Network connection mediums

To communicate with one another, devices should be physically joined through a medium. There are a few types of this media: copper cables, wireless, and fiber optic cables. Each type has advantages and disadvantages over the other two; therefore, the type we use depends on our scenarios.

Fiber-optic cabling

Fiber-optic is convenient for long-distance use. It supports fast bandwidths and is not prone to crosstalk or other interference. Therefore, it has lower rates of packet loss. However, this technology is way more expensive than the other types and is less durable. There are two types of fiber-optic cabling: single-mode and multi-mode. Single-mode uses expensive lasers that emit a single ray of light. In contrast, multi-mode uses LEDs to send light pulses, which makes them cheaper but shortens the distance they work through.

Wireless Media

Wireless media carry electromagnetic signals that represent binary digits of data. It is extremely mobile. However, they have a limited coverage area, are prone to interference, are not very secure, and can only operate in half-duplex mode.

Copper Cabling

Copper cabling is the most common cabling type. It is relatively cheap and is widely applied. It passes data through electric pulses and, therefore, is easily affected by Electromagnetic interference (EMI) or radio frequency interference (RFI). It is also prone to crosstalk.
There are three types of copper cables: Unshielded Twisted-Pair(UTP), Shielded Twisted-Pair(STP), and Coaxial. The first two are almost the same; they are both made of 4 color-coded twisted pairs. However, STPs are protected from electromagnetic interference; therefore, they cost more. Coaxial cables are mostly used for wireless installations and cable internet installations. UTPs are the most common network media. They are usually terminated with RJ-45 plugs. There are two standards for terminating RJ-45 plugs: T568A and T568B. Cables can be straight-through (when both ends are terminated with the same standard), crossover (when ends are terminated with different standards), and rollover (when all the pins are assigned oppositely).

Unshielded Twisted Pair

There are a few generations of UTPs, each generation employed higher data rates and had different applications.
Category 1- transmits data at a maximum rate of 1 Mbps, is used for telephone communication, and was not well-suited for long-distance communication.
Category 2- transmits data at a maximum rate of 4 Mbps, and is used for data and voice transmission.
Category 3- transmits data at a maximum rate of 10 Mbps, is used for 10BASE-T and Token Ring networks

Category 4- transmits data at a maximum rate of 16 Mbps, and is used for Token Ring networks
Category 5- transmits data at a maximum rate of 100 Mbps, is used in Ethernet, Fast Ethernet, and Token Ring
Category 5e- transmits data at a maximum rate of 1 Gbps, is used in Ethernet, Fast Ethernet, and Gigabit Ethernet
Category 6- transmits data at a maximum rate of 10 Gbps, is used for Gigabit Ethernet, 10G Ethernet
Category 6a- transmits data at a maximum rate of 10 Gbps, is used for Gigabit Ethernet, 10G Ethernet, but can be used over longer distances
Category 7- transmits data at a maximum rate of 10 Gbps, is used for Gigabit Ethernet, 10G Ethernet, but its four individual pairs, and the overall cable are protected from EMI and crosstalk.