Welcome to Cybersecurity and Ethical hacking

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Module 3-4: Networking Fundamentals

- What it Computer Network
- Key Components
- Types of Network
- OSI & TCP/IP Model
- IP Address, Mac-address
- Ports & Protocols

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Computer Networking

What is Computer Networking?

Computer Networking is the process of connecting multiple computers and devices together to share data, resources (like printers), and internet access

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Key Components of a Network:

- Devices : Computers, laptops, mobile phones, servers
- Network Devices: Routers, switches, modems, access points
- Transmission Media: Wired (Ethernet) and Wireless (Wi-Fi)
- Protocols: Rules for communication (e.g., TCP/IP, HTTP, FTP)

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Types of Networks:

Four types of Computer Network:

- **LAN :** Local Area Network– within homes or offices
- **MAN:** Wide Area Network – large-scale networks like the internet
- **WAN:** Metropolitan Area Network – across cities or campuses
- **PAN:** Personal Area Network – small-scale, like Bluetooth

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Why Networking is Important in Cybersecurity

- Understanding how data flows helps detect attacks.
- Identifying vulnerable protocols and ports.
- Network-level attacks like MITM, ARP spoofing, port scanning
- Foundation for ethical hacking and penetration testing.

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OSI Model (7 Layers)

Layered Approach to Network Communication

- **Application –** User interface (HTTP, FTP)
- **Presentation –** Data format/Encryption (SSL/TLS)
- **Session –** Connection control (NetBIOS)
- **Transport –** End-to-end connection (TCP/UDP)
- **Network –** Routing (IP)
- **Data Link –** MAC address, ARP
- **Physical –** Cables, signals

OSI Model

Application	Data
Presentation	Data
Session	Data
Transport	Segment
Network	Packet
Data Link	Frame

OSI Model

Data Flow

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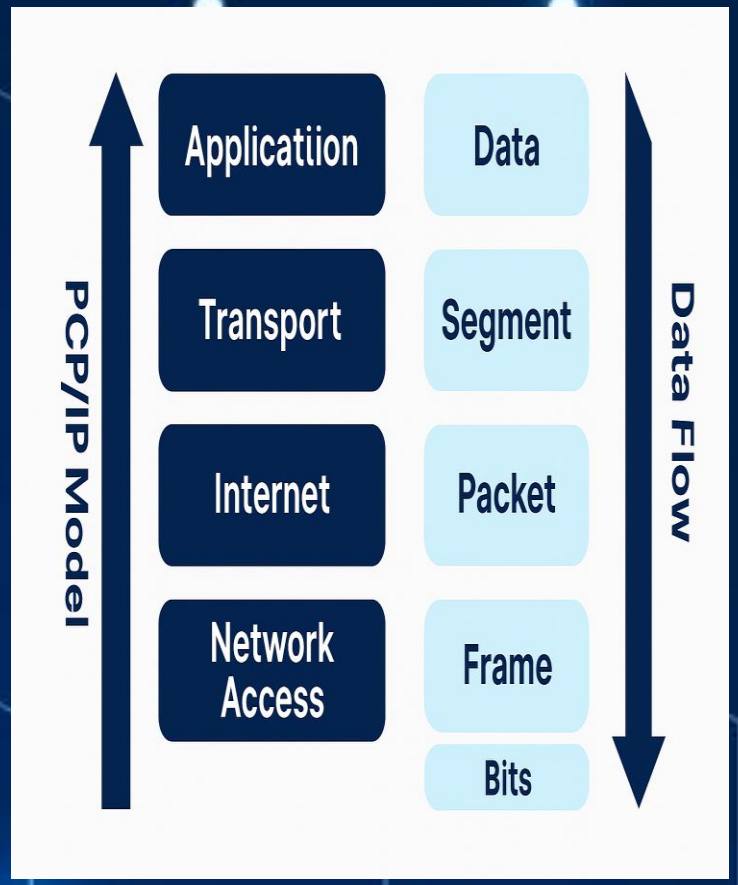
TCP/IP Model (4 Layers)

Layered Approach to Network Communication

- **Application** – FTP, HTTP, DNS
- **Transport –** TCP/UDP
- **Internet** – IP, ICMP
- **Network Access –** Ethernet, MAC

TCP/IP Model



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IP Addressing (IPv4 Basics)

What is an IP Address?

An IP Address (**Internet Protocol Address**) is a **unique identifier** assigned to each device connected to a network that uses the **Internet Protocol** for communication.

- **Types:**
  - **Public IP:** Accessible over the internet.
  - **Private IP:** Used in local networks (e.g., 192.168.x.x)
  - **Static IP:** Manually set and doesn't change.
  - **Dynamic IP:** Automatically assigned and may change over time.

MAC Address

What is a MAC Address?

A MAC Address (**Media Access Control Address**) is a **unique hardware identifier** assigned to a network interface card (NIC) by the device manufacturer.

Key Points:

- It operates at the **Data Link Layer** (Layer 2) of the OSI model.
- Used to identify devices on a **local network** (like LAN or Wi-Fi).
- Usually written in **hexadecimal format**, such as **00:1A:2B:3C:4D:5E**.
- Unlike IP addresses, MAC addresses **don't usually change** (though they can be spoofed).

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Ports & Protocols

Ports:

- **Logical endpoints for communication.**
- **Range: 0 – 65535**
  - ✓ **0-1023**: Well-known (HTTP: 80, HTTPS: 443, SSH: 22)
  - ✓ **1024-49151**: Registered
  - ✓ **49152-65535**: Dynamic/Private

Ports & Protocols

Common Protocols:

Protocol	Port	Use
HTTP	80	Web traffic
HTTPS	443	Secure web
FTP	21	File Transfer
SSH	22	Secure shell
DNS	53	Domain Name System
SMTP	25	Email sending

Tools Like Nmap Use Ports for Scanning

Summary

Common Protocols:

- **OSI & TCP/IP:** Foundation of how data flows.
- **IP & MAC:** Identity of devices.
- **Ports & Protocols:** Channels and rules for communication.
- Crucial for **network attacks, sniffing, enumeration.**

Answer these questions

- ✓ Which Types of Protocol are used in Transport Layer?
- ✓ What is the Full Form of SMTP?
- ✓ HTTP port number is _____?
- ✓ How can you find your public IP?

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The End

Thank You

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