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# Networking Basics

## Fundamentals of Computer Networks

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# Table of contents

- ❑ **Networking Terminology**
- ❑ **Common Physical and Logical Topologies**
- ❑ **Networking Architectures and Protocols**
- ❑ **Open Systems Interconnection (OSI) Model**
- ❑ **Network Elements**

# Introduction

This presentation covers the essential networking concepts, including terminology, topologies, architectures, protocols, and key network elements that form the backbone of modern communication.

# Networking Terminology

- **Node:** Any device connected to a network.
- **Host:** A device identified by a unique IP address.
- **Packet:** A unit of data transmitted across a network.
- **Protocol:** A set of rules for data transmission (e.g., TCP/IP).
- **Bandwidth:** Maximum data transfer rate of a network.
- **Latency:** Delay between sending and receiving data.
- **Throughput:** Actual data transfer rate achieved.
- **IP Address:** Unique address for each device on a network.

# Common Physical and Logical Topologies

Network topology refers to the arrangement of devices in a network.

**Physical Topologies focus on cable and device layout.**

➢ Bus Topology: All devices share a common backbone.
➢ Star Topology: All devices connect to a central hub.
➢ Ring Topology: Devices connected circularly.
➢ Mesh Topology: Every device connects to every other device.

**Logical Topologies refer to data transmission methods.**

➢ Logical Bus: Data travels over a shared communication line.
➢ Logical Star: Data passes through a central hub.
➢ Logical Ring: Data moves in a circular direction.

# Networking Architectures and Protocols

Network Architectures define how resources are shared.

1- Client-Server Architecture: A centralized server provides resources.
2- Peer-to-Peer (P2P) Architecture: Each node acts as a server and client.

Protocols define data transmission between devices.
TCP/IP: Foundational protocol of the internet.
UDP: Faster, connectionless protocol for streaming.
HTTP/HTTPS: Protocols for transmitting web data.
FTP: Used to transfer files over a network.

# Open Systems Interconnection (OSI) Model

The OSI model is a seven-layer framework for networking protocols.

➢ Physical Layer: Transmits raw data over media.
➢ Data Link Layer: Reliable transmission management.
➢ Network Layer: Handles routing of data.
➢ Transport Layer: End-to-end communication.
➢ Session Layer: Manages application sessions.
➢ Presentation Layer: Translates data formats.
➢ Application Layer: Provides services to applications.

# Network Elements

Hubs connect multiple computers and broadcast data to all devices, leading to congestion.

Layer 2 Switches operate on MAC addresses, forwarding data only to intended devices.

Layer 3 Switches can forward data based on IP addresses, allowing advanced routing.

Routers connect different networks, analyze IP addresses, and manage data routing.

# Conclusion

Understanding networking terminology, topologies, architectures, and devices is crucial for delving into complex networking concepts. The OSI model provides a structured method for analyzing data flow, while elements like hubs, switches, and routers efficiently manage communication.

# Thank you!

**Do you have any questions?**

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