

Ethernet Over Twisted Pair Technologies

Ethernet over twisted pair cables is the most common technology used in business and home networks. It ensures devices can connect and communicate effectively through wired connections. Let's break down the key components and concepts.

Role of Twisted Pair Ethernet Cables

Twisted pair Ethernet cables, commonly known as CAT cables, play a vital role in establishing wired connections. They are used to:

- Deliver internet from a modem to a router or computer.
 - Distribute wired network connections within a building.
 - Provide telephone and television services in some cases.
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Why Twisted Pair Cables Are Important

Initially, copper wires were laid parallel, but this design caused interference issues. Twisting the wires reduced problems like:

- **Electromagnetic Interference (EMI):** Disruptions caused by nearby electrical devices.
- **Radio Frequency Interference (RFI):** Noise from radio signals.
- **Crosstalk:** Data interference between wires.

Twisted pair cables are widely used in Local Area Networks (LANs) because they are:

1. **Affordable:** UTP cables offer cost-effective solutions for homes and small businesses.
 2. **Flexible:** Thin, lightweight, and easy to install.
 3. **Versatile:** Suitable for short-distance connections and capable of transmitting data and voice communications.
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Types of Twisted Pair Cables

Twisted pair Ethernet cables contain four pairs of copper wires (color-coded) twisted together. These cables fall into three main categories:

1. **Unshielded Twisted Pair (UTP):**
 - Most common and affordable.
 - Provides basic protection against EMI, RFI, and crosstalk.
2. **Shielded Twisted Pair (STP):**
 - Includes a braided aluminum or copper shield for added protection.
 - Used in environments with significant interference.
3. **Foiled Twisted Pair (FTP):**
 - Uses a foil shield around the wire bundle.
 - Ideal for areas with high interference like industrial settings.

Combination Shields (SF/FTP): Some cables combine shielding methods (e.g., braided and foil shields) for maximum protection, often used in environments with extreme interference.

Straight-Through Cables

Straight-through cables, or patch cables, are the most common Ethernet cables used in computer networks. They connect devices like computers, routers, hubs, and Ethernet switches.

How to Identify Straight-Through Cables

- Check both ends of the cable. If the colors and stripe order of the twisted pairs match at both ends, it's a straight-through cable.
- Example: An orange-striped wire at pin position 1 on one end will also be at pin position 1 on the other end.

Straight-Through Cable Configurations

- **Computers and Routers:**
 - Pins 1 & 2: Orange wires for sending data.

- Pins 3 & 6: Green wires for receiving data.
- **Hubs and Switches:**
 - Pins 1 & 2: Green wires for sending data.
 - Pins 3 & 6: Orange wires for receiving data.

Power Over Ethernet (PoE)

Gigabit Ethernet can use blue and brown wires to deliver power to devices like cameras or access points.

Choosing the Right Cable

When selecting Ethernet cables:

1. **UTP:** For general use in homes and small businesses.
 2. **STP or FTP:** For areas with significant interference.
 3. **SF/FTP:** For industrial environments with extreme EMI or RFI.
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Understanding Ethernet over twisted pair technologies is essential for configuring efficient and reliable networks. By knowing the types of cables and their uses, you can ensure optimal performance in both home and business settings.

Twisted pair Ethernet: Crossover cable

Crossover cables

Crossover cables may still be in use in older network environments. This section provides information for working with crossover Ethernet cable for older Enterprise network devices. Note that most new Enterprise devices have the ability to detect Ethernet connection types and select the correct wires for sending and receiving data using Auto Medium Dependent Interface Crossover (Auto-MDI/MDIX) technology. The Auto-MDI/MDIX ports replace the crossover cable's function for connecting two devices that use the same sending and receiving wires for data communications.

Crossover cables are used to connect two computing devices directly to one another. As an IT Support specialist, you might use a short crossover cable to connect an IT administrator laptop directly to an Enterprise machine (e.g., server, switch, router, hub, etc.). This type of connection is normally used to update, repair, and perform other administrative tasks on the Enterprise machine. A crossover cable should be connected between the Ethernet port/Network Interface Card (NIC) on the IT administrative system and the management port of the Enterprise machine. This connection is then used to access the operating system and/or the management interface of the Enterprise machine. Additionally, crossover cables can connect two switches, two hubs, or a switch to a hub, as well as two routers, two PCs, or a router to a PC.

Like straight-through cables, crossover cables can also be identified by comparing both ends of the cable to one another. Crossover cable ends will have different patterns in the color order of the twisted pairs. The crossover cable key below describes a typical setup for a T-568-A. If the green wires appear in pin positions 1 and 2 on one side of the cable, on the opposite end of the cable, the green wires will appear in the pin positions 3 and 6. The orange wires will appear in positions 3 and 6 at one end of the cable, crossing over to the 1 and 2 positions at the opposite end.

For the T-568-B scheme, if you see orange wires start at pin positions 3 and 6, they should cross over to pin positions 1 and 2 at the opposite end of the cable. Green wires should start at pin positions 1 and 2, crossing over to 3 and 6 at the opposite end. This wiring crossover is needed to connect two computers that transmit and receive data on the same wires. Blue and brown wires do not cross over to different positions in this set-up.

Straight-through cables use the T568B wiring scheme, while crossover cables use both schemes.

Crossover cable key:

- Endpoint 1 of the Ethernet cable:
 - Pins 1 & 2 - Green wires for sending data
 - Pins 3 & 6 - Orange wires for receiving data

- Endpoint 2 of the Ethernet cable:
 - Pins 1 & 2 - Orange wires for sending data
 - Pins 3 & 6 - Green wires for receiving data

