

The Future of Copper: Category 8 Cabling

Understanding the characteristics and capabilities of the next-generation of twisted pair copper cabling

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Coming soon to a data center near you— 25 and 40GBASE-T over Category 8 cabling

As bandwidth demands continue to increase, choosing the right cabling is important to future-proof data centers for requirements that lie ahead. The ongoing challenge that data center architects face is in understanding just what those future requirements will be, as they are often unpredictable.

With most cabling infrastructures designed for an intended lifespan of 20 to 25 years, you should understand your options for meeting your long-term requirements. Twisted pair copper cabling is unquestionably the most commonly deployed structured cabling solution for enterprises looking to deploy Ethernet.

While many data centers currently employ Category 6 or 6A copper cabling, 25 and 40GBASE-T over Category 8 cabling is in development and will be the new standard. Category 8 cabling has been approved by TIA and is the future of copper, providing numerous benefits for data centers looking to seamlessly add bandwidth for Ethernet.

This ebook details Category 8 cabling considerations and recommendations to prepare for adoption.



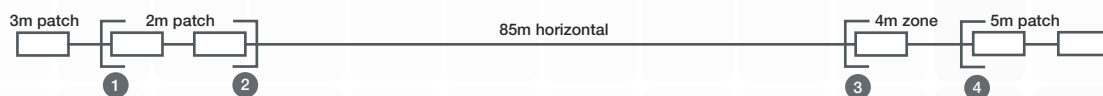
What is Category 8 Cabling?

Category 8, the standard for next-generation twisted-pair cabling specifications, will allow you to transport data up to four times faster on the same type of cabling already being used. It is primarily intended to support 25GBASE-T and 40GBASE-T applications for short distances (up to 30 meters) for switch-to-server connections.

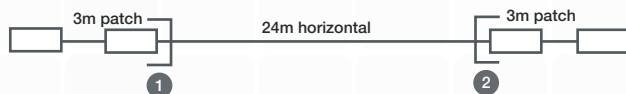
However, it is important to note that technical tradeoffs in chip technology relative to power usage will limit the launch of 25GBASE-T and 40GBASE-T to 30 meters (100 feet) reach, placing the focus on data center links. The first applications for Category 8 will be 25Gbps Ethernet for switch-to-server links, with expectations to increase to 40Gbps or even 50Gbps in future years.

	Max Length	# Connectors	Bandwidth	PHY Power	Cable Type	Connector Type
10GBASE-T	100m	4	500MHz	1.5W (current)	Unshielded or Shielded	RJ45
25/40GBASE-T	30m	2	2000MHz	3W (initial, expected)	Shielded	RJ45

Cat 6A Channel



Cat 8 Channel



Category 6A channels are up to 100 meters long, with up to four connectors, supporting 500MHz of bandwidth. The cabling system can be either shielded or unshielded. Category 8 cabling systems are shielded-only and allow up to 30 meters operating in a two connector configuration and have a 2000 MHz bandwidth.

Characteristics of Category 8 Cabling

- Shielded RJ45 connectors
- Supports 25 and 40GBASE-T
- 2000 MHz bandwidth (4x Cat 6A)
- 30 meter channel maximum
- 4 meter channel minimum (3m link, 1m of patch)
- Field terminable

Category 8 offers four times the bandwidth of Category 6A cabling, with internal impairments specified up to 2 GHz; alien impairments are also specified up to 2 GHz.

Structured Cabling Components

If shielding and length limitations are put aside, Category 8 is fundamentally the same cabling system as prior categories; it is simply made to perform at much higher bandwidth.

Cables

Category 8 cables will be shielded, but will not be limited to any specific shielding construction. The cables can use an F/UTP construction, in which the shield surrounds the twisted-pairs but not the individual twisted-pairs, or they can use an S/FTP construction, in which the individual twisted-pairs are also shielded. Other shielding cable constructions will be valid as well.

Connectors

Category 8 connectors will use the familiar and ubiquitous RJ45 interface. Category 8 jacks will require proper grounding to the cable and to the device they are installed into (patch panel or outlet). They will be designed for field termination, but will also be available pre-terminated as part of Panduit's QuickNet line.

Ideal Environments for Category 8

Category 8 will be most useful in data center applications or small enterprise LANs in commercial buildings. Because of the reach, connector limitations and its shielded-only requirements, Category 8 is targeted for data center switch-to-server interconnections, primarily in top-of-rack or end-of-row topologies.

Reach

Enterprise LANs have been designed to accommodate up to 100 meters, 1000BASE-T or 10GBASE-T, thus making a transition to 25GBASE-T or 40GBASE-T seem impractical for large commercial buildings. However, there may be some atypical short-reach data networks in commercial buildings that could use the 30 meter reach of 25/40GBASE-T in the future.

Number of Connectors

While Category 8 is limited to two connectors in the copper channel (excluding connections on end equipment), this is typically adequate in a data center environment and many common enterprise links.

Shielded

Though shielded cabling systems must be grounded, this is also not an issue in most data centers, since the connections are closer together. Shielding problems like ground loops can typically be avoided when both ends of the channel are in the same room and nearby. Shielding problems can also be avoided by using proper grounding techniques and products like the Panduit® StructuredGround™ System.

Category Cabling Standards

Category	ISO Channel Class	Maximum Bandwidth	Maximum Ethernet Data Rate	Cabling System	Connector Type
6	E	250MHz	1000Mbps	Unshielded or shielded	RJ45
6A	E _A	500MHz	10Gbps	Unshielded or shielded	RJ45
7*	F	600MHz	10Gbps	Shielded only	Non-RJ45 (IEC 60603-7-71 and IEC 61076-3-104)
7A*	F _A	1000MHz	10Gbps	Shielded only	Non-RJ45 (IEC 60603-7-71 and IEC 61076-3-104)
8	8.I and 8.II	2000MHz	25Gbps 40Gbps	Shielded only	RJ45

* Category 7 and 7A are not recognized by ANSI/TIA-568-C.2

Why is Category 8 the Future of Copper?

First and foremost, Category 8 will provide faster data transmission—up to four times that of Category 6A.

Cost Savings

Twisted pair copper cabling has always been the most cost-effective way to deploy a given Ethernet speed due to the low cost of the copper channel. Moreover, there is no need for additional hardware purchases, such as transceivers.

A common question encountered involves power usage requirements, which can lead to cooling challenges. 25 or 40GBASE-T systems running on Category 8 cabling are not expected to require more power than a 10GBASE-T system due to drawing power over a smaller distance, 30 meters versus 100 meters, and therefore is not expected to create cooling issues.

Ease of Deployment

Category 8, like other categories of cabling, can be terminated in the field, making installation easier to manage (without service loops). Since it is a BASE-T system, it also will have the traditional auto-negotiation capabilities, making it a plug-and-play solution.

Smooth Migrations to Higher Bandwidth

Additionally, Category 8 makes it easier to add bandwidth needs increase over time. Since the same RJ45 interface will continue to be compatible, transitioning from Category 6 or 6A to 8 will provide a smooth 1G to 10G to 25/40G migration path.

Preparing for Category 8

Data center architects looking to adopt Category 8 cabling should begin by arranging their rack and cabinet layouts to support maximum 30-meter channel reach at their locations. Doing so will facilitate migration to 25G/40GBASE-T when the technology becomes available.

This means planning for a maximum 24 meter, jack-to-jack permanent link and up to 6 meters of patch cords (in a structured approach).

If top-of-rack or other point-to-point topologies are utilized, plan for more than 20 meters of patch cord reach, depending on the patch cord wire gauge and amount of loss per unit length. Patch cords typically have higher loss than the horizontal cables used for jack-to-jack connections.

Upgrading Cabling Pre-Category 8

If data center architects do not have an appropriate amount of time to wait for the availability of Category 8, the recommendation is to utilize Category 6A, the next fastest cabling system on the market to date. In addition, it is recommended that your data center is designed to accommodate the new limits Category 8 will present - including length, shielding and number of connections to ensure your data center is prepared for future upgrades when needed.

Taking an Active Role in the Future of Copper

❑ “Panduit has successfully developed a full 30-meter system that meets the latest Category 8 draft standard. The successful performance of this system shows the industry is embracing this new challenging standard that has four times the bandwidth of existing Category 6A to support both 25 and 40 gigabit transmission.”

— Antoine Pelletier, Project Engineer, Intertek

Panduit believes that Category 8 is the future of twisted-pair copper cabling.

As an active participant in the IEEE Next Generation BASE-T Study Group, the IEEE P802.3bq 40GBASE-T Task Force, and the IEEE 25GBASE-T Study Group, Panduit has once again proven its role as an industry leader. In fact, Panduit has over 17 publically available contributions within these groups to support the development of these new applications.

The Panduit solution

Panduit's Category 8 offering will be timed to commercial active equipment. We have an established reputation in providing customers with easy-to-terminate jacks, and we are poised to deliver a proven and tested Category 8 solution that will exceed the standards of other providers. Our solution will not only be rigorously tested in production—and, like our existing jacks—it will be the highest quality Category 8 jack on the market.

Stay informed about Category 8

Panduit is dedicated to providing you with the latest information about emerging technologies, and identifying ways in which you can benefit. Stay tuned for more information on Panduit's Category 8 release.

[Read more about Panduit's Category 8 solution.](#)



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