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Course/Section: CPE 212 - CPE31S4	Date Submitted: 8/8/25
Instructor: Sir Robin Valenzuela	Semester and SY: 1st Sem (25 - 26)

Activity 1: Configure Network using Virtual Machines

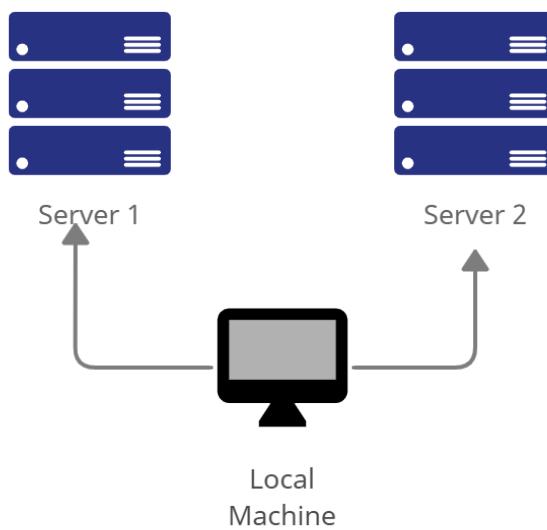
1. Objectives:

- 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:

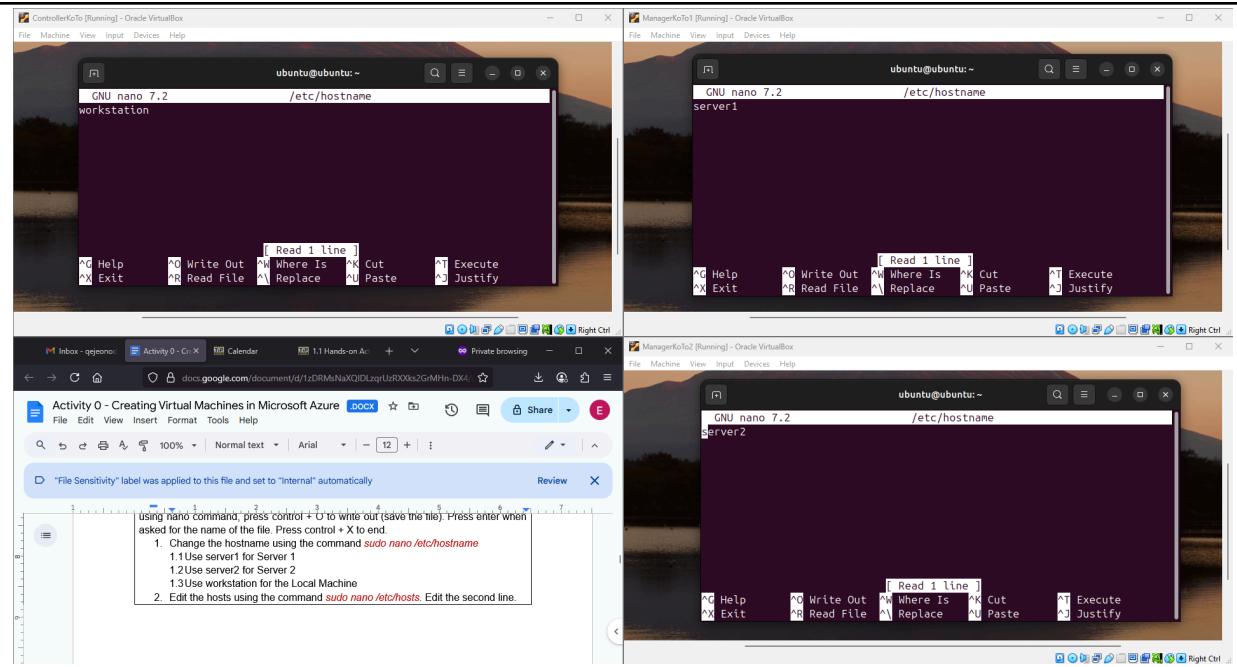
Network Topology:

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*).

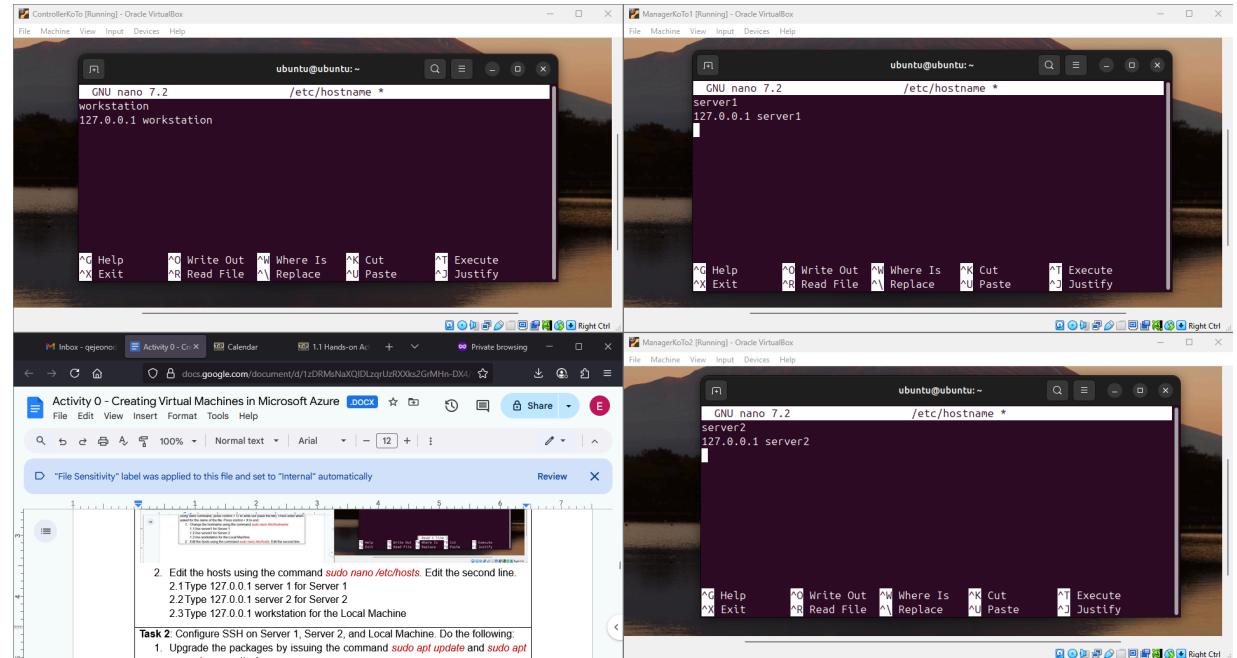


Task 1: Do the following on Server 1, Server 2, and Local Machine. In editing the file using nano command, press control + O to write out (save the file). Press enter when asked for the name of the file. Press control + X to end.

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.

ControllerKoTo [Running] - Oracle VirtualBox

```
ubuntu@ubuntu:~$ Get:100 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:101 http://archive.ubuntu.com/ubuntu noble-backports/multiverse Icons (48x48) [29 B]
Get:102 http://archive.ubuntu.com/ubuntu noble-backports/multiverse Icons (64x64) [29 B]
Get:103 http://archive.ubuntu.com/ubuntu noble-backports/multiverse Icons (64x64@2) [29 B]
Fetched 46.3 MB in 1min 7s (697 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
679 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ubuntu:~$
```

ManagerKoTo [Running] - Oracle VirtualBox

```
ubuntu@ubuntu:~$ Get:100 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:101 http://archive.ubuntu.com/ubuntu noble-backports/multiverse Icons (48x48) [29 B]
Get:102 http://archive.ubuntu.com/ubuntu noble-backports/multiverse Icons (64x64) [29 B]
Get:103 http://archive.ubuntu.com/ubuntu noble-backports/multiverse Icons (64x64@2) [29 B]
Fetched 46.3 MB in 32s (1438 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
679 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ubuntu:~$
```

Inbox - gejeno: Activity 0 - Creating Virtual Machines in Microsoft Azure

Activity 0 - Creating Virtual Machines in Microsoft Azure

File Sensitivity label was applied to this file and set to "Internal" automatically

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`

ManagerKoT2 [Running] - Oracle VirtualBox

```
ubuntu@ubuntu:~$ Get:100 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 gnupg al 2.2.4-2ubuntu17.3 [359 kB]
Get:101 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 keyboard amd64 2.4.4-2ubuntu17.3 [78.3 kB]
Get:102 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 gpgv amd64 2.4.4-2ubuntu17.3 [158 kB]
Get:103 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 logsave amd64 1.47.0-2.4-expubuntu4.1 [22.7 kB]
Get:104 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 ubuntu-minimal amd64 1.59.2 [11.1 kB]
Get:105 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 amd64-microcode amd64 259311.ubuntu.0.24.94.1 [299 kB]
Get:106 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 linux-firmware amd64 20240518.g1t3b120b60.0ubuntu2.15 [537 MB]
Fetched 118 [132 linux-firmware 22.1 MB/537 MB 4%] 1444 kB/s 14min 37s
118 [132 linux-firmware 22.1 MB/537 MB 4%]
```

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

ControllerKoTo [Running] - Oracle VirtualBox

```
ubuntu@ubuntu:~$ Unpacking ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up openssh-client (1:9.6p1-0ubuntu13.13) ...
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Setting up openssh-sftp-server (1:9.6p1-0ubuntu13.13) ...
Setting up openssh-server (1:9.6p1-0ubuntu13.13) ...
Created symlink /etc/systemd/system/sockets.target.wants/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
ubuntu@ubuntu:~$
```

ManagerKoTo [Running] - Oracle VirtualBox

```
ubuntu@ubuntu:~$ Unpacking ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up openssh-client (1:9.6p1-0ubuntu13.13) ...
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Setting up openssh-sftp-server (1:9.6p1-0ubuntu13.13) ...
Setting up openssh-server (1:9.6p1-0ubuntu13.13) ...
Created symlink /etc/systemd/system/sockets.target.wants/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
ubuntu@ubuntu:~$
```

Inbox - gejeno: Activity 0 - Creating Virtual Machines in Microsoft Azure

Activity 0 - Creating Virtual Machines in Microsoft Azure

File Sensitivity label was applied to this file and set to "Internal" automatically

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`

ManagerKoT2 [Running] - Oracle VirtualBox

```
ubuntu@ubuntu:~$ Unpacking ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up openssh-client (1:9.6p1-0ubuntu13.13) ...
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Setting up openssh-sftp-server (1:9.6p1-0ubuntu13.13) ...
Setting up openssh-server (1:9.6p1-0ubuntu13.13) ...
Created symlink /etc/systemd/system/sockets.target.wants/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
ubuntu@ubuntu:~$
```

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`**

Activity 0 - Creating Virtual Machines in Microsoft Azure

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`
`4.3 sudo ufw status`

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`

Activity 0 - Creating Virtual Machines in Microsoft Azure

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`

Task 3: Verify network settings on Server 1, Server 2, and Local Machine. On each device, do the following:

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.____
- 1.2 Server 2 IP address: 192.168.56.____
- 1.3 Server 3 IP address: 192.168.56.____

The screenshot shows a Microsoft Word document with the following content:

```

Activity 0 - Creating Virtual Machines in Microsoft Azure.docx

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._____
  1.2 Server 2 IP address: 192.168.56._____
  1.3 Server 3 IP address: 192.168.56._____

```

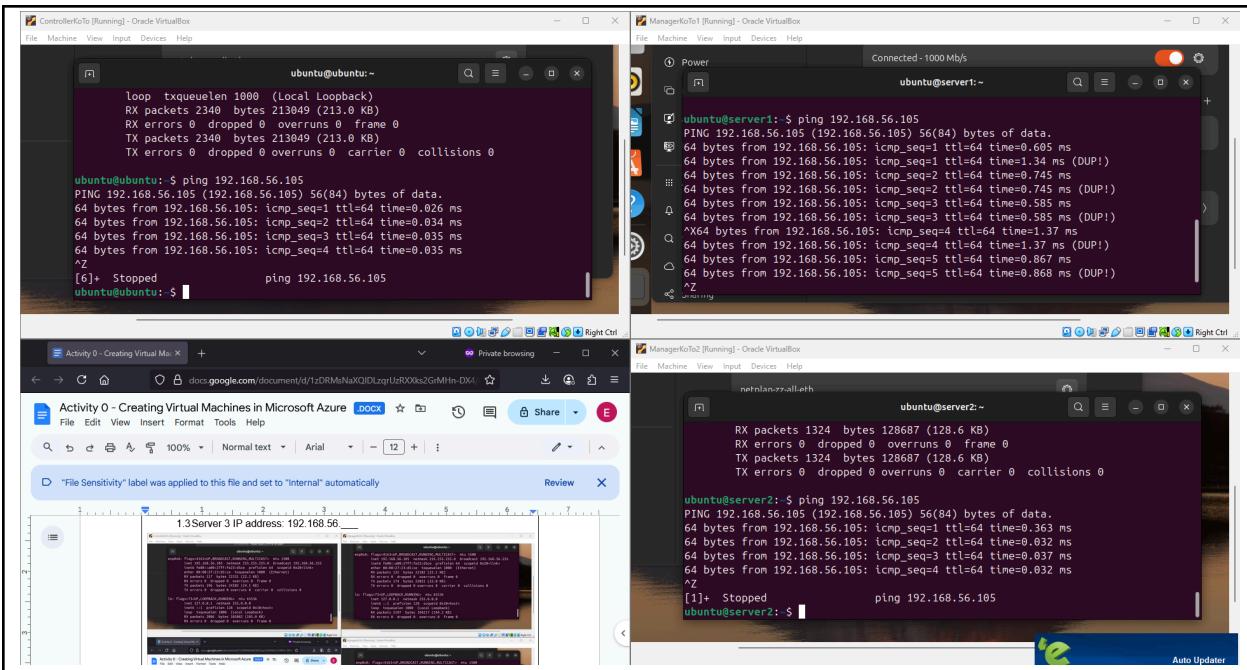
Below the document, there are three terminal windows from Oracle VM VirtualBox:

- ControllerKoTo [Running] - Oracle VM VirtualBox**: Shows network interface details for 'ubuntu@ubuntu'.
- ManagerKoTo1 [Running] - Oracle VM VirtualBox**: Shows network interface details for 'ubuntu@ubuntu'.
- ManagerKoTo2 [Running] - Oracle VM VirtualBox**: Shows network interface details for 'ubuntu@ubuntu'.

The terminal output includes information like MTU, broadcast address, and statistics for RX/TX packets.

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



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.

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)

```
ControllerKoTo [Running] - Oracle VirtualBox
File Machine View Input Devices Help
ubuntu@ubuntu:~$ nano /etc/hosts
GNU nano 7.2          /etc/hosts *

# 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
ff02::3 ip6-allhosts

IP_address server1 192.168.56.105
IP_address server2 192.168.56.105

^G Help      ^O Write Out  ^W Where Is  ^K Cut      ^T Execute  ^C Location
^X Exit      ^R Read File   ^L Replace    ^U Paste     ^J Justify  ^I Go To Line
^Q Help      ^O Write Out  ^W Where Is  ^K Cut      ^T Execute  ^C Location
^X Exit      ^R Read File   ^L Replace    ^U Paste     ^J Justify  ^I Go To Line
```

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 jvtaylor@server1`. Enter the password when prompted. Verify that you have entered Server 1. Do the same for Server 2.

Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
Using the DNS system.
2. How secured is SSH? Depends on how much you configure it.