Operating System Lab 4

Validate Network Configuration

In Linux

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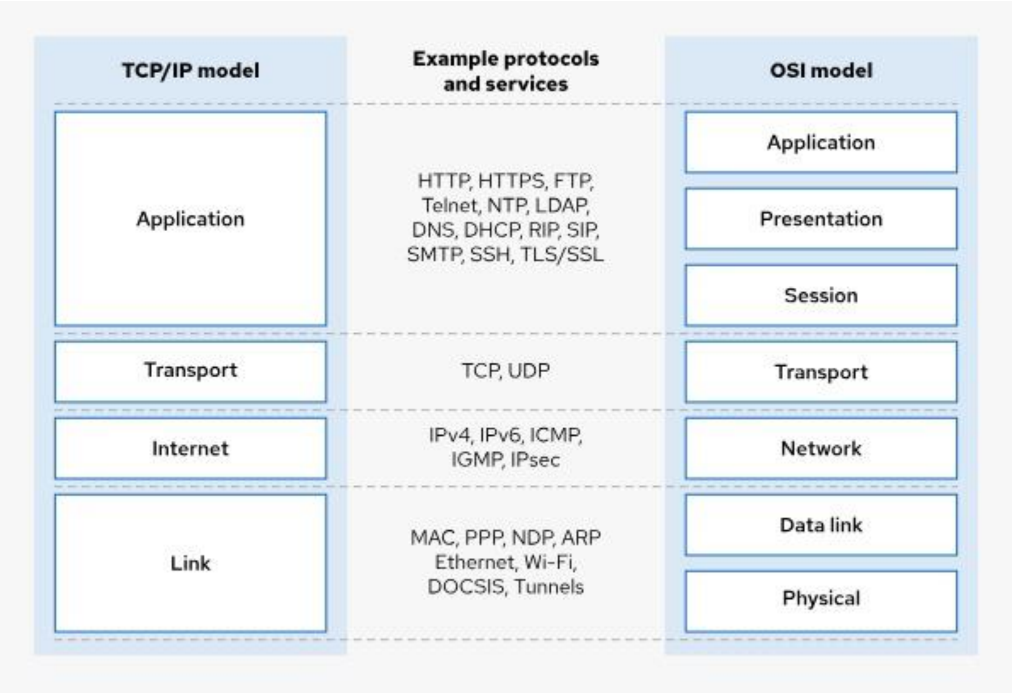
Part 1: Some Network Concepts

Objective:

The objective of this lab is to familiarize students with network configuration in Linux. By the end of this lab, students will be able to identify and configure network interfaces, and use essential networking commands (ip link, ip a, ip route).

TCP/IP Model Vs OSI Model



TCP/IP model	Example protocols and services	OSI model
Application	HTTP, HTTPS, FTP, Telnet, NTP, LDAP, DNS, DHCP, RIP, SIP, SMTP, SSH, TLS/SSL	Application Presentation Session
Transport	TCP, UDP	Transport
Internet	IPv4, IPv6, ICMP, IGMP, IPsec	Network
Link	MAC, PPP, NDP, ARP Ethernet, Wi-Fi, DOCSIS, Tunnels	Data link Physical

Network Interface Card

A Network Interface Card (**NIC**), also known as a network adapter, network interface controller, or Ethernet card, is a hardware component that connects a computer to a network. It allows the computer to communicate with other devices on the network, either through wired (Ethernet) or wireless (Wi-Fi) connections.

Key Components and Features of a NIC:

- Physical Interface:
  - Ethernet Port: For wired connections, an NIC typically includes one or more RJ-45 ports for Ethernet cables.
  - Antenna: For wireless NICs, antennas are used to connect to Wi-Fi networks.
- MAC Address: Each NIC has a unique Media Access Control (MAC) address, which is a hardware identifier used to distinguish it from other network devices.
- Types of NICs:
  - Ethernet NIC: Used for wired networks, connects via Ethernet cables.
  - Wireless NIC: Used for wireless networks, connects via Wi-Fi.
  - Fiber Optic NIC: Used for high-speed fiber optic networks.

Describe Network Interface Names:

Network interfaces on a computer are named differently depending on the operating system and the context in which they are used. Here are some common naming conventions for network interfaces across various operating systems:

- Linux: In Linux, network interfaces are named according to different schemes, depending on the system distribution and configuration. Some common naming conventions include:
  - ethX: Ethernet interfaces (e.g., eth0, eth1).
  - wlanX: Wireless interfaces (e.g., wlan0, wlan1).
  - lo: Loopback interface.
- Windows: In Windows, network interfaces are usually named more descriptively, often depending type of connection:
  - Ethernet: Named based on the adapter (e.g., "Ethernet", "Ethernet 2").
  - Wireless: Named based on the adapter (e.g., "Wi-Fi", "Wi-Fi 2").

Operating System Lab 1

Introduction to the File system

In Linux

Part 2: Gather Network Interface Information

- **ip link:**
  - The ip link command lists all available network interfaces on your system.

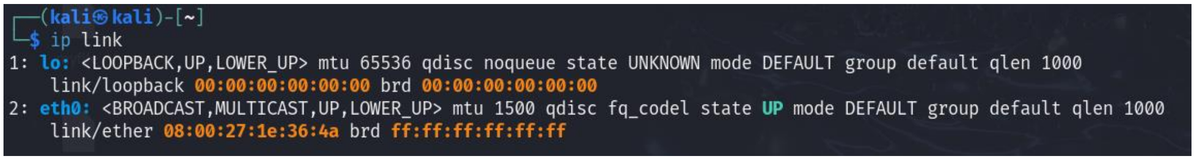
- Syntax:

ip link

Example:

- Basic Output→ ip link
- Display Information for a Specific Interface → ip link show dev eth0
- disable specific (eth1) interface → ip link set eth1 down
- enable specific interface → ip link set eth1 up

- Output format:



```
┌──(kali㉿kali)-[~]
└─$ ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:1e:36:4a brd ff:ff:ff:ff:ff:ff
```

- **ip a:**

  - The ip a command is part of the iproute2 package and provides more detailed information about network interfaces compared to the ip link command. For example, ip a will show the assigned IPv4 and IPv6 addresses for each interface, which is not displayed by ip link.

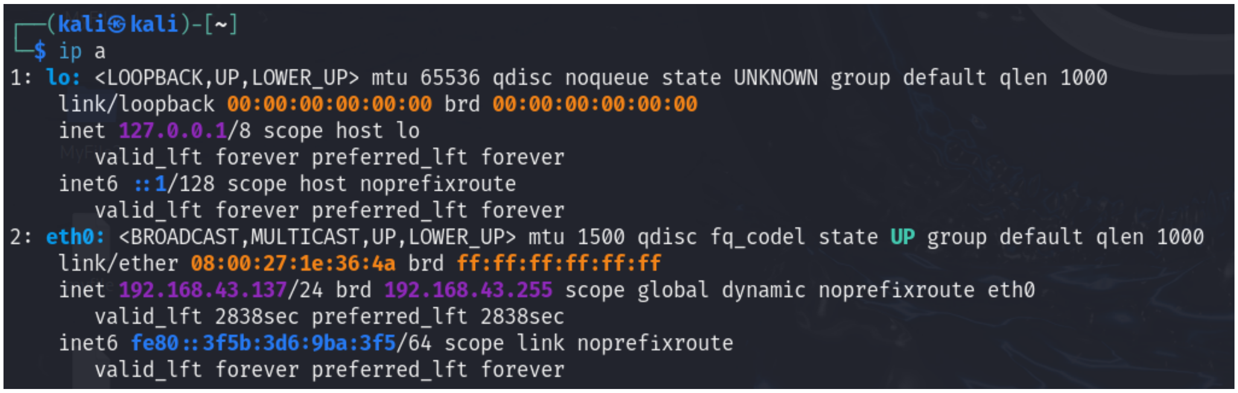
- Syntax:

Ip a

- Example:

- Basic Output→ ip a
- Display Information for a Specific Interface→ ip a show dev eth0

- Basic Output format:



```
┌──(kali㉿kali)-[~]
└─$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:1e:36:4a brd ff:ff:ff:ff:ff:ff
    inet 192.168.43.137/24 brd 192.168.43.255 scope global dynamic noprefixroute eth0
       valid_lft 2838sec preferred_lft 2838sec
    inet6 fe80::3f5b:3d6:9ba:3f5/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

- **Ip route:**

  - The ip route command is used to display and manipulate the IP routing table in Linux.

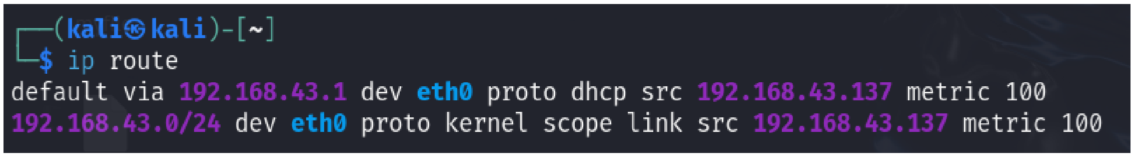
- Syntax:

ip route

- Example:

  - Display the Current Routing Table → ip route
  - Add a Static Route → sudo ip route add 192.168.1.0/24 via 192.168.43.1 dev eth0
  - Creating a series of files with sequential numbers → sudo ip route del 192.168.1.0/24

- Basic Output format:



```
┌──(kali㉿kali)-[~]
└─$ ip route
default via 192.168.43.1 dev eth0 proto dhcp src 192.168.43.137 metric 100
192.168.43.0/24 dev eth0 proto kernel scope link src 192.168.43.137 metric 100
```

Operating System Lab 1

Validate Network Configuration

Part 2: Let's Try

Let's try together:

- Now, I will solve one of the questions. Focus with me, and then it will be your turn.
- Question 1: Display your IP Address and Interface Details

Use ifconfig, ip link, and ip addr to answer the following questions:

- show the IP address and subnet mask of the eth0 network interface on a Linux system.
- display all IP addresses assigned to all network interfaces on a Linux system.
- disable and then re-enable the eth0 network interface on a Linux system.

Now it's your turn:

- *Solve the following Question and then go to the eLearning website to submit your solution.*
- Question 2: Network Routing Management with ip route.

Use IP Route to solve the following questions

- Display all current IP routes.
- Add a new route to the network 192.168.2.0/24 via gateway 192.168.1.1.
- Display all current IP routes.
- Delete the newly added route.

Best Wishes