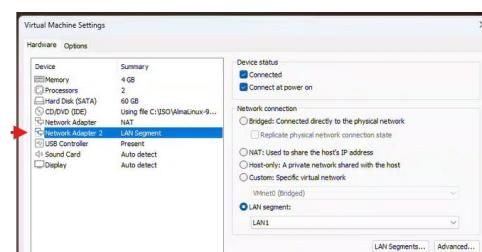
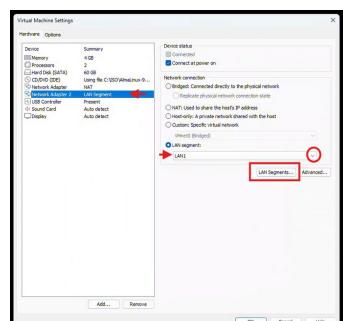
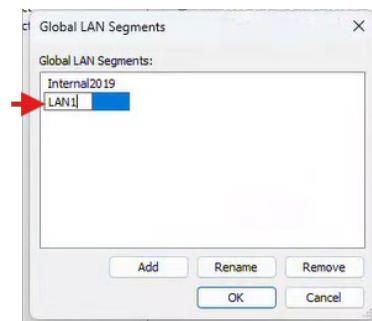
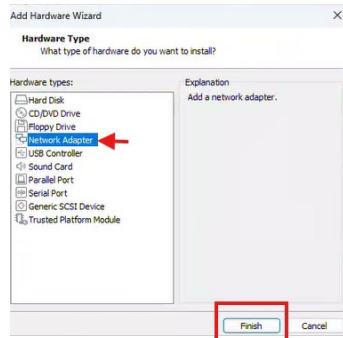


Exercise 1 – Configuring Network Interfaces on AlmaLinux

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:

Lab 5 - Linux Network and Routing Configuration

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

systemctl status NetworkManager

```
[mperez@server1 ~]$ systemctl status NetworkManager
● NetworkManager.service - Network Manager
   Loaded: loaded (/usr/lib/systemd/system/NetworkManager.service; enabled; preset: enabled)
   Active: active (running) since Thu 2025-03-27 22:32:22 EDT; 2 days ago
     Docs: man:NetworkManager(8)
           https://www.freedesktop.org/software/NetworkManager/Devices/3
 Main PID: 972 (NetworkManager)
   Memory: 12.3M
      CPU: 4.058s
 CGroup: /system.slice/NetworkManager.service
           └─ 972 /usr/sbin/NetworkManager --no-daemon

Mar 28 17:47:33 server1 NetworkManager[972]: <info> [1743371243.0628] dhcpcd (ens160): state changed new lease, address=192.168.204.128
Mar 28 18:09:23 server1 NetworkManager[972]: <info> [1743372443.0637] dhcpcd (ens160): state changed new lease, address=192.168.204.128
Mar 28 18:15:10 server1 NetworkManager[972]: <info> [1743373010.1576] device (ens160): carrier: link connected
Mar 28 18:15:10 server1 NetworkManager[972]: <info> [1743373010.1576] device (ens160): org.freedesktop.NetworkManager/Devices/3
Mar 28 18:15:10 server1 NetworkManager[972]: <info> [1743373010.2635] device (eth0): interface index 3 renamed iface from "eth0" to "ens192"
Mar 28 18:15:10 server1 NetworkManager[972]: <info> [1743373010.2721] device (ens192): state change: unmanaged -> unavailable (reason 'managed', sys-iface-state: 'external')
Mar 28 18:15:10 server1 NetworkManager[972]: <info> [1743373010.2721] device (ens192): org.freedesktop.NetworkManager/Devices/3
Mar 28 18:15:10 server1 NetworkManager[972]: <info> [1743373010.2721] device (ens192): state change: unavailable -> disconnected (reason 'carrier-changed', sys-iface-state: 'managed')
Mar 28 18:16:07 server1 NetworkManager[972]: <info> [1743373043.0518] dhcpc (ens160): state changed new lease, address=192.168.204.128
Mar 28 18:16:07 server1 NetworkManager[972]: <info> [1743373043.0518] dhcpc (ens160): state changed new lease, address=192.168.204.128
[mperez@server1 ~]$
```

Using the **nmcli** tool:

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

nmcli device status

```
[mperez@server1 ~]$ nmcli device status
DEVICE  TYPE      STATE            CONNECTION
ens160  ethernet  connected        ens160
lo     loopback  connected (externally)  lo
ens192  ethernet  disconnected    --
```

- List the connections of all network interfaces.

nmcli connection show

```
[mperez@server1 ~]$ nmcli connection show
NAME      UUID                                  TYPE      DEVICE
ens160    7f6d1680-3494-3dc0-ba77-fd362a9f3ab9  ethernet  ens160
lo        072d8c85-4ac4-4487-9fbe-b87ff5d89e9d  loopback  lo
[mperez@server1 ~]$
```

- List the details of your active connection.

```
[mperez@server1 ~]$ nmcli connection show ens160
connection.id:          ens160
connection.uuid:        7f6d1680-3494-3dc0-ba77-fd362a9f3ab9
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:    1743129142
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
802-3-ethernet.mac-address: --
802-3-ethernet.cloned-mac-address: --
802-3-ethernet.generate-mac-address-mask: --
802-3-ethernet.mac-address-denylist: --
802-3-ethernet.mtu:       auto
802-3-ethernet.s390-subchannels: --
802-3-ethernet.s390-nettype:  --
802-3-ethernet.s390-options: --
```

Lab 5 - Linux Network and Routing Configuration

```
802-3-ethernet.s390-subchannels:      --
802-3-ethernet.s390-nettype:          --
802-3-ethernet.s390-options:         --
802-3-ethernet.wake-on-lan:           default
802-3-ethernet.wake-on-lan-password:  --
802-3-ethernet.accept-all-mac-addresses:-1 (default)
ipv4.method:                          auto
ipv4.dns:                            --
ipv4.dns-search:                     --
ipv4.dns-options:                   --
ipv4.dns-priority:                  0
ipv4.addresses:                      --
ipv4.gateway:                        --
ipv4.routes:                         --
ipv4.route-metric:                  -1
ipv4.route-table:                    0 (unspec)
ipv4.routing-rules:                 --
ipv4.replace-local-rule:             -1 (default)
ipv4.dhcp-send-release:              -1 (default)
ipv4.ignore-auto-routes:             no
ipv4.ignore-auto-dns:                no
ipv4.dhcp-client-id:                --
ipv4.dhcp-iaid:                      --
ipv4.dhcp-dscp:                      --
ipv4.dhcp-timeout:                  0 (default)
ipv4.dhcp-send-hostname:             yes
ipv4.dhcp-hostname:                 --
ipv4.dhcp-fqdn:                      --
ipv4.dhcp-hostname-flags:            0x0 (none)
ipv4.never-default:                 no
ipv4.may-fail:                       yes
ipv4.required-timeout:               -1 (default)
ipv4.dad-timeout:                   -1 (default)
ipv4.dhcp-vendor-class-identifier:   --
ipv4.link-local:                    0 (default)
ipv4.dhcp-reject-servers:           --
ipv4.auto-route-ext-gw:              -1 (default)
ipv6.method:                          auto
ipv6.dns:                            --
ipv6.dns-search:                     --
ipv6.dns-options:                   --
ipv6.dns-priority:                  0
ipv6.addresses:                      --
ipv6.gateway:                        --
```

```
ipv6.addresses:                      --
ipv6.gateway:                        --
ipv6.routes:                         --
ipv6.route-metric:                  -1
ipv6.route-table:                    0 (unspec)
ipv6.routing-rules:                 --
ipv6.replace-local-rule:             -1 (default)
ipv6.dhcp-send-release:              -1 (default)
ipv6.ignore-auto-routes:             no
ipv6.ignore-auto-dns:                no
ipv6.never-default:                 no
ipv6.may-fail:                       yes
ipv6.required-timeout:               -1 (default)
ipv6.dad-timeout:                   -1 (default)
ipv6.temp-valid-lifetime:            0 (default)
ipv6.temp-preferred-lifetime:       0 (default)
ipv6.addr-gen-mode:                 eu64
ipv6.ra-timer:                      0 (default)
ipv6.rtr-solicits:                  --
ipv6.dhcp-pd-int:                   --
ipv6.dhcp-duid:                      --
ipv6.dhcp-iaid:                      --
ipv6.dhcp-timeout:                  0 (default)
ipv6.dhcp-send-hostname:             yes
ipv6.dhcp-hostname-flags:            0x0 (none)
ipv6.auto-route-ext-gw:              -
ipv6.token:                          --
proxy.method:                        none
proxy.power-only:                   no
proxy.pac:                           --
proxy.pac-script:                   --
GENERAL_NAME:                       ens160
GENERAL_UID:                         7fd1680-3494-3dc8-ba77-fd362a9f3ab9
GENERAL_IP_INTERFACE_S:              ens160
GENERAL_IP_INTERFACE_C:              ens160
GENERAL_STATE:                       activated
GENERAL_DEFAULT:                     yes
GENERAL_DEFAULT6:                   no
GENERAL_SPEC_OBJECT:                 --
GENERAL_DBUS_PATH:                  /org/freedesktop/NetworkManager/ActiveConnection/2
GENERAL_DBUS_PATH6:                 /org/freedesktop/NetworkManager/Settings/1
GENERAL_CON_PATH:                   /org/freedesktop/NetworkManager/Settings/1
```

Lab 5 - Linux Network and Routing Configuration

```

GENERAL_VPN: no
GENERAL_DBUS_PATH: /org/freedesktop/NetworkManager/ActiveConnection/2
GENERAL_CONNECTION: ...
GENERAL_ZONE: ...
GENERAL_MASTER_PATH: ...
IP4.ADDRESS[1]: 192.168.204.128/24
IP4.GATEWAY: 192.168.204.2
IP4.ROUTE[1]: dst = 0.0.0.0/0, nh = 192.168.204.2, mt = 100
IP4.ROUTE[2]: dst = 192.168.204.0/24, nh = 0.0.0.0, mt = 100
IP4.DNS[1]: 192.168.204.2
IP4.DOMAIN[1]: localdomain
DHCP4.OPTION[1]: broadcast_address = 192.168.204.255
DHCP4.OPTION[2]: dhcp_client_identifier = 01:00:0c:29:e7:f8:a
DHCP4.OPTION[3]: dhcp_lease_time = 1000
DHCP4.OPTION[4]: dhcp_message_type = 5
DHCP4.OPTION[5]: domain_name = localdomain
DHCP4.OPTION[6]: domain_name_servers = 192.168.204.2
DHCP4.OPTION[7]: expiry = 174376645
DHCP4.OPTION[8]: ip_address = 192.168.204.128
DHCP4.OPTION[9]: mask = 255.255.255.0
DHCP4.OPTION[10]: requested_broadcast_address = 1
DHCP4.OPTION[11]: requested_domain_name = 1
DHCP4.OPTION[12]: requested_domain_name_servers = 1
DHCP4.OPTION[13]: requested_domain_search = 1
DHCP4.OPTION[14]: requested_dhcpv6_ra = 1
DHCP4.OPTION[15]: requested_interface_atu = 1
DHCP4.OPTION[16]: requested_ms_classless_static_routes = 1
DHCP4.OPTION[17]: requested_nis_domain = 1
DHCP4.OPTION[18]: requested_nis_servers = 1
DHCP4.OPTION[19]: requested_ntp_servers = 1
DHCP4.OPTION[20]: requested_routers = 1
DHCP4.OPTION[21]: requested_rout_path = 1
DHCP4.OPTION[22]: requested_routers = 1
DHCP4.OPTION[23]: requested_static_routes = 1
DHCP4.OPTION[24]: requested_subnet_mask = 1
DHCP4.OPTION[25]: requested_tcp_mtu_set = 1
DHCP4.OPTION[26]: requested_wpad = 1
DHCP4.OPTION[27]: routers = 192.168.204.2
DHCP4.OPTION[28]: subnet_mask = 255.255.255.0
fe80::20c:29ff:fee7:f8da/64
IP6.ADDRESS[1]: ...
IP6.GATEWAY: ...
IP6.ROUTE[1]: dst = fe80::/64, nh = ::, mt = 1024
[unredactedserver1 ~]$ 

```

Category	Setting	Value
General	Name	ens160
	UUID	7f6d1680-3494-3dc0-ba77-fd362a9f3ab9
	Type	802-3-ethernet (Wired Ethernet)
	Interface	ens160
	Autoconnect	Yes
	State	Activated
	Default IPv4	Yes
	Default IPv6	No
Ethernet	MTU	auto
	Auto-negotiation	No
	MAC Address	(Not manually set)
	Wake-on-LAN	default
IPv4	Method	auto (DHCP)
	IP Address	192.168.204.128/24
	Gateway	192.168.204.2
	DNS Server	192.168.204.2
	Domain	localdomain
DHCIPv4	DHCP Server	192.168.204.254
	Lease Time	1800 sec (30 min)
	Subnet Mask	255.255.255.0
IPv6	Method	auto (SLAAC/DHCIPv6)
	Link-local Address	fe80::20c:29ff:fee7:f8da/64
	Default Gateway	(None)

Proxy	Method	none (No proxy)
-------	--------	-----------------

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**

```
nmcli connection add type ethernet ifname ens192 con-name LAN1 ipv4.addresses 192.168.50.10/24
ipv4.method manual
```

```
[mperez@server1 ~]$ nmcli connection add type ethernet ifname ens192 con-name LAN1 ipv4.addresses 192.168.50.10/24 ipv4.method manual
Connection 'LAN1' (c8f16404-b81c-4d9e-b41c-3d55eed3362f) successfully added.
```

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

```
nmcli connection show LAN1
```

```
[mperez@server1 ~]$ nmcli connection show LAN1
connection.id:           LAN1
connection.uuid:         c8f16404-b81c-4d9e-b41c-3d55eed3362f
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:    1743378315
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
802-3-ethernet.mac-address: --
802-3-ethernet.cloned-mac-address: --
802-3-ethernet.generate-mac-address-mask: --
802-3-ethernet.mac-address-denylist: --
802-3-ethernet.mtu:      auto
802-3-ethernet.s390-subchannels: --
802-3-ethernet.s390-nettype: --
802-3-ethernet.s390-options: --
```

Lab 5 - Linux Network and Routing Configuration

```
802-3-ethernet.s390-options:      --
802-3-ethernet.wake-on-lan:       default
802-3-ethernet.wake-on-lan-password:  --
802-3-ethernet.accept-all-mac-addresses: -1 (default)
ipv4.method:                      manual
ipv4.dns:                         --
ipv4.dns-search:                  --
ipv4.dns-options:                 --
ipv4.dns-priority:                0
ipv4.addresses:                   192.168.50.10/24
ipv4.gateway:                     --
ipv4.routes:                      --
ipv4.route-metric:                -1
ipv4.route-table:                 0 (unspec)
ipv4.routing-rules:               --
ipv4.replace-local-rule:          -1 (default)
ipv4.dhcp-send-release:           -1 (default)
ipv4.ignore-auto-routes:          no
ipv4.ignore-auto-dns:             no
ipv4.ignore-auto-dns:             no
ipv4.dhcp-client-id:              --
ipv4.dhcp-iaid:                   --
ipv4.dhcp-dscp:                   --
ipv4.dhcp-timeout:                0 (default)
ipv4.dhcp-send-hostname:          yes
ipv4.dhcp-hostname:               --
ipv4.dhcp-fqdn:                   --
ipv4.dhcp-hostname-flags:         0x0 (none)
ipv4.never-default:               no
ipv4.may-fail:                    yes
ipv4.required-timeout:            -1 (default)
ipv4.dad-timeout:                 -1 (default)
ipv4.dhcp-vendor-class-identifier: --
ipv4.link-local:                  0 (default)
ipv4.dhcp-reject-servers:         --
ipv4.auto-route-ext-gw:           -1 (default)
ipv6.method:                      auto
ipv6.dns:                         --
ipv6.dns-search:                  --
ipv6.dns-options:                 --
ipv6.dns-priority:                0
ipv6.addresses:                   --
ipv6.gateway:                     --
ipv6.routes:                      --
ipv6.route-metric:                -1
```

```
ipv6.route-metric:                -1
ipv6.route-table:                 0 (unspec)
ipv6.routing-rules:               --
ipv6.replace-local-rule:          -1 (default)
ipv6.dhcp-send-release:           -1 (default)
ipv6.ignore-auto-routes:          no
ipv6.ignore-auto-dns:             no
ipv6.ignore-auto-dns:             no
ipv6.never-default:               no
ipv6.may-fail:                    yes
ipv6.required-timeout:            -1 (default)
ipv6.ip6-privacy:                 -1 (default)
ipv6.temp-valid-lifetime:         0 (default)
ipv6.temp-preferred-lifetime:     0 (default)
ipv6.addr-gen-mode:               default
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:                       none
proxy.method:                    no
proxy.browser-only:               no
proxy.pac-url:                   --
proxy.pac-script:                 --
GENERAL.NAME:                    LAN1
GENERAL.UUID:                    c8f16404-b81c-4d9e-b41c-3d55eed3362f
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/4
GENERAL.CON-PATH:                /org/freedesktop/NetworkManager/Settings/6
GENERAL.ZONE:                    --
GENERAL.MASTER-PATH:              --
IP4.ADDRESS[1]:                  192.168.50.10/24
IP4.GATEWAY:                     --
```

Missing Gateway and DNS IP

Lab 5 - Linux Network and Routing Configuration

```
nmcli connection modify LAN1 ipv4.gateway 192.168.50.1 ipv4.dns "8.8.8.8"
```

```
nmcli connection down LAN1 && nmcli connection up LAN1
```

```
[mperez@server1 ~]$ [mperez@server1 ~]$ nmcli connection modify LAN1 ipv4.gateway 192.168.50.1 ipv4.dns "8.8.8.8"
[mperez@server1 ~]$ nmcli connection down LAN1 && nmcli connection up LAN1
Connection 'LAN1' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/4)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/5)
[mperez@server1 ~]$ [mperez@server1 ~]$
```

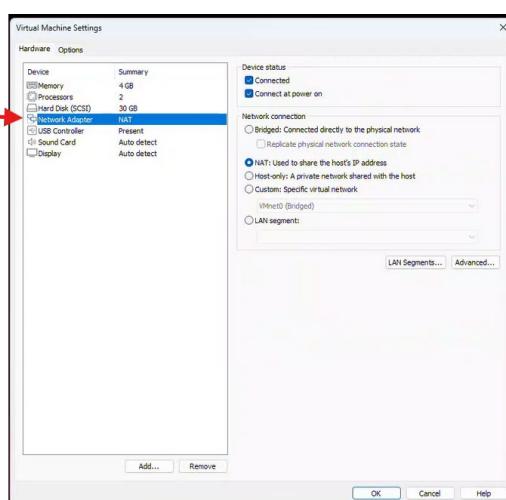
Note : Keep the session open on AlmaLinux and log in on the Ubuntu machine.

Exercise 2 – Configuring Network Interfaces on Ubuntu

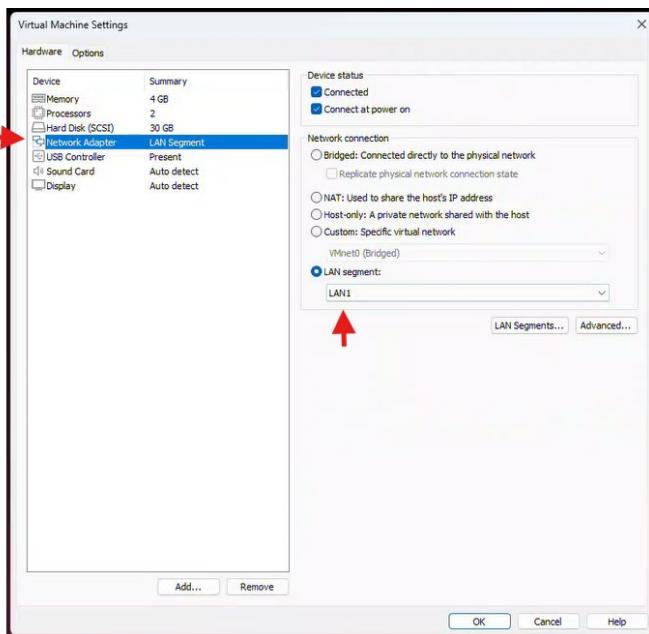
Tasks to Perform on Ubuntu:

Step 1:

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



Lab 5 - Linux Network and Routing Configuration



Step 2:

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

```
systemctl status NetworkManager
```

```
mpererez@client1: $ systemctl status NetworkManager
● NetworkManager.service - Network Manager
   Loaded: loaded (/lib/systemd/system/NetworkManager.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2025-03-27 00:01:52 EDT; 3 days ago
     Docs: man:NetworkManager(8)
 Main PID: 5715 (NetworkManager)
   Tasks: 11 (limit: 4549)
      CPU: 21.188s
     Memory: 11.1M
    CGroup: /system.slice/NetworkManager.service
           └─5715 /usr/sbin/NetworkManager -no-daemon

Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.4757] manager: NetworkManager state is now DISCONNECTED
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6096] device (ens3): carrier: link connected
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6099] device (ens3): state change: unavailable -> disconnected (reason 'none')
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6132] policy: auto-activating connection 'Wired connection 1' (3bed)
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6135] device (ens3): Activation: starting connection 'Wired connection 1'
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6136] device (ens3): state change: disconnected -> prepare (reason 'none')
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6139] device (ens3): state change: prepare -> config (reason 'none')
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6154] device (ens3): state change: config -> ip-config (reason 'none')
Mar 30 21:43:15 client1 NetworkManager[5715]: <Info> [1743385395.6183] dhcpc4 (ens3): activation: beginning transaction (timeout 10s)
mpererez@client1: $
```

Using the **nmcli** tool:

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

```
nmcli dev status
```

```
mpererez@client1: $ nmcli dev status
DEVICE  TYPE      STATE      CONNECTION
ens3    ethernet  disconnected --
lo     loopback  unmanaged   --
mpererez@client1: $
```

3. List the connections of all network interfaces.

```
nmcli connection show
```

Lab 5 - Linux Network and Routing Configuration

```
mperez@client1: $ nmcli connection show
NAME           UUID                                  TYPE      DEVICE
Wired connection 1 3bef7675-23c9-33dd-8394-e6921a71b949  ethernet  ens33
mperez@client1: $
```

4. List the details of your active connection.

```
mperez@client1: $ nmcli connection show --active
mperez@client1: $
```

5. Delete the current connection (if any).

N/A

6. Create a new connection with the following details:

- Connection name: **LAN1**
- Manual IP address: **192.168.50.20/24**
- Default Gateway: **192.168.50.10**
- DNS server: **8.8.8.8**

**nmcli connection add type ethernet ifname ens33 con-name LAN1 ipv4.addresses 192.168.50.20/24
ipv4.gateway 192.168.50.10 ipv4.dns 8.8.8.8 ipv4.method manual**

```
mperez@client1: $ nmcli connection add type ethernet ifname ens33 con-name LAN1 ipv4.addresses 192.168.50.20/24 ipv4.gateway 192.168.50.10 ipv4.dns 8.8.8.8 ipv4.method manual
Connection 'LAN1' (2e5f18e7-638d-4cba-88b8-7ac06094ad97) successfully added.
mperez@client1: $
```

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

nmcli connection show

nmcli connection show LAN1

```
mperez@client1: $ nmcli connection show
NAME           UUID                                  TYPE      DEVICE
LAN1           2e5f18e7-638d-4cba-88b8-7ac06094ad97  ethernet  ens33
Wired connection 1 3bef7675-23c9-33dd-8394-e6921a71b949  ethernet  --
mperez@client1: $
```

Lab 5 - Linux Network and Routing Configuration

```
mperez@client1:~$ mperez@client1:~$ nmcli connection show LAN1
connection.id:           LAN1
connection.uuid:         2e5f18e7-638d-4cba-88b8-7ac06094ad97
connection.stable-id:    --
connection.type:         802-3-ethernet
connection.interface-name: ens33
connection.autoconnect:  yes
connection.autoconnect-priority: 0
connection.autoconnect-retries: -1 (default)
connection.multi-connect: 0 (default)
connection.auth-retries: -1
connection.timestamp:    1743386233
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
802-3-ethernet.mac-address: --
802-3-ethernet.cloned-mac-address: --
802-3-ethernet.generate-mac-address-mask: --
802-3-ethernet.mac-address-blacklist: --
802-3-ethernet.mtu:      auto
802-3-ethernet.s390-subchannels: --
802-3-ethernet.s390-nettype:  --
802-3-ethernet.s390-options: --
802-3-ethernet.wake-on-lan: default
802-3-ethernet.wake-on-lan-password: --
802-3-ethernet.accept-all-mac-addresses: -1 (default)
ipv4.method:              manual
ipv4.dns:                 8.8.8.8
ipv4.dns-search:          --
ipv4.dns-options:         --
ipv4.dns-priority:        0
ipv4.addresses:           192.168.50.20/24
```

Lab 5 - Linux Network and Routing Configuration

```
ipv4.addresses:          192.168.50.20/24
ipv4.gateway:            192.168.50.10
ipv4.routes:              --
ipv4.route-metric:       -1
ipv4.route-table:         0 (unspec)
ipv4.routing-rules:      --
ipv4.ignore-auto-routes: no
ipv4.ignore-auto-dns:    no
ipv4.dhcp-client-id:    --
ipv4.dhcp-iaid:          --
ipv4.dhcp-timeout:       0 (default)
ipv4.dhcp-send-hostname: yes
ipv4.dhcp-hostname:      --
ipv4.dhcp-fqdn:          --
ipv4.dhcp-hostname-flags: 0x0 (none)
ipv4.never-default:      no
ipv4.may-fail:            yes
ipv4.required-timeout:   -1 (default)
ipv4.dad-timeout:        -1 (default)
ipv4.dhcp-vendor-class-identifier: --
ipv4.dhcp-reject-servers: --
ipv6.method:              auto
ipv6.dns:                 --
ipv6.dns-search:          --
ipv6.dns-options:         --
ipv6.dns-priority:        0
ipv6.addresses:           --
ipv6.gateway:             --
ipv6.routes:               --
ipv6.route-metric:        -1
ipv6.route-table:          0 (unspec)
ipv6.routing-rules:        --
ipv6.ignore-auto-routes:  no
ipv6.ignore-auto-dns:    no
ipv6.never-default:       no
ipv6.may-fail:             yes
ipv6.required-timeout:   -1 (default)
ipv6.ip6-privacy:         -1 (unknown)
ipv6.addr-gen-mode:       stable-privacy
ipv6.ra-timeout:          0 (default)
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.token:                --
proxy.method:              none
proxy.browser-only:       no
proxy.pac-url:             --
proxy.pac-script:          --
GENERAL.NAME:             LAN1
GENERAL.UUID:             2e5f18e7-638d-4cba-88b8-7ac06094ad97
GENERAL.IP-IFACE:          ens33
GENERAL.STATE:             activated
GENERAL.DEFAULT:           yes
GENERAL.DEFAULT6:          no
GENERAL.SPEC-OBJECT:       --
GENERAL.VPN:                no
GENERAL.DBUS-PATH:          /org/freedesktop/NetworkManager/ActiveConnection/10
GENERAL.CON-PATH:           /org/freedesktop/NetworkManager/Settings/2
GENERAL.ZONE:                --
GENERAL.MASTER-PATH:        --
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
IP6.ADDRESS[1]:             fe80::6ef0:de03:28d2:41cf/64
IP6.GATEWAY:                --
IP6.ROUTE[1]:               dst = fe80::/64, nh = ::, mt = 1024
npererez@client1:~$ nmcli connection show
```

```
tpv6.token:                --
proxy.method:              none
proxy.browser-only:       no
proxy.pac-url:             --
proxy.pac-script:          --
GENERAL.NAME:             LAN1
GENERAL.UUID:             2e5f18e7-638d-4cba-88b8-7ac06094ad97
GENERAL.IP-IFACE:          ens33
GENERAL.STATE:             activated
GENERAL.DEFAULT:           yes
GENERAL.DEFAULT6:          no
GENERAL.SPEC-OBJECT:       --
GENERAL.VPN:                no
GENERAL.DBUS-PATH:          /org/freedesktop/NetworkManager/ActiveConnection/10
GENERAL.CON-PATH:           /org/freedesktop/NetworkManager/Settings/2
GENERAL.ZONE:                --
GENERAL.MASTER-PATH:        --
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
IP6.ADDRESS[1]:             fe80::6ef0:de03:28d2:41cf/64
IP6.GATEWAY:                --
IP6.ROUTE[1]:               dst = fe80::/64, nh = ::, mt = 1024
npererez@client1:~$ nmcli connection show
```

Delete Wired connection since not used

nmcli con delete Wired\ connection\ 1

```
mperez@client1: $  
mperez@client1: $ nmcli con delete Wired\ connection\ 1  
Connection 'Wired connection 1' (3bef7675-23c9-33dd-8394-e6921a71b949) successfully deleted.  
mperez@client1: $
```

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.

```
mperez@client1: ~$  
mperez@client1: ~$ 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=2.25 ms  
64 bytes from 192.168.50.10: icmp_seq=2 ttl=64 time=0.329 ms  
64 bytes from 192.168.50.10: icmp_seq=3 ttl=64 time=1.87 ms  
^C  
--- 192.168.50.10 ping statistics ---  
■ 3 packets transmitted, 3 received, 0% packet loss, time 2052ms  
■ rtt min/avg/max/mdev = 0.329/1.483/2.248/0.830 ms  
mperez@client1: ~$
```

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.

```
[mperez@server1 ~]$ 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=0.404 ms  
64 bytes from 192.168.50.20: icmp_seq=2 ttl=64 time=0.384 ms  
64 bytes from 192.168.50.20: icmp_seq=3 ttl=64 time=0.193 ms  
64 bytes from 192.168.50.20: icmp_seq=4 ttl=64 time=0.165 ms  
64 bytes from 192.168.50.20: icmp_seq=5 ttl=64 time=0.175 ms  
64 bytes from 192.168.50.20: icmp_seq=6 ttl=64 time=0.252 ms  
64 bytes from 192.168.50.20: icmp_seq=7 ttl=64 time=0.182 ms  
64 bytes from 192.168.50.20: icmp_seq=8 ttl=64 time=0.196 ms  
^C  
--- 192.168.50.20 ping statistics ---  
8 packets transmitted, 8 received, 0% packet loss, time 7189ms  
rtt min/avg/max/mdev = 0.165/0.243/0.404/0.090 ms  
[mperez@server1 ~]$ ^C  
[mperez@server1 ~]$ ^C
```

Exercise 3 – Routing Configuration

Tasks to Perform on AlmaLinux:

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

sudo sysctl -w net.ipv4.ip_forward=1

```
[mperez@server1 ~]$ sudo sysctl -w net.ipv4.ip_forward=1
[sudo] password for mperez:
net.ipv4.ip_forward = 1
[mperez@server1 ~]$
```

To make change persistent

sudo nano /etc/sysctl.conf

Add line - **net.ipv4.ip_forward=1**

```
GNU nano 5.6.1
# sysctl settings are defined through files in
# /usr/lib/sysctl.d/, /run/sysctl.d/, and /etc/sysctl.d/.
#
# Vendors settings live in /usr/lib/sysctl.d/.
# To override a whole file, create a new file with the same in
# /etc/sysctl.d/ and put new settings there. To override
# only specific settings, add a file with a lexically later
# name in /etc/sysctl.d/ and put new settings there.
#
# For more information, see sysctl.conf(5) and sysctl.d(5).
net.ipv4.ip_forward=1
```

```
[mperez@server1 ~]$ cat /etc/sysctl.conf
# sysctl settings are defined through files in
# /usr/lib/sysctl.d/, /run/sysctl.d/, and /etc/sysctl.d/.
#
# Vendors settings live in /usr/lib/sysctl.d/.
# To override a whole file, create a new file with the same in
# /etc/sysctl.d/ and put new settings there. To override
# only specific settings, add a file with a lexically later
# name in /etc/sysctl.d/ and put new settings there.
#
# For more information, see sysctl.conf(5) and sysctl.d(5).
net.ipv4.ip_forward=1
[mperez@server1 ~]$
```

Apply changes

sudo sysctl -p

```
[mperez@server1 ~]$ sudo sysctl -p
net.ipv4.ip_forward = 1
[mperez@server1 ~]$
```

nmcli

Lab 5 - Linux Network and Routing Configuration

```
[mperez@server1 ~]$ nmcli
ens160: connected to ens160
  "VMware VMXNET3"
  ethernet (vmxnet3), 00:0C:29:E7:F8:DA, hw, mtu 1500
  ip4 default
  inet4 192.168.204.128/24
    route4 default via 192.168.204.2 metric 100
    route4 192.168.204.0/24 metric 100
  inet6 fe80::20c:29ff:fee7:f8da/64
    route6 fe80::/64 metric 1024

ens192: connected to LAN1
  "VMware VMXNET3"
  ethernet (vmxnet3), 00:0C:29:E7:F8:E4, hw, mtu 1500
  inet4 192.168.50.10/24
    route4 192.168.50.0/24 metric 101
    route4 default via 192.168.50.1 metric 101
  inet6 fe80::3e70:81df:4f1a:15be/64
    route6 fe80::/64 metric 1024

lo: connected (externally) to lo
  "lo"
  loopback (unknown), 00:00:00:00:00:00, sw, mtu 65536
  inet4 127.0.0.1/8
  inet6 ::1/128
    route6 ::1/128 metric 256

DNS configuration:
  servers: 192.168.204.2
  domains: localdomain
  interface: ens160

  servers: 8.8.8.8
  interface: ens192

Use "nmcli device show" to get complete information about known devices and
"nmcli connection show" to get an overview on active connection profiles.

Consult nmcli(1) and nmcli-examples(7) manual pages for complete usage details.
[mperez@server1 ~]$
```

Ping external interface from ubuntu towards Alma

```
mperez@client1: ~
mperez@client1: $ ping 192.168.204.128
PING 192.168.204.128 (192.168.204.128) 56(84) bytes of data.
64 bytes from 192.168.204.128: icmp_seq=1 ttl=64 time=0.700 ms
64 bytes from 192.168.204.128: icmp_seq=2 ttl=64 time=0.183 ms
64 bytes from 192.168.204.128: icmp_seq=3 ttl=64 time=0.166 ms
^C
--- 192.168.204.128 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2084ms
rtt min/avg/max/mdev = 0.166/0.349/0.700/0.247 ms
mperez@client1: $
```

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

List available firewall zones

firewall-cmd - -get-zones

List active firewall zones

firewall-cmd --get-active-zones

Lab 5 - Linux Network and Routing Configuration

```
[mperez@server1 ~]$ firewall-cmd --get-zones
block dmz drop external home internal nm-shared public trusted work
[mperez@server1 ~]$ firewall-cmd --get-active-zones
public
  interfaces: ens160 ens192
[mperez@server1 ~]$
```

List firewall services

firewall-cmd –list-services

```
[mperez@server1 ~]$ firewall-cmd --list-services
cockpit dhcpcv6-client ssh
[mperez@server1 ~]$
```

Assign ens160 to external zone

```
[mperez@server1 ~]$ nmcli con mod ens160 con.zone external
[mperez@server1 ~]$ nmcli con d ens160 ; nmcli con u ens160
Connection 'ens160' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/2)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/6)
[mperez@server1 ~]$
```

Assign LAN1 to nm-shared

```
[mperez@server1 ~]$ nmcli con mod LAN1 con.zone nm-shared
[mperez@server1 ~]$ nmcli con d LAN1 ; nmcli con u LAN1
Connection 'LAN1' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/5)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/7)
[mperez@server1 ~]$
```

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

```
[mperez@server1 ~]$
[mperez@server1 ~]$ firewall-cmd --get-active-zones
external
  interfaces: ens160
nm-shared
  interfaces: ens192
[mperez@server1 ~]$
```

4. List the firewall rules associated with each zone.

sudo firewall-cmd --list-all-zone=nm-shared
sudo firewall-cmd --list-all-zone=external

```
[mperez@server1 ~]$ 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
[mperez@server1 ~]$ sudo firewall-cmd --list-all --zone=external
[sudo] password for mperez:
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:
[mperez@server1 ~]$
```

sudo firewall-cmd --list-all-zones

```
[mperez@server1 ~]$ sudo firewall-cmd --list-all-zones
[sudo] password for mperez:
Sorry, try again.
[sudo] password for mperez:
block
  target: %%REJECT%%
  icmp-block-inversion: no
  interfaces:
  sources:
  services:
  ports:
  protocols:
  forward: yes
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:

dmz
  target: default
```

Lab 5 - Linux Network and Routing Configuration

```
icmp-block-inversion: no
interfaces:
sources:
services: ssh
ports:
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:

drop
target: DROP
icmp-block-inversion: no
interfaces:
sources:
services:
ports:
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:

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:

home
target: default
icmp-block-inversion: no
interfaces:
sources:
services: cockpit dhcpcv6-client mdns samba-client ssh
ports:
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:

internal
target: default
icmp-block-inversion: no
interfaces:
sources:
services: cockpit dhcpcv6-client mdns samba-client ssh
ports:
protocols:
forward: yes
```

Lab 5 - Linux Network and Routing Configuration

```
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:

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

public
target: default
icmp-block-inversion: no
interfaces:
sources:
services: cockpit dhcpcv6-client ssh
ports:
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:

trusted
target: ACCEPT
icmp-block-inversion: no
interfaces:
sources:
services:
ports:
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:

work
target: default
icmp-block-inversion: no
interfaces:
sources:
services: cockpit dhcpcv6-client ssh
ports:
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:
```

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.

Test pings

```
mperez@client1:~$  
mperez@client1:~$ ping 8.8.8.8  
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.  
64 bytes from 8.8.8.8: icmp_seq=1 ttl=127 time=2.19 ms  
64 bytes from 8.8.8.8: icmp_seq=2 ttl=127 time=1.99 ms  
64 bytes from 8.8.8.8: icmp_seq=3 ttl=127 time=2.13 ms  
64 bytes from 8.8.8.8: icmp_seq=4 ttl=127 time=2.02 ms  
^C  
--- 8.8.8.8 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3005ms  
rtt min/avg/max/mdev = 1.985/2.079/2.187/0.081 ms  
mperez@client1:~$ ping google.com  
PING google.com (142.250.69.46) 56(84) bytes of data.  
64 bytes from pnyula-aa-in-f14.1e100.net (142.250.69.46): icmp_seq=1 ttl=127 time=2.03 ms  
64 bytes from qro02s19-in-f14.1e100.net (142.250.69.46): icmp_seq=2 ttl=127 time=2.25 ms  
64 bytes from qro02s19-in-f14.1e100.net (142.250.69.46): icmp_seq=3 ttl=127 time=2.18 ms  
64 bytes from pnyula-aa-in-f14.1e100.net (142.250.69.46): icmp_seq=4 ttl=127 time=3.01 ms  
64 bytes from pnyula-aa-in-f14.1e100.net (142.250.69.46): icmp_seq=5 ttl=127 time=1.95 ms  
^C  
--- google.com ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4007ms  
rtt min/avg/max/mdev = 1.946/2.282/3.007/0.378 ms  
mperez@client1:~$
```

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

Firefox is not installed; Chrome is there and connection to internet is possible

