

# College of Computer Training (CCT)

## Assignment Cover Page

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<b>Module Title:</b>	Operating Systems
<b>Assignment Title:</b>	Proof of Concept Linux Virtual Network Project
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<b>Assignment Due Date:</b>	8 <sup>th</sup> May 2021, 23.55

**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 plagiarised 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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## ‘Consult & Connect Ltd’

A networking consultancy services for companies located in Ireland. Bellow you see step by step of the project of a virtualized Linux Network infrastructure based on a new third level college’s network – the name of the college is Dublin City College (DCC).

```
Ubuntu 20.04.2 LTS linux-1 tty1
linux-1 login: ubuntuuser
Password:
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-72-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Mon 3 May 12:49:39 UTC 2021

System load:  0.0               Processes:    91
Usage of /:   43.3% of 8.79GB   Users logged in: 0
Memory usage: 17%              IPv4 address for enp0s3: 10.0.2.15
Swap usage:  0%                IPv4 address for enp0s8: 10.0.3.15

48 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Last login: Mon May 3 11:30:06 UTC 2021 on tty1
ubuntuuser@linux-1:~$ ping www.google.com
PING www.google.com (216.58.209.100) 56(84) bytes of data:
64 bytes from dub08s03-in-f4.1e100.net (216.58.209.100): icmp_seq=1 ttl=115 time=20.7 ms
64 bytes from dub08s03-in-f4.1e100.net (216.58.209.100): icmp_seq=2 ttl=115 time=22.0 ms
64 bytes from dub08s03-in-f4.1e100.net (216.58.209.100): icmp_seq=3 ttl=115 time=23.6 ms
^C
--- www.google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 20.658/22.092/23.614/1.208 ms
ubuntuuser@linux-1:~$ sudo apt update
```

```
>% [Working] [ 1920.865253] e1000 0000:00:03:0 enp0s3: Detected Tx Unit Hang
[ 1920.865253] Tx Queue <0>
[ 1920.865253] TDH <1f>
[ 1920.865253] TDT <23>
[ 1920.865253] next_to_use <23>
[ 1920.865253] next_to_clean <1f>
[ 1920.865253] buffer_info[next_to_clean]
[ 1920.865253] time_stamp <1000629a8>
[ 1920.865253] next_to_watch <20>
[ 1920.865253] jiffies <100062eb8>
[ 1920.865253] next_to_watch.status <0>
>% [Working] [ 1922.881545] e1000 0000:00:03:0 enp0s3: Detected Tx Unit Hang
[ 1922.881545] Tx Queue <0>
[ 1922.881545] TDH <1f>
[ 1922.881545] TDT <23>
[ 1922.881545] next_to_use <23>
[ 1922.881545] next_to_clean <1f>
[ 1922.881545] buffer_info[next_to_clean]
[ 1922.881545] time_stamp <1000629a8>
[ 1922.881545] next_to_watch <20>
[ 1922.881545] jiffies <1000630b0>
[ 1922.881545] next_to_watch.status <0>
>% [Working] [ 1924.228085] e1000 0000:00:03:0 enp0s3: Reset adapter
Hit:1 http://ie.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://ie.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://ie.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:4 http://ie.archive.ubuntu.com/ubuntu focal-security InRelease [109 kB]
Get:5 http://ie.archive.ubuntu.com/ubuntu focal/main Translation-en_GB [485 kB]
Get:6 http://ie.archive.ubuntu.com/ubuntu focal/restricted Translation-en_GB [3,860 B]
Get:7 http://ie.archive.ubuntu.com/ubuntu focal/universe Translation-en_GB [319 kB]
Get:8 http://ie.archive.ubuntu.com/ubuntu focal/multiverse Translation-en_GB [105 kB]
Fetched 1,236 kB in 13s (94.1 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
51 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntuuser@linux-1:~$ sudo apt upgrade
```

Obtain Linux updates - Update and upgrade the server system.

```
[ 471.484359] next_to_watch.status <0>
[ 473.500848] e1000 0000:00:03:0 enp0s3: Detected Tx Unit Hang
[ 473.500848] Tx Queue <0>
[ 473.500848] TDH <26>
[ 473.500848] TDT <27>
[ 473.500848] next_to_use <27>
[ 473.500848] next_to_clean <26>
[ 473.500848] buffer_info[next_to_clean]
[ 473.500848] time_stamp <10000a622>
[ 473.500848] next_to_watch <26>
[ 473.500848] jiffies <10000a950>
[ 473.500848] next_to_watch.status <0>
[ 475.516367] e1000 0000:00:03:0 enp0s3: Detected Tx Unit Hang
[ 475.516367] Tx Queue <0>
[ 475.516367] TDH <26>
[ 475.516367] TDT <27>
[ 475.516367] next_to_use <27>
[ 475.516367] next_to_clean <26>
[ 475.516367] buffer_info[next_to_clean]
[ 475.516367] time_stamp <10000a622>
[ 475.516367] next_to_watch <26>
[ 475.516367] jiffies <10000ab48>
[ 475.516367] next_to_watch.status <0>
[ 477.532528] e1000 0000:00:03:0 enp0s3: Detected Tx Unit Hang
[ 477.532528] Tx Queue <0>
[ 477.532528] TDH <26>
[ 477.532528] TDT <27>
[ 477.532528] next_to_use <27>
[ 477.532528] next_to_clean <26>
[ 477.532528] buffer_info[next_to_clean]
[ 477.532528] time_stamp <10000a622>
[ 477.532528] next_to_watch <26>
[ 477.532528] jiffies <10000ad40>
[ 477.532528] next_to_watch.status <0>
[ 479.070882] e1000 0000:00:03:0 enp0s3: Reset adapter

ubuntuclient@linux-2:~$ sudo apt update_
```

```
CA-Linux-2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
[ 475.516367] TDT <27>
[ 475.516367] next_to_use <27>
[ 475.516367] next_to_clean <26>
[ 475.516367] buffer_info[next_to_clean]
[ 475.516367] time_stamp <10000a622>
[ 475.516367] next_to_watch <26>
[ 475.516367] jiffies <10000ab48>
[ 475.516367] next_to_watch.status <0>
[ 477.532528] e1000 0000:00:03:0 enp0s3: Detected Tx Unit Hang
[ 477.532528] Tx Queue <0>
[ 477.532528] TDH <26>
[ 477.532528] TDT <27>
[ 477.532528] next_to_use <27>
[ 477.532528] next_to_clean <26>
[ 477.532528] buffer_info[next_to_clean]
[ 477.532528] time_stamp <10000a622>
[ 477.532528] next_to_watch <26>
[ 477.532528] jiffies <10000ad40>
[ 477.532528] next_to_watch.status <0>
[ 479.070882] e1000 0000:00:03:0 enp0s3: Reset adapter

ubuntuclient@linux-2:~$ sudo apt update
[sudo] password for ubuntuclient:
Hit:1 http://ie.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://ie.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://ie.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:4 http://ie.archive.ubuntu.com/ubuntu focal-security InRelease [109 kB]
Get:5 http://ie.archive.ubuntu.com/ubuntu focal/main Translation-en_GB [485 kB]
Get:6 http://ie.archive.ubuntu.com/ubuntu focal/restricted Translation-en_GB [3,860 B]
Get:7 http://ie.archive.ubuntu.com/ubuntu focal/universe Translation-en_GB [319 kB]
Get:8 http://ie.archive.ubuntu.com/ubuntu focal/multiverse Translation-en_GB [105 kB]
Fetched 1,236 kB in 1s (1,334 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
51 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntuclient@linux-2:~$ sudo apt upgrade
```

Obtain Linux updates - Update and upgrade the client system.

```
Setting up apache2 (2.4.41-4ubuntu3.1) ...
Enabling module mpm_event.
Enabling module authz_core.
Enabling module authz_host.
Enabling module authn_core.
Enabling module auth_basic.
Enabling module access_compat.
Enabling module authn_file.
Enabling module authz_user.
Enabling module alias.
Enabling module dir.
Enabling module autoindex.
Enabling module env.
Enabling module mime.
Enabling module negotiation.
Enabling module setenvif.
Enabling module filter.
Enabling module deflate.
Enabling module status.
Enabling module reqtimeout.
Enabling conf charset.
Enabling conf localized-error-pages.
Enabling conf other-vhosts-access-log.
Enabling conf security.
Enabling conf serve-cgi-bin.
Enabling site 000-default.
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/system/apache-htcacheclean.service.
Processing triggers for ufw (0.36-6) ...
Processing triggers for systemd (245.4-4ubuntu3.6) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
ubuntu@linux-1:~$ sudo apt install apache2 -y
```

```
Setting up friendly-recovery (0.2.41ubuntu0.20.04.1) ...
Sourcing file '/etc/default/grub'
Sourcing file '/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.4.0-72-generic
Found initrd image: /boot/initrd.img-5.4.0-72-generic
done
Setting up ubuntu-release-upgrader-core (1:20.04.32) ...
Setting up update-manager-core (1:20.04.10.6) ...
Setting up libpam-systemd:amd64 (245.4-4ubuntu3.6) ...
Setting up update-notifier-common (3.192.30.7) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for rsyslog (8.2001.0-1ubuntu1.1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for dbus (1.12.16-2ubuntu2.1) ...
Processing triggers for install-info (6.7.0.dfsg.2-5) ...
Processing triggers for initramfs-tools (0.136ubuntu6.4) ...
update-initramfs: Generating /boot/initrd.img-5.4.0-72-generic
ubuntu@linux-2:~$
ubuntu@linux-2:~$ sudo apt update
[sudo] password for ubuntu:
Hit:1 http://ie.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://ie.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://ie.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:4 http://ie.archive.ubuntu.com/ubuntu focal-security InRelease [109 kB]
Fetched 324 kB in 1s (299 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
All packages are up to date.
ubuntu@linux-2:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
ubuntu@linux-2:~$ sudo apt install lynx -y
```

Installing apache2 and lynx on the VM's.

```

link/ether 08:00:27:a6:0d:5b brd ff:ff:ff:ff:ff:ff
inet 10.0.3.15/24 brd 10.0.3.255 scope global dynamic enp0s8
    valid_lft 72934sec preferred_lft 72934sec
inet6 fe80::a00:27ff:fea6:d5b/64 scope link
    valid_lft forever preferred_lft forever
ubuntuuser@linux-1:~$ sudo ifconfig enp0s3 192.168.56.50 netmask 255.255.255.0
[sudo] password for ubuntuuser:
ubuntuuser@linux-1:~$ ifconfig
enp0s3: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.56.50 netmask 255.255.255.0 broadcast 192.168.56.255
    inet6 fe80::a00:27ff:fea6:bd52 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:68:bd:52 txqueuelen 1000 (Ethernet)
    RX packets 11 bytes 1945 (1.9 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 27 bytes 2740 (2.7 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:fea6:d5b prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:a6:0d:5b txqueuelen 1000 (Ethernet)
    RX packets 18552 bytes 25524720 (25.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 6898 bytes 441845 (441.8 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 154 bytes 13667 (13.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 154 bytes 13667 (13.6 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ubuntuuser@linux-1:~$

```

```

4 bytes from ig-in-f106.1e100.net (74.125.193.106): icmp_seq=3 ttl=108 time=7.79 ms
4 bytes from ig-in-f106.1e100.net (74.125.193.106): icmp_seq=4 ttl=108 time=7.68 ms
^C
-- www.google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3007ms
rtt min/avg/max/mdev = 7.681/7.869/8.050/0.144 ms
ubuntuclient@linux-2:~$ sudo ifconfig enp0s3 192.168.56.60 netmask 255.255.255.0
[sudo] password for ubuntuclient:
ubuntuclient@linux-2:~$ ifconfig
enp0s3: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 192.168.56.60 netmask 255.255.255.0 broadcast 192.168.56.255
    inet6 fe80::a00:27ff:fef8:84b8 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:f8:84:b8 txqueuelen 1000 (Ethernet)
    RX packets 15 bytes 2694 (2.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 29 bytes 2978 (2.9 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:feb1:6274 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:b1:62:74 txqueuelen 1000 (Ethernet)
    RX packets 17633 bytes 24244184 (24.2 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 5503 bytes 353981 (353.9 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 154 bytes 13503 (13.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 154 bytes 13503 (13.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ubuntuclient@linux-2:~$ _

```

IP's configured.

```

        inet6 fe80::a00:27ff:fe68:bd52 prefixlen 64 scopeid 0x20<link>
        ether 08:00:27:68:bd:52 txqueuelen 1000 (Ethernet)
        RX packets 14 bytes 5666 (5.6 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 16 bytes 2007 (2.0 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:fea6:d5b prefixlen 64 scopeid 0x20<link>
        ether 08:00:27:a6:0d:5b txqueuelen 1000 (Ethernet)
        RX packets 66548 bytes 99917516 (99.9 MB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 8255 bytes 526187 (526.1 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 128 bytes 10636 (10.6 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 128 bytes 10636 (10.6 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ubuntuuser@linux-1:~$ 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=6 ttl=64 time=0.766 ms
64 bytes from 192.168.56.60: icmp_seq=7 ttl=64 time=0.605 ms
64 bytes from 192.168.56.60: icmp_seq=8 ttl=64 time=0.732 ms
64 bytes from 192.168.56.60: icmp_seq=9 ttl=64 time=0.800 ms
64 bytes from 192.168.56.60: icmp_seq=10 ttl=64 time=0.761 ms
^C
--- 192.168.56.60 ping statistics ---
10 packets transmitted, 5 received, 50% packet loss, time 9114ms
rtt min/avg/max/mdev = 0.605/0.732/0.800/0.067 ms
ubuntuuser@linux-1:~$

```

```

        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 17 bytes 2077 (2.0 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

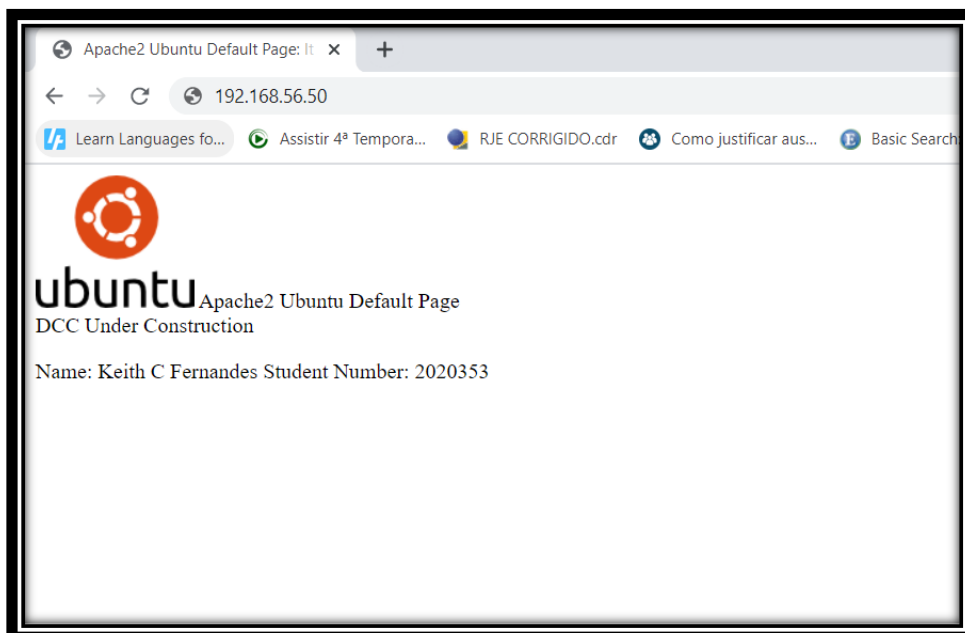
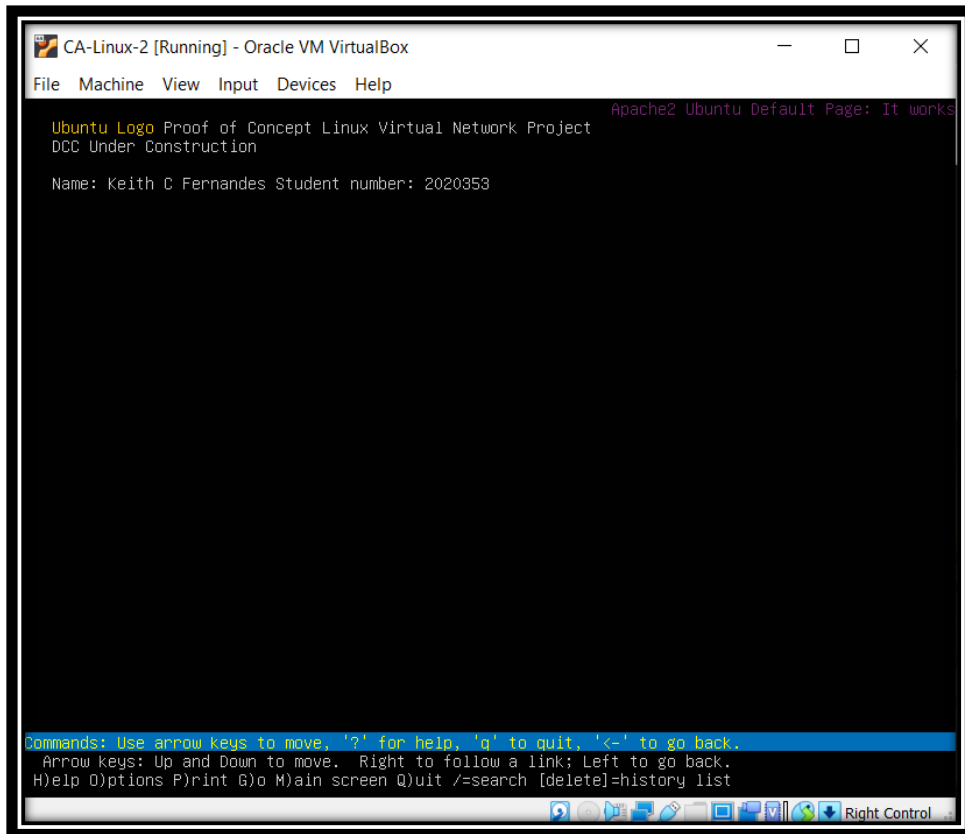
enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.3.15 netmask 255.255.255.0 broadcast 10.0.3.255
        inet6 fe80::a00:27ff:feb1:6274 prefixlen 64 scopeid 0x20<link>
        ether 08:00:27:b1:62:74 txqueuelen 1000 (Ethernet)
        RX packets 65999 bytes 99080365 (99.0 MB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 9155 bytes 578911 (578.9 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 120 bytes 9860 (9.8 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 120 bytes 9860 (9.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ubuntucient@linux-2:~$ 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=30 ttl=64 time=0.755 ms
64 bytes from 192.168.56.50: icmp_seq=31 ttl=64 time=0.857 ms
64 bytes from 192.168.56.50: icmp_seq=32 ttl=64 time=0.811 ms
64 bytes from 192.168.56.50: icmp_seq=33 ttl=64 time=0.733 ms
64 bytes from 192.168.56.50: icmp_seq=34 ttl=64 time=0.715 ms
64 bytes from 192.168.56.50: icmp_seq=35 ttl=64 time=0.673 ms
64 bytes from 192.168.56.50: icmp_seq=36 ttl=64 time=0.558 ms
64 bytes from 192.168.56.50: icmp_seq=37 ttl=64 time=0.771 ms
^C
--- 192.168.56.50 ping statistics ---
37 packets transmitted, 8 received, 78.3784% packet loss, time 36701ms
rtt min/avg/max/mdev = 0.558/0.734/0.857/0.085 ms
ubuntucient@linux-2:~$ _

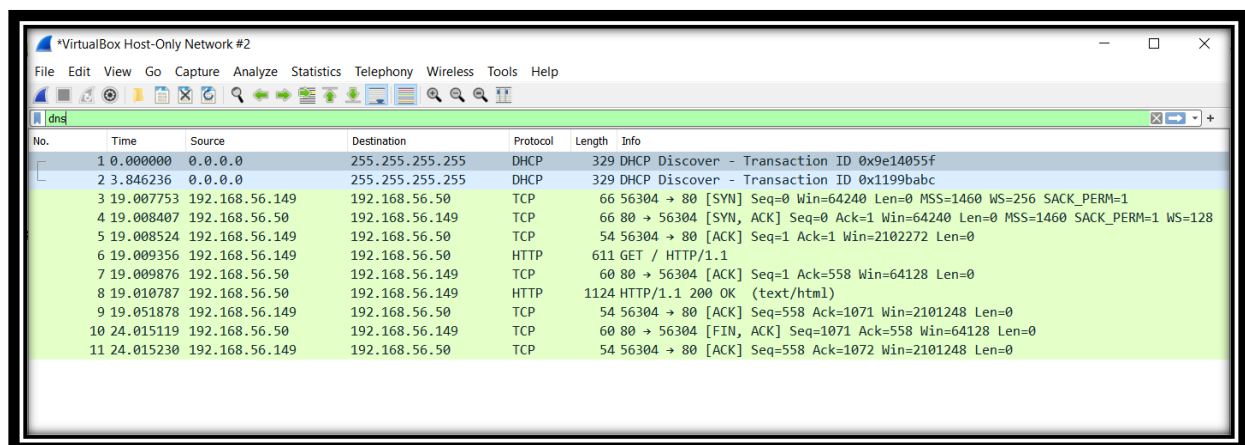
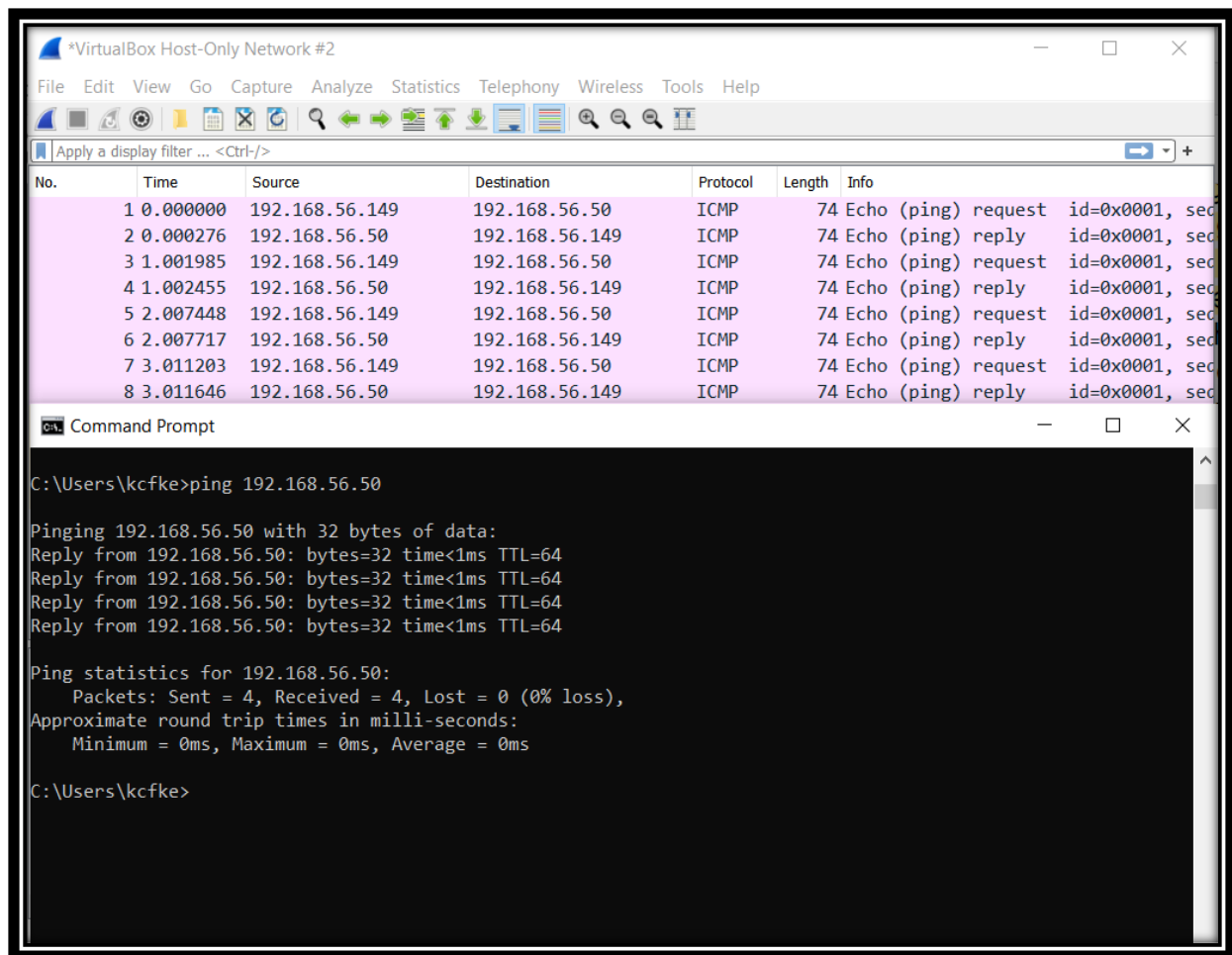
```

Virtual Machines pinging each other.



Accessing Apache website home page by Client machine and by browser.

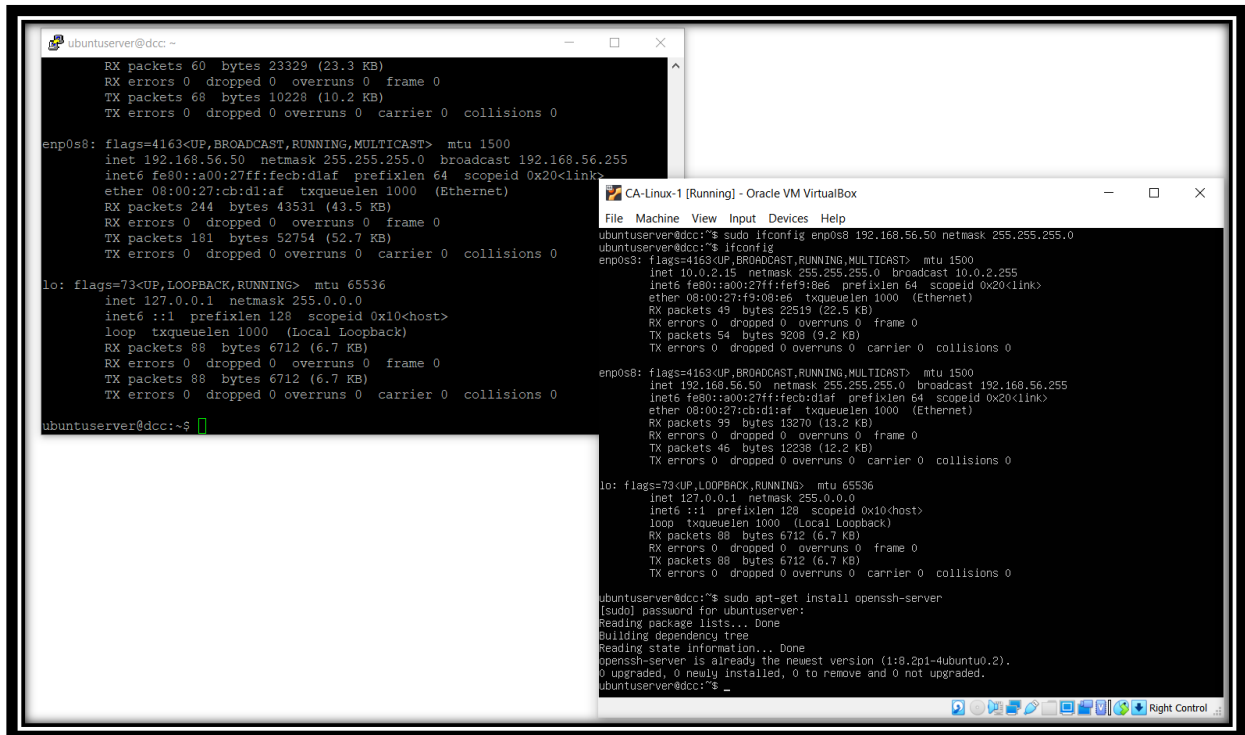




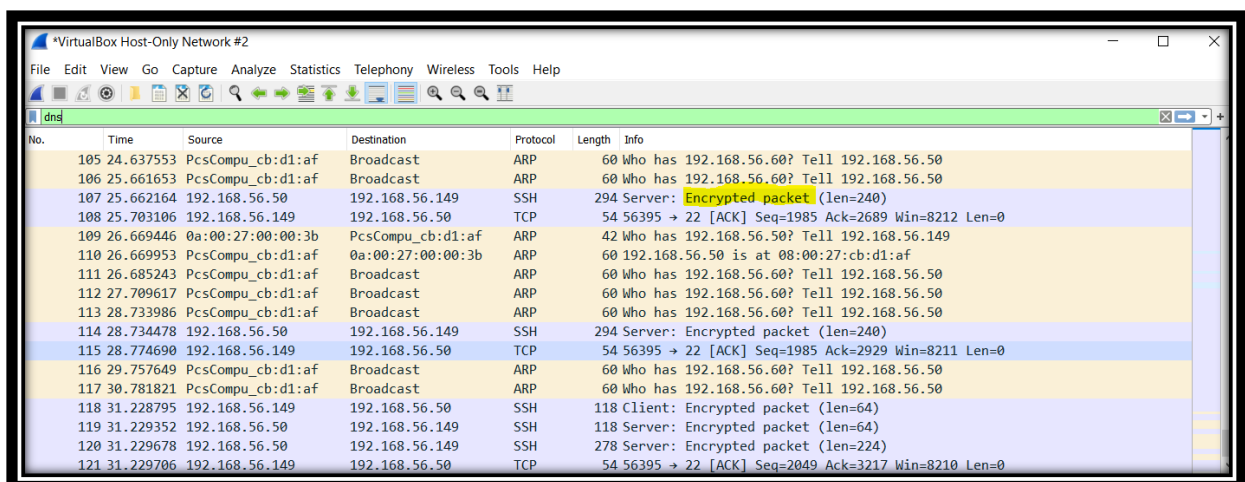
Checking the three-way handshake of Apache website.

## Installing OpenSSH.

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



Host operating System logging into the VM by using SSH.



Communication encrypted between them.

## IP Addresses and Hostname Management

Changing the ephemeral IP to static IP. Such IP addresses are ephemeral, meaning they are bound to the lifetime of the resource they are attached to. Once that resource is destroyed (or stopped, in the case of Compute Engine instances), the IP address is freed, and will eventually be assigned to another resource.

```
Ubuntu 20.04.2 LTS web-server-353 tty1
web-server-353 login: ubuntuuserver
Password:
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-72-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Wed  5 May 18:37:08 UTC 2021

System load:  0.0               Processes:            102
Usage of /:   45.3% of 8.79GB   Users logged in:     0
Memory usage: 18%              IPv4 address for enp0s8: 10.0.3.15
Swap usage:   0%

 * Pure upstream Kubernetes 1.21, smallest, simplest cluster ops!

  https://microk8s.io/

Last login: Wed May  5 15:34:22 UTC 2021 from 192.168.56.149 on pts/0
ubuntuuserver@web-server-353:~$ hostname
web-server-353
ubuntuuserver@web-server-353:~$
```

```
Ubuntu 20.04.2 LTS web-client-353 tty1
web-client-353 login: ubuntuclient
Password:
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-72-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Wed  5 May 18:35:38 UTC 2021

System load:  0.15               Processes:           100
Usage of /:   45.2% of 8.79GB    Users logged in:    0
Memory usage: 18%               IPv4 address for enp0s8: 10.0.3.15
Swap usage:   0%

 * Pure upstream Kubernetes 1.21, smallest, simplest cluster ops!

  https://microk8s.io/

Last login: Wed May  5 15:39:17 UTC 2021 on tty1
ubuntuclient@web-client-353:~$ hostname
web-client-353
ubuntuclient@web-client-353:~$ _
```

Renaming the hostnames.

```

    valid_lft forever preferred_lft forever
ubuntu@server-353:/etc/netplan$ ping 192.168.56.200
PING 192.168.56.200 (192.168.56.200) 56(84) bytes of data:
64 bytes from 192.168.56.200: icmp_seq=6 ttl=64 time=0.756 ms
64 bytes from 192.168.56.200: icmp_seq=7 ttl=64 time=0.820 ms
64 bytes from 192.168.56.200: icmp_seq=8 ttl=64 time=0.845 ms
^C
--- 192.168.56.200 ping statistics ---
3 packets transmitted, 3 received, 62.5% packet loss, time 7121ms
rtt min/avg/max/mdev = 0.756/0.807/0.845/0.037 ms
ubuntu@server-353:/etc/netplan$ cat 01-config-rede.yaml
#Config static IP
network:
  version: 2
  renderer: networkd
  ethernets:
    enp0s3:
      dhcp4: no
      dhcp6: no
      addresses: [192.168.56.100/24]
      gateway4: 192.168.56.1
      nameservers:
        addresses: [192.168.56.1]
ubuntu@server-353:/etc/netplan$ ping 192.168.56.200
PING 192.168.56.200 (192.168.56.200) 56(84) bytes of data:
64 bytes from 192.168.56.200: icmp_seq=1 ttl=64 time=0.834 ms
64 bytes from 192.168.56.200: icmp_seq=2 ttl=64 time=0.829 ms
64 bytes from 192.168.56.200: icmp_seq=3 ttl=64 time=0.831 ms
64 bytes from 192.168.56.200: icmp_seq=4 ttl=64 time=0.788 ms
64 bytes from 192.168.56.200: icmp_seq=5 ttl=64 time=0.810 ms
64 bytes from 192.168.56.200: icmp_seq=6 ttl=64 time=0.770 ms
64 bytes from 192.168.56.200: icmp_seq=7 ttl=64 time=0.828 ms
^C
--- 192.168.56.200 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6011ms
rtt min/avg/max/mdev = 0.770/0.812/0.834/0.023 ms
ubuntu@server-353:/etc/netplan$

```

```

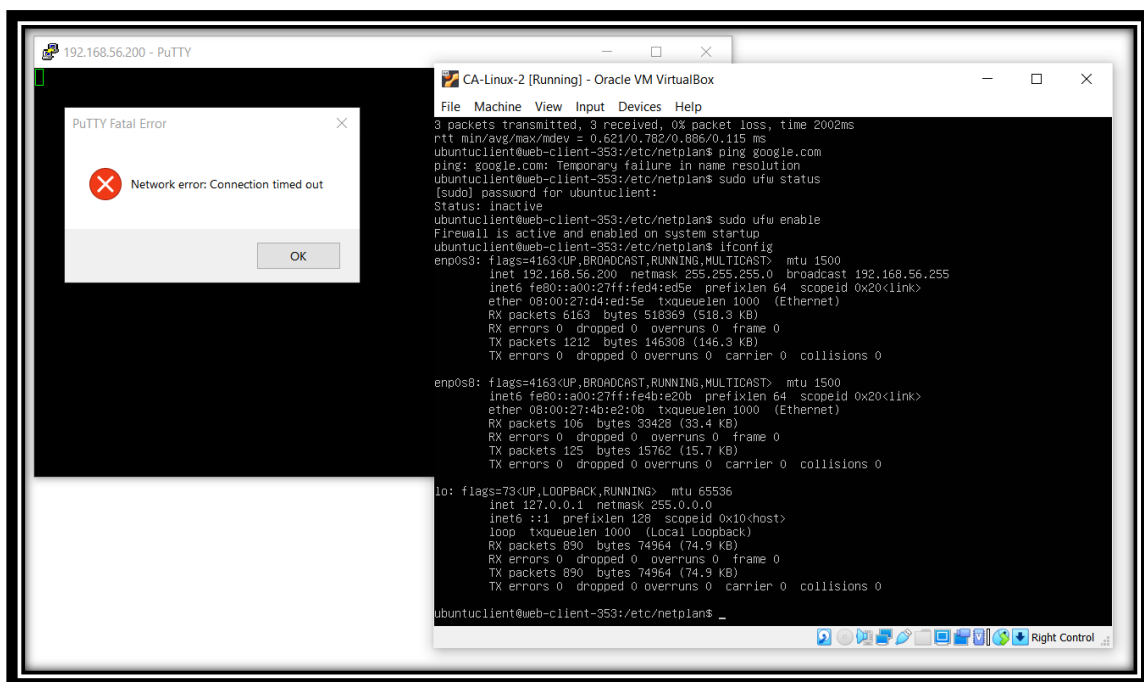
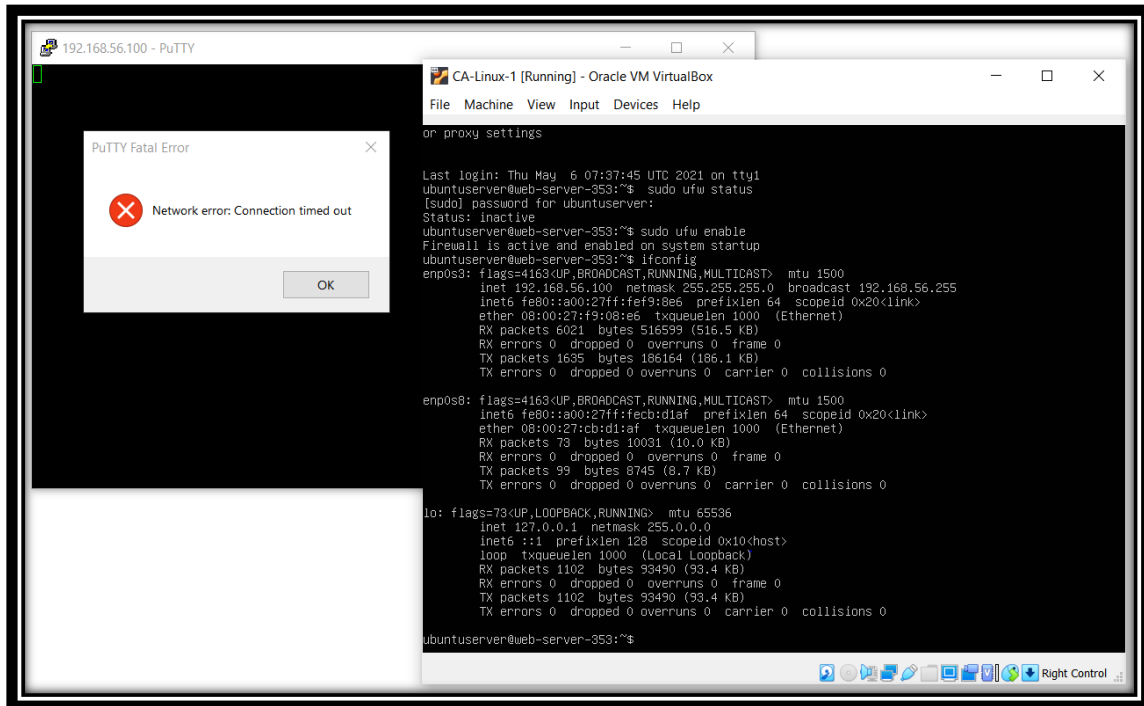
    valid_lft forever preferred_lft forever
ubuntu@client-353:/etc/netplan$ ping 192.168.56.100
PING 192.168.56.100 (192.168.56.100) 56(84) bytes of data:
64 bytes from 192.168.56.100: icmp_seq=1 ttl=64 time=1.25 ms
64 bytes from 192.168.56.100: icmp_seq=2 ttl=64 time=0.763 ms
64 bytes from 192.168.56.100: icmp_seq=3 ttl=64 time=0.816 ms
64 bytes from 192.168.56.100: icmp_seq=4 ttl=64 time=0.750 ms
64 bytes from 192.168.56.100: icmp_seq=5 ttl=64 time=0.825 ms
^C
--- 192.168.56.100 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4007ms
rtt min/avg/max/mdev = 0.750/0.880/1.248/0.186 ms
ubuntu@client-353:/etc/netplan$ cat 01-config-rede.yaml
#Config static IP
network:
  version: 2
  renderer: networkd
  ethernets:
    enp0s3:
      dhcp4: no
      dhcp6: no
      addresses: [192.168.56.200/24]
      gateway4: 192.168.56.1
      nameservers:
        addresses: [192.168.56.1]
ubuntu@client-353:/etc/netplan$ ping 192.168.56.100
PING 192.168.56.100 (192.168.56.100) 56(84) bytes of data:
64 bytes from 192.168.56.100: icmp_seq=1 ttl=64 time=0.519 ms
64 bytes from 192.168.56.100: icmp_seq=2 ttl=64 time=0.812 ms
64 bytes from 192.168.56.100: icmp_seq=3 ttl=64 time=0.806 ms
64 bytes from 192.168.56.100: icmp_seq=4 ttl=64 time=0.872 ms
64 bytes from 192.168.56.100: icmp_seq=5 ttl=64 time=0.807 ms
^C
--- 192.168.56.100 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4013ms
rtt min/avg/max/mdev = 0.519/0.763/0.872/0.124 ms
ubuntu@client-353:/etc/netplan$

```

Changing IP address configuration – using netplan. VM's pinging each other.

# Firewall

A firewall's main purpose is to allow non-threatening traffic in and to keep dangerous traffic out.



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

```
ubuntuuser@web-server-353:/etc/netplan$
ubuntuuser@web-server-353:/etc/netplan$
ubuntuuser@web-server-353:/etc/netplan$ sudo ufw deny out http
[sudo] password for ubuntuuser:
Rule added
Rule added (v6)
ubuntuuser@web-server-353:/etc/netplan$ sudo ufw status
Status: active

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

80/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)

ubuntuuser@web-server-353:/etc/netplan$ sudo ufw deny http
Skipping adding existing rule
Skipping adding existing rule (v6)
ubuntuuser@web-server-353:/etc/netplan$ sudo ufw status
Status: active

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

80/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)

ubuntuuser@web-server-353:/etc/netplan$ _

ubuntuclient@web-client-353:/etc/netplan$
ubuntuclient@web-client-353:/etc/netplan$
ubuntuclient@web-client-353:/etc/netplan$ sudo ufw deny out http
[sudo] password for ubuntuclient:
Rule added
Rule added (v6)
ubuntuclient@web-client-353:/etc/netplan$ sudo ufw status
Status: active

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

80/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)

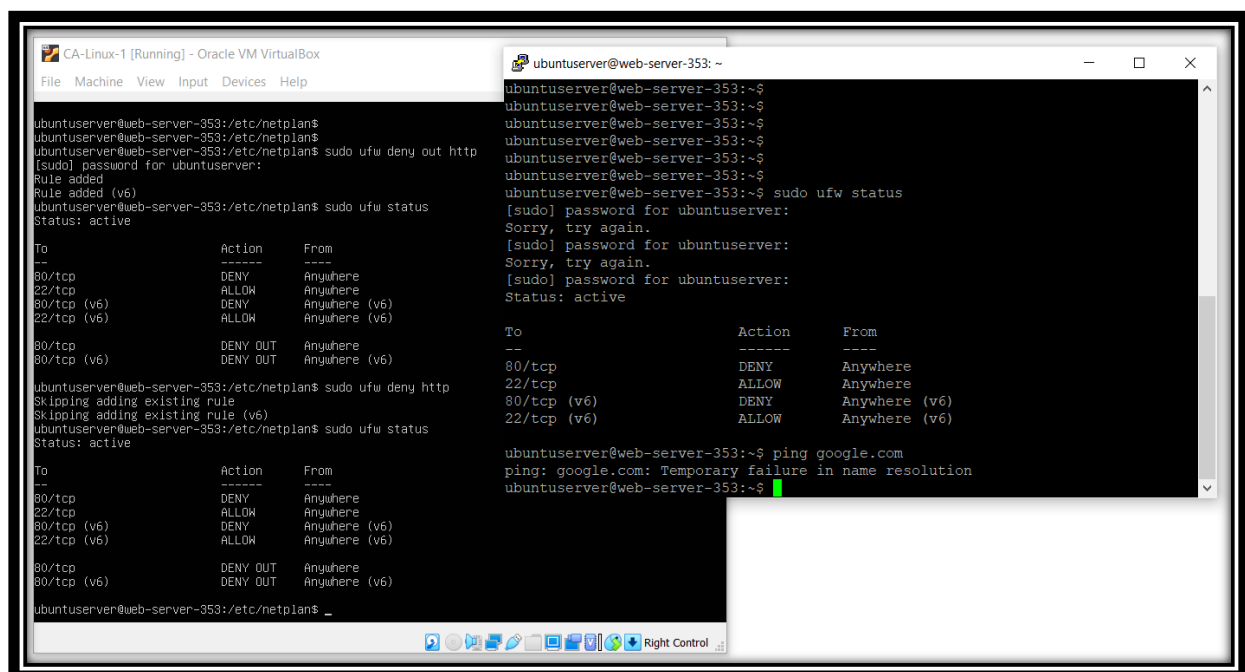
ubuntuclient@web-client-353:/etc/netplan$ sudo ufw deny http
Skipping adding existing rule
Skipping adding existing rule (v6)
ubuntuclient@web-client-353:/etc/netplan$ sudo ufw status
Status: active

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

80/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)

ubuntuclient@web-client-353:/etc/netplan$
```

HTTP traffic not permitted.



```
CA-Linux-1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

ubuntuuser@web-server-353:/etc/netplan$
ubuntuuser@web-server-353:/etc/netplan$
ubuntuuser@web-server-353:/etc/netplan$ sudo ufw deny out http
[sudo] password for ubuntuuser:
Rule added
Rule added (v6)
ubuntuuser@web-server-353:/etc/netplan$ sudo ufw status
Status: active

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

80/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)

ubuntuuser@web-server-353:/etc/netplan$ sudo ufw deny http
Skipping adding existing rule
Skipping adding existing rule (v6)
ubuntuuser@web-server-353:/etc/netplan$ sudo ufw status
Status: active

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

80/tcp DENY OUT Anywhere
80/tcp (v6) DENY OUT Anywhere (v6)

ubuntuuser@web-server-353:/etc/netplan$ _

ubuntuuser@web-server-353: ~
ubuntuuser@web-server-353:~$
ubuntuuser@web-server-353:~$
ubuntuuser@web-server-353:~$
ubuntuuser@web-server-353:~$
ubuntuuser@web-server-353:~$ sudo ufw status
[sudo] password for ubuntuuser:
Sorry, try again.
[sudo] password for ubuntuuser:
Sorry, try again.
[sudo] password for ubuntuuser:
Status: active

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

ubuntuuser@web-server-353:~$ ping google.com
ping: google.com: Temporary failure in name resolution
ubuntuuser@web-server-353:~$
```

SSH operating and being allowed while HTTP is not.

## Best practices that you could use to automate the script execution

[illegible]

```
~  
~  
~  
~  
~  
~  
  
"helloworld.sh" 8L, 240C written  
ubuntu@server-353:~$ ./helloworld.sh  
Best Practices for Bash Script  
-trap handlers- shell that helps register a cleanup function.  
-set builtins- ensures your script exit as soon as it is finished.  
-shellcheck- a static-analysis tool for Bash scripts.  
ubuntu@server-353:~$ _
```

Writing and executing short bash shell.



DCC is exploring new authentication techniques. Allow SSH connections from the web-client using no passwords.

```
RX packets 84 bytes 14931 (14.9 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 147 bytes 14443 (14.4 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 4343 bytes 381341 (381.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 4343 bytes 381341 (381.3 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ubuntuuser@web-server-353:~$ ssh ubuntuuser@web-server-353
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-72-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Thu  6 May 17:07:33 UTC 2021

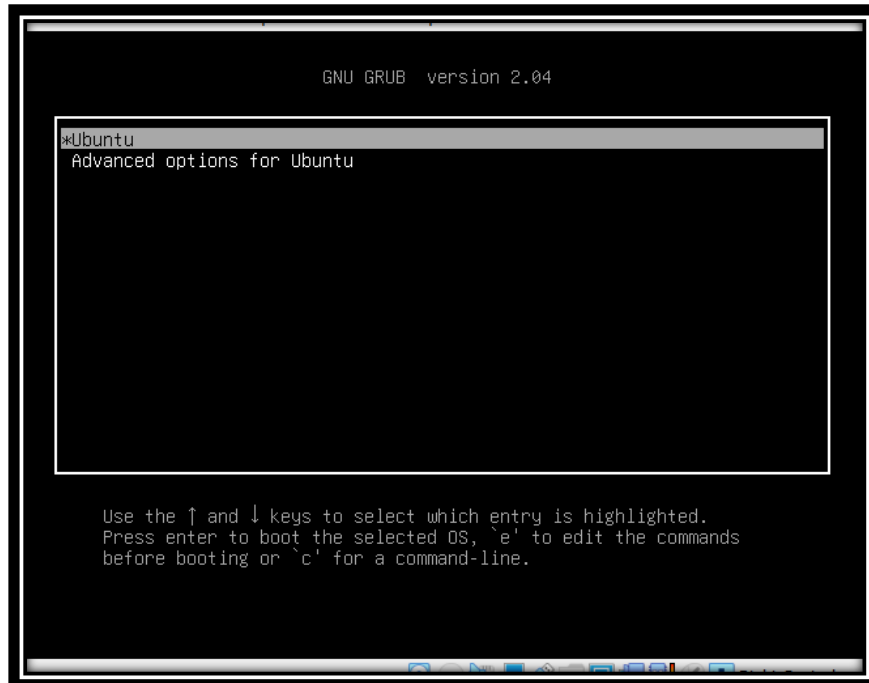
System load:  0.0          Processes:           114
Usage of /:   45.4% of 8.79GB Users logged in:          1
Memory usage: 22%         IPv4 address for enp0s3: 192.168.56.100
Swap usage:   0%          IPv4 address for enp0s8: 10.0.3.15

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

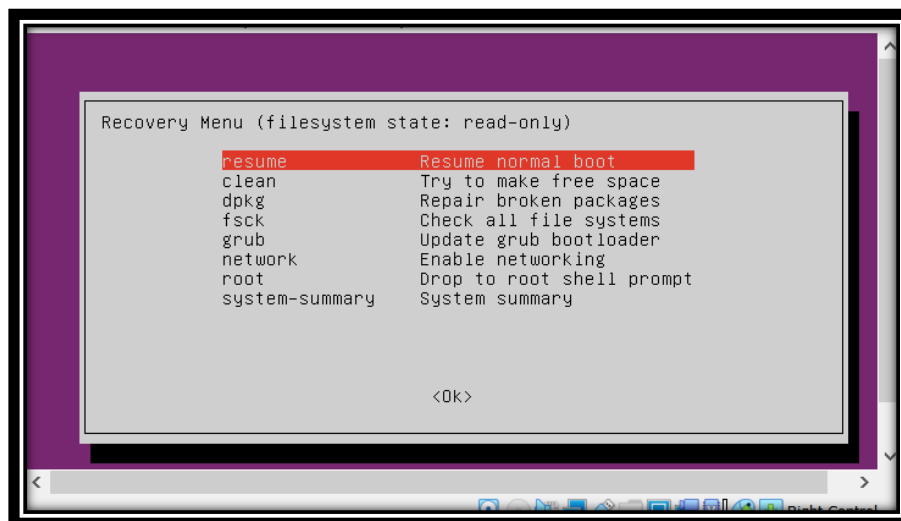
Last login: Thu May  6 17:05:22 2021 from 192.168.56.100
ubuntuuser@web-server-353:~$ _
```

## Way to get into a VM by resetting password.

First the machine needs to be powered of and when it turns on after being initialized, we press enter or shift and we can access the ubuntu advanced options.



Then enter, goes to recovery mode and wait.



In this next step we need to choose “root”, then we give the commands:

- `mount -rw -o remount /`
- `passwd <here.goes.user.name>`

Then you type your new password, and retype your new password, press enter, and it is updated.

```
root@web-server-353:~# mount -rw -o remount /
root@web-server-353:~# passwd ubuntuuserver
New password:
Retype new password:
passwd: password updated successfully
root@web-server-353:~# _
```

Password updated successfully.

## References

<https://www.oreilly.com/library/view/google-cloud-platform/9781788837675/1d02f31d-292d-4751-aa14-eb6797ec26b4.xhtml>

<https://www.checkpoint.com/cyber-hub/network-security/what-is-firewall/>

<https://www.hostinger.com.br/tutoriais/conexao-ssh-sem-senha>

<https://canaltech.com.br/linux/Introducao-ao-Shell-Script/>

<https://www.youtube.com/watch?v=klbyaBPm-2Y>