

What is Networking?

What Is Networking? – Concise Study Notes

1. Definition

- **Networking** is the practice of connecting computers, devices, and services so they can exchange data, share resources, and communicate with each other.
 - It enables **communication** (e?mail, messaging, voice/video calls), **resource sharing** (files, printers, internet access), and **collaboration** across local or wide?area environments.
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2. Core Concepts

Concept	Description	Typical Example
Node	Any device that can send, receive, or forward data (PC, smartphone, server, router, printer).	A laptop on a corporate LAN
Link	Physical or logical connection between nodes (cable, fiber, wireless signal).	Ethernet cable between a switch and a PC
Protocol	Set of rules governing how data is formatted, transmitted, and interpreted.	TCP/IP, HTTP, DHCP
Topology	Physical or logical layout of nodes and links.	Star, bus, mesh, ring
Addressing	Unique identifiers that allow devices to locate each other.	IPv4 address?192.168.1.10, MAC address?00:1A:2B:3C:4D:5E
Layering	Division of networking functions into stacked layers (OSI, TCP/IP).	Application ? Transport ? Internet ? Link ? Physical

3. Types of Networks

Scale	Typical Range	Common Use Cases
PAN (Personal Area Network)	A few meters	Bluetooth headset, smartwatch
LAN (Local Area Network)	Building or campus	Office computers, printers

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Scale	Typical Range	Common Use Cases
MAN (Metropolitan Area Network)	City-wide	Municipal Wi-Fi, university campus
WAN (Wide Area Network)	Regional to global	Internet, corporate branch connections
CAN (Campus Area Network)	Multiple LANs within a limited area	University campuses
SAN (Storage Area Network)	Dedicated high-speed network for storage	Data-center block storage

4. Key Network Devices

Device	Primary Role	Typical Placement
Hub	Repeats incoming signals to all ports (OSI Layer ?1).	Small, legacy LANs
Switch	Forwards frames based on MAC addresses (Layer?2).	Modern LANs, data centers
Router	Routes packets between different IP networks (Layer?3).	Edge of LAN, ISP backbone
Access Point (AP)	Provides wireless connectivity to wired LAN.	Offices, public Wi-Fi
Firewall	Inspects and filters traffic based on security policies.	Network perimeter
Modem	Converts digital data to/from analog signals for ISP link.	Home/office internet connection
Load Balancer	Distributes traffic across multiple servers for reliability.	Web farms, cloud services

5. The TCP/IP Model (Practical Layering)

1. **Application** – Protocols: HTTP, SMTP, FTP, DNS.
2. **Transport** – Protocols: TCP (reliable), UDP (fast, connectionless).

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3. **Internet** – Protocol: IP (addressing & routing).

4. **Link (Network Access)** – Ethernet, Wi-Fi, PPP.

Each layer adds its own header/trailer, enabling modular design and interoperability.

6. Common Networking Protocols

Layer	Protocol	Purpose
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Application	**	
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