

Computer Network Protocols: Introduction

ICT 2255

Syllabus

- Course Objectives
- Course Outcomes
- Books

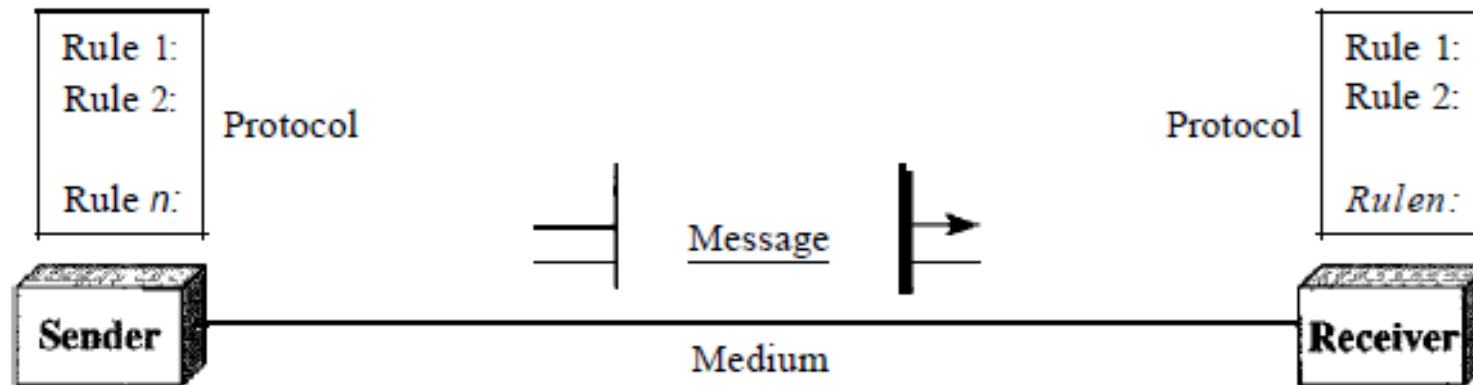
Books

1. Behrouz A. Forouzan, TCP/IP Protocol Suite, Tata McGraw Hill, 4th Edition, 2017.
2. Tannenbaum, A.S, COMPUTER NETWORKS, Prentice Hall of India EE Edition, 5th Edition, 2013.
3. Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw Hill, 5th Edition, 2013.
4. Leon Garcia and Widjaja, Communication Networks, Tata McGraw Hill, 2nd Edition, 2004.

A Quick Recap

Basics

- What is Computer Network?
- Components of Computer Network?



- Internet vs internet

Basics: Network Criteria

- Performance

- Transit Time, Response Time
- #Users, Type of transmission Medium, Capabilities of connected hardware, efficiency of software
- Throughput, Delay

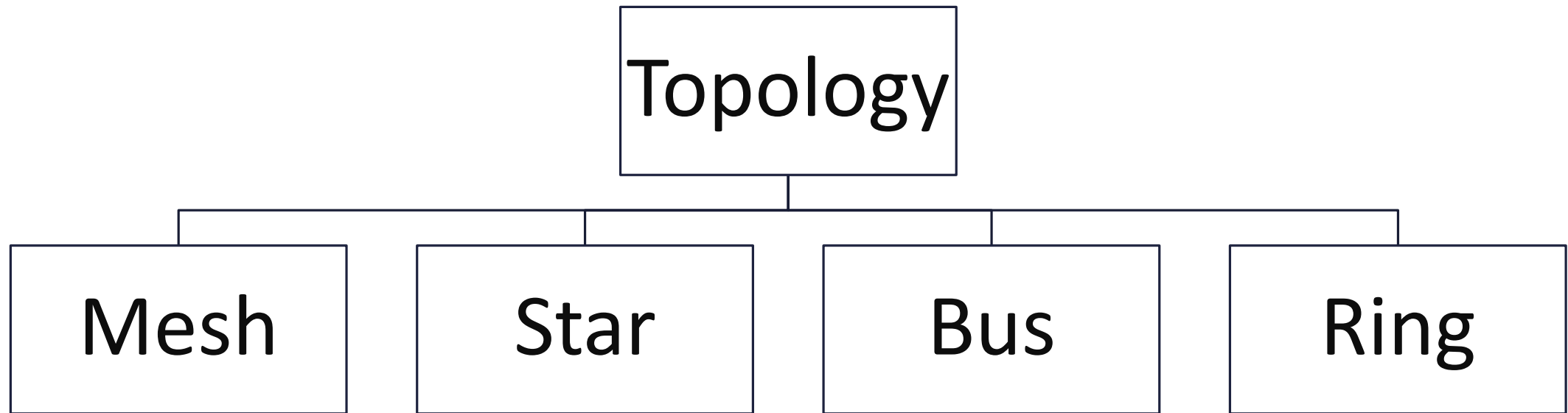
- Reliability

- Accuracy of delivery.
- Frequency of failure, time to recover from a failure, and network's robustness.



- Security

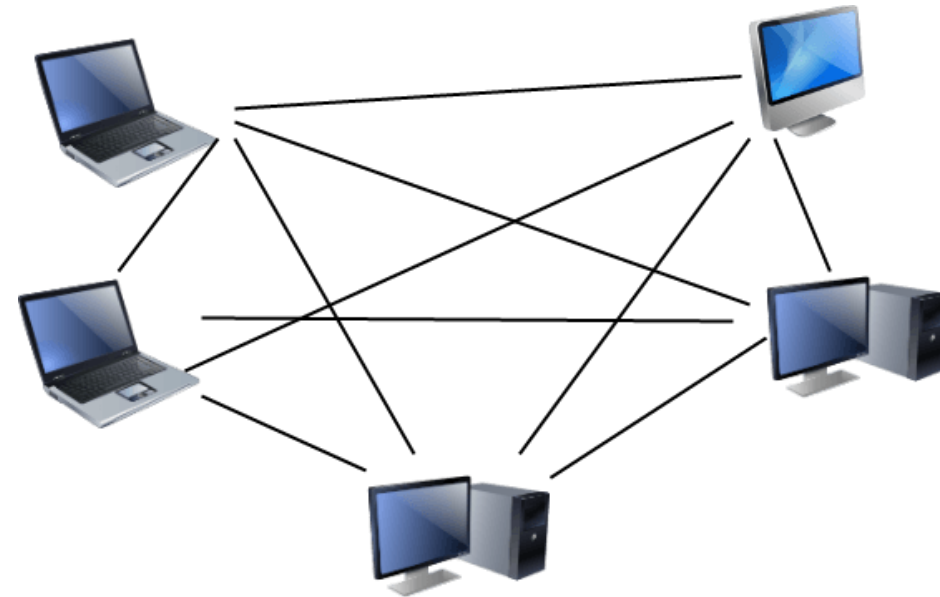
- CIA

Basics: Network Topologies



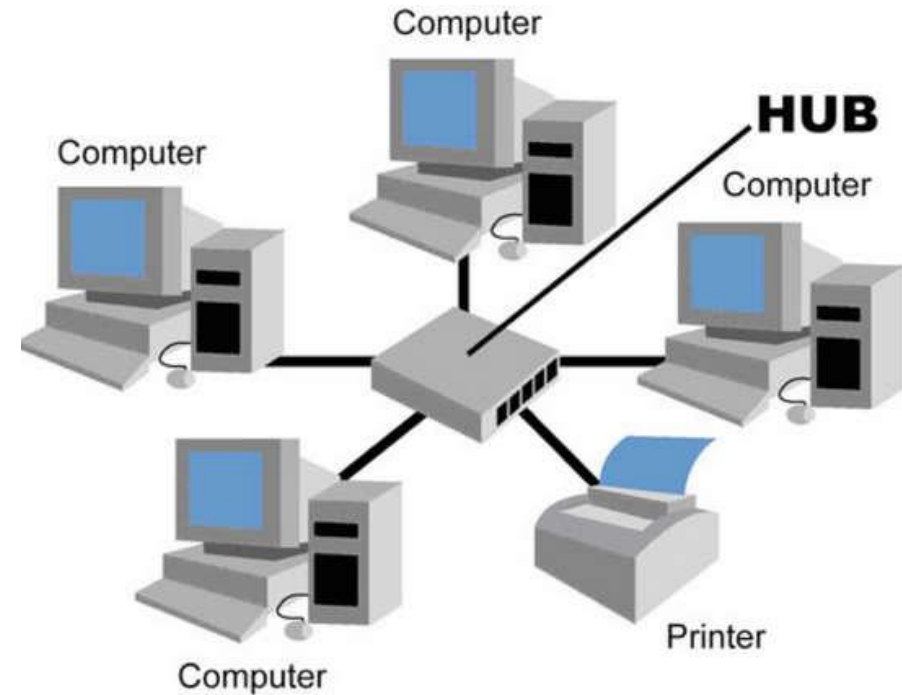
Mesh Topology

- A dedicated point-to-point link from every device to every other device.
- Total number of physical links in a fully connected mesh? 
-  number of I/O ports on each device?
- Advantages
- Disadvantages



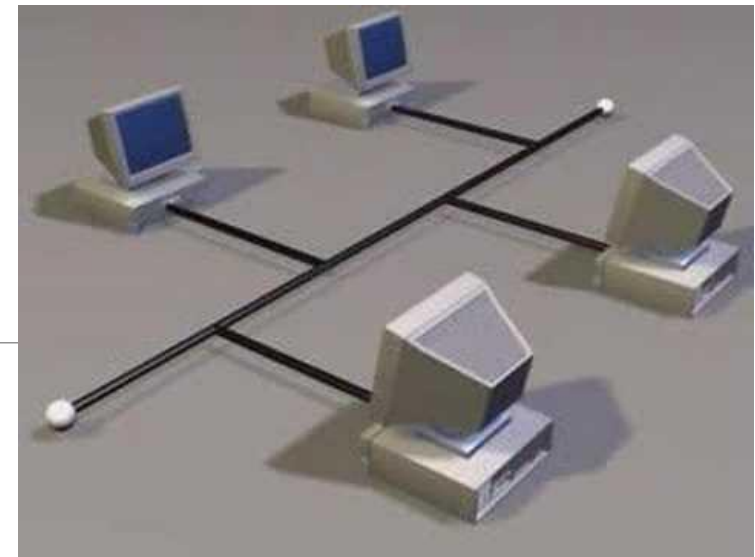
Star Topology

- P-to-P link from every device to only a central device/controller.
- Controller acts as exchange.
- Advantages
- Disadvantages



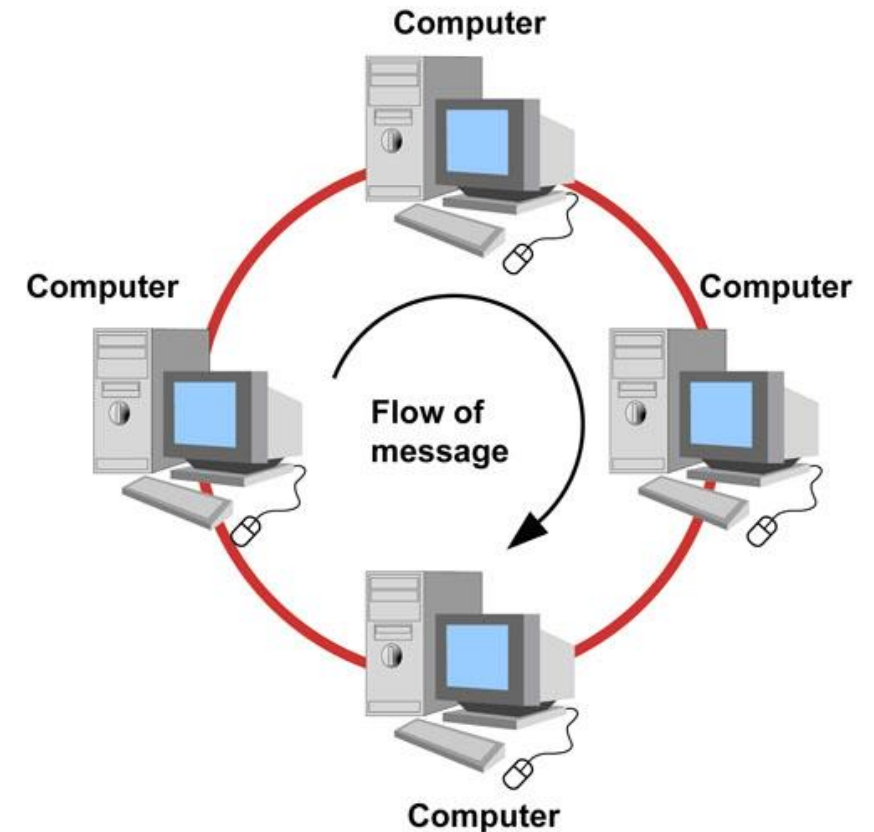
Bus Topology

- Multipoint, unlike Mesh and Star.
- Long cable acts as a backbone to all devices.
- Nodes are connected to the cable by **droplines** and **taps**.
- There is a limit to the number of taps a bus can support. Why?
- Advantages
- Disadvantages

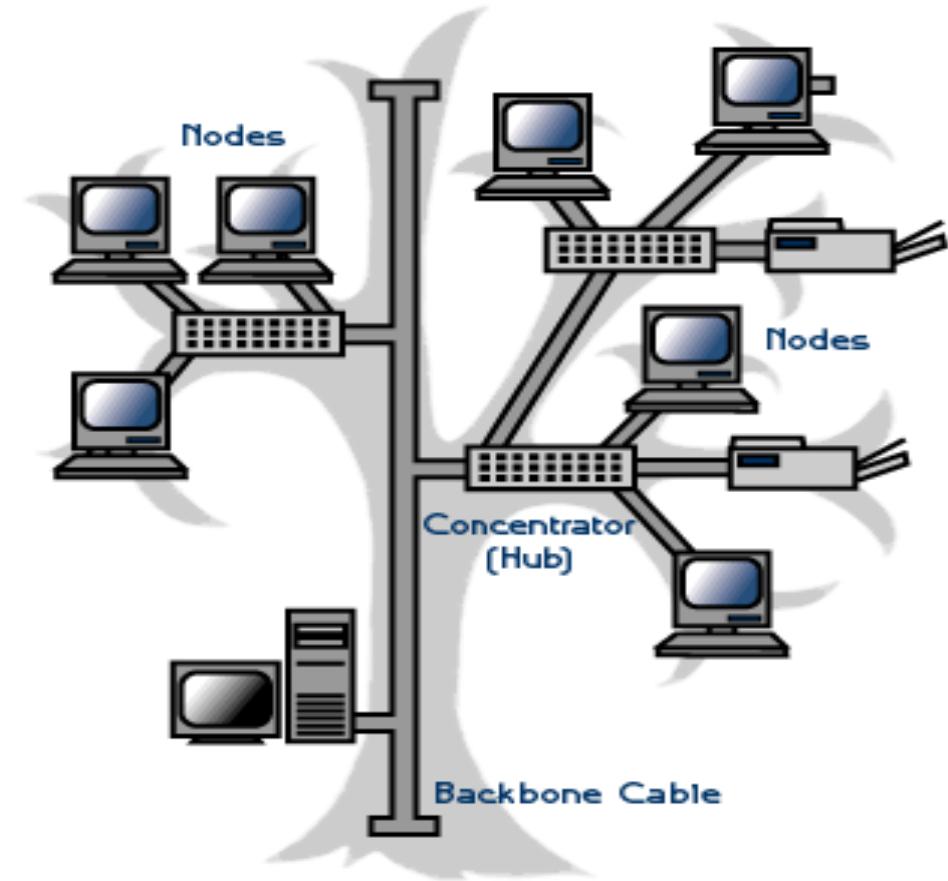
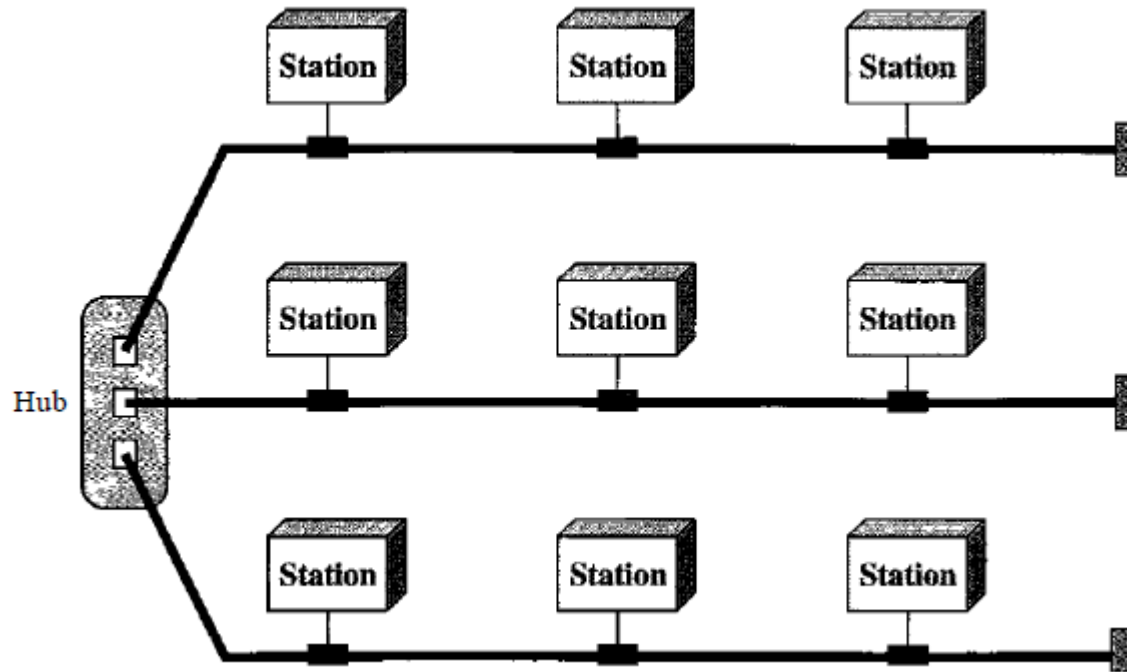


Ring Topology

- Dedicated P-to-P connections with only 2 devices on either side of it.
- Signal is passed along in one direction.
- Each device in the ring incorporates a repeater.
- Advantages
- Disadvantages

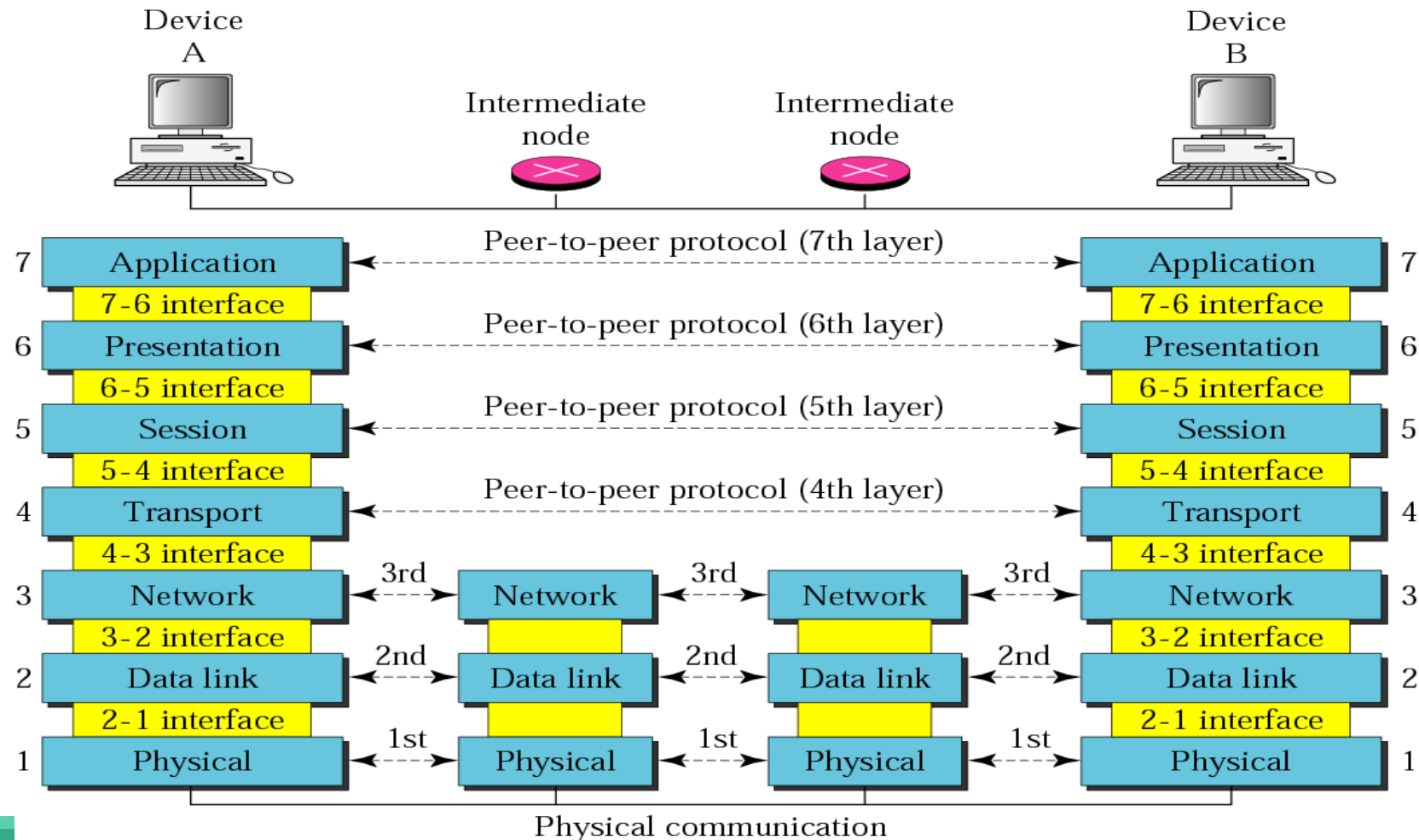


Question: Identify the topology.



Basics: OSI Model and Layers

- Layers
- Protocols
- Interfaces
- Services



Basics : Layers

- Why Layers?
 - To reduce the design complexity, most networks are organized as a stack of **layers** or **levels**, each one built upon the one below it to enable communications.
- What is it?
 - The grouping of the communication functions into **related and manageable** sets is called **Layering** and the sets are called as **Layers**.
 - The number of layers, the name of each layer, the contents of each layer, and the function of each layer differ from network to network.
- Purpose of each layer?
 - To offer certain services to the higher layers while **shielding** those higher layers from the implementation details.

Basics: Protocol

- A protocol is an agreement between the communicating parties on how communication is to proceed.
- It defines:
 - what is communicated,
 - how it is communicated, and
 - when it is communicated.
- Layer n protocol.
- **Peers** communicate with each other by means of protocols.

Basics: Interfaces and Services

- **Interface:** interaction between layers (request a service and convey results).
- Defines which **primitive operations and services** the lower layer makes available to the upper one.
- The **abstraction** at the layers is possible through a clearly defined service and interface.
- Advantages of a clear-cut interface?
- **Services:** Set of primitives (operations) that a layer provides to the layer above it.
- Connection-oriented vs Connectionless service.

Connection-Oriented vs Connectionless Service

- Layers offer two different types of service
 - Connection-oriented
 - Connectionless
- Connection-oriented service is modelled after the telephone system.
- Connectionless service is modelled after the postal system.

Connection-Oriented Service

- Using a connection-oriented network service
 - Establish a connection,
 - Use the connection,
 - Release the connection.
- Parameter **negotiation**:
 - Done by : the sender, receiver, and subnet.
 - During: Connection Establishment.
 - Decide upon: Maximum message size, Quality of service required, and other issues.
- One side makes a proposal and the other side can accept it, reject it, or make a counter-proposal.

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Connectionless Service


- Each message is routed through the intermediate nodes inside the system independent of all the subsequent messages.
- Different names for messages in different contexts:
 - network layer: **packet**
 - Transport layer: ?
- **Store-and-forward switching**: When the intermediate nodes receive a message in full before sending it on to the next node.
- **Cut-through switching**: The onward transmission of a message at a node starts before it is completely received by the node.

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Connection-Oriented Service

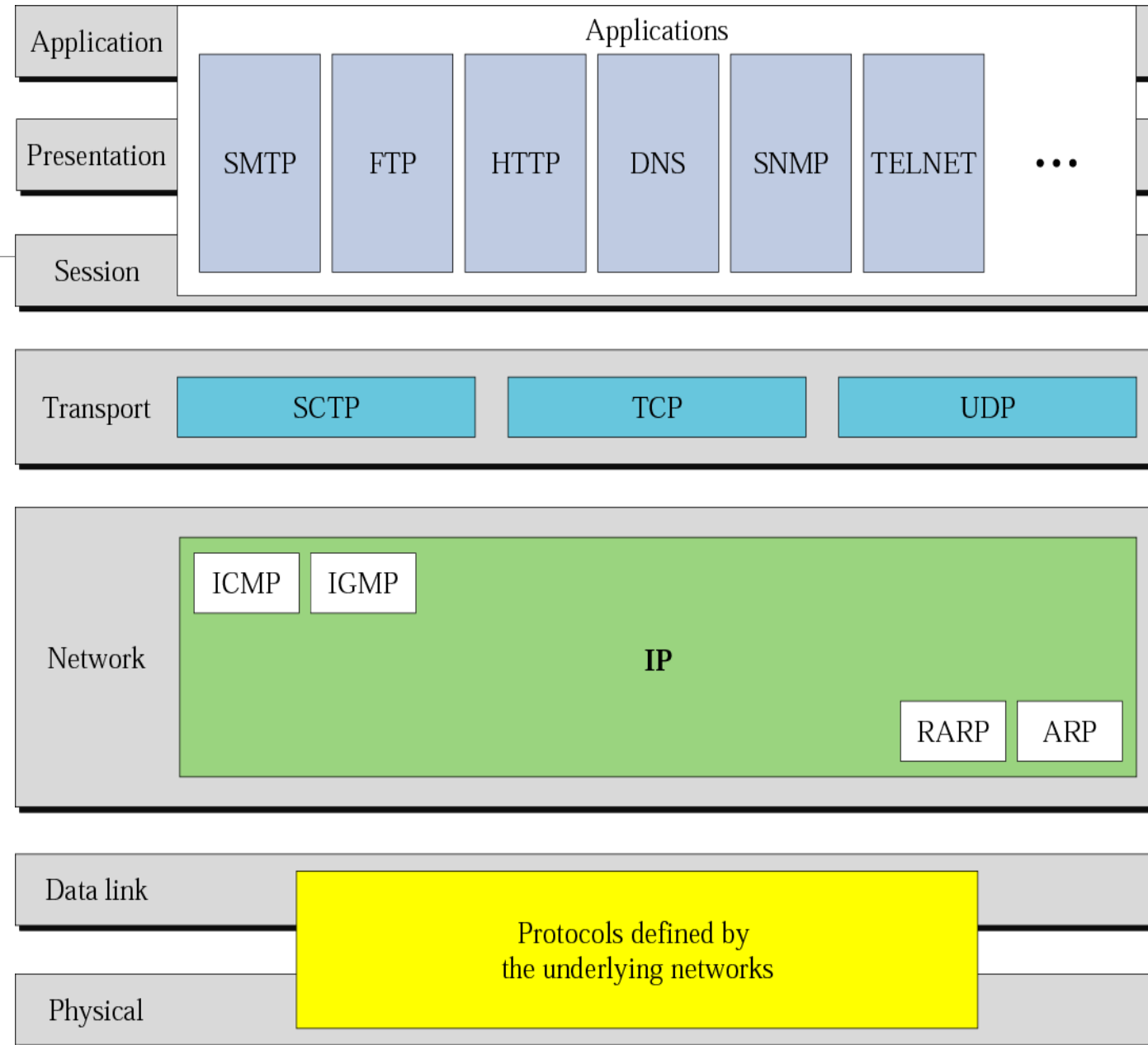
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TCP/IP Protocol Suite

- A set of layers and protocols is called a **network architecture**.
- A list of the protocols used by a certain system, one protocol per layer, is called a **protocol stack**.



Connecting Devices

- Hub
- Switch
- Router
- Switch vs Bridge?
- Bridge vs Repeater?
- Layer 3 switch vs Router?



Summary

- Computer Network and its components.
- Network Criteria
- Data Flow, Types of Connection, Physical Topologies.
- OSI Model: Layers, Protocols, Interfaces and Services.
- Connectionless vs Connection-oriented services.
- Overview of the TCP/IP Protocol Suite, Responsibilities of the Network Layer.
- Connecting Devices and Addresses.