Routing And Switching

1 . What is Switching?

Switching happens inside a **local network (LAN)** — like inside your home, office, or organization.

A **Switch** is a **network device** that connects multiple devices (computers, printers, servers) within the same network and allows them to communicate efficiently.

How it Works :

- A switch receives data packets and looks at their **MAC address** (a unique hardware address).
- It then forwards the data **only to the device** it is meant for — not to every device.
- This makes communication **fast, secure, and reduces congestion**.

Example :
If Computer A sends a file to Computer B within the same office, the **switch** ensures only Computer B gets it — not everyone else.

📡 Protocols Used :

- Ethernet
- VLAN (Virtual LANs)
- Spanning Tree Protocol (STP)

2 . What is Routing?

Routing happens between **different networks** — for example, between your home network and the Internet.

A **Router** is a **network device** that connects multiple networks and directs data from one network to another.

How it Works :

- The router reads the **destination IP address** of each packet.
- It uses a **routing table** to decide the best path to send that packet.
- It forwards the data toward the destination through the most efficient route.

Example :
When you open *www.google.com*, your router sends your data from your local network to your Internet Service Provider (ISP), and then to Google's server using the best possible route.

📡 Protocols Used:

- RIP (Routing Information Protocol)
- OSPF (Open Shortest Path First)
- BGP (Border Gateway Protocol)
- EIGRP (Enhanced Interior Gateway Routing Protocol)

3 . Key Difference Between Routing and Switching

Feature	Switching	Routing
Purpose	Connects devices within the same network (LAN)	Connects multiple networks (LAN to WAN)
Device Used	Switch	Router
Address Type	MAC Address	IP Address
Works On (OSI Layer)	Layer 2 (Data Link Layer)	Layer 3 (Network Layer)
Protocol Type	Ethernet, VLAN	RIP, OSPF, BGP
Speed	Faster (within local network)	Slightly slower (inter-network)
Example	Sending a file between office PCs	Accessing a website on the Internet

4 . **In Simple Terms:**

- **Switching** = *Directing traffic inside your network*
- **Routing** = *Finding the best path between networks*

Or think of it like this:

🏠 **Switch** = Traffic manager *inside* your city
🚗 **Router** = GPS that guides cars *between* cities

5 . **Why It Matters in Cybersecurity**

Understanding routing and switching is crucial for:

- Network design and troubleshooting
- Firewalls and access control
- Packet sniffing and intrusion detection

Ethical hacking and penetration testing.