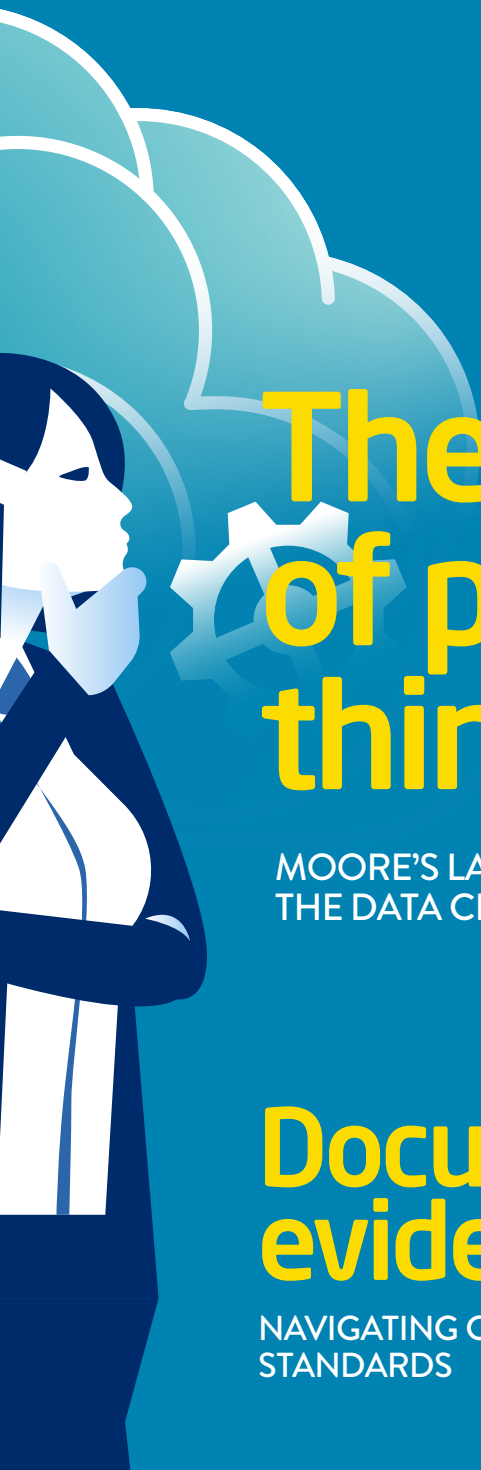


Inside_Networks

First and foremost

HOW DATA CENTRES CAN
ACHIEVE ENERGY EFFICIENCY
AND SUSTAINABILITY BY DESIGN





The power of positive thinking

MOORE'S LAW AND ITS IMPACT ON
THE DATA CENTRE SECTOR

Documentary evidence

NAVIGATING COPPER CABLING
STANDARDS

ARISTA



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Join experts from Siemon and Arista to explore the current market trends and applications driving these changes, as well as the technologies and approaches available that you can use to achieve your strategic goals.

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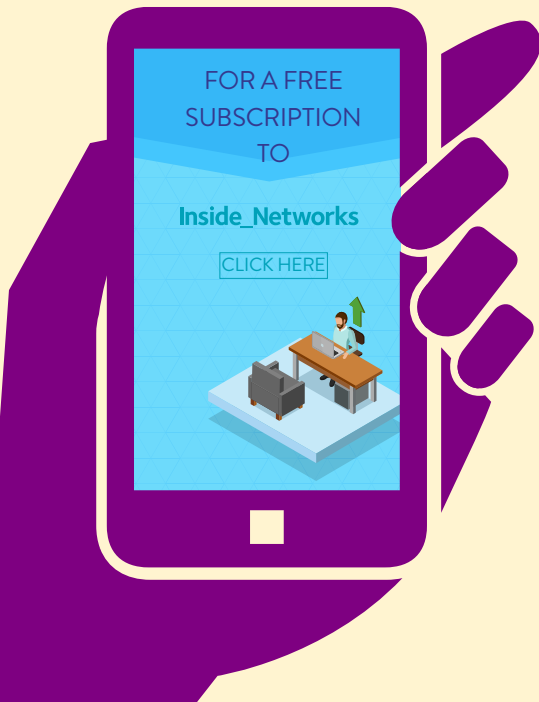


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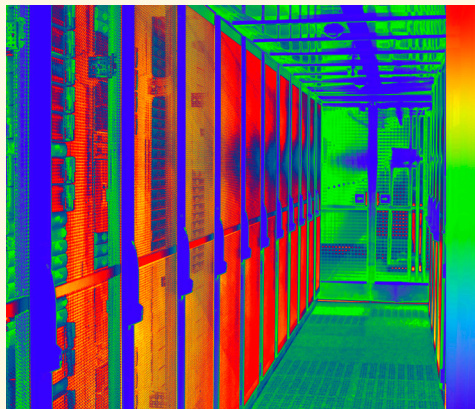
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Predictive text

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The death of Gordon Moore in March marked the passing of one of the IT industry's great minds. Not only was he the co-founder and former chairman of Intel, he was an ardent conservationist, with the Moore Foundation committing more than \$800m since 2000 towards protecting the Amazon.

What he is perhaps most famous for though is his remarkable ability to predict the pace of semiconductor chip development. In 1965, in what became known as Moore's Law, he claimed that the number of transistors that could be placed on a silicon chip would double at regular intervals for the foreseeable future.

For such a fast moving industry, his prediction proved to be incredibly accurate. For how long this will continue, however, is up for debate and it's the subject tackled in this issue's Question Time by a specially selected panel of industry representatives, who also summarise the impact of Moore's Law on the development of the data centre sector.

The history of copper network cabling infrastructures is fascinating for many reasons – not least because every time it's suggested that its potential has been reached, it evolves in new and interesting ways. James Withey, liaison officer between IEEE 802.3 and ISO/IEC SC25 WG3, explains the recent developments in copper cabling standards, while Paul Malone of Sudlows looks at copper cabling standards from an installer's perspective and how they are applied to projects.

This issue also contains a special feature on energy management, with two excellent articles on the subject. First up, Mark Yeeles of Schneider Electric looks at how data centres can achieve energy efficiency and sustainability by design. He's followed by Dean Boyle of EkkoSense, who looks at why getting a head start on raising data centre temperatures should be a priority.

Last but certainly not least, I'd like to say a massive thank you to all those who participated, sponsored and provided raffle prizes for the Inside Networks 2023 Charity Golf Day. The amazing sum of £11,000 was raised for Macmillan Cancer Support and a great time was had by all. You can see a round-up of the event in next month's issue.

Rob Shepherd

Editor



Inside Networks
THE NETWORK INFRASTRUCTURE E-MAGAZINE

A large, grey, modular UPS unit is shown against a background of a blue and orange sky, suggesting a space or high-tech environment. On top of the unit, two small astronaut figures are standing. A white cable loops around the top of the unit, connecting to a small screen on the front panel. The screen displays a technical interface with various data points and graphs. The unit has a large, perforated metal grille on the front, and a small 'Schneider Electric' logo is visible on the grille. The overall aesthetic is futuristic and emphasizes the unit's compact and advanced design.

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UTC Heathrow celebrates another award win and welcomes Vertiv as its latest partner

University Technical College (UTC) Heathrow and its partners – CNet Training, Amazon Web Services (AWS), Ark Data Centres, CBRE, CyrusOne, Kao Data, LMG, Soben, Virtus Data Centres and Yondr Group – have been recognised with a third global accolade in 12 months by scooping the Education and Employment Project Award of the Year at the Datacloud Global Awards.

It recognises the ongoing success of the UTC Heathrow initiative, which delivers a curriculum for the exclusive Digital Futures Programme. Aimed at 14-18 year olds, the programme has been established with the aim of tackling the industry's skills shortage

and driving new talent into the digital infrastructure industry.

Joanne Harper, CEO of the Activate Learning Education Trust that UTC



Heathrow is part of, said, 'We are delighted that the work has been recognised again at the Datacloud Awards. What is even more exciting is that the employer partners have been in discussions to widen the remit of the partnership to open three further UTCs dedicated to the industry, considerably increasing the

number of students that the project can reach.'

UTC Heathrow has also announced a partnership with Vertiv, which will see its people working alongside UTC Heathrow to deliver a programme of learning based on the data centre sector.

Equinix appoints Bruce Owen as managing director for the UK

Equinix has appointed Bruce Owen as its new managing director for the UK. He will be responsible for advancing digital progress alongside crucial environmental and community initiatives, aligning with both Equinix's and the country's sustainable goals and vision.

An Equinix veteran, Owen joined the company in 2010 as a member of the EMEA corporate development and finance team. Three

years ago, he established the Global Community and Belonging team and last year was involved in launching the Equinix Foundation to advance digital inclusion around the world.



Owen said, 'I am honoured to become Equinix's managing director for the UK. The UK is a thriving tech hub and a critical market for our global customer base. I am dedicated to being in service to our customers, employees

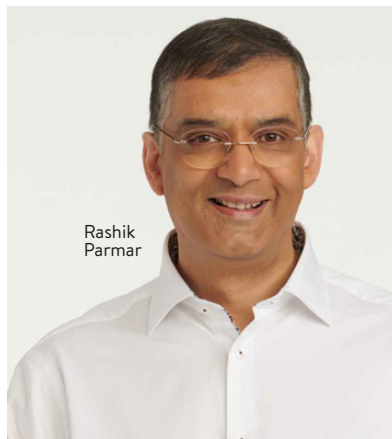
and communities by prioritising innovation, sustainability and the diversity of our workforce.'

AI 'pause' will hand advantage to bad actors

A global pause in artificial intelligence (AI) development will not work and will play into the hands of rogue regimes and organisations, according to BCS, the Chartered Institute for IT. It claims attempts at a world consensus on holding back AI will produce an 'asymmetrical pause', where bad actors seize the advantage.

An open letter by the Future of Life Institute called for an immediate halt in training of systems 'more powerful than GPT-4' for at least six months, which must be public, verifiable and include all public actors. BCS said that even if a go slow

on AI could be achieved, it would still be harmful to humanity by delaying advances in medical diagnosis, climate science and productivity.



BCS chief executive, Rashik Parmar, said, 'We can't be certain every country and company with the power to develop AI would obey a pause. So, instead of trying to smother AI, only to see it revived in secret by bad actors, we need to help it grow up in a responsible way. That means working hard together to agree standards of transparency

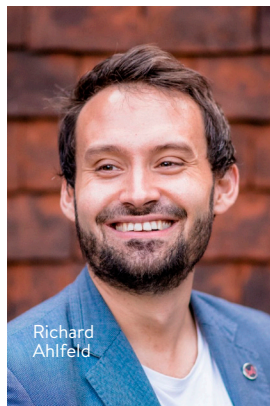
and ethical guardrails designed and deployed by AI professionals.'

70 per cent of engineering executives feel pressure to adopt AI

Monolith commissioned Forrester Consulting to carry out a study which found that 67 per cent of engineering leaders feel pressure to adopt artificial intelligence (AI). It also found that those who have are more likely to achieve increased revenue, profitability and competitiveness for their employers.

163 senior engineering leaders at multinational automotive, aerospace and industrial/manufacturing enterprises in the US and Europe were surveyed. The study sheds light on the challenges and key priorities

that engineering leaders face in the validation and verification stage of the development workflow – and how intelligent AI solutions can support them achieving better results, faster.



'A perfect storm is brewing in engineering as market trends around sustainability and digitalisation are creating even more intractable physics problems that current validation and testing methods are unable to solve,' said Richard Ahlfeld, CEO and founder at Monolith. 'As data from this study shows,

engineering leaders are at a fork in the road to innovate in new ways, as pressure to stay profitable and competitive rises.'

One third of UK companies lack basic tech skills

One third of UK businesses are being held back by a lack of basic tech skills, delaying digital transformation and the implementation of emerging technologies, according to research from UST. While the UK's digital spending is expected to increase 5.2 per cent year over year in 2023, 45 per cent of respondents said that the government should give more incentives to entice businesses to invest in research and development, while 44 per cent said more support should be given to science, technology, engineering and mathematics (STEM) programmes at

education level.

Commenting on the findings, Sheila

Flavell, chief operating officer at FDM Group, said, 'Talent shortage is currently being cited as one of the leading barriers to the adoption of new and emerging technologies – holding back both business and economic growth. It is positive to see that organisations are taking the initiative and attempting to train talent from diverse pools of individuals, such as women, returners and

ex-forces, as these groups, as well as other marginalised groups, hold relevant skills that all too often get overlooked.'



Inside_Networks 2023 Charity Golf Day raises £11,000 for Macmillan Cancer Support

The Inside_Networks 2023 Charity Golf Day raised £11,000 for Macmillan Cancer Support. This impressive sum was the result of fantastic industry-wide support and a great day's golfing at the Hanbury Manor PGA Championship Course in Ware, Hertfordshire, which was followed by a three-course dinner, prize giving, auction and charity raffle.

With main sponsorship provided by LMG, Netceed, Excel Networking Solutions, Mills, Onnec, Lynchpin Media and CNet Training, nearly 140 people turned out to make this year's event the best ever and it provided a welcome opportunity for all areas of the industry to

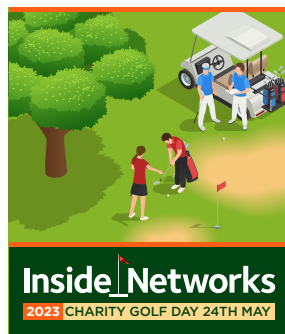
network.

Rob Shepherd, editor of Inside_Networks, said, 'Once again the industry put rivalries aside to raise a considerable

sum of money for Macmillan Cancer Support. Donating £11,000 to such a worthwhile cause highlights the generosity of those who attended. The event wouldn't have happened without such great support and I would like to extend my thanks to all the players and sponsors and, in particular, Andrew Stevens of CNet Training and Mark Cumberworth of Slice Golf

and Events for their work in making the event such a success.'

A full review of the event will appear in the Aug 23 issue of Inside_Networks.



Cisco launches skills programmes to improve cybersecurity resilience in Manchester

Cisco has joined the Greater Manchester Digital Security Hub (DiSH). Through its Country Digital Acceleration (CDA) programme, Cisco is launching a series of targeted initiatives to tackle the widening cybersecurity skills gap. Dedicated programmes will focus on three key areas – the most vulnerable organisations, the widest gap in the industry, and the future generation who will live and work in the region as it realises its digital ambitions.

As part of its role, DiSH will become a Cisco Networking Academy specifically

to support small businesses with their cybersecurity skills. Jon Lomas, cybersecurity partnership development



manager at DiSH, commented, 'We greatly value the opportunity to partner with Cisco to help deliver the critical skills needed to protect businesses of all sizes from potential attacks in an increasingly complicated threat landscape. Becoming a Cisco Networking Academy will help us to

deliver free and easily accessible training for our local business population to help them address the security risks they face.'

NEWS IN BRIEF

Sean Smyth is the new president of ECA. He recently celebrated 50 years in the electrical industry, having begun his career as a JIB apprentice in 1973 and progressing to become CEO of WT Parker Group.

i3 Solutions has been issued with two patents by the US Patent and Trademark Office (USPTO) for its Adaptable Redundant Power (ARP) topology control solution for mission critical electrical power systems.

Bulk Data Centers has formed a partnership with DE-CIX. The new DE-CIX internet exchange is now live in Bulk's data centres in Oslo (OS-IX) and Kristiansand (N01 Campus).

Iceotope has appointed Kelly Mullick as vice president technology advancement and alliances.

Wiley Edge is offering trainees on its Alumni graduate program a path to ISACA certification.

CloudTech24 has analysed the latest data available from the National Fraud & Cyber Crime Reporting Centre. It found that residents of the Greater Manchester area were most susceptible to cybercrime, receiving 1,803 cybercrime reports in the last 13 months. The Kent area, which reported 1,066 cybercrimes, came in second.

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The tip of the iceberg

Hi Rob

In the data centre industry, sustainability has become a siloed discussion focused primarily on energy efficiency. While there is no doubt energy efficiency is an important metric, it doesn't tell the whole story. For long-term change to occur, the entire sustainability chain – from embodied carbon to IT components to renewable energy sources – needs to be part of the equation.

Sustainability should not be about incrementalism, but rather holistic change. When we are solving problems, it is easy to get caught up in the minutiae of the problem. We can end up trying to engineer our way out of it by thinking we can find the solution at the component level. By doing this we run the risk of doing less with more – more space, more carbon, more cost and more regulation. It's time to move away from this engineering mindset in order to truly capitalise on sustainability gains.

Why? Because more and more customers are using sustainability as a criterion for vendor selection and carbon

reduction will be a fundamental piece of data to win new business. According to a World Economic Forum report, 66 per cent of survey respondents, and 75 per cent of millennial respondents, said they consider sustainability when making a purchase.

Businesses are realising sustainability can be an investment opportunity rather than a cost. ESG Alpha is the concept that good sustainability practices and corporate financial performance go hand in hand. It is the idea that by adopting sustainability policies and being transparent about them, it can help a company achieve higher returns compared to the market average.

There is, however, still a cost to be had. In fact, there are multiple costs. The embedded cost of carbon considers the entire production process of a built asset. There are monetary costs when it comes to green levies being imposed by local or national governments. Businesses are beginning to get a grasp of the true carbon cost as they dig into their Scope 3 emissions and better understand the



carbon lifecycle of their entire footprint from cradle to grave. Finally, there is the opportunity cost. What could your business do if it was running faster, smarter or cheaper?

Luckily for the data centre industry, there are new technologies that are having a transformative impact and are no longer just sustainable alternatives to the status quo. Precision liquid cooling is one such technology.

Servers today are designed to be air cooled. However, at a time of denser compute and data gravity, traditional air cooling technologies are reaching their limits. Precision liquid cooling significantly reduces energy and water consumption by up to 40 per cent and 90 per cent respectively. It also reduces the cost of data centre design, build and operations – making a liquid cooled data centre simpler, less complex and more efficient.

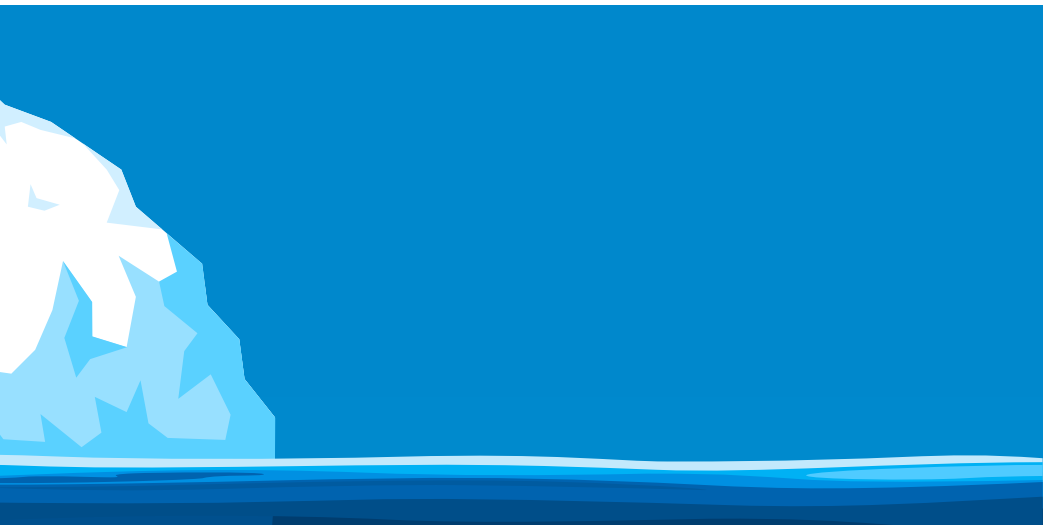
Are we ready to embrace these changes? Human nature is resistant to change, but now is not the time for incrementalism.

During a global climate crisis, hard choices and swift actions are needed. Approaching these problems holistically is not only necessary but should be required. For companies willing to adopt new technologies and find a new way to do business, there is a reward. The competitive advantage is there to be had – if they are willing to embrace it.

David Craig
Iceotope

Editor's comment

As the scale of the climate crisis becomes more widely understood, consumers are increasingly scrutinising the sustainability based credentials of the companies they purchase products and services from. As David points out, understanding a carbon footprint from cradle to grave is part of this process and companies must do more to provide customers with the information they need to make informed purchasing decisions.



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Lasting legacy

Gordon Moore's observation that transistor density on integrated circuits will double about every two years has been remarkably accurate. Inside_Networks has asked a panel of experts to explain its longevity and look at whether time is running out for Moore's Law

▶ On 24th March 2023 Gordon Moore passed away at the age of 94. Moore and his colleague Robert Noyce founded Intel in July 1968 but in 1965 he had a paper published in Electronics Magazine. Nothing particularly remarkable about that you may think, but this article contained an observation that has shaped developments in computer hardware technology ever since.

Moore noted that the number of components in integrated circuits had doubled every year from their invention in 1958 to the time he produced his paper for publication. While originally he predicted that this trend would last for at least 10 years, it has in fact lasted much longer.

But will Moore's Law last much longer? Moore himself went on record in 2005 and said, 'In terms of size of transistor you can see that we're approaching the size of atoms, which is a fundamental barrier. It'll be two or three generations before we get that far – but that's as far out as we've ever been able to see. We have another 10-20 years before we reach a fundamental limit. By then they'll be able to make bigger chips and have transistor budgets in the billions.'

So, in order to assess the impact of Moore's Law, why it proved to be so accurate and whether it will continue to be relevant, Inside_Networks has assembled a panel of industry experts to discuss the issue.

IN LIGHT OF THE RECENT PASSING OF GORDON MOORE, HOW LONG DO YOU THINK MOORE'S LAW WILL CONTINUE TO BE RELEVANT? WHY DO YOU THINK HIS 1965 PREDICTION THAT THE NUMBER OF TRANSISTORS ON A CHIP WILL DOUBLE EVERY 24 MONTHS REMAINED SO ACCURATE AND HOW WOULD YOU SUMMARISE ITS IMPACT ON THE DEVELOPMENT OF THE DATA CENTRE SECTOR?

CARRIE GOETZ

PRINCIPAL AND CHIEF TECHNOLOGY OFFICER AT STRATEGITCOM

Moore's Law governed computing for many years, and at least part of it still does. There were actually two parts to Moore's Law. As transistors are getting smaller and smaller, only so much can fit on a chip without dealing with limitations like electrical leakage, overheating and the like. Heat and real estate have proven to be a limitation in recent chip iterations.

New materials may help – graphene is one and carbon nanotubes may be another. New purpose built chips may aid energy concerns by offloading tasks specific to a chip. For instance, we may end up with chips that process images separately from the central processing unit (CPU).

Photonics is also being studied. Photonics can use light pulses instead of electrical signals, which could increase speed over traditional electronics signalling, all while offloading processor tasks. Photonic qubits are being studied as building blocks for quantum computing alongside copper/electrical qubits. The point is that there may be many future options.

Even on the coding side, Compute Express Link (CLX) is a high speed technology that can move instructions faster between components internally to a server like graphics processing unit (GPU) and CPU. There are limitations on single processors, as parallel processing is used, and getting information chip to chip is also

taxing on power.

CLX is poised to speed up parallel processing and make more efficient use of storage and memory. In addition, CLX will move communications faster so that

components don't have to stay active as long – thereby decreasing energy use at the server. Of course, these technologies don't replace Moore's Law, but they may extend it by addressing existing limitations.

The second, rarely discussed part of Moore's Law proves the cost to manufacture the chips halves in that same 18 month period. As for the monetary side, the

financial law held for many years but is no longer accurate primarily due to rising costs in and of fabrication plants. It will undoubtedly be interesting, as new chip plants come online with new capabilities.

Ultimately, I still think Moore would be 'more' happy than dismayed at the length of time his law has hit the mark.



'AS TRANSISTORS ARE GETTING SMALLER AND SMALLER, ONLY SO MUCH CAN FIT ON A CHIP WITHOUT DEALING WITH LIMITATIONS LIKE ELECTRICAL LEAKAGE, OVERHEATING AND THE LIKE. HEAT AND REAL ESTATE HAVE PROVEN TO BE A LIMITATION IN RECENT CHIP ITERATIONS.'



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ED BISSELL

SALES DIRECTOR AT STELLIUM DATACENTERS

While it's difficult to predict the future with certainty, many believe that Moore's Law will continue to hold true for at least the next few years – although perhaps at a slower pace than previously.

One reason that Moore's Law has remained accurate for so long is that it was based on a fundamental understanding of the physics of semiconductor technology. It was not a random prediction, but rather a well-informed projection based on data and observations of the industry at the time. Additionally, Moore's Law has been sustained by

significant investments in research and development, as well as manufacturing improvements that have enabled smaller and more complex chips to be produced at a lower cost.

Moore's Law has had a significant impact on the development of the data centre sector. As the number of transistors on a chip has increased, the computing power of individual devices has skyrocketed, leading to the development of more powerful and efficient data centre infrastructure. This has allowed for the creation of larger and more complex applications and services, as well as the ability to process and analyse massive amounts of data in real time.

This has led to significant advances in

fields such as artificial intelligence (AI), machine learning and data analytics. As the amount of data being generated continues to grow at an unprecedented rate, the data centre has become a crucial hub for

AI development. With the help of Moore's Law, data centres have been able to rapidly evolve to meet the computational demands of AI workloads.

Gordon Moore's prediction has proven to be incredibly accurate and has had a profound impact on the data centre industry. While it is uncertain how long Moore's Law will continue to hold

true, the principles it embodies will continue to drive innovation and progress in the field of computer technology for many years to come. As data centres continue to push the limits of Moore's Law, we can expect to see even more powerful technology applications emerge in the years to come.



'WHILE IT IS UNCERTAIN HOW LONG MOORE'S LAW WILL CONTINUE TO HOLD TRUE, THE PRINCIPLES IT EMBODIES WILL CONTINUE TO DRIVE INNOVATION AND PROGRESS IN THE FIELD OF COMPUTER TECHNOLOGY FOR MANY YEARS TO COME.'



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MICHAEL AKINLA

BUSINESS MANAGER NORTHERN EUROPE AT PANDUIT

Gordon Moore is one of the giants in the development of modern day microprocessors, and by standing on his, and others, shoulders the data processing industry has expanded and affected almost every aspect of economic life.

Every decade since his pronouncement in 1965, the relevance of Moore's Law and its application has been brought into question. However, Moore's Law continues to be acclaimed as new developments in transistor fabrication are brought online. This continues the economies of scale that the rise in processing power creates for every step down in transistor size.

The need for greater processing power packed into smaller servers, or multiple processors per server across thousands of racks within hundreds of data centres, is an illustration of Moore's impact on the industry. The ability to plan data centre infrastructure and equipment requirements based on calculations for server-chip capabilities, power and cooling utilisation should allow organisations, whether data centre owners or customers, to plan effectively and maximise total investment.

Understanding chip performance predictions ensures that data connectivity developments, such as optical fibre and copper data speeds and bandwidth, support future processor needs, whilst offering installation longevity to reduce the necessity for re-cabling with every processor performance jump. Densification

of cabling to the rack and across data centres is driven by the processors' data throughput.

Faster, more powerful chips pushing greatly increased data rates around data centres obviously increase heat, which needs to be removed, and this influences the cooling methodology in data centres. Increasingly, cooling data halls with mechanical systems uses more energy that should target the more powerful processors. Therefore, the need to efficiently cool servers has become increasingly relevant.

Housing server racks within enclosures, and operating hot or cold environments, has become increasingly popular in data centres to reduce the energy used to cool servers. This allows more energy to be focused on powering the IT equipment. New developments in direct liquid cooling of the servers is increasing, as is the need to focus power on the processing of data, and not cooling the environment, gains importance.

Moore's Law remains an appropriate gauge of technology development and there will always be someone willing to climb on the shoulders of giants to take the industry to new heights.



'MOORE'S LAW CONTINUES TO BE ACCLAIMED AS NEW DEVELOPMENTS IN TRANSISTOR FABRICATION ARE BROUGHT ONLINE.'

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MATTHIAS GERBER

MARKET MANAGER OFFICE CABLING AT R&M

For many years, Moore's Law has provided guidance in the development of data transmission equipment in both the local area network (LAN) and data centre environments.

Up until 2010, the transmission rate of active components was doubling every two years. The number of transistors had always been a good indication of the achievable transmission speed, however, since 2010 we are seeing an exponential, albeit much slower, increase in transmission rate, which is now doubling every five years. This is an indication that, regarding data transmission protocols, devices are beginning to approach physical limitations of the transmission channels. These limitations cannot be overcome using processing power alone.

Another 'glass ceiling' we are approaching in the LAN environment is the processing power of individual devices – the amount of information an individual device can process is starting to stagnate. With this in mind, we should consider how much data an individual in front of a device can process in real time. It would appear we are approaching a natural limit of the Open Systems Interconnection (OSI) Layer 8 (the human being). As a result, further speed increase may not be necessary for single devices.

However, in the data centre environment, and to some extent in wireless access

points, aggregation of the ever increasing number of devices and applications still requires an increased backbone data

rate. Here we are experiencing data rates that continue to grow, as well as a push for faster transmission protocols.

To summarise, Moore's Law, where raw data processing power could directly increase transmission speed, has probably come to an end in the data communications environment. However, better data processing power allows the use of more elaborate

transmission schemes and therefore can continue to power further data transmission speed increases, mainly in the data centre environment.



'UP UNTIL 2010, THE TRANSMISSION RATE OF ACTIVE COMPONENTS WAS DOUBLING EVERY TWO YEARS. THE NUMBER OF TRANSISTORS HAD ALWAYS BEEN A GOOD INDICATION OF THE ACHIEVABLE TRANSMISSION SPEED, HOWEVER, SINCE 2010 WE ARE SEEING AN EXPONENTIAL, ALBEIT MUCH SLOWER INCREASE IN TRANSMISSION RATE, WHICH IS NOW DOUBLING EVERY FIVE YEARS.'

ALAN KEIZER

SENIOR TECHNICAL CONSULTANT AT AFL

Gordon Moore's passing is a moment to reflect on the significance of his famous 'law' and its impact on computing. Moore's Law has played a crucial role in the technology industry for over five decades, setting the cadence of major developments and helping us plan with reasonable confidence.

Moore's Law states that the number of transistors on leading integrated circuit chips doubles every two years. It was an observation of the behaviour of a complex ecosystem of design, materials, processes and equipment, and not based on any specific physical principles. What does it mean in tangible terms? Here's an answer based on personal experience.

In 1968, as a graduate student in physics, I spent hundreds of hours connecting my high energy physics experiment with a Digital Equipment Corporation PDP-8 minicomputer. This was one of the earliest small computers for real time use. It was the size of a refrigerator and contained about 1,400 discrete transistors. The die size of these transistors was about 0.1mm^2 with smallest features of 100 micrometres.

In the mid-1970s, I worked in semiconductor equipment development including step and repeat cameras used for wafer imaging. We used early microprocessors such as the Intel 4004. Each chip contained 2,300 transistors on a

12mm^2 die using a 10 micrometre process.

Fast forward to today and I am involved in connectivity design of hyperscale data centres including networks supporting large artificial intelligence (AI) training

clusters. A typical chip used in these clusters is the NVIDIA H100. It has an unimaginable 80 billion transistors on an 800mm^2 die. The smallest features are four nanometres or 0.004 micrometres. That's an 80 billionfold increase in 55 years, which means doubling in just over a year and a half. Moore's Law has held for me.

Can this continue? Most certainly not. In fact, the time to double has increased in the last decade, and leading edge chips are not far from known physical limits. This does not mean that advances in computer performance will stop. Some of the innovations that we can expect in this decade include greater parallelism, chip stacking, more tensor processing and, perhaps, optical and quantum computing. It's not over yet.



'MOORE'S LAW HAS PLAYED A CRUCIAL ROLE IN THE TECHNOLOGY INDUSTRY FOR OVER FIVE DECADES, SETTING THE CADENCE OF MAJOR DEVELOPMENTS AND HELPING US PLAN WITH REASONABLE CONFIDENCE.'

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STEPHEN BOWES-PHIPPS

VICE PRESIDENT EMEA DATA CENTRES AND CLOUD AT STATE STREET

Moore's Law has been the driving force behind the rapid advancements in computing technology over several decades. As technology continues to advance, however, questions are arising about the sustainability of the law, and how long it will remain relevant in the future.

The silicon chip industry has had an impact on all aspects of daily life but for a long time we needed greater advancements of power to drive our ever-increasing use of compute. As fabrication technologies and quality advanced, chip manufacturers were able to increase the speed at which a chip operated at, and therefore gained a performance boost without adding further transistors. This came at a price – more energy is required to increase chip speed and, consequently, more energy is expelled as waste heat – almost 100 per cent of energy delivered to a data centre is expelled as waste heat.

This began to cause a problem for data centres in the 2000s, as IT energy use started to stretch the power and cooling architectures available and there were few exemplars of 'energy efficient data centres' at the time. The EU Code of Conduct for Data Centres changed all this as it drove more efficient paradigms and practices. Some data centres even repurposed heat in district heating systems.

The chips were now so performant that the compute for most tasks was not

the bottleneck, rather it was the network and storage. Moore's Law was producing compute that was mostly not needed and underutilised. New applications involving blockchain technologies, artificial intelligence and machine learning

have given the humble central processing unit (CPU) a lift once more into prominence, but processing is now more likely to be provided by specifically tuned ASICs than general purpose CPUs.

Although it is difficult to determine exactly how long Moore's Law will continue to be relevant, innovative solutions will likely play a critical role in maintaining our rate of technological progress, and may even surpass the expectations set by Moore's original prediction.

The impact on the data centre industry is therefore fairly easy to predict. While miniaturisation of components continues apace, and innovation brings new processing materials and paradigms into the data centre, Jevon's Paradox will continue to play its part and drive ever more consumption and growth.



'ALTHOUGH IT IS DIFFICULT TO DETERMINE EXACTLY HOW LONG MOORE'S LAW WILL CONTINUE TO BE RELEVANT, INNOVATIVE SOLUTIONS WILL LIKELY PLAY A CRITICAL ROLE IN MAINTAINING OUR RATE OF TECHNOLOGICAL PROGRESS, AND MAY EVEN SURPASS THE EXPECTATIONS SET BY MOORE'S ORIGINAL PREDICTION.'

Plotting a course

With so many different organisations, each producing entire libraires of standards, it can be daunting to try to find the information you need – and even when you find the right document it can lead into a paper trail of references and further reading. James Withey, liaison officer between IEEE 802.3 and ISO/IEC SC25 WG3, offers some guidance

▶ Understanding how to get the most out of a standard can make it much easier to find the right document and, perhaps more importantly, not waste time trawling through documents that don't contain the answers you are looking for – which may well be in a different document! It's a common practice to open a standard and spend hours flicking through the pages, or scrolling and searching a PDF, in the hope that answers will leap out at you. If you know the document well, then this can be a quick solution, but, even so, it is advisable to take some time to start at the 'very good place to start'.

CLAUSE AND EFFECT

Every standard has two clauses in the first pages of the document. Taking time to read and digest both the scope and the introduction before diving into the detail within the body of the standard will

let you know if this is the document you need and what you can expect to find.

The scope is the first thing to read and the most important part to understand. Although it is often one of the shortest sections, it explains what information you

will find in the document, who needs to read it, and how it should be used. The introduction will then give further detail, background and explanation, which can help the reader zero in on answers.

TEXT MESSAGE

Taking, for example, the upcoming ISO/



IEC 11801-1 Amd.1, these clauses explain that the document is an amendment to ISO/IEC 11801-1. This means that it is not a complete document and contains changes and additions to the published version that specify three new categories of single pair

components and the three new classes of channels and links to support single pair applications.

There is similar text in the scope of the recently published ANSI/TIA 568.5 for single pair cabling, although in this case the standard only specifies one new category, and is also being amended with additional requirements in the new project ANSI/TIA 568.5-1. As the scope of these is in the specification of individual components and cabling, then we have to look in other places for standards related to other topics like installation, cable heating or field testing.

EVERYTHING EVERYWHERE

Not every standards organisation is working on the same topics. This means taking note of who published the standard can indicate the scope of the document(s). As a general rule of thumb for data cabling standards, ISO provides standards for installed cabling such as links, channels and other topologies like modular plug terminated links (MPTL), end to end links (E2E) and direct attach cables (DAC), and these form part of the ISO/IEC 11801 series of standards and technical reports.

The base document ISO/IEC 11801-1 covers the main technical requirements for transmission parameter performance, and is a core reference for other parts in the series, which are specific requirements to certain kinds of premise cabling.

However, this deep level of detail into dBs and ohms may not be needed by many designers, installers and operators, who may specify compliance simply as is stated in the premise document, or just refer to that standard.

The premise specific documents discuss greater detail on topology, routing, labelling, specific details of required component types and all the other detail needed for that type of premise. These are ISO/IEC 11801-2 for office premises, ISO/IEC 11801-3 for industrial premises, ISO/IEC 11801-5 for homes, ISO/IEC 11801-5 for data centres and ISO/IEC 11801-6 for distributed building networks. So, an installation that is just focused on industrial premises may have no need to refer to other parts of the series, other than where guided by ISO/IEC 11801-3.

POINT OF ORDER

All these premise documents lead to the planning and installation standard ISO/IEC 14763-2, which acts as core point of reference for any ISO/IEC generic cabling premise. In addition, anyone looking at remote powering may also want to look at ISO/IEC TS 29125, which discusses heating rise and building concerns when using data cabling for applications such as power over Ethernet (PoE).

It should also be noted that both of these documents are being updated to cover the new higher current power levels offered by Single Pair Ethernet (SPE). Those considering use of existing classes of four pair cabling to act as cable sharing channels for single pair applications should also be aware of the upcoming technical report, ISO/IEC 11801-9911, that is due for publication in 2024.

These ISO cabling standards tend to refer to other IEC standards for the detailed requirements related to technical specifications of cables, connectors and test procedures. Those less focused on overall premise and installation, and needing the latest component specifications, will benefit from following



‘Understanding how to get the most out of a standard can make it much easier to find the right document and, perhaps more importantly, not waste time trawling through documents that don’t contain the answers you are looking for.’

reference to the IEC 61935 series (testing) IEC 61156 series (cable), IEC 60603 series (RJ-45 connectors), IEC 61076 series (such as Category 7A connectors) and IEC 63171 (pair connectors).

While these documents have been stable for four pair applications since the launch of Category 8, there have been a lot of updates on single pair components and test techniques. Much of this has been published within the last year or is pending imminent publication.

DOCUMENTARY EVIDENCE

TIA is similar, however, it provides much more detail about components and testing without referring to other documents. The

main installation and planning documents are ANSI/TIA-568.0-E and ANSI/TIA-568.1-E, and the base document for technical transmission specifications is ANSI/TIA-568.2-D (with a project to revise this to the next E edition started earlier this year).

Single pair is handled by ANSI/TIA-568.5 for commercial premises and the new ANSI/TIA-568.7 for components related to 100/1000BASE-T. TIA is also in the final stages of publishing the next edition of its main industrial standard, ANSI/TIA 1005-B, which amongst other updates introduces E2E links for the first time in TIA.

Standards describing applications can come from many places, especially when looking at industrial automation or the transport sector. But by far the biggest application used today is Ethernet, which is specified by IEEE. The latest revision of the Ethernet document IEEE 802.3 was published in 2022, but there is still new activity since then, with publication of the IEEE 802.3da for time synchronisation



of SPE, active projects looking to extend the throughput of SPE to 100Mb/s with IEEE 802.3dg, and increase the reach and node count of the 10Mb/s version with IEEE 802.3da. Both of these are due for publication in 2024.

FURTHER AFIELD

No single document can cover everything, and so standards writing relies on referencing other standards – sometimes from other organisations. This means the documents can be shorter, easier to read and keep up to date, but it does mean that you may need to look at other documents.

This is where the normative reference section shines out as one of the most overlooked areas of any standard – but one of the most useful. This simple list of documents includes all of the other standards that provide requirements to the document that you are reading. It can also be used to work out if a certain reference is of use to you, as each entry contains the full title of the reference standard. So when a reference is found in the body text, this can be cross checked in the normative references.

If it does not appear in this list, then it should not be essential for understanding or complying with the standard. If it does appear, then the reader can see what that reference will cover. For example, looking up the upcoming 2nd edition of IEC 63171-1 in the normative references will show that this standard will cover single pair connector specifications and, as such, may only be of interest to those that focus on connector design and selection.

Conversely, every standard contains a bibliography at the end, which may be educational reading for someone who wishes to dive deeper into a topic than the standard requires.

Using these tools helps the reader avoid digging any deeper into the topic than they might need to go, and can save a lot of wasted time, energy and money.

COMPLETE PICTURE

The standards you need depend greatly on the objectives you have. Using the scopes, references and having an understanding of who published a standard can all help prevent being distracted by answers you don't need. But it's worth keeping in mind that nobody is expected to know all of this, and help is at hand by contacting your friendly neighbourhood installers, manufacturers and consultants, who will be up to date with the latest information to help you choose the right standard and make sure your project conforms – wherever you are. ■



JAMES WITHEY

James Withey is principal research and development engineer at Fluke Networks. He has over 20 years of experience in testing of cabling systems and has been involved with most international standard bodies including TIA, ISO/IEC and IEEE. He is the liaison officer between IEEE 802.3 and ISO/IEC SC25 WG3.

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be easily presented as professional PDF reports, ready to be shared with colleagues and clients.

Until 31st August, NaviTEK NT Plus is available at a discounted price as part of the Trend Networks Summer Savings promotion – making troubleshooting and maintaining copper networks even more affordable. The NaviTEK NT Pro tester is also included in the promotion with a £200 discount. This model also offers the flexibility to support optical fibre cable network testing.

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For field termination needs, the Siemon Z-PLUG enables the seamless connection of power over Ethernet (PoE) devices for a range of applications including lighting, wireless access points, audiovisual equipment, distributed antenna systems (DAS) and building automation systems (BAS). Z-PLUG can be terminated to both shielded and unshielded, as well as solid and stranded

cables.

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User friendly

Paul Malone of Sudlows looks at copper cabling standards from an installer's perspective and how they are applied to projects

▶ Standards are governed regionally. This is important, as we should aim to install to meet local standards – they will be the authority having jurisdiction (AHJ). An AHJ is an organisation, office or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation or a procedure. However, global specifications and delays in adopting standards regionally may influence the installation, design, planning and operation in day to day practice.

GUIDING LIGHT

In general, most installers adhere to the installation guidelines set out by a specific vendor, so that a system can be certified under a 25 year warranty programme to cover the lifetime of the installation. All manufacturer training and guidelines will be based on current standards, which is why it is important to supply and support a training regime that enables design, estimation and operations staff to access training. This, in turn, will make them aware of industry best practice and standards updates.

We all like to install to the very highest level we can. Therefore, it's strange to think that standards are based upon achieving minimal performance from any given set of products. Understanding why minimal performance is measured, and how high end manufacturers can guarantee

over and above the minimum standard compliance limits, is how we can gauge the low, mid-range and premium option performance for structured cabling system products in the marketplace.

MIX AND MATCH

Essentially, standards were created to achieve compatibility between cabling



vendor products. In theory, we can choose a module from vendor one, cable from vendor two, panels from vendor three and patch leads from vendor four, and still achieve a pass for any given cabling channel.

This is because there is an acceptance range in which evaluated products must meet – but this is not necessarily the optimal performance limit. If we are aware of these limits, we may choose to procure value products from various distributors to achieve a standards compliant link.

However, what we do not then achieve is optimal channel performance and/or manufacturer application assurance.

MEASURING UP

Applications assurance is the guarantee that the cabling will meet a specification. It also ensures that the applications will operate in accordance with the performance specifications, provided that the manufacturer's installation guidelines have been adhered to and that all components are from said single vendor.

We previously discussed minimum compatibility. However, if we now take modules, cable, panels and patch leads from a single vendor and connect them in a channel, what we will see is improved headroom due to mated connectors that are tuned to optimal performance levels. These will provide headroom over and above the standard limits. Within these vendor specific channels, warranties will often provide extended distances and channel complexities above those specified in the standards. In providing a compliant channel from a single vendor we can be confident that current applications will run unimpeded across our structured cabling systems.



‘Understanding why minimal performance is measured, and how high end manufacturers can guarantee over and above the minimum standard compliance limits, is how we can gauge the low, mid-range and premium option performance for structured cabling system products in the marketplace.’

After downloading and comparing test results from a finished installation, the average headroom for a high end vendor should be more apparent than from a low end or mixed vendor/component link – even if they are all installed to the highest standards and by the same installation team. Any installation with more than two per cent of links below 2dB should be reviewed for installation and termination quality. This will usually be commented on

when results are submitted for warranty. A detailed review of test results against limits will enable you to not only understand the standard limit lines, but give you the ability to offer structured cabling systems that can meet or exceed standards.

CLEARER PICTURE

What can be confusing is when a custom specification requires a set dB – for example, 4dB above the minimum required



test parameter limits. Whereas this may well be achievable, and we should always look at the average dB across our completed installations, it will not necessarily be required.

No manufacturer, even when saying they can achieve a set dB above the standard limit will, in reality, require it for warranty application approval. Therefore, if you receive a specification requesting a specific value over and above, you should open a dialogue to make sure you do not get contractually held to something that is not only unnecessary but potentially unachievable. It might occur that if you do not meet the custom limits specified by the end user it could cause issues, so make sure you read the specifications and understand the parameters being requested.

TESTING TIMES

Another pitfall may occur when you have clients with global specification documents that specify a particular set of test parameters. Regardless of the global specification, we should be installing to local standards and AHJ, and we should always check that using these test parameters will be accepted by the manufacturers locally to achieve the system warranty.

This can often be tricky, as we could need to be compliant to a specification and a standard that might conflict. For example, a US customer global specification will state TIA test limits, however, if the installation is in the UK and will be warrantied in the UK, it will require CENELEC BS EN standard test limits. In this instance it would be good to speak to the

technical team responsible for issuing the warranty. Most modern test devices can recertify from a set of EN standards to TIA/ISO, or vice versa, which might be a good work around to meet both the global specifications and local standard parameters – providing the end user will accept recertified test results.

HORSES FOR COURSES

We need to be aware of both regional and global standards and make sure we install our cables to the correct standard for the region we are working in. Dialogue with the cabling vendors, the consultant(s) writing the specifications, end users and installers is key to a compliant installation. ■

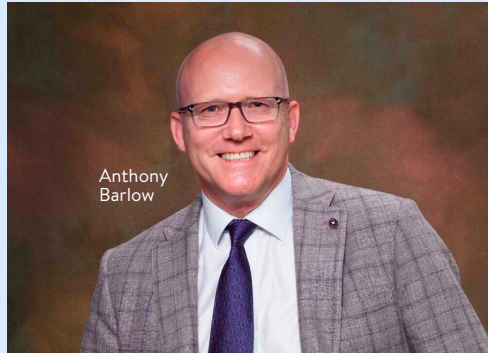


PAUL MALONE

Paul Malone is an experienced communications engineer and head of the Sudlows estimating team based in Manchester. He has been RCDD accredited for over 14 years and has a total of 29 years' experience in the cabling industry.

Anthony Barlow joins Proximity as business development director

Proximity Data Centres has appointed Anthony Barlow as business development director. Barlow has over 30 years sales and new business development experience in the telecoms and data centre industries. This includes time at Cable & Wireless, Virgin and Evoque Data Center Solutions. He has also acted as an independent investments, technologies and networks consultant, advising global enterprise and data centre operator clients on suitable colocation and interconnectivity sites.



'I am excited to be joining Proximity and its growing network of regional edge data centres,' said Barlow. 'The potential for new sales growth is considerable, with so many

businesses and service providers now making the avoidance of data congestion, latency related delays and high data transit costs a priority. Our scalable edge colocation and regional internet exchange

proposition is totally aligned with these requirements, bringing data closer to end user customers and devices securely and cost effectively.'

Evolve IP EMEA partner engagement model continues growth trend

Evolve IP has added a series of new reseller partners across the EMEA region to fuel continued growth in its network. The company's partner model is built on a combination of a deep understanding of partner needs, customer use cases, training, co-sales, implementation, support resources, platform resiliency and geographic coverage, as well as support for important charitable causes.

Evolve IP recently kicked off its partner event schedule by hosting a successful golf day with key resellers, technology partners



and the Evolve IP EMEA team, all in support of UNICEF. 32 players took part at the Downs Course, Goodwood, amidst a collaborative and competitive spirit helping to raise funds for the children's charity.

Jamie Hughes, Evolve IP's UK sales director, commented, 'The Evolve IP success story continues to

grow with the recent addition of 11 new reseller partners. Productive partnerships represent the cornerstone of our business and the golf day was a great use of everyone's time.'

Stellium Datacenters takes on new business sales manager

Stellium Datacenters has appointed James Cooper as its new business sales manager. His role is to help grow new client business at a regional and national level for Stellium's sustainable colocation and global connectivity services. Cooper brings 25 years of working successfully in the technology sector including 10 years at Verizon selling colocation and connectivity solutions and services.

'Stellium offers huge business development potential and is an attractive proposition for a wide range of

organisations – from fast growing small to medium sized enterprises and major

corporates to the public sector and the global hyperscalers,' said Cooper.

Ed Bissell, Stellium's sales director, added, 'We are delighted to have James on board with his proven industry experience and successful business development track record. This is an exciting time to be in the data

centre business and we are totally focused on making Stellium's world class campus the data centre of choice.'



Stuart Miller named director of business development for Excel Networking Solutions

Mayflex has appointed Stuart Miller as director of business development for Excel Networking Solutions in the UK. Miller joins Mayflex from the Networks Centre Group, where he was sales director, and he has an extensive background in infrastructure, security and the smart building sector, working with Redstone Converged Solutions, Datacom Cabling and R&M.

Ross McLetchie, sales director at Mayflex, commented, 'We are delighted to welcome Stuart. He has a wealth of knowledge and relevant



experience, and a proven track record of driving and growing business. With his positive attitude we know that he's the right fit to join the Mayflex team.'

Miller added, 'I'm excited to join Mayflex having competed against Excel for so many years, I'm fully aware of the strengths and benefits of the

range, and I'm looking forward to being on the other side with the backing of Mayflex and Sonepar behind me.'

n2s appoints Richard Churchill as sales director

n2s has appointed Richard Churchill as sales director. He brings over 20 years' tech sector experience including senior roles at various blue chip organisations such as Dell, IBM and Oracle. His expertise includes corporate sales and business development in key target markets where consumption and frequent replacement of IT equipment is significant and growing exponentially. These include the data centre, financial services and energy sectors.



Richard Churchill

'I am excited to have joined n2s at a point in its evolution where growth is a real focus,' said Churchill. 'The circular economy is core to what n2s offers and I'm looking forward to driving significant sales growth for the business, while also making a positive contribution to the creation of a truly sustainable circular economy for technology. This is critical as customers and organisations strive to hit the 2030 Agenda for Sustainable Development and Environmental Sustainability Goals.'

CHANNEL UPDATE IN BRIEF

Gigamon has appointed Mark Jow as EMEA sales engineering leader and technical evangelist to help organisations harness the power of deep observability and realise the full potential of the hybrid cloud.

Infovista has appointed Rick Hamilton as deputy chief executive officer.

Aryaka has launched Aryaka Ignyte, a reseller partner program within the Aryaka Accelerate Global Partner Program. The program seeks to reignite Aryaka's partnerships with value added resellers and systems integrators across the globe.

STX Next has appointed Matthew Ziff as UK managing director. Ziff brings over a decade of sector specific experience and will support the business' plans to scale in the UK.

North has appointed David Crawford as its new chief executive officer as it seeks to drive further growth.

Elite sailing team Luna Rossa Prada Pirelli has selected Ruckus Networks as its Wi-Fi official supplier.

Arne Weber has been appointed as chief financial officer (CFO) at maincubes.

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Reaping the benefits

Mark Yeeles of Schneider Electric looks at how data centres can achieve energy efficiency and sustainability by design

 In recent times data centres have become the focus of much attention, as demand rises, energy costs soar and sustainability issues persist. Energy consumption and efficiency have rightly come under the spotlight, but questions about capital and operational expenditure have given way to an awareness and understanding of total expenditure. Similarly, as carbon emissions are considered, so too is embodied carbon for a complete picture of lifecycle carbon assessment.

POWER TOOL

Data centre efficiency and sustainability can be improved and optimised by employing the new and emerging range of digital tools during the design stage, through operational life and even into decommissioning. Through techniques such as computational fluid dynamics (CFD), digital twins and artificial intelligence (AI) assisted predictive maintenance, data centres can, and must, be designed, constructed, managed and operated for maximum efficiency.

The IT infrastructure industry is facing multiple challenges. Energy costs have remained stubbornly high, while certain geographies are reaching the limits of supply, as seen in greater Dublin, London and other areas across the UK and Ireland.

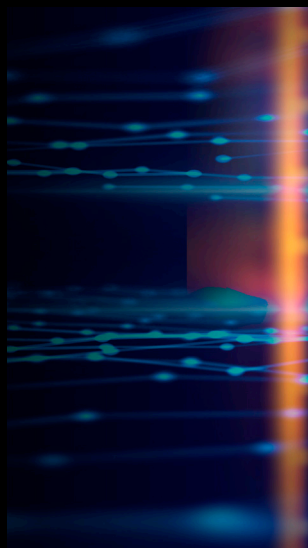
Everywhere, there are stringent targets to reduce emissions, with pressure now coming from consumers of digital services too.

Increasingly, data centre providers are being asked for sustainability commitments in requests for proposals (RFP). For example, a report by Schneider Electric and 451 Research found that customer requirements are driving sustainability initiatives, and that the majority of end users expect both sustainability and efficiency clauses within their contracts.

STRATEGIC OBJECTIVE

Those operators that cannot produce such commitments face isolation in the market and a lack of competitiveness for some time to come. This has created a pressing need for stringent energy management and sustainability strategies that encompass Scope 1, 2 and 3 emissions.

The use of renewables is just one example of enabling a more sustainable operation, and



many of today's end users expect their mission critical loads to be powered by 100 per cent green energy. As such, the industry's major operators are using power purchase agreements (PPAs) to procure, and provide access to, abundant renewable energy, while proactively reducing their environmental impact as part of strict decarbonisation strategies.

DIGITALISING DESIGNS

Many operators are seeking a new means to embed energy efficiency and sustainability within their operations, prior to breaking ground on new builds. To do this, they must harness the power of advanced software capabilities to manage energy consumption, lower costs and reduce carbon emissions.

All of this must also be achieved at a price to remain competitive in the market. As economies worldwide remain finely poised between growth and recession, price sensitivity is a key factor in the data centre and cloud services market. Through the evolution of advanced software, it is now possible to digitise the infrastructure design process beyond 3D modelling

and create a digital twin that can predict, through AI, the complete lifecycle of a data centre.

Tools such as energy management platforms, smart construction applications and unified operations for data centres can effectively create and model new facilities, allowing multiple configurations to be tried and tested before a single brick is laid. This ensures that efficiency and sustainability criteria are designed and incorporated from the outset.

SOMETHING IN THE AIR

When combined with CFD technology, airflows can be modelled and optimised, while end users and operators can experiment with IT layouts, capacity and scaling to find the optimum configuration. This approach, however, can determine far more than hot aisle and cold aisle layouts. For example, it can identify problem areas for cooling IT equipment, such as hotspots, and help address them before they become an issue. Furthermore, the use of CFD software can provide insights in terms of future planning and load layout to avoid challenges with capacity utilisation.



‘Many operators are seeking a new means to embed energy efficiency and sustainability within their operations, prior to breaking ground on new builds. To do this, they must harness the power of advanced software capabilities to manage energy consumption, lower costs and reduce carbon emissions.’

In essence, software platforms, including digital twins, have now become more sophisticated and, taking inspiration from the metaverse, are being run alongside their operational counterparts for change management, scenario exploration and experimentation. This level of digitalisation can provide greater insight, including the implementation of science based emissions metrics and common reporting frameworks, while addressing key points such as embodied carbon, which were previously difficult to gauge.

OPERATIONAL LIFE

Within the data centre industry too, the power of software is creating new efficiencies and opportunities to drive sustainability. Data centre infrastructure management (DCIM) systems have evolved to become hosted on the cloud, thereby becoming interoperable systems architected to cope with hybrid IT,

homogeneous estates and services from a multitude of data centre environments.

The term DCIM 3.0 has also come into fruition, where the monitoring, management, planning and modelling of IT physical infrastructure is made possible, with flexible deployment options that include on premises and cloud based solutions to support distributed IT environments – from a few to thousands of sites globally. With the assistance of AI, next generation

DCIM not only orchestrates and manages the distributed, hybrid enterprise, it builds a picture of operations to offer insights



for optimisation, thereby reducing the incidence and impact of stranded capacity and identifying underutilised or unreliable equipment in need of replacement.

INCREASING UPTIME

Another benefit of digitally designed

facilities is that end users and operators can become familiar with the facilities and systems digitally, before ever setting foot inside. This is seen as critical in reducing human error in maintenance and configuration changes.

The 2022 Outage Analysis from the Uptime Institute, for example, reports that 60 per cent of failures now result in at least \$100,000 in total losses, with the vast majority (85 per cent) of incidents stemming from staff failing to follow procedures or flaws in the processes themselves. An IDC estimate puts the organisational cost of human error at \$62.4m annually.

DCIM 3.0 also facilitates predictive maintenance, further increasing resilience. As such, the software can help proactively plan maintenance cycles to reduce costs, ensure adequate levels of uptime and mitigate the potential impact of failures. Moreover, advanced software can serve as the basis for increased automation and lights out operations.

NEW AND IMPROVED

The new software capabilities found in digital design tools, operational systems and modelling, can allow data centre operators to better understand the complete impact and lifecycle operation of a new facility in detail not previously thought possible.

Leveraging developments in sensors, monitoring systems and advanced data analytics, modelling in the form of digital twins is giving unprecedented opportunities to meet the needs of energy efficiency, resilience and adaptability, while enabling sustainability targets to be both met and exceeded. Furthermore, the lifetime impact of a data centre can be

better understood and controlled – from design and operations to decommissioning, reuse and recycling.

PLAN AHEAD

With digital design and development tools allied to new operational management controls, the data centres of the future will be more efficient from the day they are deployed, more resilient for their operational life and, ultimately, more sustainable. ■



MARK YEELES

Mark Yeeles is vice president of Schneider Electric's Secure Power division in the UK and Ireland. He joined Schneider Electric's Industrial Automation business in 2015 and during his tenure as vice president delivered a sustained period of growth for its robotics and process automation solutions. In his role at the Secure Power division, Yeeles is tasked with driving profitable growth by working with Schneider Electric's data centre customers, end users and IT channel partners to address the challenges associated with sustainability, efficiency, energy security and resilience.

Heat of the moment

Dean Boyle of EkkoSense looks at why getting a head start on raising data centre temperatures should be a priority

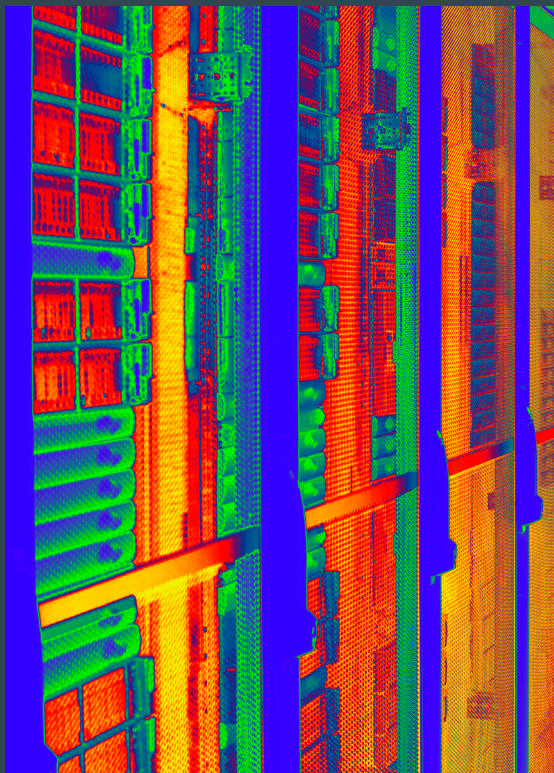
▶ With analyst predictions from Technavio suggesting that data centre workloads are set to keep on growing at a compound annual growth of as much as 21 per cent through to 2025, things aren't likely to slow down anytime soon for the data centre industry. Is this a surprise? No, not really. Data centre facilities around the world are hard at work supporting all of the online services we increasingly rely on for our personal and professional lives. Driven by trends that show no sign of slowing down – such as working from home, increased use of streaming services and 5G adoption – these escalating activities are clearly having an impact on data centre workloads.

UNDER PRESSURE

At the same time, businesses and their critical facilities such as data centres are under intense pressure to reduce their energy use. Finding ways to cut energy/carbon usage on the one hand, while the data centre's workload is escalating on the other is challenging! These apparently conflicting demands leave operations teams with the task of finding new ways to address both workload and carbon reduction needs. Meanwhile, the reality of corporate environmental, social and governance (ESG) programme requirements and net zero commitments are starting to bite.

So, it was interesting earlier this year

when Equinix announced its commitment to reduce its overall data centre power usage by working to increase operating temperature ranges. Equinix talked about setting out a 'multi-year global roadmap for thermal operations within its data



centers'. The eventual goal is to achieve significantly more efficient cooling – aiming to operate its facilities closer to 27°C, and

referencing alignment with the American Society of Heating, Refrigerating and Air Conditioning Engineers' (ASHRAE) A1A standards. The company estimated that potential energy efficiency improvements resulting from this could be as much as 10 per cent in various locations.

COST INEFFECTIVE

It's easy to see how initiatives like this are coming about. Data centre efficiency is invariably tied to a facility's original design, and frequently based on expected IT loads that have long been overtaken. At the same time change is a constant factor, with

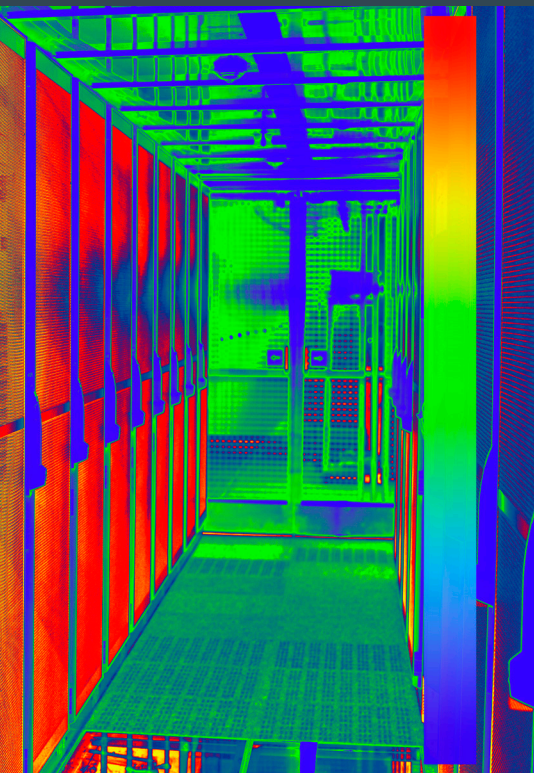
drive for new applications.

The result is a global data centre infrastructure that regularly finds it hard to match current and planned IT loads to their critical infrastructure. This typically leads to excess cooling – EkkoSense research recently estimated that the global data centre industry is overspending by as much as \$1.7bn a year on cooling energy costs. Despite this, the research also found that average cooling utilisation within critical facilities was still only 40 per cent.

MOVING ON UP

Before data centre teams start thinking about how they can begin to raise temperatures in their facilities, they first need to focus on how they can improve visibility across their operations. It's surprising just how many data centre teams have little or no visibility of their assets, capacity and operating efficiency – or if they do then the data is buried deep in legacy systems such as older building management systems or electrical power management systems. New classes of machine learning and artificial intelligence (AI) powered live 3D views can capture an organisation's entire data centre space utilisation, power usage and cooling capacity – either on a room by room basis or across an entire estate.

With this kind of visibility it's possible for operations teams to begin the process of raising data centre temperatures. The potential impact will be far reaching. Existing cooling units and chillers can run more efficiently and consume less power, leading to significant energy reductions across the whole cooling chain. However, raising operating temperatures will also require much more granular environmental monitoring than is generally seen today – along with new methods to understand,



platforms, equipment design, topologies, power density requirements and cooling demands all evolving with the continued

‘Before data centre teams start thinking about how they can begin to raise temperatures in their facilities, they first need to focus on how they can improve visibility across their operations. It’s surprising just how many data centre teams have little or no visibility of their assets.’

towards more efficient cooling and operating temperatures within their facilities? Energy savings don’t just come from temperature setpoint changes.

analyse and act on the implications of this change.

TRACK AND TRACE

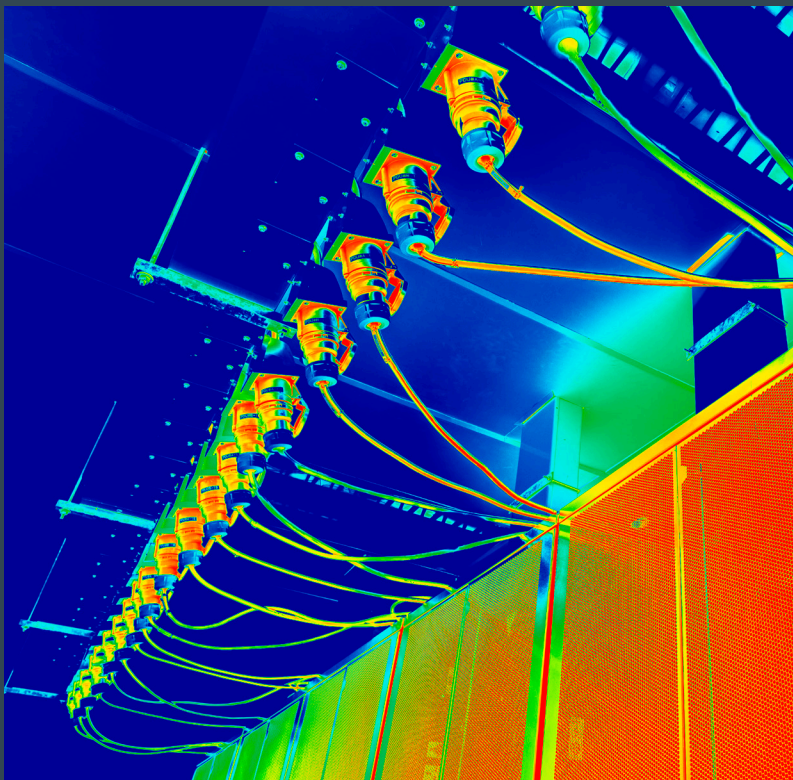
While companies like Equinix are committed to building a more sustainable digital world, there’s also a pressing requirement for them to ensure that customers are able to track and reduce the Scope 3 emissions associated with their hosted data centre operations. Scope 3 emissions are often particularly challenging for organisations to identify, measure and manage, as they typically occur outside of their immediate control.

While Equinix and its partners focus on building out their global roadmap for thermal operations to support the increasing operating temperature ranges, what can operations do in the near-term to begin the process of evolving

Instead, full optimisation for the cooling set-up is needed to deliver the true benefit – something that is often missed when teams do ‘blanket’ setpoint increases.

KEEP IT REAL

Without real time data and visualisations that can identify issues, diagnose them, and then resolve them, it’s easy to see why



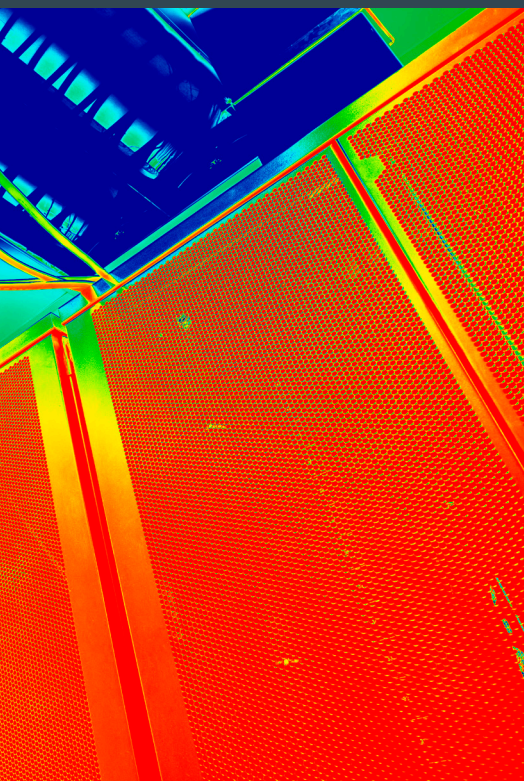
some organisations are hesitant about raising operating temperatures. With no way of measuring real time temperature performance across their sites, it's hard to build a complete thermal picture. Raising operating temperatures demands a much more granular approach to environmental monitoring and optimisation than is generally seen today – along with new methods to understand, analyse and act on the implications of this change.

AI enabled data centre optimisation software helps data centre managers to safely increase their temperatures, while managing the risks involved. Using analytics tools, operations teams can highlight any potential issues with cooling units, work to identify any anomalies and then use the software's embedded advisory tool to

provide recommendations for resolution.

THE TIME IS NOW

Given the breadth of its operations, it's understandable that Equinix is focusing on a multi-year global roadmap for its thermal operations initiative. The good news though is you don't need to wait that long. Fully optimising your data centre's thermal performance takes just months and the results are impressive, with clients typically securing a reduction in data centre cooling energy use of between 10-30 per cent, while also removing risk with 100 per cent ASHRAE thermal compliance. ■



DEAN BOYLE

Dean Boyle co-founded EkkoSense in 2013, with a clear mission to help organisations resolve the thermal risks their data centres face from inefficient cooling strategies. As chief executive officer (CEO) he has driven the company's development – from a start-up through to its current position as a leading provider of software driven thermal optimisation and capacity planning for critical live environments.

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Cisco has published its Cybersecurity Readiness Index. [CLICK HERE](#) to read the report.

Lowering The Impact: How To Keep Data Center Power Costs In Check is a report from **AMD** in partnership with **451 Research**. [CLICK HERE](#) to download a copy.

In his blog titled Reduce DC Fiber Network Operational Costs, Gary Mitchell of **AFL Hyperscale** offers his top five tips for lowering the expenditure associated with a data centre optical fibre network. [CLICK HERE](#) to read it.

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Evaluating Digitalization Progress With The Industry 4.0 Maturity Index is white paper from **Nokia** and **ABI Research**. [CLICK HERE](#) to download a copy.

Breaking New Ground With Cloud is white paper from the **Cloud Industry Forum** that looks at how the cloud is poised to take businesses to a new level of digital transformation. [CLICK HERE](#) to download a copy.

The Basics Of Selecting Cable Management is a white paper from **Chatsworth Products (CPI)**. [CLICK HERE](#) to read it.



Keeping it real

Keith Sullivan and Alan Keizer of AFL identify the challenges and solutions for supporting artificial intelligence (AI) driven applications in the data centre

▶ AI means different things to different people and different organisations. This can be especially true depending on whether AI is being used to tackle small problems or big problems at scale. Generally, the accepted definition of AI is the ability of a computer system to perform a task typically thought to require intelligence, learn from that task and refine the intelligence. Often the tasks associated with AI are thought to require at least close to human level reasoning ability – the difference being that AI systems can deal with data at a volume and velocity far in excess of human ability.

SCOPE OF INTEREST

At one end of the spectrum AI, in practical terms, can mean anything from recognising faces on your phone to reading documents in order to extract content or context. At the other end of the spectrum we could be talking about large data centre clusters full of telemetry relating to anything from vehicle fleets for a global supply chain operation that is using AI to optimise routes and suppliers to large language models, which are trained on vast volumes of unstructured information resulting in tools such as the now popular ChatGPT.

AI innovations require highly

available, high capacity architectures to support the volumes of data being distributed and redistributed on demand for training and serving these AI models in production. This creates significant challenges for data centre operators – and hyperscalers especially. They are having to deal with increasingly diverse workloads at



scale, which can range from batch loading of large datasets to train the models, to the high volumes of smaller requests that need to be serviced when these models are deployed in production.

PROBLEM SOLVING

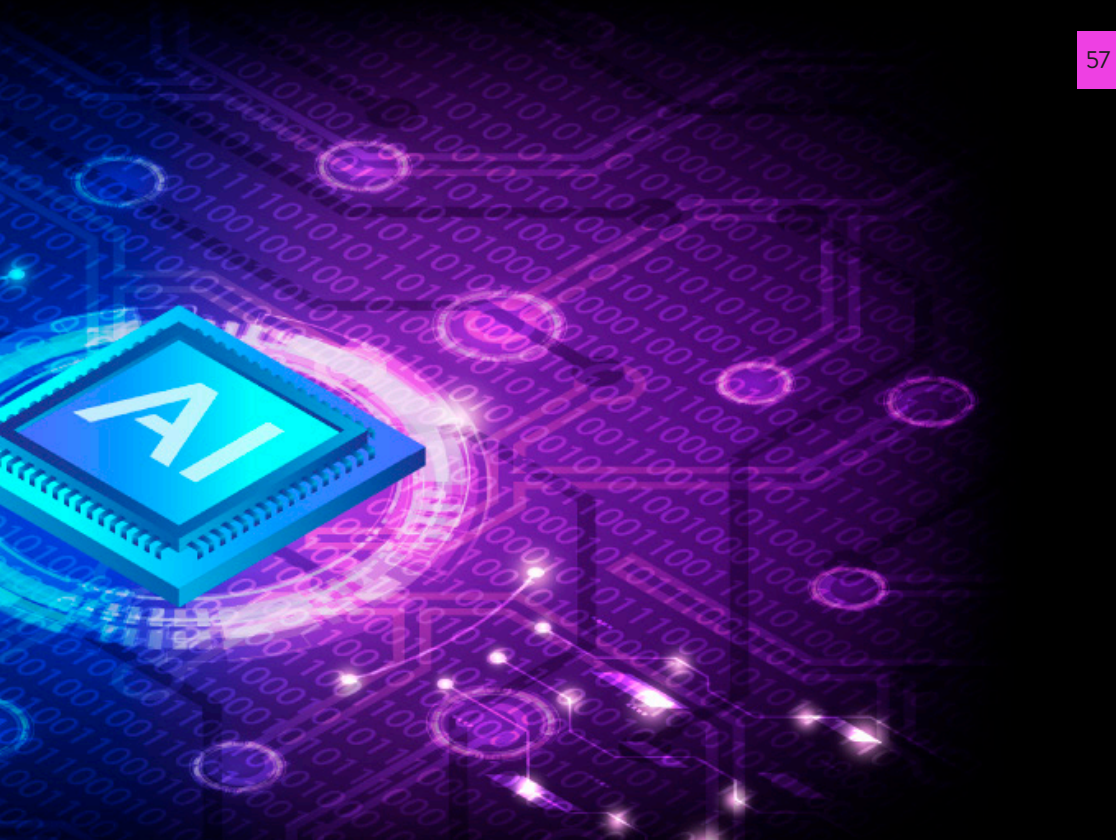
Throwing more infrastructure at the problem is typically not considered to be a long-term solution. However, we are not dealing with technologies where the long-term needs are known. The challenge is compounded with the fact that data centre operators can't stop to take a breath to figure it out – there is no pause button in this market. Customer demands are

higher than ever already and whilst current approaches may be suitable for smaller AI workloads, this is a different story when addressing larger requirements.

Allowing for the evolution of an accidental network architecture through short-term solutions, patching capacity or availability issues is a typical recipe for long-term pain. This is especially true in the world of AI, where an AI cluster can be formed by combining thousands of AI accelerators into one homogeneous 'AI brain'.

DIRECTION OF TRAVEL

The challenge here doesn't come especially from north-south traffic – data moving



‘AI innovations require highly available, high capacity architectures to support the volumes of data being distributed and redistributed on demand for training and serving these AI models in production. This creates significant challenges for data centre operators – and hyperscalers especially.’

in and out of the data centre. This is still important, as we need to get data into these systems, but the fact is that high performance AI systems are the aggregation of these AI accelerators, which scale horizontally by adding new nodes to the network rather than adding hardware to each node.

This means that the performance needs relating to east-west traffic or node to node communication within the cluster needs to be heavily optimised. Effectively, a dedicated network needs to act as super low latency backplane in order for the cluster to perform as it needs to.

This is demonstrated clearly in the fact that Nvidia sought to acquire Mellanox so it could include a dedicated high speed InfiniBand network to act as the dedicated network backplane for its DGX pods and super pod

systems. When you consider these needs alongside the pace of innovation in the AI developer community, and the increasing scale of the models being trained and served, data centres are faced with a real challenge.

LOOK AHEAD

Traditional thinking suggests data centres need to future proof their architecture. But the future needs of what they may be dealing with in six months, one year or three years ahead is uncertain, so the ability to future proof is limited. This makes



it essential to build as flexibly as possible with partners who can help you see into the future as far as is humanly possible.

However, the needs in the market are immediate and pressing. Operators are forced to implement whatever the most current and highest performing networking solutions are available right now, in the knowledge that next year the technology

may change and their infrastructure must accommodate that future technology.

FAST FORWARD

As the pace of innovation in AI continues to accelerate, partnering with companies that have strong research and development at the core of the organisation is critical. ■



ALAN KEIZER

Alan Keizer is a senior technical consultant at AFL. Over the past four decades he has worked as an individual technologist, a business development leader and senior executive. Joining FibreFab in 2006, he was a key contributor to the business, which was acquired by AFL Telecommunications, and became a key component of AFL Hyperscale. His main focus now is the development of optical fibre connectivity solutions for hyperscale computing.



KEITH SULLIVAN

Keith Sullivan is the director of strategic innovation hyperscale at AFL. With over 27 years of experience, he is an accomplished business leader in the optical fibre industry, with a specialty in data centres. He started his career in 1995 in a factory in England producing specialty fibre assemblies for high speed devices in the telecom industry. Since then, he has worked for leading organisations in sales, marketing and product line management.

Allied Telesis

Businesses increasingly rely on IP based networks for their day to day operations and profitability. As network complexity increases, the IT personnel managing these environments risk becoming overwhelmed – especially as business activities ramp up in the hybrid working era.

Auger from Allied Telesis is a new 24/7/365 cloud hosted service providing specialist vendor independent remote monitoring of networks and IT infrastructure. It enables IT teams to be released from running networks and concentrate instead on

revenue generating projects.

Existing commercial and self-serve network monitoring solutions require a substantial investment in time and resources to install and tune. Auger monitoring is performed by an accredited partner and supported by Allied Telesis, giving companies confidence that the optimisation of their network performance is in

safe hands, across all devices.

Auger offers different service levels to fit most types of business. To learn if Auger is right for you, **CLICK HERE.**
www.alliedtelesis.com



Panduit

Panduit's RapidID is a software enabled network mapping system for smart, scalable and efficient connectivity solutions.

RapidID is designed to reduce the time and cost of patch cord documentation by up to 50 per cent. Using pre-labelled Panduit patch cords and the RapidID Bluetooth enabled handheld scanner, network engineers can place and trace cables. The up to 50 per cent time savings are based on an internal time study Panduit conducted in 2021.

The RapidID network mapping system automates the labour intensive and error prone cable documentation process to



reduce the risk of a network outage. RapidID is a practical alternative to traditional manual approaches and is ideally suited for building a new telecom room, locating installed cabling or replacing a network switch.

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

HellermannTyton

The recent acquisitions of gabocom in Germany in 2019 and now Höhle in Estonia, mean HellermannTyton Connectivity delivers a full end to end FTTX solution, bringing together a wide range of quality products and a wealth of industry knowledge and experience.

Delivering a winning combination of quality fibre optic closures and wall boxes, along with precision engineered microduct, means the demands of fibre deployment are met at every stage of the last mile network. From the street



to the building and into your property, HellermannTyton offers a full range of connectivity solutions completing the fibre journey from the central office to the router.

With products for both internal and external fibre applications, HellermannTyton allows end users and installers to source a full fibre solution from a reliable and globally renowned brand with extensive connections in the UK, across Europe and the

wider global market.

To find out more **CLICK HERE.**
www.htdata.co.uk



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MLL Telecom transforms network at The Scottish Fire & Rescue Service

MLL Telecom has completed a wide area network (WAN) transformation at The Scottish Fire and Rescue Service (SFRS).

Replacing the previous IPVPN based WAN, the new network is a key milestone in the ongoing fully managed services contract that MLL won in 2021.

The new SD-WAN now connects over 360 fire and rescue stations located throughout Scotland, while ensuring reduced network latency for an enhanced user experience, especially at remote sites. Additionally, the future proofed solution will support SFRS's planned migration to

public and private cloud based services, including a revised security architecture.

The often remote and rugged locations

of many of the SFRS locations presented significant engineering and connectivity challenges. These had adversely impacted the performance of the previous WAN solution, sometimes

preventing routine tasks being undertaken by SFRS personnel, as well as more critical ones such as accessing cloud based training applications.



Stellium Datacenters implements battery storage and solar solution

Stellium Datacenters has implemented a self-funding battery storage and solar solution to further reduce its carbon footprint and customer energy costs. Total

Data Centre Solutions worked with Stellium on the solution, which will be funded and implemented by Energy Optimisation Solutions (EOS).

The initial scheme comprises a containerised 2.3MWh battery storage solution and rooftop solar PV system connected to Stellium Datacenters' electrical infrastructure in Newcastle. The

scheme will be expandable as required. Savings in power costs will be achieved through a reduction in distribution use of system (DUoS) charges and capacity

market charges, as well as capturing arbitrage value between peak and off-peak rates in the wholesale and balancing mechanism markets.

Additional revenue will be achieved through grid balancing services. The new solar PV asset will displace around 380,000kWh of imported power from the grid,

reducing costs against retail priced grid power. Carbon reduction from operation of the scheme will be around 125.9Mt of CO₂ per annum, from which Stellium will directly benefit in terms of carbon reduction and reporting.



Kao Data invests £350m in new 40MW Manchester data centre

Kao Data has announced a new 40MW data centre in Manchester. Following the acquisition of two new data centres last year, the move represents the next phase in the continued expansion of the Kao Data platform, with Manchester named as the first of its new Tier II locations in Europe.

Kao Data has secured a 39,000m² ex-industrial site for sustainable redevelopment at Kenwood Point, Manchester. Planned to become operational in late 2025, the data centre will comprise nine data halls, creating a leading infrastructure hub to support



Manchester's growing technology ecosystem and the UK's largest high performance computing (HPC) and artificial intelligence (AI) sectors outside of London and the Oxford-Cambridge arc.

The data centre will follow the organisation's award winning high performance design, efficiency and sustainability ethos, providing an OCP-Ready and NVIDIA-DGX Ready certified infrastructure platform for advanced computing. The facility will deliver Power Usage Effectiveness (PUE) rating of 1.2, be powered by 100 per cent renewable energy and utilise hydrotreated vegetable oil (HVO) in its generators.

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Teledata appoints Keysource to deliver new data centre

Teledata has appointed Keysource as the lead contractor for the design and preconstruction of its new 30,000ft² data

centre facility – MCR2 – which has been funded by UBS. In addition, Keysource will also be responsible for delivering ambitious sustainability goals following the calculation of the ‘whole life carbon’

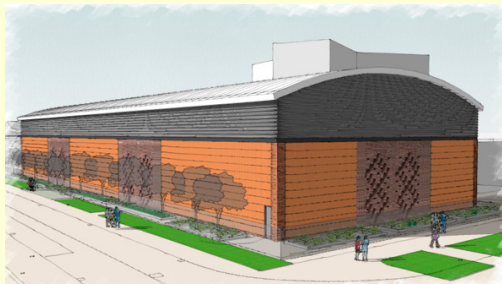
of the facility and a carbon assessment that has informed the design.

The project, which leverages existing planning permission, involves a combined

design and planning application to ensure local regeneration goals are integrated.

Keysource is also harnessing the power of computational fluid dynamics (CFD) to lead the design process to provide high performing, resilient and efficient solutions. This will include ensuring that the available site power capacity

and available space to increase rack count capacity is maximised, delivering an annualised Power Usage Effectiveness (PUE) of less than 1.15.



PROJECTS & CONTRACTS IN BRIEF

Vantage Data Centers has announced the development of a second data centre campus – LHR2 – in London. LHR2 will consist of a single data centre that will deliver 20MW of IT capacity across 18,000m² and will open its doors to customers in early 2025.

The University of Southampton is midway through a programme of implementing Raritan power distribution unit (PDU) technology within its main data centre and more than 200 multi-campus IT hub locations.

Colt Data Centre Services has commenced construction of its fourth major data centre in Inzai City, Japan. It has a site area of 8,747m² and a designed capacity of approximately 20MW.

Proximity Data Centres has announced the operation of IX Birmingham, the first regional internet exchange in the heart of the West Midlands.

Virtus Data Centres has announced plans to expand into continental Europe with the construction of its first data centre campus outside of the UK. The new data centre – Virtus Berlin1 – is set to be operational in 2026.

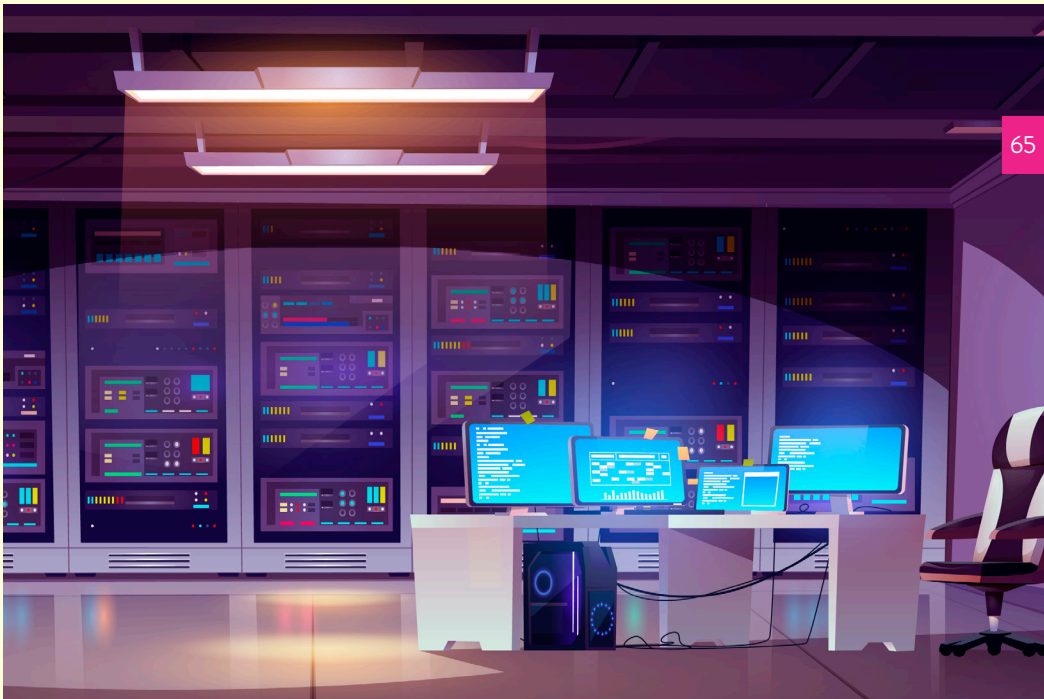
Host-IT has opened a data centre in Birmingham. The new secure ISO 27001, Tier 3 facility is strategically located in central Birmingham, close to the major optical fibre networks traversing the UK and various regional fibre providers.

What's in store?

James Hart of BCS explains the current developments and options for energy storage in data centres

▶ There are many areas around the physical data centre that present energy considerations, either through process, technology or design. However, all are linked by two core factors – performance and investment. Every data centre requires a certain level of performance to balance environmental goals with service reliability. Implementing

to improve is that of energy storage – specifically localised or on-site energy storage that contributes to the 100 per cent availability desires of the data centre energy system. There is also a move to find replacement sources of energy and reduce reliance on not only direct fed electricity generated by non-renewable energy sources, but also sourcing localised



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any solution can have a high upfront cost that will need to demonstrate a suitable and attainable return on investment.

POWER FACTOR

One area in which the industry is looking

renewable energy generation methods and reducing the use of fossil fuel storage solutions, such as diesel, to run emergency generators.

It is imperative for any data centre to have a reliable source of back-up power in

‘The transition to a sustainable, zero carbon energy system for the data centre industry will undoubtedly need ultra-low cost storage produced from environmentally benign recyclable materials that offer long-term stability without degradation or energy loss.’

the event of a network outage, to ensure service performance. For many, diesel fuel has proven to be the go-to solution for on-site generator back-up or secondary power generation that supports the primary feed. So how can we wean ourselves off this non-renewable energy source?

Biofuel is derived from microbial, plant or animal materials and is a renewable energy source, since the carbon released when the biofuel is burned is the same carbon taken up as the original source plant grew. In addition, with an energy content of around 40MJ/Kg, it fares well in terms of energy density compared to the fossil fuel it is trying to replace.

CROP OUT

The problem with biofuels is the processing that turns plants into usable fuels requires energy – this results in CO₂ emissions. Biofuels are not zero carbon unless the entire process runs on renewable or zero carbon energy. They also compete with food production for land, with concerns around deforestation, soil erosion and fertilizer run-off, which will become even more challenging as biofuel production increases.

Fuels made from crop or general waste can be better in terms of land use and carbon emissions, but availability of these wastes is limited and processing technology

needs improvement to be more cost effective. Water based solutions in the form of algae production (green diesel) can be cultivated on land unsuitable for other purposes, with water that can’t be used for food production. In short, three major factors limiting commercial algae production exist – the

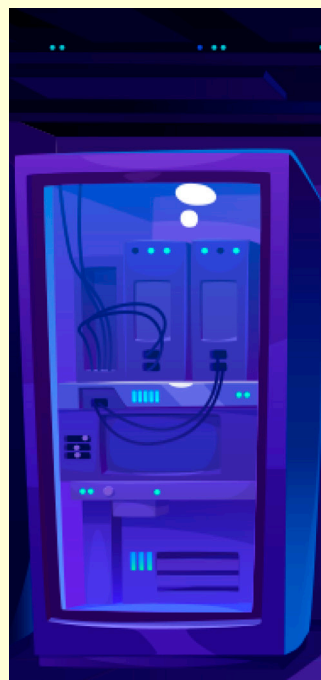
difficulty of maintaining only the desirable species in the culture system, the low yield of algae oil and the high cost of harvesting.

PRESENT AND CORRECT

Hydrogen is the most abundant chemical element on the planet and is present in almost everything – humans, animals, plants and water. There is wide support for its potential as an energy store and fuel

but as it is rare for hydrogen to exist in its own gaseous state the questions of how to produce the huge volumes of hydrogen that are predicted to be needed is polarising many supporters. However, its by-product is water and not environmentally harmful greenhouse gases such as carbon dioxide.

There are challenges to overcome to enable the



strategy of widespread deployment of hydrogen enabled infrastructure. The cost of production is still high versus existing carbon fuels, and the technology is still to be proven at scale. The industry is still waiting on governments to provide regulatory levers and incentives and considerable investment is needed to remove first mover cost disadvantages until there is supply and demand coordination.

GO WITH THE FLOW

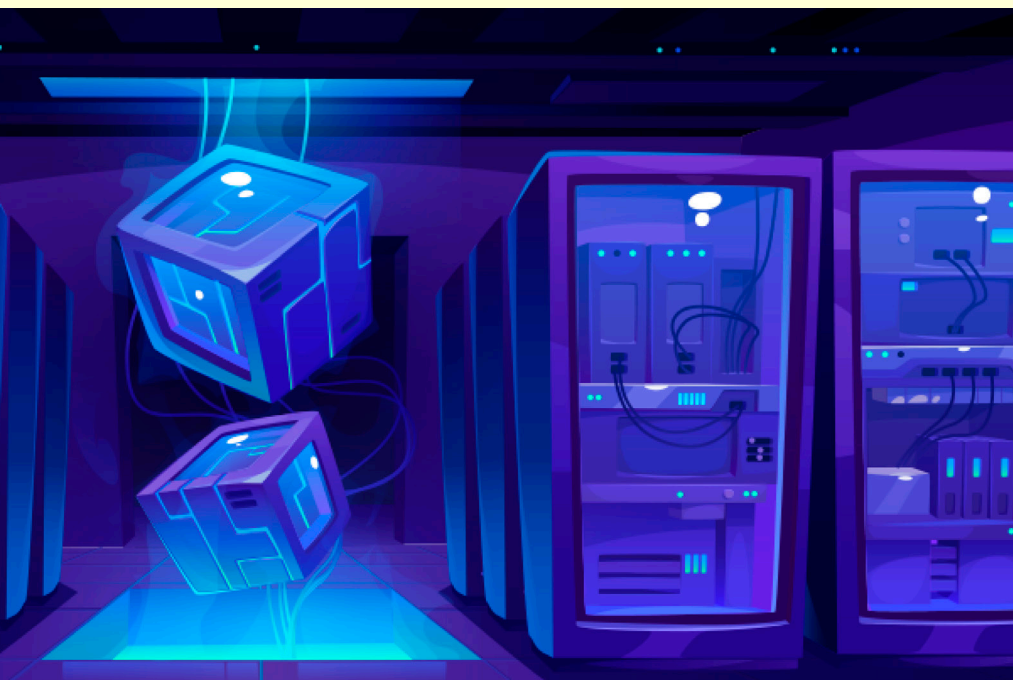
Importantly, hydrogen can also be used in a fuel cell. These are similar to a battery, converting the energy stored in chemical bonds to useful electrical energy. Unlike batteries, a fuel cell isn't recharged, but is supplied with a flow of hydrogen that reacts with an oxidant (air or pure oxygen), which is then converted to electrical energy.

Data centres are increasingly exploring

hydrogen powered fuel cells as a back-up generator alternative, although it appears early in the technology cycle as to whether it provides the scale of power diesel generators offer in a cost effective manner. The process of green hydrogen production is seen as one solution to address overgeneration from renewable sources such as solar or wind generators, avoiding curtailment by using hydrogen as a storage medium and fuel for use across the economy.

TIME TRAVEL

Valve regulated lead acid batteries (VRLA) have long been established as the building block of uninterruptible power supply (UPS) solutions, although lithium-ion is finding its way into the data centre. Lithium-ion tends to have a lifespan of over 10 years compared to 3-5 years for VRLA, resulting in fewer battery



refreshes. With their ability to operate at higher temperatures, they could lower the total cost of ownership for data centre operators, despite the initial cost of a lithium-ion battery being higher than a VRLA battery.

With 60-70 per cent less weight than a VRLA battery and 40-60 per cent less size overall, the footprint of a lithium-ion battery is much smaller, giving data centres more floorspace for core IT. Also, with fewer refreshes required, the risk of incidents during battery replacement work is also lower, meaning higher reliability.

BIG ISSUE

The environmental impact of finding all the lithium required to enable that transformation could become a serious issue in its own right. It is estimated that more than half the world's supply of lithium sits beneath Argentina, Bolivia and Chile – the Lithium Triangle. The extraction process is very water heavy, with around 500,000 gallons of salty water (brine) needed to extract one tonne of lithium. These areas, however, are some of the driest on the planet, so water demand is a key concern.

Add to this the dangers of leaking toxic chemicals or waste products that are filtered out of the process, and the fact that less than five per cent of lithium-ion batteries are being recycled, and there are some important environmental concerns. But, on balance, whilst lithium-ion batteries are not a perfectly green technology, they do offer a reliable, effective energy storage solution that facilitates the push towards electrification.

PLAYING A PART

The world is moving to find replacement sources of energy and ways to store it. The data centre industry needs to play its part

to reduce its reliance on fossil fuel storage solutions to run emergency generators and this is no easy task, as any replacement needs to offer a similar performance. The transition to a sustainable, zero carbon energy system for the data centre industry will undoubtedly need ultra-low cost storage produced from environmentally benign recyclable materials that offer long-term stability without degradation or energy loss. It is our next challenge. ■



JAMES HART

James Hart is chief executive officer at BCS. He has specialised in business critical facilities such as data centres, mission critical infrastructure and secure installations for the past 15 years, with a total of 30 years in the mechanical and electrical industry. He drives the strategic direction of BCS and helps deliver assured outcomes for its customers.

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