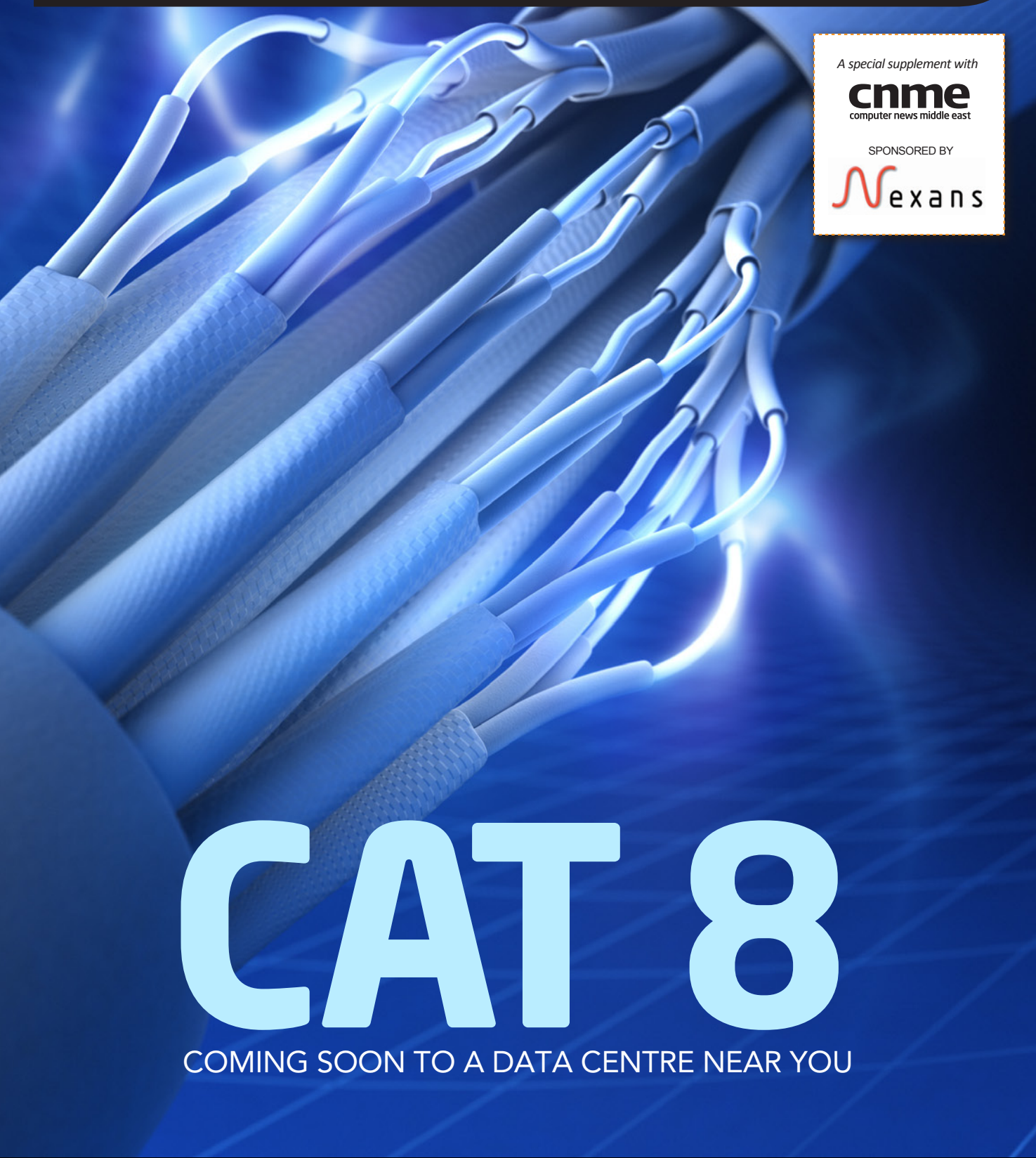
CABLING PLANNER

MAKING THE RIGHT CONNECTIONS

2015 ISSUE 016



A special supplement with

cnme
computer news middle east

SPONSORED BY

Nexans

CAT 8

COMING SOON TO A DATA CENTRE NEAR YOU

FLUKE networks

GET IT **RIGHT** THE **FIRST TIME!**

MANAGE PROJECTS AND **CONSOLIDATE TEST RESULTS** REMOTELY FROM **SMART DEVICES**

The **CLOUD-ENABLED DSX-5000 CABLEANALYZER™** ensures copper certification jobs are correct the first time, **saving you time**, **money**, and a late night **trip back to the client**. The new build-in LinkWare Live SaaS provides unmatched job visibility and superior job control from your laptop, tablet ór even your smartphone. LinkWare Live Professional provides: **1.** Test Setup Creation and uploading. **2.** Real Time test setup correction/update. **3.** The ability to accept and reject test results in early stages of job. **PERFORM A VALID CERTIFICATION FASTER AND GET PAID SOONER.**

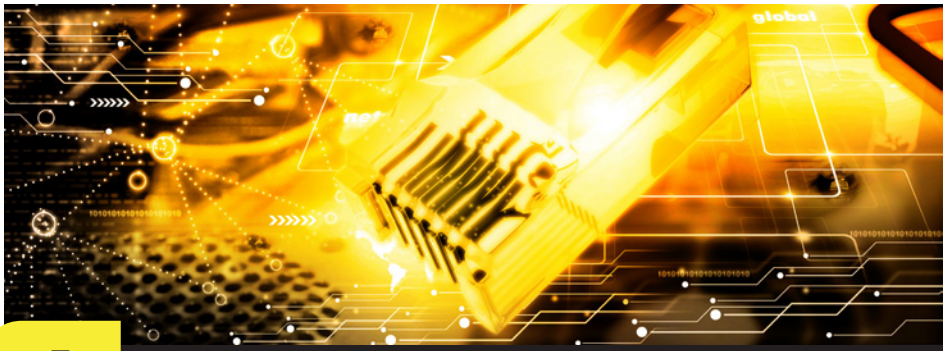
READ MORE

Download our free LinkWare white paper "Reducing Costs Through More Effective Results Management" or visit www.flukenetworks.nl

CABLING PLANNER

MAKING THE RIGHT CONNECTIONS 2015 ISSUE 016

CONTENTS



Published by
CPI MEDIA GROUP

Registered at IMPZ
PO Box 13700
Dubai, UAE

Tel: +971 4 440 9100
Fax: +971 4 447 2409

Printed by
Al Ghurair Printing & Publishing

Regional partner of
IDG
INTERNATIONAL DATA GROUP

FEATURE

CAT 8

A NEW CAT ON **THE BLOCK**

What you need to know about the forthcoming twisted-pair cable standard for 40G

Category 8 (Cat 8), the next-generation twisted-pair cabling specification, is still in the draft stage, but the outlook looks quite positive. Cat 8 will purportedly provide four times today's bandwidth of 500MHz, and promises a new copper speedway for data centres in the not-too-distant future.

"What Cat 8 copper cabling will do for the data centre is let them transport data four times faster on essentially the same type of cable they now use," says Sterling Vaden, chairman of TIA 42.7, the TIA subcommittee on Copper Cabling Systems. "That makes great sense application-wise and economically, because the intended data rate being developed by IEEE is 40G, four times faster than 10GBASE-T, using the same or less power per port, which has an unofficial target of less than 2 Watts."

UNDERSTANDING THE NEW CAT

Although the standard will not be finalised for several months, it is important to data centre managers to have a good sense of what Cat 8 will look like and how it will affect the data centre infrastructure.

When can you expect the new cable standard to be ratified?

"As there are three different standardisation committees -- IEEE, ISO/IEC and TIA involved, the ratification dates will vary. We expect the IEEE to be the first standard to be ratified in 2016," says Tarek Helmy, Regional Director Gulf and Middle East, South 7 East Africa of Nexans Cabling Solutions.

Both ISO/IEC and TIA Telecommunications Cabling Standards bodies are developing requirements for the balanced twisted-pair media that will support the 25GBASET and 40GBASE-T applications that are currently under development by IEEE 802.3. ISO/IEC is developing requirements for class I cabling constructed from Cat 8.1 components and class II cabling constructed from Cat 8.2 components.

"TIA is developing requirements for Cat 8 cabling constructed from Cat 8 components and is also undertaking an initiative to develop class II cabling requirements that will harmonise with ISO/IEC. Draft ISO/IEC class I and II and TIA Cat 8 cabling specifications are mature and currently circulating for industry comment and review. Depending upon the number and type of proposed changes received during the review process, these Standards could publish as early as Q4 2015. It is reasonable to expect that both ISO/IEC and TIA Standards will be available for purchase early next year," says Valeria Maguire, Director of Standards and Technology, Siemon.

THE SPECS

The current TIA draft specification for Cat 8 cabling and components has defined performance characteristics up to 2 GHz.

"Unlike other Ethernet applications over BASE-T, which have a four-connector, 100 metre objective, the 40GBASE-T objective is for a two-connector, 30 metre channel. This was chosen to support End of Row and Middle of Row architectures, which are common for data centre server to access switch connections. Based on the reduced distance, its focus will be in the data centre, " says Dave Hughes, Technical Director at CommScope Middle East and Africa.

Asef Baddar, Senior Manager – Technical Sales & Services, Leviton Network Solutions, adds that Cat 8 will be shielded, twisted pair cabling only with very high testing frequency. "The shorter distance will address data centre requirement within the row. The new cabling will be a good replacement for current copper cabling such as twinax cable except with longer distances and supporting 25 and 40 Gbps speeds. This is a great impact on the data centre business in terms of speed update from the server cabinet to the Horizontal Distribution Area (HDA)."

Dr. Thomas Wellinger, Market Manager Data Centre, Reichle & De-Massari AG, says unlike copper cabling for earlier 1G and 10G technologies, Cat 8 will have a 100 metre range. "For most data centre purposes, however, this limitation is not a problem. TIA has performed cabling surveys to assess the reach needs in the typical data centre, and these surveys indicate that the majority of data centre applications can be serviced with a 30-metre overall reach. The IEEE study group has also reviewed and confirmed the results of these studies."

Paul Cave, Technical Manager-Infrastructure, Excel Networking Solutions, says Cat 8 will have an effect on the way we design data centre infrastructure. "Quite how much is unsure at this stage. The End Of Row/Top Of Rack topology already exists in most leading data centres; however, it is currently based on fibre. The main driver for Cat 8 is currently cost, and significant savings can be achieved if switch manufacturers can discard the fibre QSFPs needed to convert the signal."

"THE SHORTER DISTANCE WILL ADDRESS DATA CENTRE REQUIREMENTS WITHIN THE ROW. THE NEW CABLING WILL BE A GOOD REPLACEMENT FOR CURRENT COPPER CABLING SUCH AS TWINAX CABLE EXCEPT WITH LONGER DISTANCES AND SUPPORTING 25 AND 40 GBPS SPEEDS."

Asef Baddar, Senior Manager – Technical Sales & Services, Leviton Network Solutions

How will the data transport performance of Cat 8 improve over its predecessor versions?

"The enhancement needed to improve the performance through the wider bandwidth is basically a refinement of the manufacturing processes," Vaden says. "Without going into a discussion of proprietary techniques, manufacturing processes must be more accurately controlled in order to have consistent performance up to these higher frequencies."

Interestingly, for every transmission parameter except return loss, ISO/IEC class FA channel and permanent link limits are more severe than those proposed specified by class I and Cat 8 up to 1 GHz, says Maguire from Siemon.

In the case of internal crosstalk parameters, the differences are significant; with class FA beating class I and Cat 8 performance by more than 20 dB! Class I and Cat 8 do have the advantage in that they are characterised out to double the bandwidth of class FA. Class II requirements represent the most stringent performance specifications for balanced twisted-pair cabling that the industry has ever seen. The end result is that all three solutions will offer unprecedented signal-to-noise margin for support of 25 Gb/s and higher transmission rates, she adds.

According to Vaden, Cat 8 cables will physically be very similar to shielded Cat 6A or Cat 7A cables. The conductor size will not change, nor should the overall diameter.

"Cat 6A and Cat 7A cables and earlier versions have been sold into the data centre for a long time," he says, "and they are very well understood. Data cabling is much less expensive than other data centre equipment. Plus, the service life of copper cabling, including Cat 8, is 20 years. So, it seems very logical to suggest that when data centre managers install copper cabling, they should install the highest performing cabling so that when they upgrade other equipment, they can plug it in without having to redo the cabling plan."

"THE END OF ROW/TOP OF RACK TOPOLOGY ALREADY EXISTS IN MOST LEADING DATA CENTRES; HOWEVER, IT IS CURRENTLY BASED ON FIBRE. THE MAIN DRIVER FOR CAT 8 IS CURRENTLY COST, AND SIGNIFICANT SAVINGS CAN BE ACHIEVED IF SWITCH MANUFACTURERS CAN DISCARD THE FIBRE QSFPS NEEDED TO CONCERT THE SIGNAL."

Paul Cave, Technical Manager- Infrastructure, Excel Networking Solutions

Is it meant mainly for 40G?

"Currently, it is mainly meant for 40G. But there are discussions in the committees about a new 25G application. The Cat 8 is intended to support this as well, says Helmy.

Wellinger from R&M echoes a similar opinion, "Although first defined for 40GBASE-T, Cat 8 is also anticipated to be the target channel for 25GBASE-T. It is expected that analysis of 25GBASE-T on Cat 8 will show that it is generally an easier problem to solve than running 10 Gb/s on 100 metres of Cat 6A. First time that IEEE 802.3 has specified two new higher-speed BASE-T PHYs that run on the same cabling system. This creates an inherently long life roadmap for Cat 8 cabling system."

Paul Kish, Director of Systems and Standards, Belden, points out there are other applications that can benefit from the increased bandwidth capability of the cabling system. "For example, broadband CATV cabling. There is a possibility that Cat 8 could also be used in the future to support 40G connections for high-end work area environments from a Telecommunications Enclosure. This would require 100G/400G optical fibre cabling in the backbone."

The intention of the Cat 8 standard is to be fully backward-compatible with the previous Cat 6A and lower standards.

"Cat 8 will be backward compatible with previous version with some restrictions: Cat 8.1/ Class I will be backward compatible with Cat 6A, and Cat 8.2/ Class II will be backward compatible with Cat 7/7A. Regarding the application, as with all IEEE802.3 standards, 40GBASE-T has provisions for auto-negotiation to lower BASE-T rates," says Hughes.

Kish from Belden agrees that Cat 8 cabling is fully backward compatible with Cat 6A cabling, including RJ45 connectivity, and supports all Cat 6A applications such as 10GBASE-T for a distance of 100 metres. In addition the Cat 8 cabling is designed to support emerging applications such as 25GBASE-T and 40GBASE-T that are specified over an extended bandwidth of 2000 MHz for a distance of 30 metres. To be able to achieve that type of bandwidth using RJ45 connectivity is a significant accomplishment. Cat 8 cabling is also a shielded system that provides about 15 dB improvement (32 times less) alien crosstalk interference, he adds.

Most likely composed of four shielded copper twisted pairs, with the similar overall diameter as Cat 6A and Cat 7A cables, the Cat 8 cabling system under development also will use the popular modular RJ-45 style of connectors.

The biggest question asked by data centre users about the new standard is how are you going to go four times faster over the RJ45 connector? Studies have shown that insertion loss of the cable is the primary limiting factor and not the connector itself. These studies have also found that it looks possible to have 40G data rate transmission though the standard RJ45 connectors. In fact, the EIA/TIA wants to take a more direct path and directly define a Cat 8 standard based on a shielded RJ45 plug face and intended for frequencies of up to 2,000MHz.

"As for ISO / IEC, the body has specified Class I channel with Cat 8.1 components and Class II channel with Cat 8.2 components. The difference between Class I and Class II is that the first one requires the well-known and reliable RJ45, whereas the latter allows three different faces based on ARJ45, GG45 and Tera connector systems introduced with Cat 7A. These three connector systems are not compatible with each other or with RJ45," says Wellinger.

He adds that this is something of a dilemma for the user as the overwhelming majority of device ports will continue to use RJ45, and therefore Class II cabling will require hybrid patch cords. For the time being, RJ45 will remain number one – for 40GBASE-T, too.

"THERE IS A POSSIBILITY THAT CAT 8 COULD ALSO BE USED IN THE FUTURE TO SUPPORT 40G CONNECTIONS FOR HIGH-END WORK AREA ENVIRONMENTS FROM A TELECOMMUNICATIONS ENCLOSURE. THIS WOULD REQUIRE 100G/400G OPTICAL FIBRE CABLING IN THE BACKBONE."

Paul Kish, Director of Systems and Standards, Belden

LEVERAGING THE EXISTING INFRASTRUCTURE

Will Cat 8 cables be physically similar to Cat 6A and Cat 7A cables, so that users can implement it leveraging the existing infrastructure?

"Class I, Class II, and Cat 8 cabling will have a similar "look" and "feel" to lower grades of cabling and installation methods will not be significantly different. However, the existing infrastructure will need to be upgraded to support 25GBASE-T and 40GBASE-T," says Maguire.

Wellinger from R&M agrees, "No, leveraging existing cabling infrastructures will not be possible here. Both Cat 6A and 7A were specified to lower frequencies – 500 and 1000 MHz respectively – and hence, cannot support Cat 8 performance."

Will Cat 8 cables require more power?
"The answer is no," says Kish, because 25GBASE-T / 40GBASE-T equipment is designed to operate over shorter distances up to a maximum of 30 metres. The power needed to transmit a signal 30 metres at 40 Gb/s is approximately the same as the power needed for 10GBASE-T transmission for distances up to 100 metres. Low power is one of the key objectives of the IEEE 802.3bq task force that is developing the 25GBASE-T / 40GBASE-T Standard.

Maguire agrees that Class I, Class II, and Cat 8 cabling does not require more power to operate. In fact, due to lower DC resistance and insertion loss, these cables may more efficiently support remote powering applications (Power over Ethernet or "PoE") and offer improved heat dissipation. "Higher speed Ethernet equipment, however, does tend to consume more power and it is realistic to expect that first generation 25G/40GBASE-T equipment will consume more power per port than 10GBASE-T equipment. As technology evolves, it is likely that 25G/40GBASE-T equipment port power consumption will be comparable to 10GBASE-T equipment port power consumption."

Will the arrival of Cat 8 impact the adoption of Cat 7/ 7 A?
"Industry statistics show that Cat 7/7A has had a very low adoption rate, with less than one percent of all channels currently rated as either Cat 7 or Cat 7A. Since these cable categories are not mentioned in the Cat 8 standards, it is expected that the limited share of Cat7/7A deployments will be further reduced due to its lack of inclusion in the new standards and its use of non-RJ45 connectors, which require hybrid patch cords," says Hughes.

Wellinger adds another perspective, "Keeping in mind that unlike active equipment such as servers which have three to five year refresh cycles, the passive infrastructure is more likely to remain in place for 15-20 years, it seems most likely that data centre managers will opt for the very latest standard that is available at the time of their deployment. So when Cat 8 does hit the markets, it will definitely result in reduced sales of the Cat 7/7A varieties."

However, not everyone agrees that impending arrival of Cat 8 will eat into the market share of Cat 7/7A cables. Maguire argues that since Class II cabling performance can be achieved with many of the Cat 7A connectors that are commercially available today, end-users should not see the arrival of Class I and Cat 8 products change the landscape of available solutions.

In fact, the superior performance offered by Class II cabling may encourage more users to adopt fully-shielded cabling solutions constructed from non RJ-style connectors. Furthermore, while it's too early to guarantee 25GBASE-T application support, there are efforts in place to characterise the capability of existing installed class FA/Cat 7A cabling plants to support 25 Gb/s data transmission, she says.

Helmy from Nexans agrees, "Due to the 30 metres link length, Cat 8 is meant mainly for data centre infrastructure. Cat 7 and Cat 7A have a 100 metres reach and hence can be best used for enterprise cabling!"

While the jury is still out on that, what is for sure is that Cat 8 promises to be an excellent, future-proof solution for current and upcoming generation of active equipment. With this cabling standing, data centre managers can make a cost-effective choice and reduce CAPEX without sacrificing ease of use, flexibility and reliability.

"THE DIFFERENCE BETWEEN CLASS I AND CLASS II IS THAT THE FIRST ONE REQUIRES THE WELL-KNOWN AND RELIABLE RJ45, WHEREAS THE LATTER ALLOWS THREE DIFFERENT FACES BASED ON ARJ45, GG45 AND TERA CONNECTOR SYSTEMS INTRODUCED WITH CAT 7A. THESE THREE CONNECTOR SYSTEMS ARE NOT COMPATIBLE WITH EACH OTHER OR WITH RJ45."

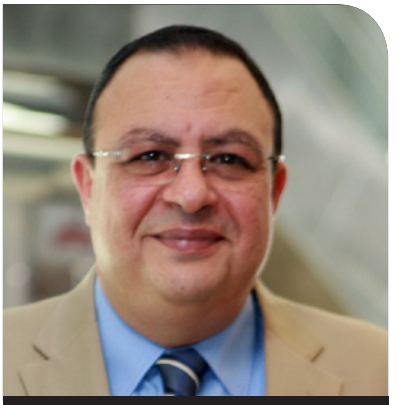
Dr. Thomas Wellinger, Market Manager Data Centre, Reichle & De-Massari AG

"TIA IS DEVELOPING REQUIREMENTS FOR CAT 8 CABLING CONSTRUCTED FROM CAT 8 COMPONENTS AND IS ALSO UNDERTAKING AN INITIATIVE TO DEVELOP CLASS II CABLING REQUIREMENTS THAT WILL HARMONISE WITH ISO/IEC."

Valeria Maguire, Director of Standards and Technology, Siemon

PRIMED FOR GROWTH

Tarek Helmy, Regional Director Gulf and Middle East, South & East Africa of Nexans Cabling Solutions, talks about some of the latest trends shaping the cabling landscape in the region.



Tarek Helmy, Regional Director – Gulf and Middle East, South & East Africa, Nexans Cabling Solutions

With the impending arrival of Category 8 (Cat 8), what should users keep in mind while adopting this new generation of cabling?

This type of cabling is meant to be used in data centres to connect switch-to-server with data transmission speeds up to 40Gbps. The distance is limited to 30 metres. Unfortunately there will be different definitions within Cat 8 and users should be clear whether to specify either Cat 8.1, which is basically an enhanced Cat 6A definition or Cat 8.2, which is an enhanced Cat 7A definition.

How does Cat 8 compare with Cat 7 A?

Cat 7A is defined for a frequency range of up to 1000MHz and aimed to support distances up to 100 metres, whereas Cat 8 will be defined for a frequency range twice as much but with a limited distance up to 30 metres. Cat 8 is intended to be used in data centres, whereas Cat 7A can also be used for enterprise cabling.

Cabling in data centres is increasingly moving towards fibre. Does it mean we are going to see a decline in the use of copper?

The increased usage of fibre is already going on for a while and can be explained by the poor market adoption of 10GBase-T-10Gbps Ethernet over copper cabling. 10GBase-T has been too expensive for a long time, forcing users to adopt Top-of-Rack (ToR) designs and usage of fibre. ToR has its disadvantages in terms of higher costs of switches and energy consumption. With the expected arrival of 25GBase-T and 40GBase-T – higher bandwidth of copper cabling – it remains to be seen if the industry makes a swing back away from ToR- towards more energy efficient Middle-of-Row or End-of-Row designs.

What are the new products launched by Nexans in the last six months?

Nexans has launched several products to be used in industrial and harsh environments - dust, liquid ingress, contacts to chemicals or EMC.

Also we have further expanded on our fibre cabling offering for data centres.

Furthermore we have introduced LANactive Fibre-to-the-Office solutions in the Middle East. FTTO is an a new alternative approach to office networking which uses passive fibre cabling and components together with locally distributed active switches to provide Ethernet services via standard copper based RJ45 technology to the device.

Has the pervasive use of WLAN impacted the number of port counts in enterprise networks?

The adoption of WLAN has been growing significantly over the last few years and is expected to grow further. In the far majority of the cases WLAN is used as an overlay of the wired networks. Although wireless network speeds have been growing, through-put is dependent on number of users and the distance to the wireless access point. It is expected that the throughput remains significantly lower compared with wired connections. This will result to users being offered the choice – wireless (and enjoy the advantage of flexibility) or wired connection (and enjoy a better and faster network connection).

Do you think we need to rewire existing data centres with high bandwidth cabling infrastructure as we move to cloud and software-defined networking?

There are a lot of changes going on in data centres such as centralisation of sites and growth of cloud based solutions. The amount of data send and stored is growing exponentially. This is all made possible because of 'virtualisation' technology. Virtualisation is also the technical driver for the need of higher bandwidth. This will not only affect new build data centres but also existing ones.

OPINION

FLUKE NETWORKS

ENCIRCLED FLUX: REAL OR IMAGINARY?

If installers are not yet required to be Encircled Flux (EF) compliant in their optical fibre testing, it is not too soon to start preparing for the inevitable, writes Adrian Young, Senior Technical Support Engineer, Fluke Networks' Technical Assistance Centre.

In optical fibre testing, variability of up to 40 percent has been a common occurrence when two different testers give two different results. EF is a metric for defining launch conditions on multimode optical fibre that reduces the measurement uncertainty in link loss measurements shown by different test equipment. EF correlates test results to conservative launch-condition performances in gigabit Ethernet optical fibre transceivers, and refers to the ratio between the transmitted power at a given radius of an optical fibre core and the total injected power.

EF was approved in October 2010 with the publication ol ANSI/TIA-526-14-B Optical Power Loss Measurements of Installed Multimode Fibre Cable Plant.

Interest in EF has increased over the past six months—a trend that will likely continue with the publication of TIA-TSB-4979, "Practical Considerations for Implementation of Encircled Flux Launch Conditions in the Field," which was released in 2014.

This article describes the EF testing method and the practical considerations for implementing the method. ANSI/TIA-526-14-B assumed installers were already implementing best practices for optical fibre field testing, but as anyone in the technical support field will tell you, that assumption is often untrue. There are now four pieces to the jigsaw puzzle that make for a successful Tier 1 optical loss measurement—the light emitting diode (LED) source, the reference, reference grade connectors, and EF as the final piece. Each of these pieces must be done correctly to achieve optimum results.

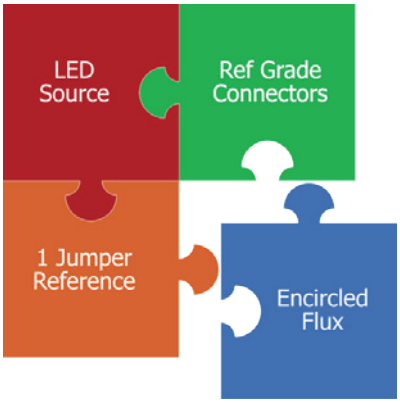


Figure 1: Encircled flux (EF) is the final piece of the puzzle for successful Tier 1 Optical loss measurement.

The Source

When testing multimode optical fibre links, the user theoretically has the option to test either with a vertical cavity surface emitting laser (VCSEL) or LED. However, ANSI/TIA-526-14-B specifies the source must have a spectral width of between 30 nanometres (nm) and 60 nm, which is easily achieved with an LED source. A VCSEL source has a spectral within the region of just 0.65 nm, which is not even close to the required 30 nm, making its use a violation of some industry standards. Previous standards included clauses that allowed the user to use a VCSEL, but those clauses have been removed, and VCSELs are no longer allowed. The reasoning is that the VCSEL launch into the optical fibre varies substantially between different VCSEL sources, increasing measurement uncertainty to a point where it is no longer acceptable. The VCSEL launch is also underfilled, resulting to an optimistic loss measurement reading.

There is a long held belief that the light source used for testing should be the same as the light source of the active equipment. This is not a bad argument if we dismiss the measurement uncertainty associated with using a VCSEL and ignore the loss values defined in IEEE 802.3 for 10GBASE-SR that are based on an LED source. More important is whether the cabling vendor will accept an application warranty if the optical fibre system is tested with a VCSEL. Most will not, due to the uncertainty of the measurement. That is why most test equipment vendors no longer offer a VCSEL option for customers. As with all cabling standards, it is the responsibility of the individual testing and warranting the system to ask what type of source needs to be used when testing. If in doubt,review the test equipment on the vendors' data sheet and verify the requirements with the vendor offering the warranty for the cabling system.

Adrian Young, Senior Technical Support Engineer, Fluke Networks' Technical Assistance Centre

The Reference

Setting the reference incorrectly can lead to optimistic and negative loss results. Negative results are the largest cause for failed system acceptance and denial of warranty. A negative optical loss suggests an amplification of the optical signal, which is impossible in a passive system. Sadly, many technicians still set a reference through a bulkhead adapter and then simply connect to the optical fibre under test

It is essential to follow the industry standards and set a reference using a single test reference cord. Many know this as the 1 Jumper Method of Method B for multimode optical fibre and Method A.1 for singlemode optical fibre. When setting a reference using a bulkhead adapter as shown in Figure 2, measurernent uncertainty starts with whatever the loss is in that bulkhead adapter. Since there is no way to know that loss, measurement uncertainty could be as high as 1.5 dB.

The loss in the bulkhead adapter is removed from the loss measurement, which is how the results indicate a negative loss. One can get around this by adding a short jumper after setting the reference, but that can add more uncertainty to the measurement. The optical fibre in Figure 2 is coiled around a mandrel.

If not using a mandrel, the results will be pessimistic by up to 0.4 dB and probably unstable depending

on whether the source is overfilled or underfilled. Consequently, perfectly good links could show a false fail.

Another common problem is that many want to use bend insensitive multimode fibre (BIMMF) test reference cords. These are not suitable for use with dual wavelength testers. With BIMMF, the standard 25 millimetre (mm) mandrel will not strip out the higher order modes at 850 nm resulting in pessimistic 850 nm losses. It will perform as if there was no mandrel at all. A 4 mm mandrel could be used but then 1300 nm measurements will be incorrect.

To achieve reliable measurements, optical fibre test equipment that has interchangeable adapters on the input ports is required. This allows for setting a 1 Jumper Reference in accordance with TIA and more importantly, in accordance with the cabling vendor requirements since they issue the cabling warranty. It is also important to purchase the correct adapters and test rererence cords to go with them. Too many installers have the correct optical fibre equipment but not the right adapters or hybrid test reference cords.

Working in the Technical Assistance Centre, I had a call come in where the installer was denied their warranty application after submitting results that contained negative loss readings. Further investigation revealed that the installer set a reference through a bulkhead adapter against the requirements of the cabling vendor and industry standards. The installer is now looking at having to retest more than 7,000 optical fibre links. While the installer is at fault, the responsibility for training lies with all of us, including test equipment vendors. Many global seminars and webinars have been conducted over the years through organisations such as BICSI and The Fibre Optic Technology Consortium

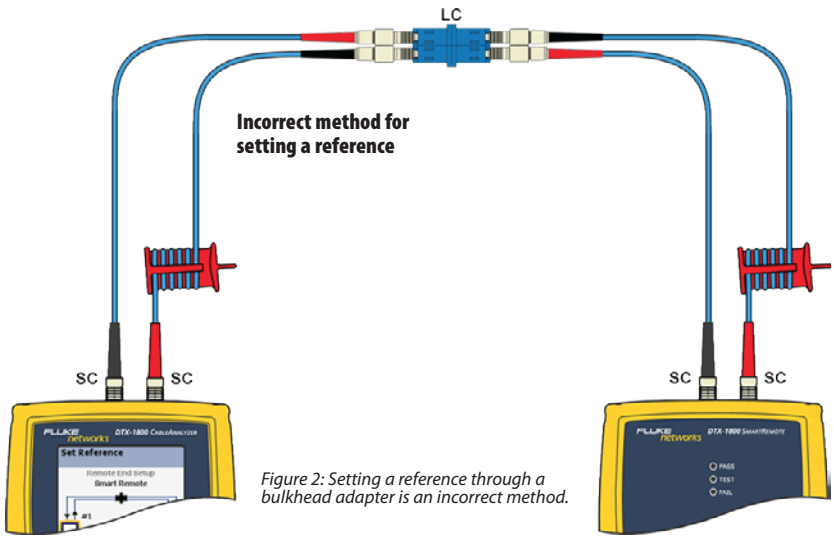


Figure 2: Setting a reference through a bulkhead adapter is an incorrect method.

(FOTC), yet poor referencing still occurs. To address this, test equipment vendors are creating automated wizards to walk technicians through the reference procedure process with the use of animated setup screens. While not a substitute for hands-on training, it will hopefully help prevent the all-too- often "I did not know" or "I have always done it this way" response.

Reference Grade Connectors

Bad test cords lead to poor and inconsistent test results. ANSI/TIA-526-14-B discusses the use of reference grade connectors but does not define them. ISO/IEC 14763-3, Testing of Optical Fibre Cabling, defines a multimode optical fibre reference grade connector to have a loss of <0.10 dB. For some, that comes as a shock as traditionally anything better than <0.5 dB is considered acceptable. Why such low values? In ISO/IEC 14763-3, the first and last mated connections must have a multimode loss of <0.3 dB and a singlemode loss of <0.5 dB, which can only be achieved with reference grade connectors. But there is more to what the standards say.

With the introduction of low-loss (<0.35 dB) multi-fibre push-on (MPO) to LC modules, the connector at the end of the test cord needs to be better than the 0.5 dB most have become accustomed to using. The low loss of <0.35dB is achieved by having an LC connector rated at <0.15dB. Consequently, if the test cord is not <0.15 dB, chances of hitting the <0.35 dB loss for the module are slim.

If using a 1 Jumper reference, the test reference cords can be verified. Once the 1 Jumper reference has been made, the cords are removed trom the input ports. A quality cord is then inserted into the input ports, the main and remote units are joined together using a singlemode-rated bulkhead adapter and the test is run. The loss result should be saved and become part of the system documentation. Anyone reviewing the test results will have increased confidence in the measurements. It will also reduce finger pointing if two tests were done on different days with different

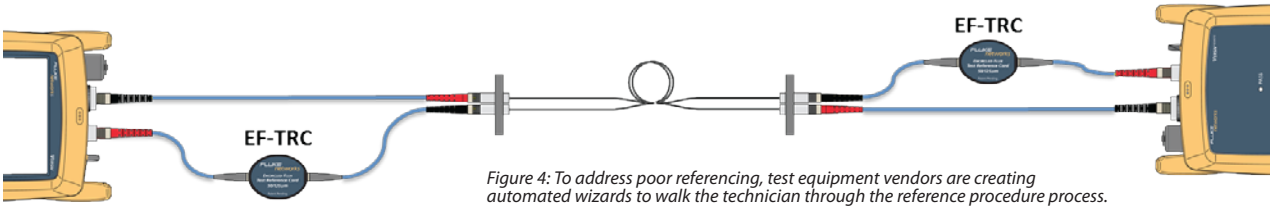


Figure 4: To address poor referencing, test equipment vendors are creating automated wizards to walk the technician through the reference procedure process.

outcomes. Using a 1 Jumper reference and verifying the test reference cords dramatically improves the consistency of optical loss testing. However, there is one final element that can still result to a 40 percent uncertainty between different test equipment vendors—the launch of the optical source into the optical fibre. That is where EF comes in as the missing piece of the puzzle.

Encircled Flux

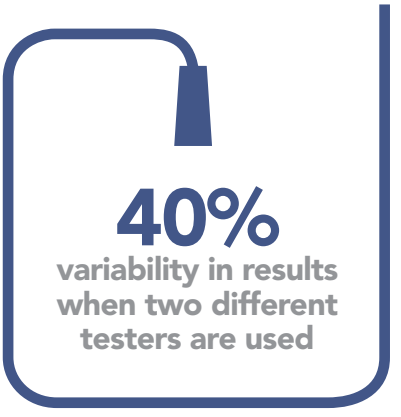
One would think that setting a 1 Jumper reference and verifying the test reference cords at <0.1 dB would result in the same outcome even if using different vendors' equipment. Unfortunately, it does not. TIA standards have always defined the launch condition from a multimode optical source in the form of coupled power ratio (CPR) to reduce the measurement uncertainty caused by different light sources. The flaw in CPR Started to reveal itself back in 2006 with the publication of ISO/IEC 14763-3, where CPR was dropped in favor of modal power distribution (MPD) to better define the launch condition. The CPR verification was a curious process. If CPR verification was tor 50/125 micron (µm) multimode optical fibre, the optical source was connected to the power metre using a 50/125 µm multimode optical fibre cord. The optical power in dBm was recorded.

Next, the cord was removed from the input port onthe power metre. A 5/125 µm singlemode optical cord was connected to the input port on the power metre and the two cords were coupled using a bulkhead adapter. The power was then measured again and referenced against a look-up table in ANSI/TIA-526-14-A. The 5/125 µm cord the issue here. The CPR process at 850 nm only looks at the modes in the middle of the core. The modes outside of 5µm are ignored, and that is where the sometimes extreme variation between sources is observed.

To correctly specify the launch condition of a source, the entire 50 µm end face needs to be specified, not just the 5 µm in the middle. EF specifies the modal power across the entire end face of the launch with the use of template. One important point is that EF has to be met at the end of the test reference cord. Modern production techniques allow an EF compliant source without too much trouble. The challenge is that when adding the test reference cords, the EF template must be maintained to the end of the test reference cord.

TIA-TSB-4979 calls out two options for meeting EF requirements. The first is to use an external launch conditioner. This has one critical advantage in that it can turn any LED source into an EF-compliant solution, avoiding the need to buy new test equipment. However, push back is inevitable when users discover the high expense of external launch conditioners, their bulkiness and the need to replace them when the connector at the end breaks. Thankfully, many data centre managers who are operating with tight optical loss budgets simply tell installers to include the cost of the launch conditioners into the bid.

The TSB gives the user a second option where the optical source is EF compliant and a tuned test reference cord is attached to the source (shown in Figure 4). This is a proprietary solution, but the cords are less expensive than launch conditioners and less bulky. It does require the purchase of new test equipment. If existing test equipment has fixed input ports that do not allow a 1 Jumper LC reference, it might behoove installers to jump two generations of testers, making testing of optical fibre both EF and 1 Jumper compliant in accordance with the ANSI/TIA-526-14-B at the same time.



Conclusion

EF has a real impact on system acceptance, especially if installing low-loss components. Operating to custom loss budgets based on the specification given by the vendor will result in ever-tightening margins. If installers are not yet required to be EF compliant in their optical fibre testing, it is not too soon to start preparing for the inevitable. Take a look at your field test procedures and ensure that your installers are following these current best practices:

- Do not set references through bulkhead adapters.
- At the very least, use mandrels to remove higher modes, but remernber that mandrels are not a substitute for EF adapters.
- Use LEDs, not VCSELs, as the light source to avoid optimistic results.
- Invest in optical fibre test equipment witn interchangeable adapters on the input ports.

Verify test reference cords and do not use BIMMF as a test cord.

Make sure to save measurements and make them part of the documentation.

Create a strategy for EF compliance—whether using launch conditioners or selecting a proprietary solution. Keep in mind that vendors may start to insist on a 1 Jumper EF-compliant measurement before sending an engineer to troubleshoot a failing system. Installers may need to be ready and able to provide this information.

EF is real—it is not a method made up by test equipment manufacturers. I have been out in the field, seen different sources and conducted the testing. There is a difference in the launch conditions between different sources. Although there was some confusions over EF when the metric was first discussed, there is now complete agreement in the industry over the methodology and the proper test equipment. Up until the last few years, there was no need for a precise method and metric to define a predetermined launch condition from a multimode optical fibre source. But with tighter loss budgets and higher data rate systems, EF is becoming an increasingly important parameter to measure.

OPINION

R&M

THE SMART PLAN

Shibu Vahid, Head of Technical Operations, R&M Middle East, Turkey & Africa, writes why Smart Cities need smart networks.

Urbanisation is progressing at a rapid pace. Since 2007, more people have lived in urban areas than in rural areas. By 2050 the urban population will account for 70 percent of the total according to UN statistics and forecasts. In the future, cities will welcome every sensible technology that contributes to optimum living conditions, efficient information processing, cooperative communal life and better communication and education.

Many 'City of the Future' concepts say that broadband Internet access will have to become just as much a resource as power, water and clean air. The vision is this: Smart City- a learning city that is intelligent, sustainable and thoroughly networked. In a market study, Navigant Research determined that the number of network nodes newly installed for Smart City networks every year will more than triple – from 16.3 million in 2014 to 54.8 million in 2020.

Based on its wealth of industry experience, R&M urges cities to keep several key principles and planning and

evaluation criteria in mind anytime they discuss their communication and data networks or plan construction. These are outlined below:

1. The transmission infrastructures should offer the greatest possible functionality. This is the first recommendation of R&M. The objective is not just to connect computers. For example, cameras, sensors and measuring equipment inside and outside buildings also have to be seamlessly integrated and must be able to communicate with each other over the Internet. Adaptable, application-neutral cabling is the prerequisite for this capability.

2. There are still no standards for the networking of a Smart City. In the judgement of R&M, the obvious thing to do would be to consistently continue the trend toward Ethernet /IP-based communication and to apply this globally uniform industry standard wherever it is practiceable. The advantage: favourable investment and running costs.

3. Open access will be important for the fibre optic connection of apartments to create fair market conditions for providers. In principle, every possible type of connection for machines, sensors and other users should have an open access design. Standardised, compatible and commercially available connectivity is a must for Smart Cities.

4. The platforms and connections need to be installed and operated intuitively so mistakes can be minimised in installation and especially in maintenance. The cabling systems should have a logical, clearly-structured design. Quick mounting technology should simplify each movement.

5. Security is another central criterion. Smart Cities should ask how well cabling systems can be protected against operating mistakes, errors, attacks and manipulations. Outdoor products should withstand critical environmental influences and be able to be repaired quickly and without complication following an accident or violent storm.

54.8 M
Smart Cities network nodes in 2020

Shibu Vahid, Head of Technical Operations, R&M Middle East, Turkey & Africa

6. Good transmission quality is indispensable. A Smart City needs the most reliable network connections because the connectors, cables and distributors often transmit data vital to life. The cabling has to be capable of bridging large distances free of loss and of accommodating a large number of connections

7. The convergence of the networks is an essential aspect of a Smart City. Support must be given in particular to the convergence of field and mobile, that is the linking of different mobile communication networks and WLANs with cable-bound infrastructures. This convergence facilitates reachability and access to all types of information at any location.

8. Aesthetic aspects also play a role. Connections and lines should be able to be integrated intelligently in the surroundings. In projects involving the networking of older buildings, people would want cabling systems that can be readily concealed or that requires minimal conversion work

If cities follow these pieces of advice, they can avoid bad investments and lay suitable groundwork for becoming Smart Cities.

OPINION

COMMSCOPE

CATEGORY 8 – A STRUCTURED APPROACH TO 40G

David Hughes, Senior Technical Manager, CommScope MEA, gives the skinny on the forthcoming cable standard

David Hughes, Senior Technical Manager, CommScope MEA

Category 8 cabling specifications are rapidly evolving in the ISO, IEC, and TIA standards development organisations. Since its inception over the past 20 months, the IEEE 802.3bq task force has developed a working draft of the 40GBASE-T application. Although written off by many industry experts and vendors, the Cat 8 cabling specifications also include an RJ-45 MDI interface connector. It should be mentioned that since the RJ45 was standardised in 1987, it has rapidly become the universal ubiquitous user interface connector for data networking applications. The strength of the RJ45 is in its ability to be re-invented to support ever increasing data rates; from its initial specification up to 3 KHz, the RJ45 is now specified up to 2GHz for inclusion in the Cat 8 specifications. Another notable development is that Cat 8 will step away from the conventional 100 metre channel / 90 metre link distance specifications the industry has become accustomed to and incorporate a 30 metre channel. However, within a data centre environment this distance seems sufficient for most current and emerging network architectures.

IEEE 802.3 Ethernet Working Group

Back in 2013 the IEEE 802.3bq task force established a number of objectives to develop the IEEE 40GBASE-T Ethernet standard, including the following:

- Support full duplex operation
- Support a BER better than or equal to 10-12 at the MAC/PLS service interface
- Support Auto-Negotiation
- Support local area networks using point-to-point links over structured cabling topologies, including directly connected link segments
- Support a data rate of 40 Gb/s at the MAC/PLS Service Interface

Define a channel model based upon copper media specified by ISO/IEC JTC1/SC25/WG3 and TIA TR42.7 meeting the following characteristics:

- four-pair, balanced twisted-pair copper cabling
- up to two connectors
- up to at least 30 metres
- Define a single 40 Gb/s PHY supporting operation on the channel model

The committee further agreed that cabling be specified up to 2000 MHz and has included link segment specifications based on ISO/IEC 11801-1 (Edition 3) Class I and ANSI/TIA-568-C.2-1 Cat 8 – with adoption of an RJ45 MDI. This establishes interoperability for 40GBASE-T using auto-negotiation with previous IEEE BASE-T applications such as 10GBASE-T and 1000BASE-T and 100BASE-T. In addition to the economic advantages, the convenience and flexibility of auto-negotiation during upgrades has been a key reason for the widespread adoption of Ethernet using twisted-pair cabling. IEEE 802.3bq is also undertaking the study of the proposed 25GBASE-T application. It is likely that this application will be incorporated into the 40GBASE-T document and use the same cabling architecture allowing easy migration from 25 G to 40 G for server links.

Cat 8 Cabling Architecture

The primary application area for the 40GBASE-T application is in server to access switch links in data centres. IEEE 802.3bq, TIA, and ISO have accepted a maximum channel reach of 30 metre with a maximum of two connections as shown in figure 1. The conventional structured cabling approach has been preserved and continues to offer effective management and administration within the network.

Other Applications

The following excerpts from TIA TSB-5019 illustrate the use cases for Cat 8 cabling. Essentially, 25 and 40GBASE-T will work anywhere in a data centre where 30 metre connections will reach including:

Classic 3 level hierarchy

- For the fat-tree / leaf-and-spine / interconnected fat-tree fabric architecture
- For full-mesh, interconnected meshes, and centralised switch or virtual switch

Figures 2 and 3 from ANSI/TIA-942-A-1 data centre fabric architectures show two examples where Cat 8 cabling may be used to extend the server link speeds to 25 and 40GBASE-T.

Figure 2 Cat 8 use case in data centre traditional three tier architecture

Figure 3 Cat 8 use case in data centre leaf and spine architecture

TIA Updates

At the December 2014 meeting, TIA TR42.7 engineering sub-committee approved to circulate a TIA ballot of the latest draft 3 of the Cat 8 specification. The committee is also interested in establishing interoperability of Cat 8 components so end users have an open competitive market to choose components. A contribution submitted to TIA TR42.7 shows interoperability where cords and modular RJ-45 plugs from two different manufacturers were mated with links consisting of cable and modular RJ-45 jacks from a third manufacturer. This "mixed" channel was tested using a field tester showing good operational margin for the specified transmission parameters. TIA-568-C.2-1 Cat 8 cabling under development in TIA TR42.7 is fast approaching the implementation phases with generally mature and stable specifications. The committee is advancing the concepts of interoperability and field testability to make Cat 8 an attractive and competitive cabling solution for customers. Plug and play interoperability of components from three different manufacturers has been demonstrated using field testers showing good margin to channel specifications.

ISO/IEC Updates

ISO TR 11801-99-1 with cabling in support of 40 G applications has been published with Class I and Class II specifications in support of 40GBASE-T. Unfortunately, this technical report had a maximum frequency of 1600 MHz instead of the 2000 MHz required by IEEE 802.3bq for its 40GBASE-T application. Consequently ISO/IEC/JTC1/SC25/WG3 is in the process of extending the frequency to 2000 MHz and incorporating Class I (using 8.1 components) and Class II (using 8.2 components) into edition 3 of the ISO 11801-1 generic standard as detailed below:

- Class I can be achieved by a reference implementation approach using Cat 8.1 components (RJ45 MDI)
- Class II can be achieved by a reference implementation approach using Category 8.2 components (Other MDI)

Since it is intended to support the 8-pin IEC 60603-7-81 (RJ-45 interface) connector, Category 8.1 is specified to be backward compatibility with Cat 6A. This backward compatibility ensures plug and play mechanical interoperability as well as ensuring that Cat 8 is fully backward compatible to all previous standardised applications. Cat 8.2 MDI's are also to be finalised.

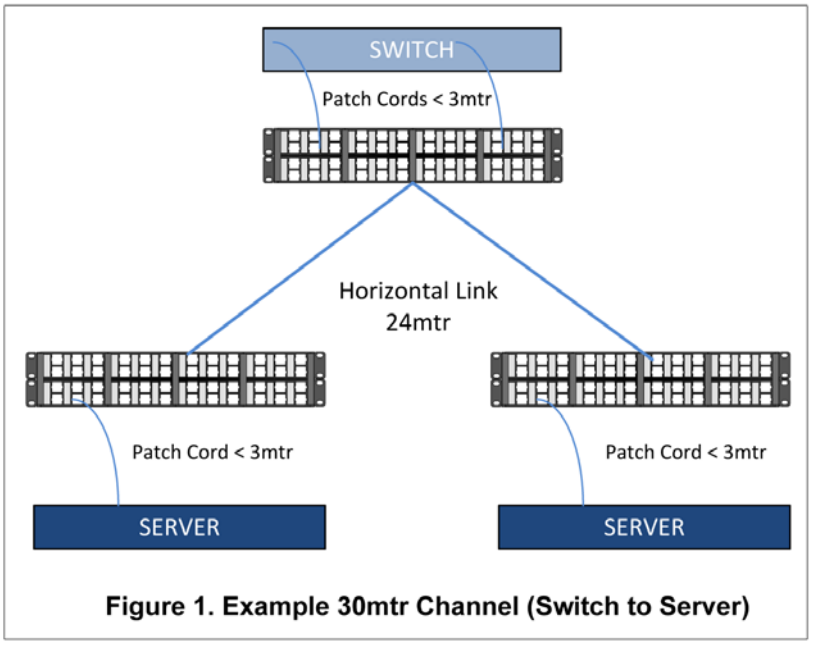
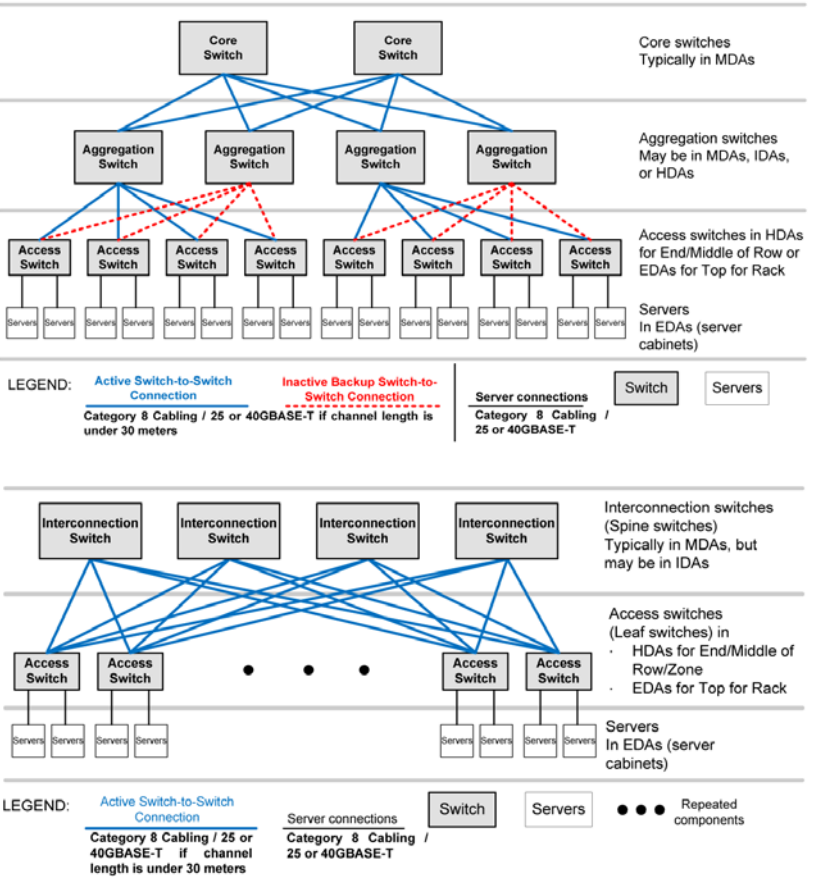


Figure 1. Example 30mtr Channel (Switch to Server)



Observations

The cabling requirements are intended to support backward compatibility with existing cabling and equipment to allow auto-negotiation between 100 Mb/s, 1 Gb/s, 10 Gb/s, and 40 Gb/s BASE-T Ethernet applications. This will enable the gradual evolution of LAN networks to higher speeds without a major upgrade, making the change cost effective and less disruptive for both existing and new data centres. As shown the Cat 8 solution can provide many benefits for both traditional and emerging network architectures and proves that copper structured cabling lives on within the industry.

BELDEN'S BUS COUPLER

Belden has introduced a new addition to Lumberg Automation's fieldbus system – the LioN-Link EtherNet/IP bus coupler. This bus coupler makes updates easy as a result of its flexible interface with industrial networks running EtherNet/IP protocols. This single input/output (I/O) module supports diverse field wiring designs, numerous configuration options and long-distance connections. Its unique standardised wiring components also provide unprecedented flexibility for even the harshest industrial environments.

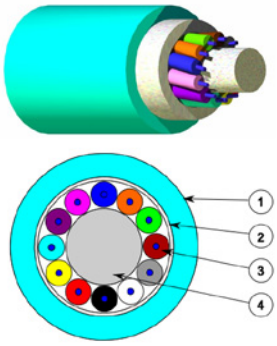
The flexible interface options – along with the fact that there are no special cables or connectors required – make installation as simple as plugging in the new bus coupler to get the network up and running. "The LioN-Link system provides simplified connection options between the entire fieldbus system and the fieldbus independent I/O modules, which are lightweight and use limited space. Software is integrated into each bus coupler, allowing communications with the Web server, as well as access to real-time data and diagnostics across the entire manufacturing process. Each bus coupler connects up to 30 I/O modules distributed through two lines, with a maximum of 15 devices per line. The lines can extend up to 100 metres, twice the distance of any other product on the market.

AXIS DEBUTS WIRELESS INSTALLATION TOOL

AXIS T8415 Wireless Installation Tool is a battery-powered handheld device able to directly power up network cameras during installation. It includes a free-of-charge app for Android and iOS-based mobile devices allowing for live video feeds to be displayed via a direct Wi-Fi connection. From the live video, easy access to basic key features to set the cameras optimal viewing angle, focus and IP settings.

AXIS T8415 is a battery-powered handheld device that connects directly to a camera and displays live video at the installation site. This makes setting the camera's viewing angle and focus easier than with the use of a laptop or remote computer. With its powerful battery, AXIS T8415 can power up an Axis PoE camera up to 30 W for several hours. The tools built-in Wi-Fi function connects it within seconds to an installer's smartphone or tablet so the camera's live view can be accessed in a convenient manner. While the camera is mounted and connected via one-cable connection to the main unit, the installer can get close to the camera with a smartphone device and adjust basic camera functions, such as focus, IP address and image rotation. The app on the smartphone (iOS or Android) can be downloaded free-of-charge from the App Store or Google Play.

NEXANS INTRODUCES INSTALLER-FRIENDLY TIGHT BUFFER UNIVERSAL CABLES



Nexans has launched its new LANmark-OF Tight Buffer Universal Cable, which harmonises its Tight Buffer Indoor and Universal cable portfolio with an installer-friendly and more cost effective Tight Buffer Universal cable for indoor and outdoor use. Nexans developed the new cable using a new type of glass yarn that combines rodent protection with installer friendliness and avoids skin-irritation when compared to similar products of other vendors.

"The LANmark-OF Tight Buffer Universal cable is a fibre cable that can be used indoor and outdoor in a duct. It complies with the indoor fire requirements and can be installed indoor both vertically and horizontally. It can also be used for outdoor installation in a duct as the water tight glass yarns make the cables fully waterproof and rodent retardant," says Tarek Helmy, Regional Director Gulf and Middle East, South & East Africa of Nexans Cabling Solutions.

"Our existing Tight Buffer cables portfolio have glass yarns for rodent protection and water tightness but unfortunately these glass yarns could cause skin-irritating during installation. Hence for our latest LANmark-OF Tight Buffer Universal cables, we have developed a new type of glass yarn that combines rodent protection with installer friendliness and avoids skin-irritation. With these features the glass yarns can better be used indoors," Helmy adds.

The LANmark-OF Tight Buffer Universal cable is developed for horizontal and vertical installations, indoor and outdoor in a duct. It is dielectric and fully dry and has 900 um buffered fibres. This second coating till 900 um provides additional protection of the fibres and facilitates the handling when terminating the fibres in a patch panel.

EXCEL LAUNCHES NEW EXCELERATOR RANGE

Excel Networking Solutions, the copper, optical cabling and rack solutions provider, has launched a new range of pre-terminated fibre systems under the EXCELERATOR brand name.

Where time is limited on site pre-terminated copper and fibre solutions offer the perfect solution and can save up to 75 percent of the installation time. The products are fully tested before being delivered, traceable and are backed with the 25 year warranty when installed by an accredited partner.

EXCELERATOR fibre pre-terminated solutions are available in four different options:

Distribution cables – 900 micron tight buffered cables for use in panel to panel applications, such as rack to rack DC and backbone links. Cables can be manufactured using four core to 48 core cables.

Breakout cables – Jacketed two millimetres buffered ruggedised fibre contained, available from four core through 72 core and designed for direct equipment to equipment or patching connectivity.

Mini Breakout cables – These trunk cables have a smaller outside diameter compared to breakout cables being designed around 250 micron buffered fibre with fan outs of either 2mm ruggedised fibre of 900mm buffer created by the use of a splitter manifold. These compact cables are ideal for use inside of the fibre panel direct to equipment or as a direct attachment for equipment to equipment, depending on the construction of the breakout. These cables are available from 4 core to 72 core.

Each of the above cables are offered as standard with Low Smoke Zero Halogen designs, and can be terminated with a range of connectors with LC and SC being most common.

Similarly a range of performance categories from multimode OM1 through to OM4, and single-mode OS2 can be chosen.

R&M LAUNCHES COMBIMODULE

R&M has launched its new CombiMODULE for 19" racks which is a new scalable, easy-to-assemble distributor solution. The broad-based usage scenarios for the versatile solution include distribution projects in larger buildings of all kinds, in data centres and in exchanges.

The CombiMODULE fits in street cabinets, where it supports full coverage fibre optic distribution in cities and residential areas. The housing occupies ten units in the 19" cabinet and the module accommodates up to 1152 spliced fibre optic connections or up to 576 Small Form Factor (SFF) or 288 Big Form Factor (BFF) plug connections.

Quick mounting technology simplifies mounting from the front in standard distribution frames, whether for initial installation or for existing racks.

The two-part housing has room for any combinations of splice and patch units to connect and distribute optical fibres reliably. For splice cabling, R&M offers its single circuit management (SCM) system. It consists of easy-to-use trays for the management of fibres. The carrier tray can be folded out and serves as a work table during installation and maintenance. A splice unit can hold as many as 96 SCM trays for 1152 fibre optic connections.

SIEMON EXPANDS MAPIT G2 AUTOMATED INFRASTRUCTURE MANAGEMENT SYSTEM

Siemon has expanded its MapIT G2 Automated Infrastructure Management System with its fully shielded TERA solution into the Middle East. The combination of MapIT G2 technology built into TERA patch panels and cords and the upcoming feature-rich Siemon EagleEye Connect software will deliver real-time tracking and management of the highest performing and most secure Category 7A/class FA twisted-pair cabling system available.

The MapIT G2 TERA system includes robust intelligent patch panels that are easy to install with modules that snap-in from the front or rear and include Quick-Ground technology for proper grounding of the shielded system. The panel's angled design allows for easier cable routing directly to vertical managers. The panel displays real-time information about each patch cord connection and circuit trace locally at the backlit graphic LCD display.

Designed for superior reliability and corrosion resistance, the MapIT G2 TERA patch cords are available in both two- and four-pair versions and feature an accessible sensor pin at the rear of the boot for testing and mapping purposes. The 2-pair cords accommodate cable sharing where two two-pair applications such as VoIP or 10/100BASE-T can run over a single four-pair cable and outlet, saving cable cost and pathway space.

A combination of MapIT G2 smart connectivity technology and Siemon's EagleEye Connect software provides complete visibility and control of the physical layer. Using real-time port monitoring and tracing capability, the system identifies faults, unauthorised connections and unused ports to improve troubleshooting response time, work order processes, security and asset management. MapIT G2 TERA patch panels are extremely efficient, using up to 78 percent less power than competing systems. They are also available in field-upgradable MapIT G2-ready versions for a simple and cost-effective migration path to automated infrastructure management.

LANactive

Switch to the future

Intelligent
Fibre To The Office
Miniswitch

FTTO Active & Passive Solutions

Nexans is pleased to announce LANactive, an alternative approach to structured cabling. Using Fibre To The Office (FTTO) topology together with access switches installed near to the work place, it provides Ethernet services via standard copper based RJ45 technology to the device.

The approach offers significant cost savings and other benefits in specific circumstances:

- **Long distance transmission**
- **Eliminating the costly Floor Distribution (Space, Switching & Passive accessories)**
- **Reduced cable containment**
- **Refurbishment with minimum disruption**
- **Redundancy at user level**

Your 1GB PoE+ port at your desk

sales.middleeast@nexans.com
www.nexans.com/LANsystems

Nexans
Global expert in cables and cabling systems