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Cat 5e v Cat 6 Common Questions

Why do I need all the bandwidth of category 6? As far as I know, there is no application today that requires 200 MHz of bandwidth.

Bandwidth precedes data rates just as highways come before traffic. Doubling the bandwidth is like adding twice the number of lanes on a highway. The trends of the past and the predictions for the future indicate that data rates have been doubling every 18 months. Current applications running at 1 Gb/s are really pushing the limits of category 5e cabling. As streaming media applications such as video and multi-media become commonplace, the demands for faster data rates will increase and spawn new applications that will benefit from the higher bandwidth offered by category 6. This is exactly what happened in the early 90's when the higher bandwidth of category 5 cabling compared to category 3 caused most LAN applications to choose the better media to allow simpler, cost effective, higher speed LAN applications, such as 100BASE-TX. Note: Bandwidth is defined as the highest frequency up to which positive power sum ACR (Attenuation to Crosstalk Ratio) is greater than zero.

What is the general difference between category 5e and category 6?

The general difference between category 5e and category 6 is in the transmission performance, and extension of the available bandwidth from 100 MHz for category 5e to 200 MHz for category 6. This includes better insertion loss, near end crosstalk (NEXT), return loss, and equal level far end crosstalk (ELFEXT). These improvements provide a higher signal-to-noise ratio, allowing higher reliability for current applications and higher data rates for future applications.

Will category 6 supersede category 5e?

Yes, analyst predictions and independent polls indicate that 80 to 90 percent of all new installations will be cabled with category 6. The fact that category 6 link and channel requirements are backward compatible to category 5e makes it very easy for customers to choose category 6 and supersede category 5e in their networks. Applications that worked over category 5e will work over category 6.

What does category 6 do for my current network vs. category 5e?

Because of its improved transmission performance and superior immunity from external noise, systems operating over category 6 cabling will have fewer errors vs. category 5e for current applications. This means fewer re-transmissions of lost or corrupted data packets under certain conditions, which translates into higher reliability for category 6 networks compared to category 5e networks.

When should I recommend or install category 6 vs. category 5e?

From a future proofing perspective, it is always better to install the best cabling available. This is because it is so difficult to replace cabling inside walls, in ducts under floors and other difficult places to access. The rationale is that cabling will last at least 10 years and will support at least four to five generations of equipment during that time. If future equipment running at much higher data rates requires better cabling, it will be very expensive to pull out category 5e cabling at a later time to install category 6 cabling. So why not do it for a premium of about 20 percent over category 5e on

an installed basis?

What is the shortest link that the standard will allow?

There is no short length limit. The standard is intended to work for all lengths up to 100 meters. There is a guideline in ANSI/TIA/EIA-568-B.1 that says the consolidation point should be located at least 15 meters away from the telecommunications room to reduce the effect of connectors in close proximity. This recommendation is based upon worst-case performance calculations for short links with four mated connections in the channel.

What is a "tuned" system between cable and hardware? Is this really needed if product meets the standard?

The word "tuned" has been used by several manufacturers to describe products that deliver headroom to the category 6 standard. This is outside the scope of the category 6 standard. The component requirements of the standard have been carefully designed and analyzed to assure channel compliance and electrical/ mechanical interoperability.

What is impedance matching between cable and hardware? Is this really needed if product meets the standard?

The standard has no impedance matching requirements. These are addressed by having return loss requirements for cables, connectors, and patch cords.

Is there a use for category 6 in the residential market?

Yes, category 6 will be very effective in the residential market to support higher Internet access speeds while facilitating the more stringent Class B EMC requirements (see also the entire FCC Rules and Regulations, Title 47, Part 15). The better balance of category 6 will make it easier to meet the residential EMC requirements compared to category 5e cabling. Also, the growth of streaming media applications to the home will increase the need for higher data rates which are supported more easily and efficiently by category 6 cabling.

Why wouldn't I skip category 6 and go straight to optical fiber?

You can certainly do that but will find that a fiber system is still very expensive. Ultimately, economics drive customer decisions, and today optical fiber together with optical transceivers is about twice as expensive as an equivalent system built using category 6 and associated copper electronics. Installation of copper cabling is more craft-friendly and can be accomplished with simple tools and techniques. Additionally, copper cabling supports the emerging Data Terminal Equipment (DTE) power standard under development by IEEE (802.3af).

What is meant by the term "Electrically Balanced"?

A simple open wire circuit consisting of two wires is considered to be a uniform, balanced transmission line. A uniform transmission line is one which has substantially identical electrical properties throughout its length, while a balanced transmission line is one whose two conductors are electrically alike and symmetrical with respect to ground and other nearby conductors.* "Electrically balanced" relates to the physical geometry and the dielectric properties of a twisted pair of conductors. If two insulated conductors are physically identical to one another in diameter, concentricity, dielectric material and are uniformly twisted with equal length of conductor, then the

pair is electrically balanced with respect to its surroundings. The degree of electrical balance depends on the design and manufacturing process. Category 6 cable requires a greater degree of precision in the manufacturing process. Likewise, a category 6 connector requires a more balanced circuit design. For balanced transmission, an equal voltage of opposite polarity is applied on each conductor of a pair. The electromagnetic fields created by one conductor cancel out the electromagnetic fields created by its "balanced" companion conductor, leading to very little radiation from the balanced twisted pair transmission line. The same concept applies to external noise that is induced on each conductor of a twisted pair. A noise signal from an external source, such as radiation from a radio transmitter antenna generates an equal voltage of the same polarity, or "common mode voltage," on each conductor of a pair. The difference in voltage between conductors of a pair from this radiated signal, the "differential voltage," is effectively zero. Since the desired signal on the pair is the differential signal, the interference does not affect balanced transmission. The degree of electrical balance is determined by measuring the "differential voltage" and comparing it to the "common mode voltage" expressed in decibels (dB). This measurement is called Longitudinal Conversion Loss "LCL" in the Category 6 standard. * The ABC's of the telephone Vol. 7

Category 6 Cable Questions

What is the difference between enhanced category 5e cable rated for 400 MHz and category 6 cable rated for 250 MHz?

Category 5e requirements are specified up to 100 MHz. Cables can be tested up to any frequency that is supported by the test equipment, but such measurements are meaningless without the context of applications and cabling standards. The category 6 standard sets minimum requirements up to 250 MHz for cables, connecting hardware, patch cords, channels and permanent links, and therefore guarantees reasonable performance that can be utilized by applications.

Why did all category 6 cable used to have a spline, and now is offered without one?

Some category 6 cable designs have a spline to increase the separation between pairs and also to maintain the pair geometry. This additional separation improves NEXT performance and allows category 6 compliance to be achieved. With advances in technology, manufacturers have found other ways of meeting category 6 requirements. The bottom line is the internal construction of the cable does not matter, so long as it meets all the transmission and physical requirements of category 6. The standard does not dictate any particular method of cable construction.

Is there a limitation on the size of bundles one can have with category 6? Can you have 200-300 and still pass category 6?

There is no limit imposed by the standards on the maximum number of category 6 cables in a bundle. This is a matter for the market and the industry to determine based on practical considerations. It should be pointed out that after six or eight cables, the performance in any cable will not change significantly since the cables will be too far away to add any additional external (or alien) NEXT.

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Category 6 Patch Cord Questions

Will contractors be able to make their own patch cords?

Category 6 patch cords are precision products, just like the cables and the connectors. They are best manufactured and tested in a controlled environment to ensure consistent, reliable performance. This will ensure interoperability and backward compatibility. All this supports patch cords as a factory-assembled product rather than a field-assembled product.

Do you have to use the manufacturer's patch cords to get category 6 performance?

The category 6 standard has specifications for patch cords and connectors that are intended to assure interoperable category 6 performance. If manufacturers can demonstrate that each component meets the requirements in the standard, minimum category 6 performance will be achieved. However, manufacturers may also design their products to perform better than the minimum category 6 requirements, and in these cases compatible patch cords and connectors may lead to performance above the minimum category 6 requirements.

Category 6 Connecting Hardware Questions

Are the connectors for category 5e and category 6 different? Why are they more expensive?

Although category 6 and category 5e connectors may look alike, category 6 connectors have much better transmission performance. For example, at 100 MHz, NEXT of a category 5e connector is 43 decibels (dB), while NEXT of a category 6 connector is 54 dB. This means that a cat6 connector couples about 1/12 of the power that a cat5e connector couples from one pair to another pair. Conversely, one can say that a category 6 connector is 12 times less "noisy" compared to a category 5e connector. This vast improvement in performance was achieved with new technology, new processes, better materials and significant R&D resources, leading to higher costs for manufacturers.

What will happen if I mix and match different manufacturers' hardware together?

If the components are category 6 compliant, then you will be assured of category 6 performance.