

OSI Physical Layer



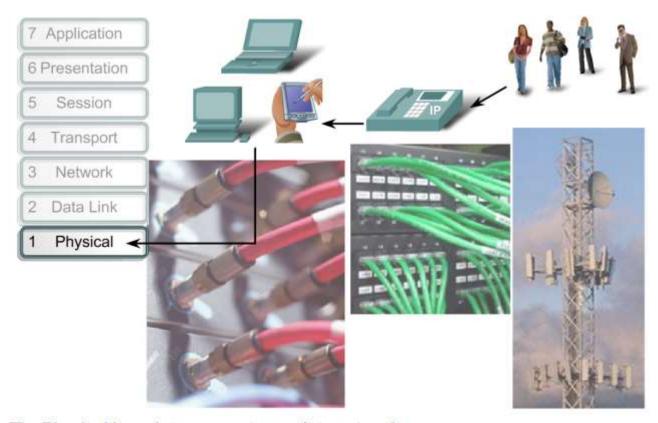
Network Fundamentals – Chapter 8

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Objectives

- Explain the role of Physical layer protocols and services in supporting communication across data networks.
 - Describe the role of signals used to represent bits as a frame as the frame is transported across the local media
- Describe the purpose of Physical layer signaling and encoding as they are used in networks
- Identify the basic characteristics of copper, fiber and wireless network media
- Describe common uses of copper, fiber and wireless network media

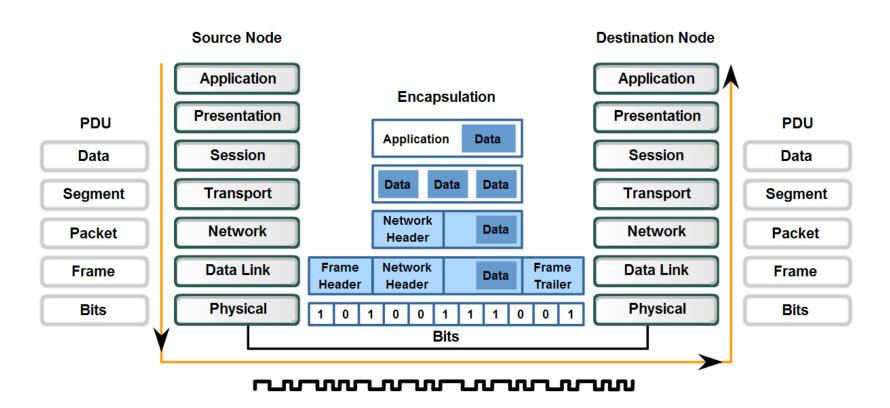
 Describe the purpose of the Physical layer in the network and identify the basic elements that enable this layer to fulfill its function



The Physical layer interconnects our data networks.

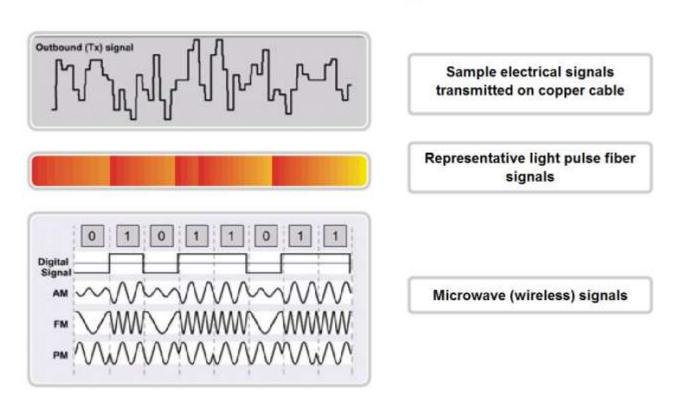
 Describe the role of bits in representing a frame as it is transported across the local media.

Transforming Human Network Communications to Bits



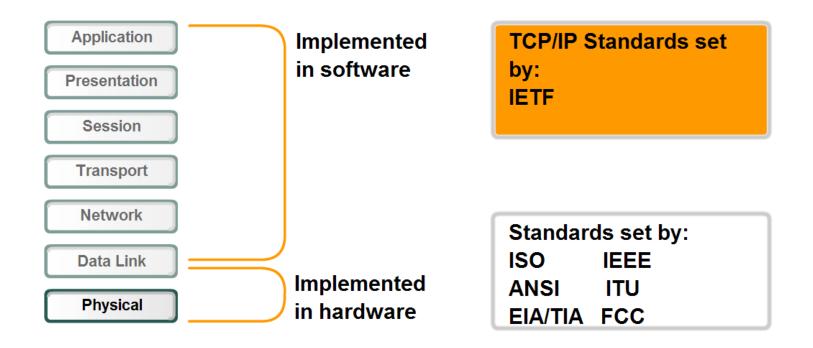
Describe the role of signaling in the physical media.

Representations of Signals on the Physical Media



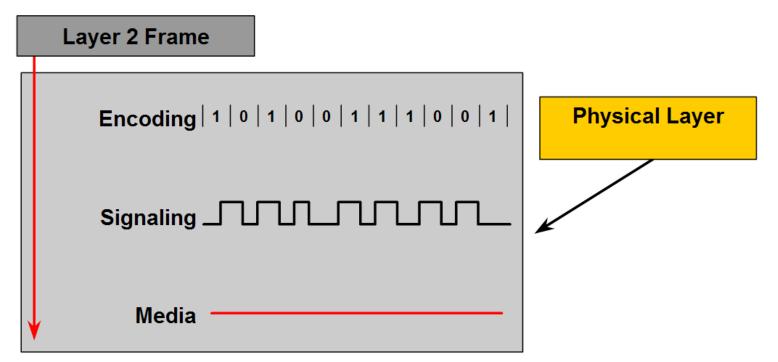
 Distinguish who establishes and maintains standards for the Physical layers compared to those for the other layers of the network

Comparison of Physical layer standards and upper layer standards



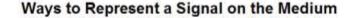
 Identify hardware components associated with the Physical layer that are governed by standards

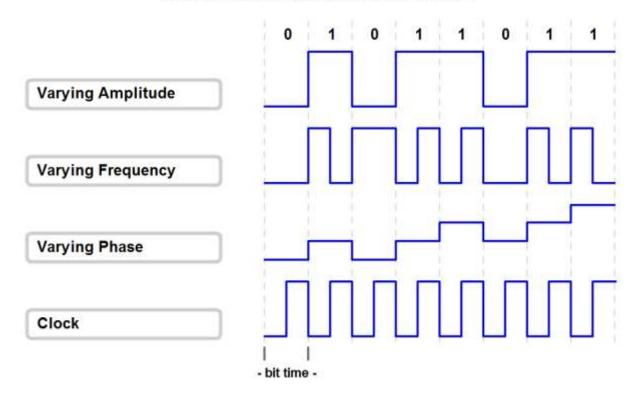
Physical Layer Fundamental Principles



Physical Layer Signaling and Encoding

 Explain that network communication at this layer consists of individual bits encoded onto the Physical layer and describe the basic encoding techniques.





Physical Layer Signaling and Encoding

 Describe the role of encoding as it applies to the transmission of bits and explain the value of treating a collection of bits as a code.

Recognizing Frame Signals Specific physical Physical signals Random unframed Specific signal signal pattern representing frame signals on physical pattern denotes the denotes the start of media due to noise or contents end of the frame the frame interference PHYSICAL LAYER DECODES FRAMED MEDIA SIGNALS INTO BINARY CODE 1101000101101xxxxxxxxxxxxxxxxx 110001101000101101xxxxxxx Unframed signals not A specific bit pattern Bit pattern Specific bit pattern decoded and not denotes the start of representing frame denotes the end of contents passed to passed to Data Link the frame the frame Data Link layer layer

Physical Layer Signaling and Encoding

Define the terms bandwidth, throughput, and goodput

Data Throughput and Goodput

Goodput **End Node** End Node Application Application Presentation Presentation Application Data Session Session Data Data Transport Transport Network Network Data Network Header **Data Link** Frame Network Frame **Data Link** Data Header Header Trailer **Physical** Physical

Throughput

Data throughput is actual network performance. Goodput is a measure of the transfer of usable data after protocol overhead traffic has been removed.

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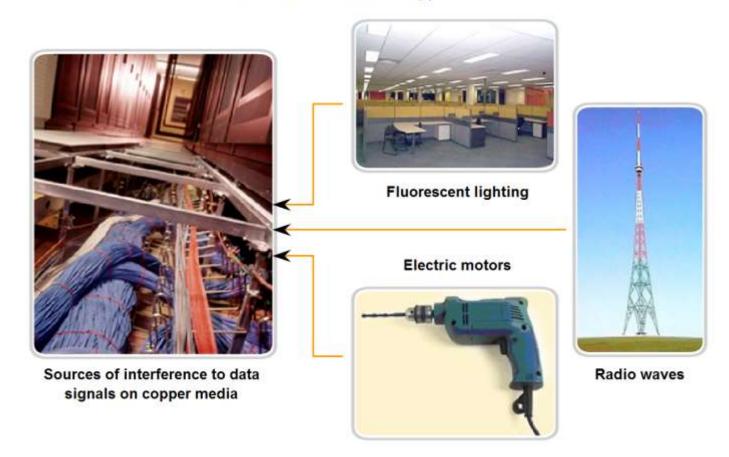
 Identify several media characteristics defined by Physical layer standards.

Physical Media - Characteristics Ethernet Media

	10BASE-T	100BASE-TX	100BASE-FX	1000BASE-CX	1000BASE-T	1000BASE-SX	1000BASE-LX	1000BASE-ZX	10GBASE-ZR
Media	EIA/TIA Category 3, 4, 5 UTP, two pair	EIA/TIA Category 3, 4, 5 UTP, two pair	50/62.5 µm multi mode fiber	STP	EIA/TIA Category 3, 4, 5 UTP, four pair	62.5/50 micron multimode fiber	50/62.5 micron multimode fiber or 9 micron single mode fiber	9µm single mode fiber	9µm single mode fiber
Maximum Segment Length	100m (328 feet)	100m (328 feet)	2 km (6562 ft)	25 m (82 feet)	100 m (328 feet)	Up to 550 m (1,804 ft) depending on fiber used	550 m (MMF)10 km (SMF)	Approx. 70 km	Up to 80 km
Topology	Star	Star	Star	Star	Star	Star	Star	Star	Star
ropology	Oldi			ENGINEE SERVICE	Old	Char	Out.	Otta	Cita
Connector	ISO 8877 (RJ-45)	ISO 8877 (RJ- 45)		ISO 8877 (RJ- 45)	ISO 8877 (RJ- 45)				

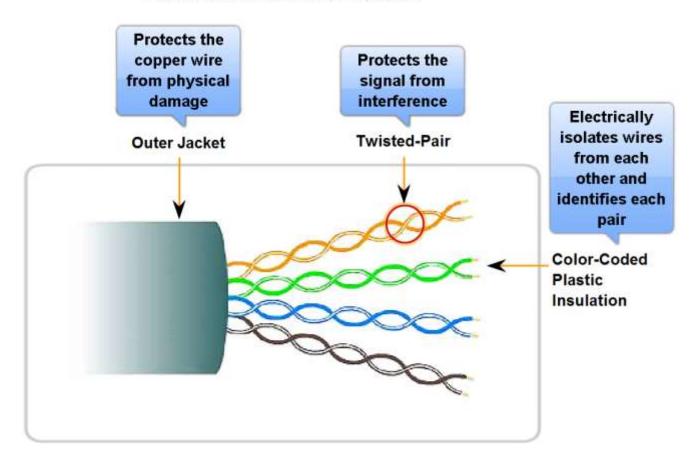
 Describe the impact interference has on throughput and the role of proper cabling in reducing interference

External Interference with Copper Media



Identify the basic characteristics of UTP cable

Unshielded Twisted-Pair (UTP) Cable

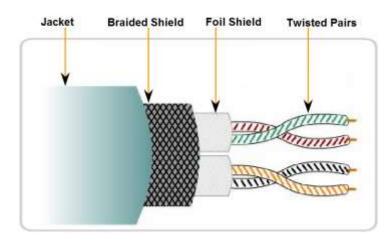


Identify the basic characteristics of STP and Coaxial cable

Outer Jacket Braided Copper Shielding Copper Conductor Plastic Insulation



Shielded Twisted-Pair (STP) Cable



 Identify types of safety issues when working with copper cabling

Copper Media Safety



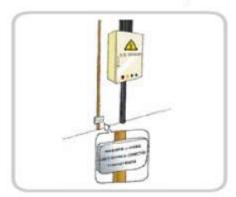
The separation of data and electrical power cabling must comply with safety codes.



Installations must be inspected for damage.



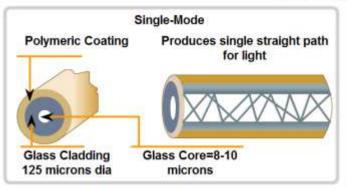
Cables must be connected correctly.

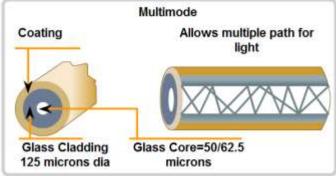


Equipment must be grounded correctly.

 Identify several primary characteristics of fiber cabling and its main advantages over other media

Fiber Media Modes



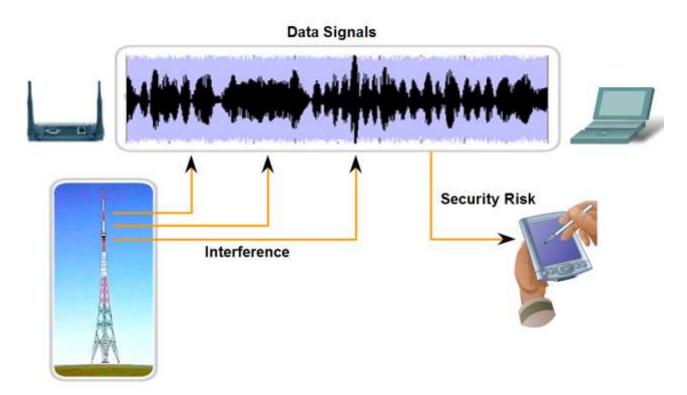


- · Small Core
- Less Despersion
- Suited for long distance applications (up to 100 km, 62,14 mi.)
- Uses lasers as the light source often within campus backbones for distance of several thousand meters

- Larger core than single-mode cable (50 microns or greater)
- Allows greater dipersion and therefore, loss of signal
- Used for long distance appllication, but shoter than single-mode (up to ~2km, 6560 ft)
- Uses LEDs as the light source often within LANs or distances of couple hundred meters within a campus network

 Describe the role of radio waves when using air as the media and the increased need for security in wireless communications

Wireless Media Signals and Security



 Identify the characteristics used to categorize connectors, describe some common uses for the same connectors, and identify the consequences for misapplying a connector in a given situation

Copper Media Connectors



110 punch block





RJ45 UTP Plugs





RJ45 UTP Socket



Summary

In this chapter, you learned to:

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- Describe common uses of copper, fiber, and wireless network media.

