Cable Management

Ethernet Standards

Ethernet is the most popular technology used to connect devices

Modern Ethernet uses twisted pair copper or fiber

BASE (baseband)
Single frequency using the entire medium
Broadband uses many frequencies, sharing the medium

10 and 100 megabit Ethernet
Also Known As 10BASE-T (twisted pair)

Two pair
Category 3 cable minimum
100 meter maximum distance

100BASE-TX
Fast Ethernet

Two pair
Category 5 minimum twisted pair copper wires
100 meter maximum distance

Gigabit Ethernet over Category 5

4-pair balanced twisted-pair
Category 5 (deprecated, instead 5e is used)
A shift to using all four pair
100 meter maximum distance

10GBASE-T
10 Gig Ethernet over copper

4 pair balanced twisted pairs
Frequency use of 500MHz (125MHz was the normal for gigabit Ethernet)
Minimum Category 6
Up to 55 meters if unshielded
Up to 100 meters if shielded
Category 6A cabling can support 100 meters regardless if it's shielded or not

40GBASE-T

4-pair balanced twisted-pair

Category 8 cable
Up to 30 meters

100BASE-FX

Pair of multi mode fiber
Minimum Category 8
Laser components
400 meters (half-duplex)
2 kilometers (full-duplex)

100BASE-SX

Less expensive version of the 100 megabit Ethernet over fiber
Led optics
300 meters maximum distance

1000BASE-SX

Gigabit Ethernet over Fiber using short wavelength laser
Usually over multi-mood fiber
220 meters to 550 meters depending on the type of fiber

1000BASE-LX

Gigabit Ethernet over Fiber using long wavelength laser
Multi-mode fiber to 550 meters
Single-mode fiber to 5 kilometers

10GBASE-SR

Short range
Multimode fiber
26 to 400 meters, depending on the type of fiber

10GBASE-LR

Long range
Single-mode fiber
10 kilometers maximum range

Network Transceivers

Transceivers

Transmitter and Receiver (Usually in 1 component)

Provides a modular interface (add the transceiver that matches your network)

Many different types and designs

With most transceivers, there will be 2 fibers (transmit and receive)

Sometimes it will be bi-directional transceivers, where traffic goes in both directions (using different wavelength)
This reduces the number of fiber runs by half

Small Form-factor Pluggable (SFP)
a type of transceivers
Commonly used to provide 1 Gbit/s fiber
1 Gbit/s RJ45 SFPs are also available (copper)

SFP+ is an enhanced model that supports higher throughput up to 16 Gbit/s and it's common with 10 Gbit Ethernet

Quad Small Form-Factor Pluggable (QSFP)

4 Channel SFP = 4 * 1 Gbit/s = 4 Gbit/s

There is also QSFP+ that has 4 SFP+ channels = 4 * 10 Gbit/s = 40 Gbit/s

Saves amount of fiber and equipment

Bi-Directional (Bi-Di) QSFP and QSFP+ adds additional efficiency over time

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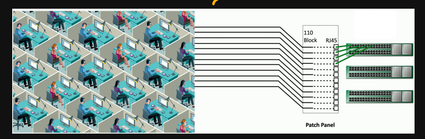

Changes are done on the RJ45 side not the other side

Punch-down block on one side and RJ45 side on the other side

Fiber Distribution Panel

Fiber is run through different floors or buildings but not end-users (because of its expense)

Fiber bend radius must be taken into consideration as fiber breaks when it's bent too tightly

Often includes a service loop which has extra fiber for future exchange and provides an inexpensive insurance

Different Types of Blocks

66 Block

A patch panel for analog voice and some digital links

Left side is patched to the right which makes an easy to follow path

Write and a punch-down tool so no additional connectors required

Generally replaced with 110 blocks

110 Block

Wire-to-wire patch panel

No intermediate interface required

Replaces the 66 block

Patch category 5 and category 6 cables
Wires are punched into the block (Connecting block is on top)

Additional wires punched into connecting block (Patch the top to the bottom)

Krone Block

An alternative to 100 block (common in Europe)

Options are are available for many purposes (analog and digital)

Different models can support higher frequencies

Building Industry Cross-connect (BIX)

Created in the 1970s by Northern Telecom

Updated through the years

Gigabix performance is better than Category 6 cable standard