Network Protocols and Communications and Network Access

Introduction to Networks v6.0

Chapter 4: Network Access

Pertemuan ke 4

Kompetensi Khusus

- Mahasiswa dapat mengidentifikasikan setiap layer model OSI pada perangkat komunikasi dan bagaimana aliran data pada jaringan untuk mencapai alamat tujuannya (C2)

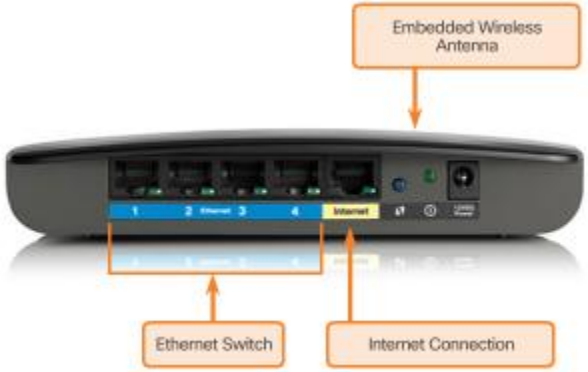
Materi:

1. Physical Layer Protocols
2. Network Media
3. Data Link Layer Protocols
4. Media Access Control

1. Network Access

1.1 Physical Layer Connection

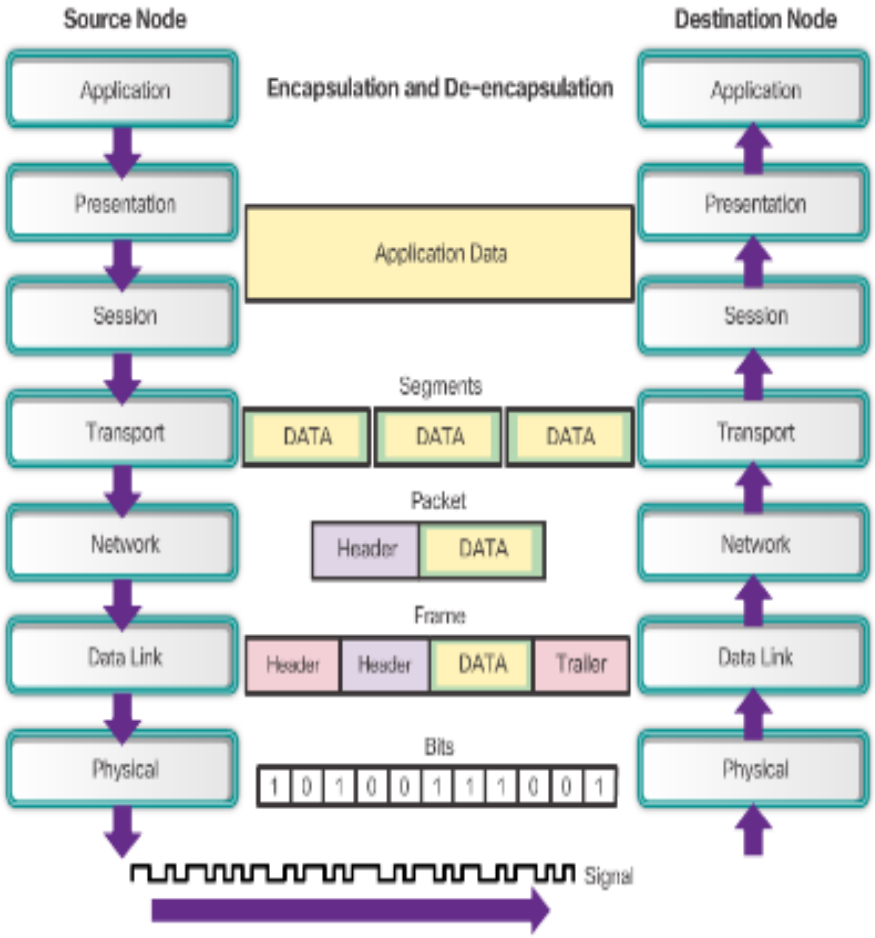
- Types of Connections



- Network Interface Cards

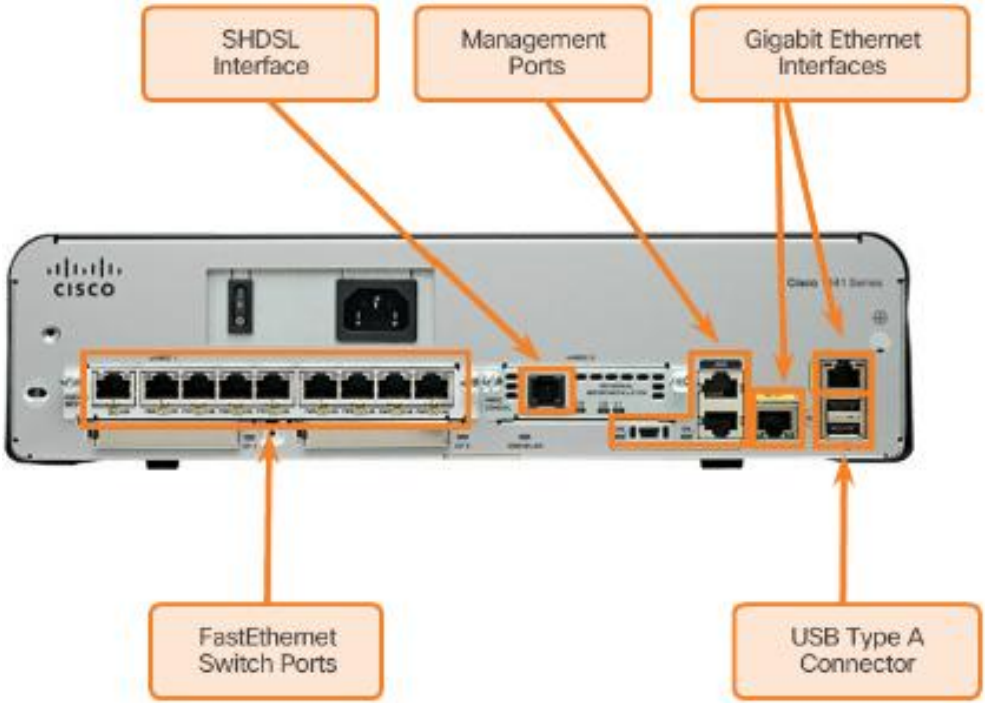
1.2 Purpose of the Physical Layer

- The Physical Layer
  - Accepts a complete frame from the data link layer
  - Encodes it as a series of signals that are transmitted onto the local media
- Physical Layer Media
  - Describe the media types
- Physical Layer Standards



1.3 Physical Layer Characteristics

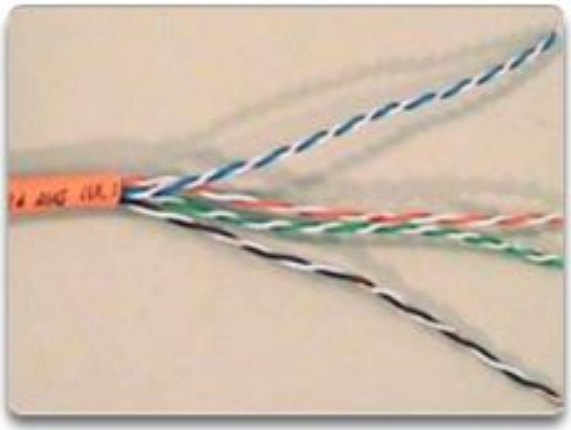
- Functions
  - Physical components
  - Encoding
  - Signaling
- Data Transfer
  - Bandwidth – capacity to a medium to carry data
  - Throughput - measure of the transfer of bits across the media
- Types of Physical Media



2. Network Media

2.1 Copper Cabling

- Characteristics of Copper Cabling
  - Inexpensive, easy to install low resistance to electric current
  - Distance and signal interference
- Copper Media
- Unshielded Twisted-Pair Cable
- Shielded Twisted-Pair Cable
- Coaxial Cable
- Copper Media Safety
  - Fire and electrical hazards



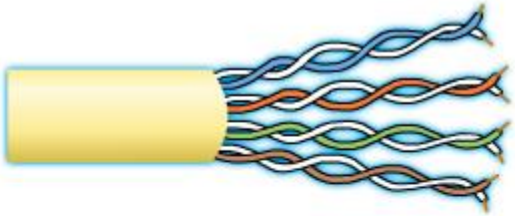
Unshielded Twisted-Pair (UTP) cable

Shielded Twisted-Pair (STP) cable

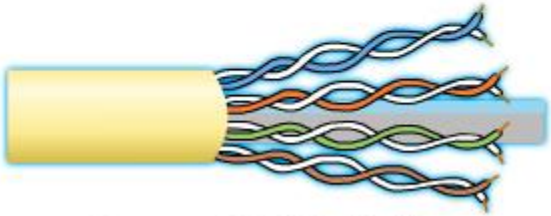
Coaxial cable

2.2 UTP Cabling

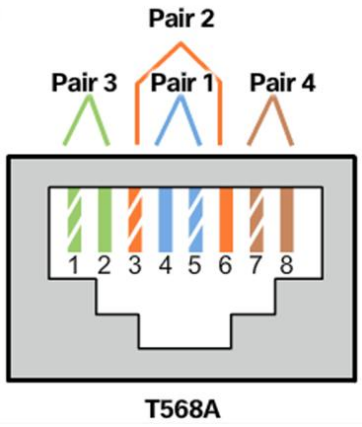
- Properties of UTP Cabling
  - Cancellation of EMI and RFI signals with twisted pairs
- UTP Cabling Standards
  - TIA/EIA-568
  - IEEE: Cat5, Cat5e, Cat6, Cat6e
- UTP Connectors
- Types of UTP Cable
  - Rollover
  - Crossover
  - Straight-through
- Testing UTP Cables
- Cable Pinouts

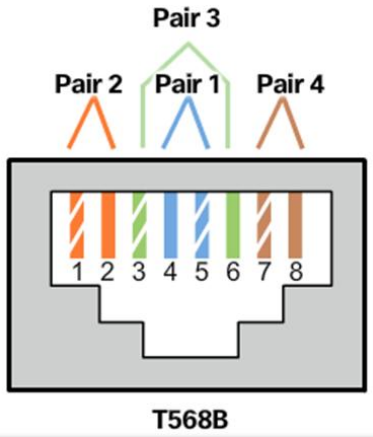


Category 5 and 5e Cable (UTP)



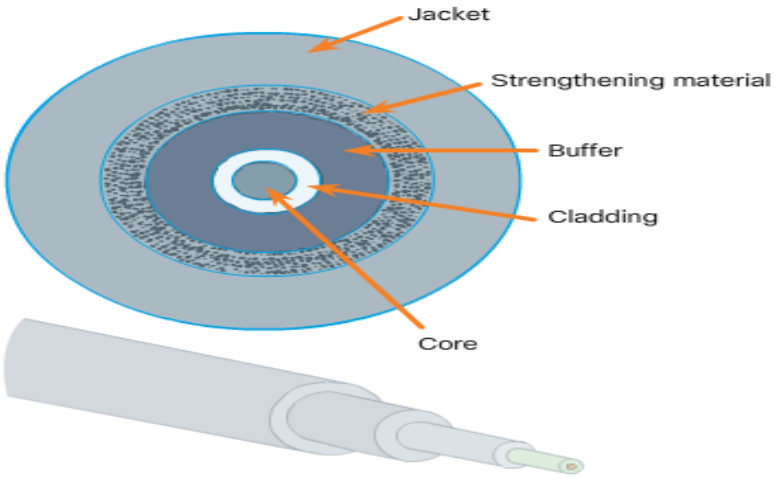
Category 6 Cable (UTP)





2.3 Fiber-Optic Cabling

- Properties of Fiber-Optic Cabling
  - Transmits data over longer distances
  - Flexible, but thin strands of glass
  - Transmits with less attenuation
  - Immune to EMI and RFI
- Fiber Media Cable Design
- Types of Fiber Media
  - Single mode and multimode
- Fiber-Optic Connectors
- Testing Fiber Cables
- Fiber versus Copper



Implementation Issues	UTP Cabling	Fiber-optic Cabling
Bandwidth supported	10 Mb/s - 10 Gb/s	10 Mb/s - 100 Gb/s
Distance	Relatively short (1 - 100 meters)	Relatively high (1 - 100,000 meters)
Immunity to EMI and RFI	Low	High (Completely immune)
Immunity to electrical hazards	Low	High (Completely immune)
Media and connector costs	Lowest	Highest
Installation skills required	Lowest	Highest
Safety precautions	Lowest	Highest

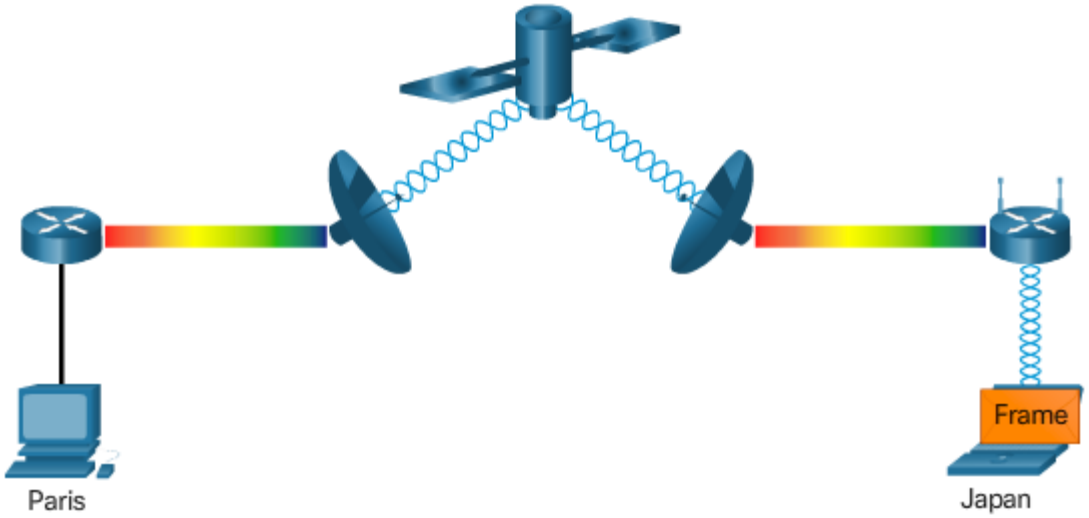
2.4 Wireless Media

- Properties of Wireless Media
  - Data communications using radio or microwave frequencies
- Types of Wireless Media
  - Wi-Fi, Bluetooth, WiMax
- Wireless LAN
  - Wireless Access Point
  - Wireless NIC adapters

3. Data Link Layer Protocols

3.1 Purpose of the Data Link Layer

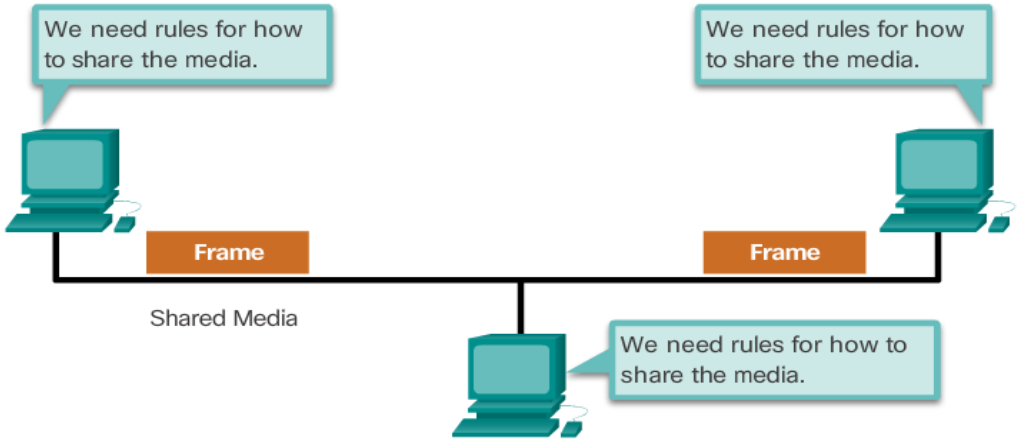
- The Data Link Layer
  - What is this layer responsible for?
- Data Link Sublayers
  - LLC communicates with the network layer
  - MAC defines the media access processes
- Providing Access to Media
- Data Link Layer Standards
  - IEEE
  - ITU
  - ISO
  - ANSI



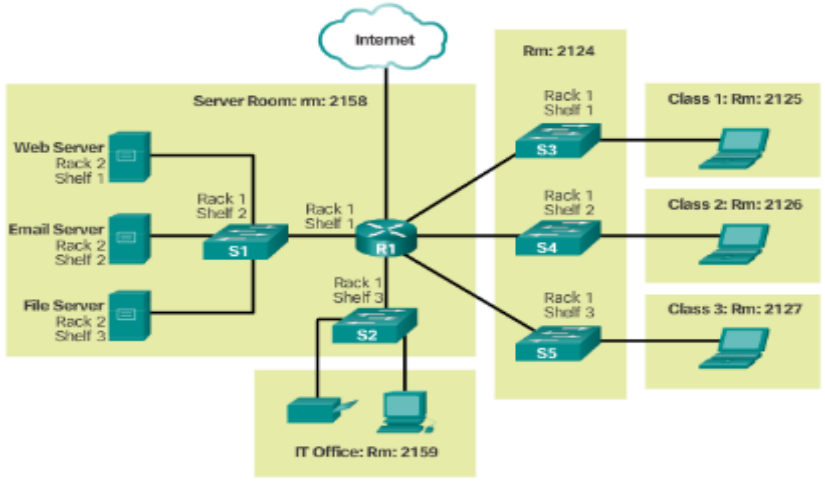
4. Media Access Control

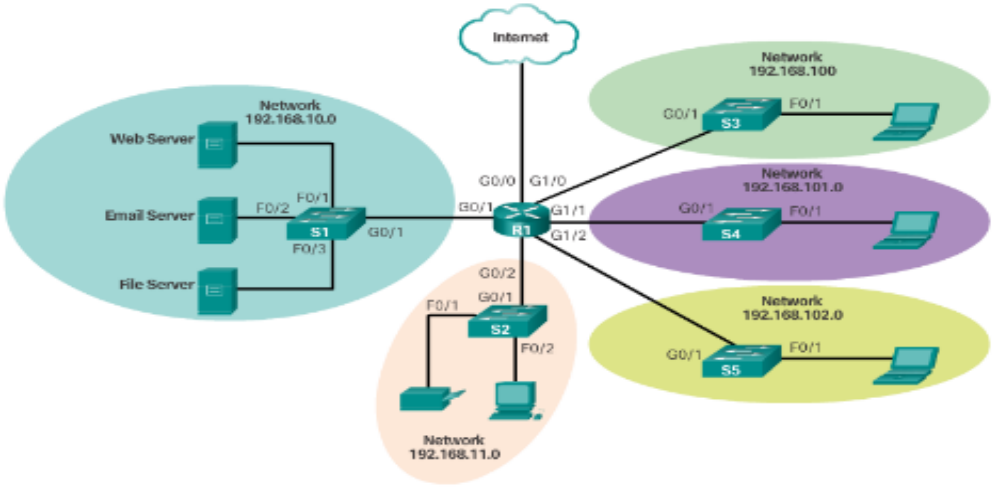
4.1 Topologies

- Controlling Access to the Media

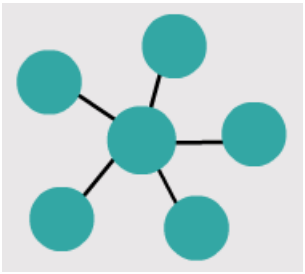


- Physical and Logical Topologies

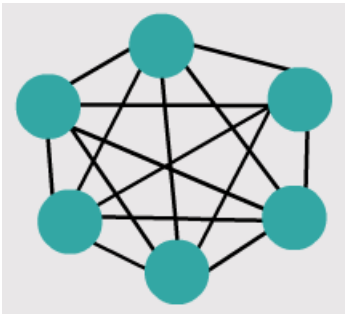




4.2 WAN Topologies

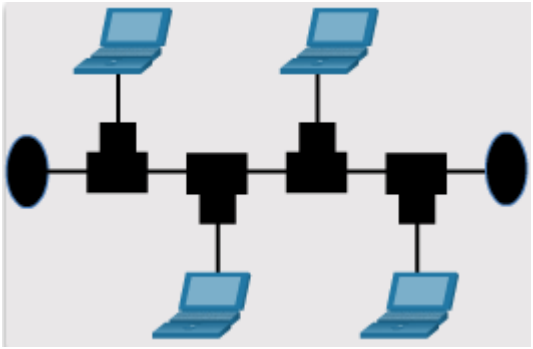


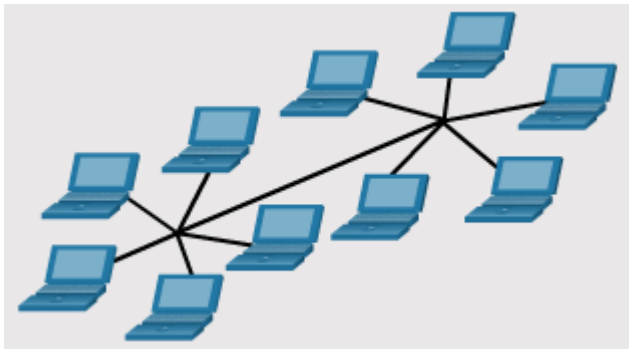
- Common Physical WAN Topologies
  - Point-to-point
  - Hub and spoke
  - Mesh
- Physical Point-to-Point Topology
- Logical Point-to-Point Topology



4.3 LAN Topologies

- Physical LAN Topologies
- Half and Full Duplex
- Media Access Control Methods
- Contention-Based Access
  - CSMA/CD vs. CSMA/CA



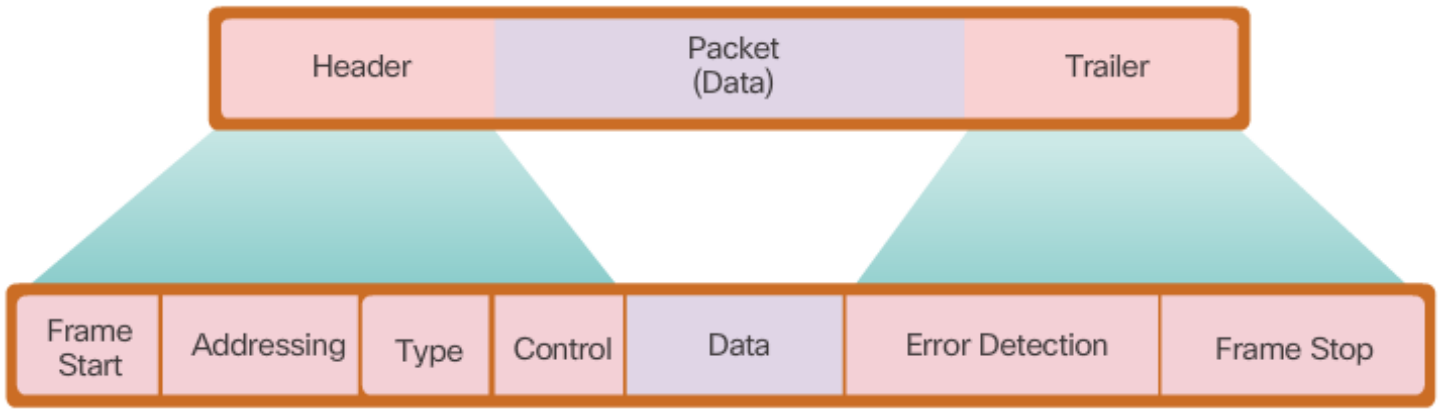


4.4 Data Link Frame

- The Frame
  - Header
  - Data
  - Trailer
- Frame Fields
- Layer 2 Address

LAN and WAN Frames

- 802.11 Wireless Frame
- PPP Frame
- HDLC
- Frame Relay
- Ethernet Frame



Chapter Summary

Summary

- Explain how physical layer protocols and services support communications across data networks.
- Build a simple network using the appropriate media.
- Explain how the Data Link layer supports communications across data networks.
- Compare media access control techniques and logical topologies used in networks.

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