

cablethe future

LAN TRENDS

Broadcasting
goes digital

BEST PRACTICE LAN TECHNOLOGY

Data centres
face traffic
challenges

COVER STORY BIG DATA

Mining your own business

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Cabling into the future

Cabling is never installed to last for the lifespan of just one single generation of active equipment. However, at present, there is no telling exactly what the network demands of the future will be. We are being challenged by changing environments and applications, and increasing requirements.

Today, network convergence is placing ever greater demands on infrastructures. We can see this in Data Centres where 'always on' data availability, energy efficiency drives and competing network topologies are forcing designers to rethink DC architectures; in offices where 'Bring Your Own Device' are demanding increased wireless capacity to be installed alongside the fixed network and in Broadcasting where increased digitalisation is turning TV & Media transmission centres into high performance DC's.

With ubiquitous building networks driven by IP convergence on the horizon, topologies which successfully supported classic office voice and data outlets need to be revised. Growing numbers of connection points, required to accommodate more and more devices, are challenging the way we design networks. Installing parallel networks - to manage building services for example - is often mentioned as a possible solution, but the solutions put in place to add to network capacity might not be able to migrate and accommodate future needs. Furthermore, equipment that complies to the base level of current standards just won't be good enough in the near future.

Big Data, which is increasingly regarded as a valuable asset in today's business, will pose bandwidth challenges to data centres. A great deal of effort is being put into defining standards for 40G over copper cabling (one of



the topics covered in this edition of *Cable the Future*). There will also be an increasing demand for high density fibre networks to accommodate these higher bandwidth requirements. However, it's not only about bandwidth. Yet when we look at energy efficiency, for example, we see that the relevant concepts are not fully integrated. The focus is still very much on signal continuity and bandwidth.

Right now, we see specific applications, 40G and IP convergence pushing more and more functions onto the Local Area Network. This implies many of today's building designs won't be flexible enough to accommodate certain devices or applications in future. So when designing, installing or upgrading networks, it is, as the saying goes, better to be safe than sorry. Future proofing has never been more vital.

With this new issue of *Cable the Future*, we hope to provide some input for vital decision-making. As ever, we're interested in your opinions and suggestions, so please share them through our social media channels.

Mark Rogers
General Manager
Nexans Cabling Solutions

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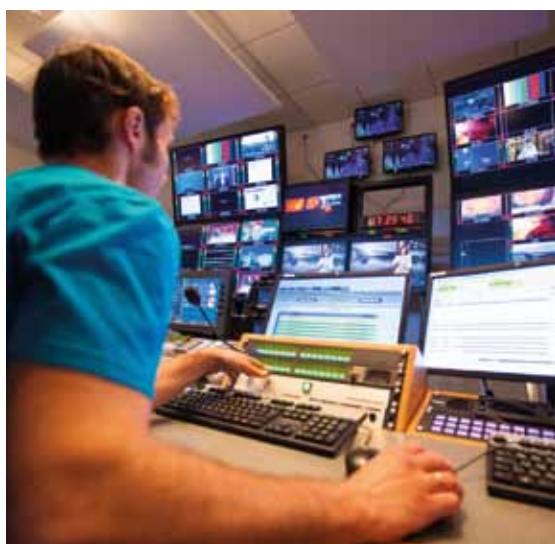
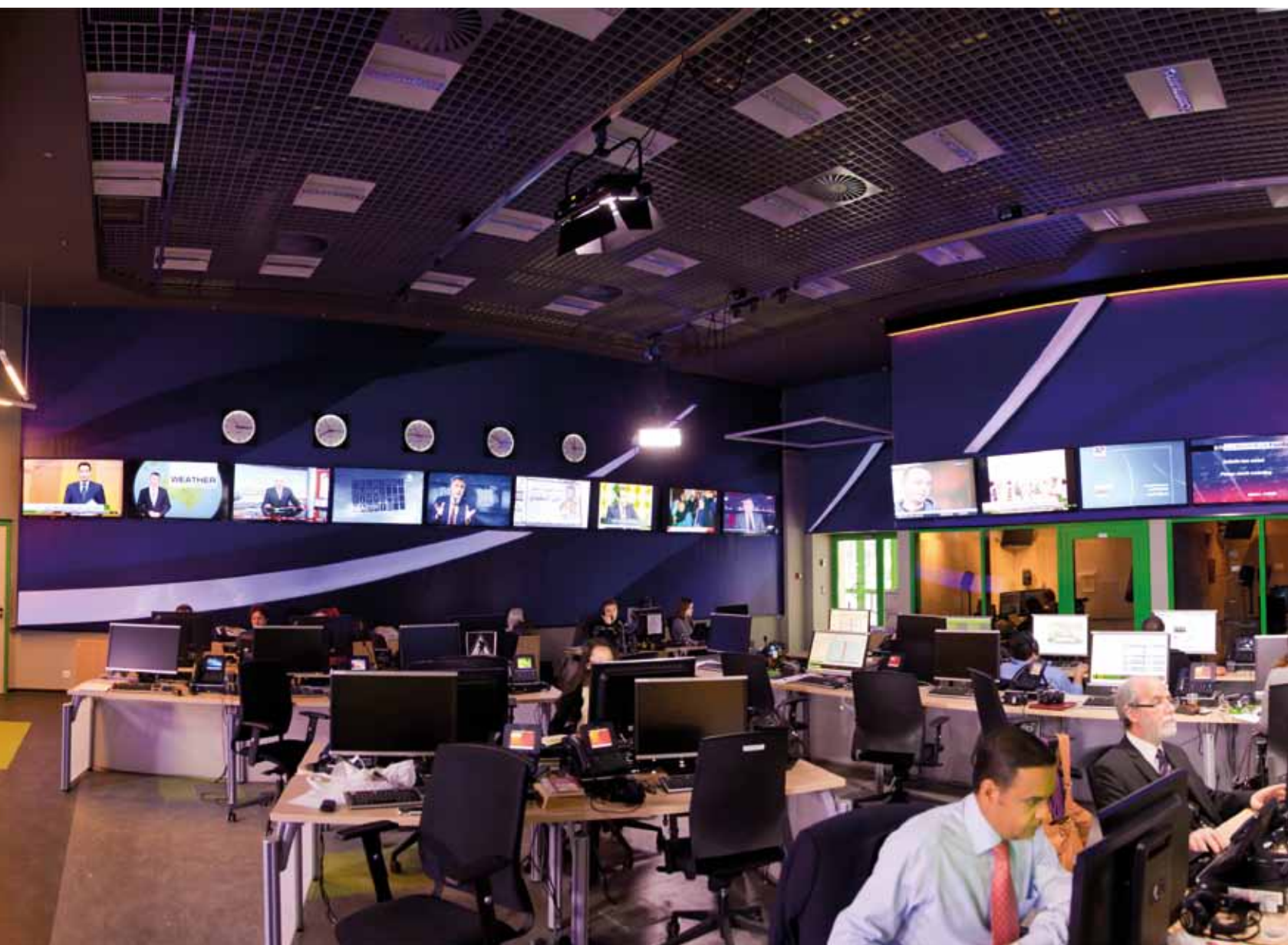


GETTING READY FOR THE FUTURE OF MEDIA BROADCASTING GOES DIGITAL

Today's consumers are becoming increasingly used to the idea of watching content anytime and anywhere, which is completely changing the concept of television. As broadcast facilities become more and more like data centres, it becomes possible to introduce new ways of working and collaborating on creative projects.

To provide video to a vast array of different devices, broadcasting companies everywhere are migrating from dedicated infrastructures to IT-based platforms. The tools used to film, record, edit and manipulate programmes are now also almost exclusively within the digital domain, which brings many practical and economic advantages. Of course, the rapid shift toward digital production, post-production, archiving and file transportation requires an appropriate infrastructure. Previously, broadcast companies would operate multiple

IT infrastructures: one for media content production, another for delivery, another for enterprise IT functions and so on. The current trend is to combine all of these into a single infrastructure. This brings a variety of issues which any Data Centre Manager will find very familiar: ensuring affordable power and sufficient cooling, introducing security measures, finding space to house server racks and storage media. Nexans has recently been helping out several leading broadcasters in this transition, making sure to avoid any IT network and infrastructure issues.



RT: SUPPORTING EXPANSION

RT (formerly Russia Today), launched in December 2005, currently consists of three global news channels. Nexans, contractor OKNO-TV and subcontractor ANT-Network were closely involved in a major project in which all staff and equipment were relocated to a new studio complex which houses management offices, news rooms, storage facilities and a data centre. RT required 1G Ethernet connections in all offices to facilitate data, IP telephony and security networks. Pre-terminated fibre solutions and copper links were required for the data centre and storage. The building uses a Nexans LANsense intelligent network of electronic devices to monitor and control its mechanical, electronics and lighting systems. Users can add devices at a wide variety of convenient locations across the network and very quickly and easily relocate groups of people or equipment. No additional IT or cabling auditing is required with this self-documenting system, which saves a significant amount of time and money. Wiring closets can be centrally monitored from one single network operations centre (NOC) for vastly increased efficiency.



PINEWOOD: A CENTURY IN THE LEAD

The Pinewood Studios Group has been a leading provider of studio and related services to the global film and television industry for almost a century. Recent film and TV productions that used the Studios' facilities include *Skyfall*, *Anna Karenina* and *Prometheus*. The Pinewood Studios Group selected Nexans for the cabling upgrade necessary to prepare its television studios for advances in High Definition technology. This is the first project of its kind in Europe and has provided an upgrade path for advances in television technology. The work began in June 2012, necessitating a new cabling network to support the advanced technologies and cope with the high bandwidth demands placed upon it. The facility was launched in September 2012. Pinewood selected long-standing Nexans Certified Solution Partner Cheyne Link for the project and they installed a shielded Category 6_A cabling system to protect against the risk of external interference. LANmark-OF OM3 fibre cables were also installed in the central apparatus room and galleries. Director of Broadcast at Pinewood Studios, Paul Darbyshire, said: "With the development of technology in the next 10 to 20 years the last thing we want to do is to remove infrastructure. Nexans have ensured the installation will allow for the possibility of higher bandwidth in the future as we move into the age of full High Definition across all channels."

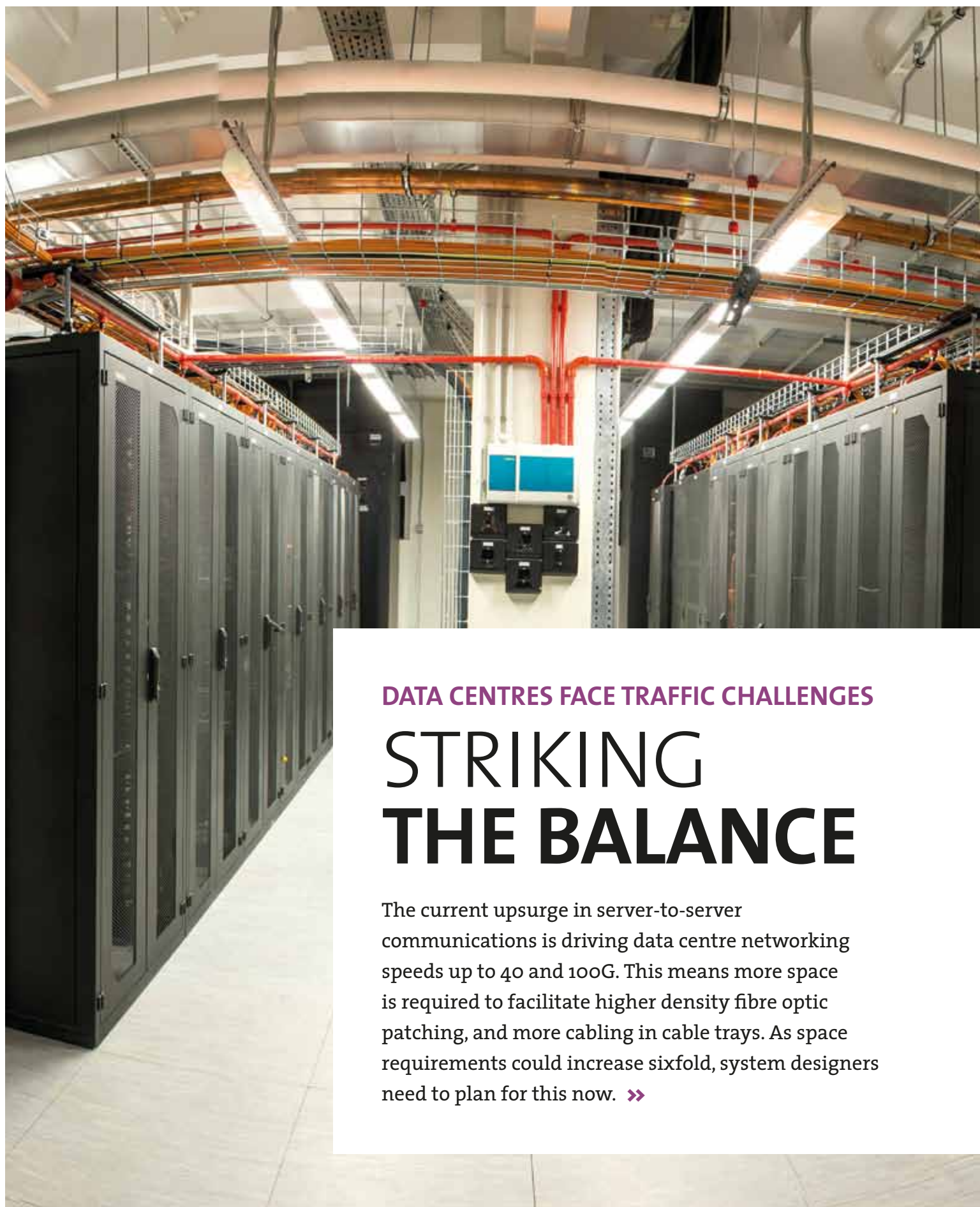
INFOSTRADA: AUDIOVISUAL GIANT

Infostrada in Hilversum, the Netherlands, helps major broadcasters, studios and distributors with the production and global distribution of their most valuable titles. This digital pioneer has transformed time-consuming traditional broadcast processes into smooth integrated workflow solutions. To deliver cloud-based production and distribution services, Infostrada operates one of Europe's largest audiovisual data centres. Over 200 video editing clients are connected to a highly scalable online storage and archive facility. Audiences can be reached on any device: TV, mobile and internet. With demanding clients such as FOX and Pathé, reliability is key, so the company has its own redundant 80 GB uplink to the Internet. The Infostrada facility at Mediapark Hilversum is used for hosted services as well as for colocation purposes for both internal and external customers. Nexans advised a minimum of Cat.6_A cabling to prepare for 10GBase-T Ethernet and provide the best possible shielding to avoid Alien Crosstalk. Migrating to Cat.6_A went smoothly, as Infostrada was used to working with 'normal' Cat.6 UTP. Nexans trained Infostrada's engineers in connecting shielded systems on-site.



MUDRA: READY FOR THE FUTURE

As one of India's leading advertising, communications and brand management companies, Mudra Communications relies heavily on its network infrastructure for high-definition video, social media, design software, business application systems and more. The LAN has to perform consistently with no signal loss, time-outs or slowing down. In 2010, work began on the company's new nine-storey central HQ. The setup consists of 6,000 metres of LANmark-6 for each floor's horizontal network supplying 1 GB to the desk through 1,600 nodes. These are supported by a vertical uplink based on LANmark-OF fibre cable. Installation was performed by Bangalore-based Wipro Technologies. Reducing the carbon footprint is helped, in part, by the LANmark-6 network's ability to accommodate Power over Ethernet (PoE). Intelligent Infrastructure Management (IIM) also offers important network security benefits, including automatic tracking of where all devices are located, or when they're removed or added. "Who knows what web-based media, devices or technologies will be embraced by young people just five years hence," says Sebastian Joseph, President – CIO, Mudra Communications. "But whatever the next trend is, it will certainly fit within this infrastructure."



DATA CENTRES FACE TRAFFIC CHALLENGES

STRIKING THE BALANCE

The current upsurge in server-to-server communications is driving data centre networking speeds up to 40 and 100G. This means more space is required to facilitate higher density fibre optic patching, and more cabling in cable trays. As space requirements could increase sixfold, system designers need to plan for this now. >>



INCREASING DENSITY, APPROACHING PARITY

Previously, some 80% of data centre traffic was generated by people accessing server-hosted applications over the internet or intranet from a desktop or laptop computer. However, recent times have seen a massive increase in mobile apps and cloud computing and, as a result, there is an upsurge in traffic between servers. This development has quite a few implications for the present and future, particularly in the areas of switch and patch panel port density and capacity.

As more and more users access an increasing number of applications, server utilisation has increased substantially. Some studies claim data centre utilisation has shot up from about 15% to over 50%. Servers accessed on a massive scale need state-of-the-art processors to manipulate and manage this higher volume of data.

Every expansion step has specific implications for space requirements, in order to accommodate ever-increasing capacity and density. This matter must be considered well in advance of any data centre building or upgrading activities. After all, it is not unimaginable that extra patch panels might be required at some point to ensure a 40G/100G architecture meets the necessary specifications (see box and illustrations for details).

Making sure your cabinets have the room to accommodate inevitable future expansion might just save you from having to move to a newly-built data centre! Nexans' continuous commitment to developing new products and increasing customer awareness can greatly assist system designers and planners in meeting future challenges and change.

A typical server cabinet today might contain 48 x 1000Base-T copper downlinks from a switch connected to the server ports. The connections from this switch to a switch in the next layer up would typically be 2 x 10GBase-SR uplinks. This would provide an oversubscription ratio of 2.4:1. So, although we have 48 x 1 Gb/s throughput capacity on the downlinks, there is only 20G capacity available through the uplinks. As server utilisation has always been on the low side, this is quite normal. However, as demand on the server grows, both downlink and uplink speeds must increase accordingly and the 2.4:1 oversubscription ratio will need to approach parity i.e. 1:1. To accommodate a far higher volume of traffic on the uplinks, their speed needs to match that of the downlinks.

An example presented to the Institute of Electrical and Electronics Engineers (IEEE), showed a 1U 19" 40 Gb/s switch with symmetrical capacity on fibre and copper. Twenty-four 40 Gb/s downlinks on a switch offered a combined throughput up to 960 Gb/s, and was matched by boosting the fibre uplink capacity to 1Tb with 10 x 100G ports.

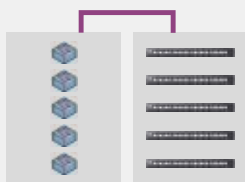
In a fibre optic patching frame, you would now have ten 100 Gb/s MPO ports instead of two 10 Gb/s LC ports for each switch, increasing the space requirements of the patching frame significantly. Patching all the 100G uplinks on the switch attached to the server to the next layer of switches introduces requirements for greater space. Data centre system planners designing for 10G uplinks today, and who have a requirement for 100G in the future, just might not take this into account.



PATCHING FRAME SIZE

40G DOWNLINKS
100G UPLINKS

960 downlinks
40 switches

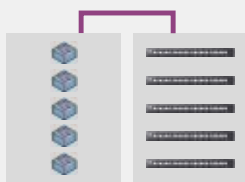


400 MPO uplinks
4800 fibres

960 Cat.7_A server connections

10G DOWNLINKS
40G UPLINKS

960 downlinks
20 switches

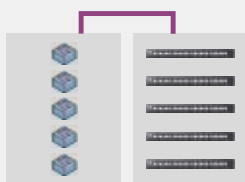


120 MPO uplinks
1440 fibres

960 Cat.6_A server connections

10G DOWNLINKS
10G UPLINKS

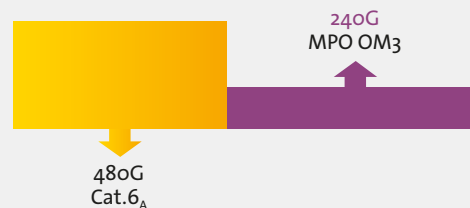
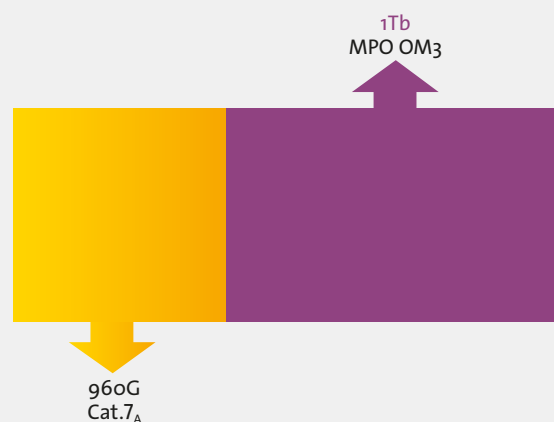
960 downlinks
20 switches



480 duplex LC uplinks
960 fibres

960 Cat.6_A server connections

TYPICAL SWITCH CONFIGURATION





DRIVING THE NEED FOR CATEGORY 6_A AND 10 GB/S CHANGING INFRASTRUCTURE: A NEW LOOK AT CABLING

Flexible office spaces and infrastructure are changing the way we work and do business. More and more buildings are adapting their infrastructure to accommodate the vast growth of mobile devices. These developments in turn have far-reaching consequences for the way cabling is used and what is expected of a wireless network.

The new EN50173-6 Distributed Building Services standard enables migration of distributed building systems to generic cabling systems, accommodating WLAN, Building Management Systems (BMS), security systems and more, without losing sight of specific channel requirements. The standard lists the minimum class of cabling required to support various applications.

PLANNING AHEAD

In the past, systems from different manufacturers used widely varying protocols and cabling systems. Now, however, we see far-reaching integration taking place. The EN50173-6 standard fits in with a 'Zone

Distribution' approach to cabling and includes the requirements of established and developing systems, as well as systems that haven't used structured cabling so far.

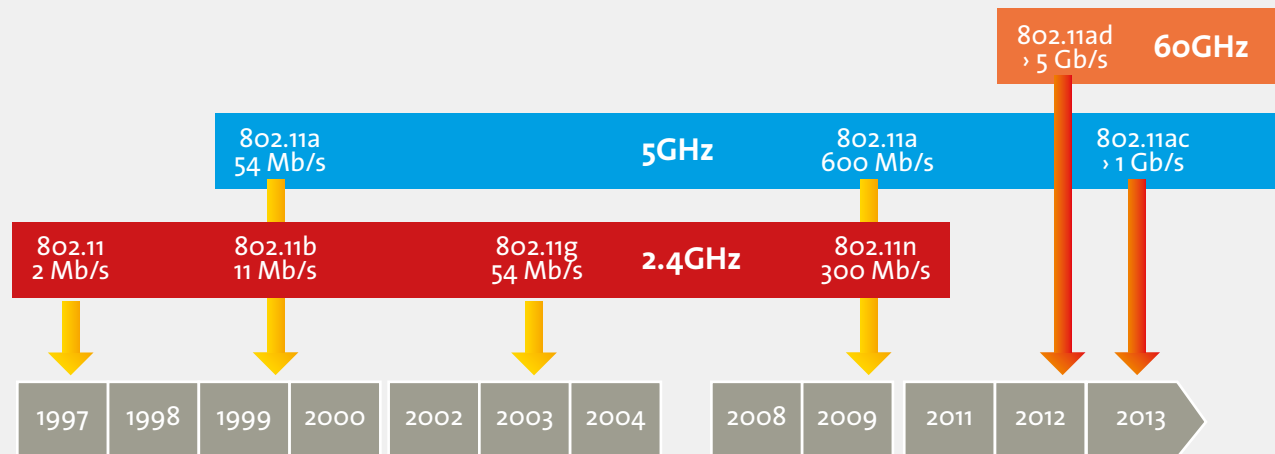
The increasing downlink speeds foreseen for wireless networking drive a need to plan for 10 Gb/s in the wired backbone for wireless networks – which in turn implies Category 6_A cabling to service outlets for Wireless Access Points (WAP) connectivity. EN50173-6 addresses cabling which doesn't end with the user, but connects one system device to another. This type of cabling is rolled out early on during building projects, as part of the core infrastructure - which is why it is vital to get

it right from the start. Saving some money on cabling might seem a good idea at the outset, but this will place serious restrictions on bandwidth. Of course, 100 Mb/s downlinks and Cat.5E cabling may suffice in many cases today, but when we look at the next generation of WAPs, it soon becomes clear this is not a future-proof solution. Next-Gen WAP technology was introduced in consumer products last year, and enterprise products are currently beginning to appear.

SHARING ACCESS

Unlike a peer-to-peer protocol such as Bluetooth, WAPs connect devices to the internet or intranet and need sufficient

Wireless LAN Data Evolution



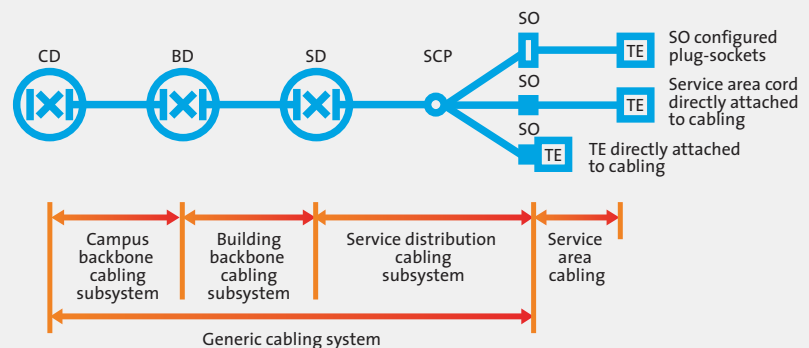
wireless backbone as well as cabling that can accommodate multiple users. You may have 1 Gb/s access in the workplace, but if you have to share that with 99 other wireless device users, you'll each be getting 10 Mb/s - if you're lucky. Furthermore, you might have wisely invested in the latest WAPs, but as more and more multiple users share bandwidth, the backbone could present some serious bottlenecks. After all, any good wireless LAN has a good wired LAN behind it.

So, in essence, you need greater throughput from the WAP to the switch than from the WAP to any single user. Initially, using Cat.6A might seem somewhat overspecified for WAP purposes, but it is vital to accommodate the fast growing number of wireless devices and users, and avoid disruption at a later stage. What might seem like overcapacity is in fact a necessity in any multi-user wireless environment. The up-front cost is, after all, just a fraction of what it would cost to retrofit cables and other system components.

2 types of deployment

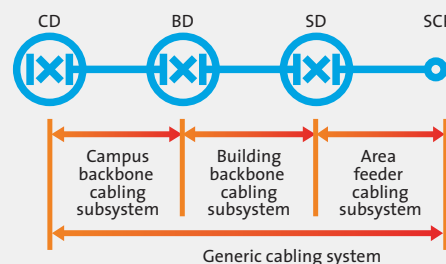
1 GENERIC CABLING TO SO (SERVICE OUTLET)

This deployment type uses the same channel models as standard infrastructure cabling. Terminal Equipment may be attached in different ways.



2 GENERIC CABLING TO SCP (SERVICE CONCENTRATION POINT)

Generic cabling runs to the SCP, after this, cabling is customised in line with the system to be installed. Network Concentration Equipment is installed to support different topologies.



BIG DATA

MINING YOUR OWN BUSINESS

Today, data is no longer considered just another cost factor, or something that simply needs to be stored for a legally specified period. Instead, it is increasingly being seen as an asset from which value can be derived.

According to Google, the human race produced a total of 5 exabytes (10¹⁸ bytes) of data from the dawn of civilisation to 2003. Now, we produce five exabytes every two days. In 2016, internet data will be four times larger than in 2011 and global mobile data traffic will increase 25 times over between 2010 and 2015, according to research published on whatsthebigdata.com.

The current vast growth of data is largely organic. In recent years it has been driven by social media, advanced business applications, online transactions and the rise of mobile devices. All this data can provide society, education and business with vital insights - if stored, collated and harnessed correctly. Regardless of economic developments, exponential year-on-year growth is continuing and companies today are spending more and more on data.

FOUR KEY APPLICATIONS

As soon as your traditional information infrastructure cannot cope with analysing the huge volumes of data, at the speed required, and in all possible combinations,

we speak of 'big data,' explains Frank Buytendijk, Research Vice President Information Management at Gartner. "This is, therefore, a relative definition. Today's big data is tomorrow's data-as-usual. Still, there is enormous interest. A quarter of all companies worldwide are actively working with big data at present, and almost one-third have stated they will soon start doing so. Recent figures indicate that 4.4 million new jobs will be created worldwide, 29% of which in Europe. Data scientists, for example, as well as IT specialists, software developers and telecom professionals."

"Gartner has defined four key applications areas for big data. The first is realising faster and more cost-effective company processes. The second is improving client relationships, for example, by understanding their social media behaviour and comments. A third application is 'new business', for instance, introducing different information-based business models, including selling information to others. A fourth application is preventing fraud. As with most technology innovations,





“Big data doesn’t just have implications for how we do business, but also how individuals and societies will interact in the future.”

FRANK BUYTENDIJK

corporations will pioneer and develop these technologies, which will shift towards consumers, who will apply them in new ways. Big data doesn’t just have implications for how we do business, but also how individuals and societies will interact in the future.”

FROM STORING TO EXPLORING

According to International Data Corporation (IDC), the big data technology and services market will grow at a 31.7% compound annual growth rate through 2016. “Big data is about much more than growth,” explains Donna Taylor, Research Director EMEA Storage, EMEA Systems and Infrastructure Solutions, IDC. “It’s not just about the number of terabytes, but about how the data is being used. In the past, the focus was on keeping data storage manageable. Now, however, companies are no longer just storing data just in case they might need it in the future. Instead, they’re looking for new ways to mine it and create new value.”

“Data can have value in different ways for different groups. The automotive industry, for example, can track the performance



FRANK BUYTENDIJK

Research Vice President Information Management at Gartner

Frank offers more than 20 years’ experience and has worked as a software implementation consultant, project manager, management consultant, industry analyst, strategist and business executive. Besides working for top information technology research and advisory firm Gartner, Frank is also a visiting fellow at Cranfield University School of Management, a speaker at conferences worldwide and the author of several books.

“Institutions and companies are going to increasingly work together and will, as a result, be able to identify and compare larger, more detailed patterns.”

DONNA TAYLOR



DONNA TAYLOR

Research Director EMEA Storage, EMEA Systems and Infrastructure Solutions IDC

Donna joined IDC, a globally leading market research, analysis and advisory firm specialising in information technology, telecommunications and consumer technology, in 2011. Her research focuses on overlapping technologies, including big data, cloud applications, data centres, converged infrastructure and virtualisation. Donna started at IBM storage systems division and has worked in the technology field for fifteen years.

of an engine through real-time analysis, providing an insight into its quality. In the retail industry, data can be used to efficiently manage supply, demand and stocks, but also to understand more about customers' purchasing preferences and behaviours. As a result, marketing and sales can be more targeted than ever. Medical institutions, for example, might contain epidemics simply by looking at regional search activity and responding quickly. By tracking climate data, meteorologists can make more accurate predictions about the future. Cities can become smart by using networked data to optimise power usage and distribution.”

“Real time analysis allows companies to be more flexible and agile than ever before. In industries like retail and consumer goods, where things can change from day to day, or even by the hour, companies can adapt to global and local conditions rapidly and effectively. You can become the key expert in your own business, without relying on external parties. However, it is important to realise that there's more to it than letting algorithms loose on your data - you also need the right people in-house to make sense of the outcome and to draw sensible conclusions.”

NECESSARY INVESTMENTS

Many companies are not only making more of the data they already have, but are also making sure they can take some major steps when the economy starts to ramp up. Other companies that don't want to invest in new technologies right now might have a lot of catching

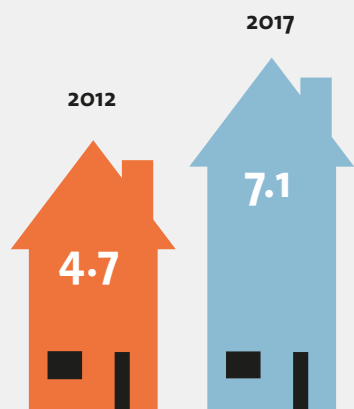
up to do. The investments don't need to be as large as many people think. When cloud computing first appeared, many companies worried about costs, as well as about aspects such as latency and security. Improvements in Solid State Drives technology (SSD) and rising adoption have led to lower prices, and this effect spreads to other related technologies, too. More people can benefit from the enhancements at a lower cost, as the costs are spread amongst a larger number of users.

“Big data is placing a lot of strain on data centre facilities. Our research shows that major challenges for data centre administrators today are security, keeping data highly available and complying with data-related regulatory requirements. Capacity planning is also becoming a big problem. Archives, digital images, analytics applications and data on virtual machines are all under pressure. Our research has also found that expanding storage capacity and improving storage performance are among the top storage spending priorities for European IT executives.

As many as 44% of respondents said they are confident that they can deal with big data woes by expanding storage capacity and only 29% said they need to reassess their information management process to deal with big data.”

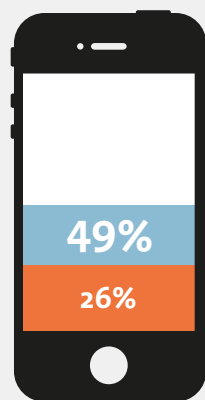
“Interconnectedness is critical in order to derive value from big data,” Donna Taylor continues. “All data needs to be shared across different infrastructure and

IN THE YEAR 2017...



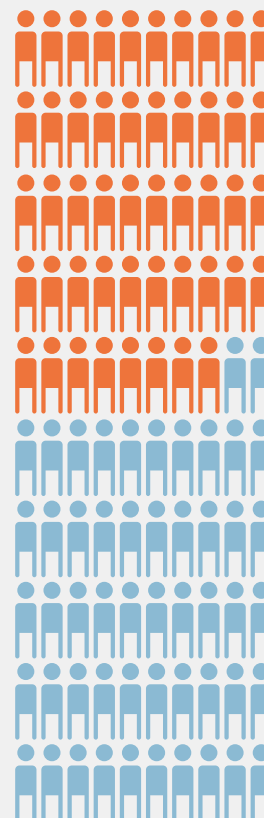
The **'INTERNET OF EVERYTHING'** will incorporate 19 billion connections. That's 7.1 devices or connections per household.

ANNUAL IP TRAFFIC
WILL HAVE TRIPLED TO 1.4 ZETTABYTE OR
1,000,000 DVDS A DAY.



49% of all **IP TRAFFIC** will be generated by devices other than PCs such as Smart TVs, 3D-printers, tablets and smartphones.

More data will be exchanged online than in all previous **'INTERNET YEARS'** together.



48% of the world's population will have **INTERNET ACCESS.**

Source: The Cisco Visual Networking Index (VNI) Forecast (2012 - 2017)

platforms. The best way to tackle this is different for each company, there's more than one solution. However, generally speaking, if the technologies don't keep up with the requirements they will become a weak link. It would be wise to address this consistently throughout the entire chain, from the end user to the data centre. Otherwise, we could end up with a development not unlike that

of virtualisation, where the bottleneck was pushed from the virtualisation technology to the storage area and then on to the network. However, many of the companies I've spoken to have put into place a roadmap to address these issues.

"Looking ahead, I think we're going to see more collective, sector- or industry-wide developments in the near future.

Institutions and companies are going to increasingly work together and will, as a result, be able to identify and compare larger, more detailed patterns. Instead of individual analyses, we will see broader networks of analyses, allowing even greater insight into process and end-user needs and behaviours, and therefore significantly enhanced efficiency and flexibility."

ENERGY EFFICIENT ETHERNET

THE ROAD AHEAD
FOR IT NETWORKS

According to PikeResearch senior analyst Eric Woods, “servers can use 60% of their maximum power while doing nothing at all”. The ICT industry appears set to become one of the world’s most polluting industries. How can IT networks become more sustainable?

The IEEE 802.3 Working Group estimates that network devices and interfaces represent more than 10% of all annual IT power consumption, amounting to tens of TWhr. Industrial users use up some 37% of the total, transportation consumes 20%, residential heating, lighting, and appliances use 11% and commercial use add up to 5% of the total. 27% of the world’s energy is lost in energy transmission and generation. If we look at future requirements, things become even more challenging. Bandwidth trends in the office indicate that the number of network connections will keep growing rapidly, partly due to the vast uptake of WiFi devices and the demand for more flexible infrastructure, to suit current work patterns, across multiple locations.

In 2010, Energy Efficient Ethernet (EEE) was introduced to provide a mechanism and a standard for reducing network interfaces’ energy usage without hampering their functionality. Although this is a new technology, and best practices still need to be developed, Cisco / Intel LAB Tests have shown EEE can offer 15% direct Energy Savings on a Cisco 4500 Switch (documented in ‘Cisco/Intel: IEEE802.3az Energy Efficient Ethernet: Build Greener Networks - 2011’). Combining EEE with

Wake-on-LAN (WoL), an Ethernet standard which allows devices to be switched on or awakened by a network message, can bring further savings of up to 50%.

EEE is based on the idea that the communication link should only consume power when data is being sent. Since the 1990s, most wireline protocols have used continuous transmission, thereby consuming power when no data is sent. EEE’s signalling protocol (a modification of the normal ‘idle’ transmitted between data packets) allows a transmitter to point out gaps in the data, allowing the link to go idle and resume when data reappears, following a pre-defined delay (see diagram for more about ‘Low Power Idle’ functionality).

GREAT SAVINGS

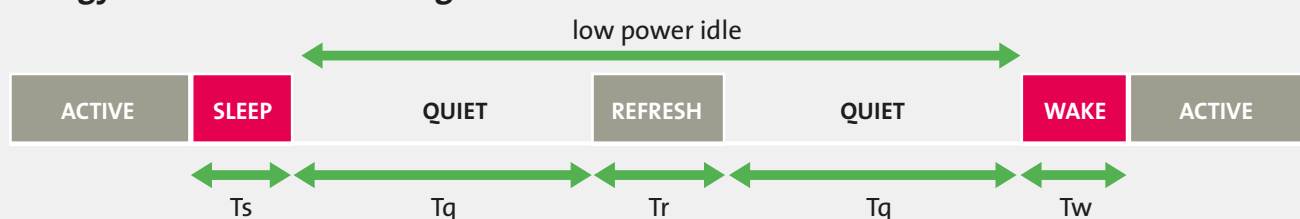
From its inception, the standard was defined so that higher layer services would run over EEE links without any noticeable degradation. During the development process, a lot of attention was paid to backwards compatibility. The new standard had to be deployable in networks where the majority of equipment uses legacy interfaces and also seamlessly support the very wide range of applications that already run on these networks.

Energy savings for early implementations of the standard may be relatively small, but later EEE-compatible products may lead to far greater savings. Through applying static logic design in the physical layer devices, which typically consume 20 to 40% of the system power, energy savings of up to 50% can be realised whenever there’s no data present. As the proportion of EEE equipment grows incrementally, networks will increasingly benefit from EEE.

Future networking systems will be able to employ more aggressive energy savings techniques, such as power islands or voltage scaling, which require new architecture design. Over the slightly longer term, developments in network architecture that can utilise energy-efficient control plane solutions will help ensure that multiple interconnected EEE networking systems can operate in a way that minimises total energy use.

ENERGY EFFICIENT ETHERNET IS CURRENTLY ONLY SPECIFIED FOR COPPER INTERFACES REQUIRING E.G.

- > LANmark-6A
- > LANmark-7A

Energy Efficient Ethernet diagram



PROTECTION FOR FLAWLESS COMMUNICATION

10 GB/S: SCREENED OR UNSCREENED CABLING?

With the appearance of an economically viable version of 10GBase-T and marked growth in equipment and network interfacing cards, 10 Gb Ethernet is finally becoming widely available. Data centres in particular are expected to migrate to 10 Gb Ethernet. >>



Screened cabling is far less susceptible to picking up Radio Frequency Interference (RFI) from external sources.

DID YOU KNOW...?

- Good Alien Crosstalk immunity performance is essential for cabling systems designed to support 10GBase-T.
- Due to high transmission frequency and complex encoding, 10GBase-T is more sensitive to external noise from surrounding cables.
- U/UTP systems generally have just a few dB of margin against Alien Crosstalk; shielded systems offer tens of dBs.
- Shielded systems support 10G simply by design.

Adoption of 802.3an 10GBase-T brings down costs and cable installation barriers to 10G deployment, usually associated with optical cabling and top of rack switches. Furthermore, backwards compatibility with 1G networks helps protect legacy investments. These developments give rise to the question: does 10 Gb require shielded cable – or is that really unnecessary?

Although higher grade cabling like Cat.7 works well for 10GBase-T, the standardisation industry picked Cat.6A for its quality, which lies somewhere between Cat.6 and Cat.7. Cat.6A has been specially designed to support 10G and the IEEE and ISO/IEC11801 cabling standards support both unscreened and screened versions. So is shielding really necessary? Our simple answer is: yes. Shielded systems demonstrate superior performance in the critical higher frequency spectrum. This is the most future-proof way of avoiding Alien Crosstalk (AXT) problems in 10G networks – and beyond.

Until recently, a bad connection or noise might slow down a Fast Ethernet network, but any resulting problems were manageable. However, the faster the network, the more sensitive it becomes. Alien Crosstalk does not present a problem at speeds up to 1 Gb/s. But, over

a 10G network, external crosstalk from surrounding cables can shut everything down in an instant, requiring a restart. In fact, when we take a closer look at all the parameters that might affect 10GBase-T performance, AXT is the most significant.

10GBASE-T: SENSITIVE TO EXTERNAL NOISE

During the development of 10GBase-T it became clear that sensitivity to external noise was a problem. 1GBase-T transmission requires all internal cabling parameters (Attenuation, NEXT, Return Loss etc.) to be specified for the 1 to 100 MHz range using a Cat.5e (Class D) or Cat.6 (Class E) cabling system. 10GBase-T, however, requires a cabling channel with all parameters specified to an upper frequency of 500 MHz which may be realised using a Cat.6A (Class EA) or higher system.

In the higher frequency spectrum in which 10G operates, sensitivity to interference is much greater. This is a result of its complex modulation encoding (PAM 16). Furthermore, as 10 Gb/s uses more transmitting power, up to 30x higher per port, there is far more self-radiation in the relevant 250 to 500 MHz bandwidth. In this part of the spectrum, the signal can be disturbed by neighbouring cables in a bundle, but also by cables which are further away. All this adds up to more crosstalk.

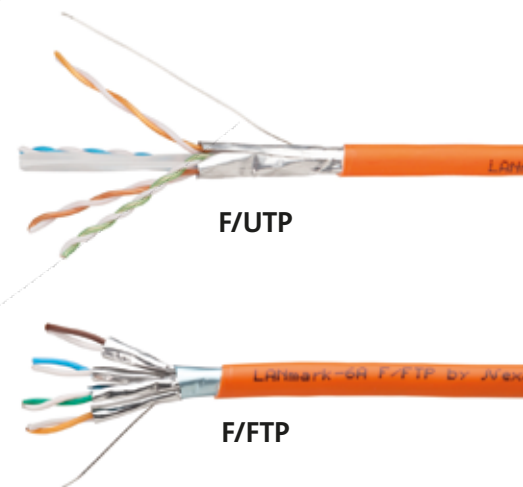
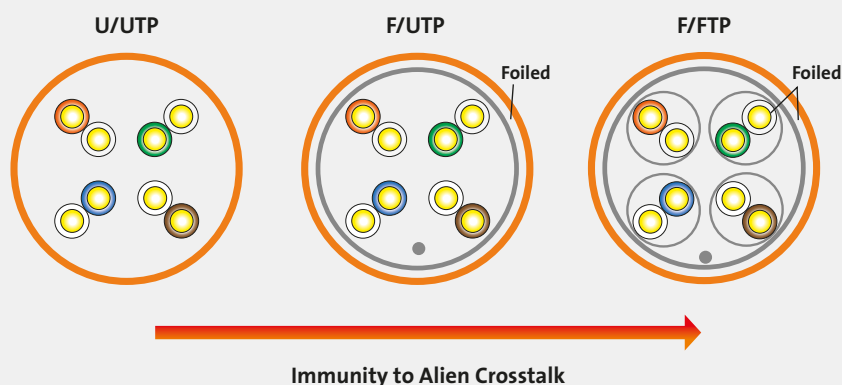
Screened or shielded cabling is immune to Alien Crosstalk transmitted from adjacent cables. Screened cabling performs at least 10 dB to 40 dB better than unshielded cabling, meaning it is far less susceptible to picking up Radio Frequency Interference (RFI) from external sources. Comparative measurements of unscreened versus screened solutions confirm that screened cables provide a high level of protection against Electromagnetic Interference (EMI) at high frequencies.

TESTING INSTALLATIONS

It is also important to consider that, in practice, unshielded cabling requires significant field testing. The international cabling standard ISO 11801 sets AXT testing as a 'normative requirement' where the 'sampling rate' is agreed with the client, unless it can be proven beforehand that the system is insensitive to external crosstalk (the so-called 'met by design' principle). But how can you determine this in advance?

Yet another standard, ISO/IEC 14763-2, offers more insight: the coupling attenuation over the entire 500 MHz frequency range must have a margin of at least 10 dB. If a manufacturer can't supply a certificate, AXT has to be measured in the field by the installer. As only a small percentage of the full installation will be tested, the selection

DIFFERENT CABLE TYPES TO SUPPORT 10GBASE-T



of samples is very subjective, and therefore, AXT test results may vary significantly.

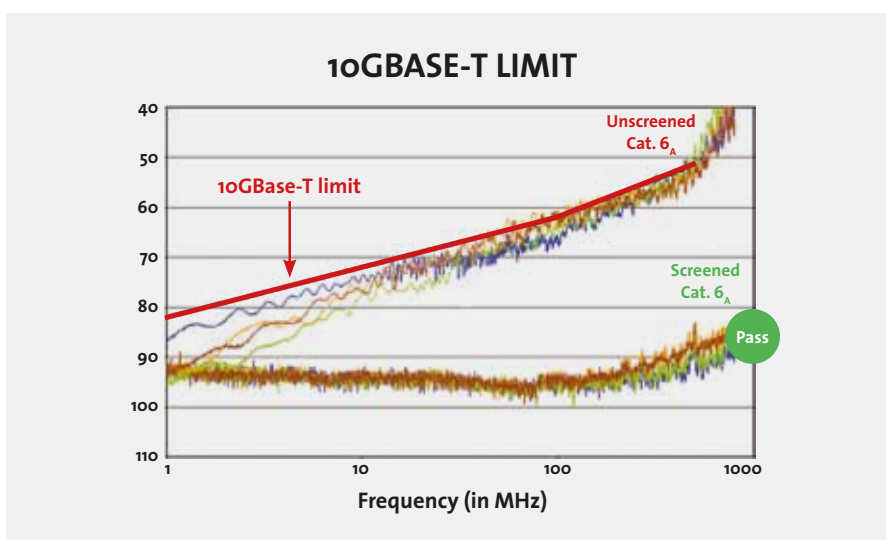
SHIELDED SYSTEMS: SUPPORTING 10G BY DESIGN

When using shielded cable, none of these issues present a problem. Users considering 10GBase-T-ready cabling can easily convince themselves by carrying out a mock-up test with different cable types before installation, using AXT test results as a selection criterion.

Some claim that unshielded U/UTP cabling is easier and cheaper to install than shielded. This may be the case for Cat.5e and Cat.6, but for Cat.6_A cables, this no longer applies. Shielded and unshielded cables are the same weight and thickness and installing and processing takes around the same time for both. Where U/UTP systems generally have a few dB of margin against external noise parameters, shielded systems offer tens of dBs.

LOOKING AHEAD

The widespread adoption and economic feasibility of 10GBase-T has taken a relatively long time. Development of 10G PHY chipsets initially made 10GBase-T expensive and power hungry and its latency performance was poor. Economically viable products are only appearing now, after

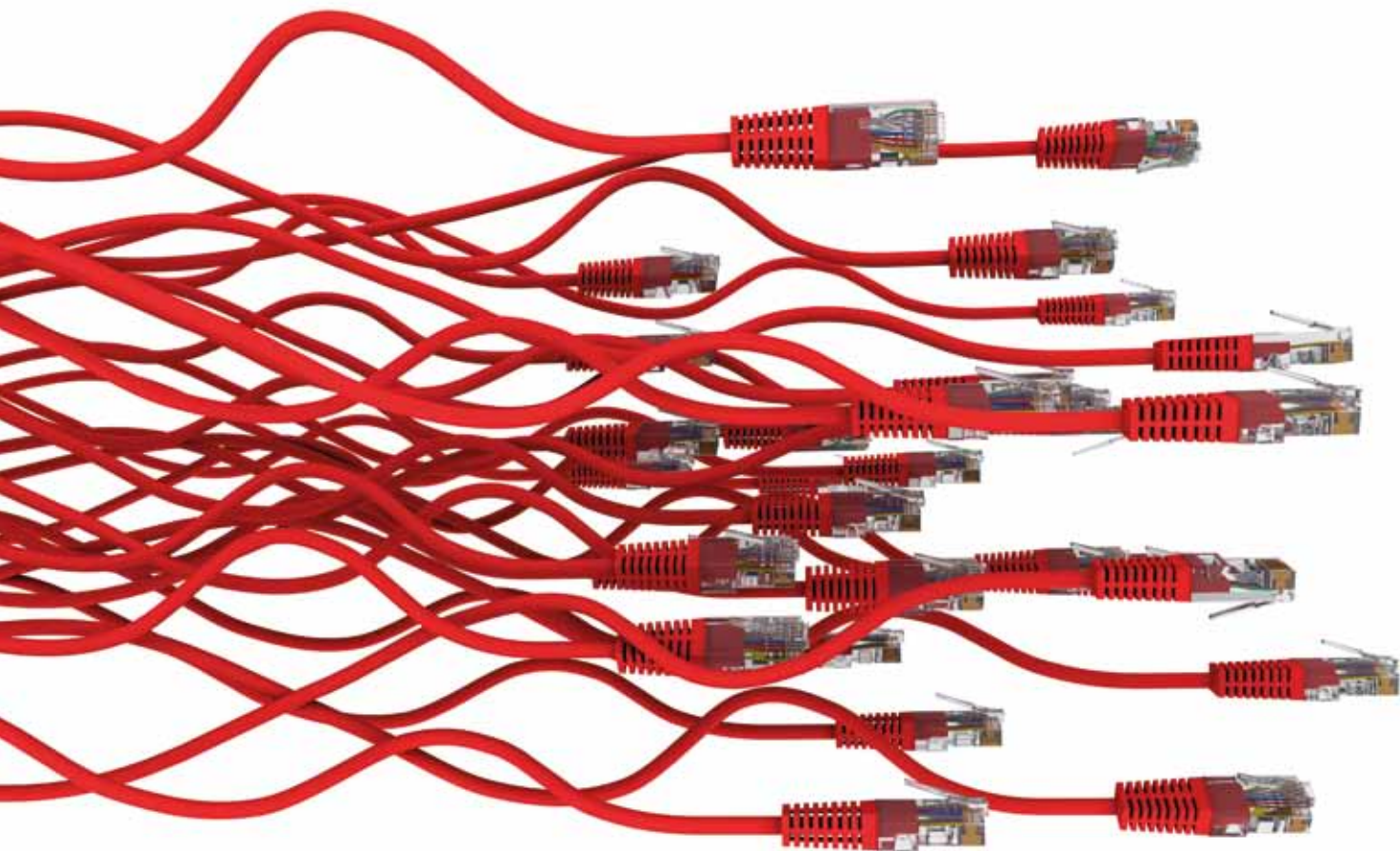


some five years and several generations of development. The industry is now applying learning from this experience to its current standard development for the next, even faster, Ethernet version 40GBase-T.

If we look ahead to the arrival of 40GBase-T, currently being defined by the IEEE, ISO and TIA standardisation committees, we can safely say that 40G will be even more difficult for a cabling system to support than 10G. A new balance will need to be struck between cable quality and cost, on the one hand, and complexity, energy

consumption and cost of chipsets, on the other. However, nobody doubts that these cables will require shielding.

To summarise: as more and more 10GBase-T cards become available on the market, we are seeing an increased need for cabling that enables flawless 10GBase-T communications. Shielded systems demonstrate superior performance in the critical higher frequency spectrum. This is the best and most future-proof way to avoid Alien Crosstalk problems in 10G networks – and beyond.



STANDARDS UPDATE

What's happening in the world of standards?

What has been recently introduced or announced and which developments are underway? We look at three of the many issues being discussed.

1 NEXT GENERATION BASE-T FOR TWISTED PAIR CABLING

The IEEE Ethernet standardisation body has started work on the development of 40 Gb/s Next Generation Base-T for twisted pair cabling. The 40GBase-T study group finished its work in March and an official 40GBase-T task force, ratified for 2-3 years, began in May. Several new technical contributions are being made related to Cat.6A and 7/7A cabling, some related to coupling, others to shielding effectiveness.

There is some discussion as to whether 'enhanced Cat.6A' – currently referred to as Cat.8 (Channel 1/Cat.8.1) – or 'enhanced Cat.7A' (Channel 2/Cat.8.2) should be used to support speeds up to 40 Gb/s. Both can support the same data rates and both options have roughly equal support. The advantage of the Channel 2 option is that it has a better signal to noise ratio, and therefore requires less power for noise cancelling. Also, Channel 2 products have been around for a decade, and are mature, while there is a learning curve ahead for the new prototype Channel 1 systems.

In any case, there is vast interest in this new standard because copper is easy to install, and backwards compatible with other – often older – RJ45 based equipment. This is an important feature in data centres.

2 GETTING TO THE HEART OF AIM SOLUTIONS

Since its publication, the ISO/IEC14763-2 standard has specified requirements for the planning, installation and operation of cabling infrastructures. This includes not only cabling, but also pathways, spaces, earthing and bonding and, importantly, also covers 'administration' wherein resides Automated Infrastructure Management or AIM. Unfortunately the definition of AIM has been somewhat unclear. There has been an amendment to clarify "core functionality", because it is felt that difficulty in scoping an implementation is preventing widespread adoption, calling for the 'standardising' of requirements for AIM and its interaction with other systems.

A draft explanatory annex for both ISO/IEC14763-2 and the European equivalent EN50174-1 describes the minimum core functionality of AIM solutions. This encompasses items such as inventory, automatic detection of switches and support in error recovery. The annex will help specifiers to easily scope AIM installs.

Additional functionalities discussed in the annex include workflow management and CAD integration of, for example, floor plans, racks and layouts.

Today, managing and utilising assets is a challenge following the introduction of more and more devices and applications. AIM software and hardware will be able to document infrastructure elements as described in the standard. Patch connections can be automatically monitored and managed, and whenever connections change, documentation is updated and alerts provided. New services must be easy to deploy and factors such as environmental regulations and capacity planning taken into account. Additionally, the integration of Automated Infrastructure Management with energy, building and other systems enables efficiency enhancements and the development of advanced 'smart' applications. AIM reduces infrastructure maintenance by implementing a measure of self-monitoring and intelligence into increasingly complex networks.

The annex and ongoing standardisation activities will help AIM claim its place beside other building management systems. Furthermore, interconnection between different manufacturers' solutions and third-party applications could be strongly supported through a data exchange solution, helping to create a workable DCIM solution built around an AIM core.

3 ETHERNET TAKES TO THE ROAD

A new IEEE P802.3bp task force started exploring Gigabit Ethernet Twisted Pair PHY* on less than four pairs in June 2013. This is mainly driven by the automotive industry's growing bandwidth requirements. Cabling is the third heaviest in-car component next to the chassis and engine, so reducing the amount of cable and ensuring this cable is as reliable as possible is vital to the automotive industry. Ethernet has been used in vehicles since 2008, mainly for diagnostics and firmware upgrades. Due to EMC limits, Ethernet is not typically used in cars when on the road. However, Ethernet can support the bandwidth and latency demands of automotive applications, based on IEEE 802.1 AVB and IEEE 1722 standards (current and ongoing work). Following completion of the group's work, trade-offs between various channels can be evaluated by PHY Companies. Eventually, various discrete legacy systems may be replaced by a centralised Ethernet backbone architecture supporting GPS, vehicle data, infotainment and driver cameras. The new Gigabit Ethernet PHY should operate on fewer than four pairs of UTP cabling over a channel model developed in conjunction with automotive/industrial networking industries. It must also meet automotive EMC and susceptibility requirements and environmental requirements. Looking forward, reduced Twisted Pair Gigabit Ethernet PHY could be leveraged across other segments, including industrial and avionics networking.

ISO	International Organisation for Standardisation
IEC	International Electrotechnical Commission
CENELEC	Comité Européen de Normalisation Electrotechnique (European Committee for Electrotechnical Standardisation)
IEEE	The Institute of Electrical and Electronics Engineers
*PHY	Physical Layer: encodes frames for transmission and decodes received frames with the modulation specified for the speed of operation, transmission medium and supported link length.

WOULD YOU LIKE TO FIND OUT MORE?

Subscribe to our regular 'Decoding Standards' newsletter, with the latest news on developments in the world of LANs and networking. More information on <http://lansystems.nexans.com/decodingstandards>



SLIMFLEX: THE RIGHT FIBRE IN THE RIGHT PLACE

The increase in demand for cabling in data centres is leading to space and density challenges. Today's vast increases in port density and the need for more system flexibility result in ever-greater amounts of cabling being installed under floors and above racks.

"One of the biggest risks related to data centre failure is patching," claims Joost Grillaert, Fibre Product Manager at Nexans. "We know installation rules aren't always followed when it comes to maintaining the bend radius of patch cords. This can lead to increases in attenuation and the risk that every time you add or remove a connection in 'spaghetti cabling' you might pull or strain other cords without even realising. These two factors can result in application failure. That's why Nexans developed Slimflex flexible cords that significantly reduce the risk of signal loss."

BIMMF: A PERFECT FIT FOR PATCH CORDS

Slimflex patch cords fit into Nexans' strategy of using the right fibre in the right place. "We only employ bend-insensitive fibre where it actually makes a difference. In inter-rack cabling running in pathways, trunking and cable trays, we continue to promote the use of cost-effective traditional fibre cables. The real need for Bend-Insensitive MultiMode Fibre (BIMMF) is in patching zones, where patch cords can be tightly packed in bundles, often with small bend radii and subjected to further movement."

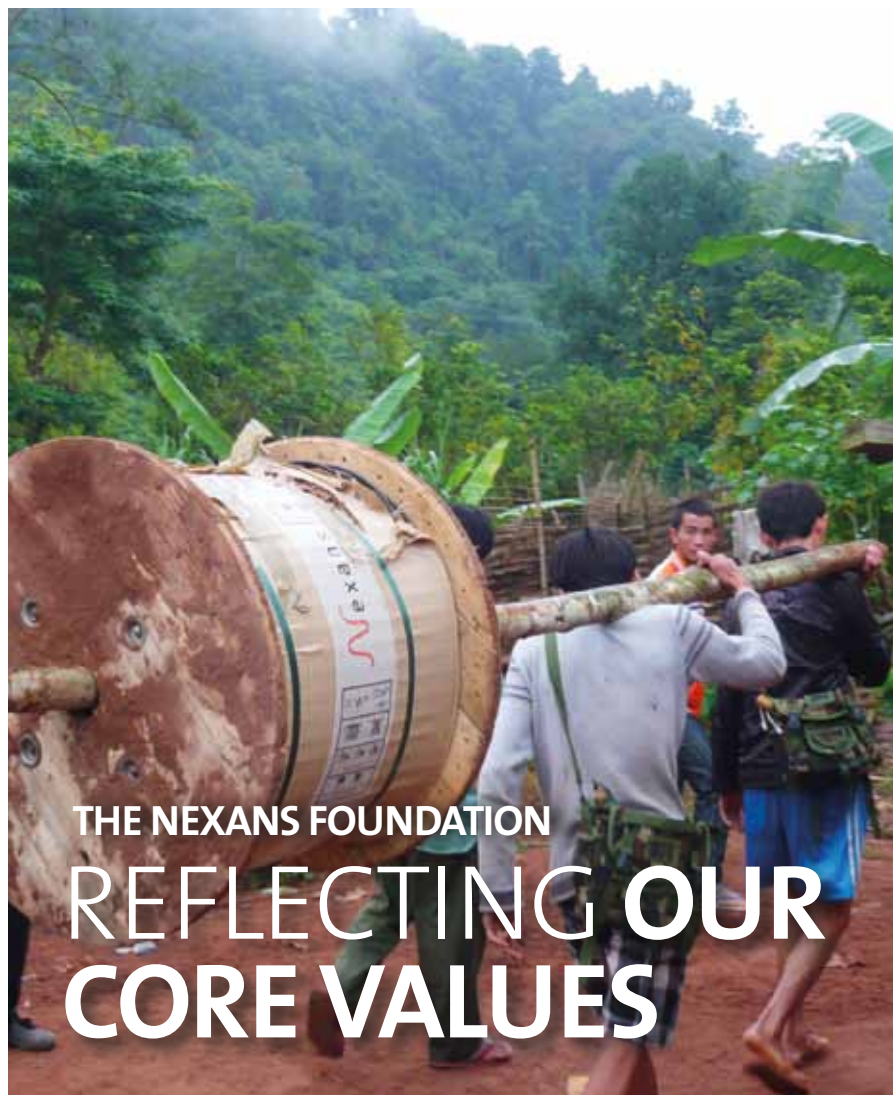
Available in singlemode and OM4 multimode, a Slimflex patch cord is constructed using a 2.6 diameter round patch cable with a Gigalite^{FLX} bend-insensitive fibre core. Around this core we chose a polyurethane (PUR) outer sheath that has a higher resistance

to abrasion and cutting compared with LSZH. The result is a very flexible cord with a reduced bend radius of only 7.5mm – as opposed to 40mm for traditional cords.

GOOD HOUSEKEEPING WITH HIGH DENSITY SLIMFLEX

Generally speaking, patch cords are equipped with LC connectors. When patched or inserted into active equipment or patch panels, these connectors are located so closely together that their small latches are difficult to reach, and a special tool must be employed. The 'pull tab' on the High Density Slimflex connector makes it possible to add cords or change routings on panels and switches by hand, even when a large number of cords are placed close together. The uniboot connector which allows a duplex connector to be handled as a single connector and the round patch cable provide easier handling and keep connections tidy and well-organised. They improve visibility and accessibility in densely populated panels. Additional features include low loss connectors with insertion loss of just 0.3 dB.





THE NEXANS FOUNDATION REFLECTING OUR CORE VALUES

The Nexans Foundation assists and supports our long-term participation in worldwide solidarity initiatives and acts as a common platform for all our corporate sponsorship activities.

“The foundation furthers the initiatives taken across the company over many years,” says Frédéric Vincent, Chairman and CEO, Nexans. “A large company such as ours is entirely integrated into society and must actively contribute to the general interest over the long term. The Nexans Foundation also aims to involve all Nexans employees in its development and activities.” The Nexans Foundation focuses on two key areas, in line with our

corporate values. One is providing support for general interest projects of a social and humanitarian nature, fighting energy insecurity and poverty worldwide. By providing access to energy, the Nexans Foundation allows disadvantaged communities to access services essential for their human, social and economic development. The other area is preserving the world’s cultural heritage by supporting the Palace of Versailles’ projects.



Before the creation of its Foundation, Nexans was already involved with the following projects:

- **Electriciens sans Frontières (Electricians without Borders/ESF):** This NGO contributes to making access to energy a developmental lever for the most disadvantaged communities worldwide. Nexans covers 50% of ESF’s low and medium voltage power cable needs.
- **Palace of Versailles:** Nexans has supplied some 550 km of mostly low, medium and high voltage cables and safety cables to help with renovations of this UNESCO World Heritage Site.
- **Louvre-Lens Museum (Northern France):** Nexans donated all the cables for the 28,000 m² of buildings and the premises and 22 hectares of land.

Does your fibre system tick all the boxes?

- 
- ☒ Maximise reliability
 - ☒ bending radius
 - ☒ insertion loss budget
 - ☒ Minimise cost
 - ☒ save space
 - ☒ high density
 - ☒ installation time
 - ☒ 40G/100G ready
 - ☒ life time
 - ☒ **LANmark-OF**

LANmark-OF : Competitive Fibre Optic Solutions

40G

- Micro-Bundle cables save up to 50% trunk space
- HD Slimflex cords facilitate high density patching
- Pre-terminated assemblies reduce installation time
- MPO connectivity enables cost efficient migration to 40/100G

LANmark-OF brings the best fibre technologies together to ensure maximum reliability and lowest operational cost.

**Accelerate business
at the speed of light**

100G



OF brochure