Answer on Question #52543, Programming, Other

Task:

describe the three categories of UTP cabling that are recognized by EIA-568-A.

Answer:

EIA-568-A recognizes three categories of UTP cabling:

- **Category 3:** UTP cables and associated connecting hardware whose transmission characteristics are specified up to 16 MHz.
- **Category 4:** UTP cables and associated connecting hardware whose transmission characteristics are specified up to 20 MHz.
- **Category 5:** UTP cables and associated connecting hardware whose transmission characteristics are specified up to 100 MHz.

Of these, Category 3 and Category 5 cable have received the most attention for LAN applications. Category 3 corresponds to the voice-grade cable found in abundance in most office buildings. Over limited distances, and with proper design, data rates of up to 16 Mbps should be achievable with Category 3. Category 5 is a data-grade cable that is becoming increasingly common for pre-installation in new office buildings. Over limited distances, and with proper design, data rates of up to 100 Mbps should be achievable with Category 5.

A key difference between Category 3 and Category 5 cable is the number of twists in the cable per unit distance. Category 5 is much more tightly twisted, typically 3 to 4 twists per inch compared to 3 to 4 twists per foot for Category 3. The tighter twisting is more expensive but provides much better performance than Category 3.

EIA-568-A specifies the expected performance of Category 3 and 5 UTP, as well as the more expensive shielded twisted pair STP. The first parameter used for comparison, *attenuation*, is fairly straightforward. The strength of a signal falls off with distance over any transmission medium. For copper wire media, attenuation is generally logarithmic and therefore is typically expressed as a constant number of decibels per unit distance. Attenuation introduces three considerations for the designer:

- First, a received signal must have sufficient magnitude so that the electronic circuitry in the receiver can detect and interpret the signal.
- Second, the signal must maintain a level sufficiently higher than noise to be received without error.
- Third, attenuation is an increasing function of frequency.

Near-end crosstalk, as applied to twisted pair wiring systems, is the coupling of the signal from one pair of conductors to another pair. These conductors may be the metal pins in a connector or wire pairs in a cable. The term *near end* refers to coupling that takes place when the transmit signal entering the link couples back to the receive conductor pair at that same end of the link; that is, the near transmitted signal is picked up by the near receive pair.

The EIA-568 standards have been important to the development of high-speedlocal area network (LAN) standards. The EIA-568 media are referenced in twoimportant 100 Mbps LAN standards. The so-called*Fast Ethernet*specification, 100Base-T, allows the use of Category 5 links consisting of twotwisted pairs. 100Base-T also allows Category 3, but in this case four twistedpairs are required, with each pair carrying only 25 Mbps. The copper version ofFDDI (Fiber Distributed Data Interface), known as *CDDI*(*CopperDistributed Data Interface*), allows the use of Category 5 UTP.

Since the publication of EIA-568-A, there has been ongoing work on thedevelopment of standards for premises cabling. These are being driven by twoissues:

- First, the Gigabit Ethernet specification requires the definition ofparameters that are not specified completely in any published cablingstandard.
- Second, there is a desire to specify cabling performance to higherlevels, namely Enhanced Category 5 (Cat 5E), Category 6, and Category 7. Table 1 summarizes these new cabling schemes and compares them to the existingstandards.

Table 1 Twisted Pair Categories and Classes

	Category 3 Class C	**Category 5 Class D**	**Category 5E**	**Category 6 Class E**	**Category 7 Class F**
Bandwidth	16 MHz	100 MHz	100 MHz	200 MHz	600 MHz
Cable Type	UTP	UTP/FTP	UTP/FTP	UTP/FTP	SSTP
Link Cost (Cat 5 =1)	0.7	1	1.2	1.5	2.2

Table 1 uses the following abbreviations:

UTP—Unshielded twisted pair
FTP—Foil twisted pair
SSTP—Shielded screen twisted pair

EIA-568 also provides recommended wiring installation practices for use of STP and UTP in building wiring. The standard is referred to as a *structured cabling system*, and it defines a generic wiring scheme that can be used in any office building.

A structured cabling strategy is based on the use of a hierarchical, star-wired cable layout. External cables, from the local telephone company and from wide area networks, terminate in an equipment room that's generally on the ground floor or a basement level. Patch panel and cross-connect equipment in the equipment room connect the external cables to internal distribution cables. Typically, the first level of distribution consists of backbone cables. In the simplest implementation, a single backbone cable or set of cables runs from the equipment room to telecommunications closets (called*wiring closets*) on each floor. A telecommunications closet differs from the equipment room only in that it's less complex; the telecommunications closet generally contains cross-connect equipment for interconnecting cable on a single floor to the backbone.

The cable distributed on a single floor is referred to as *horizontal cabling*. This cabling connects the backbone to wall outlets that service individual telephone and data equipment.

The use of a structured cabling plan enables an enterprise to use the transmission media appropriate for its requirements in a systematic and standardized fashion. EIA-568 indicates the recommended media for each portion of the structured cabling hierarchy. For horizontal cabling, a maximum distance of 90 meters is recommended, independent of media type. This distance is adequate to provide coverage for an entire floor for many commercial buildings. For buildings with very large floor space, backbone cable may be required to interconnect multiple telecommunications closets on a single floor. For backbone cabling, distances range from 90 meters to 3,000 meters, depending on cable type and position in the hierarchy.