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A matter of opinion

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As artificial intelligence (AI) driven data centres grapple with surging demand for faster data transmission and greater compute density, a cabling conundrum has emerged – whether to use a point-to-point or structured cabling configuration. And it's an issue that is dividing some of the leading industry figures.

Each clearly has advantages and disadvantages. Point-to-point cabling may appear to be the more straightforward option, as it offers direct, dedicated connections between devices and is cost effective. Yet, as the network expands and becomes more complex, this method reveals its limitations – leading to cable clutter and maintenance challenges.

In contrast, structured cabling offers a more organised and scalable solution. It uses a centralised patch panel system that keeps connections neat, making it ideal for large scale, high density deployments that require long-term scalability. However, it requires more upfront planning and a higher initial investment.

It's an important decision and a vital strategic investment, so in this issue's Question Time we've asked a specially selected panel of industry experts to offer their views on the subject and suggest which is most effective – point-to-point or structured cabling. As the responses make clear, it's not as straightforward as it sounds!

Sticking with cabling infrastructure, this issue contains a feature on fibre optic technology that covers a range of subjects. These include how it can support high performance computing, the performance of fibre cables over extended periods of time, and the role of fibre cabling and connectivity solutions in modern railway systems.

Given the heat generated in AI-driven data centres, it is perhaps timely that this issue also has a feature dedicated to cooling and climate management. Richard Collar of Kao Data identifies what needs to be done to cool the AI workloads of the future, while Panduit's Hans Obermillacher looks at the key considerations when it comes to effective data centre climate control.

I hope you enjoy this issue of Inside_Networks and if you'd like to comment on any of these subjects, or anything else, I'd be delighted to hear from you.

Rob Shepherd
Editor

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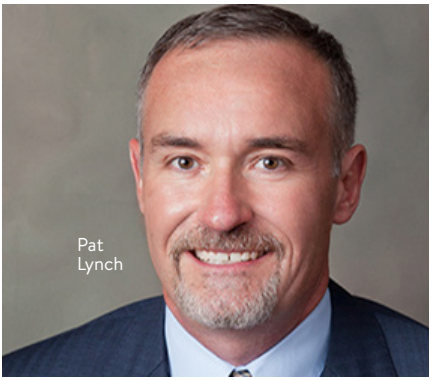
Core data centre markets across the globe race to increase supply as competition heats-up

Demand from hyperscalers and cloud service providers fuelled record leasing volume in the first quarter of 2025 amid widespread adoption of artificial intelligence (AI) and persistent power constraints, according to CBRE's latest Global Data Center Trends report.


Pat Lynch

Limited availability in core markets led hyperscalers to turn to secondary markets, creating new hotspots like Richmond, Santiago, Chile and Mumbai. North America had the largest year-over-year inventory increase in Q1 at 43 per cent, with Northern Virginia remaining the largest data centre market. Atlanta and Phoenix are now the second and third largest data centre markets in North America, respectively, surpassing Dallas and Silicon Valley, now fourth and fifth, for the first time.

'Rising demand is shrinking vacancy and operators with available capacity in key markets are commanding premium rates,' said Pat Lynch, executive managing director for CBRE's Data Center Solutions. 'As supply tightens in core markets, we're seeing rapid growth and investor interest in emerging markets, which are becoming central to global deployment strategies.'

One-third of UK businesses losing up to £4m annually due to network failures

An IDC InfoBrief commissioned by Expereo has revealed that 33 per cent of UK businesses report revenue losses of up to £4m annually due to network outages and poor performance, with another 18 per cent facing losses exceeding £4m. These findings highlight the growing impact of network instability.

Following a wave of high profile IT disruptions over the past year, 50 per cent of UK businesses have urgently re-evaluated their technology infrastructure. As a result, networking and connectivity have risen sharply on the C-suite agenda, with 40 per cent of businesses now prioritising investment in these areas over the next 12 months, surpassing even AI, which falls to third place (35 per cent).


Andy Ward

Andy Ward, senior vice president international at Absolute Security, commented, 'UK businesses are feeling the cost of fragile networks, and while it's positive to see more investment in cybersecurity, tools alone aren't enough. Organisations need a cyber resilience strategy built on real-time visibility, proactive threat detection and self-healing capabilities to maintain continuity in the face of disruption.'

Carrie Goetz publishes 2025 edition of her data centre bestseller

Renowned data centre expert and bestselling author, Carrie Goetz, has published an updated version of her book, Jumpstart Your Career in Data Centers. Breaking down the essentials of data centre design and operations, and with a fresh focus on cutting edge topics like AI, this book explores how data centres work, and how you can work within the industry.

In an easy to digest format, it answers the who, what, where, when, why and how of data centres. It looks at what a data centre is, why this industry matters and why joining its ranks offers lucrative potential. With over 200 job roles showcased, it explains where to find scholarships, trade support, veteran resources and women's initiatives to kickstart your journey.

Goetz commented, 'At the time of the updated release, there were over 500,000 active job listings that include the words data centre. These jobs are for every level of skill and education. We simply have to stop treating the trades as anything less than brilliant. This book helps everyone understand the digital world we interface with every single day.'

If you'd like a copy of Jumpstart Your Career in Data Centers **CLICK HERE.**

UK is one of the most sceptical countries in EMEA when it comes to AI

Research from ServiceNow has highlighted a clear shift in consumer expectations across Europe, Middle East and Africa (EMEA) around AI. Consumers in the UK are the best at spotting AI and despite 54 per cent of them seeing the importance of a good chatbot service, 69 per cent see AI chatbots as efficient but emotionless, often missing nuances like tone, urgency or frustration. Just 55 per cent believe this gap between human and machine interactions will close.

This scepticism increases with age. Whilst 27 per cent of 18-34 year olds in the UK believe AI will never understand emotions, 62 per cent of those aged 55+ share this doubt. Over a quarter of consumers say they are most likely to choose talking to a human on the phone over other forms of channels including AI.

Cathy Mauzaize, president EMEA at ServiceNow, said, 'Business leaders across EMEA risk being left behind if they fail to embrace the collaboration between AI and human expertise. Consumers are no longer satisfied with disconnected, inefficient service. They expect AI to streamline interactions, anticipate their needs and complement human agents, not replace them.'

80 per cent of intellectual property professionals under pressure but most not convinced by AI's power

Research from RWS has found that while 80 per cent of intellectual property professionals face mounting pressure to boost revenues and reduce costs, few are leveraging AI's potential to transform their future. According to 79 per cent of respondents concerns around accuracy and reliability remain the biggest barrier to adoption. Additionally, 62 per cent cite security and data protection as the second biggest barrier.


James Lacey

The research involved in-depth interviews with 312 global intellectual property professionals across legal firms and corporates in 33 countries. Interestingly, eight per cent of those questioned describe themselves as having no interest in or plans for AI and when asked about the expected benefits of AI, efficiencies, better automation and productivity were singled out.

'The intellectual property sector has adopted a cautious approach to embracing AI,' said James Lacey, senior vice president at RWS. 'However, a number of professionals have identified that, when AI is combined with human expertise, it can reshape how teams operate, scale and deliver value.'

Nutanix finds financial services firms are fast-tracking GenAI adoption

Most financial services leaders believe generative artificial intelligence (GenAI) solutions help improve levels of productivity, automation and efficiency. This is according to research from Nutanix, which showed that nearly all the financial services organisations surveyed are currently leveraging GenAI applications or workloads today, with a focus on real-life applications gravitating towards customer support and content development.


Lee Caswell

Despite widespread GenAI adoption, financial services organisations are struggling to keep pace. Most cite a skills gap needed to manage GenAI with existing infrastructure. Moreover, 97 per cent of respondents admit they could do more to secure their GenAI models and applications.

'Financial services organisations are turning to containers and hybrid cloud not just as technology upgrades, but as strategic enablers of customer value,' said Lee Caswell, senior vice president of product and solutions marketing at Nutanix. 'But AI and how organisations want to use it is also changing very rapidly. While GenAI remains a part of their activities, customers are telling us they have moved to adopt agentic AI and are looking to harness its potential across their organisations and in how they interact with their customers.'

Airports face growing data trust challenge as cyber fears land with public

Airports face a growing challenge in passenger trust, with nearly six in 10 UK air travellers worried about the security of their personal data when flying, according to research from Getronics. Despite this, the findings also reveal clear opportunities for airport leaders to strengthen trust, especially around biometric and mobile based travel systems.


Andrew Madigan

Asked whether they agreed with the statement 'I am concerned about the security of my personal data when travelling', 59 per cent of respondents said yes, while 20 per cent disagreed. The remaining 21 per cent were unsure, suggesting that many travellers could still be positively influenced through clear communication and privacy first design. When asked which types of personal data caused them the most concern, 40 per cent highlighted credit card details, followed by 30 per cent who said passport information and 14 per cent who cited contact details.

Andrew Madigan, client director at Getronics, said, 'Travellers are telling us they want convenience, but not at the cost of control. While there is concern, there's also a clear path forward for airports that build transparent, reliable and consent based systems."

NEWS IN BRIEF

The Government Legal Department (GLD), which provides legal counsel to the UK government, blocked nearly six million malicious emails last year, highlighting the rise in cyberthreats targeting critical government services. The data reveals the scale of digital threats targeting the UK government's in-house legal team between May 2024 and April 2025, with 5,904,287 spam emails, 15,852 phishing emails and 1,565 malware threats stopped at the gate.

AWS has announced a $100m investment in its Generative AI Innovation Center to spearhead future AI innovations, especially as it evolves into more autonomous and agentic systems.

Meta plans to significantly expand its AI capabilities by constructing massive data centres across the US, with a view to developing advanced technologies that surpass human intelligence. In an online post, Meta's CEO, Mark Zuckerberg, said the first of these, a data centre named Prometheus located in New Albany, Ohio, is set to become operational in 2026.

Vertiv has entered into an agreement to acquire the Great Lakes Data Racks & Cabinets family of companies for $200m. Great Lakes is recognised for designing and manufacturing customised data rack enclosures and other integrated infrastructure offerings that form the foundation of today's data centres.

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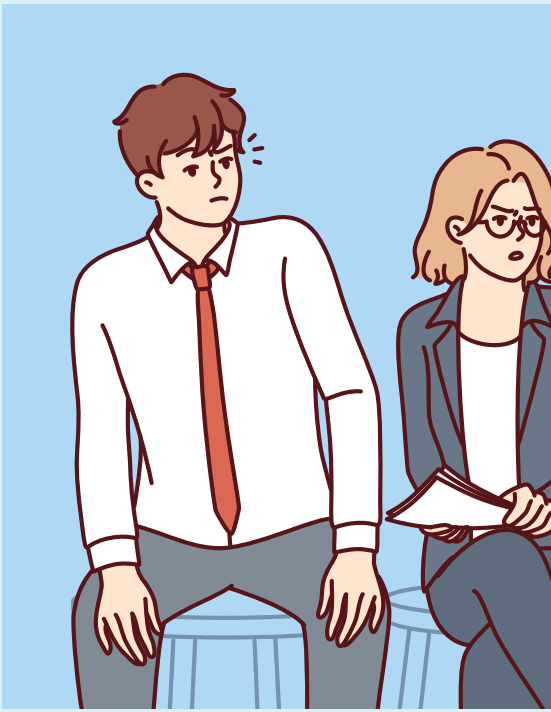
Hi Rob



In the wake of the artificial intelligence (AI) revolution, I think it's only natural that individuals and organisations feel a sense of unease. What I call the fear of AI (FOAI) is very real, and, from my experience as a CEO working closely with this technology, I believe it's not only an understandable anxiety but also a healthy one.

Fear, after all, is a sign that we're paying attention. It means we recognise the power of what's in front of us and that we want to proceed with caution. In my opinion, that's not a weakness – it's wisdom.

AI brings tremendous promise through helping us make better decisions – with benefits including reduced human error and freeing people from repetitive, manual work. At the same time, I've seen firsthand the concerns it raises.

There exists an air of caution both in boardrooms and amongst everyday users of AI. People worry about job displacement, erosion of trust and the potential for AI systems to make mistakes that humans may not recognise. Make no mistake, these are not fringe fears. From experience they are perfectly valid and deserve to be part of a wider conversation.

Particularly in large organisations, I've witnessed the complexity of adopting AI at scale. It's rarely just a technical challenge – it's cultural and strategic. It's also emotional.

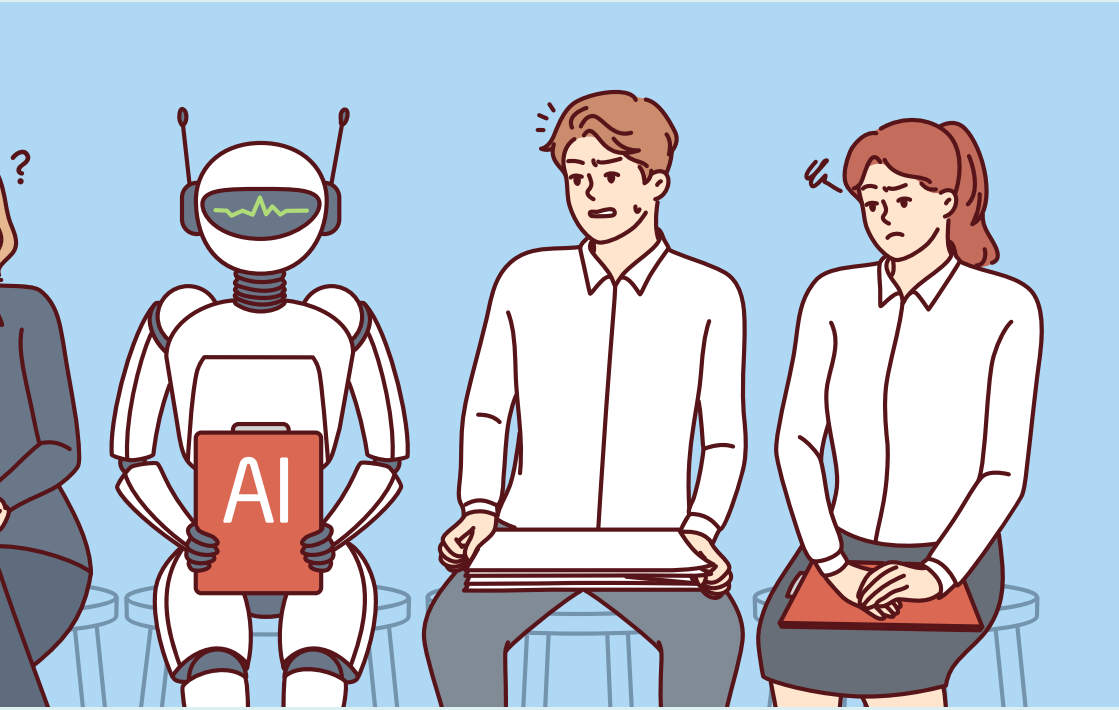
Leaders often grapple with data that's incomplete or inconsistent, legacy systems that don't play well with new AI tools and teams that aren't sure whether AI will be their ally or their replacement. It takes time, intention and communication to get past that fear and build confidence.

Looking ahead, I believe we are just scratching the surface of what AI can do. Tools such as ChatGPT may have captured the world's imagination but, believe me, this is just the beginning. I think that in the not too distant future we'll see AI systems evolve into more autonomous, capable agents that are able to take on complex tasks without step-by-step instructions.

We'll also see more personalised experiences that adapt to the individual, not just the average user. And we must, as a society, invest in building ethical frameworks that guide these systems toward fairness, privacy and transparency.

One of the reasons FOAI exists is that, at times, it can feel like a black box. Often,

e our fear of AI



I attempt to explain in simple terms what's happening behind the scenes.

At its core, a bot uses natural language processing to understand what we say, machine learning to improve its responses over time, and access to data or application programming interfaces (APIs) to provide useful outputs. It's not magic – it's math and code. I think that the more we demystify how these tools work the less intimidating they become.

In the end, I've learned fear doesn't mean we should pull back from AI. It means we should engage with it more thoughtfully. Ask more questions and push for better answers. It's okay to be afraid because that fear, if we channel it wisely, can lead to better decisions, more inclusive innovation and a solid technology that truly serves us all.

Tal Barmeir
BlinqIO

Editor's comment

FOAI, as Tal refers to it, is very real and, as she makes clear, should not be dismissed. At the extreme end, the idea of superintelligent AI surpassing human intelligence raises existential risks, while concerns about loss of control, job displacement, privacy invasion and misuse are not unfounded. That said, AI is here and it's not going away, so we must all play a part in making sure that it acts as a force for good.

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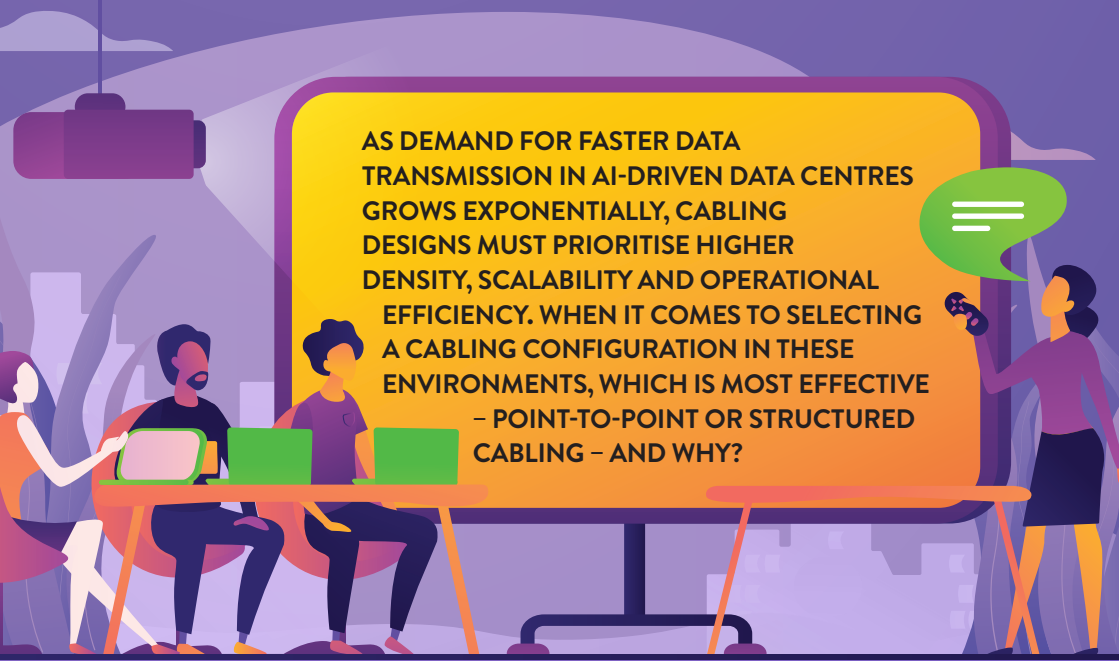
Spoilt for choice

With artificial intelligence (AI) driven data centres expanding at a rapid rate, the pressure to transmit data faster and more efficiently is mounting. This has led to the need for smarter cabling choices, so Inside_Networks has brought together a panel of industry experts to examine whether point-to-point or structured cabling is the most suitable option

In the ever growing world of AI-driven data centres, the demand for faster and more efficient data transmission is intensifying. This calls for smarter cabling solutions that deliver high performance while maintaining effective cable management. There is a choice to be made – point-to-point or structured cabling.

At first glance, point-to-point cabling might seem like the quicker and simpler solution as, after all, it directly connects devices with minimal set-up. However, as infrastructure grows in size and complexity, point-to-point starts to show its flaws. Structured cabling, on the other hand, can seem like a more organised and forward thinking approach, as it relies on a centralised patch panel system that keeps everything tidy and makes it easier to add or change connections. However, initial set-up requires significant planning and capital investment.

So, which option is most suitable – point-to-point or structured cabling? Inside_Networks has assembled a panel of experts to offer their views on the subject.



MICHAEL AKINLA

BUSINESS MANAGER NORTHERN EUROPE AT PANDUIT

As AI and high performance computing redefine data centres, structured cabling emerges as the optimal choice over point-to-point cabling. With deployments involving tens of thousands of graphics processing units (GPUs) and petabytes of data, modern infrastructures demand high density, scalable and efficient network architectures.

Structured cabling does not degrade latency performance. Although it introduces a few extra connectors, the impact on latency, typically within 250ns over 50m, is negligible compared to forward error correction (FEC), buffering and queuing delays. Modern high speed transceivers, such as Nvidia's quad small form factor pluggable (QSFP) devices, operate effectively even with added optical loss, supporting 400Gb/s to 800Gb/s speeds.

AI superpods feature dense configurations. The base structure of a scalable unit consists of 32 server nodes with eight GPUs, plus the leaf and spine connections facilitating the network connections. When these scalable units are expanded to form superpods we then have vast quantities of structured cabling that must be deployed and managed, making point-to-point cabling impractical.

Structured cabling enables streamlined installations, reduces human error and simplifies maintenance with labelled patch panels and colour coded cables. It enhances airflow, reduces cable slack and supports rapid fault resolution through modular patching, minimising downtime.

AI architectures now adopt rail optimised topologies requiring deterministic port switch mapping. Structured cabling enables this precision through documented and labelled infrastructure, unlike error prone point-to-point layouts. Its modularity also supports frequent hardware refresh cycles without disturbing backbone infrastructure.

Though structured cabling involves higher upfront material costs, it delivers long-term savings through standardised components, reduced labour and simplified containment. Most importantly, it minimises downtime.

AI data centres host multiple networks, compute, storage and management. Structured cabling accommodates these layers efficiently, using colour coded segregation to ensure operational clarity and rapid troubleshooting, especially in environments with massive volumes of copper connections. It also enables digital twin modelling, cable mapping and design precision, supporting automation, predictive maintenance and standardised global deployments.

In high density AI GPU environments, structured cabling is not just a design choice, it is a strategic investment. It delivers superior performance, operational agility and future ready scalability.

'STRUCTURED CABLING EMERGES AS THE OPTIMAL CHOICE OVER POINT-TO-POINT CABLING.'

CHRIS FRAZER

PRINCIPAL CONSULTANT AT LAYER ZERO SERVICES

Much depends on what you understand by the term structured cabling. A typical campus/building/floor distributor and telecommunications outlet structured cabling design in a star configuration doesn't directly fit many data centre installations, which are often panel-to-panel links, possibly via an optical fibre or copper distribution frame.

I view panel-to-panel links as point-to-point designs and these are more efficient in terms of minimising the number of connections in a typical data centre link than that used in traditional structured cabling designs. However, there isn't a one size fits all cabling design for every data centre, as there often is for structured cabling in a typical office environment. It should be emphasised that panel-to-panel links, even via distribution frames, are included in relevant cabling standards documents.

The cabling designer must have a good understanding of the network architecture to be deployed in the data centre to design a system to support that architecture. An end of row (EoR), middle of row (MoR) or top of rack (ToR) switch deployment can be much different to a multi-link spine and leaf architecture.

It could be disastrous to simply implement a 'basic' cabling architecture, such as central frame with connections to every cabinet, as that may not provide the connectivity required for the network equipment that is eventually deployed. Then there are questions of fibre core types and quantities to be considered.

I think that using point-to-point, although there is very much a structure to that, is more likely to be the optimum solution for an AI implementation, as it can more easily support AI connectivity than a traditional structured cabling approach. Having said that, it isn't necessarily the case that everything inside an AI-centric data centre is for AI equipment – there are often other connection types to be considered. Today's cabling designers must be extremely knowledgeable and up to date with the latest developments in data centre implementations.

Remember though, a cabling designer can't work in isolation. The cabling architecture must not be the prime factor in choosing the network equipment to be deployed – that would definitely be putting the cart before the horse!

'I THINK THAT USING POINT-TO-POINT, ALTHOUGH THERE IS VERY MUCH A STRUCTURE TO THAT, IS MORE LIKELY TO BE THE OPTIMUM SOLUTION FOR AN AI IMPLEMENTATION, AS IT CAN MORE EASILY SUPPORT AI CONNECTIVITY THAN A TRADITIONAL STRUCTURED CABLING APPROACH.'

DOMINIC ROSS

TECHNICAL ACCOUNT MANAGER GLOBAL STRATEGIC PROJECTS AT SIEMON

When installing cabling for AI-powered data centres, deciding between a point-to-point and a structured cabling configuration is fundamental, especially as the need for speed and data capacity keeps growing. It's not as simple as picking one over the other, as it rather depends on what the project or application calls for.

Point-to-point cables provide direct, individual connections between devices. They are budget friendly and work well for top of rack (ToR) links between switches and servers. They don't use any units in the rack and allow for power savings. Direct attach cables (DACs) consume the least power and provide the best latency performance.

If you have determined the use of high speed cable assemblies for short range point-to-point connections in the data centre, you now introduce some deliverables with substantial commercial benefits. By simplifying cabling infrastructure, cutting the use of costly optical transceivers and using embedded transceiver technology, these assemblies slash upfront capital expenditure.

Operational savings are even more compelling. With, on average, 50 per cent lower power usage and reduced cooling requirements, organisations can significantly cut energy costs and boost sustainability metrics. The results are a leaner, greener and more cost effective data centre in parts – an attractive proposition for businesses seeking high performance without the overhead.

On the other hand, structured cabling offers a centralised and standardised backbone of patch panels, switches and cables – making it ideal for large scale, high density deployments that require long-term scalability. It allows for easy integration of new devices without major rework, supports future upgrades in speed and bandwidth, and promotes easier management and troubleshooting. Structured cabling is particularly valuable in hyperscale or colocation environments where consistency and modularity are key.

Ultimately, the most effective solution is often not one or the other but a balanced mix. By working with experienced partners who offer a full suite of options and an unbiased perspective, organisations can design a cabling strategy that aligns with their technical, operational and commercial goals – ensuring the data centre is not only high performing, but also future ready.

'IT'S NOT AS SIMPLE AS PICKING ONE OVER THE OTHER, AS IT RATHER DEPENDS ON WHAT THE PROJECT OR APPLICATION CALLS FOR.'

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CARSTEN LUDWIG

MARKET MANAGER DATA CENTRES AT R&M

IT architecture is increasingly becoming a network in which every element must be connected to every other element efficiently. As AI-driven data centres face exponentially increasing demands for faster data transmission, the network must evolve into a highly efficient, flexible mesh where every component communicates seamlessly. Supporting this dynamic environment requires infrastructure that accommodates ultra-high speed applications moving rapidly, flexibly and unpredictably through the network – much like an amoeba.

To keep pace, the physical transport medium must be carefully matched to the transmission needs. The optimal transport medium needs to be selected for different parts of the networks.

Copper cabling can still serve low latency, short distance demands within the rack. However, for high volume, long distance data transfer between racks or zones, fibre optics are better suited. This presents a clear challenge for planning – how many transformations between electrical to optical can be made without disturbing the movement of shapeshifting amoeba applications? The challenge lies in minimising electrical to optical conversion points, which can introduce latency and compromise the fluid movement of AI workloads.

Another consideration is the integration of AI workloads, which adds another layer of complexity. Modern data centre design must now accommodate two operational layers – standard IT applications and high performance AI-driven workloads. This duality calls for a cabling strategy that supports separation, seamless migration and scalable expansion between the two environments.

At some point, there may be opportunities to optimise by introducing cabling paths that run across the installation. This enables smooth migrations, allowing standard and high level applications to be separated or merged, while supporting expansion from standard architecture to a more AI-driven version.

If we consider all of the above, structured cabling is the most effective choice. Unlike point-to-point cabling, which can become restrictive and unmanageable as networks grow and change, structured cabling offers a modular, standardised, easily upgradeable framework without compromising on performance, speed and latency – if planned, executed and maintained correctly! It provides flexibility to adapt to evolving data flow patterns, simplifies maintenance, supports scalability and ensures high density deployment – ideal for the demands of AI-driven data centres.

‘UNLIKE POINT-TO-POINT CABLING, STRUCTURED CABLING OFFERS A MODULAR, STANDARDISED, EASILY UPGRADEABLE FRAMEWORK WITHOUT COMPROMISING ON PERFORMANCE, SPEED AND LATENCY.’

BARRY ELLIOTT
DIRECTOR AT CAPITOLINE

After seeing so many patch cord horror shows, I have always been a proponent of organised structured cabling installations in data centres. Customers should look toward standards such as TIA-942 Telecommunications Infrastructure Standard for Data Centers and EN 50600-2-4 Data Centre Facilities and Infrastructures - Part 2-4: Telecommunications Cabling Infrastructure. Cabling architecture is almost exclusively based on Ethernet (with some Fiber Channel) and Category 6/6A copper cables and OM3/OM4 optical fibre.

The arrival of AI and high density computing has changed that narrow view and somebody looking to get into the world of products like the Nvidia DGX superpod and processors like the Nvidia DGX GB300 will have to start looking at some form of direct attach cabling (DAC) just to make them work. A single DGX GB300 unit specification states 72x octal small form factor pluggable (OSFP) single port with 800Gb/s InfiniBand and 18x dual port with 200Gb/s InfiniBand and Ethernet. And there could be hundreds of these.

This is now recognised in the 2024 edition of TIA-942-C:

- The use of DAC as an alternative to structured cabling should be limited to specific use cases. DACs between rows is not recommended. Any DAC should be routed in cable management or accessible pathways and not interfere with fixed cabling. When DACs are no longer used, the cables shall be removed.

- Cable lengths for DAC between equipment in the equipment distribution area (EDA) should be no greater than 7m (23ft) and should be between equipment in immediately adjacent (not multiple) racks or cabinets in the same row.

- DAC within distributors and entrance spaces should be constrained within the distributor or entrance space and within a contiguous row.

We can conclude that for regular data centres an overlay structured cabling system is a must but for high density superpod AI-type installations DAC is inevitable, with copper and fibre InfiniBand looking like the favoured attachment protocol.

‘FOR REGULAR DATA CENTRES AN OVERLAY STRUCTURED CABLING SYSTEM IS A MUST BUT FOR HIGH DENSITY SUPERPOD AI-TYPE INSTALLATIONS DAC IS INEVITABLE.’

ALASTAIR WAITE

SENIOR MANAGER MARKET DEVELOPMENT DATA CENTRE AT COMMSCOPE

As AI-driven data centres face exponential demand for faster data transmissions and higher compute density, the choice between point-to-point and structured cabling is critical. While both have their place depending on the application and scale, structured cabling is proving to be the more effective long-term strategy.

The industry must take an innovation led approach to infrastructure – one that looks beyond immediate performance to anticipate the needs of emerging AI workloads. As data rates escalate toward 400Gb/s, 800Gb/s and 1.6Tb/s, and as AI network architectures evolve, cabling infrastructure is going to need to scale without any disruption to performance.

This is where structured cabling shines. For example, the introduction of the MPO16 optical fibre connector, deployed as part of an end to end structured cabling solution, has enabled data centres to align with the IEEE roadmap and meet the demands of next generation AI architectures.

Beyond the connectors themselves, installation speed is paramount. Having the ability to pull high fibre count factory terminated cable assemblies through a conduit can significantly reduce build time for AI deployments, while ensuring factory level optical performance over multiple channels. Assemblies that can provide 1,728 fibres, all pre-terminated on to MPO connectors in a controlled factory environment, enable providers to connect multiple front end and back end switches and servers together quickly.

This speed and scalability are particularly crucial in today's AI arms race. Not only are the major cloud players scaling rapidly, but so are newer entrants and previously Tier 2 or Tier 3 providers. Their success is being measured by how quickly they can spin-up AI infrastructure and deliver GPU access to customers – often under aggressive timelines.

While point-to-point cabling may appear simpler and more cost effective for smaller set-ups, structured cabling offers a future proof solution better suited to the scale and demands of AI-driven data centres. Though the initial investment in structured cabling may be higher, it delivers greater long-term efficiency and economic advantages by significantly reducing the time and complexity involved in network upgrades. Ultimately, this is not just a cabling choice – it's a strategic infrastructure decision.

'WHILE POINT-TO-POINT CABLING MAY APPEAR SIMPLER AND MORE COST EFFECTIVE FOR SMALLER SET-UPS, STRUCTURED CABLING OFFERS A FUTURE PROOF SOLUTION BETTER SUITED TO THE SCALE AND DEMANDS OF AI-DRIVEN DATA CENTRES.'

R&M RailCon

secure connectivity for safe and effective daily operations

Today's railway networks face challenges related to high-speed communication, real-time monitoring, and environmental resilience.

R&M's fully integrated fibre-optic cabling and connectivity solutions redefine railway communication, ensuring robust, reliable, and scalable infrastructure for ETCS signalling, FRMCS, SCADA, and passenger services.

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- **FOXS & PRIME ODF Systems** – High-density, tool-free installation for trackside and station fibre management.
- **Ground Guard** – Advanced shielding and ground loop protection for secure data transmission.
- **SYNO Dome Closure** – Gel-sealed, modular closures for extreme railway environments.
- **ZOONA Access Closure** – Rapid, cost-effective fibre deployment with versatile installation options.
- **LUNAR PreCon Box** – Rugged, flexible fibre connections for mobile cell sites and FRMCS.
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- **HEC Connectors** – High-performance fibre optic connections for harsh environments.

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R&M

ALAMURI SITARAMAIAH

DATA CENTRE SOLUTIONS PORTFOLIO CONSULTANT AT STL

The layout of AI data centres can be spread over or across the floor, needing significant distances to be covered by network cabling systems. AI data centres are also compute intensive. Therefore, network cabling systems that connect the various components of such data centres need to support high speeds and low latency across scores of GPUs.

Interconnected GPUs require very high bandwidth – 100Gb/s, 200Gb/s, 400Gb/s and even 800Gb/s speeds at the server level – with switch-to-switch links rapidly migrating to 800Gb/s and 1.6Tb/s speeds. Such links also need to support extremely low latency, often less than 20 milliseconds in the east-west data transmission between nodes. InfiniBand and Ethernet Protocols are often deployed to support such high bandwidth and low latency communication requirements.

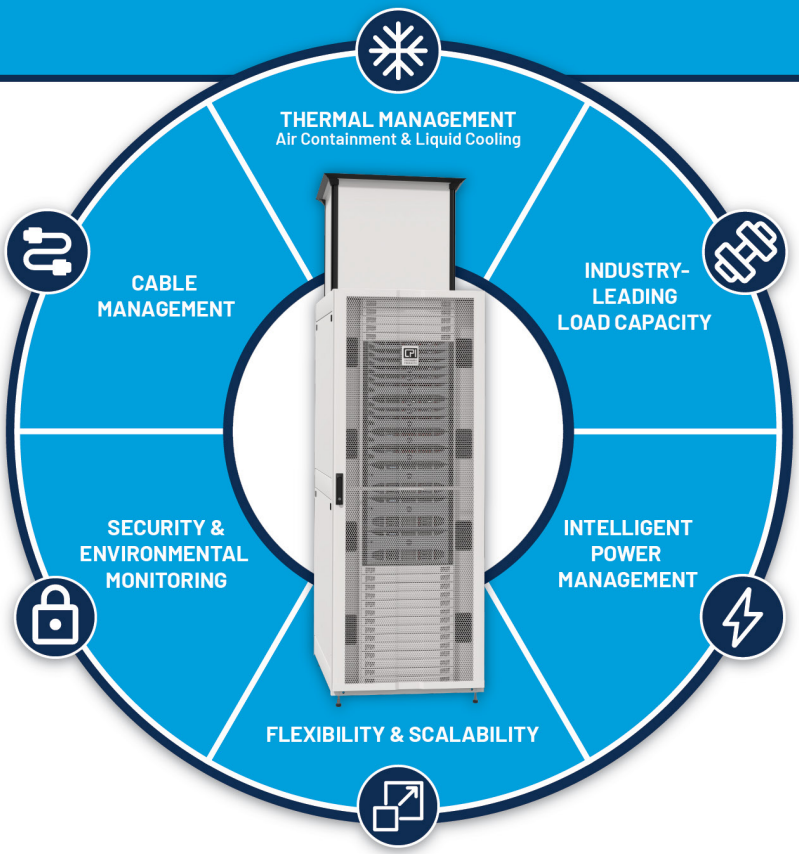
Standards define various optical fibre interface specifications. Very short reach (VSR) and short reach (SR) are typical specifications for multimode fibres and support up to 50m and 150m respectively. Data centre reach (DR) and fibre reach (FR) are typical singlemode interfaces and support up to 500m and 2000m respectively. These interfaces have stringent insertion loss requirements.

High speed applications are also susceptible to optical reflectance, while poor reflectance performance can adversely impact channel insertion loss and transmission performance. Multimode MTP/MPO/UPC connectors typically have a reflectance value of -20dB, while multimode MTP/MPO/APC connectors have an improved reflectance value of -35dB. For structured cabling within AI data centre networks, ultra-low loss (ULL) MPO/MTP connectivity ensures maximum channel distances. ULL cabling systems also ensure margin for installation variables such as using cross connects for improving manageability, scalability and speed of deployment.

While longer cabling distance links benefit from structured cabling, short, low latency connections for GPUs often rely on point-to-point solutions like direct attach cables (DACs). While DACs can be distance limited, active optical cables (AOCs) and individual fibre cables offer up to 100m for cabinet-to-cabinet connections. However, managing such point-to-point cabling in large clusters can soon become a problem during moves, adds and changes (MACs).

Selecting and specifying the right connectivity within AI data centres requires a balance that can address performance issues around high speed, low latency networks while managing costs, power consumption and ease of management.

> ‘WHILE LONGER CABLING DISTANCE LINKS BENEFIT FROM STRUCTURED CABLING, SHORT, LOW LATENCY CONNECTIONS FOR GPUS OFTEN RELY ON POINT-TO-POINT SOLUTIONS.’



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Standing the test of time

Research into the performance of fibre optic cables over extended periods offers interesting insights into points of failure and cable attenuation when exposed to heat or moisture. Brian Risch of Prysmian Digital Solutions explores this issue

At the heart of network reliability lies the protection to optical fibres afforded by coating systems and cable materials. In addition to providing essential mechanical protection, these coatings and materials must maintain stable properties throughout the cable's lifetime, even when exposed to a wide range of environmental conditions. Typical rated service temperatures for fibre cables range from -40°C to 70°C. During service, conditions such as humidity and ultraviolet (UV) exposure can also vary significantly.

A CLOSER LOOK

Understanding fibre cables' long-term reliability requires close examination of the principal mechanisms of degradation that can occur over decades of service. The three primary failure modes – thermal degradation, hydrolysis and fibre coating delamination – each represent distinct threats to the structural and optical integrity of fibre and cabling systems, especially when exposed to extreme or fluctuating environmental conditions.

• Thermal degradation. This arises predominantly in hot, dry environments, where prolonged exposure to elevated temperatures can cause polymeric materials – such as cable jackets, buffer tubes and fibre coatings – to deteriorate. This degradation typically manifests through oxidative reactions or chain scission, leading to embrittlement, loss of flexibility and micro-cracks.

As these materials degrade, they lose their ability to protect the fibres from mechanical stress, making the fibres more susceptible to microbending or macrobending, both of which can increase signal attenuation. This mechanism is particularly relevant in desert regions or within industrial environments where thermal insulation is poor and ambient temperatures can remain consistently high.

• Hydrolysis. This is the chemical breakdown of materials due to reaction with water – a critical concern in hot and humid conditions. Common in tropical climates, underground installations or marine environments, hydrolysis primarily affects coating materials, especially those based on acrylate polymers, by causing them to soften, swell or chemically degrade.

This compromises the mechanical stability of the fibre coating and can also introduce pressure points that lead to signal loss through increased attenuation. If water ingress occurs, for instance due to damaged cable sheathing or faulty sealing, the rate of hydrolytic degradation can accelerate, further jeopardising long-term performance.

• Delamination. This refers to the failure of the adhesive bond between the fibre's glass core and its primary coating layer. Often

triggered by extended water exposure or as a secondary effect of thermal ageing, delamination results in a loss of adhesion that permits the fibre to slip within its coating.

This slippage can cause microbending, scattering light and raising attenuation levels. Delamination is a threat to optical performance and affects handling during installation or maintenance, as it reduces the strip force required to remove coatings during splicing. A significant decrease in strip force serves as a key diagnostic indicator of adhesive failure. Detection methods such as optical time domain reflectometry (OTDR) can be employed to identify localised attenuation changes that may indicate the presence of delamination.

MIX AND MATCH

These mechanisms do not act in isolation. Cables may be subjected to combinations of heat, moisture and mechanical stress over time, requiring robust design and testing to ensure durability.

Long-term testing regimes – including dry heat ageing, humidity cycling and water soak evaluations – are essential. These validate that materials and construction methods can resist these degradation modes, maintaining structural integrity as well as optical performance over lifespans exceeding 50 years.

SETTING THE STANDARD

The ANSI/ICEA S-122-744 standard for optical fibre outside plant communications cable does not explicitly define a required operational lifetime for fibre cables, but instead focuses on performance based requirements, specifying criteria such as mechanical and environmental durability, allowable attenuation limits, temperature cycling performance, resistance to water penetration and UV exposure, as well as fibre identification, bend radius, tensile loading and other physical performance characteristics.

The standard sets test methods and pass/fail criteria that are intended to reflect the performance needed for long-term outdoor use. This is often interpreted as supporting lifespans of 20-40 years or more, depending on installation conditions.

PERFORMANCE REVIEW

Cable manufacturers can use the ANSI/ICEA S-122-744 testing framework to simulate long-term environmental exposure, often accelerated under elevated conditions, to project performance over extended lifetimes. Prysmian has

'The three primary failure modes – thermal degradation, hydrolysis and fibre coating delamination – each represent distinct threats to the structural and optical integrity of fibre and cabling systems, especially when exposed to extreme or fluctuating environmental conditions.'

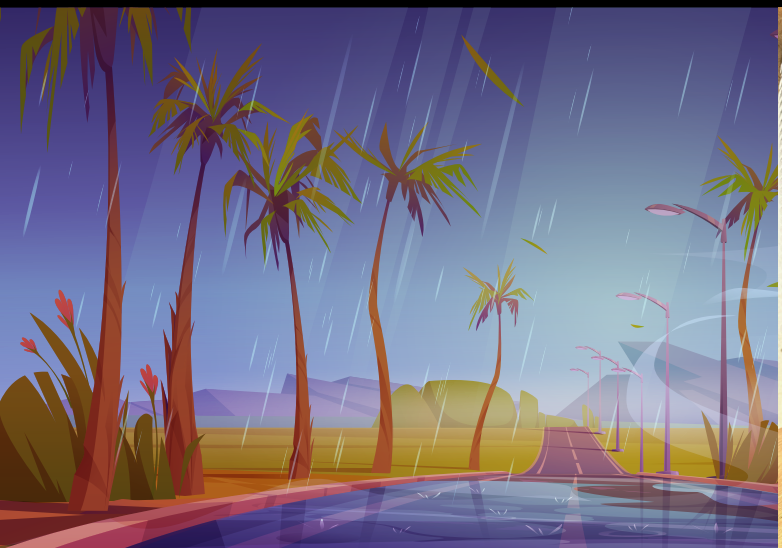
conducted extensive long-term ageing and lifetime testing of fibre cables and their internal fibres, simulating a service life of at least 50 years under ageing conditions. This included dry heat and humidity ageing, as well as cable kink test results.

Measurements of cable attenuation and other performance indicators following this lifetime simulation have confirmed that cables with appropriate coating systems and construction can meet the ANSI/ICEA S-122-744 industry standard for outside plant microduct loose tube fibre cables and outside plant micromodule cables – even after simulated exposure equivalent to more than five decades of service in harsh environments. The data clearly demonstrates that, following tests, fibre attenuation, cable performance and material integrity remain continue to meet the specifications required of newly manufactured cables.

IDEAL CHARACTERISTICS

To ensure consistent performance for 50 years or more, fibre cables must be designed and manufactured with a range of critical characteristics that allow them to withstand the varied and often harsh conditions encountered in real world deployments. All materials must be chemically compatible and retain their functional integrity after decades of service. This includes primary materials like the fibre and jacket, but also secondary elements such as printing inks and adhesives.

At the heart of long-term reliability is thermal stability. Materials must be able to endure extended exposure to elevated



temperatures, such as 85°C, without degradation, while maintaining consistent optical performance across a wide operational temperature range, typically from -40°C to 70°C. Equally important is resistance to hydrolytic degradation. In hot and humid environments a durable bond between the glass and the primary coating is essential. The ability of the fibre to maintain proper strippability must also remain within specified thresholds even after prolonged ageing.

ENDURANCE TEST

Mechanical durability plays a vital role as well. The cable's buffer tubes, outer jackets and overall structure must retain their tensile strength, elongation capacity and bend resistance throughout decades of service. These components must resist cracking, kinking and other forms of mechanical failure after repeated thermal cycling and exposure to humidity.

Environmental resistance is key, particularly in relation to UV exposure. The outer cable jackets should exhibit high resistance to UV light, ensuring no significant changes in physical performance or loss of printed marking clarity even after thousands of hours of exposure. In addition, cables must provide effective protection against water penetration, maintaining a sealed structure that prevents moisture ingress under normal and aged conditions.

Fibre colours, buffer tube codes and printed markings on the cable, which are essential for field work and maintenance, must remain clearly identifiable after heat, humidity and abrasion testing. Long-term tests should show attenuation levels across common telecommunications wavelengths (1310nm, 1550nm and 1625nm) do not exceed industry accepted thresholds – even after accelerated ageing, water immersion and extensive temperature cycling.

PEACE OF MIND

By incorporating thermal and hydrolytic resistance, mechanical robustness, environmental protection, stable optical performance and long-term material integrity, a fibre cable can confidently support network infrastructure needs over a service life of 50 years or more.■

BRIAN RISCH

Brian Risch is materials technology manager at Prysmian Digital Solutions North America. He has over 30 years of experience in the study of structure property relationships in polymeric materials and materials reliability, and over 20 years of experience in the fibre optic cable business. He holds more than 60 US and international patents, has authored over 70 scholarly publications and has participated in cooperative research initiatives with various universities and research institutions.

On the right track

Manuel Gohl of R&M explains the role of fibre optic cabling and connectivity solutions in modern railway systems

Fibre optic cabling and connectivity solutions are revolutionising the railway industry by enhancing communication, safety and operational efficiency. Fibre's capacity for high speed, high bandwidth data transmission makes it ideal for modernising railway infrastructure, supporting wireless communications, sustainability and the real-time monitoring of train networks.

SENDING THE RIGHT SIGNALS

To meet the complex and demanding conditions of railway environments, cabling and connectivity solutions must go beyond the fibre itself. The infrastructure requires robust interconnection components such as distribution frames, splice closures, modular enclosures and structured cabling systems that are all designed for durability, reliability and regulatory compliance.

Fibre, now integral to railway communication systems, is being deployed at trackside, railway stations and in buildings to enhance reliability and capacity. This shift improves service quality by reducing delays and cancellations, while enabling IP-based services for third-party applications.

Several North American railroads have fibre along up to 90 per cent of their mainline routes. Los Angeles Metro is upgrading its communication transmission system with 288-strand singlemode fibre for real-time signalling, train control and passenger information. Meanwhile, fibre based sensing and control innovations are improving monitoring, reliability and automation extensively across countries including the UK, Germany and India.

JUST THE TICKET

Fibre's immunity to electromagnetic interference (EMI) and capacity for long distance data transmission without signal

loss make it ideal for harsh and expansive railway settings, supporting trackside monitoring, predictive maintenance and passenger services. Key applications of fibre in railway environments include:

• European Train Control System (ETCS) and signalling
The ETCS relies on real-time data transmission between trains, control centres and trackside equipment. Fibre connectivity is essential to this communication and its effectiveness depends on the quality of the entire interconnection system including fibre termination boxes, rack units and protected pathways. This communication is crucial for maintaining safety, improving reliability and ensuring seamless cross border operations across Europe.

• Global System for Mobile Communications – Railway (GSM-R) and Future Railway Mobile Communication System (FRMCS) networks
GSM-R and its successor, FRMCS, use fibre optic backhaul to provide the necessary bandwidth, low latency and reliability for mission critical railway applications. These systems require resilient cable paths, protected connectivity points and scalable connection platforms to ensure continuous operation and future expansion capabilities.

• Supervisory Control and Data Acquisition (SCADA)
Railway networks often span long distances, with centralised control centres monitoring and managing remote stations, signalling equipment and trackside sensors. Fibre installations support data transmission over tens of kilometres without signal degradation and help gather large volumes of data in real-time including signals from switches, track circuits, power substations and environmental monitoring sensors.

• Operational monitoring and surveillance
Fibre networks support live monitoring of train locations, infrastructure status and environmental conditions. Here, sealed distribution boxes, cable trays and pre-terminated cabling solutions play a vital role in ensuring system uptime under continuous stress. This enables rapid response to issues, predictive maintenance and enhanced safety for passengers and cargo.

• Railway station and trackside connectivity
Modern railway stations and trackside systems demand seamless communication and integration. This requires fibre cabling as well as flexible connectivity points such as modular patch panels, trackside cabinets and infrastructure for digital interlocking systems.

• Passenger services
Entertainment services, onboard internet access and the communication of train control and passenger information demand faster and more reliable transmission of large data volumes within trains.

• Distributed acoustic sensing (DAS)
Railways are increasingly leveraging fibre infrastructure for DAS technology. This transforms fibre optic cables into vibration sensors, enabling real-time monitoring of track conditions by detecting issues like rail cracks, rockslides or unauthorised access – thus enhancing safety and reducing reliance on manual inspections.

FIRST CLASS

Transition to fibre in rail environments requires careful planning and specialised

'Fibre, now integral to railway communication systems, is being deployed at trackside, railway stations and in buildings to enhance reliability and capacity. This shift improves service quality by reducing delays and cancellations.'

hardware to ensure reliability and durability. Networks demand products tailored to harsh environments, with validated testing and approvals for railway specific use. Some key considerations when choosing solutions include:

• Environmental resistance
Equipment must withstand extreme temperatures, chemical exposure, ultraviolet (UV) radiation, dust, debris, strong winds and storms. This necessitates robust enclosures, effective dust filters and waterproof sealing to protect sensitive components. The fibre backbone needs to feature robust protection for critical fibre connections, ensuring reliable and uninterrupted data transmission across extensive railway networks.

• Mechanical durability
Railway equipment is exposed to constant vibrations, shocks and EMI. Fibre hardware must be designed with strong housings, secure mounting and proper grounding to maintain consistent performance. Fibre cables must be engineered for high mechanical durability. This includes exceptional crush resistance to withstand mechanical stress without performance degradation, as well as abrasion resistance for installations in conduit systems or harsh environmental conditions.

• Installation and maintenance
Easy to deploy solutions such as pre-connectorised fibre cables, closures or boxes, as well as flexible splice management, are essential for rapid installation and maintenance, particularly in remote or hard to reach trackside locations. Quick and reliable field termination reduces downtime and ensures compatibility with legacy systems, contributing to streamlined maintenance and system upgrades.

• Compliance and standards
Adherence to standards such as EN 50155 for railway electronic equipment, EN 50173-2 for structured cabling systems and IEC 60794 for outdoor cables, is essential for meeting deployment guidelines and ensuring long-term reliability. Compliance with fire safety standards such as EN 45545- for fire protection in railway vehicles is crucial, as is the use of low smoke zero halogen (LSZH) cables.

• Network requirements and topology
High data rates are essential for real-time communication, signalling and passenger services like Wi-Fi and infotainment. Additionally, low latency is critical to support signalling and control applications effectively. Cable layout planning – whether aerial, underground or within conduits along tracks – should prioritise redundancy and failover mechanisms. Implementing ring or star topologies can enhance network reliability by avoiding single points of failure. Fibre optic networks should be configured with redundant

paths and failover mechanisms to maintain uninterrupted service during outages or damage.

• Cost and maintenance considerations
Cost effective configurations and accessible maintenance are key to long-term reliability. Future scalability should be considered, guaranteeing that selected fibre solutions remain flexible and compatible with evolving infrastructure needs.

ALL ABOARD

In rail applications, copper cabling and fibre optic cabling complement each other. Copper can be used for short distance communication (typically up to 100m) within stations, signal control rooms and onboard train networks. What's more, copper cabling supports power over Ethernet (PoE), allowing network devices such as security cameras, Wi-Fi access points and sensors to receive both data and power through a single cable.

In railway environments, local area networks (LAN) in offices and stations require special consideration due to the unique electrical properties of rail systems. Railway tracks serve as a return conductor for electrical engines, causing ground potential to fluctuate based on locomotive traffic. Since railway offices are often located near tracks, they are particularly susceptible to these fluctuations.

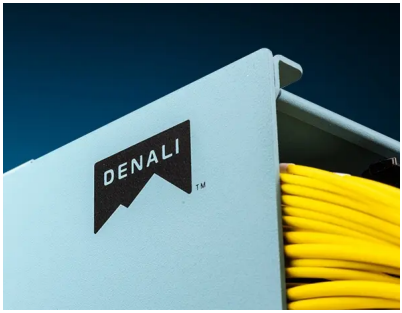
To ensure safety and minimise interference, cable shielding must be properly earthed. Structured building cabling following ISO/IEC 11801 and EN 50173 standards recommends the use of shielded twisted pair cabling in challenging electromagnetic compatibility (EMC) environments. However, multiple grounding points can create ground loops – a common issue in railway networks. The construction of properly meshed earthing systems is also essential. Where this is insufficient or impossible, special ground loop breakers for RJ-45 connectivity can be applied to solve problems on specific links.

TRAIN OF THOUGHT

Fibre optic cabling and connectivity solutions are redefining the future of railway communication by enabling faster, more reliable and safer communication and operations. Their use in railway infrastructure not only enhances performance but also ensures that railway systems are sustainably equipped for growing demands and future technologies. ■

MANUEL GOHL
Manuel Gohl is a consultant for public networks at R&M, bringing extensive expertise in technical consulting, pre-sales support and fibre optic and copper network solutions. Previously, he served as junior consultant and application engineer, where he supported product development and sales with hands-on technical insights.

AFL



AFL's DENALI is a modular optical fibre platform specifically engineered for high growth graphics processing unit (GPU) environments with minimal infrastructure upgrades. The DENALI platform delivers leading edge data centre performance today, while positioning the facilities of tomorrow to scale with the increasing complexity and volume of hyperscale and artificial intelligence (AI) workloads.

With its modular design, the DENALI platform adapts as networks grow, featuring advanced rackmount hardware, cassettes and pre-terminated customisable assemblies. This platform delivers up to 288 LC duplex ports (576-fibres) in 4RU of rack space and supports speeds from 10Gb/s to 800Gb/s and beyond.

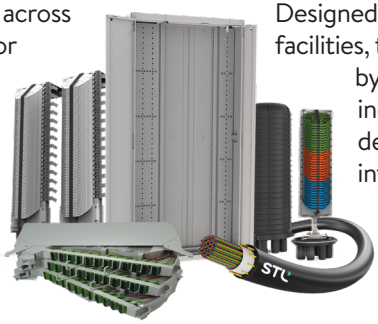
The platform's design reduces the number of components required for installation, streamlining inventory management and reducing potential points of failure. DENALI also ensures seamless integration with existing infrastructure, minimising disruption during upgrades and expansions, while cable management solutions reduce maintenance requirements and improve long-term network reliability.

To find out more **CLICK HERE.**
www.aflglobal.com

STL - Sterlite Technologies

Power next generation data centres with STL's high density DCI solutions.

STL's Data Centre Interconnect (DCI) portfolio is purpose built to connect multiple data halls across buildings within campuses or metro areas, addressing the growing east-west traffic demands of cloud era networks.



At the core are STL's high count IBR fibre cables, offering up to 6912-fibres in compact, standards compliant (IEC, ITU-T, RoHS and REACH) designs. These are paired with ultra-high density closures (up to 1728-fibres) for aerial, underground or indoor deployment.

Need dense transitions? STL's 19-inch Splice Bays handle up to 2016 splices, while Optical Cross-Connect frames manage 4320-fibres. These are ideal for meet-me rooms and edge facilities.

Designed and tested in world class facilities, these solutions are backed by expert design services, including computer aided design (CAD) and building information modelling (BIM) documentation, tailored to specific project needs.

Choose STL for smarter DCI. Precision built. Performance tested. Ready for your data centre.

CLICK HERE for more information.
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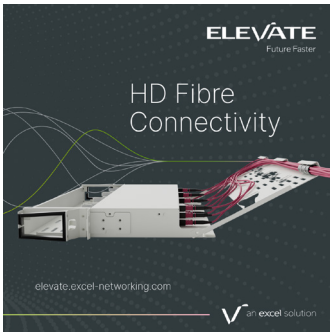
Elevate



Elevate's High Density Fibre Connectivity solutions are engineered to meet today's data centre demands while future proofing for tomorrow. With ultra-high density in a compact footprint, they maximise rack space without compromising performance. Superior insertion loss, return loss and end face geometry ensure consistently reliable operation in mission critical environments.

Designed for flexibility, Elevate's modular system allows scalable connectivity and rapid deployment. Paired with Elevate's fibre duct, it enables secure, neatly routed pathways that protect and maintain the performance of critical infrastructure.

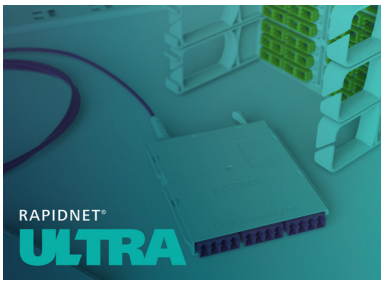
At the core of Elevate is a simple promise – to deliver Future Faster by investing in partnerships, solutions and people. A recent multi-six figure investment at Environ House has enhanced the optical fibre preconfiguration facility with state-of-the-art termination equipment.

Combined with recent MPO training from its partner Senko, Elevate is well positioned to deliver premium preconfigured fibre solutions with unmatched precision, speed and consistency.

CLICK HERE to explore Elevate.
www.elevate.excel-networking.com

HellermannTyton

HellermannTyton has developed a full data centre connectivity solution, which is designed to offer high density optical fibre capacity, excellent cable management and panel housing. The all new RapidNet Ultra is a cassette based pre-terminated system that delivers a wide variety of options and flexibility when designing a data centre network.



RapidNet Ultra takes the existing data centre fibre solution beyond today's requirement. It offers an even greater fibre density while accommodating very small form factor connectivity and supports tomorrow's requirements for high bandwidth, advanced network architectures and Ultra Ethernet.

To support the RapidNet Ultra solution, HellermannTyton has also produced its Data Centre Cabling Guide, which helps specifiers and data managers choose the best RapidNet system to achieve their network design. It covers everything from optical transceivers to polarity and data centre architecture and topology, assessing the key benefits and considerations at the design phase.

To complete its data centre solution, HellermannTyton can now offer Gigaduct, the brand new fibre raceway solution, which is designed for high performance fibre routing in your data centre.

For more information **CLICK HERE.**
www.htdata.co.uk

Networks Centre

Whether you are looking to minimise or equalise latency, Networks Centre has a range of solutions to meet these requirements.

• Latency equalisation

Equaliselt is a latency controlled optical fibre connectivity solution that complies with Article 1 of (EU) 2017/573, where MIFID II requires (amongst other things) that customers get equal latency over cabling. Equaliselt uses a combination of bare fibre spooled in cassettes/enclosures matched with EuroClass Cca/B2ca ruggerised patch cords to achieve the overall required length.

• Minimising latency

The solutions are shortening cables and/or using hollow core fibre (HCF). Traditional silica core fibres inherently limit light speed due to their refractive index. HCF technology significantly reduces latency by allowing light to travel through an air filled core, where it moves approximately 30 per cent faster than in glass.

Networks Centre has expertise in both areas, so please contact us to discuss your application. To find out more **CLICK HERE** to visit our website.

www.networkscentre.com

Siemon

Siemon's LightStack and LightStack 8 ultra-high density fibre plug and play system delivers superior density, port access and cable management in a sleek, modern platform. This makes it ideal for today's advanced data centre or enterprise networking environments.

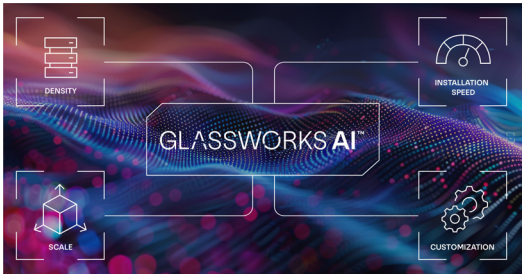
The black LightStack enclosure and connectivity range is the Base-12 format, while the grey LightStack 8 enclosure and connectivity range is the Base-8 format. Both configurations support singlemode and multimode fibre.

Siemon's innovative solution supports up to 144 fibres per rack unit in a 1U enclosure and enables easy access and management of connectivity from the front or rear. It offers various mounting options and high capacity management clips that are designed to support the maximum capacity of cables, as well as simple access. It also includes a range of plug and play transition modules and pass-through adaptor plates designed to deliver a level of performance exceeding today's standards.

To find out more **CLICK HERE.**

www.siemon.com

Corning Optical Communications



Corning GlassWorks AI offers a one stop shop of products and services to help operators build the dense optical fibre infrastructure required for generative AI. The end-to-end portfolio provides industry leading fibre, cable and connectivity products along with best in class network planning, design and deployment support for AI network design challenges – from long haul to inside the data centre.

Addressing density, installation speed, scale and the need to customise solutions, it includes:

• Contour Flow cables – small diameter, high density cables that accelerate and simplify deployments while reducing overall handling complexity.
• Corning Configured Racks (CCR) – preassembled and customisable for larger scale deployments, they align with current infrastructure and future scalability needs. They accelerate deployments, reduce complexity and enhance safety on-site.
• Custom Trunk Assemblies – perfect for high density, point-to-point applications, these assemblies reduce congestion, speed up installations and optimise space in racks and trays.
• Shuffle Solutions – designed to address the scalability challenges of spine and leaf network architectures, these solutions enable seamless integration of new switches and servers while maintaining high signal integrity and performance.

CLICK HERE to discover more.
www.corning.com

Best of both worlds

In order to support high performance computing, Dominic Ross of Siemon examines the benefits of taking a hybrid approach that integrates localised high speed point-to-point connectivity with structured cabling

Application type, distance, performance and flexibility are critical parameters in data centre infrastructure to support high performance computing. Never before have these parameters been more critical when selecting the right cabling infrastructure, and media selection plays a pivotal role in enabling high speed connectivity.

POINT OF ORDER

Point-to-point cable assemblies offer simple connectivity and a highly efficient solution for high speed data transmission, with zero signal loss and ultra-low latency. This approach is dedicated to its application and is extremely effective when using PAM4 technology across both Ethernet (RoCE) and InfiniBand protocols.

It is one of the most powerful ways to deliver peak performance for high speed applications. With the use of embedded optical transceiver technology integrated directly into the cable, power consumption is minimised, resulting in lower thermal output and significant cost savings. This set-up offers unrivalled performance, supporting application speeds ranging from 10Gb/s to 800Gb/s.

COVERING ALL BASES

Although high speed cable assemblies offer these advantages, key parameters remain unmet – flexibility and distance. While high speed cables offer unrivalled performance, they lack flexibility, are not classified as structured cabling and are limited in distance, which necessitates alterations to the physical environment such as space, cabinet and rack placements. This compromises equipment positioning and limits the proximity between active equipment, reducing deployment flexibility. Structured cabling, on the other hand, offers a high performance and fully flexible solution whilst still being able to manage link distance.

Today, over 85 per cent of data centres are connected via optical fibre with transceivers. With a wide variety of media types, connector options, density considerations, channel configurations and bandwidth capabilities, structured cabling allows tailored solutions through meticulous planning and design. When aligned with current and future application speed requirements, structured cabling can support every functional area of the data centre. This unmatched flexibility facilitates easier expansion and accommodates future growth in servers, storage and network devices.

SUPPORT STRUCTURE

Structured cabling offers a high performance, reliable, scalable and manageable infrastructure platform. A well designed fibre set-up supports multiple data rate iterations – 10Gb/s, 25Gb/s, 40Gb/s, 100Gb/s, 200Gb/s, 400Gb/s and 800Gb/s – with both forward and

backward compatibility, enabling seamless equipment evolution without constant re-cabling.

However, cross-connectivity introduces insertion loss. This is due to additional components such as patch panels, cassettes, transceivers and mated pairs in the channel link. Over time, legacy creep, which is the accumulation of older, lower performing components, can compromise performance and hinder infrastructure upgrades unless managed carefully. Structured cabling may also be affected by increased hops, leading to higher signal loss and latency.

KEY CONSIDERATIONS

Data centre topology has evolved, accommodating a variety of configurations, ranging from point-to-point embedded transceiver technology to structured cabling over diverse distances. High performance connectivity solutions must now support a complex array of infrastructure including central processing unit (CPU) based servers, storage arrays, graphics processing unit (GPU) nodes, and front end and back end switches – all of which need to communicate efficiently across traditional and emerging architectures.

Designing for high performance computing requires an understanding of general purpose workloads and how data is transferred to and from back end networks. These networks may use either point-to-point or structured cabling based on the required distances and layout.

For example, middle of row (MoR) cabinet configurations are particularly advantageous for high performance computing and artificial intelligence (AI) workloads. By minimising and equalising the distances between leaf switches, point-to-point connectivity becomes more localised. Meanwhile, structured cabling can feed high speed traffic from the spine into the row. High performance computing back end networks often utilise 800 Gigabit Ethernet spine-leaf connections, supporting row-to-row or intrarow deployments using MoR topologies.

Top of rack (ToR) configurations are more suited to environments where spine and leaf switches share a cabinet, making them ideal for low latency, localised

'Ultimately, how you make your choice regarding cabling solutions really depends on the application but integrating localised high speed point-to-point connectivity with structured cabling is proving highly effective.'

connectivity. These scenarios often benefit from point-to-point cabling or embedded transceiver cabling, which reduces power consumption, lowers heat output and cuts costs.

UNDER THE INFLUENCE

Considerations in design should always be a top priority when planning space and layout, as this influences topology and cabling distances. For flexibility and scalability, structured cabling with cross-connects should be considered. This simplifies operations and future upgrades, and makes it easier to integrate new pods and expand networks. But also, you have power and cooling constraints, so colocating switches and servers increases rack density, requiring robust infrastructure.

Another consideration is latency, which is less of an issue with high speed cable assemblies since they offer lower latency and reduced power consumption in ToR and MoR topologies. With extended structured cabling, however, insertion loss must be considered. A scalable unit like a small compute cluster operates well with point-to-point, but when you leave that cluster, every leaf needs to connect to every spine. That's where structured cabling comes into play and works the best, connecting scalable units together or one superpod to another superpod.

TREND RESETTING

Inherently built into our data centre infrastructure from the past was the dominant trend to oversubscribe the fibre counts to make an allowance for future proofing. However, what we have seen is that an allowance was never made for the rapid growth of bandwidth and speeds. Simply, some of the link distances are too long to support applications over 100Gb/s, which has cSEPht data centres out when implementing new high performing equipment. Choosing the right fibre media – OM4 for multimode or OS2 for singlemode – is crucial for maintaining optimal performance across different distances and topologies.

These design elements are especially

important when leveraging north-south data traffic for internet connectivity, storage movement, high performance computing workloads and external communications. To achieve optimal performance and support massive data transfers between computing nodes with high availability, a hybrid approach starts to become attractive and is recommended. This approach combines high speed cable assemblies with fibre structured cabling, catering to the growing demands of AI, machine learning and other advanced computing models.

DELIVERY DRIVER

Since no single connectivity method satisfies all four design parameters – application, distance, performance and flexibility – a hybrid infrastructure model merges the advantages of structured cabling with the performance benefits of high speed localised connections, delivering any-to-any communication with high bandwidth, low latency and exceptional resilience across intra and inter data centre environments. This hybrid strategy is supported by leading equipment manufacturers, from enterprise environments to hyperscale data centres, delivering superpods and the most advanced computing solutions to date.

Connectivity options to consider within the hybrid infrastructure consist of two transceivers connected via MPO/LC jumper (XCR), direct attach cables (DAC) and active optical cables (AOC). A combination of all three within a hybrid infrastructure is truly a powerful and unmatched platform for cutting edge supercomputing. Gold standard InfiniBand, along with advancements in Ethernet with RoCE protocols, can be delivered across the infrastructure.

DECISION TIME

With the convergence of back end networks in the data centre to facilitate high performance computing requirements, there is a greater need to design infrastructure platforms that consider all the topology and performance requirements of enterprise and hyperscale data centres. Ultimately, how you make your choice regarding cabling solutions really depends on the application but integrating localised high speed point-to-point connectivity with structured cabling is proving highly effective in capturing the significant demands across various aspects of the computing architecture. ■

DOMINIC ROSS

Dominic Ross is technical account manager global strategic projects at Siemon. He has been involved in technical management, project management, consultancy and manufacturing in the telecommunications industry for over 22 years, delivering technologies and supporting the latest developments in next generation solutions and standards for high performance infrastructure.

See the light

The quest to support higher network speeds continues as traffic patterns across networks evolve. Alamuri Sitaramaiah of STL - Sterlite Technologies looks at the role optical fibre plays in supporting emerging higher network speeds

As copper cabling systems become limited in their ability to cost effectively support meaningful distances, optical fibre cabling systems are relied upon for higher network speeds. Parallel optics are at the forefront, with the type of connectors required for supporting such high speed interfaces also evolving from simple two-fibre duplex connectors to multi-fibre connectors and now to very small form factor (VSFF) connectors.

SETTING THE STANDARD

EEE and TIA standards have been central in efforts to develop and specify network speeds, the distances supported and optical connector requirements. As standards continue to evolve, driven by industry innovations and the need to support newer network applications, TIA publishes a newer Telecommunication Systems Bulletin (TSB) before such developments are consolidated and standards are revised.

One such TSB is TIA TSB 6000, which was published in January 2025. It collates the application channel attenuation and supportable distances for various interfaces across recognised media in the TIA-568 standard – twisted pair copper, fibre and broadband coaxial cabling. TSB 6000 allows the user to readily access basic information to make informed decisions about media choices and system design. It lists the supported distances on multimode and singlemode fibres for Ethernet, EtherChannel and InfiniBand single data rate (SDR), double data rate (DDR) and quad data rate (QDR) applications.

ON A HIGH

InfiniBand is a computer communications standard used in high performance computing that features very high throughput and very low latency. InfiniBand is commonly used in high performance computing and hyperscale data centres.

Ethernet, as we know, is a family of general computer networking technologies commonly used in premises networks and data centres, commonly referred to as IEEE 802.3. Ethernet adoption lately is seeing increasing adoption over InfiniBand, even in artificial intelligence (AI) networks, with need for InfiniBand to adopt forward

error correction, thus narrowing the gap of network latency supported by InfiniBand and Ethernet.

The interfaces and connectors for the network applications have evolved too. Active optical cable (AOC) is an optical fibre cable bonded with an optical transceiver that is not removable. A transceiver (transmitter plus receiver) is a converter with an electrical connector on one end and optical connector in the other end. Typically, AOCs are more common in InfiniBand installations, while transceivers with patch cables are more common in Ethernet systems with structured cabling.

ON FORM

Transceivers come in a variety of form factors. A small form factor pluggable (SFP) is a transceiver or cable with a one or two lanes (channel) in each direction. SFP+ denotes the 10-14Gb/s type of AOC/ transceivers up to 10Gb/s, while SFP28 is the notation for the 25-28Gb/s products with an SFP form factor used with 25Gb/s interfaces. SFP-DD is a double density version of SFP. SFP transceivers are part of the Ethernet architecture but not used in InfiniBand systems.

Quad small form factor pluggable (QSFP) is a bidirectional transceiver with four lanes in each direction. QSFP+ denotes transceivers for 4x(10-14) i.e 40Gb/s applications, while QSFP28 denotes the 4x (24-28) i.e 100Gb/s applications. QSFP form factor is used for InfiniBand EDR 100Gb/s ports and 100 Gigabit Ethernet ports. Some IEEE definitions of 100Gb/s interfaces are:

100GBASE-CR4. Typically used for direct attach cables (DAC) for very short reaches, up to about 7m.

- 100GBASE-SR4. Short reach, supports distances about 100m on OM4 multimode fibre and uses eight fibres.
- 100GBASE-LR4. Long reach, supports distances up to 10km using wavelength division multiplexing (WDM) on singlemode fibre and uses two fibres.
- 100GBASE-ER4. Extended reach, supports up to 40km using WDM on singlemode fibre and uses two fibres.

QSFP56 denotes 4x(50-56) i.e 200Gb/s applications and is used for InfiniBand HDR 200Gb/s and 200 and 400 Gigabit Ethernet transceivers.

QSFP-DD refers to a double density version of the QSFP transceiver supporting 200 and 400 Gigabit Ethernet. It employs eight lanes operating at up to 25Gb/s with non-return to zero (NRZ) modulation or 50Gb/s with PAM4 modulation.

Some IEEE definitions of 100Gb/s interfaces are:

- 200GBASE-CR4. Typically used for DAC (passive copper) twisted pair cable, up to 3m.
- 200GBASE-SR4. Short reach, supports distances up to 100m on OM4 multimode fibres and uses eight fibres.
- 200GBASE-DR4. Supports up to 500m on singlemode fibres and uses eight fibres.
- 200GBASE-FR4. Supports up to 2km on singlemode fibres using coarse wavelength division multiplexing (CWDM) and uses two fibres.

'IEEE and TIA standards have been central in efforts to develop and specify network speeds, the distances supported and optical connector requirements.'

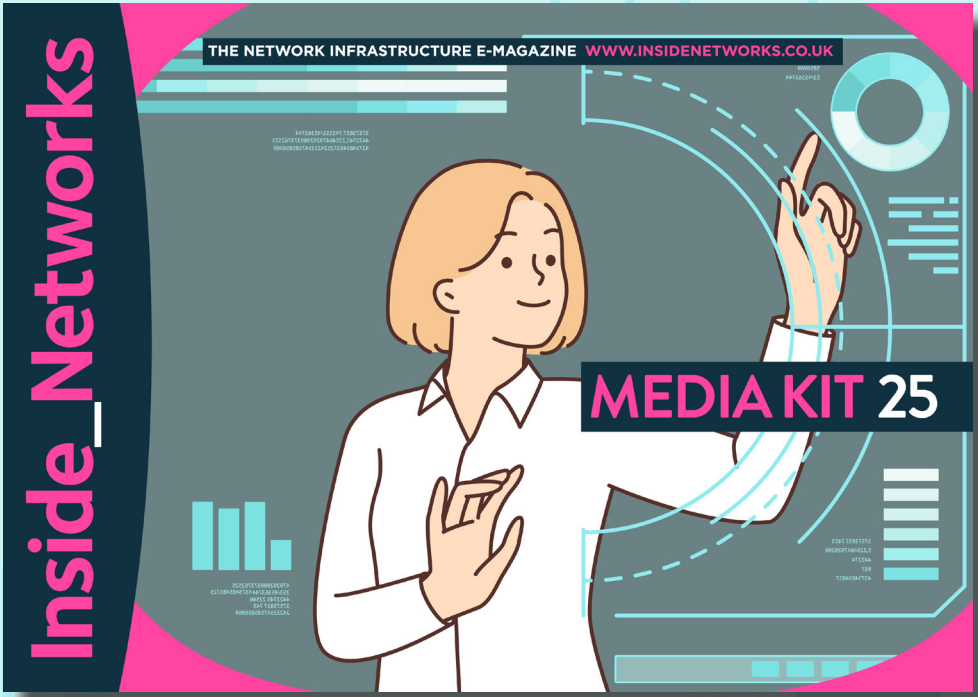
• 200GBASE-LR4. Supports up to 10kms, using singlemode fibres with WDM and uses two fibres.
• 400GBASE-DR4. Supports up to 500m on singlemode fibres using eight fibres.
• 400GBASE-FR4. Supports up to 2km on two singlemode fibres using WDM.
• 400GBASE-FR8. Supports WDM up to distances of 2km on two singlemode fibres.
• Octal small form factor pluggable (OSFP) is wider and longer than QSFP and accommodates eight lanes side-by-side. This form factor is used for 200Gb/s, 400Gb/s and 800Gb/s transceivers.

CRITICAL MASS

While duplex LC connectors are typically used with SFP transceivers, multi-fibre push on (MPO) connectors supporting one or multiple rows of up to 12 fibres in each row are typically used with QSFP transceivers. Singlemode MPO connectors are specified with angled polish (APC), while multimode MPO connectors are specified with low loss ultra physical contact (UPC) polish. As speeds touch and exceed 200Gb/s, low insertion loss and proper alignment will continue to remain critical for performance. With more complex signalling protocols requiring tighter transceiver specifications, optical return losses may become critical and a need to ensure signal integrity under tighter link budgets is emerging. Increasingly vendors are therefore specifying and adopting APC polished multimode connectors. ■

ALAMURI SITARAMAIAH
Alamuri Sitaramaiah is consultant data centre solutions portfolio at STL – Sterlite Technologies. He has successfully led several network infrastructure businesses to market leadership in India and is skilled in taking new technologies to market and driving sales breakthroughs. Sitaramaiah has led numerous deployments across utilities, enterprises and public safety.

All you need to know



CLICK ON THE COVER TO VIEW THE 2025 MEDIA KIT

BCS appoints Alexandra Thorer as chief development officer


Alexandra Thorer

Business Critical Solutions (BCS) has appointed Alexandra Thorer as its chief development officer, with a broad global remit and responsibility for the continuing strategic development of the business. Thorer returns to BCS to take-up the newly created role after rejoining from Stack Infrastructure, where she was vice president strategy and development EMEA.

In her new role, Thorer will support the company's commitment to an international vision with local capabilities, expanding its markets and growing and strengthening its services whilst ensuring that client relationships remain its foundation. She said, 'BCS has experienced significant growth to date for a reason – its culture, expertise and commitment to delivering for its clients. It is vital that we maintain these values and this approach as our journey continues as a business that focuses on building client relationships rather than selling services.'

Emcor UK launches end-to-end data centre operations solution

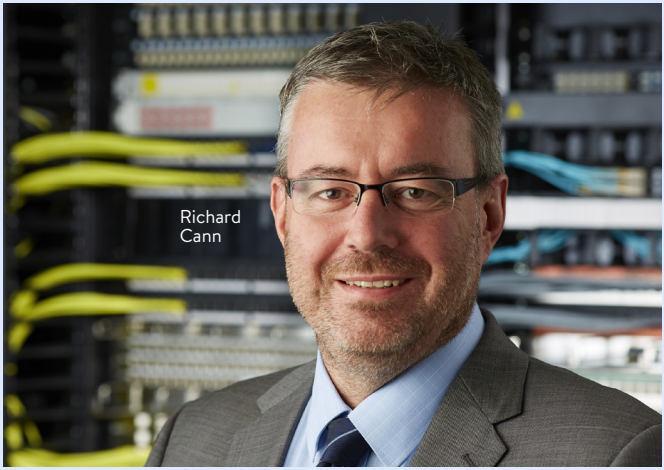
Emcor UK has launched a solution covering the full lifecycle of data centre operations, spanning design, build, management and maintenance. The solution is designed to meet rising demand for new data centres and the company will offer self-delivered solutions, modernise existing sites and manage critical infrastructure.


Steve Clifford

Emcor UK's data centre team will manage all services from the initial stages of design, which includes collaborating with customers to shape efficient, resilient and sustainable data centres. It will also fully support the ongoing management of data centre operations, taking a forward thinking approach to smarter and sustainable performance in the evolving digital landscape.

The solution will be run by Emcor UK's specialist data centre team, led by Steve Clifford, director of data centres. Clifford said, 'Our end-to-end self-delivered solution gives customers a complete design, build, management and maintenance offering. It provides them with the uptime, assurance and resilience they need to meet today's data centre demands, while also creating readiness for future sustainability, scaling and growth.'

Elevate strengthens its MPO expertise with Senko



As Elevate – Future Faster from Excel Networking Solutions continues to build momentum in the EMEA data centre market, its configuration team recently completed advanced training in multi-fibre push-on (MPO) connectivity, delivered by Senko. The training covered the full spectrum of MPO best practice – termination, polishing, testing, inspection and cleaning – reinforcing Elevate's ability to deliver the highest standards for mission critical data centre infrastructure.

Excel's decade long commitment to pre-configuration services have seen major expansion over the past 12 months and its headquarters includes a purpose built fibre room. Richard Cann, the company's configuration team manager, said, 'As demand for MPO grows, having this expertise in-house gives Elevate and our customers a real advantage by delivering high quality, UK assembled solutions at speed and scale.'

CHANNEL UPDATE IN BRIEF

EfficiencyIT has entered into a strategic partnership with Michael Smith Switchgear (MSSL) to speed delivery of secure, sustainable prefabricated artificial intelligence (AI) and high performance computing infrastructure across the UK and Europe.

Black Box has appointed Sean Maguire as senior vice president of sales for its data centre business. With over 25 years of sales leadership experience with firms including Atos, Digital Realty, Olsson, CEC Facilities Group and Stratygy, Maguire brings an understanding of both technology and the customer.

Parker Burke has joined Fluke Corporation as the president and group president of Fortive's Connected Reliability Group. He will lead both Fluke Corporation and Fluke Reliability.

Snowflake has appointed Chris Niederman as senior vice president of alliances and channels. Niederman will be responsible for leading the Snowflake global channel and partner ecosystem, as well as driving growth and collaboration.

Vertiv has opened its new Vertiv Academy training centre in Frankfurt. Strategically located in one of Europe's most connected cities, the new facility will enhance technical training, service innovation and customer engagement across Germany, Austria and Switzerland.

Quick clicks

Your one click guide to the very best industry events, webinars, electronic literature, white papers, blogs and videos

Unlocking Growth In The Mid-Market is a report from **Node4** that identifies how cloud is being optimised for performance, compliance and more direct control.
CLICK HERE to download a copy.

Public Cloud: Does The Reality Live Up To The Hype? is the question posed in a white paper from **Asanti.**
CLICK HERE to download a copy.

Digital Sovereignty At Risk In The Public Sector is a blog from **Nutanix.**
CLICK HERE to read it.

Flexible Data Centers To The Rescue Of An AI-Induced Power Crunch is a blog by Steven Carlini of **Schneider Electric.**
CLICK HERE to read it.

Ensuring Field Integrity In Field Testing is a white paper from **AEM Precision Cable Test** that focuses on the reliable methods of confirming shield continuity in the field.
CLICK HERE to download a copy.

Sudlows' Zac Potts recently appeared as the first guest in the return of Power Talks' podcast titled Watt's The Plan For Sustainability.
CLICK HERE to listen to it.

The **European Data Centre Association (EUDCA)** has published its State of European Data Centres 2025 report.
It provides an overview of the European data centre landscape, comprising a survey of over 60 colocation decision makers.
CLICK HERE to download a copy.

Cool under pressure

As digital transformation accelerates, the demand for high density computing environments has never been greater. Panduit's Hans Obermillacher looks at the key considerations when it comes to effective data centre climate control

Organisations deploying advanced artificial intelligence (AI) models, running sophisticated simulations or processing vast data streams, increasingly rely on high performance computing clusters, graphics processing unit (GPU) rich server pods and cloud based AI. These infrastructure advances all bring significant thermal challenges. In this context, cooling and climate management solutions must offer robust, scalable answers for the evolving data centre landscape.

ON THE UP

Energy consumption continues to rise across Europe's data centres – and not just within the traditional Frankfurt, London, Amsterdam, Paris and Dublin (FLAP-D) facilities. As such, Europe's data centre power consumption is forecasted to grow by +70 per cent between 2024-2030, which increases the need for cooling capacity.

Traditional 2-5kW per rack densities are being replaced by 15kW, 30kW and, in some cases, over 50kW per rack. For example, a typical AI rack with four Nvidia DGX H100 servers needs 40.8kW. These loads generate a significant amount of heat that requires proper climate management to make sure the equipment lifespan, efficiency and overall performance do not suffer.

Furthermore, government, industry and businesses increasingly look to eliminate inefficiencies in power use and equipment cooling costs. Best in class energy efficiency technologies such as heat pumps are a necessity and are being driven by the Energy Efficiency Directive (EED), which defines Power Usage Effectiveness (PUE) and Energy Reuse Factor (ERF).

TARGET PRACTICE

Barbour ABI has identified 95 data centre construction projects in the UK slated to start within the next 12 months, including major sites such as a 40MW hyperscale site in Manchester. While at the same time, the UK data centre sector has committed to meet very ambitious environmental targets by 2030:

- Cutting PUE to ~1.3
- Powering facilities 100 per cent from renewables
- Achieving carbon neutrality
- Steering AI expansion toward sustainable models via clean energy, advanced cooling, water efficiency and heat recovery

GOAL KICK

Climate management in modern UK data centres must achieve three key goals:

- Thermal efficiency. Maximise cooling with minimal energy use.
- Reliability. Prevent thermal hotspots that could cause server failure.
- Scalability. Adapt easily to increasing rack densities and future needs.

Data centre infrastructure providers address these three requirements through a comprehensive portfolio of physical infrastructure solutions specifically engineered for thermal optimisation. Solutions span the entire cooling ecosystem including passive cooling optimisation (containment systems), active cooling systems (rear door heat exchangers (RDHx), in-row cooling), environmental monitoring and control, as well as cable and pathway management for improved airflow. Each element contributes to a unified thermal strategy that maximises efficiency and uptime.

IN THE ZONE

A core approach is passive cooling, which is usually an airflow containment system that is designed to keep cool air and hot air in separate zones and eliminate hot air recirculation and cold air bypass. These are two major sources of cooling inefficiency in legacy and modern data centres alike.

There are a variety of modular cold aisle containment and hot aisle containment systems now available, which are ideal for retrofits or new builds. These systems reduce energy costs by as much as 30 per cent, support rack densities up to 30kW per cabinet and require operators to

‘Often overlooked, but a critical factor in data operations, is cabling and pathway design, which has a direct impact on airflow and cooling. Optimised cabinets direct airflow paths to maximise cooling, while specifically designed overhead optical fibre and copper pathways remove cable clutter from underfloor air plenums.’

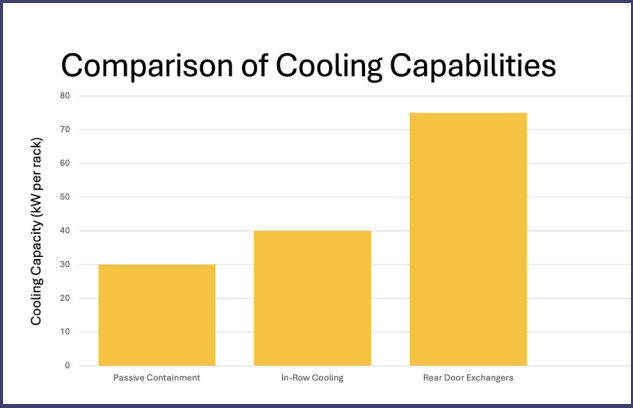
ensure supplied systems are compliant with ASHRAE TC9.9 guidelines.

ACTIVELY ENGAGED

Passive cooling methods are often insufficient for modern compute intensive deployments. For rack densities exceeding 30kW or tightly packed GPU based superpods, active cooling becomes critical.

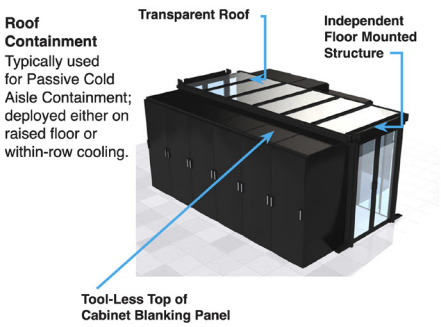
RDHx are compatible and simple to deploy within a variety of cabinet frames and offer up to 75kW of heat removal per rack. The latest designs provide 100 per cent heat removal at rack level and, depending on the scale of the deployment, can eliminate server room cooling infrastructure, which reduces capital expenditure and ongoing operational costs. Operators should ensure the chosen system provides integration with building chilled water systems, which is essential to RDHx operation. This fault tolerant system design, usually in an N+1 based redundant solution, can provide near silent, fan assisted or passive options depending on the operators’ requirements.

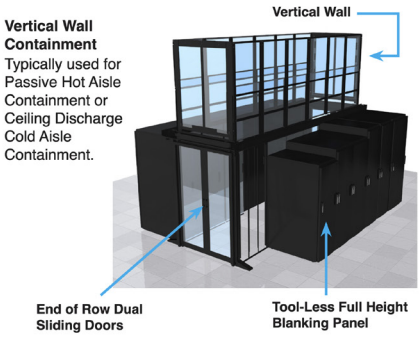
In-row cooling units reduce air travel distance, increasing cooling efficiency. They are modular, scalable, N+1 based and can be used with variable speed fans and intelligent controls. These solutions target cool air to individual server racks directly, rather than the entire room. This improves efficiency by cooling the source of the heat generation in the server and extracting the heat, while preventing the mixing of hot and cold air. The key benefits of in-row cooling infrastructure include the reduction of overall cooling energy consumption, improved server cooling, which prevents component overheating, and optimal performance, as well as flexible deployment that can adapt to various rack configurations.



KNOW HOW

Effective cooling relies on real time environmental monitoring systems that allow operators to measure temperature and humidity at the top, middle and bottom of each rack. They can also





monitor differential air pressure, leak detection and secure door access. These solutions allow data centre managers to automate cooling adjustments, reduce energy consumption and improve service level agreement (SLA) adherence.

Often overlooked, but a critical factor in data operations, is cabling and pathway design, which has a direct impact on airflow and cooling. Optimised cabinets direct airflow paths to maximise cooling, while specifically designed overhead optical fibre and copper pathways remove cable clutter from underfloor air plenums. Furthermore, high capacity vertical cable managers reduce congestion and thermal blockages.

GREEN PIECE

Net-zero targets are shaping infrastructure investments. As such, data centre solutions must support sustainability by implementing modular systems that reduce waste during upgrades, lower energy consumption through efficient airflow and targeted cooling, and employ reusable components to enable greener refresh cycles. In an era defined by data intensive applications and ever-rising server rack power density, thermal management is no longer an operational afterthought.

Modern infrastructure provides the flexibility, reliability and performance needed to meet todays and tomorrow's thermal demands. ■

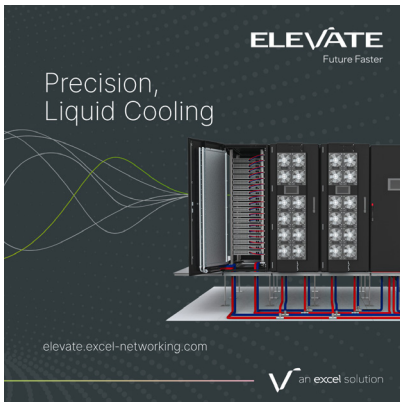
HANS OBERMILLACHER

Hans Obermillacher is senior business development manager for data centres EMEA at Panduit. He has over 20 years' experience in the data centre industry.

Elevate

Rising compute densities demand smarter approaches to heat management. Elevate's data centre cooling solutions are engineered to address key thermal challenges, balancing performance, sustainability and operational continuity.

Through a partnership with nVent, Elevate offers precision liquid cooling systems designed to efficiently dissipate high heat loads while minimising energy consumption. These solutions enable higher rack densities and improved Power Usage Effectiveness (PUE), supporting scalable, modular deployment across a range of environments.



Fully compatible with the broader Elevate ecosystem – including high density racks, high density connectivity and fibre duct and intelligent power – cooling solutions are engineered for seamless integration. This ensures a cohesive, end-to-end infrastructure that simplifies deployment and optimises performance across the white space.

Elevate accelerates the deployment of next generation cooling by aligning technical capability with evolving data centre demands, delivering infrastructure designed to meet tomorrow's thermal requirements today.

CLICK HERE to explore Elevate.

www.elevate.excel-networking.com

Stulz

Stulz has invested in a new production facility dedicated to liquid cooling solutions at its headquarters in Hamburg. The expansion reflects the company's strategic focus on meeting the growing demand for advanced cooling systems for high performance computing and artificial intelligence (AI) driven data centres.

Stulz has a comprehensive portfolio of liquid cooling solutions tailored to the diverse needs of cutting edge data centres. These include individually configurable complete systems, advanced chillers with free cooling functionality to enhance energy efficiency, and innovative micro-modular data centre products for scalable, high density deployments.

One of the key products to benefit from the enhanced production capability is the CyberCool CMU cooling distribution unit. This device allows for precise control over the facility water system and technology cooling system sides of a liquid cooling infrastructure. It facilitates better management of coolant flow rates, temperatures and pressure, thereby boosting system efficiency.

To find out more **CLICK HERE.**

www.stulz.com

Panduit

Panduit's FlexFusion XGL cabinets provide maximum capacity to manage high cable density in data centre, enterprise or colocation deployments. Available with lockable door solutions, FlexFusion XGL cabinets offer a secure cabinet for 19-inch rackmount IT equipment, providing extensive cable management options with high thermal efficiency and are suitable for hot aisle/cold aisle or thermal containment.

Manufactured in welded steel, the cabinets come in fixed configurations of 600mm and 800mm widths, 1070mm and 1200mm depths and 42RU and 48RU heights. Front single hinge door and split hinged rear doors provide 80 per cent open perforation, maximising cooling airflow to the IT equipment. A 170° door open angle minimises aisle obstruction and horizontally split side panels enable easy interconnection of equipment in a side by side configuration, while brush cable top of cabinet entry points reduce air leakage.

FlexFusion XGL cabinets are available in black and white. They retain maximum scalability for future moves, adds and changes, and offer a massive static weight capacity of nearly 1.6 tons and a rolling load of up to 454kg.

CLICK HERE to find out more.

www.panduit.com

Ahead of our time

Richard Collar of Kao Data identifies what needs to be done to cool the artificial intelligence (AI) workloads of the future

According to government figures, the UK AI market surpassed £72bn in value in 2024, firmly establishing the nation as the third largest AI market globally, trailing only the United States and China. Concurrently, leading graphics processing unit (GPU) manufacturers continue to release advanced processing technologies, significantly heightening computational requirements.

PERFORMANCE ART

Nvidia's latest GPUs, including architectures such as the Blackwell series, exemplify a new era of performance that necessitates significant adjustments in data centre infrastructure, pushing traditional cooling methods to their limits and prompting the rapid evolution of hybrid cooling solutions. This rapid advancement is mirrored globally, placing the UK at the forefront of addressing the cooling challenges associated with robust AI-driven infrastructure.

The exponential growth in AI technologies presents significant challenges for data centre operators, particularly in thermal management and power distribution. Increasing rack densities have fundamentally altered the thermal dynamics within data centres, escalating cooling requirements far beyond previous standards.

The need for hybrid cooling solutions that combine liquid and air cooling is now critical, driven by the increasing heat output from next generation GPUs. This challenge is further compounded by structural demands, such as the need for reinforced concrete slab flooring to support the substantial weight of modern GPU systems and liquid cooling infrastructure.

DEFINING MOMENT

Another significant issue facing operators is the absence of universally defined industry standards for hybrid cooling designs. Each GPU manufacturer specifies

e

'While liquid cooling solutions are now becoming mandatory due to the heightened thermal loads associated with advanced GPUs, air cooling still plays a crucial supporting role. Data centres typically need to maintain around 10-20 per cent air cooling capacity to manage residual radiant heat effectively.'

unique thermal requirements, which vary substantially, ranging from circa 25°C to around 35°C. This variability creates complex dilemmas in facility design, forcing operators to choose between potential customer limitations or higher upfront capital expenditure and increased ongoing operational costs.

These decisions directly impact energy efficiency metrics such as Power Usage Effectiveness (PUE), requiring strategic long-term planning to balance efficiency with flexibility and customer compatibility. Additionally, the environmental impact associated with increased cooling demands adds further complexity, driving operators to seek more sustainable and energy efficient solutions.

FUTURE FLEXIBILITY

Forward thinking data centre operators are increasingly leveraging digital technologies to proactively address these challenges. The implementation of digital twin technologies enables the creation of precise virtual replicas of physical data centre environments. Operators utilise these digital twins to rigorously model and simulate various scenarios such as fluctuating operating conditions, diverse hardware configurations and different cooling topologies. This detailed simulation capability significantly improves decision making, allowing facilities to maximise energy efficiency, reliability and sustainability.

Some data centre operators have already begun integrating digital twin solutions into their planning processes. This advanced digital modelling

'Supporting AI workloads requires sophisticated data centres specifically engineered with flexible hybrid cooling solutions. Data centre operators that proactively incorporate these innovative technologies into their infrastructure planning can significantly future proof their facilities.'

approach enables thorough testing and validation of proposed infrastructure changes and optimisations before physical implementation, significantly enhancing operational effectiveness, resource utilisation and overall sustainability. Digital twins also enable operators to anticipate future needs and proactively adapt their infrastructure, thereby maintaining competitiveness and operational readiness in a rapidly evolving technological landscape.

BEST OF BOTH

Given the continuously increasing GPU densities, hybrid cooling environments that integrate both direct to chip liquid cooling and air cooling technologies are becoming increasingly indispensable. While liquid cooling solutions are now becoming mandatory due to the heightened thermal loads associated with advanced GPUs, air cooling still plays a crucial supporting role. Data centres typically need to maintain around 10-20 per cent air cooling capacity to manage residual radiant heat effectively.

The necessity to simultaneously support legacy servers and cutting edge GPUs creates additional complexity. Today's data centre infrastructure must be sufficiently adaptable to accommodate diverse generations of GPU technology, ensuring seamless operational continuity and flexibility. This need has driven GPU manufacturers to increasingly mandate liquid cooling compatibility from the outset, directly influencing facility design parameters and infrastructure planning. As this trend accelerates, the ability of data centre operators to manage transitions between various generations of technology

will become increasingly critical to their operational success.

GUIDING LIGHT

In response to the dynamic demands of advanced cooling systems, industry bodies such as ASHRAE and its TC 9.9 working group are actively developing new S-class specifications. These evolving guidelines delineate specific thresholds where chillers, cooling towers and dry coolers become necessary – effectively marking the limits at which traditional air and adiabatic cooling approaches are viable. This framework aims to provide clearer guidance for the deployment of cooling distribution units (CDUs) and other critical cooling infrastructure.

However, achieving industry-wide consensus remains challenging due to varied thermal requirements among GPU manufacturers. The lack of uniformity highlights the pressing need for flexible and adaptable infrastructure designs that can accommodate evolving, and often diverse, cooling specifications, ensuring long-term operational viability and efficiency.

Additionally, collaborative industry efforts to standardise cooling parameters would significantly streamline future digital infrastructure planning and development.

BE PREPARED

Ultimately, supporting AI workloads requires sophisticated data centres specifically engineered with flexible hybrid cooling solutions. Data centre operators that proactively incorporate these innovative technologies into their infrastructure planning can significantly future proof their facilities. By continuously adapting to evolving AI-driven demands, it is possible to sustain high standards of sustainability, energy efficiency and operational reliability. The ability to dynamically respond to these rapid technological advancements will prove crucial in supporting the relentless pace of AI innovation and ensuring robust infrastructure performance for years to come. ■

RICHARD COLLAR

Richard Collar is Kao Data's technical director. With 25 years of expertise in complex special engineering and mission critical projects, and a specific focus on data centres for the past 12 years, Collar spearheads the development of Kao Data's business engineering strategy. He ensures the delivery of future proof designs that align with current and emerging high density AI requirements.

Former Scottish steelworks at Ravenscraig set to become major data centre

Plans have been unveiled to transform part of Ravenscraig – once one of the biggest hot strip steel mills in Europe – into one of the UK's largest green artificial intelligence (AI) data centres. The site would bringing more than 2,000 new jobs and an estimated £3.9bn capital investment, as well as contributing an additional 0.4 per cent to Scotland's annual gross domestic product (GDP) once operational.

The ambitious proposal has been put forward by Apatura, with plans to develop a major data centre with battery energy storage on 160 acres. It will be powered by 550MW of grid connections due to come online by 2030. Ravenscraig is one of five AI-ready sites Apatura is progressing across Scotland's central belt, backed by over 1.6GW of confirmed grid connections, making it one of only a few UK developers ready to deliver AI infrastructure at this scale.

CityFibre celebrates first connected Project Gigabit customers in Buckinghamshire

CityFibre has connected its first customers in Buckinghamshire as part of its Project Gigabit rollout across the area. The build in Buckinghamshire is part of a larger Project Gigabit contract that will also provide better broadband to Hertfordshire and East Berkshire, where residents will be able to connect later in the year as build continues.

CityFibre hosted an event to mark this important milestone at Longueville Hall. Longueville Hall serves as a community hub for the residents of Newton Longville, offering rentable spaces and hosting parish council meetings regularly.

The rollout was made possible thanks to over £58m in government funding enabling more than 34,000 homes and businesses to unlock superfast and ultra-reliable full fibre broadband. CityFibre is also contributing its own investment to support the project. In total, over 1.3 million homes and businesses stand to benefit from CityFibre's Project Gigabit rollout, which forms part of the company's commitment to reach more than eight million premises nationwide.

Queen Mary University of London delivers data centre district heating project with Schneider Electric

Schneider Electric and its EcoXpert partner, Advanced Power Technology (APT), have delivered a cutting edge, data centre modernisation project at the Queen Mary University of London – one of the world's top 100 universities. The companies have created a platform for heat recovery at Queen Mary's data centre, enabling waste heat from the facility to be connected to a campus-wide district heating network, providing heating and hot water for the buildings and student accommodation nearby.

The project not only reduces the campus's Scope 1 CO2 emissions in line with Queen Mary's sustainability goals but has also allowed it to reduce the costs of its energy bills. Further, the new energy efficient data centre has provided Queen Mary with increased resiliency and processing power for its on-premises, large scale research and intensive computing applications, helping it to provision for future expansion.

PROJECTS & CONTRACTS IN BRIEF

Alibaba Cloud will launch its second data centre in South Korea by the end of June 2025 in response to the growing demand for cloud computing and AI services from local businesses. The investment – made three years after the establishment of Alibaba Cloud's first data centre in South Korea in 2022 – demonstrates its continued commitment to investing in the country and is in response to the anticipated demand for AI infrastructure.

The Bank of England has significantly scaled up its investment in IT hardware by £7.7m over the past three years, purchasing laptops, phones and tablets as part of a broader digital transformation strategy aligned with increased demands for cybersecurity, remote access and operational efficiency.

Ark Data Centres has announced a long-term agreement with Nebius that will see one of the UK's first deployments of Nvidia Blackwell Ultra graphics processing units (GPUs) installed at Ark's Longcross Park campus in Surrey. The cluster, comprising an initial deployment of 4,000 Nvidia Blackwell Ultra GPUs, will enable UK start-ups, research institutes, enterprises and public sector organisations build AI using the world's most advanced computer.

The London Internet Exchange (LINX) has announced a strategic partnership with Megaport to enhance cloud connectivity options for its members.

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Small but mighty

Given that we are living in an age of huge growth in data centre power demand, Rolf Bienert of the OpenADR Alliance discusses the advantages and challenges of microgrids in providing flexibility and clean energy

Generating enough power for the demands of artificial intelligence (AI), cryptocurrency and other power hungry applications is a major challenge facing data centres right now. So, is this surging data centre power demand an opportunity for microgrids?

SUPPLY AND DEMAND

A request made through ChatGPT consumes 10 times the electricity of a Google search, according to the International Energy Agency (IEA). The Electric Power Research Institute (EPRI) claims that a ChatGPT request uses 2.9 watt-hours (Wh), while traditional Google queries use about 0.3Wh each. With an estimated nine billion daily searches, this means an additional demand of nearly 10TWh of electricity per year!

With the rise of AI and expectation in terms of what it can deliver, the next few years are likely to see a significant rise in the number and size of data centres, with Google pouring billions into new data centre investment and doubling up on data centres using nuclear energy. This all has serious consequences for the

energy sector at a time when technology firms are under growing pressure to make data centres more energy efficient and sustainable. With a power grid already under pressure and in the process of trying to modernise and flex to cope with the huge demands placed on it, the industry needs to rethink the way it adapts to these challenges.

PROOF OF CONCEPT

Microgrids or virtual power plants – the two are almost interchangeable – could be the answer in providing a more sustainable and efficient energy supply for data centres. While the concept of a microgrid can vary depending on how they are used, they can be defined as small scale, localised electrical grids that operate independently or in conjunction with the main power grid. They range in size from a campus to a home.

We are seeing them used in some interesting scenarios – from residential to large campuses like Apple in Silicon Valley. One such interesting use case is MCE, a California community choice aggregator, which has established a standardised set-up for residential virtual power plants with OpenADR used as the utility connection to manage the prices and consumption.

This innovative approach is intended to serve as a model to help homebuyers at every income level access clean, all electric technology for their homes. MCE's virtual power plant helps participants save money with clean energy technologies and receive monthly credits on their energy bills. In exchange, they allow their smart energy devices to respond to MCE's signals to shift load based on the grid's needs. This includes reducing energy use during more expensive times of the day, sending energy back to the grid when needed, and reducing grid strain when weather events threaten outages.

SEEING THE ADVANTAGES

The feasibility and suitability of microgrids depends very much on factors like the specific requirements of the data centre itself, the regulatory environment and

the long-term goals for sustainability, resilience and cost efficiency. In terms of advantages, the real value is in helping to overcome grid constraints and improving reliability by managing consumption and maintaining power during grid issues. For data centres that require uninterrupted operation, this ability to deliver resilience is critical.

'While the concept of a microgrid can vary depending on how they are used, they can be defined as small scale, localised electrical grids that operate independently or in conjunction with the main power grid.'

Sustainability is another key advantage. By integrating renewable energy sources, such as solar or wind power and energy storage, microgrids can significantly reduce carbon footprint. In terms of cost savings, they can reduce operational costs by utilising local power generation and demand-response strategies.

Microgrids are modular, which means they can grow as a data centre's needs evolve. When it comes to regulation, they face fewer hurdles compared to other options like nuclear power facilities because they can operate mostly net-zero on the grid connection.

ADDRESSING CHALLENGES

For data centre operators and investors trying to address power supply and stability issues, the use of microgrids can also mean challenges. The first of these is the start-up costs. While we talk about a reduction in operational costs once up and running, set-up costs for microgrids can be high, requiring significant capital investment especially for larger data centres. This is important to bear in mind.

Sustainability may be a big plus point, but the use of renewables like solar and wind depend on the weather – and the weather can be fickle. This necessitates robust storage solutions, back-up power or large grid connections to ensure reliability and stability at all times. It's also important to stress that the effective integration of these various distributed energy sources and systems can be technically challenging, so working with good integrators and partners is of paramount importance.

POWER UP

When it comes to powering data centres, microgrids are not the only option being considered. Alternatives like small modular reactors (SMRs) are also being touted as potential power sources. In my mind, SMRs are not in competition with microgrids but could become an important baseline component of them.

In their favour, SMRs provide a constant, high capacity output, ideal for 24/7 operation, and a zero emissions power source. Once operational, they offer stable costs over decades. But they also face challenges like stringent regulation and

public opposition to development, while a nuclear plant, even a small scale one, involves substantial upfront investment. This is aside from the risks around nuclear waste and safety.

BOTTOM LINE

The data centres of the future are going to need a very high continuous supply of power and microgrids offer options for a more resilient and responsive energy infrastructure. Decentralised power through a network of microgrids could help dynamically manage power loads and optimise renewable energy sources – especially as demands on the grid grow as we march onwards towards an AI-powered future.■

ROLF BIENERT

Rolf Bienert is technical and managing director of the OpenADR Alliance. He is responsible for creating and managing its technical strategy, direction and activities. Bienert has been involved in many international standardisation efforts and an active member of the NIST SGTCC, USNAP Alliance, SunSpec Alliance, ZigBee Alliance and other organisations driving the development of new technologies.

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