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Activity 1: Configure Network using Virtual Machines

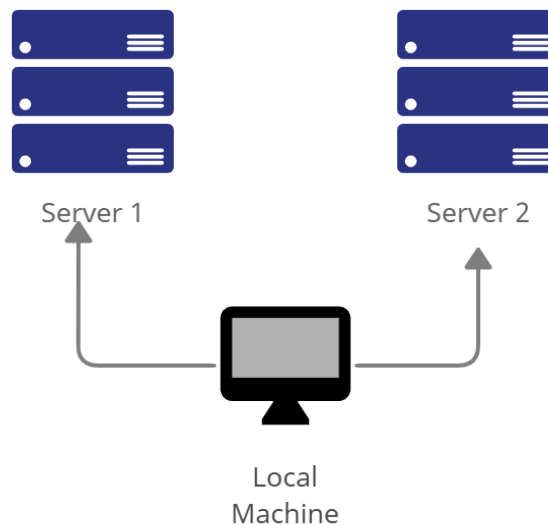
1. Objectives:

- 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

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

```
davonn@davonn-VirtualBox: ~  
GNU nano 4.8 /etc/hostname  
server 1
```

1.2 Use server2 for Server 2

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

```
Firefox Web Browser davonn@davonn-VirtualBox: ~  
GNU nano 4.8 /etc/hostname Modified  
server 2
```

1.3 Use workstation for the Local Machine

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

```
davonn@davonn-VirtualBox: ~  
GNU nano 4.8 /etc/hostname Modified  
workstation
```

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

```
davonn@davonn-VirtualBox: ~  
GNU nano 4.8 /etc/hosts  
127.0.0.1 localhost  
127.0.0.1 server 1  
  
# 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

```
davonn@davonn-VirtualBox: ~  
GNU nano 4.8 /etc/hosts  
127.0.0.1 localhost  
127.0.0.1 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
```

2.3 Type 127.0.0.1 workstation for the Local Machine

```
Aug 27 21:41  
davonn@davonn-VirtualBox: ~  
GNU nano 4.8 /etc/hosts Modified  
127.0.0.1 localhost  
127.0.0.1 workstation  
  
# 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
```

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.

Server 1

```
davonn@davonn-VirtualBox:~$ sudo apt update  
Hit:1 http://ph.archive.ubuntu.com/ubuntu focal InRelease  
Hit:2 http://ph.archive.ubuntu.com/ubuntu focal-updates InRelease  
Hit:3 http://ph.archive.ubuntu.com/ubuntu focal-backports InRelease  
Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]  
Get:5 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [40.6 kB]  
Get:6 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [77.2 kB]  
Get:7 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2,464 B]  
Fetched 234 kB in 2s (113 kB/s)  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
270 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

```
davonn@davonn-VirtualBox:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following package was automatically installed and is no longer required:
  libfwupdplugin1
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
  libfwupdplugin5 libopengl0
The following packages will be upgraded:
  alsa-ucm-conf apport apport-gtk apt apt-utils base-files bash
  bind9-dnswutils bind9-host bind9-libs bluez bluez-cups bluez-obexd bolt
  ca-certificates command-not-found cpp-9 cups cups-bsd cups-client
  cups-common cups-core-drivers cups-daemon cups-ipp-utils cups-ppdc
  cups-server-common dbus dbus-user-session dbus-x11 dirmngr distro-info-data
  dnsmasq-base dpkg firefox fonts-opensymbol fwupd fwupd-signed gcc-9-base
  gir1.2-gdkpixbuf-2.0 gir1.2-gst-plugins-base-1.0 gir1.2-gstreamer-1.0
  gir1.2-gtk-3.0 gir1.2-javascriptcoregtk-4.0 gir1.2-polkit-1.0
  gir1.2-webkit2-4.0 gnome-control-center gnome-control-center-data
  gnome-control-center-faces gnupg gnupg-l10n gnupg-utils gpg gpg-agent
  gpg-wks-client gpg-wks-server gpgconf gpgsm gpgv gstreamer1.0-alsa
  gstreamer1.0-gi gstreamer1.0-gtk3 gstreamer1.0-plugins-base
  gstreamer1.0-plugins-base-apps gstreamer1.0-plugins-good
  gstreamer1.0-pulseaudio gstreamer1.0-tools gstreamer1.0-x
```

```
davonn@davonn-VirtualBox: ~
Setting up libuno-cppu3 (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libpam-systemd:amd64 (245.4-4ubuntu3.17) ...
Setting up policykit-1 (0.105-26ubuntu1.3) ...
Setting up libuno-cppuhelpergcc3-3 (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libuno-purpnhelpergcc3-3 (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up dbus-user-session (1.12.16-2ubuntu2.2) ...
Setting up ure (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up modemmanager (1.18.6-1~ubuntu20.04.1) ...
Installing new version of config file /etc/dbus-1/system.d/org.freedesktop.Mode
mManager1.conf ...
Setting up libjurt-java (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-common (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libjuh-java (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-core (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-math (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-pdfimport (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-draw (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-gnome (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-impress (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-base-core (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up python3-uno (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-ogltrans (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-calc (1:6.4.7-0ubuntu0.20.04.4) ...
Setting up libreoffice-writer (1:6.4.7-0ubuntu0.20.04.4) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for initramfs-tools (0.136ubuntu6.7) ...
update-initramfs: Generating /boot/initrd.img-5.15.0-46-generic
Progress: [ 95%] [#####...]
```

Server 2

```
davonn@davonn-VirtualBox:~$ sudo apt update
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:2 http://ph.archive.ubuntu.com/ubuntu focal InRelease
Hit:3 http://ph.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://ph.archive.ubuntu.com/ubuntu focal-backports InRelease
Get:5 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [40.6 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [77.2 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2,464 B]
Fetched 234 kB in 3s (92.5 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
270 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

```
davonn@davonn-VirtualBox:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following package was automatically installed and is no longer required:
  libfwupdplugin1
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
  libfwupdplugin5 libopengl0
The following packages will be upgraded:
  alsa-ucm-conf appport appport-gtk apt apt-utils base-files bash
  bind9-dnsutils bind9-host bind9-libs bluez bluez-cups bluez-obexd bolt
  ca-certificates command-not-found cpp-9 cups cups-bdd cups-client
  cups-common cups-core-drivers cups-daemon cups-ipp-utils cups-ppdc
  cups-server-common dbus dbus-user-session dbus-x11 dirmngr distro-info-data
  dnsmasq-base dpkg firefox fonts-opensymbol fwupd fwupd-signed gcc-9-base
  gir1.2-gdkpixbuf-2.0 gir1.2-gst-plugins-base-1.0 gir1.2-gstreamer-1.0
  gir1.2-gtk-3.0 gir1.2-javascriptcoregtk-4.0 gir1.2-polkit-1.0
  gir1.2-webkit2-4.0 gnome-control-center gnome-control-center-data
  gnome-control-center-faces gnupg gnupg-l10n gnupg-utils gpg gpg-agent
  gpg-wks-client gpg-wks-server gpgconf gpgsm gpgv gstreamer1.0-alsa
```

```

davonn@davonn-VirtualBox: ~
Get:16 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 libxatracker2 amd64 21.2.6-0ubuntu0.1~20.04.2 [1,803 kB]
Get:17 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 linux-firmware all 1.187.33 [125 MB]
Get:18 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 mesa-vulkan-drivers amd64 21.2.6-0ubuntu0.1~20.04.2 [5,788 kB]
Get:19 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 modemmanager amd64 1.18.6-1~ubuntu20.04.1 [895 kB]
Get:20 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openvpn amd64 2.4.7-1ubuntu2.20.04.4 [476 kB]
Get:20 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openvpn amd64 2.4.7-1ubuntu2.20.04.4 [476 kB]
Get:21 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-louis all 3.12.0-3ubuntu0.1 [7,532 B]
Get:22 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 orca all 3.36.2-1ubuntu1~20.04.2 [509 kB]
Get:23 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-jwt all 1.7.1-2ubuntu2.1 [18.0 kB]
Get:24 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-paramiko all 2.6.0-2ubuntu0.1 [122 kB]
Get:25 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 sbsigntool amd64 0.9.2-2ubuntu1.1 [63.8 kB]
Get:26 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 snapd amd64 2.55.5+20.04 [35.6 MB]
Get:27 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 thunderbird-locale-en amd64 1:91.11.0+build2-0ubuntu0.20.04.1 [948 kB]
Get:28 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 thunderbird amd64 1:91.11.0+build2-0ubuntu0.20.04.1 [55.4 MB]
96% [28 thunderbird 42.0 MB/55.4 MB 76%] 5,673 kB/s 3s

```

```

setting xserver-xorg-legacy/xwrapper/allowed_users from configuration file
(Reading database ... 178105 files and directories currently installed.)
Preparing to unpack .../libc6-dbg_2.31-0ubuntu9.9_amd64.deb ...
Unpacking libc6-dbg:amd64 (2.31-0ubuntu9.9) over (2.31-0ubuntu9.2) ...
Preparing to unpack .../libc6_2.31-0ubuntu9.9_amd64.deb ...
Unpacking libc6:amd64 (2.31-0ubuntu9.9) over (2.31-0ubuntu9.2) ...

```

```

Progress: [ 0%] [ ..... ]

```

Workstation

```

davonn@workstation: ~
davonn@workstation:~$ sudo apt update
[sudo] password for davonn:
Hit:1 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:2 http://ph.archive.ubuntu.com/ubuntu focal InRelease
Hit:3 http://ph.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://ph.archive.ubuntu.com/ubuntu focal-backports InRelease

```

```
davonn@workstation: ~  
davonn@workstation:~$ sudo apt upgrade  
[sudo] password for davonn:  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Calculating upgrade... Done  
The following package was automatically installed and is no longer required:  
  libfwupdplugin1  
Use 'sudo apt autoremove' to remove it.  
The following NEW packages will be installed:  
  libfwupdplugins5 libopenl0  
The following packages will be upgraded:  
  alsa-ucm-conf apport apport-gtk apt apt-utils base-files bash  
  bind9-dnsutils bind9-host bind9-libs bluez bluez-cups bluez-obexd bolt  
  ca-certificates command-not-found cpp-9 cups cups-bsd cups-client  
  cups-common cups-core-drivers cups-daemon cups-ipp-utils cups-ppdc  
  cups-server-common dbus dbus-user-session dbus-x11 dirmngr distro-info-data  
  dnsmasq-base dpkg firefox fonts-opensymbol fwupd fwupd-signed gcc-9-base  
  gir1.2-gdkpixbuf-2.0 gir1.2-gst-plugins-base-1.0 gir1.2-gstreamer-1.0  
  gir1.2-gtk-3.0 gir1.2-javascriptcoregtk-4.0 gir1.2-polkit-1.0  
  gir1.2-webkit2-4.0 gnome-control-center gnome-control-center-data  
  gnome-control-center-faces gnupg gnupg-l10n gnupg-utils gpg gpg-agent  
  gpg-wks-client gpg-wks-server gpgconf gpgsm gpgv gstreamer1.0-alsa  
  gstreamer1.0-gl gstreamer1.0-gtk3 gstreamer1.0-plugins-base  
  gstreamer1.0-plugins-base-apps gstreamer1.0-plugins-good  
  gstreamer1.0-pulseaudio gstreamer1.0-tools gstreamer1.0-x  
  gtk-update-icon-cache gvfs gvfs-backends gvfs-bin gvfs-common gvfs-daemons  
  gvfs-fuse gvfs-libs gzip iio-sensor-proxy intel-microcode isc-dhcp-client  
  isc-dhcp-common klibc-utils kmod libapt-pkg6.0 libarchive13 libbluetooth3
```



```
Terminal Aug 27 22:23
davonn@workstation: ~

Unpacking dbus-user-session (1.12.16-2ubuntu2.2) over (1.12.16-2ubuntu2.1)
Preparing to unpack .../12-dbus-x11_1.12.16-2ubuntu2.2_amd64.deb ...
Unpacking dbus-x11 (1.12.16-2ubuntu2.2) over (1.12.16-2ubuntu2.1) ...
Preparing to unpack .../13-libdbus-1-3_1.12.16-2ubuntu2.2_amd64.deb ...
Unpacking libdbus-1-3:amd64 (1.12.16-2ubuntu2.2) over (1.12.16-2ubuntu2.1)
Preparing to unpack .../14-dbus_1.12.16-2ubuntu2.2_amd64.deb ...
Unpacking dbus (1.12.16-2ubuntu2.2) over (1.12.16-2ubuntu2.1) ...
Preparing to unpack .../15-systemd-sysv_245.4-4ubuntu3.17_amd64.deb ...
Unpacking systemd-sysv (245.4-4ubuntu3.17) over (245.4-4ubuntu3.15) ...
Preparing to unpack .../16-libpam-systemd_245.4-4ubuntu3.17_amd64.deb ...
Unpacking libpam-systemd:amd64 (245.4-4ubuntu3.17) over (245.4-4ubuntu3.15)
Preparing to unpack .../17-libnss-systemd_245.4-4ubuntu3.17_amd64.deb ...
Unpacking libnss-systemd:amd64 (245.4-4ubuntu3.17) over (245.4-4ubuntu3.15)
Preparing to unpack .../18-systemd-timesyncd_245.4-4ubuntu3.17_amd64.deb ..
Unpacking systemd-timesyncd (245.4-4ubuntu3.17) over (245.4-4ubuntu3.15) ..
Preparing to unpack .../19-libgnutls30_3.6.13-2ubuntu1.7_amd64.deb ...
Unpacking libgnutls30:amd64 (3.6.13-2ubuntu1.7) over (3.6.13-2ubuntu1.6) ..
Setting up libgnutls30:amd64 (3.6.13-2ubuntu1.7) ...
(Reading database ... 181158 files and directories currently installed.)
Preparing to unpack .../libssl1.1_1.1.1f-1ubuntu2.16_amd64.deb ...
Unpacking libssl1.1:amd64 (1.1.1f-1ubuntu2.16) over (1.1.1f-1ubuntu2.10) ..
Preparing to unpack .../kmod_27-1ubuntu2.1_amd64.deb ...
Unpacking kmod (27-1ubuntu2.1) over (27-1ubuntu2) ...
Preparing to unpack .../libkmod2_27-1ubuntu2.1_amd64.deb ...
Unpacking libkmod2:amd64 (27-1ubuntu2.1) over (27-1ubuntu2) ...
Preparing to unpack .../systemd_245.4-4ubuntu3.17_amd64.deb ...
Unpacking systemd (245.4-4ubuntu3.17) over (245.4-4ubuntu3.15) ...

Progress: [ 10%] [#####.....]
```

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

Server 1


```

davonn@davonn-VirtualBox:~$ 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:
  libfwupdplugin1
Use 'sudo apt autoremove' to remove it.
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 688 kB of archives.
After this operation, 6,010 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ph.archive.ubuntu.com/ubuntu focal/main amd64 ncurses-term all 6.2
-0ubuntu2 [249 kB]
Get:2 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-sftp
-server amd64 1:8.2p1-4ubuntu0.5 [51.5 kB]
Get:3 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-serv
er amd64 1:8.2p1-4ubuntu0.5 [377 kB]
Get:4 http://ph.archive.ubuntu.com/ubuntu focal/main amd64 ssh-import-id all 5.
10-0ubuntu1 [10.0 kB]
Fetched 688 kB in 1s (534 kB/s)

```

Server 2

```

davonn@davonn-VirtualBox:~$ 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:
  libfwupdplugin1
Use 'sudo apt autoremove' to remove it.
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 688 kB of archives.
After this operation, 6,010 kB of additional disk space will be used.
After this operation, 6,010 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ph.archive.ubuntu.com/ubuntu focal/main amd64 ncurses-term all 6.2
-0ubuntu2 [249 kB]
Get:2 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-sftp
-server amd64 1:8.2p1-4ubuntu0.5 [51.5 kB]
Get:3 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-serv
er amd64 1:8.2p1-4ubuntu0.5 [377 kB]
Get:4 http://ph.archive.ubuntu.com/ubuntu focal/main amd64 ssh-import-id all 5.
10-0ubuntu1 [10.0 kB]
Fetched 688 kB in 1s (551 kB/s)

```

--

```
davonn@workstation: ~  
Building dependency tree  
Reading state information... Done  
270 packages can be upgraded. Run 'apt list --upgradable' to see them.  
davonn@workstation:~$ sudo apt install openssh-server  
Reading package lists... Done  
Building dependency tree  
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 269 not upgraded.  
Need to get 688 kB/1,359 kB of archives.  
After this operation, 6,010 kB of additional disk space will be used.  
Do you want to continue? [Y/n] y  
Get:1 http://ph.archive.ubuntu.com/ubuntu focal/main amd64 ncurses-term all 6.2-0ubuntu2 [249 kB]  
Get:2 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-sftp-server amd64 1:8.2p1-4ubuntu0.5 [51.5 kB]  
Get:3 http://ph.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-server amd64 1:8.2p1-4ubuntu0.5 [377 kB]  
Get:4 http://ph.archive.ubuntu.com/ubuntu focal/main amd64 ssh-import-id all 5.10-0ubuntu1 [10.0 kB]  
Fetched 688 kB in 1s (1,044 kB/s)  
Preconfiguring packages ...
```

```
davonn@workstation: ~  
Selecting previously unselected package ssh-import-id.  
Preparing to unpack .../ssh-import-id_5.10-0ubuntu1_all.deb ...  
Unpacking ssh-import-id (5.10-0ubuntu1) ...  
Setting up openssh-client (1:8.2p1-4ubuntu0.5) ...  
Setting up ssh-import-id (5.10-0ubuntu1) ...  
Attempting to convert /etc/ssh/ssh_import_id  
Setting up ncurses-term (6.2-0ubuntu2) ...  
Setting up openssh-sftp-server (1:8.2p1-4ubuntu0.5) ...  
Setting up openssh-server (1:8.2p1-4ubuntu0.5) ...  
  
Creating config file /etc/ssh/sshd_config with new version  
Creating SSH2 RSA key; this may take some time ...  
8072 SHA256:oi73Ur3WtaLimyuRuo5/PSLk+pS7S0TgsSnunt2jmc root@workstation (RSA)  
Creating SSH2 ECDSA key; this may take some time ...  
256 SHA256:PoCG1qtHVXxa62C+SI9W0KPXR0/Gz0nRNGvqXW1qi+o root@workstation (ECDSA)  
Creating SSH2 ED25519 key; this may take some time ...  
256 SHA256:F0ev9iW2DwQ+DY6SiWUHNuMg0MnN2VIS7ABsH7eAoPo root@workstation (ED25519)  
Created symlink /etc/systemd/system/ssh.service → /lib/systemd/system/ssh.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /lib/systemd/system/ssh.service.  
rescue-ssh.target is a disabled or a static unit, not starting it.  
Processing triggers for systemd (245.4-4ubuntu3.15) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for ufw (0.36-6ubuntu1) ...  
davonn@workstation:~$
```

3. Verify if the SSH service has started by issuing the following commands:

3.1 *sudo service ssh start*

Server 1

```
davonn@davonn-VirtualBox:~$ sudo service ssh start
davonn@davonn-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 Sat 2022-08-27 22:27:27 PST; 1min 50s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 45214 (sshd)
      Tasks: 1 (limit: 1638)
     Memory: 1.3M
    CGroup: /system.slice/ssh.service
            └─45214 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Aug 27 22:27:27 davonn-VirtualBox systemd[1]: Starting OpenBSD Secure Shell se
Aug 27 22:27:27 davonn-VirtualBox sshd[45214]: Server listening on 0.0.0.0 por
Aug 27 22:27:27 davonn-VirtualBox sshd[45214]: Server listening on :: port 22.
Aug 27 22:27:27 davonn-VirtualBox systemd[1]: Started OpenBSD Secure Shell ser
lines 1-15/15 (END)
```

Server 2

```
davonn@davonn-VirtualBox:~$ sudo service ssh start
davonn@davonn-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 Sat 2022-08-27 22:51:38 PST; 1min 43s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 45291 (sshd)
      Tasks: 1 (limit: 1638)
     Memory: 1.0M
    CGroup: /system.slice/ssh.service
            └─45291 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Aug 27 22:51:38 davonn-VirtualBox systemd[1]: Starting OpenBSD Secure Shell se
Aug 27 22:51:38 davonn-VirtualBox sshd[45291]: Server listening on 0.0.0.0 por
Aug 27 22:51:38 davonn-VirtualBox sshd[45291]: Server listening on :: port 22.
Aug 27 22:51:38 davonn-VirtualBox systemd[1]: Started OpenBSD Secure Shell ser
lines 1-15/15 (END)
```

Workstation

```
davonn@workstation:~$ sudo service ssh start
davonn@workstation:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: ▶
   Active: active (running) since Sat 2022-08-27 21:48:08 PST; 2min 5s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 2264 (sshd)
      Tasks: 1 (limit: 1638)
     Memory: 1.0M
    CGroup: /system.slice/ssh.service
            └─2264 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Aug 27 21:48:08 workstation systemd[1]: Starting OpenBSD Secure Shell server...
Aug 27 21:48:08 workstation sshd[2264]: Server listening on 0.0.0.0 port 22.
Aug 27 21:48:08 workstation sshd[2264]: Server listening on :: port 22.
Aug 27 21:48:08 workstation systemd[1]: Started OpenBSD Secure Shell server.
lines 1-15/15 (END)
```

3.2 *sudo systemctl status ssh*

Server 1

```

davonn@davonn-VirtualBox:~$ sudo service ssh start
davonn@davonn-VirtualBox:~$ 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 Sat 2022-08-27 22:27:27 PST; 1min 50s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 45214 (sshd)
      Tasks: 1 (limit: 1638)
     Memory: 1.3M
    CGroup: /system.slice/ssh.service
            └─45214 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Aug 27 22:27:27 davonn-VirtualBox systemd[1]: Starting OpenBSD Secure Shell se
Aug 27 22:27:27 davonn-VirtualBox sshd[45214]: Server listening on 0.0.0.0 por
Aug 27 22:27:27 davonn-VirtualBox sshd[45214]: Server listening on :: port 22.
Aug 27 22:27:27 davonn-VirtualBox systemd[1]: Started OpenBSD Secure Shell ser
lines 1-15/15 (END)

```

Server 2

```

davonn@davonn-VirtualBox:~$ sudo service ssh start
davonn@davonn-VirtualBox:~$ 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 Sat 2022-08-27 22:51:38 PST; 1min 43s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 45291 (sshd)
      Tasks: 1 (limit: 1638)
     Memory: 1.0M
    CGroup: /system.slice/ssh.service
            └─45291 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Aug 27 22:51:38 davonn-VirtualBox systemd[1]: Starting OpenBSD Secure Shell se
Aug 27 22:51:38 davonn-VirtualBox sshd[45291]: Server listening on 0.0.0.0 por
Aug 27 22:51:38 davonn-VirtualBox sshd[45291]: Server listening on :: port 22.
Aug 27 22:51:38 davonn-VirtualBox systemd[1]: Started OpenBSD Secure Shell ser
lines 1-15/15 (END)

```

Workstation

```

davonn@workstation:~$ sudo service ssh start
davonn@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 Sat 2022-08-27 21:48:08 PST; 2min 5s ago
     Docs: man:sshd(8)
           man:sshd_config(5)
    Main PID: 2264 (sshd)
      Tasks: 1 (limit: 1638)
     Memory: 1.0M
    CGroup: /system.slice/ssh.service
            └─2264 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Aug 27 21:48:08 workstation systemd[1]: Starting OpenBSD Secure Shell server...
Aug 27 21:48:08 workstation sshd[2264]: Server listening on 0.0.0.0 port 22.
Aug 27 21:48:08 workstation sshd[2264]: Server listening on :: port 22.
Aug 27 21:48:08 workstation systemd[1]: Started OpenBSD Secure Shell server.
lines 1-15/15 (END)

```

4. Configure the firewall to all port 22 by issuing the following commands:

4.1 *sudo ufw allow ssh*

Server 1

```

davonn@davonn-VirtualBox:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)

```

Server 2

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

Workstation

```
davonn@workstation:~$ sudo ufw allow ssh
Rules updated
Rules updated (v6)
```

4.2 sudo ufw enable

Server 1

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

Server 2

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

Workstation

```
davonn@workstation:~$ sudo ufw enable
Firewall is active and enabled on system startup
```

4.3 sudo ufw status

Server 1

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

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

Server 2

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

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

Workstation

```
davonn@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: 192.168.56.101

1.3 Server 3 IP address: 192.168.56.103

2. Make sure that they can ping each other.

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

```
davonn@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=0.029 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=64 time=0.080 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=64 time=0.039 ms
64 bytes from 192.168.56.102: icmp_seq=4 ttl=64 time=0.039 ms
```

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

```
davonn@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=0.842 ms
64 bytes from 192.168.56.103: icmp_seq=2 ttl=64 time=0.419 ms
64 bytes from 192.168.56.103: icmp_seq=3 ttl=64 time=0.336 ms
64 bytes from 192.168.56.103: icmp_seq=4 ttl=64 time=0.375 ms
64 bytes from 192.168.56.103: icmp_seq=5 ttl=64 time=0.411 ms
```


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

```
davonn@server1:~$ 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=0.547 ms
64 bytes from 192.168.56.101: icmp_seq=2 ttl=64 time=0.706 ms
64 bytes from 192.168.56.101: icmp_seq=3 ttl=64 time=0.399 ms
64 bytes from 192.168.56.101: icmp_seq=4 ttl=64 time=0.778 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 jvtaylor@192.168.56.120`

```
davonn@workstation:~$ ssh davonn@192.168.56.102
The authenticity of host '192.168.56.102 (192.168.56.102)' can't be established
.
ECDSA key fingerprint is SHA256:PoCG1qtHVXxa62C+SI9W0KPXR0/Gz0nRNGvqxW1qi+o.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '192.168.56.102' (ECDSA) to the list of known hosts.
davonn@192.168.56.102's password:
Welcome to Ubuntu 20.04.5 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.

Your Hardware Enablement Stack (HWE) is supported until April 2025.
*** 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
```

1.2 Enter the password for server 1 when prompted

```
davonn@workstation:~$ ssh davonn@192.168.56.102
The authenticity of host '192.168.56.102 (192.168.56.102)' can't be established
.
ECDSA key fingerprint is SHA256:PoCG1qtHVXxa62C+SI9W0KPXR0/Gz0nRNGvqxW1qi+o.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '192.168.56.102' (ECDSA) to the list of known hosts.
davonn@192.168.56.102's password:
Welcome to Ubuntu 20.04.5 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

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Your Hardware Enablement Stack (HWE) is supported until April 2025.
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individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
```

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

```
davonn@workstation:~$ ssh davonn@192.168.56.102
davonn@192.168.56.102's password:
Welcome to Ubuntu 20.04.5 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.

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Sat Aug 27 23:04:40 2022 from 192.168.56.102
```

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

```
davonn@workstation:~$ logout
Connection to 192.168.56.102 closed.
```

3. Do the same for Server 2.

```
davonn@workstation:~$ ssh davonn@192.168.56.101
The authenticity of host '192.168.56.101 (192.168.56.101)' can't be established
.
ECDSA key fingerprint is SHA256:2GrHfYd+JWktdL+r/WQEx+ywiyqzyCFuw5GVn8Hn4Y.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '192.168.56.101' (ECDSA) to the list of known hosts.
davonn@192.168.56.101's password:
Welcome to Ubuntu 20.04.5 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.

Your Hardware Enablement Stack (HWE) is supported until April 2025.

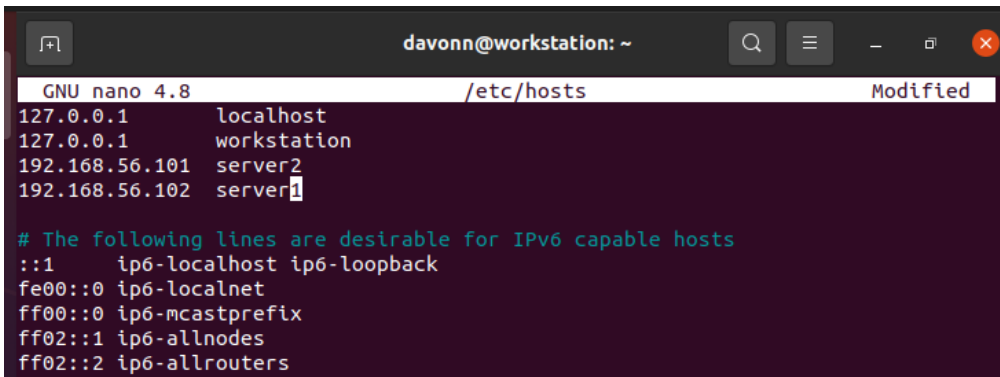
The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

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

```
davonn@server2:~$ logout
Connection to 192.168.56.101 closed.
```

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

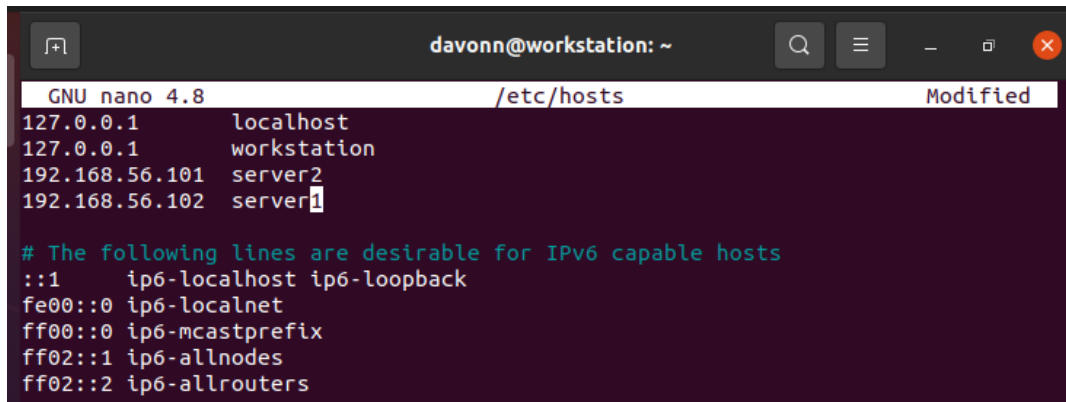
4.1 *IP_address server 1* (provide the ip address of server 1 followed by the hostname)



```
davonn@workstation: ~
GNU nano 4.8 /etc/hosts Modified
127.0.0.1    localhost
127.0.0.1    workstation
192.168.56.101 server2
192.168.56.102 server1

# 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
```

4.2 **IP_address server 2** (provide the ip address of server 2 followed by the hostname)



The screenshot shows a terminal window with the title bar 'davonn@workstation: ~'. The terminal is running the GNU nano 4.8 editor on the file /etc/hosts. The file content is as follows:

```
GNU nano 4.8 /etc/hosts Modified
127.0.0.1    localhost
127.0.0.1    workstation
192.168.56.101 server2
192.168.56.102 server1

# 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
```

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.

```
davonn@workstation:~$ ssh davonn@server1
The authenticity of host 'server1 (192.168.56.102)' can't be established.
ECDSA key fingerprint is SHA256:PoCG1qtHVXxa62C+SI9W0KPXR0/Gz0nRNGvqxW1qi+o.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'server1' (ECDSA) to the list of known hosts.
davonn@server1's password:
Welcome to Ubuntu 20.04.5 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.

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Sat Aug 27 23:08:14 2022 from 192.168.56.102
davonn@workstation:~$ logout
Connection to server1 closed.
```

```
davonn@workstation:~$ ssh davonn@server2
The authenticity of host 'server2 (192.168.56.101)' can't be established.
ECDSA key fingerprint is SHA256:2GrHfYd+JWKtkDL+r/WQEx+ywiyqzyCFuw5GVn8Hn4Y.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added 'server2' (ECDSA) to the list of known hosts.
davonn@server2's password:
Welcome to Ubuntu 20.04.5 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.

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Sat Aug 27 23:14:58 2022 from 192.168.56.102
davonn@server2:~$ logout
Connection to server2 closed.
```

Reflections:

Answer the following:

1. How are we able to use the hostname instead of IP address in SSH commands?
We can be able to use the hostname because we can edit the host using the command `sudo /etc/hosts` then provide the ip address together with the hostname setted up on the other machines.
2. How secured is SSH?
SSH is secure in a way that it uses keys to encrypt the data and also it delivers these through a secured channel.

**I affirm that I shall not give or receive any unauthorized help on this exam and
that all work shall be my own. - Davonn Escobilla**