



Future Proofing with Category 7 and 7A Cabling for 25 and 40GBASE-T Carries High Levels of Risk

Introduction

At the IEEE 802.3 Working Group meeting in July of 2012, the Next Generation BASE-T Call for Interest (CFI) was approved with a very high level of support. This group has since become the P802.3bq Task Force whose goal is to develop a 40GBASE-T Ethernet standard. It is expected in November of 2014 to also begin working on 25GBASE-T to develop both 25 and 40GBASE-T standards by 2016. In support of this effort, the TIA cabling standard has been developing a Category 8 standard to support this next generation of Ethernet.

While much progress has been made, there is still some uncertainty as to what the final cable specifications will be. However, there are some widely accepted requirements for the cabling needed to support the transmission of 25 and 40 gigabits per second over copper. These requirements are based on a wide body of work done by IEEE working to create the 802.3bq standard, and work done by the TIA TR-42.7 Copper Cabling Systems subcommittee with their work on the Category 8 standard.

The known cabling requirements are:

- Cabling bandwidth between 1600 and 2000MHz will be required
- The 25 and 40GBASE-T standards will allow RJ45 and F/UTP cabling
- Maximum channel length will be 30 meters

There are some vendors currently marketing Category 7/Class F or Category 7A /Class FA cabling systems as being future proofed for 25 or 40GBASE-T. Based on the current working requirements within the standards bodies, it is highly unlikely that any future application would specify these cabling categories or classes. All work shows that something significantly more advanced than Category 7/Class F or Category 7A/Class FA is needed in support of 25 and 40GBASE-T. Buying these cabling systems is essentially a more costly way to run 10GBASE-T than compared to Category 6A, and that these systems will use different connectivity than the end equipment.

At the present time there are still too many unknowns to future proof with any confidence. The new standards will minimally require Category 8 cabling, which does not exist yet. Panduit recommends installing Category 6A cabling at this time to support 10GBASE-T.



Current Structured Cabling Standards Bandwidth versus 25 and 40GBASE-T Requirements

As shown in Figure 1, there is insufficient bandwidth in existing cabling standards to satisfy the proposed requirements for 25 and 40GBASE-T.

This creates two major risks:

- There is no way to know if a product's performance past 1000 MHz is good because there is no standard for comparison.
- Even if a vendor promises bandwidth above 1000 MHz, there is no field test to validate a Category 8 installation.

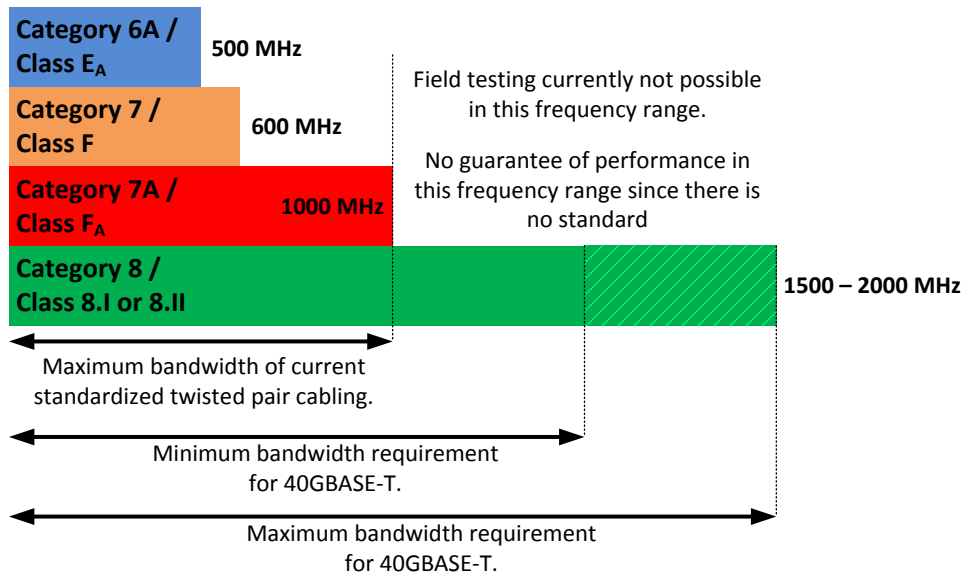


Figure 1. Bandwidth requirements of different standards versus proposed bandwidth of 40GBASE-T.



Category 7 and 7A will Likely Require Adapter Patch Cords for Equipment Compatibility

The type of connectors allowed for Category 7 and Category 7A are different than the type allowed for Category 6A, as highlighted in Table 1. The IEEE has adopted specifications allowing a RJ45 to work with the equipment. It is likely that the IEEE will adopt the RJ45 as the standard connector for all equipment. Therefore:

- Existing Category 7 or 7A / Class F or FA systems will likely require adapter patch cords to interface to 25 and 40GBASE-T equipment.
- Category 7 and 7A cable and components mandate more expensive S/FTP cabling, which requires expensive and more time-consuming termination methods, while 40GBASE-T may allow F/UTP cabling.

Table 1. Connector requirements for different categories.

Type of Connector	IEC 60603-7-41 and -51 (RJ45)	IEC 60603-7-71 (GG45)	IEC 61076-3-104 (TERA®)
Recognized in standards	Category 6A / Class E _A	Category 7A / Class F _A	Category 7A / Class F _A
Current Maximum Frequency	500 MHz	1000 MHz	1000 MHz
Supported cable types	U/UTP, F/UTP, S/FTP	S/FTP	S/FTP
Backwards compatible	Y	Y	Y (requires hybrid patch cord)

Maximum Length Reduction from 100 Meters

While this issue is not as severe as the bandwidth and connector types, Fig. 2 highlights the risks of attempting to future proof at such an early stage. A large issue within the 25 and 40GBASE-T standard development is the amount of signal loss that occurs when the signal propagates through the cabling. The primary factor that drives this signal loss is the length of the channel. Right now there is a high degree of confidence that the channel maximum channel length is believe to be 30m with only 2 connectors (24 meter permanent link with 6 meters of patch cords).

This implies that:

- Installed Category 7A/Class FA channels greater than 30 meters will not work for 25 and 40GBASE-T.
- Since Category 7A/Class FA is not controlled past 1000 MHz, the system may have additional loss further reducing the maximum length to be far less than 30 meters.

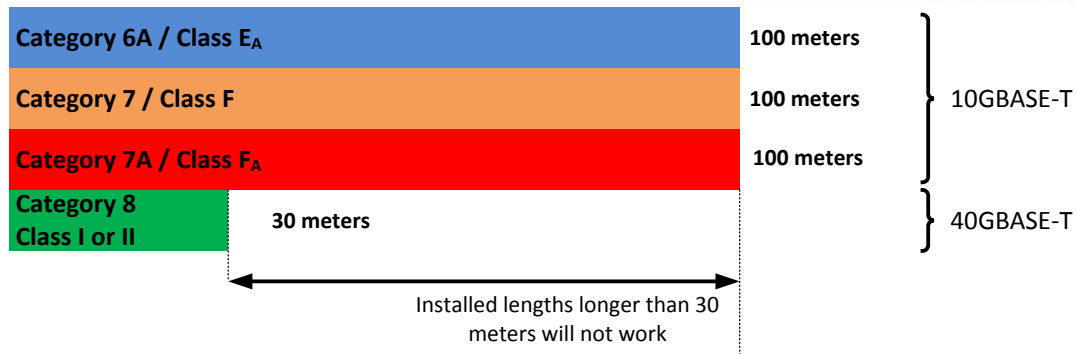


Figure 2. Maximum channel lengths for different categories/classes of cables.

Summary

There are significant risks with any Category 7A/Class FA installation relative to being future proof to 40GBASE-T. Given the 1000 MHz bandwidth limitations of Category 7A/Class FA, multiple connector options that may or may not require hybrid patch cords, and maximum length reduction, there are still too many unknowns right now to be able to future proof with confidence.

Not only are the Category 7/Class F and Category 7A/Class FA connectors and cabling more expensive than Category 6A/Class EA, but these S/FTP cables require more expensive and time consuming termination methods because each pair is fully shielded. Additionally, shielded systems require proper grounding and bonding throughout the installation, while Category 6A/Class EA systems are available as unshielded.

Recommendation

At this time, Panduit recommends against purchasing any cabling systems with the belief they will run 25 and 40GBASE-T. It is still too early in the process to provide any guidance as to what the cabling system requirements would be. Even though Panduit offers a Category 7A/Class FA cable with a 1500 MHz bandwidth (PSL8004WH-KD), Panduit does not claim that this cable would be capable of supporting 40GBASE-T at any length.

If looking to upgrade from existing Category 5E/Class D or Category 6/Class E infrastructures in order to run 10GBASE-T, Panduit currently recommends purchasing Category 6A/Class EA cabling. It is more cost effective than Category 7A/Class FA, provides the ubiquitous RJ45 connectivity found on all equipment, and fully supports all existing Ethernet applications (10/100BASE-T, 1000BASE-T, 10GBASE-T).



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