

College of Computer Training (CCT)

Assignment Cover Page

Module Title:	Network Services & Virtualization
Assignment Title:	Proof of Concept Linux Virtual Network Project
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Link:	
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Academic Year:

Year 1 ☐

Year 2 ☒

Year 3 ☐

Declaration:

I, the above-named student, confirm that by submitting, or causing the attached assignment to be submitted, to CCT, I have not plagiarized any other person's work in this assignment and except where appropriately acknowledged, this assignment is my own work, has been expressed in my own words, and has not previously been submitted for assessment.

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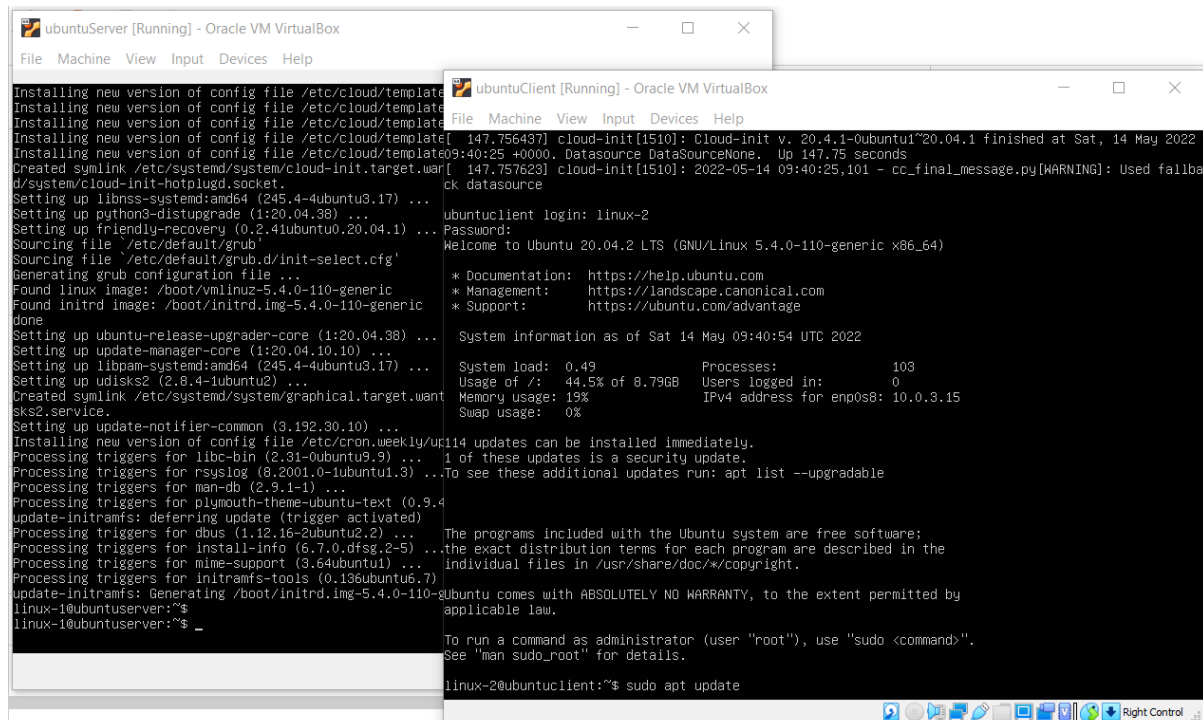
ICT - Dublin City College

A consultancy from ICT – Consult & Connect Ltd. in Dublin City College (DCC) was required to create a virtualized environment to test how their new network and services would work on it.

So first of all, installation of Linux in two virtual machines – Ubuntu Server and Ubuntu Client. Obtaining updates and upgrades of both using the following commands:

- `sudo apt update`
- `sudo apt upgrade`

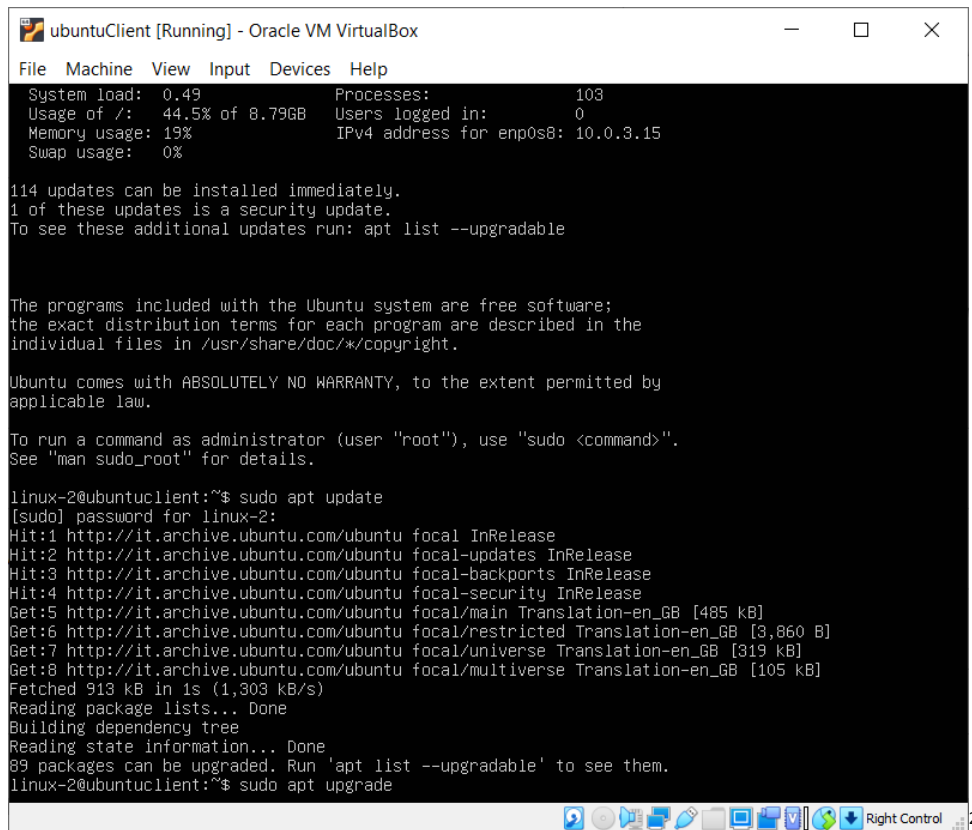
Then they looked like the figures bellow.



The screenshot shows two overlapping Oracle VM VirtualBox windows. The background window is titled 'ubuntuServer [Running] - Oracle VM VirtualBox' and displays the progress of installing Ubuntu Server 20.04.1. The foreground window is titled 'ubuntuClient [Running] - Oracle VM VirtualBox' and displays the progress of installing Ubuntu Client 20.04.1. Both windows show the progress of installing various components, including the kernel, bootloader, and system utilities. The foreground window also shows the output of the 'sudo apt update' command, which lists available updates and their sizes.

```
Installing new version of config file /etc/cloud/templates/...
Installing new version of config file /etc/cloud/templates/...
Installing new version of config file /etc/cloud/templates/...
Installing new version of config file /etc/cloud/templates/...
Created symlink /etc/systemd/system/cloud-init.target.war...
Setting up libnss-systemd:amd64 (245.4-4ubuntu3.17) ...
Setting up python3-distupgrader (1:20.04.38) ...
Setting up friendly-recovery (0.2.4ubuntu0.20.04.1) ...
Sourcing file /etc/default/grub
Sourcing file /etc/default/grub.d/init-select.cfg
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.4.0-110-generic
Found initrd image: /boot/initrd.img-5.4.0-110-generic
done
Setting up ubuntu-release-upgrader-core (1:20.04.38) ...
Setting up update-manager-core (1:20.04.10.10) ...
Setting up libpam-systemd:amd64 (245.4-4ubuntu3.17) ...
Setting up udisks2 (2.8.4-1ubuntu2) ...
Created symlink /etc/systemd/system/graphical.target.want...
Setting up update-notifier-common (3.192.30.10) ...
Installing new version of config file /etc/cron.weekly/uc114 updates can be installed immediately.
Processing triggers for libc-bin (2.31-0ubuntu9.9) ... 1 of these updates is a security update.
Processing triggers for rsyslog (8.2001.0-1ubuntu1.3) ...To see these additional updates run: apt list --upgradable
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for plymouth-theme-ubuntu-text (0.9.4...
update-initramfs: deferring update (trigger activated)
Processing triggers for dbus (1.12.16-2ubuntu2.2) ...
Processing triggers for install-info (6.7.0.dfsg.2-5) ...the exact distribution terms for each program are described in the
Processing triggers for mime-support (3.64ubuntu1) ...individual files in /usr/share/doc/*/copyright.
Processing triggers for initramfs-tools (0.136ubuntu6.7) ...
update-initramfs: Generating /boot/initrd.img-5.4.0-110-gUbuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
linux-10ubuntuserver:~$ applicable law.
linux-10ubuntuserver:~$ To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
linux-20ubuntucient:~$ sudo apt update
```

¹ Update and Upgrade of Ubuntu VM's.



```
ubuntuClient [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
System load: 0.49          Processes: 103
Usage of /: 44.5% of 8.79GB Users logged in: 0
Memory usage: 19%         IPv4 address for enp0s8: 10.0.3.15
Swap usage: 0%

114 updates can be installed immediately.
1 of these updates is a security update.
To see these additional updates run: apt list --upgradable

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.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

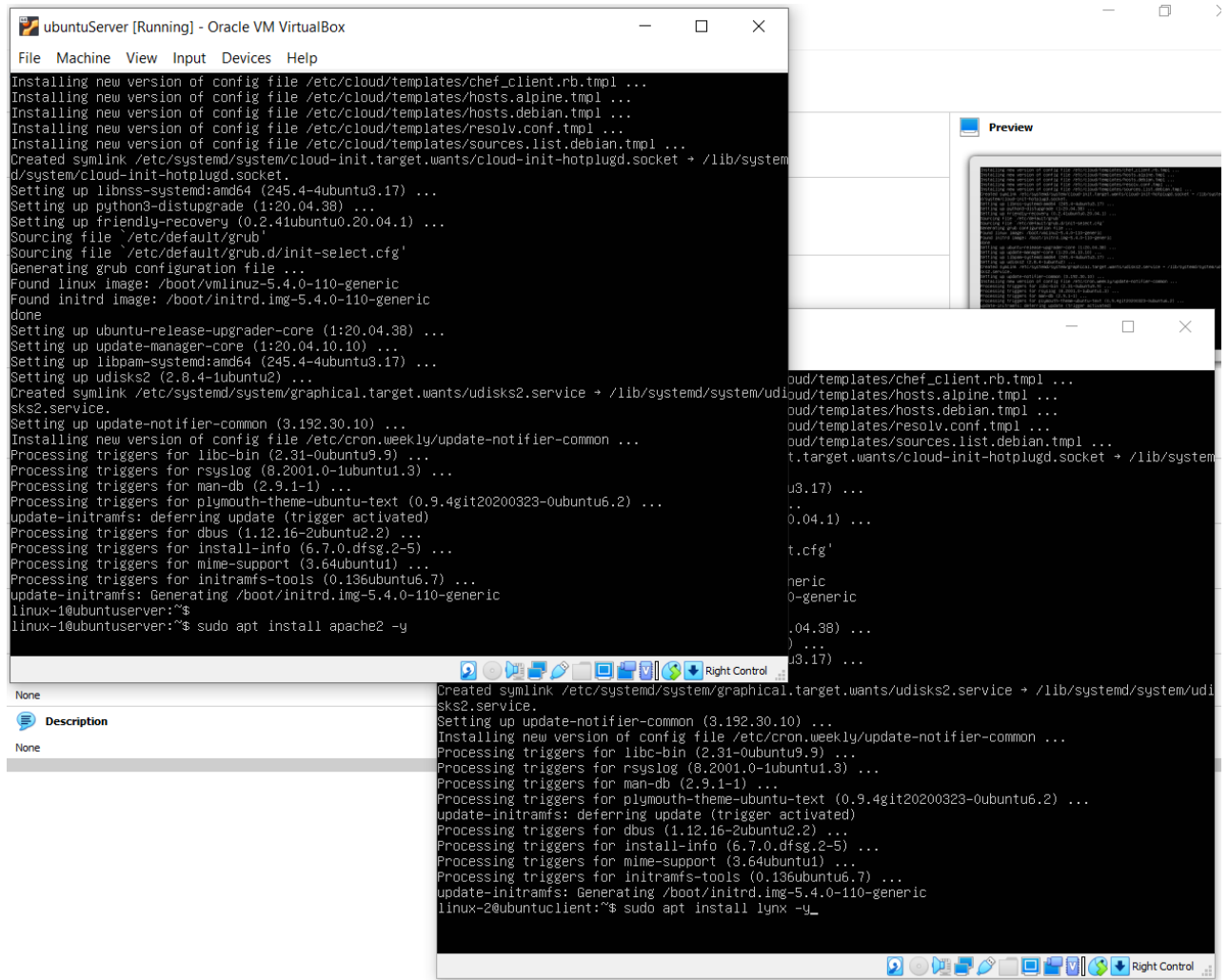
linux-2@ubuntuclient:~$ sudo apt update
[sudo] password for linux-2:
Hit:1 http://it.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://it.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://it.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://it.archive.ubuntu.com/ubuntu focal-security InRelease
Get:5 http://it.archive.ubuntu.com/ubuntu focal/main Translation-en_GB [485 kB]
Get:6 http://it.archive.ubuntu.com/ubuntu focal/restricted Translation-en_GB [3,860 B]
Get:7 http://it.archive.ubuntu.com/ubuntu focal/universe Translation-en_GB [319 kB]
Get:8 http://it.archive.ubuntu.com/ubuntu focal/multiverse Translation-en_GB [105 kB]
Fetched 913 kB in 1s (1,303 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
89 packages can be upgraded. Run 'apt list --upgradable' to see them.
linux-2@ubuntuclient:~$ sudo apt upgrade
```

Next step is the installation of the web server in Ubuntu Server and a Lynx web browser in Ubuntu Client, using the commands:

- Sudo apt install apache2 -y – for Ubuntu Server
- Sudo apt install lynx -y – for Ubuntu Client

As showing in the figure bellow.

² Update and Upgrade of Ubuntu VM's.



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Next step is the IP configuration of both machines. By using the command – `sudo ifconfig enp0s3 192.168.56.50 netmask 255.255.255.0` - is possible to get Ubuntu Server configured.

³ Installation of Web Server and Web Browser in VM's.

```
linux-1@ubuntuServer:~$ sudo ifconfig enp0s3 192.168.56.50 netmask 255.255.255.0
linux-1@ubuntuServer:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.50 netmask 255.255.255.0 broadcast 192.168.56.255
    inet6 fe80::a00:27ff:feb6:2c08 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:b6:2c:08 txqueuelen 1000 (Ethernet)
    RX packets 193 bytes 44604 (44.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 153 bytes 44614 (44.6 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

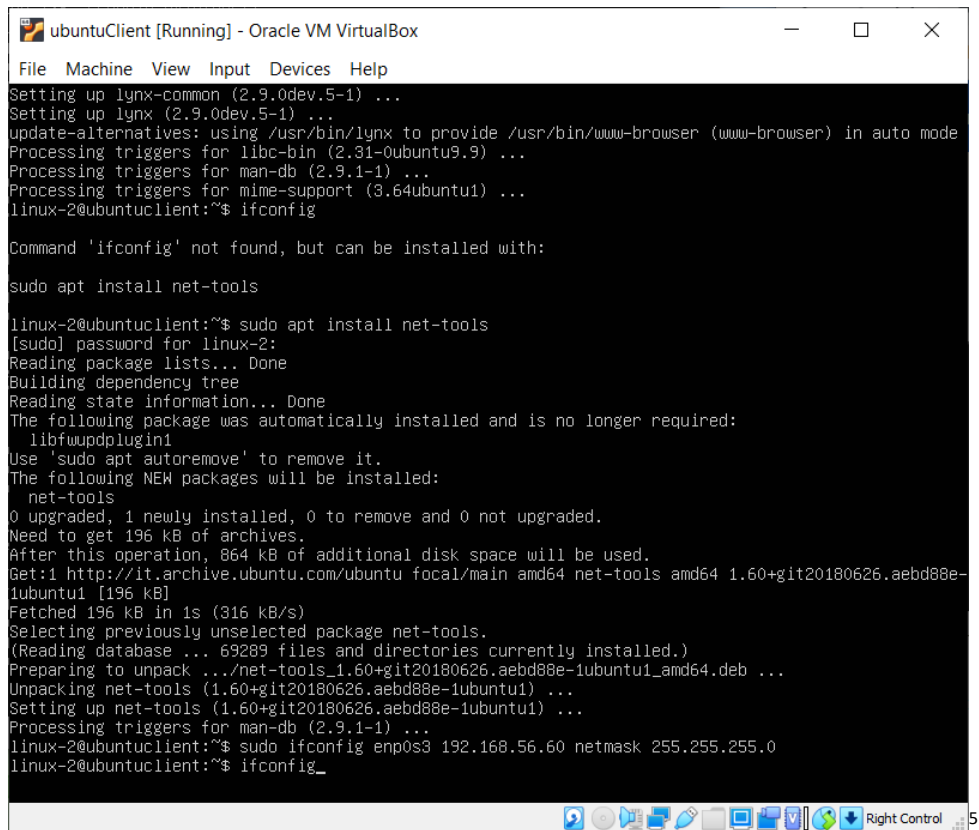
enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
    inet6 fe80::a00:27ff:fea2:4faf prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:a2:4f:af txqueuelen 1000 (Ethernet)
    RX packets 49378 bytes 73842266 (73.8 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 4579 bytes 313501 (313.5 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 150 bytes 13420 (13.4 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 150 bytes 13420 (13.4 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

linux-1@ubuntuServer:~$
```

Using the same command – `sudo ifconfig enp0s3 192.168.56.60 netmask 255.255.255.0` - is possible to get Ubuntu Client configured.

⁴ Configuring IP address Ubuntu Server.



```
ubuntuClient [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Setting up lynx-common (2.9.0dev.5-1) ...
Setting up lynx (2.9.0dev.5-1) ...
update-alternatives: using /usr/bin/lynx to provide /usr/bin/www-browser (www-browser) in auto mode
Processing triggers for libc-bin (2.31-0ubuntu9.9) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for mime-support (3.64ubuntu1) ...
linux-2@ubuntuclient:~$ ifconfig

Command 'ifconfig' not found, but can be installed with:

sudo apt install net-tools

linux-2@ubuntuclient:~$ sudo apt install net-tools
[sudo] password for linux-2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  libfwpdpplugin1
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 196 kB of archives.
After this operation, 864 kB of additional disk space will be used.
Get:1 http://it.archive.ubuntu.com/ubuntu focal/main amd64 net-tools amd64 1.60+git20180626.aebd88e-1ubuntu1 [196 kB]
Fetched 196 kB in 1s (316 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 69289 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20180626.aebd88e-1ubuntu1_amd64.deb ...
Unpacking net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Setting up net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
linux-2@ubuntuclient:~$ sudo ifconfig enp0s3 192.168.56.60 netmask 255.255.255.0
linux-2@ubuntuclient:~$ ifconfig_
```

The command `ifconfig` by itself shows the configured `enp0s3`, as showed above in figure 4.

Next step is to check the connection of Ubuntu Server and Ubuntu Client if they are going to ping each other.

⁵ Configuring IP address Ubuntu Client.

```
ubuntuServer [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

inet6 fe80::a00:27ff:feb6:2c08 prefixlen 64 scopeid 0x20<link>
ether 08:00:27:b6:2c:08 txqueuelen 1000 (Ethernet)
RX packets 193 bytes 44604 (44.6 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 153 bytes 44614 (44.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
inet6 fe80::a00:27ff:feb6:2c08 prefixlen 64 scopeid 0x20<link>
ether 08:00:27:b6:2c:08 txqueuelen 1000 (Ethernet)
RX packets 49378 bytes 73842266 (73.8 MB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 4579 bytes 313501 (313.5 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 150 bytes 13420 (13.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 150 bytes 13420 (13.4 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

linux-1@ubuntuserver:~$ ping 192.168.56.60
PING 192.168.56.60 (192.168.56.60) 56(84) bytes of data:
64 bytes from 192.168.56.60: icmp_seq=1 ttl=64 time=1.21 ms
64 bytes from 192.168.56.60: icmp_seq=2 ttl=64 time=0.81 ms
64 bytes from 192.168.56.60: icmp_seq=3 ttl=64 time=0.81 ms
64 bytes from 192.168.56.60: icmp_seq=4 ttl=64 time=0.81 ms
64 bytes from 192.168.56.60: icmp_seq=5 ttl=64 time=0.81 ms
--- 192.168.56.60 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time
rtt min/avg/max/mdev = 0.815/0.938/1.290/0.177 ms
linux-1@ubuntuserver:~$ _

ubuntuClient [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

inet6 fe80::a00:27ff:fe96:83fa prefixlen 64 scopeid 0x20<link>
ether 08:00:27:96:83:fa txqueuelen 1000 (Ethernet)
RX packets 122 bytes 32100 (32.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 125 bytes 33930 (33.9 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

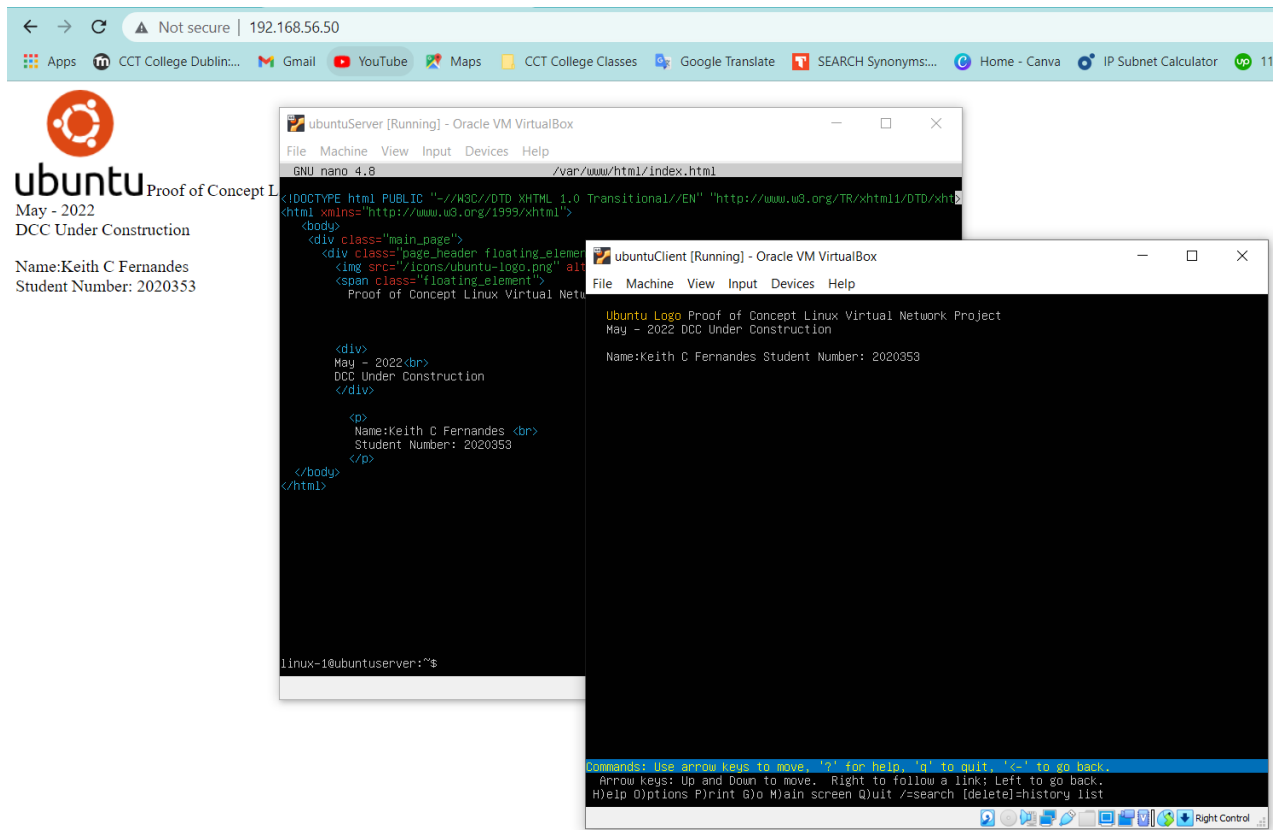
enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
inet6 fe80::a00:27ff:fe96:83fa prefixlen 64 scopeid 0x20<link>
ether 08:00:27:96:83:fa txqueuelen 1000 (Ethernet)
RX packets 49214 bytes 73538368 (73.5 MB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 4027 bytes 275571 (275.5 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 140 bytes 12256 (12.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 140 bytes 12256 (12.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

linux-2@ubuntucient:~$ ping 192.168.56.50
PING 192.168.56.50 (192.168.56.50) 56(84) bytes of data:
64 bytes from 192.168.56.50: icmp_seq=1 ttl=64 time=0.618 ms
64 bytes from 192.168.56.50: icmp_seq=2 ttl=64 time=0.838 ms
64 bytes from 192.168.56.50: icmp_seq=3 ttl=64 time=0.852 ms
64 bytes from 192.168.56.50: icmp_seq=4 ttl=64 time=0.845 ms
64 bytes from 192.168.56.50: icmp_seq=5 ttl=64 time=0.873 ms
--- 192.168.56.50 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4010ms
rtt min/avg/max/mdev = 0.618/0.805/0.873/0.094 ms
linux-2@ubuntucient:~$ _
```

As showed above, they could ping each other. Bellow it is showing by using command – `sudo nano /var/www/html/index.html` - the modified web page from Ubuntu Server, the webpage accessed by its IP and the access through Ubuntu Client – by typing `lynx 192.168.56.50` which is the Ubuntu Server IP.

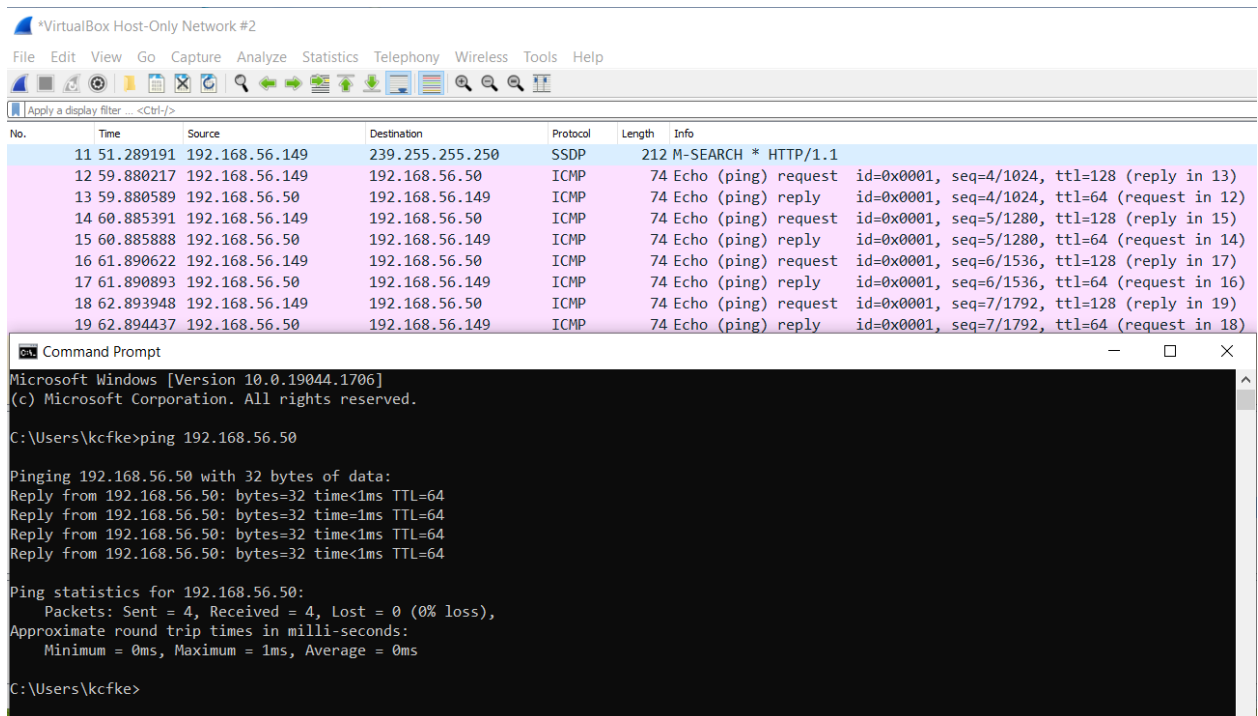
⁶ VM's Server and Client pingging each other.



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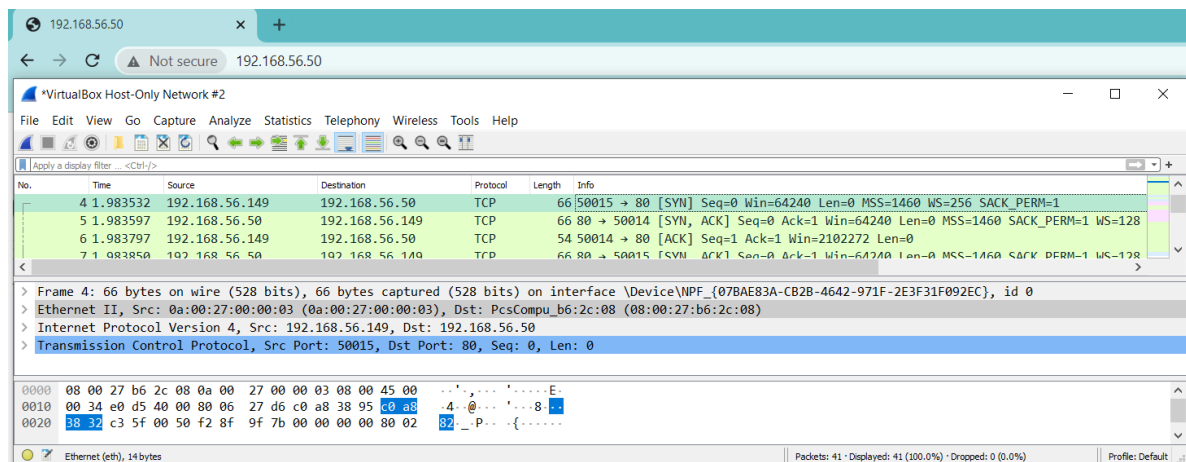
In Wireshark it is possible to see Ubuntu Server pinging the host computer, as shown in the figure bellow.

⁷ Accessing Apache home page from Web Browser, Ubuntu Client, and how was modified.



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As well as checking the tree-way handshake by going to Wireshark and opening a web browser of the Ubuntu Server.



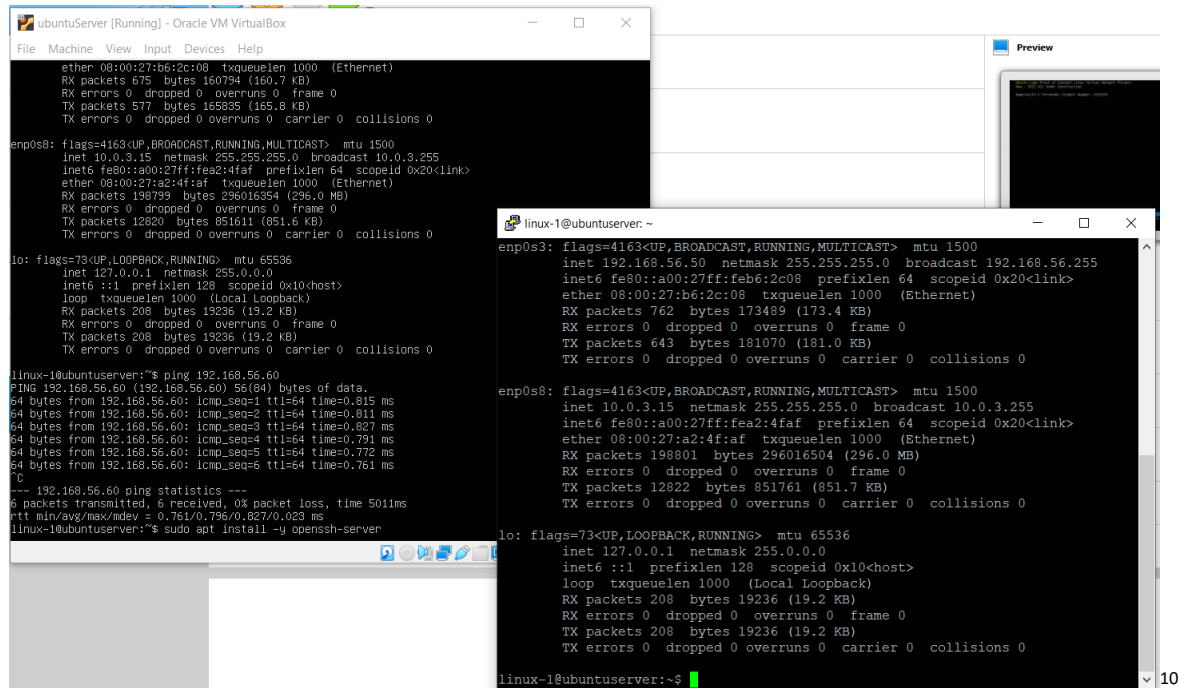
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⁸ Wireshark showing VM and host pinging.

⁹ Three-way handshake.

OpenSSH – Ubuntu Server

Providing a secure channel over an unsecured network, the OpenSSH is a suite of secure networking utilities based on the Secure Shell (SSH) in a client-server architecture.



```
ubuntuServer [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

ether 08:00:27:b6:2c:08 txqueuelen 1000 (Ethernet)
RX packets 675 bytes 160784 (160.7 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 577 bytes 165835 (165.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
inet6 fe80::a00:27ff:fea2:4faf prefixlen 64 scopeid 0x20<link>
ether 08:00:27:a2:4f:af txqueuelen 1000 (Ethernet)
RX packets 198799 bytes 296016354 (296.0 MB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 12820 bytes 851611 (851.6 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 208 bytes 19236 (19.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 208 bytes 19236 (19.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

linux-1@ubuntuServer:~$ ping 192.168.56.60
PING 192.168.56.60 (192.168.56.60) 56(84) bytes of data:
64 bytes from 192.168.56.60: icmp_seq=1 ttl=64 time=0.815 ms
64 bytes from 192.168.56.60: icmp_seq=2 ttl=64 time=0.811 ms
64 bytes from 192.168.56.60: icmp_seq=3 ttl=64 time=0.827 ms
64 bytes from 192.168.56.60: icmp_seq=4 ttl=64 time=0.791 ms
64 bytes from 192.168.56.60: icmp_seq=5 ttl=64 time=0.772 ms
64 bytes from 192.168.56.60: icmp_seq=6 ttl=64 time=0.761 ms
^C
--- 192.168.56.60 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 501ms
rtt min/avg/max/ndev = 0.761/0.796/0.827/0.023 ms
linux-1@ubuntuServer:~$ sudo apt install -y openssh-server
```

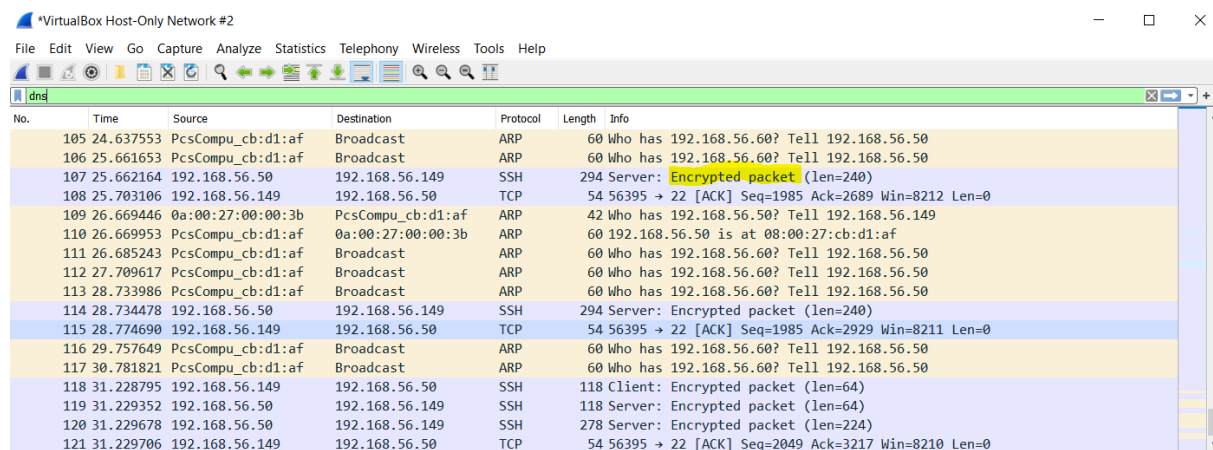
```
linux-1@ubuntuServer:~$
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.56.50 netmask 255.255.255.0 broadcast 192.168.56.255
inet6 fe80::a00:27ff:feb6:2c08 prefixlen 64 scopeid 0x20<link>
ether 08:00:27:b6:2c:08 txqueuelen 1000 (Ethernet)
RX packets 762 bytes 173489 (173.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 643 bytes 181070 (181.0 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
inet6 fe80::a00:27ff:fea2:4faf prefixlen 64 scopeid 0x20<link>
ether 08:00:27:a2:4f:af txqueuelen 1000 (Ethernet)
RX packets 198801 bytes 296016504 (296.0 MB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 12822 bytes 851761 (851.7 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 208 bytes 19236 (19.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 208 bytes 19236 (19.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

linux-1@ubuntuServer:~$
```

Using the command - `sudo apt install -y openssh-server` - it is possible to install the SSH to receive connections. Below it is showing the encryption between VM and host.



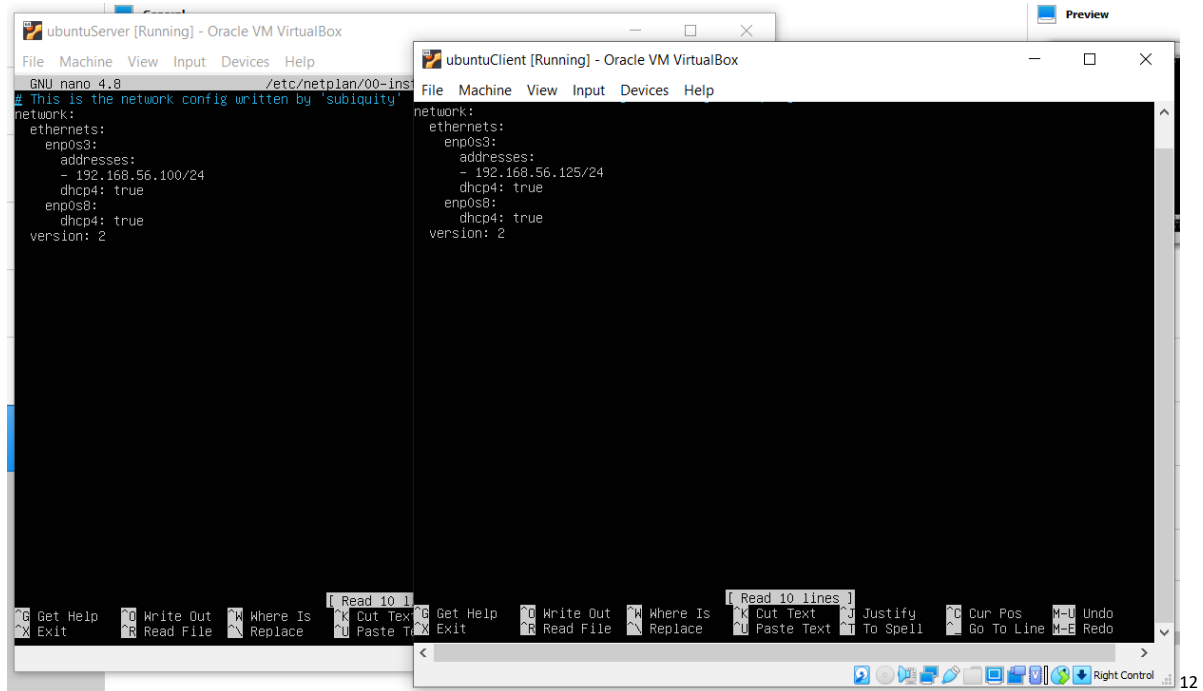
No.	Time	Source	Destination	Protocol	Length	Info
105	24.637553	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
106	25.661653	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
107	25.662164	192.168.56.50	192.168.56.149	SSH	294	Server: Encrypted packet (len=240)
108	25.703106	192.168.56.149	192.168.56.50	TCP	54	56395 → 22 [ACK] Seq=1985 Ack=2689 Win=8212 Len=0
109	26.669446	0a:00:27:00:00:3b	PcsCompu_cb:d1:af	ARP	42	Who has 192.168.56.50? Tell 192.168.56.149
110	26.669953	PcsCompu_cb:d1:af	0a:00:27:00:00:3b	ARP	60	192.168.56.50 is at 08:00:27:cb:d1:af
111	26.685243	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
112	27.709617	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
113	28.733986	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
114	28.734478	192.168.56.50	192.168.56.149	SSH	294	Server: Encrypted packet (len=240)
115	28.774690	192.168.56.149	192.168.56.50	TCP	54	56395 → 22 [ACK] Seq=1985 Ack=2929 Win=8211 Len=0
116	29.757649	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
117	30.781821	PcsCompu_cb:d1:af	Broadcast	ARP	60	Who has 192.168.56.60? Tell 192.168.56.50
118	31.228795	192.168.56.149	192.168.56.50	SSH	118	Client: Encrypted packet (len=64)
119	31.229352	192.168.56.50	192.168.56.149	SSH	118	Server: Encrypted packet (len=64)
120	31.229678	192.168.56.50	192.168.56.149	SSH	278	Server: Encrypted packet (len=224)
121	31.229706	192.168.56.149	192.168.56.50	TCP	54	56395 → 22 [ACK] Seq=2049 Ack=3217 Win=8210 Len=0

¹⁰ SSH installation and Putty.

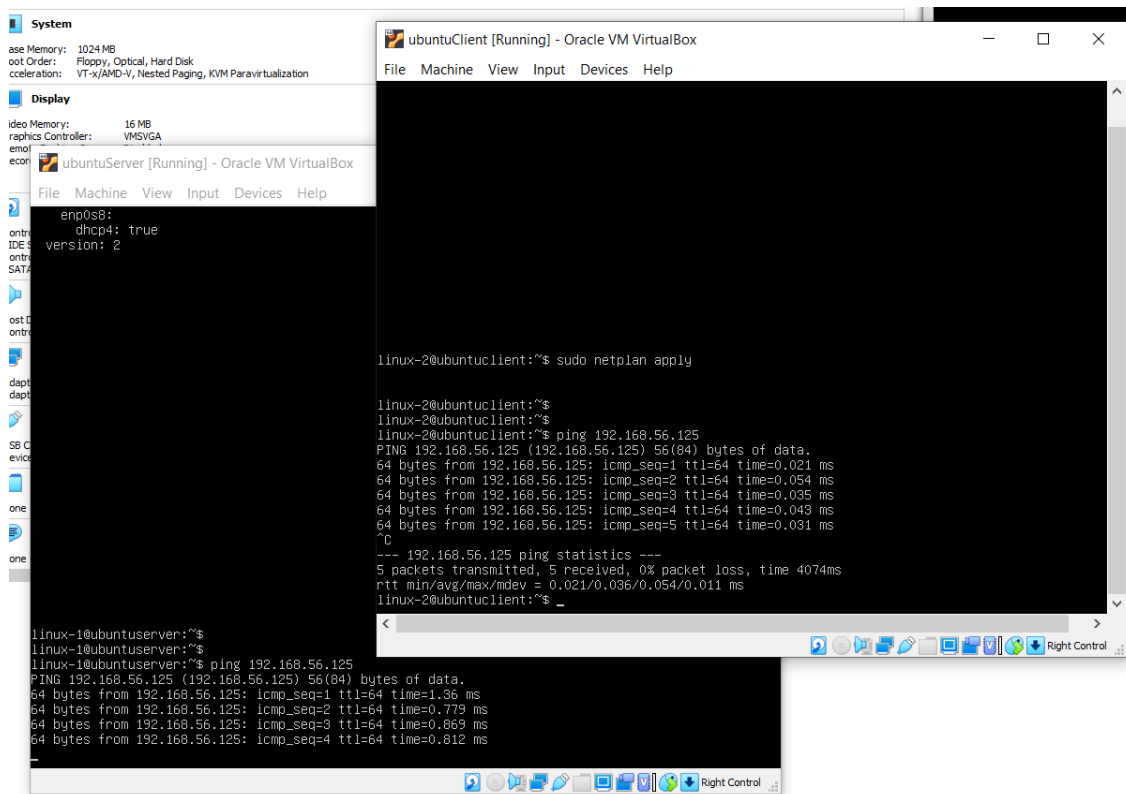
¹¹ Encryption

IP Addresses and Hostname Management

The change of ephemeral IP to static, where IP addresses are ephemeral, means that they are bound to the lifetime of the resource they are attached to. Once the resource is destroyed even stopped, the IP addresses is freed and will be assigned eventually to another resource.



¹² Evidence of the modification through Netplan.



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To change the IP through Netplan the following commands were used:

- `sudo netplan generate`
- `ls /etc/netplan/`
- `cat /etc/netplan/*.yaml`
- `sudo nano /etc/netplan/00-install-config.yaml`
- `sudo netplan apply`

The first command was to generate the renderer configuration file, then the second to check in the system if it was created, the third to check the content of it, the fourth was to open and modify it, and the last to apply the modifications. Other commands such as “CTRL+X” to exit, and use “Y” to save it, were used as well.

To rename the hostname the command is as in the following example:

- `Sudo hostname web-server-353`

¹³VM's pinging with new IP addresses.

```
ubuntuClient [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
linux-2@ubuntuclient:~$ hostname
ubuntuclient
linux-2@ubuntuclient:~$ sudo hostname web-client-353
[sudo] password for linux-2:
linux-2@ubuntuclient:~$ hostname
web-client-353
linux-2@ubuntuclient:~$

ubuntuServer [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
linux-1@ubuntuserver:~$ hostname
ubuntuserver
linux-1@ubuntuserver:~$ sudo hostname web-server-353
linux-1@ubuntuserver:~$ hostname
web-server-353
linux-1@ubuntuserver:~$
```

As well as in the Ubuntu Client as in the figure above.

¹⁴ Renaming the hostnames.

Firewall

The firewall purpose is to allow non-threatening traffic keeping dangerous traffic out. By enabling the firewall in both virtual machines Ubuntu Server and Client the access was denied.

```
ubuntuServer [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

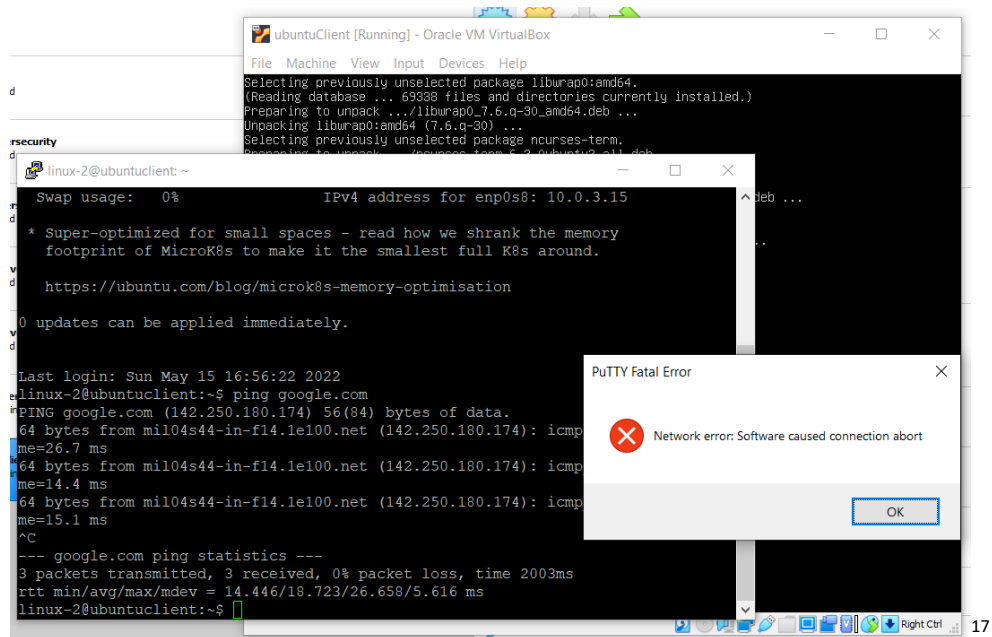
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.50 netmask 255.255.255.0 broadcast 192.168.56.255
    inet6 fe80::a00:27ff:feb6:2c08 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:b6:2c:08 txqueuelen 1000 (Ethernet)
    RX packets 34 bytes 8540 (8.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 36 bytes 8512 (8.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
    inet6 fe80::a00:27ff:fea2:4faf prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:a2:4f:af txqueuelen 1000 (Ethernet)
    RX packets 220 bytes 250237 (250.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 44 bytes 4400 (4.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

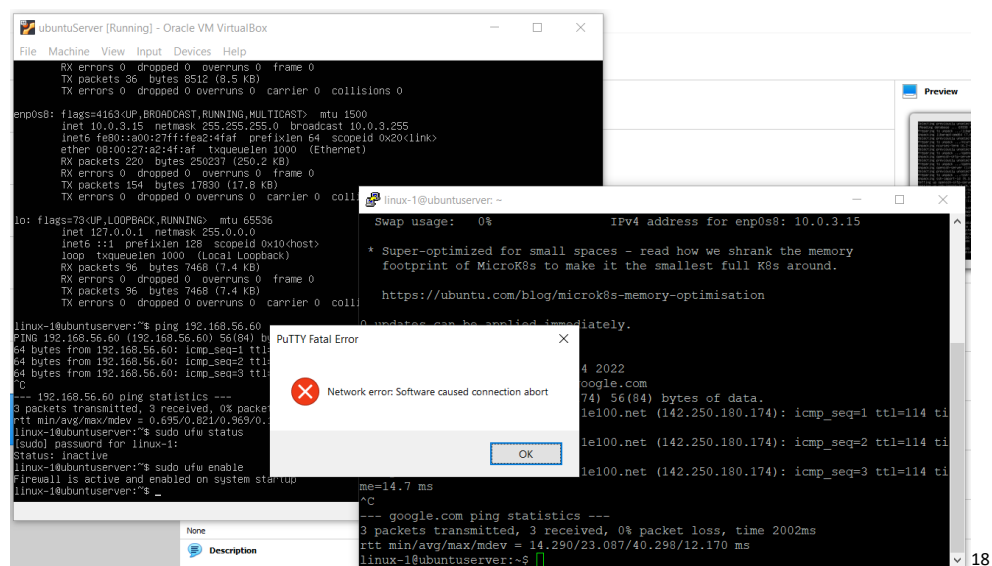
linux-1@ubuntuServer: ~
Swap usage: 0% IPv4 address for enp0s8: 10.0.3.15
* Super-optimized for small spaces - read how we shrank the memory
  footprint of MicroK8s to make it the smallest full K8s around.
https://ubuntu.com/blog/microk8s-memory-optimisation

0 updates can be applied immediately.
PING 192.168.56.50: 64 bytes from 192.168.56.50: icmp_seq=1 ttl=64 time=0.000 ms
64 bytes from 192.168.56.50: icmp_seq=2 ttl=64 time=0.000 ms
64 bytes from 192.168.56.50: icmp_seq=3 ttl=64 time=0.000 ms
^C
--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 14.290/23.087/40.298/12.170 ms
linux-1@ubuntuServer:~$
```

¹⁵ Accessing Ubuntu Server through Putty.



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Access by SSH deny and allow by firewall in server and client machines.

¹⁷ Denied access Ubuntu Server through Putty

¹⁸ Denied access Ubuntu Client through Putty

```

ubuntuServer [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
--- google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time
rtt min/avg/max/mdev = 14.108/17.091/26.302/4.625 ms
linux-1@ubuntuserver:~$ sudo ufw status
Status: active

To Action From
---
80/tcp DENY Anywhere
22/tcp DENY Anywhere
80/tcp (v6) DENY Anywhere (v6)
22/tcp (v6) DENY Anywhere (v6)
80/tcp DENY OUT Anywhere
22/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)
22/tcp (v6) DENY OUT Anywhere (v6)
linux-1@ubuntuserver:~$
linux-1@ubuntuserver:~$
linux-1@ubuntuserver:~$
linux-1@ubuntuserver:~$

ubuntuClient [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Status: active

To Action From
---
80/tcp DENY Anywhere
22/tcp DENY Anywhere
80/tcp (v6) DENY Anywhere (v6)
22/tcp (v6) DENY Anywhere (v6)
80/tcp DENY OUT Anywhere
22/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)
22/tcp (v6) DENY OUT Anywhere (v6)
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$

```

The commands to allow and deny are:

- Sudo ufw deny out ssh
- Sudo ufw deny ssh
- Sudo ufw deny out http
- Sudo ufw deny http

```

ubuntuServer [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
linux-1@ubuntuserver:~$ sudo ufw allow ssh
Rule updated
Rule updated (v6)
linux-1@ubuntuserver:~$ sudo ufw allow http
Rule updated
Rule updated (v6)
linux-1@ubuntuserver:~$ sudo ufw status
Status: active

To Action From
---
80/tcp ALLOW Anywhere
22/tcp ALLOW Anywhere
80/tcp (v6) ALLOW Anywhere (v6)
22/tcp (v6) ALLOW Anywhere (v6)
80/tcp DENY OUT Anywhere
22/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)
22/tcp (v6) DENY OUT Anywhere (v6)
linux-1@ubuntuserver:~$
linux-1@ubuntuserver:~$
linux-1@ubuntuserver:~$
linux-1@ubuntuserver:~$

ubuntuClient [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
linux-2@ubuntucient:~$ sudo ufw allow ssh
Rule updated
Rule updated (v6)
linux-2@ubuntucient:~$ sudo ufw allow http
Rule updated
Rule updated (v6)
linux-2@ubuntucient:~$ sudo ufw status
Status: active

To Action From
---
80/tcp ALLOW Anywhere
22/tcp ALLOW Anywhere
80/tcp (v6) ALLOW Anywhere (v6)
22/tcp (v6) ALLOW Anywhere (v6)
80/tcp DENY OUT Anywhere
22/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)
22/tcp (v6) DENY OUT Anywhere (v6)
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$
linux-2@ubuntucient:~$

```

¹⁹ SSH and HTTP denied.

²⁰ SSH and HTTP allowed.

Samba

Working with Samba possibilists file and print services between clients across various operating system, Samba is an open-source implementation of Server Message Block (SMB) and Common Internet File System (CIFS) protocols.

Installing Samba by using the following commands:

- `Sudo apt -y update`
- `Sudo apt -y install samba`
- `Whereis samba ----` (this command it is just to check if was installed)
- `mkdir /home/linux-1/sambashare/`
- `sudo nano /etc/samba/smb.conf ----`(to add new directory as a share)
- `[sambashare]`
 - `comment = Samba on Ubuntu`
 - `path = /home/username/sambashare`
 - `read only = no`
 - `browsable = yes`
- `sudo service smbd restart`
- `sudo ufw allow samba`
- `sudo smbpasswd -a linux-1`

```

; browseable = no
; create mask = 0600
; directory mask = 0700

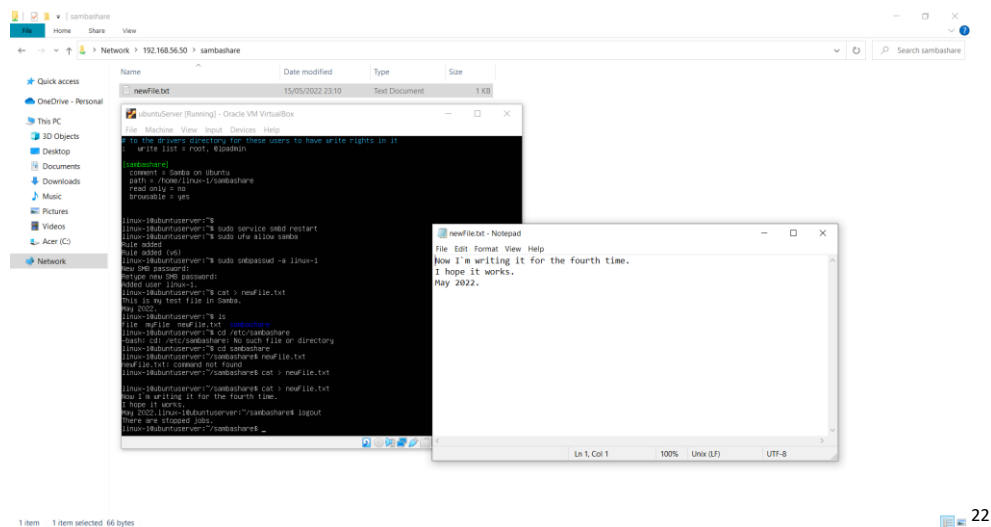
[printers]
comment = All Printers
browseable = no
path = /var/spool/samba
printable = yes
guest ok = no
read only = yes
create mask = 0700

# Windows clients look for this share name as a source of downloadable
# printer drivers
[printers]
comment = Printer Drivers
path = /var/lib/samba/printers
browseable = yes
read only = yes
guest ok = no
# Uncomment to allow remote administration of Windows print drivers.
# You may need to replace 'lpadmin' with the name of the group your
# admin users are members of.
# Please note that you also need to set appropriate Unix permissions
# to the drivers directory for these users to have write rights in it
; write list = root, @lpadmin

[sambashare]
comment = Samba on Ubuntu
path = /home/linux-1/sambashare
read only = no
browseable = yes

linux-1@ubuntuServer:~$
linux-1@ubuntuServer:~$ sudo service smbd restart_

```



To get access to the file from my host the command used was [\\ip-address\sambashare](#) .

²¹ Adding new directory as a share.

²² Accessing Samba File.

References

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