# Layer 1 – The Physical Layer

- OSI Layer 1 conveys the bit stream - electrical impulse, light or radio signals — through the network at the electrical and mechanical level.

- It provides the hardware means of sending and receiving data, including defining cables, interface cards and physical aspects.

Layer 1 Connection Types for Ethernet - UTP

- Ethernet LAN connections can be carried over coaxial cable (no longer used), twisted copper pair cable, fiber cable or wireless.

- Copper UTP (Unshielded Twisted Pair) cables are commonly used to connect desktop computers to switches.

- Connector type is RJ-45 and maximum length is 100 metres.
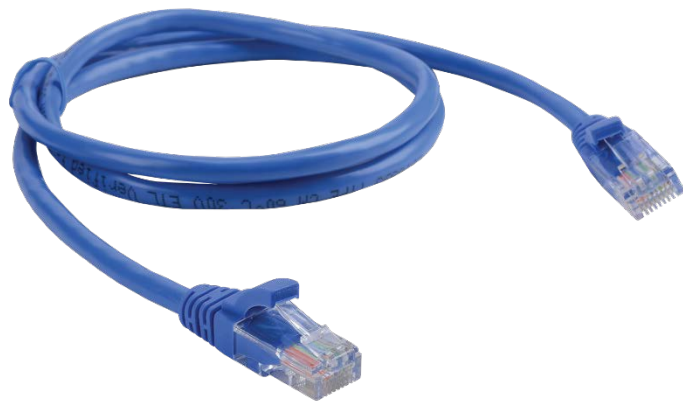
UTP Cable Categories

Category	Maximum Bandwidth
Cat 5	100 Mbps
Cat 5e	1 Gbps
Cat 6	10 Gbps
Cat 6a	10 Gbps
Cat 7	10 Gbps
Cat 8	40 Gbps

Straight-Through vs Crossover UTP Cable

- The receive and transmit wires in a UTP cable can be wired to the RJ-45 connector as either straight-through or crossover.

- Straight-through cables are used to connect an end device such as a PC or router to a switch.

- Crossover cables are used to connect devices together directly. They are most often used to connect two devices of the same type: e.g. two computers or two switches to each other.

- Modern switches support Auto MDI-X where the receive and transmit signals are reconfigured automatically to yield the expected result.

Fiber Cables

- Fiber optic cables can be used to support longer distances or higher bandwidth requirements.

- For example between separate buildings in a campus, or for switch to switch connections inside a building.
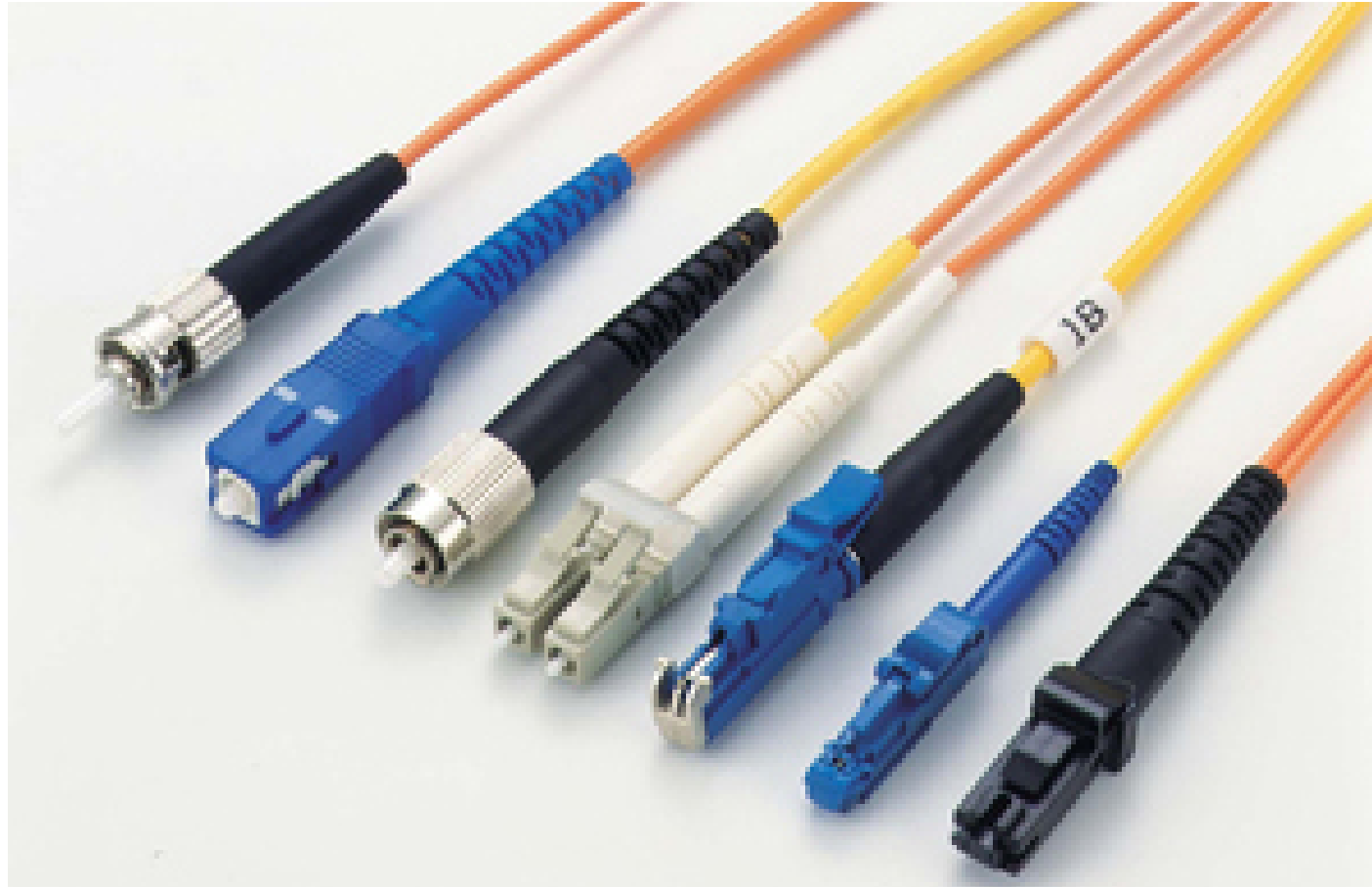
Single Mode vs Multi Mode Fiber

- Single Mode or Multi Mode Fiber can be used.
- Single Mode supports higher bandwidth and longer distances but is more expensive.
- https://en.wikipedia.org/wiki/Multi-mode_optical_fiber

Fiber Connectors

PoE Power over Ethernet

Standard Switch

PoE Switch

Standard Switch

Power Injector

FLACKBOX
www.flackbox.com