



OSI Physical Layer

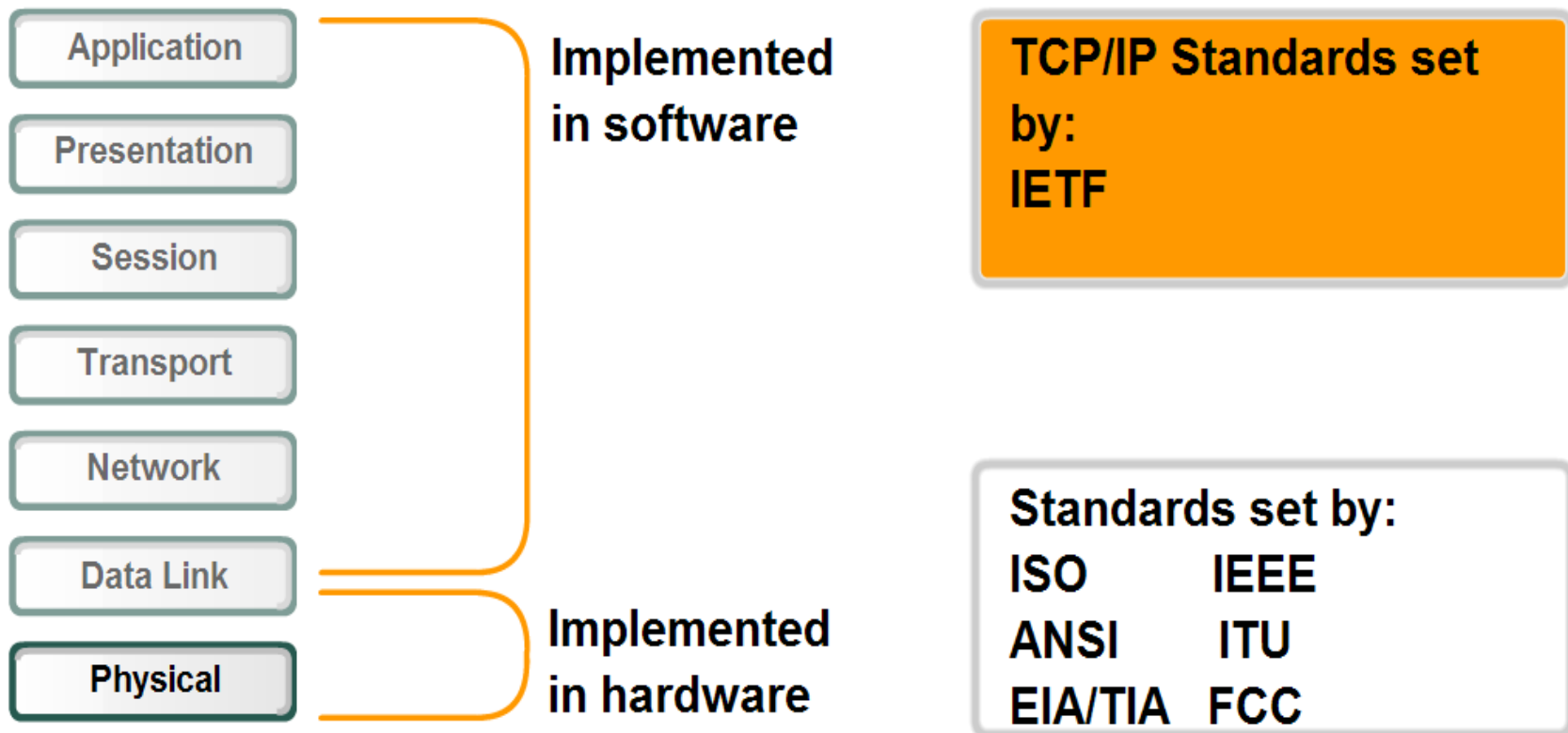


Network Fundamentals – Chapter 8

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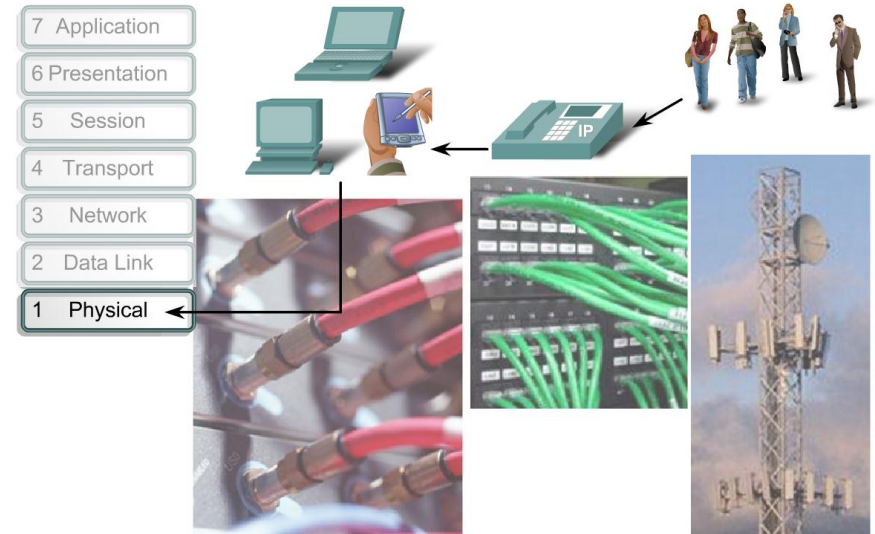
Standards

Comparison of Physical layer standards and upper layer standards



Characteristics of the Physical Layer:

- Point-to-Point or Point-to-Multipoint
- Common Connector (both sides)
- Media (copper, fiber, wireless)
- Amplitude (signal strength) and Attenuation
- Signaling Pattern
- Bandwidth (bits per second)

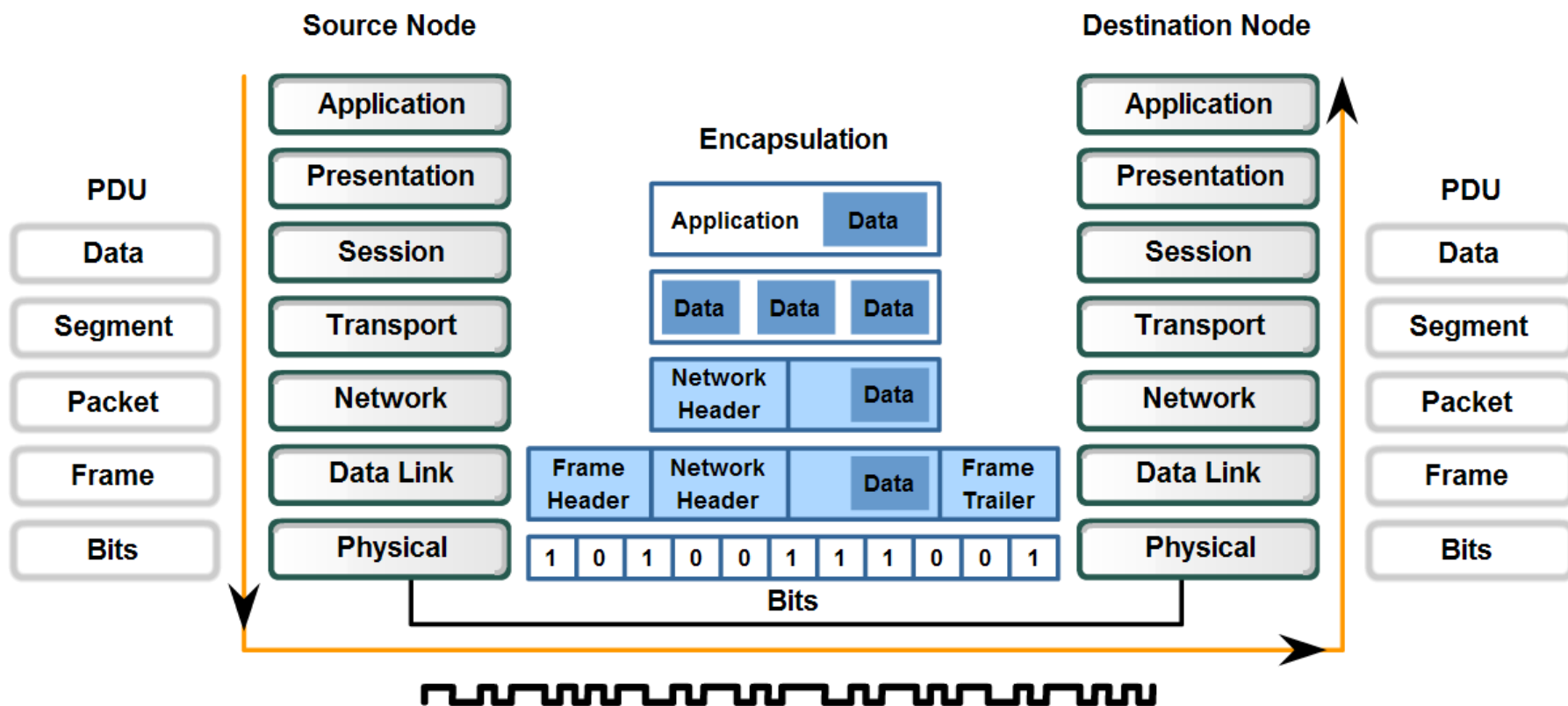


The Physical layer interconnects our data networks.

**Physical Layer
works in tandem with
Data Link Layer**

Layer One = Bits

Transforming Human Network Communications to Bits



Signaling and Encoding

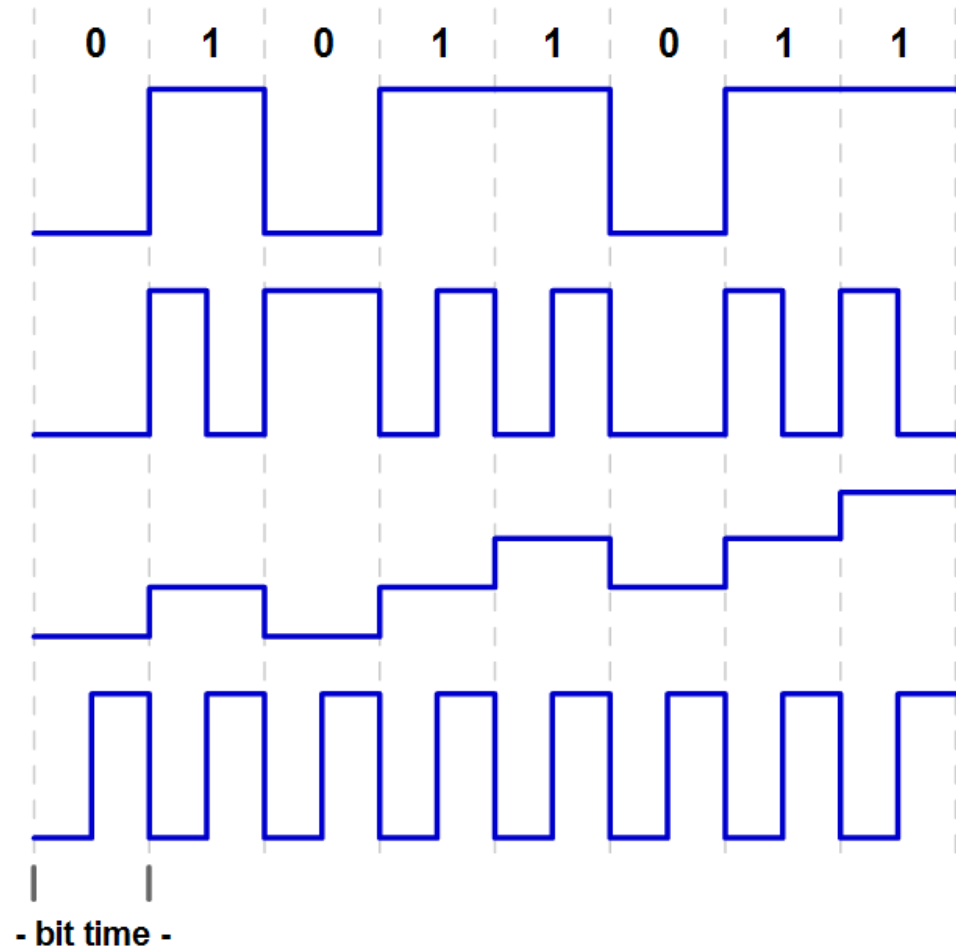
Ways to Represent a Signal on the Medium

Varying Amplitude

Varying Frequency

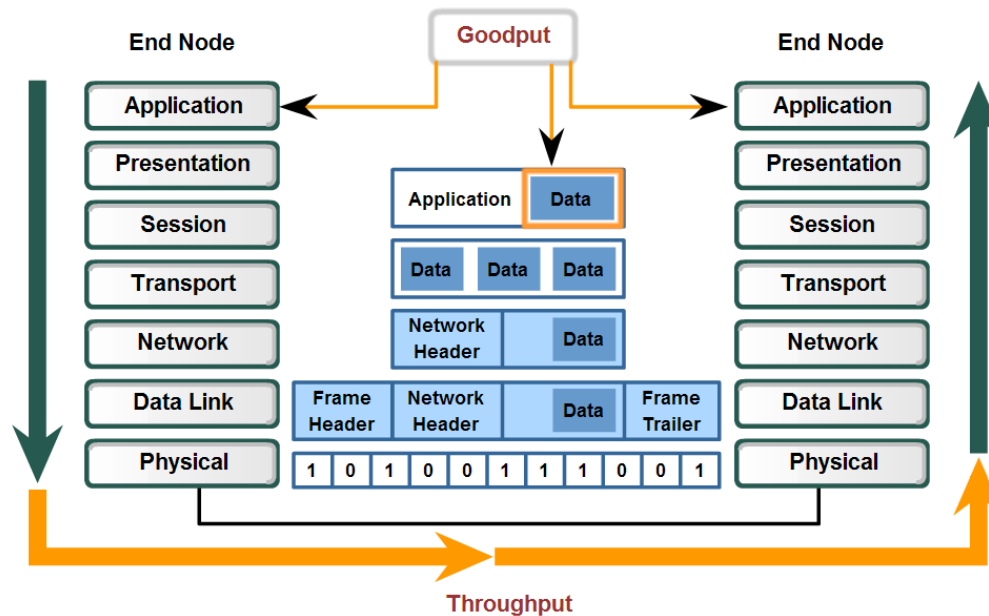
Varying Phase

Clock



Bandwidth, Throughput, and Goodput

Data Throughput and Goodput



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

- The speed of the signal is fixed at near speed of light.
- Bandwidth is measurement of number of bit signals per second.

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 μ m 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	9 μ m single mode fiber	9 μ m 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
Connector	ISO 8877 (RJ-45)	ISO 8877 (RJ-45)		ISO 8877 (RJ-45)	ISO 8877 (RJ-45)				

Potential Interference

External Interference with Copper Media



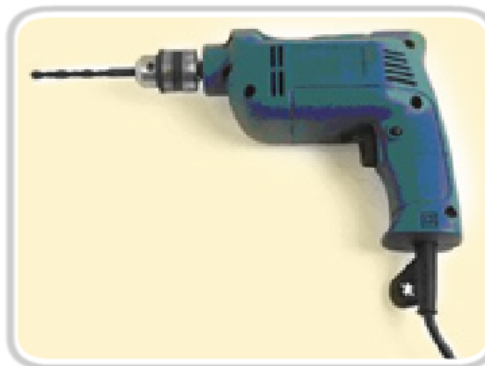
Sources of interference to data signals on copper media



Fluorescent lighting



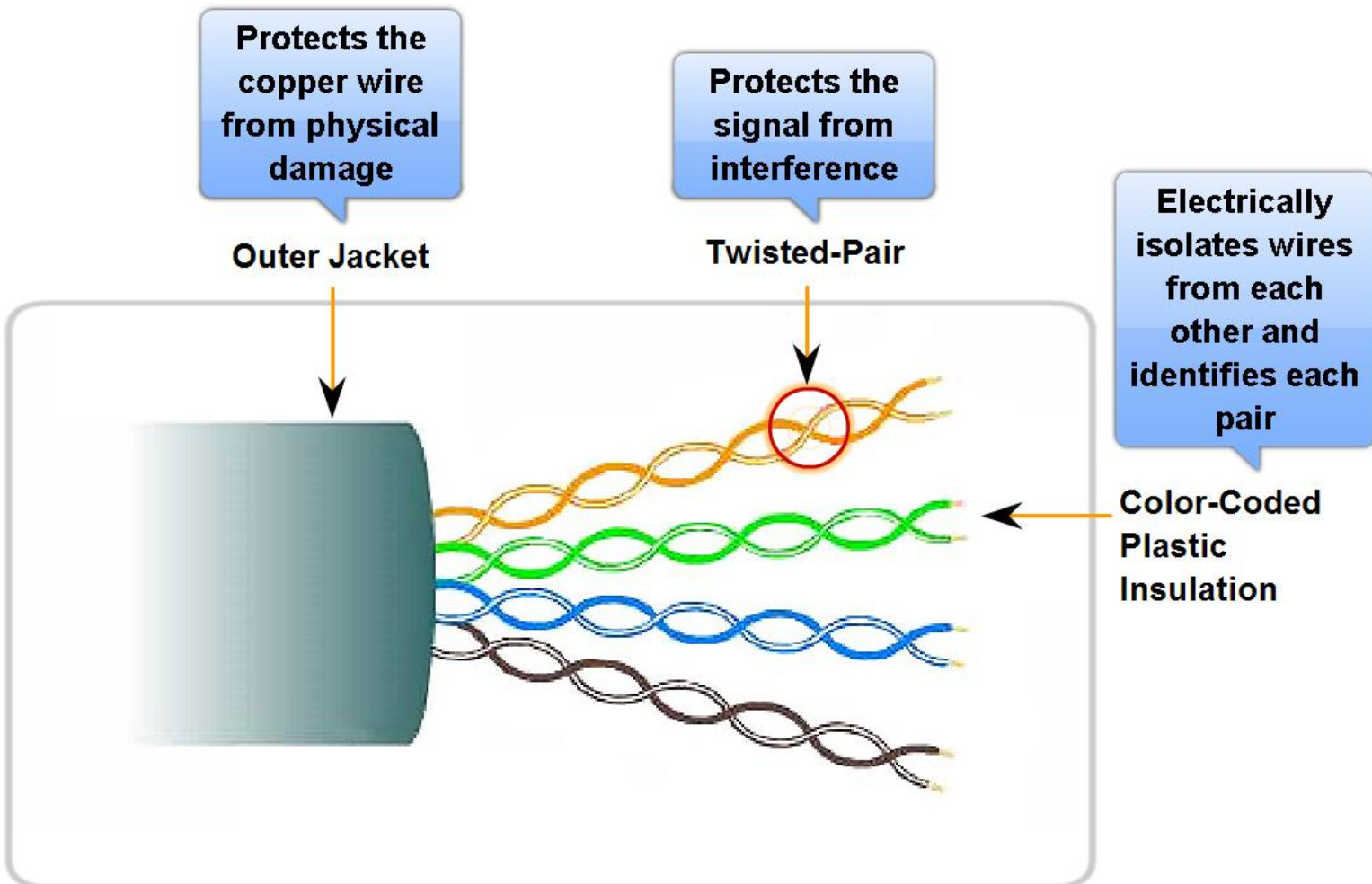
Radio waves



Electric motors

Characteristics of UTP cable

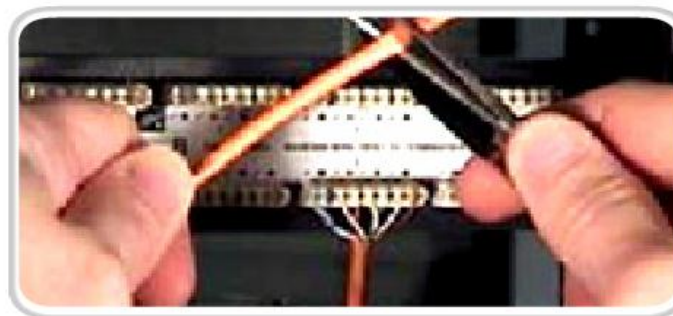
Unshielded Twisted-Pair (UTP) Cable



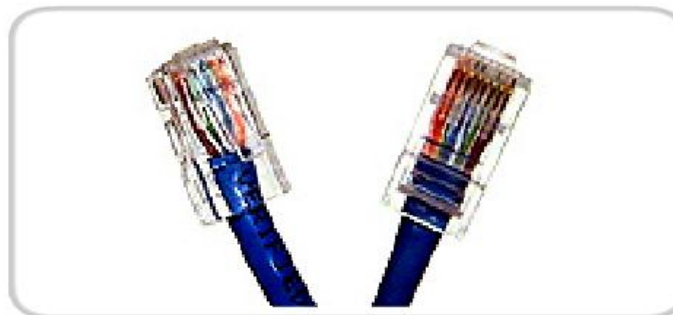
Copper Media Connectors



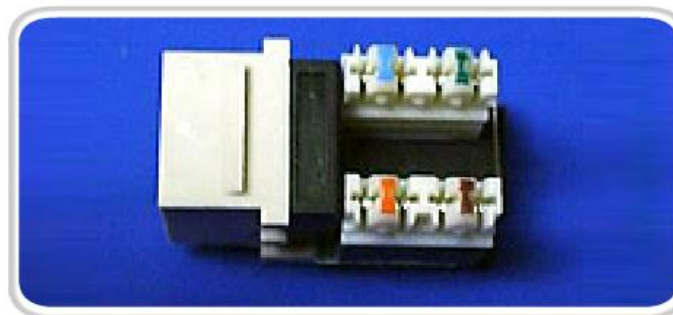
**110 punch
block**



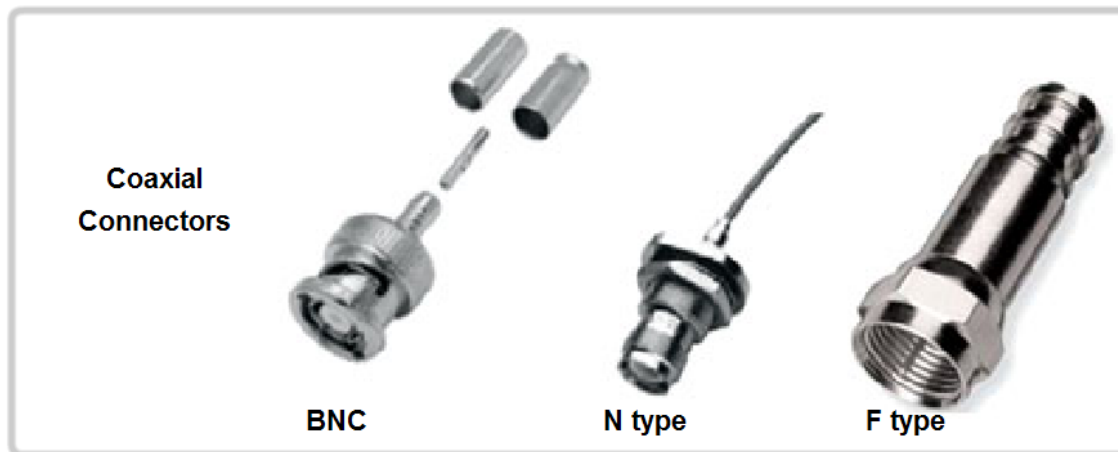
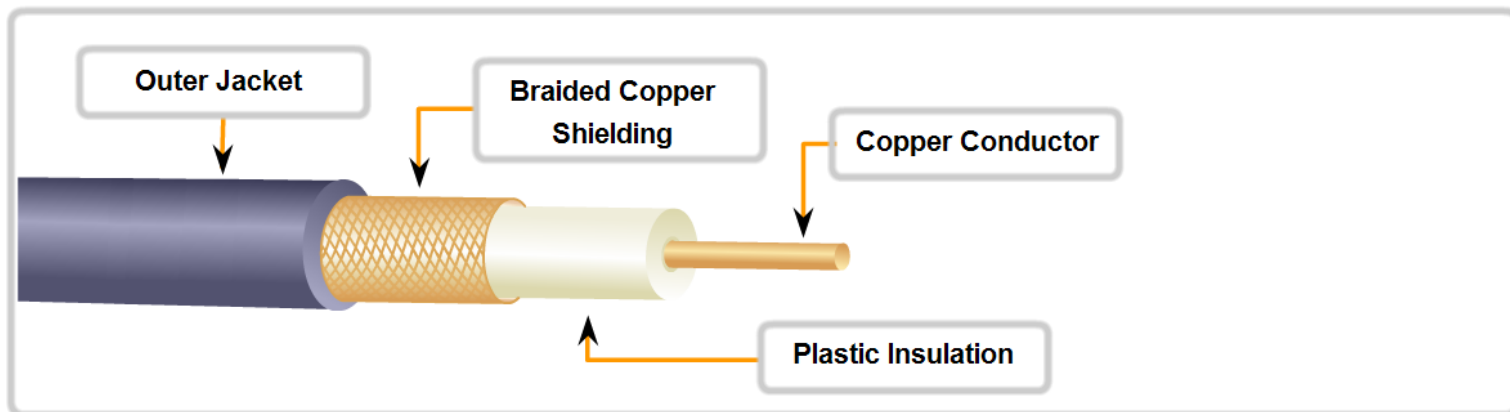
**RJ45 UTP
Plugs**



**RJ45 UTP
Socket**



Coaxial Cable Design

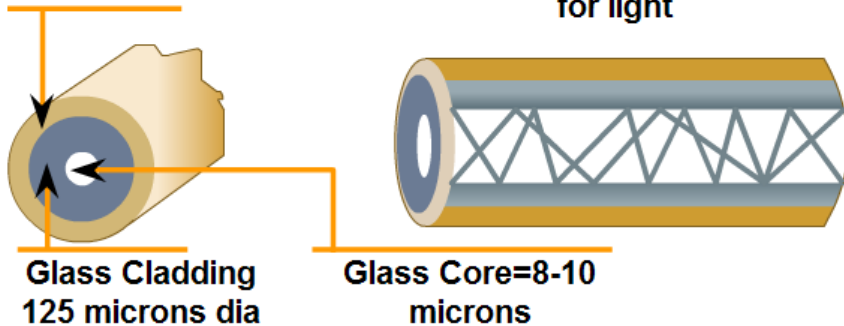


Fiber Media Modes

Single-Mode

Polymeric Coating

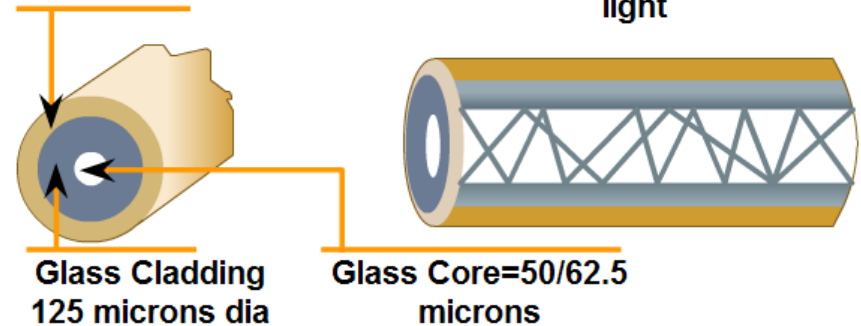
Produces single straight path for light



Multimode

Coating

Allows multiple path for light



- Small Core
- Less Dispersion
- 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 dispersion and therefore, loss of signal
- Used for long distance application, but shorter 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

Wireless Media Signals and Security

Data Signals

