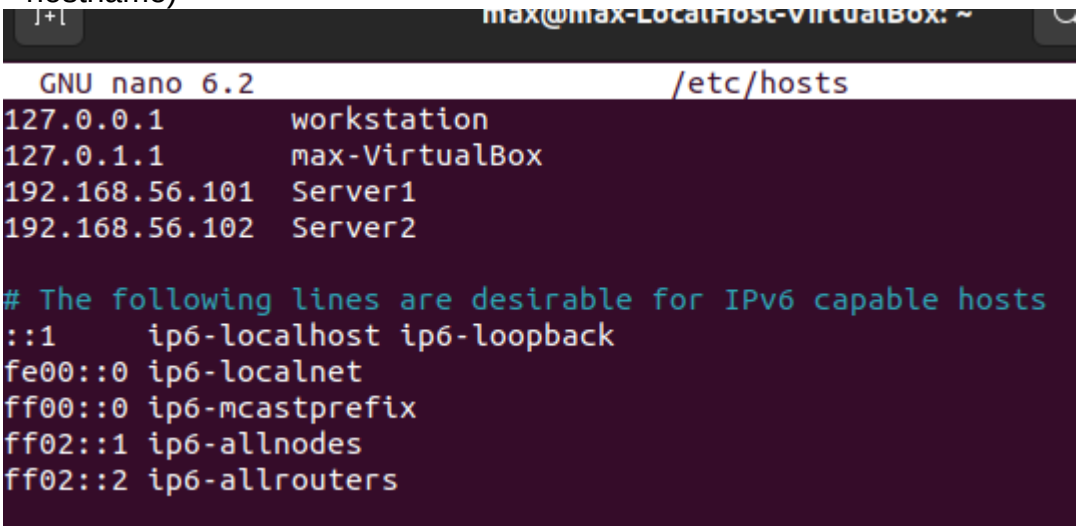
3. Do the same for Server 2.

```
max@max-Server2-VirtualBox:~$
logout
Connection to 192.168.56.102 closed.
```

4. Edit the hosts of the Local Machine by issuing the command *sudo nano /etc/hosts.* Below all texts type the following:

4.1 sudoIP_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.
server1

```
max@max-LocalHost-VirtualBox:~$ ssh max@Server1
The authenticity of host 'server1 (192.168.56.101)' can't be established.
ED25519 key fingerprint is SHA256:cbzhYiKcqyIbl4IpmIbRaAksuBxd4bxkk5fcX6J2tGw.
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 'server1' (ED25519) to the list of known hosts.
max@server1's password:
Permission denied, please try again.
max@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.

Show Applications Aug 16 12:16:03 2022 from 192.168.56.102
```

Server 2

```
max@max-LocalHost-VirtualBox:~$ ssh max@Server2
The authenticity of host 'server2 (192.168.56.102)' can't be established.
ED25519 key fingerprint is SHA256:FTkWBm6/PhyEE+dpu47qPD7M6MqXZdSoOf/dGTYCWXA.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'server2' (ED25519) to the list of known hosts.
max@server2'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: Tue Aug 16 12:09:19 2022 from 192.168.56.101
max@max-Server2-VirtualBox:~$
```

Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
   First, find the DNS manager to access the portal. To be able to use the hostname instead of the IP address, we can use the SSH commands followed by the remote username and hostname.
2. How secured is SSH?

   The SSH command provides a security that authenticate themselves by professional s like IT and information security. By this administrative protocol, it is a security measure where it has layers of control. But this doesn't guaranty safety since hackers can get these keys through social engineering.