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Course/Section: CPE232 CPE31S6	**Date Submitted: 17/08/2023**
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Activity 1: Configure Network using Virtual Machines

1. **Objectives:**

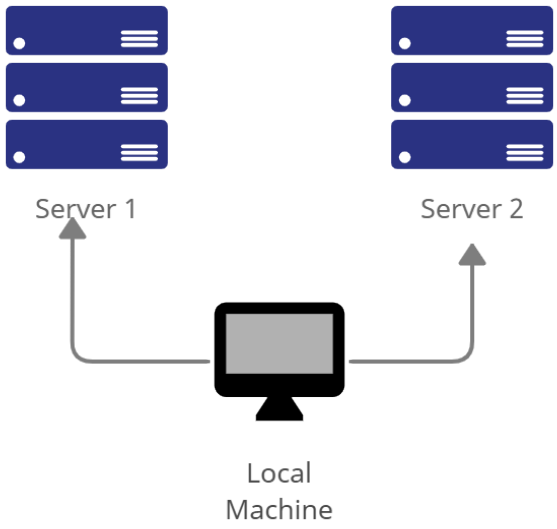
1.1. Create and configure Virtual Machines in Microsoft Azure or VirtualBox

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

2. **Discussion:**

Network Topology:

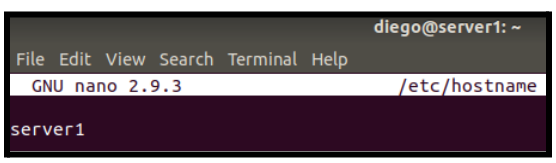
Assume that you have created the following network topology in Virtual Machines, *provide screenshots for each task*. (Note: *it is assumed that you have the prior knowledge of cloning and creating snapshots in a virtual machine*).



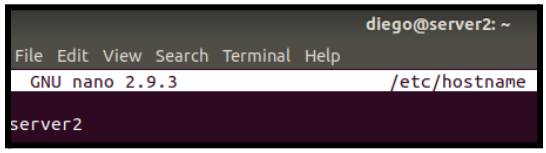
Task 1: Do the following on Server 1, Server 2, and Local Machine. In editing the file using nano command, press control + O to write out (save the file). Press enter when asked for the name of the file. Press control + X to end.

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

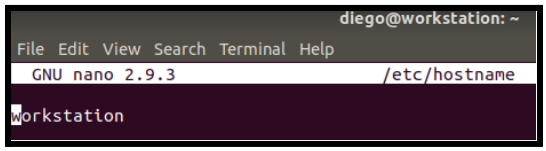
1.1 Use server1 for Server 1



1.2 Use server2 for Server 2

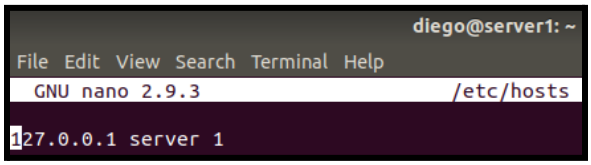


1.3 Use workstation for the Local Machine

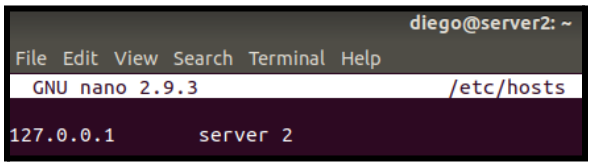


2. Edit the hosts using the command *sudo nano /etc/hosts*. Edit the second line.

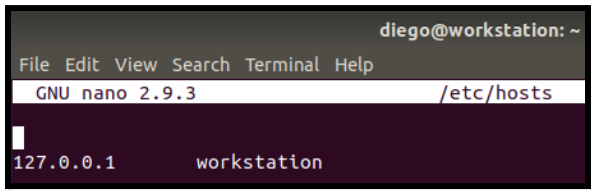
2.1 Type 127.0.0.1 server 1 for Server 1



2.2 Type 127.0.0.1 server 2 for Server 2

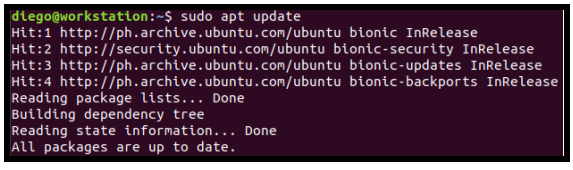


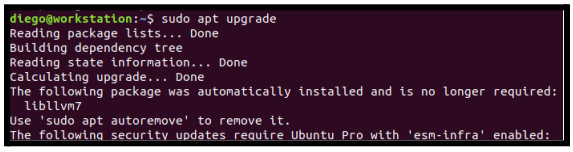
2.3 Type 127.0.0.1 workstation for the Local Machine



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.





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

```
diego@workstation:~$ 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
```

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*

```
diego@workstation:~$ sudo service ssh start
diego@workstation:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: ena
   Active: active (running) since Thu 2023-08-17 17:26:24 PST; 1min 27s ago
 Main PID: 2890 (sshd)
    Tasks: 1 (limit: 4656)
   CGroup: /system.slice/ssh.service
           └─2890 /usr/sbin/sshd -D

Aug 17 17:26:24 workstation systemd[1]: Starting OpenBSD Secure Shell server...
Aug 17 17:26:24 workstation sshd[2890]: Server listening on 0.0.0.0 port 22.
Aug 17 17:26:24 workstation sshd[2890]: Server listening on :: port 22.
Aug 17 17:26:24 workstation systemd[1]: Started OpenBSD Secure Shell server.
```

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*

```
diego@workstation:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
diego@workstation:~$ sudo ufw enable
Firewall is active and enabled on system startup
diego@workstation:~$ 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: 192.168.56.102
   1.2 Server 2 IP address: 192.168.56.103

1.3 Workstation IP address: 192.168.56.101

2. Make sure that they can ping each other.

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

```
diego@workstation:~$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data.
64 bytes from 192.168.56.102: icmp_seq=1 ttl=64 time=0.594 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.452 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=0.426 ms
64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=0.435 ms
^Z
[3]+  Stopped                 ping 192.168.56.102
diego@workstation:~$
```

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

```
diego@workstation:~$ 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=0.540 ms
64 bytes from 192.168.56.103: icmp_seq=2 ttl=64 time=0.408 ms
64 bytes from 192.168.56.103: icmp_seq=3 ttl=64 time=0.541 ms
64 bytes from 192.168.56.103: icmp_seq=4 ttl=64 time=0.386 ms
^Z
[4]+  Stopped                 ping 192.168.56.103
diego@workstation:~$
```

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

```
diego@server1:~$ ping 168.192.56.101
PING 168.192.56.101 (168.192.56.101) 56(84) bytes of data.

^Z
[1]+  Stopped                 ping 168.192.56.101
diego@server1:~$
```

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.*

```
diego@server1:~$ exit
logout
Connection to 192.168.56.102 closed.
```

3. Do the same for Server 2.

```
diego@server2:~$ exit
logout
Connection to 192.168.56.103 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 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.

```
  GNU nano 2.9.3                        /etc/hosts


127.0.0.1       workstation
192.168.56.102  server 1
192.168.56.103  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.

```
diego@workstation:~$ ssh diego@server1
The authenticity of host 'server1 (192.168.56.102)' can't be established.
ECDSA key fingerprint is SHA256:rnjUIFJ3x7gzTMVyS3QZXJOtpmadUYuZgaBVKGUBi/c.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'server1' (ECDSA) to the list of known hosts.
diego@server1'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.

78 additional security updates can be applied with ESM Infra.
Learn more about enabling ESM Infra service for Ubuntu 18.04 at
https://ubuntu.com/18-04

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 17:38:30 2023 from 192.168.56.101
diego@server1:~$
```

```
diego@workstation:~$ ssh diego@server2
The authenticity of host 'server2 (192.168.56.103)' can't be established.
ECDSA key fingerprint is SHA256:+ali9ced3LV9o5/5v0xCenac9eVSwsHktt3T0eZcsJw.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'server2' (ECDSA) to the list of known hosts.
diego@server2'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.

78 additional security updates can be applied with ESM Infra.
Learn more about enabling ESM Infra service for Ubuntu 18.04 at
https://ubuntu.com/18-04

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 17:50:44 2023 from 192.168.56.101
diego@server2:~$
```

Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
   -In SSH commands you can use either the hostname or the IP address to specify the remote server you want to connect to.
2. How secured is SSH?
   -SSH is considered to be secure when properly configured. It provides encrypted

communication , strong authentication methods, and various security features to protect data and prevent unauthorized access.

Conclusion:

-In this exercise, we learnt how to use SSH to clone and access the other servers we build, as well as how to alter the hostname and IP address of the two servers. This activity taught me a lot, and I hope to learn even more in the future.