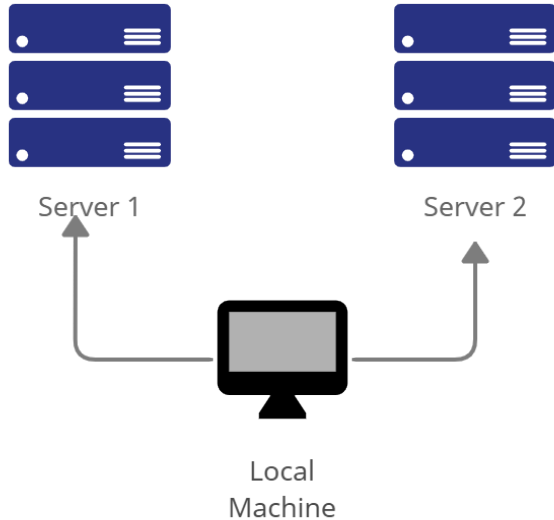| Name: Kenn Cherwin C. Yu | Date Performed: 16/01/2024 |
|---|---|
| Course/Section: CPE31S1 | Date Submitted: 16/01/2024 |
| Instructor: Sir. Jonathan Taylar | Semester and SY: 2nd Semester |

**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*

```
cherwinyu@ubuntu:~$ sudo nano /etc/hostname
cherwinyu@ubuntu:~$
```

1.1 Use server1 for Server 1

```
┌─┐                          cherwinyu@ubuntu: ~
│+│
└─┘
 GNU nano 7.2                              /etc/hostname *
[ControlNode1]
```

      1.2 Use server2 for Server 2

```
[ControlNode2]
```

      1.3 Use workstation for the Local Machine
2. Edit the hosts using the command *sudo nano /etc/hosts*. Edit the second line.

```
┌─┐                    cherwinyu@ubuntu: ~           Q  ≡  —  □  ✕
│+│
└─┘
 GNU nano 7.2                     /etc/hosts
127.0.0.1 localhost
127.0.1.1 ubuntu

# 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
```

      2.1 Type 127.0.0.1 server 1 for Server 1

```
┌─┐                    cherwinyu@ubuntu: ~           Q  ≡  —  □  ✕
│+│
└─┘
 GNU nano 7.2                     /etc/hosts *
127.0.0.1 ControlNode1
```

      2.2 Type 127.0.0.1 server 2 for Server 2
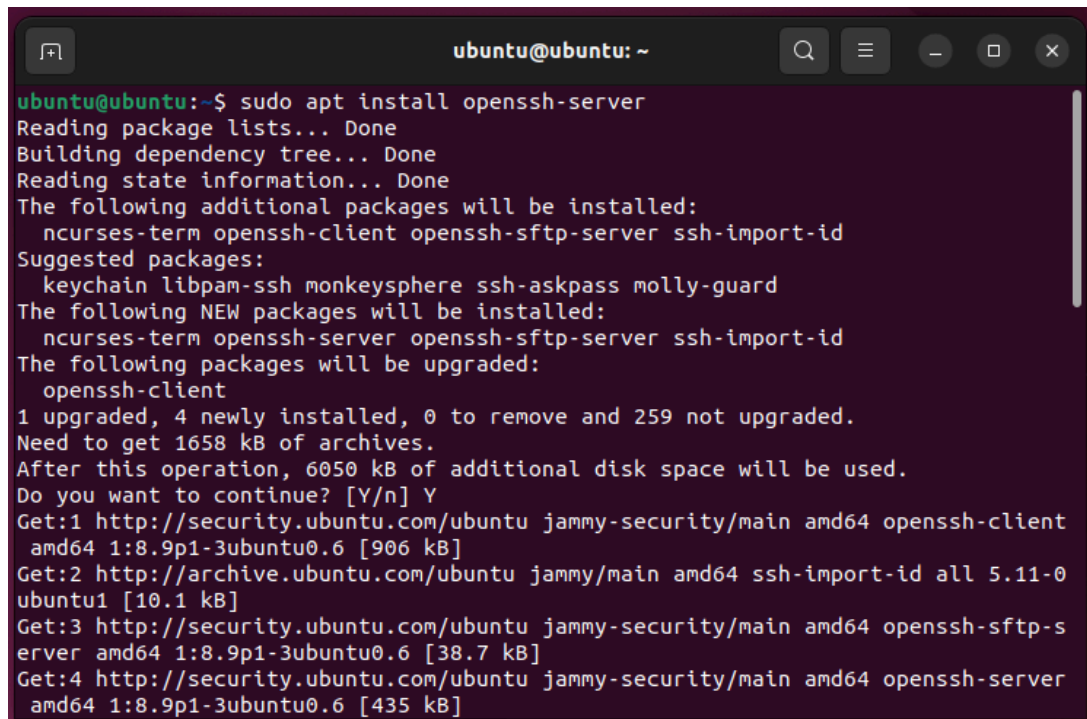
```
127.0.0.1 ControlNode2
```

      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.

```
cherwinyu@ubuntu:~$ sudo apt update
Ign:1 cdrom://Ubuntu 23.04 _Lunar Lobster_ - Release amd64 (20230418) lunar InRelease
Hit:2 cdrom://Ubuntu 23.04 _Lunar Lobster_ - Release amd64 (20230418) lunar Release
Get:4 http://archive.ubuntu.com/ubuntu lunar InRelease [267 kB]
Get:5 http://security.ubuntu.com/ubuntu lunar-security InRelease [109 kB]
Get:6 http://security.ubuntu.com/ubuntu lunar-security/main amd64 Packages [487 kB]
Get:7 http://archive.ubuntu.com/ubuntu lunar-updates InRelease [109 kB]
Get:8 http://security.ubuntu.com/ubuntu lunar-security/main Translation-en [108 kB]
Get:9 http://security.ubuntu.com/ubuntu lunar-security/main amd64 DEP-11 Metadata [7,416
Get:10 http://security.ubuntu.com/ubuntu lunar-security/main DEP-11 48x48 Icons [4,111 B]
Get:11 http://security.ubuntu.com/ubuntu lunar-security/main DEP-11 64x64 Icons [8,578 B]
Get:12 http://security.ubuntu.com/ubuntu lunar-security/main DEP-11 64x64@2 Icons [29 B]
Get:13 http://security.ubuntu.com/ubuntu lunar-security/main amd64 c-n-f Metadata [5,852
Get:14 http://security.ubuntu.com/ubuntu lunar-security/restricted amd64 Packages [483 kB
Get:15 http://archive.ubuntu.com/ubuntu lunar-backports InRelease [99.9 kB]
Get:16 http://security.ubuntu.com/ubuntu lunar-security/restricted Translation-en [79.4 k
Get:17 http://security.ubuntu.com/ubuntu lunar-security/restricted amd64 c-n-f Metadata
Get:18 http://security.ubuntu.com/ubuntu lunar-security/universe amd64 Packages [776 kB]
Get:19 http://security.ubuntu.com/ubuntu lunar-security/universe Translation-en [89.8 kB]
Get:20 http://security.ubuntu.com/ubuntu lunar-security/universe amd64 DEP-11 Metadata [
Get:21 http://security.ubuntu.com/ubuntu lunar-security/universe DEP-11 48x48 Icons [10.
Get:22 http://security.ubuntu.com/ubuntu lunar-security/universe DEP-11 64x64 Icons [18.2
Get:23 http://security.ubuntu.com/ubuntu lunar-security/universe DEP-11 64x64@2 Icons [29
Get:24 http://security.ubuntu.com/ubuntu lunar-security/universe amd64 c-n-f Metadata [12
Get:25 http://security.ubuntu.com/ubuntu lunar-security/multiverse amd64 Packages [6,864
Get:26 http://security.ubuntu.com/ubuntu lunar-security/multiverse Translation-en [1,556
Get:27 http://security.ubuntu.com/ubuntu lunar-security/multiverse amd64 c-n-f Metadata
Get:28 http://archive.ubuntu.com/ubuntu lunar/main amd64 Packages [1,396 kB]
Get:29 http://archive.ubuntu.com/ubuntu lunar/main amd64 DEP-11 Metadata [443 kB]
Get:30 http://archive.ubuntu.com/ubuntu lunar/main amd64 c-n-f Metadata [29.9 kB]
```

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

```
ubuntu@ubuntu:~$ 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-client openssh-sftp-server ssh-import-id
Suggested packages:
  keychain libpam-ssh monkeysphere ssh-askpass molly-guard
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
The following packages will be upgraded:
  openssh-client
1 upgraded, 4 newly installed, 0 to remove and 259 not upgraded.
Need to get 1658 kB of archives.
After this operation, 6050 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://security.ubuntu.com/ubuntu jammy-security/main amd64 openssh-client
  amd64 1:8.9p1-3ubuntu0.6 [906 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy/main amd64 ssh-import-id all 5.11-0
ubuntu1 [10.1 kB]
Get:3 http://security.ubuntu.com/ubuntu jammy-security/main amd64 openssh-sftp-s
erver amd64 1:8.9p1-3ubuntu0.6 [38.7 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security/main amd64 openssh-server
  amd64 1:8.9p1-3ubuntu0.6 [435 kB]
```

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*

```
ubuntu@ubuntu:~$ sudo service ssh start
ubuntu@ubuntu:~$ sudo ufw enable
Firewall is active and enabled on system startup
ubuntu@ubuntu:~$ sudo ufw status
Status: active
ubuntu@ubuntu:~$
```

**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.___
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 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*

```
workspace@workstation-VirtualBox:~$ ssh workspace@192.168.56.104
The authenticity of host '192.168.56.104 (192.168.56.104)' can't be established
.
ECDSA key fingerprint is SHA256:oCZnjMrFhSwWrW3QWMq8Go+0Muo7TIivmt2B8DbpdKk.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.56.104' (ECDSA) to the list of known hosts.
workspace@192.168.56.104'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.
```

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

```
workspace@server1:~$ logout
Connection to 192.168.56.104 closed.
workspace@workstation-VirtualBox:~$
```

3. Do the same for Server 2.

```
workspace@workstation:~$ ssh workspace@192.168.56.105
workspace@192.168.56.105'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.
Last login: Thu Aug 17 18:02:42 2023 from 192.168.56.101
workspace@server2:~$ logout
Connection to 192.168.56.105 closed.
workspace@workstation:~$
```

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.

```
127.0.1.1        workspace
192.168.56.104   Server 1
192.168.56.105   Server 2
# 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
```

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.

**Reflections:**

Answer the following:

1.  How are we able to use the hostname instead of IP address in SSH commands?
    *   **Using hostnames in SSH commands is possible due to DNS, which translates human-readable domain names to IP addresses. When a hostname is specified in an SSH command, DNS resolution occurs, enabling connections with user-friendly names instead of numerical IP addresses.**

2.  How secured is SSH?

    *   **SSH (Secure Shell) is generally considered a secure protocol for remote access and file transfer, employing strong encryption to protect data during communication. However, its security relies on proper configuration, regular updates, and good authentication practices to mitigate potential vulnerabilities.**


Screenshots: