

Number 8 | December 2012

cablethe future

LAN TECHNOLOGY

Testing
Alien
Crosstalk

BEST PRACTICE

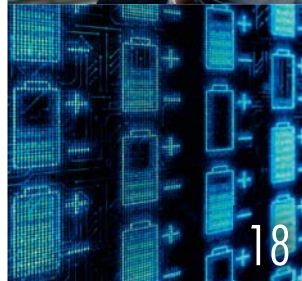
A closer look at
the Data Centre
Code of Conduct

COVER STORY

Cabling the smart workplace

Michel Mooij, workplace expert,
on a new way of (net)working

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BELGIUM
Nexans Cabling Solutions
Head Office
Alsebergsesteenweg 2, b3
1501 Buizingen

UNITED KINGDOM
Nexans Cabling Solutions
2 Faraday Office Park
Faraday Road
Basingstoke
Hampshire RG24 8QQ

BRASIL
Nexans Brasil S/A
Alameda Jau N°1754
01420-002 Sao Paulo

CHINA
Nexans Cabling Solutions
No.1 Middle Fute Road
Waigaoqiao Free Trade Zone
Shanghai 200131

FRANCE
Nexans Cabling Solutions
4 - 10 rue Mozart
92587 Clichy CEDEX

GERMANY
Nexans Cabling Solutions
Bonnenbroicher Strasse 2 - 14
41238 Mönchengladbach

GHANA
Nexans Cabling Solutions
Heavy Industrial Area
Near Tema Oil Refinery
P.O. Box CO 157
Tema

INDIA
Nexans Cabling Solutions
Marol Naka, Andheri East
Off Marol Maroshi Road
B203 Polaris
Mumbai - 400059

KENYA
Baron Telecoms Ltd.
P.O. Box 31412 - 00600
Nairobi

THANK YOU

Alice Pagès · Frédéric Rappelle · Gerard Verwoolde ·
Gerd Backhaus · Glynn Philips · Harry Forbes ·
Jan Dhondt · Jesus Roman · John Edwards · Joost
Grillaert · Konstantin Hüdepohl · Leonardo Martinez ·
Marianne Servez · Mark Rogers · Martin Rossbach ·
Michel Mooij · Mike Holmes · Nick Cartmel ·
Paolo Bertoldi · Paul Hendrickx · Peter Haigh ·
Peter Szegedi · Philippe Berte · Rob Cardigan

RESPONSIBLE EDITORS

Oene-Wim Stallinga · Yves Debroyer

DESIGN & PRODUCTION

www.mediapartners.be

NEXANS CABLING SOLUTIONS

Alsebergsesteenweg, 2, b 3
B-1501 Buizingen - Belgium
Tel.: + 32 (0)2 363 38 00
Fax: + 32 (0)2 365 09 99

NEXANS (GROUP HEADQUARTERS)

8, rue du Général Foy
75008 Paris - France
Tel.: + 33 (0)1 73 23 84 00
Fax: + 33 (0)1 73 23 84 84

**E-MAIL ANY OF YOUR
INFORMATION QUESTIONS TO**
cablethefuture.ncs@nexans.com

www.nexans.com/LANsystems

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KOREA

Nexans Korea
7th Floor l'Park Tower
160 Samseong-Dong
135-881 Gangnam-gu – Seoul

MOROCCO

Nexans Maroc
Bd Ahl Loughlam
Sidi Moumen
20400 Casablanca

THE NETHERLANDS

Nexans Cabling Solutions
Overschieeweg 317
3112 NC Schiedam

NIGERIA

Nexans Cabling Solutions
28 Henry Carr Street
Ikeja Industrial Estate
P.M.B. 21253
Ikeja
Lagos

NORWAY

Nexans Norway AS
Regnbeuveien 7
PO Box 100
N-1403 Langhus

ROMANIA

Nexans Romania
26 Av. Mircea Zorileanu Street
2nd Floor, Sector 1
012055 Bucuresti

RUSSIA

Nexans CIS LLC
Tverskaya str. 16-3
Business center 'Tverskoy'
3d and 4th floors
125009 Moscow

SINGAPORE

Nexans Singapore
111 Somerset Road, #09-06
TripleOne Somerset
Singapore 238164

SOUTH AFRICA

Nexans
146 Newlands Avenue
Western Extension
1501 Benoni

SPAIN

Nexans Cabling Solutions
Avda. de Europa 26
Edificio Atica 5-2°C
28224 Pozuelo de Alarcón
Madrid

SWEDEN

Nexans IKO Sweden AB
Företagsvägen 2
SE-435 33 Mölnlycke

TURKEY

Nexans İletişim Endüstri Ve Ticaret
Sifa Mahallesi
Ataturk Caddesi
81700 Tuzla

UNITED ARAB EMIRATES

Nexans Middle East
P.O. Box 47889
Abu Dhabi

UNITED STATES

Nexans Cabling Solutions
169 Commack Road, STE H #124
Commack, NY 11725

Choosing wisely

Today, the IT community is faced with ongoing spending cuts across virtually all sectors. However, there's also a need to invest, in order to stay competitive and meet increasingly high data speed and energy efficiency standards.

CAPEX spend is being squeezed as a result of tough economic conditions. However, new ways of working and changing office environments demand upgrades to core networks. Increased use of mobile devices is presenting challenges that simply didn't exist just a few years ago. In some cases, the issues are even more complicated. Consider the arrival and growth of cloud computing... Network designers everywhere are wondering whether it's wisest to boost investments in local infrastructure, rely heavily on centralised third party systems, or strike a balance between both options.

Just a few years ago, an IT innovation might have been considered a worthwhile investment, on the off chance that it would pay off in the future. Now, the choices are tougher. Payback on new investments might not be immediate, so they need considerable justification. However, defending budget allocations is only half the challenge. There are so many different factors driving the market today, that simply deciding where to invest requires a great deal of decision-making in its own right.

Investing in capacity today might future-proof your Data Centre - but how do you choose which areas to invest in? You have to take a structured approach, and make adjustments that give the most bang for your buck in the short term. But how do you know these will be compatible with long-term requirements? Making choices is further complicated by uncertainties: will Data Centres move to fibre or is there a cost-effective future



for copper? Can higher bandwidth really be delivered over existing infrastructure? What can current usage trends teach us about future demands? How can we get more out of existing technologies? What new technology developments will we need to take into account?

Fortunately, standardisation is playing a role in making choices easier. A number of increasingly useful network architecture standards, which go beyond mere specifications, should also help realise future-proof systems with greatly diminished risks.

In this issue of Cable the Future, we're offering a picture of today's environment, hoping to provide some input for vital decision-making. Sharing information and engaging in discussion will make critical decision-making easier all round. Of course, we're interested in your views, so please feel free to share them through our social media channels.

Mark Rogers
General Manager
Nexans Cabling Solutions

Join us on



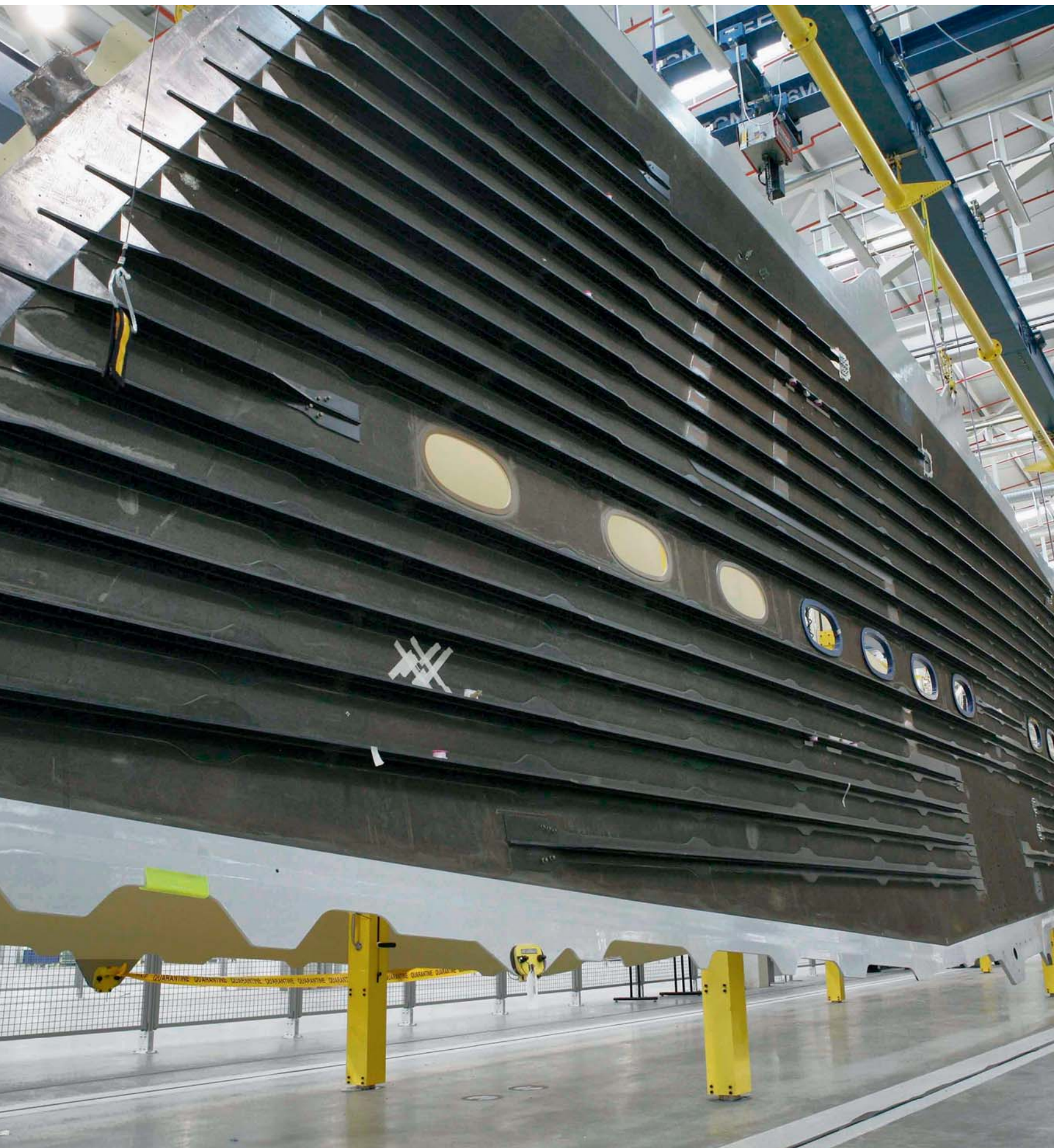
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AEROSPACE: MEETING THE HIGHEST DEMANDS

One leading annual market outlook recently projected that airline passenger traffic will nearly triple by 2030, and the number of commercial aircraft would more than double over the same period. When it comes to cabling systems, the fast-growing aviation industry has some very specific needs. Aircraft manufacturers, airlines, airports and support facilities, such as data centres, each face different challenges.

Companies working in the aviation industry are generally multinational organisations, with sites all over the world. Nexans' unique geographical, industrial and commercial presence in aviation allows us to provide optimal service. A 'glocal' approach combines this global reach with sensitivity to local needs. Operating on all continents, we are able to follow installers, project developers and manufacturers everywhere, often working with local resources to organise technology transfers and training. To provide clients with one single interface to discuss all issues, we appoint one Key Account Manager for each customer, supported by technical personnel and dedicated project teams.

TOMORROW'S NEEDS TODAY

"Ongoing advancements in the technology sector are a crucial factor in selecting a solution that offers an easy upgrade path, without the need for re-installation," says Peter Haigh, Business Development and Strategic Accounts Director, Nexans. "With this in mind, we ensured the network at

the new Airbus A350XWB wing production plant in Broughton, Wales was ready for future technologies. Bigger than Wembley Stadium and requiring 500 million euros to build, the new factory is one of the largest manufacturing facilities to be built in the UK in recent years. A complete Structured Cabling Data and Voice System now allows easy introduction of new technologies. The fully screened system was the ideal solution, as it supports the demand for high-tech construction methods. To support high bandwidth and connection speeds in this high-tech environment with 1800 data outlets, 110km of Cat.7 copper cable was rolled out and terminated with LANmark-6A connectivity, alongside LANmark fibre links. These solutions guarantee 10 Gb/s transmission capability - even in the electrically noisy manufacturing environment."

The team worked to exacting standards within a tight time frame, whilst also adhering to stringent Health & Safety

“Nexans’ unique geographical, industrial and commercial presence in aviation allows us to provide optimal service.”

controls and onsite procedures. Installation of the data cabling was particularly difficult and time-consuming, as the team had to work at a height above new wing frames, with extensive vehicle movement below. Careful coordination was required and every effort was made to make sure the cabling was implemented with the utmost care and diligence. Furthermore, working on a ‘live’ airfield meant that all engineers had to receive airside training, as one of the single mode fibre links between the North and West factories traversed the main Broughton runway. “Given the size of the project, the short lead time for production and the tight deadlines involved, Nexans met our expectations by working extremely hard,” said Nick Cartmel, Mobile Voice & Data Manager at Airbus. “The installation will meet the bandwidth requirements of any technological advancement.”

“We face some interesting challenges in our work for Airbus,” says Frédéric Rappelle, Commercial Engineer, Nexans. “At Airbus Toulouse we had to make our LANmark-6 Category 6 PE industrial cable, with its Polyethylene outer sheath, thoroughly resistant against oils and liquids. We even created movable workstations for Airbus’ assembly area, with instruction for how these have to be connected and disconnected with custom-made connectors and IP67 patch cords.”

LOOKING AHEAD

This forward-looking approach isn’t only applicable at manufacturing plants, but at business centres too. For their recently opened European flagship hub in Manchester Airport’s Voyager building, United Arab Emirates’ carrier Etihad Airways was looking for a network that provided an upgrade path for technology advancements. This had to help save on time and costs and be subsequently replicable throughout other airports. Nexans LANmark-6A

network solution exceeded all requirements, including Power over Ethernet (PoE) for the centre’s essential and sizeable array of VoIP phones. Thanks to PoE, devices can be installed virtually anywhere within the building, allowing for a scalable and flexible networking environment. In addition to call centres in Al Ain, Abu Dhabi, Australia and India, the UK addition caters for the increasingly large number of calls from English-speaking customers. The new 22,948 square foot premises opened in February, cover two floors and house nearly 200 staff.

“LANmark-6A cabling was the ideal solution for Etihad’s 10G network installation,” explains Glynn Phillips, Technical Support Manager, Nexans. “These cables are designed specifically to support the higher frequencies required for 10 Gigabit Ethernet, whilst maintaining compatibility with today’s needs. The screened cables also ensure immunity from Alien Crosstalk and other external interference and are specified up to frequencies of 500MHz – essential in the call centre in a busy international airport.” Etihad are now looking to install network solutions based on the Manchester model at airport locations across the UK.

TOTAL SOLUTIONS APPROACH

The entire aerospace industry works to the highest possible standards, which means industrial processes need to be certified accordingly. Health and safety requirements and interoperability between systems are also vital. Because work procedures simply can’t be interrupted, delivering the very best quality in both products and their implementation is of the utmost importance. This means closely monitoring projects with Certified Solution Partners (CSPs) to meet very tight deadlines. It also means building up a network of partners and CSPs suppliers which offer great flexibility and responsiveness. Nexans unique total



British Prime Minister David Cameron at the official opening of the new Airbus facility in Broughton.

solutions approach has enabled the company to establish a position as a key cable system supplier for companies in the aviation industry throughout the world. Besides supplying cabling used in aircraft, which demonstrates Nexans has the quality and procedures in place to meet very stringent air safety needs, we also provide the vital and often overlooked data infrastructure required to manage operations both within manufacturing plants and airline operators.

DID YOU KNOW...?

- ▶ Nexans has a manufacturing plant entirely dedicated to aircraft cables
- ▶ Nexans’ aircraft cabling solutions come with a 100,000 hour guarantee
- ▶ Singapore’s Changi Airport, which handles 70 million passengers per year, relies on Nexans copper and optical fibre cabling solutions
- ▶ Some 1,500 km of Nexans cables connect the airfield power network to the runway lighting transformers at King Abdulaziz International Airport, Jeddah
- ▶ Nexans provides solutions for commercial and military aeroplanes and helicopters as well as space travel
- ▶ Incheon Airport, South Korea, one of the world’s most advanced airports, uses cabling and LAN infrastructure from Nexans to support voice, data, video, and other multi media applications
- ▶ The reliability of Nexans harnesses helped keep the Mars Rover working beyond its planned lifespan



ALIEN INVASION

TESTING ALIEN CROSSTALK

In every bundle, each cable picks up interference from its neighbours. Alien Crosstalk is the overall term used to describe this. How serious is this, and how can we measure and deal with it? >>

Nexans LANmark-6A cables are specially developed to support 10G networking in enterprise buildings as well as data centres. The range consists of screened cables specified to frequencies up to 500MHz and therefore support the higher frequencies required for 10 Gigabit Ethernet while they remain fully compatible with lower speeds. LANmark-6A products are screened to ensure immunity from Alien Crosstalk and other external interference.

“Alien Crosstalk, or AXT, can be a serious problem,” explains Martin Rossbach, Director Product Marketing for Nexans. “With regular Ethernet, a bad connection will slow down the network slightly. But over a 10G network, interference can shut everything down in an instant, requiring a restart. In the higher frequency range where 10G operates, sensitivity to noise is larger. At that level not only the noise from the directly neighbouring cable pair can influence the signal, but also the noise from the other cables. When we look at all the parameters that can affect 10GBASE-T performance AXT is the most significant.

“Alien Crosstalk is caused by unwanted signal coupling from one balanced twisted-pair component, channel, or permanent link to another, or an environmental noise side-effect caused by ‘usual suspects’ such as transformers or lighting fixtures. AXT is not to be confused with Near End Crosstalk (NEXT), the noise that occurs between two twisted pairs within a single cable. In contrast to NEXT, AXT arises from unknown sources and therefore cannot be removed by cancellation techniques inside the active equipment, which NEXT actually can.”

SPACING AND SCREENING

“There are two ways of dealing with Alien Crosstalk: spacing and screening. You can try to space the cables further apart - the greater the distance from internal pair to external, the lower the noise. Another option is to use different housing shapes. For example, instead of opting for circular cables, you can employ an oval shape, which keeps cables neatly aligned but prevents them from bunching together. The best solution is to put screening around each cable, if you place metal screening around all four pairs, it will effectively reflect back external noise. Shielded (F/UTP) and pair-shielded designs (S/FTP) can improve noise immunity at all frequencies and can make AXT all but disappear.”

FACTS AND FIGURES

“As AXT is a fairly new phenomenon in our industry, it hasn’t been closely looked at previously. It was added as a test parameter 5 or 6 years ago when 10G was introduced for the first time, but AXT testing is not mandatory. The cable characteristics aren’t the only thing that has an effect on measurements. Cable routing plays a role, too. In real life, the signal in a bundle starts off relatively clean but as the bundle is split and put together along its length variations will occur. Furthermore, typical lab test data packets aren’t always representative of applications in the real world. Customers might be presented with figures for Alien Crosstalk based on lab testing which look impressive but don’t really say much about real-life cable performance. Data can be misleading as the real cable routing can’t be represented in the lab environment and ‘closed’ bundles don’t always represent the worst case.”



“The best solution for AXT is to put screening around each cable.”

MARTIN ROSSBACH, DIRECTOR PRODUCT MARKETING, NEXANS

TAKING TESTING OUT OF YOUR HANDS

With U/UTP systems, it is recommended to carry out your own field testing, which can be done with hand held testers. To get an accurate result, one must measure different cables in the bundle, in different positions. However, once a certain product’s coupling attenuation performance has been measured and rated adequate, it doesn’t need to be retested.

That’s why Nexans LANmark screened solutions don’t require field testing, as these meet AXT requirements by design, saving considerable investment in time, money and effort.

TESTABLE PARAMETERS

PS ANEXT NE : Power Sum Alien Next measured on the near end

PS ANEXT FE : Power Sum Alien Next measured on the far end

PS AACR-F NE : Power Sum Alien ACR-F* measured on the near end

PS AACR-F FE : Power Sum Alien ACR-F measured on the far end

All AXT test parameters are relevant since they are part of the pass/fail criteria for a cable bundle. Typically, the critical ones to meet are the near-end parameters, when measuring from the patch panel, where the cable density is highest.

* ACR-F: Attenuation to Crosstalk Ratio Far-end, also known as Equal Level Far-end Crosstalk (ELFEXT)

Three common mistakes

1 Choosing the wrong 'disturbers' for a given 'disturbed' cable.

Along the cable trays through the building and along the racks, disturbers should be picked that run very close to the 'disturbed' cable, e.g. in the same cable bundle.

2 Not looking at the mix of products.

'Disturbed cable' samples must be selected for each product used in the installation. If two different manufacturers' cables and jacks are used, AXT tests have to be carried out for both manufacturers' products, at the sampling rate specified in standards.

3 Running tests from only one side of the cabling.

If trunk cables are installed, only one panel side might get tested for AXT. Modern AXT testers can test both sides simultaneously for compliance.

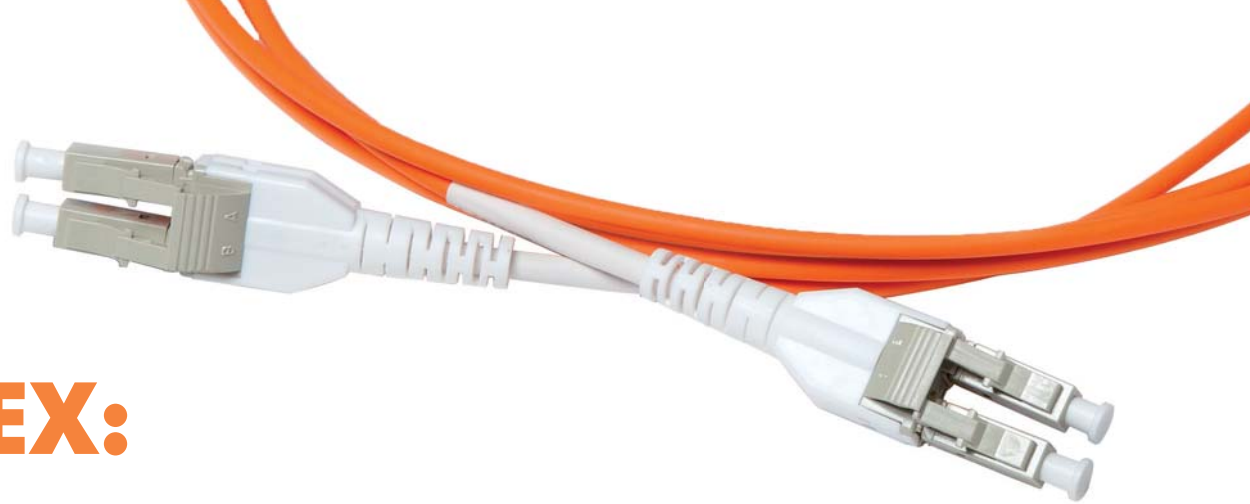


Konstantin Hüdepohl is Market Development Manager at IDEAL Industries, an international supplier of test equipment, specialized network support services and security to the communications industry. He is responsible for LAN cable testing procedures in Europe and an active member of the DKE 715.3.2 and IEC TC46WG9 standardisation panels.

ALIEN CROSSTALK - AN EXPERT VIEW KONSTANTIN HÜDEPOHL, IDEAL INDUSTRIES NETWORKS DIVISION

With modern cables, AXT is negligible for data rates up to 1 Gbps, but under certain circumstances, it can be a problem for rates of 10 Gbps or higher. Whenever cabling has to meet ISO 11801 Class E_A or Cat.6_A field testing requirements, it must be compliant with AXT specifications. This can be proven indirectly, by measuring the coupling attenuation. Basically, this attenuation describes cabling's immunity against EMI (Electromagnetic Interference) samples in the laboratory. The manufacturer only needs to prove a certain product's coupling attenuation performance once; this doesn't have to be repeated for every customer project. Once laboratory tests have been passed, the manufacturer can issue a certificate for AXT compliance and doesn't have to perform AXT field measurements. This is the safest, easiest and fastest option for installers.

If a manufacturer can't supply a certificate, AXT has to be measured in the field by the installer. The applicable field test standard is Class E_A, according to ISO 11801. Due to the theoretical amount of testing necessary to certify a complete installation, standards only call for sample testing. The installer has to choose a number of short, medium and long cables as so-called 'disturbed' cables. After selecting the 'disturbed' cables, the user has to select for every 'disturbed' cable a number of 'disturbers', that is cables that potentially can interfere with the 'disturbed' cable. The biggest difficulty in AXT testing is sample selection. Since only a few percent of the complete installation will be tested, the selection of samples is very subjective. Therefore, AXT tests may produce different results depending on the samples selected.



SLIMFLEX: THE FLEXIBLE SOLUTION

The increase in demand for cabling in data centres has led to space and density problems, as more and more cables compete for space. Increased amounts of patch cables and larger volumes of cable under the floor and in ceilings call for innovative solutions. The LANmark-OF Slimflex product family offers a practical answer.

“In studies, data centre managers indicate one of their key problems is the fear of network failure,” claims Joost Grillaert, Product Manager Fibre Products Nexans. “One of the biggest risks in this area is patching. Patch cords aren’t always applied as they should be. Installation rules are not always followed and the limited bend radius of patch cords isn’t always taken into account. Too many bends, or overly sharp bends, can lead to a vast attenuation increase making applications fail completely. Furthermore, every time you add a connection in a ‘cable spaghetti’, you might pull or strain other patch cords without even realising it. Keeping things tidy is also vital.

“The concept behind the Slimflex patch cord is to take away data centre managers’ concerns by minimising the risk of signal loss as much as possible. This is done by vastly reducing patch cables’ bend radius from 40 mm to 7.5 mm in any direction with the use of GIGALiteFLEX bend insensitive fibre. In addition, the sheath material is more flexible than standard cabling.

“Another advantage is the use of a unified single connector instead of two separate connections joined together, which allows easier handling - and looks better, too. Furthermore, it is much easier to keep connections tidy and well-organised.”

GOOD HOUSEKEEPING

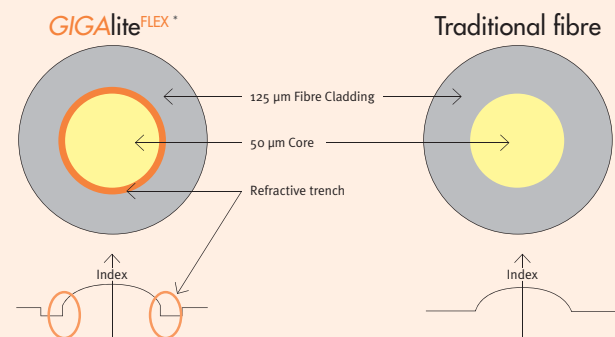
“We differ from competitors in the sense that we only employ bend-insensitive fibre where it actually makes a difference. The cables between racks themselves don’t require bend-insensitivity, as this would only add to the cost in a big way. Although pathways, trunking, cable trays and so on may fill up as the server count increases, these cables are generally installed according to strict manufacturer’s bend radius limits and industry standards. The same is true for fibres coiled in the back of patch panels, which remain static once installed. The real need for Bend-Insensitive MultiMode Fibre (BIMMF) is in patching zones, where fibre patch cords can be tightly packed around tight bends and subjected to further displacement. Here, bend radius limits might

be exceeded as patch cords are forced into tighter spaces or moved to make way for new additions.

“Slimflex uses Nexans GIGALiteFLEX advanced fibre inside, that has a very tight bend radius specification and no compatibility issues with other traditional fibres. It operates up to 10G, and we’re developing GIGALiteFLEX bend-insensitive solutions for 40G. Of course, installations and cable housekeeping should still be carried out with the greatest possible care. Using Slimflex is an extra guarantee for solid operation, but not a license for careless patching. 1G is slightly more forgiving, but with 10G and 40G, there’s no room for error. Ensuring patching is fault-proof and loss-free is becoming more important than ever.”

BEND INSENSITIVE MULTIMODE FIBRE PRINCIPLE

Macro-bending sensitivity of a multimode fibre can be improved by adding a refractive index trench just outside of the core.



* GIGALiteFLEX is Nexans advanced fibre featuring very tight bend radius specifications and no compatibility issues with traditional OM3 and OM4 fibres.



A CLOSER LOOK AT DATA CENTRE TRENDS

Today, tomorrow and the distant future

Data centres today are facing significant and often radical network and technology changes. What developments and trends do experts at Gartner and the Trans-European Research and Education Networking Association see in the immediate and distant future? What steps can network planners take now to make sure they're prepared for the next generations? What will our data centres look like a few decades from now? >>

According to leading technology analyst firm Gartner, we're seeing a total increase of some 30% in enterprise bandwidth requirements, largely driven by growth of application and internet use. Demand is set to grow even further by server virtualisation, the analysts say. Virtualisation allows resources to be pooled and presented to users as discrete devices, or Virtual Machines (VMs). This is in keeping with the methods and tools users are already familiar with, where functions are assigned to specific pieces of equipment. Taking this approach makes servers efficient and applications mobile. To keep up with the increasing demand, network architects will have to increase bandwidth density over the next two to four years, Gartner says. Designing networks with room for growth in all aggregation points is recommended.

switch types. In Gartner's view, a carefully planned evolution roadmap is vital to accommodate significant - and not always backward-compatible - technology and product evolution. In some cases, IT managers are already upgrading hardware to the next server generation, sooner than might be absolutely necessary.

LOOKING AHEAD WITH TERENA

Peter Szegedi is a Project Development Officer with TERENA, the Trans-European Research and Education Networking Association. "We facilitate collaboration, innovation and knowledge sharing, aimed at developing networks, infrastructure and services used by the research and education community. Our National Research and Education Networks, or NRENs, are highly advanced in terms of

"For the future, I can imagine a global dynamic optical network as a unified transport layer below IP networks going up to 400G lightpath and beyond."

PETER SZEGEDI, PROJECT DEVELOPMENT OFFICER, TERENA

"Designing networks with room for growth in all aggregation points is recommended. That means dual 10 Gb/s connections to each physical server, and updating the aggregation to 40 Gb/s, or even 100 Gb/s."

GARTNER

That means dual 10 Gb/s connections to each physical server, and updating the aggregation to 40 Gb/s, or even 100 Gb/s.

RISE OF THE VIRTUAL MACHINES

Gartner predicts networking needs of virtual switches will increase over the next two to three years. Internal traffic between servers will increase significantly as a result of virtualisation, new applications and application deployment models. To manage business application performance, data centres must focus on network traffic analysis and management. Furthermore, live VM migrations will require a significant redesign of the network.

The analyst firm also sees network architectures moving from a traditional tiered-tree network topology to a flat-meshed Layer 2 topology and recommends network planners prepare for this. Data centre networks will evolve to support 'fabric computing'. This revolves around flexible interconnection of nodes and requires new network design practices, technologies and

technology and services. Therefore, they can offer us an idea of what the future may hold for other networks."

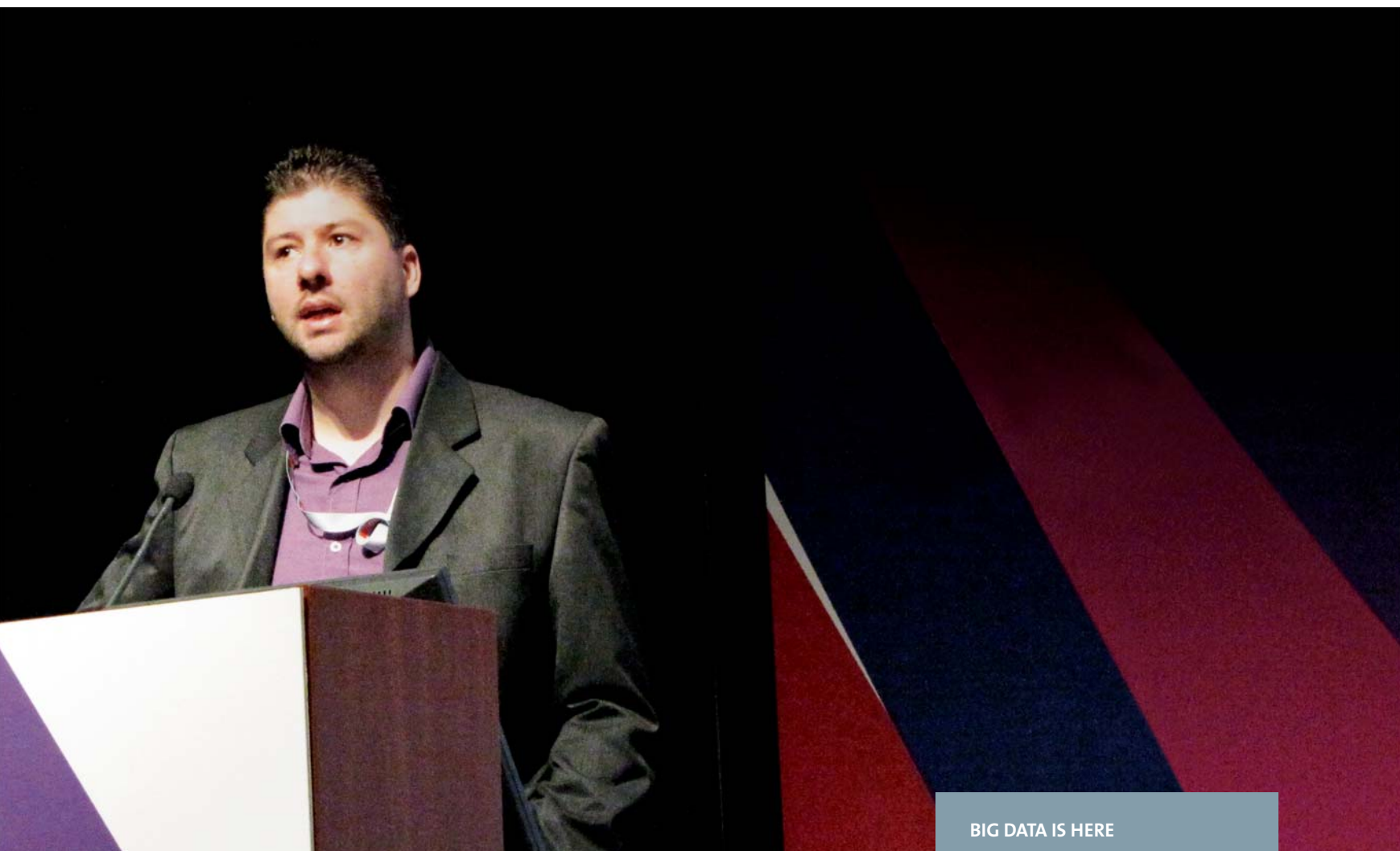
INTELLIGENT MANAGEMENT

"Today, a key goal is preventing data bottlenecks. Available bandwidth is quite sufficient for most scientific applications - as long as it is managed and controlled in an intelligent way. A great deal of research is, therefore, not about increasing speed, but managing and controlling bandwidth efficiently. Right now, NRENs are very active in experimental bandwidth-on-demand services, which means examining control and management issues, optical transport technologies, and standardisation. For example: connecting LANs across multiple core network domains requires new interoperability protocols for end-to-end optical connections, i.e. lightpaths. NRENs offer an ideal opportunity to test lightpaths, provide 'proof of concept' Open Lightpath Exchanges and feedback on standards. "For the future, I can imagine a global

dynamic optical network as a unified transport layer below IP networks going up to 400G lightpaths and beyond. A dedicated control plane would provide connections on demand - automated protocols will check a path, book the necessary bandwidth, and then provision an end-to-end connection. So whenever you need to use a high-bandwidth application, you can claim the necessary resources anywhere in the world. Standardisation body OGF has already introduced a Network Service Interface (NSI) protocol which allows end-to-end connection setup between optical network domains."

OPEN FLOW

"Another interesting development is the idea behind Open Flow: a core network framework switching technology written into the Ethernet standard, developed by Stanford University. This makes Ethernet switches and infrastructure more open and flexible, allowing users to switch



between ports more flexibly. Users can identify information flows and specify their own links. Researchers are now using this to test revolutionary new protocols and experimental infrastructure, with existing switches.

“By separating the switch control plane from the transport plane, users can implement new, unique controls and switching protocols. They can create their own virtual networks by ‘slicing up’ physical infrastructure, and create an experimental infrastructure in minutes by specifying nodes, routers and capacity. For network managers, this means that they no longer need to reserve the largest possible amount of bandwidth for all users, all the time.”

MORE DATA CENTRES

“To reach economies of scale, we also predict that in the future we’ll see far more data centres around the world. Many of these

will be relatively small, and they will be more networked with lightpaths. Chunks of information can be massively distributed, and protocols like Bit Torrent can collect all the bits, put them together and almost instantly provide the user with vast volumes of data and lightning-fast services. If we look even further ahead, the possibility of ‘freezing’ light pulses may well revolutionise data storage and transport completely...”

To summarise: experts predict an unprecedented boost in requirements for the near future - some think that means introducing much more bandwidth, others believe that optimised management of available bandwidth or advanced peer-to-peer connection technologies will provide a solution. However, the most probable solution will combine elements of all these approaches from all – more bandwidth, more data centres, more interconnection and better management and control.

BIG DATA IS HERE

The amount of data we create is growing at a staggering rate, especially with the rise of social media, advanced business applications, online transactions and mobile options. According to IBM, some 2.5 quintillion bytes of data are created every day. What's more is that 90% of all data in the world has been created over the past two years. A recent study from Omikron Data Quality reveals one in four companies increases their business data by 50% or more every year. All this data can provide society, education and business with vital insights - if stored, collated and harnessed correctly. However, Omikron's survey also showed that 29% of those questioned hadn't dealt with the subject at all, and some 54% couldn't identify any use for 'big data'.



BRICKS, BYTES AND BEHAVIOUR

WELCOME TO THE SMART WORKPLACE

Cable the future spoke with 'new way of working' experts Michel Mooij and Gerard Verwoolde on the future of our workplace and the consequences on the network level.

Michel Mooij



As industrial societies develop into information societies, traditional working methods are changing accordingly. 'The Smart Workplace' concept implies a whole new way of looking at how, when and where we work. Cable the Future takes a look at the benefits, the requirements and the implications for networks.

The concept commonly referred to as the New World of Work, Result-Oriented Working Environment, or Smart Workplace, is essentially a workplace infrastructure that engages with employees in a far more flexible manner than before. It revolves around self-regulation, collaboration, communication, and sustainability, which are enabled and supported by new, non-intrusive technologies. This philosophy has been adopted successfully by many companies and institutions worldwide. Buildings are now used in a different way, as permanent offices, cubicles and desk positions become a thing of the past. An increasing number of people are working from home and in public spaces - but they still require and expect the level and quality of access and connection they have grown accustomed to in the office. Increased computer processing power, uptake of smartphones, laptops and tablets, rollout of fibre optic networks, the advent of cloud computing and advances in wireless technology are making this possible. Also, employees are increasingly taking their own laptops, tablets and smartphones to the workplace and hooking up to the local wireless access - a development commonly referred to as 'Bring Your Own Device' (BYOD). Combined with the right software, the Smart Workplace enables all kinds of remote, real-time communications as well as advanced, secure data access and application sharing. In turn, this leads to greater efficiency and productivity. However, to successfully adopt the Smart Workplace, organisations and employees need to rethink the physical infrastructure, working hours and IT.

HOLLAND GETS SMART

The Netherlands is one of the first countries to embrace the Smart Workplace on a significant scale. Last year, a nationwide study amongst 3,500 professionals in

different lines of work, organised by leading educational publisher Kluwer, showed that more than two thirds of all respondents work at home one or more days a week. "For me, 'smart working' is not just about being able to work anytime, anywhere," states Michel Mooij, architect, founder of Workspace Consultancy, and one of the country's leading experts in this area. "Instead, I see it as a new vision on working, embraced by early adopters of the latest information and communications technologies."

"Smart working isn't just about being able to work anytime, anywhere; it's a new vision on working."

**MICHEL MOOIJ, FOUNDER
WORKSPACE CONSULTANCY**

"Although the lower cost of offices and transport has the most visible, immediate effect, the real gains are in mid- to long-term productivity enhancement. Of course, several things need to be considered beforehand. Companies must promote a clearly-defined culture, offering staff a sense of unity and shared goals and values. Also, as there are no clear cut-off times, some people can find it difficult to stop working in the evenings or on weekends. This is something managers need to keep an eye on. Trust is also essential. Only results should count, not whether people have put in a specified number of hours or not. This allows employees to work whenever it suits them best, but they must be allowed to take responsibility and be

capable of doing so. Another risk is not doing the implementation fully. If you just try and save on office space without promoting a Smart Workplace culture, you will almost certainly fail."

FORM FOLLOWS FUNCTION – AND VICE VERSA

"Looking at the architectural aspect, hard and fast rules for office design no longer exist. Instead, you need to adopt a different way of interacting with buildings. You have to look at the structure of a building as well as the needs of the people and organisation. Then, you divide the space into zones based on functionality, such as open project areas for collaborations, or cubicles for those who need to focus undisturbed. This is largely dictated by common sense: meeting areas should be placed near an exit, for example, so people coming and going don't disturb others who are trying to concentrate. All in all, Smart Workplaces require a different approach to 'the old days' when everyone occupied a fixed spot during office hours and the type of room dictated its function. In the new workplace, the technology infrastructure must be flexible, allowing people to make their own decisions about when and where to work. A network should more or less follow the overall zones into which the building is divided, according to functionality and employee needs. Often, people think all you need to do is simply provide lots of wireless capacity. But some applications require far more bandwidth than others, and specific tasks are always carried out in the same place. There could be zones where people only require enough bandwidth to check their email, but there might also be office-like areas for more demanding projects, requiring faster data streaming.

"For network designers, things are changing too. It's no longer all about simply carrying out clients' wishes regarding infrastructure capabilities and hardware placement. Instead of putting in as many cables and ports as possible, the Smart Workplace requires placing them in the right places, whilst keeping the system both flexible and manageable. It's all about the alignment of bricks, bytes and behaviour. Defining usage patterns will give system designers an idea of the general outlay, but this is kept as flexible and easily configurable as possible."

ROLE BASED ACCESS

Gerard Verwoolde, ICT Advisor at Hogeschool Utrecht University of Applied Sciences, is an enthusiast who has built up considerable experience in the field, following a large-scale roll out of the concept of Activity Based Working at the educational institution.

"Formerly, IT departments determined what was and wasn't possible, but now the user has a say, too - within certain restrictions, of course. The IT department, now more than ever, has to do its best to accommodate user wishes. Data has to be accessible any time, any place and on any device. This means introducing multiple layers of access, so that some sensitive data can't be accessed from home, for example, but can be seen in the office. Users are assigned different roles, and these determine the kind of data they can see, and their level of access."

MORE THAN SPEED

"The underlying network accommodates as much storage and high-speed data transport as possible, but it's not only about speed. Any up-to-date LAN can support Smart Workplace functionality. Some things definitely need to be checked prior to rolling out. Older firewalls might not support layered access, for example. Many functionalities are determined by software, so you can run into problems when combining these new functions with legacy systems.

"You also have to make sure data can be streamed to any device, whether it's a fixed thin client, a smartphone, a tablet or somebody's computer at home. The practice of bringing one's own device presents a challenge, as our IT department has no control over the software versions and

6 BENEFITS of the Smart Workplace

1 COST

Less costly workspaces, housing, cleaning, security, adaptations and changes to office infrastructure. You can save a lot of time, and use it more efficiently.

2 FLEXIBILITY

Organisations become more dynamic and more adaptive to change.

3 DISTANCE

People can interact with clients, move about and be part of networks. Activities and contacts are more diffused. It's also easier for teams in different locations to work together.

4 LIVING THE BRAND

Company vision and mission is translated to human interaction. Google, for example, has built its working culture around the brand.

5 CAPTIVATE AND KEEP


Organisations can attract a young generation that has grown up with social media and IT, involve them and make them feel at home.

6 SUSTAINABILITY

Improved use of resources and lower CO₂ output.



source: Workspace Consultancy, www.michelmooij.com



“Formerly, IT departments determined what was and wasn’t possible, but now the user has a say, too.”

GERARD VERWOOLDE, ICT CONSULTANT
HOGESCHOOL UTRECHT

Gerard Verwoolde

CABLING THE OFFICE for Smart Working

Operating Systems people choose to run on. We provide plenty of wireless bandwidth, besides fixed connections with cables, as it doesn’t make sense to use wireless when you’re sitting at a desk.

“Introducing a large number of wireless and wired access points requires a significant amount of high-bandwidth cabling. By introducing a number of sensibly distributed consolidation points, which are basically groups of outlets, cables can be easily run to fixed or mobile outlets, to which devices can be connected. Data safety is a concern, so we have to make sure not to leave devices lying around and unattended computers are logged out. Another vital thing is making sure presence information about who is available where and when is up to date. You have to know where people can be found - even when they’re in the same building - in case you need to speak to them or plan meetings. Everyone has to be really disciplined about managing their agenda.

“All in all, this approach fits perfectly with our philosophy of lifelong learning. This means that we acknowledge and promote continuous training and education for our students and our employees. There are many advantages to Activity Based Working. The most obvious one is more freedom to plan your day, which leads to greater productivity and efficiency as well as happier staff. In my case, it means far less travel time and less CO₂ output on days when I don’t have to go to the campus. One of my colleagues now enjoys taking his kids to school in the mornings and still is as productive as ever. Activity Based Working is about the results, not the hours, and everyone has reacted positively to this. However, we have had to adapt our organisation, ways of working and how we use our buildings. Managers have also taken time to coach individual users, looking for the best ways for them to engage with the Smart Workplace. But once everybody has adopted it, nobody wants to go back.”

- 1 Use fixed high-speed 10G ready connections from the comms room to the consolidation points
- 2 Use consolidation points in both floor and ceiling locations to provide for Wireless Application Protocol
- 3 Use flexible easy-to-move zone distribution cabling from consolidation points to the workplace, where needed
- 4 Allow for extensive use of powering devices using data cabling (PoE+)
- 5 Monitor and manage devices and track who is connected to the network (when and where) in real time, with intelligent infrastructure management

Smart energy: Europe's Data Centre Code of Conduct



The European Commission Code of Conduct on data centre efficiency consists of a series of voluntary compliance measures, designed to reduce the sector's power consumption. Cable the Future spoke to Paolo Bertoldi, of the EC's Directorate General Joint Research Centre (DG JRC), manager for the entire project.

"The Data Centre Code of Conduct was introduced in 2008," explains Paolo Bertoldi. "At the time, there was no European policy active specifically aimed at improving data centre energy efficiency. However, regulation in this area is very important as data centres use quite a large amount of energy, and this is increasing. In Western Europe, data centres used 56 TWh in 2007, which we predict will rise to 104 TWh in 2020."

"Besides keeping the servers up and running, a tremendous amount of power is required for cooling. Although many data centres were already quite efficient, power consumption could still be reduced significantly by introducing relatively simple measures. These are described in our best practices and range from optimising the distribution of electricity to improving design, configuration and management of cooling systems and virtualisation of services."

COURSE OF ACTION

"Existing data centres that sign up to the code are required to submit initial energy usage measurements over a period of at least one month. Then, an energy audit takes place to identify where savings can be made. The next step is to submit an action plan, including a list of intended best practices. Also, energy consumption is to be monitored on a regular basis and the DG JRC is to be provided with an annual report outlining any improved energy efficiency practices that have been introduced. Besides saving power and lowering carbon emission, the Code of Conduct has also been developed in order to raise awareness."

"I've been interfacing constantly with data centre experts and industry and involvement has been good. Agreement among all parties was reached fairly quickly and easily. Companies are very interested to hear how they can save energy without compromising on quality. So far one hundred providers and



Paolo Bertoldi

“In Western Europe, data centres used 56 TWh in 2007, which we predict will rise to 104 TWh in 2020.”

PAOLO BERTOLDI, MANAGER DG JRC

data centre service operators and owners have agreed to adopt our best practices and report energy consumption. Furthermore, consultants and equipment designers and manufacturers have expressed their commitment to making all elements more energy efficient.”

SPREADING THE WORD

“However, there are still thousands of data centres across Europe which we’d like to subscribe to the Code of Conduct. At the moment, we’re putting a great deal of effort into getting more data centres to report trends and energy savings figures. So we’re trying to promote the Code Of Conduct at conferences and we’re relying on the vendors, who have daily contact with the data centres, for support.”

Visit our website for more information on the Code of Conduct:
www.nexans.com/eucode

ELECTRICITY CONSUMPTION IN DATA CENTRES

The electricity consumption of data centres may be as much as 70% higher than previously predicted. The combined electricity demand of the internet/cloud (data centres and telecommunications network) globally in 2007 was approximately 623bn kWh. If the cloud were a country it would have the fifth largest electricity demand in the world. Based on current projections, demand for electricity will more than triple to 1,973bn kWh, an amount greater than the combined total demands of France, Germany, Canada and Brazil.

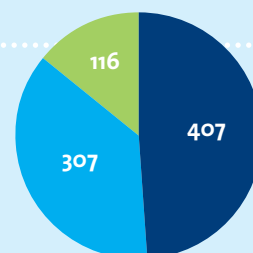
Source: Greenpeace report ‘Make IT Green: Cloud Computing and its Contribution to Climate Change’

Estimated GHG Emissions of ICT Sector:

MtCO₂e - Million Tonnes Carbon Dioxide Equivalent

Emissions 2007 (MtCO₂e)

- Data centres
- Telecoms and devices
- Computers and devices



iClimate Group and the Global e-Sustainability Initiative (GeSI) 2008.

Smart 2020: enabling the low carbon economy in the information age.

EMAC: NEXANS' ENERGY WATCHDOG

A large data centre can consume as much energy as an average-sized town. Data centres today require more power, and need more cooling, whilst the need to operate efficiently, cost-effectively and sustainably is increasing. This makes precise management information and control more critical than ever. To optimise monitoring and identify possible improvements, Nexans Environmental Monitoring and Access Control (EMAC) range includes intelligent power management capabilities which meter actual power usage and produce trend data for groups of physical systems.

- Adequate capacity for existing & future needs
- Monitoring, measuring and reporting of power usage via multiple clients
- Billing stream capability for hosted clients
- Prevention of unauthorised use of power outlets / equipment deployment
- System load management (phase balancing, capacity planning, etc.)
- Recovery of locked servers via remote IP power cycling
- Alarming & trending of system, rack, powerstrip and outlet level overload conditions

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.

SUPPORT FOR 40 Gb/s NEXT GENERATION COPPER CABLING

The recent formation of an IEEE study group confirms there will be life for copper cabling after 10GBase-T. This recognises the fact that copper cabling could accommodate 40 Gb/s or higher and is particularly useful for Ethernet topologies used in data centres, as it is easy and cost-efficient to upgrade. A Call For Interest on Next Generation BASE-T or NGBASE-T (twisted pair cabling) has been approved by IEEE in July 2012. This has led to a Study Group within IEEE, which had its first meeting in September 2012. The Study Group has fixed the data rate at 40Gb/s and started to define further details, such as coding schemes, distances and frequency.

ISO and TIA have demonstrated that balanced cabling has sufficient capacity for 40G Ethernet over four twisted pairs. It is widely believed that the cabling for NGBase-T will be shielded to prevent Alien Crosstalk. Furthermore, reduction of distance from the 100m target will be necessary, as insertion loss at higher frequencies can become so severe that 100m would require too thick AWG21 cables, with an outer diameter not less than 10mm. It is also already understood that 500MHz will not be sufficient, however, anything from 1000MHz to 1600MHz will be evaluated by IEEE's study group during the coming months and years.

In the meantime the international cabling standards community is developing a clear vision of supporting Ethernet speeds higher

than 10 Gb/s with copper cabling. Two proposals in particular affirm this. Last year, the TIA Copper Cabling Subcommittee set up a new greater-than-10 Gb/s copper-based Ethernet cabling project. In October 2012, TIA agreed to study on a new cabling category (Cat.8) based on current Cat.6_A cabling parameters but with an extrapolated upper frequency limit to 2GHz. This new cabling standard is expected somewhere in 2013/14.

A second interesting proposal in this area was already put forward in October 2011.

ISO/IEC initiated a proposal to develop twisted pair cabling capable of supporting 40G. The performance capabilities of existing 'Classes' will be addressed as well as enhanced performance channels.

The working group have had two meetings this year. In September it was decided to submit a technical report to IEEE802.3 for consideration when they define the NGBase-T protocol. The report has two parts:

The first part describes channels made out of existing and already standardised components like Class E_A and F_A.

A second part describes channels made out of components that have not yet been standardised, and potentially may require development. The section contains two new sets of channel performances, both of these are specified to 1.6GHz. The first of these is similar to the TIA Cat.8 approach, but the second shows a further increase of performance and is based on an improved version of ISO Cat.7_A.

Its preliminary conclusions are that existing EA channels could support 40G only up to 10-15m, while Class F_A channels could support 40G applications up to 50m. It therefore is a valid option for IEEE to specify the new 40G protocol over existing Cat.7_A components, probably as a 2 connector model to around 50m.

Both of these programs of work are designed to support the ever-increasing demand for

“Cloud computing is a hot topic, and its exponential growth is having an impact at all network levels.”

bandwidth as use of the cloud grows and Exabytes of data have to be moved around in data centres for mirroring and backup purposes.

Nexans continuous commitment to support these high grade cabling developments is confirmed with LANmark-7_A and GG45 connector, which features backwards compatibility with RJ45. With these products, Nexans is already supporting bandwidth up to 1500 MHz and will be offering support for higher frequencies. Nexans believes these solutions stand a good chance of supporting the new 40G Ethernet application when it will become available.



AUTOMATED INFRASTRUCTURE MANAGEMENT: READY TO ROLL

International standards bodies ISO and IEC have recognised the commercial maturity of Automated Infrastructure Management (AIM), also known as Intelligent Infrastructure Management (IIM), which traditionally has been used to manage only the physical layer.

A New Work Item Proposal now exists to develop an Annex to ISO/IEC 14763-2 which will explain the basic functionality of AIM systems and allow a benchmark to be set. This will make them easier for consultants and end users to specify and will hopefully aid their widespread adoption.

However, there appears to be considerable interest in higher level standardisation and a second phase of work is planned which addresses the interaction with other systems that deal with business management, human

resources, fire safety and so on. This initiative will attempt to bring some standardisation to 'higher functioning' AIM systems like LANSense which do more than just manage patch cords.

CLOUD COMPUTING: BIG INFRASTRUCTURE CHANGES

TIA has produced a CLOUD white paper on the basis of a federal mandate on access and neutrality. TIA has also prepared recommendations drawn up in accordance with five key areas for standards development initiatives:

- DATA CENTRE, fabric and architecture
- M2M, machine-to-machine
- STEP, sustainable technology environmental program
- EM, energy management, (for example in relation to building automation systems)
- Network Infrastructure Security

For Data Centres, the result could be a change in network models, as the aggregation layer is collapsed and a more 'east to west' traffic pattern emerges.

Cloud computing is a hot topic, and its exponential growth is having an impact at all network levels.

The STEP program is designed to complement LEED and BREEAM activities which currently take no account of technology drivers and can actually make energy efficient technology advances difficult to implement. TIA, like the ISO and CENELEC standards organisations, are currently looking at Network infrastructure security as well as Green data centres, Green IT, Power over Ethernet (PoE) and Building Management Systems for energy efficient IT implementations within buildings of all types.



- **ISO:** The International Organization for Standardization
- **IEC:** International Electrotechnical Commission
- **TIA:** The Telecommunications Industry Association represents the global ICT industry through standards development, policy initiatives, business opportunities, market intelligence and networking events.
- **CENELEC:** Comité Européen de Normalisation Electrotechnique, The European Committee for Electrotechnical Standardisation

- **LEED:** Leadership in Energy and Environmental Design: internationally recognized mark of excellence providing building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.
- **BREEAM BRE:** Environmental Assessment Method: global measurement rating for sustainable buildings, established in the UK by BRE (Building Research Establishment).
- **ISO/IEC 14763-2:** Part of ISO/IEC 14763

specifying requirements for the planning, installation and operation of cabling and cabling infrastructures in support of generic cabling standards.

- **ISO/IEC 11801:** International standard specifying general-purpose telecommunications cabling systems (structured cabling) suitable for a wide range of applications.
- **IEEE:** The world's largest professional association dedicated to advancing technological innovation and excellence, The Institute of Electrical and Electronics Engineers has over 400,000 members and is renowned for its publications, conferences, technology standards, and professional and educational activities.

ENSURING A SAFE, EFFECTIVE AND FUTURE-PROOF MIGRATION

Fast, faster, 100G

After ratification of IEEE 802.3ba in 2010, more and more 40G and 100G ethernet switches and routers started showing up. But upgrading means more than just adding faster routers, switches and cables. Though the upper-layer network may remain relatively unaffected, migration requires physical level changes, especially with regards to cabling.



BACKWARDS COMPATIBILITY: NO LONGER CERTAIN

In the past, great care was taken that each new category would offer full backwards compatibility and existing copper cabling could stay in place. To run everything at a higher speed, you just bought a new switch. However, this will change in the future. Both 40G and 100G use new connectors and the transmission media no longer offer full backwards compatibility. In fibre, a new MPO connector needs to be used for the higher speeds and in copper, an interface other than RJ45 is likely to be chosen. For a data centre, this means the infrastructure required to run 10G looks very different to the infrastructure needed for 40/100G, and the migration requires careful planning.

KEEP IT TIDY AND UPGRADE-READY

Building a 10G fibre data centre today requires 2 fibres and 2 connectors per port. Upgrading to 40G in a few years requires 8 fibres per port. Multifibre connectors (MPOs) are part of the new standard. So migrating means combining four 10G links into one 40G link, consolidating four fibres and introducing a new connector. When you go from 2 to 8 fibres - or, in the case of 100G, 20 - things can get messy. That's why many people today are already pre-cabling and laying 8 fibres per port. With an assembly such as an MPO cassette module, investments can be future-proofed, as the number of cables can be expanded later. It is also possible to introduce a 40G capable backbone and cabling already, and only use part of that capacity for now. This makes a future upgrade fast and easy and is recommended for networks that can't be shut down, even for a day.

CHECK THE ENTIRE SYSTEM

Applications, databases and server farms might not be affected by faster interfaces. Migration could, however, require upgrades to network management systems and security devices, such as firewalls

“Cabling lasts 15 years, whilst the lifetime of active equipment is three to four years, so the cabling infrastructure will be seeing several generations of active equipment.”

and intrusion detection systems. These need to offer the same service quality, but at a higher speed and data load. Some monitoring and management gear may not be able to keep up with higher rates, so it pays to check in advance.

THINK BEYOND THE BUSINESS PLAN

When making infrastructure decisions, it's best to think one - or better still: two or three - active equipment generations ahead. Cabling lasts 15 years, whilst the lifetime of active equipment is three to four years, so the cabling infrastructure will be seeing several generations of active equipment. A Cat.6A copper solution might look interesting today, but it won't support 40G moving forward. Fibre duplex circuits won't be able to handle higher speeds. Data centre owners may argue their business plan or commercial strategy only covers the next five years or so. But in reality, their facilities will be around much longer, so it makes sense to plan further ahead. Cabling represents 5% of the total network investment value, at most, whereas 95% is spent on active equipment. Reserving 5.2%, for example, for cabling means you're prepared for the next generation or two and is money well-spent.

LAN/SAN convergence: best of both worlds?

In most data centres, an Ethernet-based Local Area Network (LAN) connects servers to clients, whilst a Storage Area Network (SAN) links servers to storage devices. Converging these two separate, parallel networks can simplify and reduce equipment requirements, cut the number of cables to and from the server and improve transmission speeds. But do the benefits outweigh the investment in cost and time for every type of application and user?

“Servers generally have a Fibre Channel port for SAN traffic and an Ethernet port for LAN traffic,” explains Harry Forbes, CTO Nexans Cabling Solutions. “Combining these into a consolidated FCoE (Fibre Channel over Ethernet) I/O port, results in a ubiquitous, plug and play Ethernet network, which doesn’t require a great deal of specific skills for management and deployment. Converging the LAN and SAN simplifies network management under a single software platform. Hardware costs are lowered by reducing the number of active devices and cables. You can cut the time spent on cable management, as there are less cables per server, and save on space, power, cooling and system management.”

The Fibre Channel Industry Association’s FC-BB-5 standard only allows Fibre Channel over Ethernet traffic sharing between two devices. The new FC-BB-6 standard enables multihop - communication between two end nodes through a number of intermediate relay nodes - over many devices. This brings greater design flexibility, simplicity and expands FCoE throughout the data centre.

POWER USERS

“Anyone dealing with high volumes of data traffic and storage could benefit from convergence, as well as users who want to reduce power consumption. For every Watt of power used, you create heat, which requires energy to cool. So when you don’t

need to power as many ports, energy consumption for active IT devices and the associated cooling drops significantly. A range of new IEEE protocols has helped make Ethernet lossless, which enables convergence. On a typical Ethernet LAN, dropped data packets are re-transmitted and Transmission Control Protocol (TCP) puts them back in the correct order. That’s acceptable in certain applications that are not time sensitive, such as downloading a text file, for example. However, Fibre Channel traffic, can’t tolerate any latency or loss of data packets. Storage data has to arrive very quickly in the correct order and therefore FCoE devices need to comply with the latest IEEE Data Centre Bridging standards.”

LOOKING AHEAD

“The more switches and network ports you have in your network, the more latency is introduced. Cloud services and mobile apps are driving a lot of traffic between servers that now have to run multiple applications. This can lead to congestion. Low latency is more vital than ever and convergence certainly offers some advantages there. Eventually as Fibre Channel over Ethernet (FCoE) penetrates the marketplace, some new builds could be completely based on this technology. Today, people still want to preserve the investment they have already made in legacy Fibre Channel equipment. So for now, there still needs to be some form of backwards compatibility.”

Harry Forbes



Thinking ahead

Three things to plan very carefully:

- Map network architecture requirements for the next 3 - 5 years
- Implement a cabling infrastructure design strategy to support current and future needs
- Ensure compliance with all the latest IEEE and FCIA standards

LANmark-OF and LANmark-7A

Nexans LANmark-OF cabling and connectivity solutions offer greater speeds, higher patching density, faster deployment and use less cable tray space. Our OM3 & OM4 fibre systems cater for speeds from 10G through to 100G. Our high density patching systems are designed to meet all data centre applications - from server rack to patching frame and SAN. Space savings can be achieved with our range of miniature cables offer. Pre-terminated LANmark-OF cables offers faster deployment. Ease of management is catered for through a variety of hardware and labelling options as well as real time monitoring of the system through LANSense. Nexans LANmark-7A is a revolutionary concept in copper cabling technology. It follows closely behind the ratification of the international ISO/IEC Class Fa standard, supporting frequencies up to 1000MHz. With the potential capacity to support 40 Gigabit applications, it is also fully backwards compatible, supporting existing RJ45 based legacy equipment using the innovative GG45 connector. Migration to 40G can be realised by simply changing patch cords. This solution also offers double the bandwidth and half the crosstalk of Category 6a, maximised energy efficiency and 360° screening, making the cables effectively immune to alien crosstalk.

20 years

Connected to tomorrow



Nexans Cabling Solutions international staff

In the field of Local Area Networks, Nexans has built a 20-year history of success on the ability to turn experience into vision. For thousands of customers around the world Nexans provides the technology, experts and in-depth support that enable them to achieve their goals today, and look to the future with confidence.



www.nexans.com/LANsystems info.ncs@nexans.com