

Wiring Considerations

When choosing the type of wiring to be used in your network, a few criteria should be used to determine the best price/performance return. First, though, let's review some common cabling terms.

Cabling Terms

Network cabling often will have a name such as: 10Base5

- "10" constitutes the signaling speed of the cable. (10 MHz)
- "Base" describes the type of signaling (Baseband vs. broadband...broadband is generally used by telecommunications networks, such as cable TV cabling)
- "5" represents the approximate maximum distance allowed in 100s of meters (In this case approx. 500 meters)

Cable Construction

Twisted Pair

Twisted Copper wiring is used in 10 Base T wiring and is the most common network wiring system. Twisted Pair cable is graded according to its ability to carry data bandwidth (CAT3, CAT4, CAT5, etc...) The higher the bandwidth, or speed, of the network, the higher the grade of wire required.

Coaxial

Coaxial Cable is composed of a copper conductor that serves as the "core" of the cable. The conductor is covered by a piece of insulating plastic, which is covered by a wire mesh serving as both a shield and second conductor. This second conductor is then coated by PVC. A conductor within a conductor sharing a single axis is how the name of the cable is derived.

Fiber Optic

The glass core of a fiber optic cable is surrounded and bound to a glass tube, called cladding. Cladding adds strength disallowing any stray light wave from leaving the central core. This cladding is then surrounded by a plastic outer jacket which provides strength and protection.

Segment Distance

Each type of wiring has different segment length capability. A wiring segment is the distance from one network component (such as a Network Interface card, Hub, or Switch) and another. The maximum distance constraints described below are per wiring segment:

UTP, STP	10Base-T	100 meters (109 yards)
Coaxial	10Base-2 (Thinwire)	185 meters (200 yards)
	10Base-5	500 meters (545 yards)
Fiber Optic	10Base-F	>2 km (1.2 miles)

Noise Immunity

The electrical and magnetic "noise" generated by motors and other machinery in an industrial plant requires special planning. In those environments where RFI and EMI noise are high, care should be taken to limit the length of wiring runs with traditional UTP or STP copper network wiring. In many cases, users choose to install fiber optic cabling, due to its immunity to EMI and RFI interference. However, in applications where interference is not severe, often coaxial or shielded copper can be used. The following is a summary of different wiring media's relative noise immunity:

UTP (Unshielded Twisted Pair)	Noise Immunity - Low
10Base2 Coaxial, STP (Shielded Twisted Pair)	Noise Immunity - Medium
10Base5Coaxial	Noise Immunity - High
FiberOptic	Noise Immunity - High

Bandwidth

Different cable media support different bandwidth capabilities. What is bandwidth? Bandwidth is the total amount of data that can be transmitted via the cable per second.

When installing cable in a network, care should be taken to install the cable that will fill both current network loading requirements, and future expansion needs. Replacing cabling when it cannot support new equipment is far more expensive than installing a higher bandwidth cable during initial construction. In general, fiber optic cable can support the greatest bandwidth (upwards of 25,000 gigabits) and UTP has the lowest. UTP and STP cables are designed to carry different levels of bandwidth. CAT 5 cabling, which is the most popular cabling installed today, can handle up to 1000MB, however, at this speed, maximum distance between network segments is reduced. As these distances vary due to cable construction, check with your cabling supplier to verify:

- Maximum bandwidth supported by your cable.
- Maximum distance per segment supported at the different speeds (Your system may work fine until you try to increase network communication speed...plan for the future!

Summary

Although the network components are the most visible part of a network, the cabling is the skeleton of the system. Poor planning in the installation of cabling will result in less flexibility to implement new technology, or achieve reliable network performance. Make sure that your cabling system will support your needs now, and in the reasonable future.