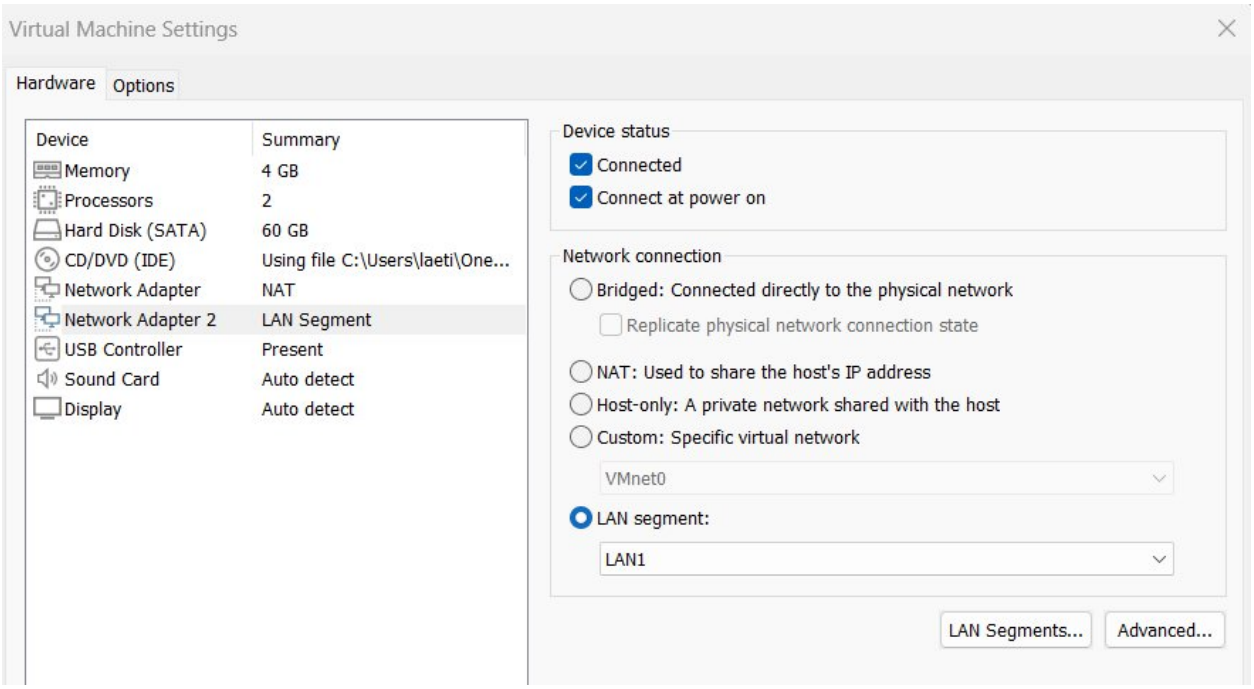
Exercise 1 – Configuring Network Interfaces on AlmaLinux

Tasks to Perform on AlmaLinux:

Step 1:

1. In your VM configuration, add **a new network interface,** connect it to a new LAN segment, and name it **LAN1.**



Step 2:

1. Verify that the **NetworkManager** service is successfully started.

```
[lmohammed@server12 ~]$ systemctl status NetworkManager
● NetworkManager.service - Network Manager
     Loaded: loaded (/usr/lib/systemd/system/NetworkManager.service; enabled; preset: enabled)
     Active: active (running) since Sun 2025-03-30 15:04:07 EDT; 2min 37s ago
       Docs: man:NetworkManager(8)
   Main PID: 1020 (NetworkManager)
      Tasks: 3 (limit: 22830)
     Memory: 12.1M
        CPU: 354ms
     CGroup: /system.slice/NetworkManager.service
             └─1020 /usr/sbin/NetworkManager --no-daemon

Mar 30 15:04:09 server12 NetworkManager[1020]: <info>  [1743361449.8214] device (ens160): Activation: successful, device activated.
Mar 30 15:04:09 server12 NetworkManager[1020]: <info>  [1743361449.8225] manager: NetworkManager state is now CONNECTED_GLOBAL
Mar 30 15:04:09 server12 NetworkManager[1020]: <info>  [1743361449.8260] manager: startup complete
Mar 30 15:04:15 server12 NetworkManager[1020]: <info>  [1743361455.5010] agent-manager: agent[dcf10a0f7fa8aebf,:1.25/org.gnome.Shell.Network>
Mar 30 15:05:02 server12 NetworkManager[1020]: <info>  [1743361502.0913] manager: (eth0): new Ethernet device (/org/freedesktop/NetworkManag>
Mar 30 15:05:02 server12 NetworkManager[1020]: <info>  [1743361502.2524] device (eth0): interface index 3 renamed iface from 'eth0' to 'ens1>
Mar 30 15:05:02 server12 NetworkManager[1020]: <info>  [1743361502.3194] device (ens192): state change: unmanaged -> unavailable (reason 'ma>
Mar 30 15:05:02 server12 NetworkManager[1020]: <info>  [1743361502.3955] device (ens192): carrier: link connected
Mar 30 15:05:02 server12 NetworkManager[1020]: <info>  [1743361502.3965] device (ens192): state change: unavailable -> disconnected (reason >
Mar 30 15:05:53 server12 NetworkManager[1020]: <info>  [1743361553.9104] agent-manager: agent[7a7629d169088ba7,:1.70/org.gnome.Shell.Network>
lines 1-21/21 (END)
```

Using the **nmcli** tool:

2. List and check the status of all network interfaces on your computer.

```
[lmohammed@server12 ~]$ nmcli device status
DEVICE  TYPE      STATE                   CONNECTION
ens160  ethernet  connected               ens160
lo      loopback  connected (externally)  lo
ens192  ethernet  disconnected            --
[lmohammed@server12 ~]$
```

3. List the connections of all network interfaces.

```
[lmohammed@server12 ~]$ nmcli con show
NAME    UUID                                  TYPE      DEVICE
ens160  8d51de43-6b03-33af-b1f4-0d98f0c8319c  ethernet  ens160
lo      97bd8356-e2c9-463a-b8ee-ce90f6225afa  loopback  lo
[lmohammed@server12 ~]$
```

4. List the details of your active connection.

```
[lmohammed@server12 ~]$ nmcli con show ens160
connection.id:                          ens160
connection.uuid:                        8d51de43-6b03-33af-b1f4-0d98f0c8319c
connection.stable-id:                   --
connection.type:                        802-3-ethernet
connection.interface-name:              ens160
connection.autoconnect:                 yes
connection.autoconnect-priority:        -999
connection.autoconnect-retries:         -1 (default)
connection.multi-connect:               0 (default)
connection.auth-retries:                -1
connection.timestamp:                   1743361449
connection.permissions:                 --
connection.zone:                        --
connection.controller:                  --
connection.master:                      --
connection.slave-type:                  --
connection.port-type:                   --
connection.autoconnect-slaves:          -1 (default)
connection.autoconnect-ports:           -1 (default)
connection.down-on-poweroff:            -1 (default)
connection.secondaries:                 --
connection.gateway-ping-timeout:        0
connection.metered:                     unknown
connection.lldp:                        default
connection.mdns:                        -1 (default)
connection.llmnr:                       -1 (default)
connection.dns-over-tls:                -1 (default)
connection.mptcp-flags:                 0x0 (default)
connection.wait-device-timeout:         -1
connection.wait-activation-delay:       -1
802-3-ethernet.port:                    --
802-3-ethernet.speed:                   0
802-3-ethernet.duplex:                  --
802-3-ethernet.auto-negotiate:          no
```

5. Create a new connection for the new interface added in Step 1, with the following details:

    a. Connection name: **LAN1**

    b. Manual IP address: **192.168.50.10/24**

```
[lmohammed@server12 ~]$
[lmohammed@server12 ~]$ nmcli con add type ethernet ifname ens192 con-name LAN1 ipv4.method manual ipv4.addresses 192.168.50.10/24
Connection 'LAN1' (8da2e628-e112-4097-84ca-7b7771544c61) successfully added.
```

6. List the details of this new **LAN1** network connection (with the new configuration).

```
[lmohammed@server12 ~]$ nmcli con show LAN1
connection.id:                          LAN1
connection.uuid:                        8da2e628-e112-4097-84ca-7b7771544c61
connection.stable-id:                   --
connection.type:                        802-3-ethernet
connection.interface-name:              ens192
connection.autoconnect:                 yes
connection.autoconnect-priority:        0
connection.autoconnect-retries:         -1 (default)
connection.multi-connect:               0 (default)
connection.auth-retries:                -1
connection.timestamp:                   1743362139
connection.permissions:                 --
connection.zone:                        --
connection.controller:                  --
connection.master:                      --
connection.slave-type:                  --
connection.port-type:                   --
connection.autoconnect-slaves:          -1 (default)
connection.autoconnect-ports:           -1 (default)
connection.down-on-poweroff:            -1 (default)
connection.secondaries:                 --
connection.gateway-ping-timeout:        0
connection.metered:                     unknown
connection.lldp:                        default
connection.mdns:                        -1 (default)
connection.llmnr:                       -1 (default)
connection.dns-over-tls:                -1 (default)
connection.mptcp-flags:                 0x0 (default)
connection.wait-device-timeout:         -1
connection.wait-activation-delay:       -1
802-3-ethernet.port:                    --
802-3-ethernet.speed:                   0
802-3-ethernet.duplex:                  --
802-3-ethernet.auto-negotiate:          no
```

```
ipv6.ra-timeout:                        0 (default)
ipv6.mtu:                               auto
ipv6.dhcp-pd-hint:                      --
ipv6.dhcp-duid:                         --
ipv6.dhcp-iaid:                         --
ipv6.dhcp-timeout:                      0 (default)
ipv6.dhcp-send-hostname:                yes
ipv6.dhcp-hostname:                     --
ipv6.dhcp-hostname-flags:               0x0 (none)
ipv6.auto-route-ext-gw:                 -1 (default)
ipv6.token:                             --
proxy.method:                           none
proxy.browser-only:                     no
proxy.pac-url:                          --
proxy.pac-script:                       --
GENERAL.NAME:                           LAN1
GENERAL.UUID:                           8da2e628-e112-4097-84ca-7b7771544c61
GENERAL.DEVICES:                        ens192
GENERAL.IP-IFACE:                       ens192
GENERAL.STATE:                          activated
GENERAL.DEFAULT:                        no
GENERAL.DEFAULT6:                       no
GENERAL.SPEC-OBJECT:                    --
GENERAL.VPN:                            no
GENERAL.DBUS-PATH:                      /org/freedesktop/NetworkManager/ActiveConnection/3
GENERAL.CON-PATH:                       /org/freedesktop/NetworkManager/Settings/3
GENERAL.ZONE:                           --
GENERAL.MASTER-PATH:                    --
IP4.ADDRESS[1]:                         192.168.50.10/24
IP4.GATEWAY:                            --
IP4.ROUTE[1]:                           dst = 192.168.50.0/24, nh = 0.0.0.0, mt = 101
IP6.ADDRESS[1]:                         fe80::25a5:8f36:8d4d:77b1/64
IP6.GATEWAY:                            --
IP6.ROUTE[1]:                           dst = fe80::/64, nh = ::, mt = 1024
lines 99-132/132 (END)
```

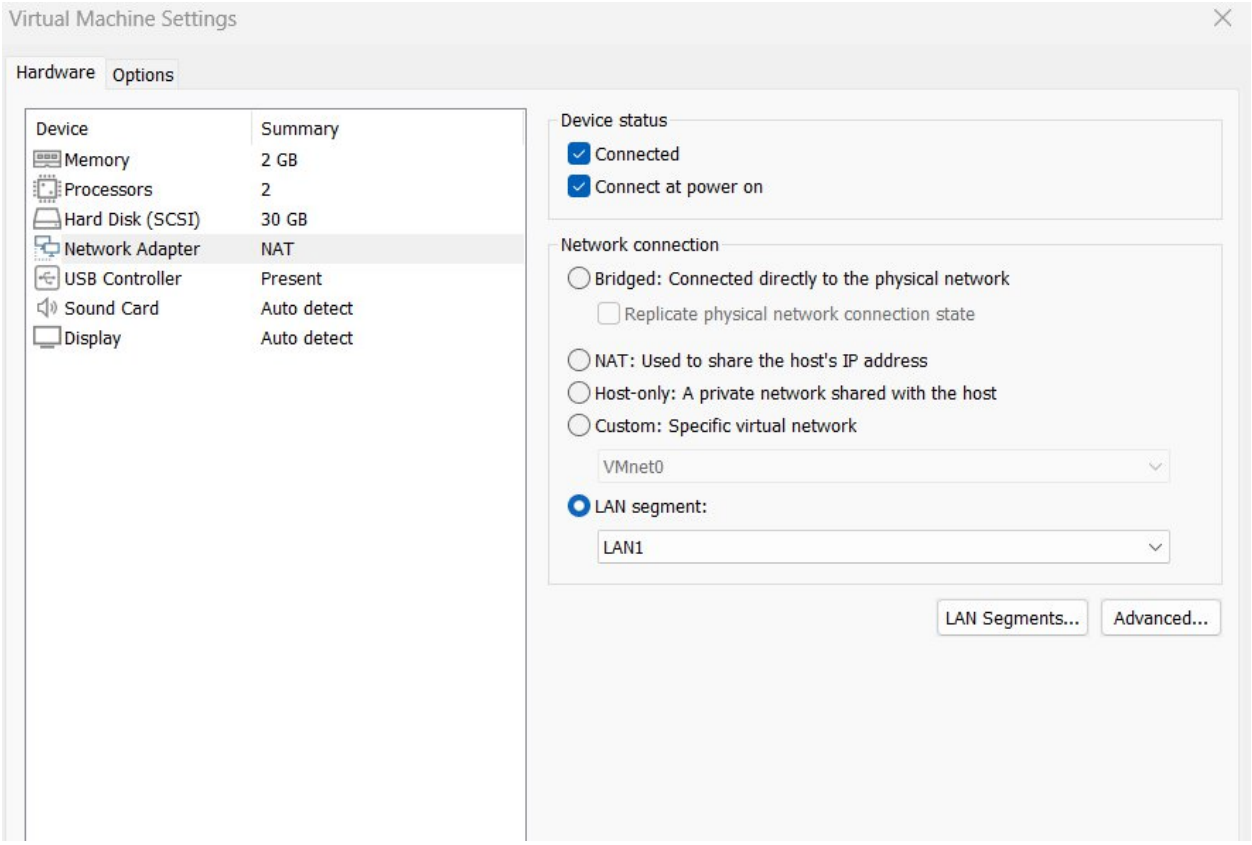
Note : Keep the session open on AlmaLinux and log in on the Ubuntu machine.

Exercise 2 – Configuring Network Interfaces on Ubuntu

Tasks to Perform on Ubuntu:

Step 1:

1. In your VM configuration, modify **the NAT network interface** and connect it to the **LAN1 segment.**



Step 2:

1. Verify that the **NetworkManager** service is successfully started.

```
lmohammed@client12:~$ systemctl status NetworkManager
● NetworkManager.service - Network Manager
     Loaded: loaded (/lib/systemd/system/NetworkManager.service; enabled; vendor preset: enabled)
     Active: active (running) since Sun 2025-03-30 15:19:58 EDT; 2min 57s ago
       Docs: man:NetworkManager(8)
   Main PID: 550 (NetworkManager)
      Tasks: 3 (limit: 2214)
     Memory: 9.3M
        CPU: 331ms
     CGroup: /system.slice/NetworkManager.service
             └─550 /usr/sbin/NetworkManager --no-daemon

Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.1819] manager: NetworkManager state
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.2552] device (ens33): carrier: link
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.2568] device (ens33): state change:
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.2901] policy: auto-activating connec
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.2990] device (ens33): Activation: st
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.3025] device (ens33): state change:
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.3028] manager: NetworkManager state
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.3035] device (ens33): state change:
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.3133] device (ens33): state change:
Mar 30 15:22:23 client12 NetworkManager[550]: <info>  [1743362543.3444] dhcp4 (ens33): activation: beg
lines 1-21/21 (END)
```

Using the **nmcli** tool:

2. List and check the status of all network interfaces on your computer.

```
lmohammed@client12:~$ nmcli device status
DEVICE  TYPE      STATE                                  CONNECTION
ens33   ethernet  connecting (getting IP configuration)  Wired connection 1
lo      loopback  unmanaged                              --
lmohammed@client12:~$
```

3. List the connections of all network interfaces.

```
lmohammed@client12:~$ nmcli con sho
NAME                UUID                                  TYPE      DEVICE
Wired connection 1  5b79bc9a-fba0-3a75-a4f9-4354d9e9507d  ethernet  ens33
lmohammed@client12:~$
```

4. List the details of your active connection.

```
lmohammed@client12:~$ nmcli con sho Wired\ connection\ 1
connection.id:                          Wired connection 1
connection.uuid:                        5b79bc9a-fba0-3a75-a4f9-4354d9e9507d
connection.stable-id:                   --
connection.type:                        802-3-ethernet
connection.interface-name:              ens33
connection.autoconnect:                 yes
connection.autoconnect-priority:        -999
connection.autoconnect-retries:         -1 (default)
connection.multi-connect:               0 (default)
connection.auth-retries:                -1
connection.timestamp:                   1743362543
connection.read-only:                   no
connection.permissions:                 --
connection.zone:                        --
connection.master:                      --
connection.slave-type:                  --
connection.autoconnect-slaves:          -1 (default)
connection.secondaries:                 --
connection.gateway-ping-timeout:        0
connection.metered:                     unknown
connection.lldp:                        default
connection.mdns:                        -1 (default)
connection.llmnr:                       -1 (default)
connection.dns-over-tls:                -1 (default)
connection.wait-device-timeout:         -1
802-3-ethernet.port:                    --
802-3-ethernet.speed:                   0
802-3-ethernet.duplex:                  --
802-3-ethernet.auto-negotiate:          no
lines 1-29
```

5. Delete the current connection (if any).

```
lmohammed@client12:~$ nmcli con del Wired\ connection\ 1
Connection 'Wired connection 1' (5b79bc9a-fba0-3a75-a4f9-4354d9e9507d) successfully deleted.
lmohammed@client12:~$
```

6. Create a new connection with the following details:
    a. Connection name**: LAN1**
    b. Manual IP address: **192.168.50.20/24**
    c. Default Gateway: **192.168.50.10**

d. DNS server: **8.8.8.8**

```
lmohammed@client12:~$ nmcli con add type ethernet ifname ens33 con-name LAN1 ipv4.method manual ipv4.addresses 192.168.50.20/24 ipv4.gat
eway 192.168.50.10 ipv4.dns 8.8.8.8
Connection 'LAN1' (2e2a7436-cac8-4775-b3fb-a41f8ac3fc5e) successfully added.
```

7. List the details of this new network connection (with the new configuration).

```
lmohammed@client12:~$ nmcli con sho LAN1 |grep IP4
IP4.ADDRESS[1]:                         192.168.50.20/24
IP4.GATEWAY:                            192.168.50.10
IP4.ROUTE[1]:                           dst = 192.168.50.0/24, nh = 0.0.0.0, mt = 100
IP4.ROUTE[2]:                           dst = 0.0.0.0/0, nh = 192.168.50.10, mt = 20100
IP4.ROUTE[3]:                           dst = 169.254.0.0/16, nh = 0.0.0.0, mt = 1000
IP4.DNS[1]:                             8.8.8.8
lmohammed@client12:~$
```

Step 3: Testing the connectivity between the two VMs:

1. Use the **ping** command to test the connection with the **AlmaLinux** VM.
   ping 192.168.50.10
   You must successfully ping the AlmaLinux VM.

```
lmohammed@client12:~$ ping 192.168.50.10
PING 192.168.50.10 (192.168.50.10) 56(84) bytes of data.
64 bytes from 192.168.50.10: icmp_seq=1 ttl=64 time=4.13 ms
64 bytes from 192.168.50.10: icmp_seq=2 ttl=64 time=1.13 ms
64 bytes from 192.168.50.10: icmp_seq=3 ttl=64 time=8.00 ms
64 bytes from 192.168.50.10: icmp_seq=4 ttl=64 time=0.791 ms
64 bytes from 192.168.50.10: icmp_seq=5 ttl=64 time=0.859 ms
^C
--- 192.168.50.10 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4009ms
rtt min/avg/max/mdev = 0.791/2.982/7.998/2.800 ms
lmohammed@client12:~$
```

2. Return to the **AlmaLinux** machine and test the connection with the **Ubuntu** VM.
   ping 192.168.50.20
   You must also successfully ping the Ubuntu VM.

```
[lmohammed@server12 ~]$ ping 192.168.50.20
PING 192.168.50.20 (192.168.50.20) 56(84) bytes of data.
64 bytes from 192.168.50.20: icmp_seq=1 ttl=64 time=2.64 ms
64 bytes from 192.168.50.20: icmp_seq=2 ttl=64 time=7.96 ms
64 bytes from 192.168.50.20: icmp_seq=3 ttl=64 time=1.48 ms
64 bytes from 192.168.50.20: icmp_seq=4 ttl=64 time=7.86 ms
64 bytes from 192.168.50.20: icmp_seq=5 ttl=64 time=8.34 ms
^C
--- 192.168.50.20 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4009ms
rtt min/avg/max/mdev = 1.483/5.655/8.336/2.960 ms
[lmohammed@server12 ~]$
```

Exercise 3 – Routing Configuration

Tasks to Perform on AlmaLinux:

1. Enable **IP forwarding** in the **kernel** settings and ensure it remains active after reboot.

```
[root@server12 ~]# sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
[root@server12 ~]#
```

```
[root@server12 ~]# echo "net.ipv4.ip_forward=1" > /etc/sysctl.conf
[root@server12 ~]# tail /etc/sysctl.conf
net.ipv4.ip_forward=1
[root@server12 ~]#
```

2. Assign the network interfaces in the appropriate **Firewall zones**.

```
[root@server12 ~]# nmcli con mod NAT con.zone external
[root@server12 ~]# nmcli con d NAT ; nmcli con u NAT
Connection 'NAT' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/4)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/5)
```

```
[root@server12 ~]# nmcli con mod LAN1 con.zone nm-shared
[root@server12 ~]# nmcli con d LAN1 ; nmcli con u LAN1
Connection 'LAN1' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/3)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/5)
[root@server12 ~]#
```

3. Verify that the interfaces are correctly assigned to their respective Firewall zones.

```
[root@server12 ~]# firewall-cmd --get-active-zones
external
  interfaces: ens160
nm-shared
  interfaces: ens192
[root@server12 ~]#
```

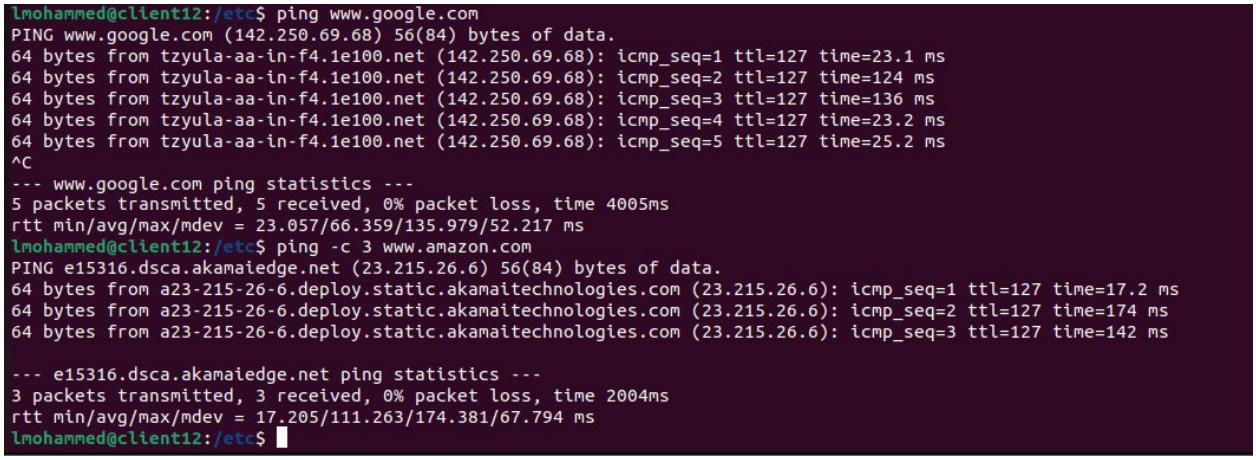
4. List the firewall rules associated with each zone.

```
[root@server12 ~]# firewall-cmd --list-all --zone=external
external (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: ssh
  ports:
  protocols:
  forward: yes
  masquerade: yes
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
[root@server12 ~]#
```

```
[root@server12 ~]# firewall-cmd --list-all --zone=nm-shared
nm-shared (active)
  target: ACCEPT
  icmp-block-inversion: no
  interfaces: ens192
  sources:
  services: dhcp dns ssh
  ports:
  protocols: icmp ipv6-icmp
  forward: no
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
        rule priority="32767" reject
[root@server12 ~]#
```

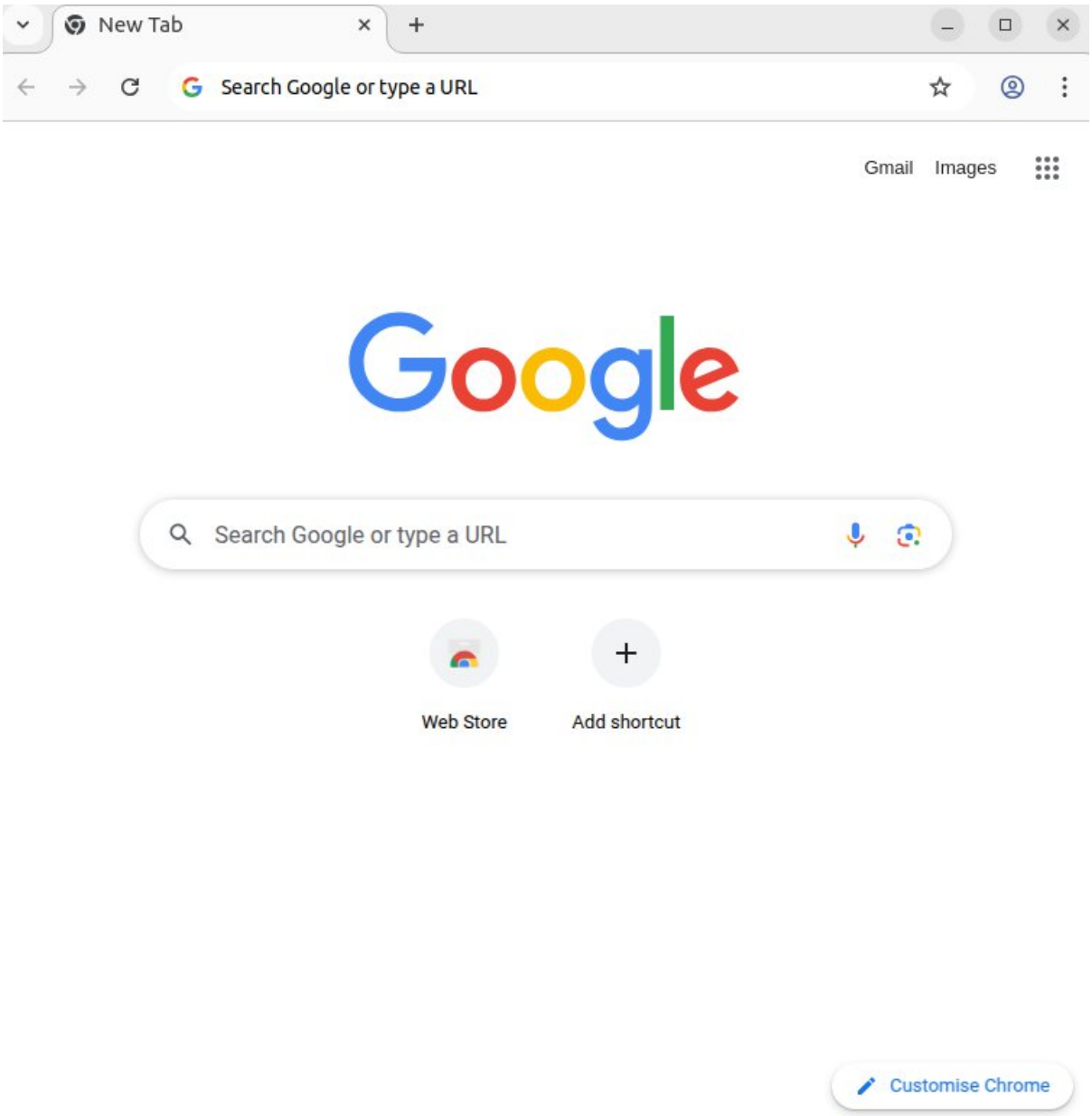
Tasks to Perform on Ubuntu:

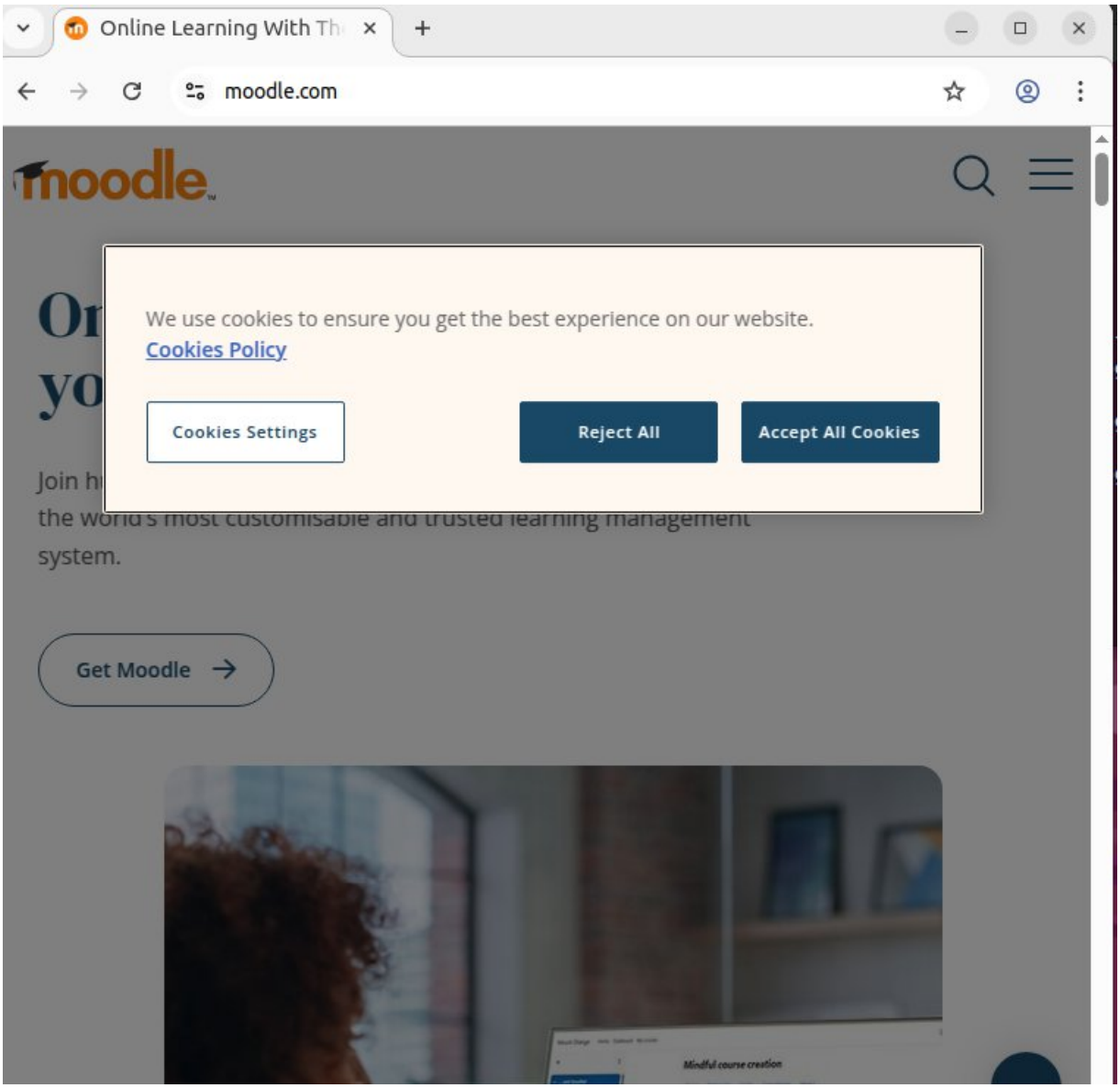
1. Send three ping requests to any **external website**. This must work. If not, recheck your configuration on the AlmaLinux side.



2. Open **Firefox** and try to connect to the internet. It must work. If not, verify the AlmaLinux settings again.

I have Google Chrome installed!


New Tab
Search Google or type a URL
Gmail
Images
Google
Search Google or type a URL
Web Store
Add shortcut
Customise Chrome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