Physical Layer 2

Wireless installations - attach antennas to wireless devices
Cable Internet installations - customer premises wiring

Properties of UTP: (1) 4 pairs - color coded - copper wires
(2) Twisted together and encased in a flexible plastic sheath
(3) No shielding

To limit crosstalk: (1) Cancellation - each pair of wires in opposite polarity [1+, 1-]
- twisted together to effectively cancel out magnetic fields on each other and outside

(2) Variation in twists per foot in each wire - helps prevent crosstalk amongst the wires in the cable

UTP Cabling Standards

TIA/EIA	IEEE
(1) Cable Types	(1) Category 3
(2) Cable lengths	(2) Category 5 / 5e
(3) Connectors	(3) Category 6
(4) Cable Termination	
(5) Testing Methods	

Straight-through : Host to network device
Cross-over : Same devices
Rollover : Cisco Proprietary

Fiber-Optic Cabling

Properties: (1) Not as common as UTP

(2) Ideal networking scenarios
(3) Transmits data over longer distances at higher bandwidth than any other media
(4) Less susceptible to attenuation / Completely immune to EMI / RFI
(5) Made of flexible, extremely thin strands of very pure glass
(6) Use a laser / LED to encode bits as light pulses
(7) Acts as a wave guide to transmit light between the two ends with minimal signal loss

Types of Fiber Media

Single-mode	Multi-mode
- Very small core	- Larger core
- Uses expensive lasers	- Use less expensive LEDs
- Long-distance applications	- LEDs transmit at different angles
	- Up to 10 Gbps over 550 m

Cabling Usage

(1) Enterprise Networks
(2) Fiber-to-the-Home (FTTH)
(3) Long-Haul Networks
(4) Submarine Cable Networks

Wireless Media

Properties: Carries electromagnetic signals as bits using radio / microwave frequencies

limitations: (1) Coverage area
(2) Interference

(3) Security
(4) Shared medium

Types: (1) Data to radio signal encoding methods
(2) Frequency & power of transmission
(3) Signal reception & decoding requirements
(4) Antenna design & construction

Wireless Standards: (1) Wi-Fi (IEEE 802.11) WLAN
(2) Bluetooth (IEEE 802.15) WPAN
(3) WiMAX (IEEE 802.16) point-to-multipoint
(4) Zigbee (IEEE 802.15.4) IoT applications

Wireless LAN requirements: (1) Wireless Access Point (WAP)
(2) Wireless NIC Adapters