

Inside Networks

THE NETWORK INFRASTRUCTURE E-M

Under the microscope

HOW SHOULD THE DATA CENTRE SECTOR
RESPOND TO NEGATIVE MEDIA INTEREST

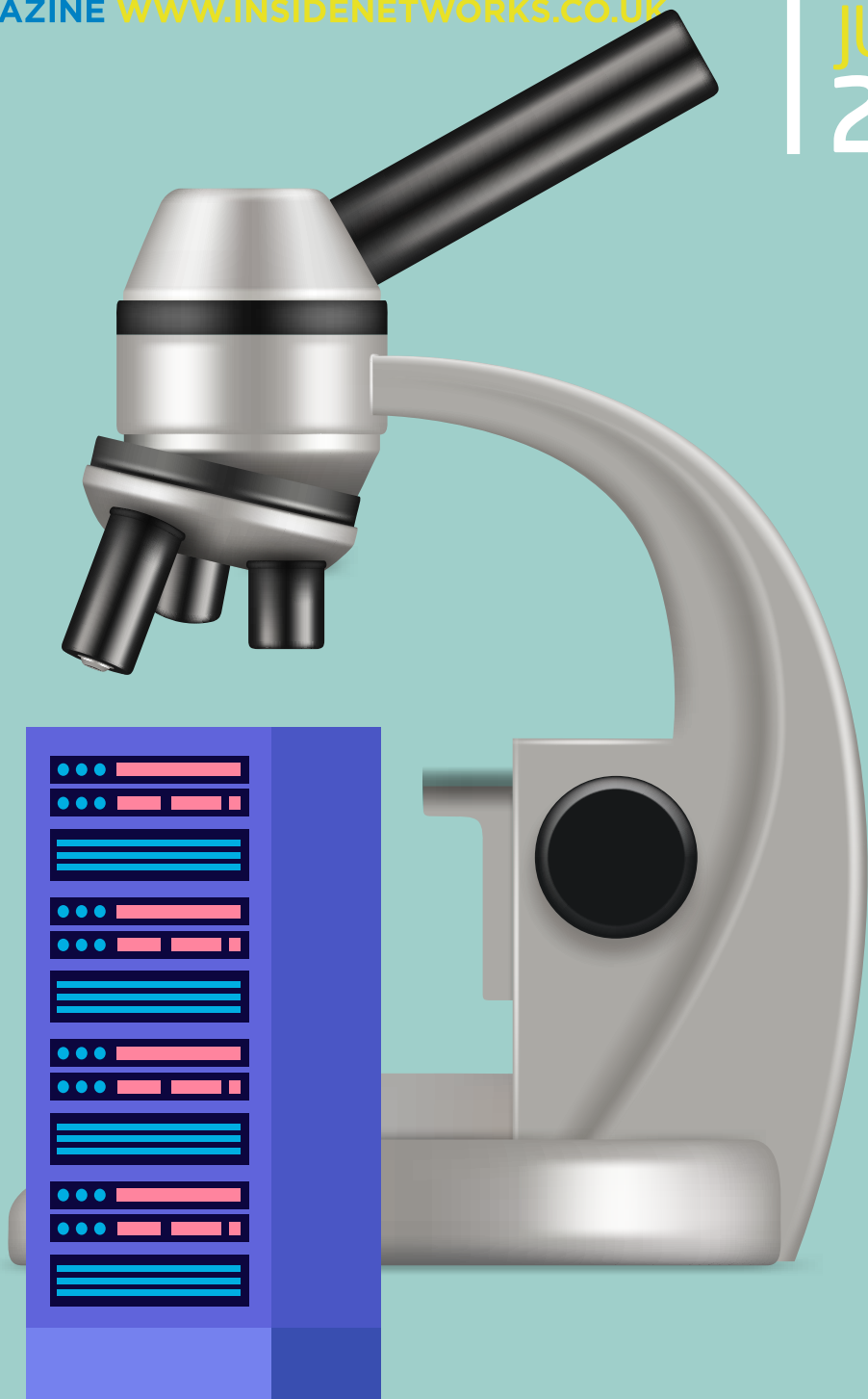
Hitting the target

ENSURING NETWORK
MONITORING AND MANAGEMENT
ARE ALIGNED WITH KPIS

Whole nine yards

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CYBER AND PHYSICAL SECURITY
IN DATA CENTRES

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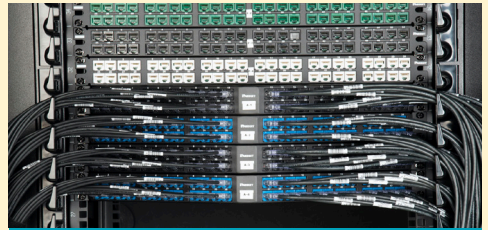
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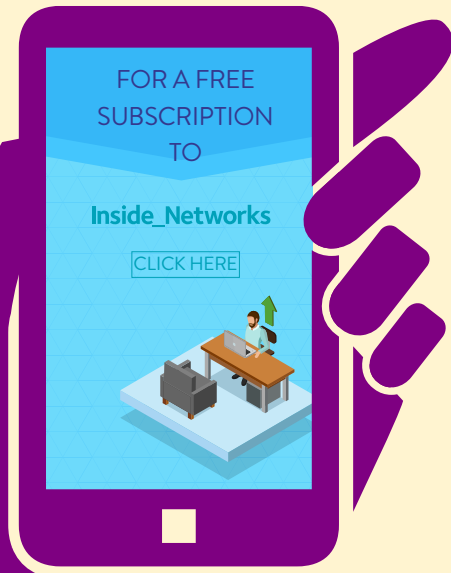
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Attention to detail

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The Covid-19 pandemic led to many changes within society and the data centre sector was not immune. During lockdowns they played a key role in keeping people working, children educated and friends and families in contact. It also meant that data centres were no longer under the radar.

While this is likely to benefit the sector in attracting new entrants to combat the skills shortage, it has also led to scrutiny about how these facilities operate. The media is also taking an interest, with the BBC Panorama documentary Is The Cloud Damaging The Planet? the most recent example.

Yet, there is a sense that if this kind of negative attention is ignored then it will go away. The bad news is that it won't. In this issue's Question Time we've asked a specially selected panel of industry representatives to suggest what should be done to highlight the sector's sustainability based activities and successes, and provide balance to the discussion.

We also have a special feature dedicated to automated infrastructure management (AIM), intelligent infrastructure management (IIM) and network management. Carsten Ludwig and Reinhard Burkert of R&M assess the importance of making sure network monitoring and management are aligned with KPIs, while Michael Akinla of Panduit explains how automated network mapping increases the effectiveness of IIM.

Last but not least, the need for effective containment should never be underestimated and Simon Jacobs of Excel Networking Solutions looks at the importance of designing the data cable management you need and choosing the right supplier. Simon is joined by Andrew Wreford of Rittal, who explains how to facilitate the opposing needs of aisle containment and cable management for a successful outcome.

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

Rob Shepherd

Editor





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Cost of living crisis fuelling rise in cybercrime according to critical national infrastructure organisations

34 per cent of organisations across UK critical national infrastructure (CNI) anticipate a rise in cybercrime as a direct result of the current economic crisis, according to research by Bridewell. The company surveyed 500 cybersecurity decision makers in the transport and aviation, utilities, finance, government and communications sectors, and found concern is particularly high in the utilities sector, with 41 per cent of respondents predicting a surge in cybercrime as a result of financial hardship.

With the rising cost of living putting employees under increased financial strain, 21 per cent of CNI decision makers now rank employee sabotage among

the biggest risks to their organisation's IT environment. The mean number of security incidents relating to employee sabotage

has already increased by 62 per cent within CNI over the last 12 months.

Anthony Young, co-CEO at Bridewell, commented, 'Decision makers need to invest in strengthening their cyber defences from the inside out. This should encompass the

robust monitoring and testing of systems and access controls, investment in data loss prevention, and the continuous education and training of employees to raise awareness of cybersecurity best practices.'



UK IT decision makers are most likely to prioritise artificial intelligence

Colt Technology Services has revealed its research of almost 1,000 IT decision makers in 12 countries across Europe and Asia. It found that those in the UK were the most likely to prioritise artificial intelligence (AI) and machine learning capabilities, with 40 per cent listing it in their top three priorities. 47 per cent US IT decision makers cited emerging technologies in their top three, while 59 per cent of Japan's IT decision makers said they prioritised network flexibility.

Across all countries improving security was the

highest priority, cited by 53 per cent of respondents, followed by network flexibility improvements, listed by 44 per cent. Enabling new collaboration and communication applications was next on the list, called out by 39 per cent of IT decision makers.

Keri Gilder, CEO at Colt Technology Services, said, 'AI, machine learning and the metaverse are fundamentally changing the way we engage, transact and interact, but these technologies will only reach their full potential if they're built on agile, scalable digital networks. As we head deeper into the latest industrial revolution, it's digital infrastructure's time to shine.'



Councils admit security failings with almost 1,500 data breaches declared in 2022

UK councils have disclosed almost 1,500 data breaches and over 600 lost or stolen devices during the course of 2022. Research conducted by Apricorn found that Suffolk County Council alone amassed 651 incidents between September 2021 and September 2022. To add to that, Warwickshire County Council declared that it had 367 breaches, North Yorkshire County Council admitted to 259 breach incidents and Essex County Council disclosed 168.



Jon Fielding, managing director EMEA at Apricorn, commented, 'When local authorities are racking up hundreds of data breaches in a very short space of time, it's a definite sign that something is amiss. Flags should be raised, security processes checked and checked again, and staff continually educated on cybersecurity best practice, whether that be highlighting the use of approved and encrypted storage devices, or simply changing passwords. It's all critical to the security of data.'

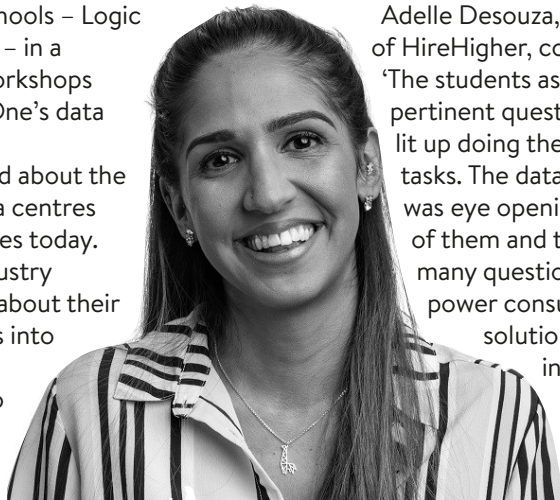
HireHigher opens students' eyes to exciting career opportunities in the data centre industry

As part of its campaign to address the ongoing skills shortage in the data centre and cloud industry, HireHigher recently brought together those working within the industry and 60 sixth form students from two London schools – Logic School and St Marks – in a productive day of workshops and a tour of CyrusOne's data centres.

The students heard about the central role that data centres play in everyone's lives today. A panel of seven industry professionals talked about their varied jobs and paths into the industry – from graduate schemes to apprenticeships. The

students also participated in two practical workshops, the first looking at how their particular style of energy can impact others and potentially help them identify a rewarding career path.

Adelle Desouza, founder of HireHigher, commented, 'The students asked so many pertinent questions and really lit up doing the practical tasks. The data centre tour was eye opening for so many of them and they asked many questions about power consumption, green solutions and financial investment.'



Adelle Desouza

BOM IT Solutions partners with Byteback to help the IT industry cut carbon emissions

BOM IT Solutions has partnered with electronic waste company, Byteback, to help the IT sector reduce its electronic waste and cut its carbon footprint. A recent report revealed that the UK is the second highest producer of e-waste globally, just behind Norway, and is responsible for 23.9kg of e-waste per head per year. The UK is also on course to become the world's largest contributor as early as 2024 and is estimated to produce as much as 55,000 tons of e-waste per year by 2030.

Byteback will support BOM IT Solutions in the safe disposal of redundant devices from across its client base. These will be broken down, with key

components recycled or refurbished, so that communities in the UK and abroad, without the means to purchase expensive new machines, can benefit from unwanted commercial technology.

Andy Carter, managing director at BOM IT Solutions, said, 'We recognise the impact the UK IT industry is having on the country's overall

e-waste statistics and the important role we can play, in partnership with organisations like Byteback, to help reduce this. Rather than the equipment just becoming another landfill statistic, Byteback has the expertise to inject new life back into devices to the benefit people and the planet.'



Andy Carter

Female leaders being overlooked for top fintech jobs

Research from EY and Innovate Finance has highlighted 'barriers' in the fintech sector, with female leaders being overlooked for senior positions.

The research, formed from the 120 finalists on the Women in Fintech Powerlist, highlighted that over one in four female leaders believed that unclear progression opportunities for promotions and a lack of recognition were holding back progress for the sector. Analysis indicated that the gender pay gap in the FinTech industry is as high as 22 per cent,

with 17 per cent of respondents from the Powerlist calling for regulation of the gender pay gap to help close the difference.

Sheila Flavell, chief operating officer at FDM Group, said, 'Tackling the gender pay gap and improving access to career opportunities should be a top priority for business leaders in fintech. Key to addressing this issue is to broaden career and training programmes, as well as working harder to retain female talent. By building a stronger, more diverse workforce, the fintech

industry will be better placed represent the customers it serves for the long-term.'



Sheila Flavell

Aligned Data Centers joins US Environmental Protection Agency's Green Power Partnership

Aligned Data Centers has joined the US Environmental Protection Agency's (US EPA) Green Power Partnership. Its participation further illustrates the company's commitment to covering 100 per cent of its electricity with green power. By choosing green power, Aligned is helping advance the voluntary market for green power and development of those resources.

According to the US EPA, Aligned's green power use is equivalent to the electricity use of nearly 13,000 average American homes annually. By moving the needle in the voluntary green power market, Aligned and other Green Power Partners

are helping to reduce the negative health impacts of air emissions including those related to ozone, fine particles, acid rain

and regional haze.

'Aligned is proud to be recognised by the US EPA as a member of its Green Power Partnership,' stated the company's CEO, Andrew Schaap. 'We are committed to partnering with our customers to assist them in meeting their clean energy goals, as we share the path towards achieving net zero

carbon emissions and a climate secure world.'



Andrew
Schaap

NEWS IN BRIEF

Stellium Datacenters has formed a strategic partnership with ITPS, enabling it to bolster its failover and disaster recovery capabilities.

BASEC Group has joined Kiwa UK.

Ionos and its UK subsidiary, Fasthosts, have secured Tier IV certification from the Uptime Institute for their £21m data centre at Worcester Six Business Park.

Research from Juniper Research has found that operators will lose \$1.3bn to undetected flash calls cumulatively between 2023 and 2027.

CityFibre has been recognised for the third year running by the Royal Society for the Prevention of Accidents (RoSPA) for demonstrating its dedication to ensuring its staff and build partners operate in a safe environment. This year it won the Highly Commended Award in the Industry Sector category.

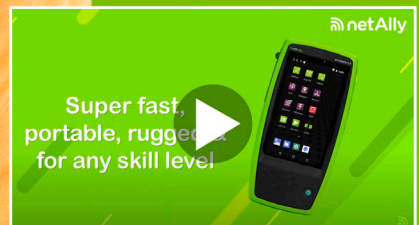
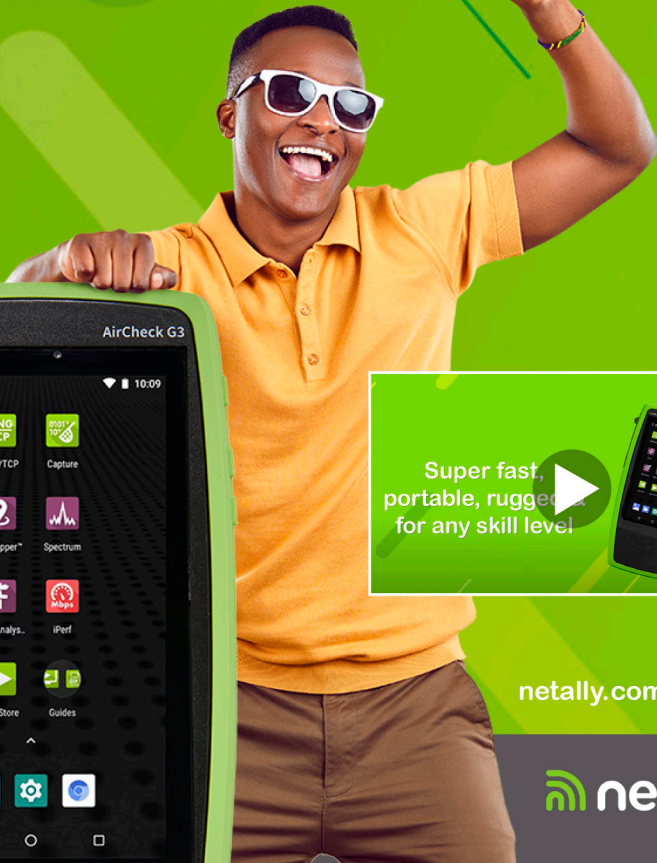
Atech Cloud has acquired Meritum Cloud Services.

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Results driven business

Hi Rob

In a world where data is king, bandwidth requirements are higher than ever before, so the need to test is critical. Errors in data transmission can at best cause inconvenient delays or inefficiencies but can also lead to system shutdowns. That would prove to be catastrophic if the involved communications were mission critical such as those found in hospitals, financial services and manufacturing environments.

Thankfully, modern instruments used for carrying out testing on communications networks have been designed to be easier than ever to operate. However, while the benefits of this are obvious – greater efficiency, faster error detection and correction, as well as reduced operational and maintenance costs – there are two key issues that worry many of us who work in this sector.

The first is that there is a lack of experienced users to operate today's advanced testing equipment. Second, weak critical thinking skills at instrument user level can lead to inaccurate assumptions and inaction when action is needed.

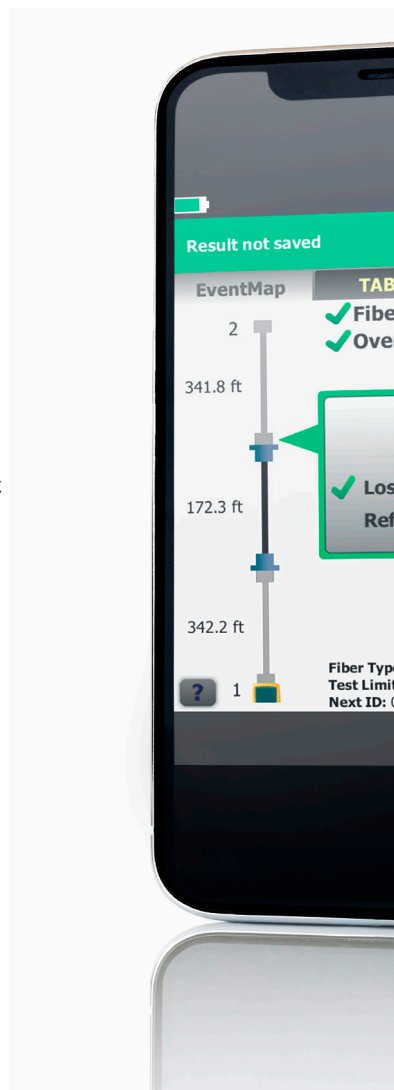
Let me elaborate. Testing in itself is neither onerous nor difficult, especially with access to instruments that are extremely user friendly and have considerable levels of intelligence built into them. Anyone operating the testers are guided so that they know exactly what they need to do. The problem is that a piece of testing kit can be as intuitive or 'smart' as you like but it is bordering on pointless to have people operating the devices who don't have the experience and knowledge to interpret the results being produced.

The difficulty with virtually anyone being

able to operate a tester in the field is that many errors can be made setting up, since users often won't possess the overall

project knowledge about cabling specifications for them to enter this information into their device. The solution? Ideally a project manager, the person with the best overall project knowledge, should always be tasked with setting up testing criteria for the first time so that everyone can be confident that data provided by the device is correct.

That's all very well, of course, but another key issue is what happens if things go wrong for the inexperienced



ess

operator? Take the example of someone using an optical time domain reflectometer (OTDR). The fact is that most operators will

struggle to interpret an OTDR trace and will simply rely on the instrument software to analyse the trace and view the loss calculations shown in an EventMap.

However, without taking into consideration the type of optical fibre used, as well as instrument specifications like dead

zone, it doesn't automatically follow that what it says on the screen of the testing device is accurate or makes sense. Yet nine of out 10 operators

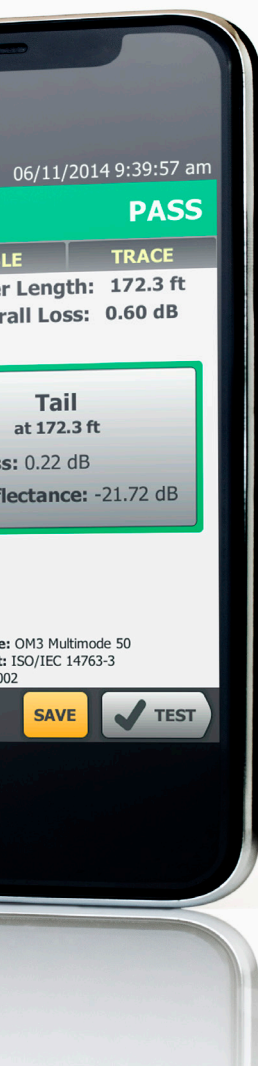
the tester to tell them what the problem is. In other words, because they lack the knowledge, familiarisation and insight to understand the outcome of an OTDR trace, it is very easy to misinterpret the readings.

We can be justifiably proud of the huge progress that has been made in recent years in developing test equipment that can be used with ease and produces levels of accuracy that were simply not available in the past and at such measurement speeds. However, it is clear that technology alone cannot replace experience and it is absolutely essential that anyone operating testing devices in safety critical or mission critical environments has a minimum degree of understanding of how to set up the equipment and how to interpret what it tells them. Attempting to test data networks in the 21st century, including the cabling itself, in any other way is simply asking for trouble.

Robert Luijten
Fluke Networks

Editor's comment

As someone who has witnessed the development of test equipment for over two decades, I think what has been achieved in terms of making them almost as simple to use as a smartphone is remarkable. However, as Robert points out, using the kit and knowing what the results mean are quite different things. Where he really hits the nail on the head is in terms of setting a device up. An incorrectly set up piece of test equipment that provides incorrect results is next to useless and the repercussions can be far reaching.



will not question the results and will rely on

Making the right hybr

Hi Rob

There is no one size fits all approach to hybrid working. For every middle aged parent revelling in the chance to do the school run, rather than sitting on a crowded train, there is a Gen Z desperate for the interaction of an office environment, rather than being stuck in a spartan shared flat.

Rigid hybrid strategies will never meet the needs of a diverse workforce, but a flexible attitude must include the unified communication (UC) tools used by employees. Wherever they choose to work, they need to be confident in their ability to use a variety of tools, from video conferencing to collaboration. But are they?

Over the past two years, IT teams have accelerated strategic UC deployments. A prime objective is to put an end to the costly and high risk shadow IT adopted in the early days of enforced working from home, when individuals made their

own choice of video conferencing, file sharing and messaging solutions. People have adapted to their preferred tools and, where possible, adapted the tools to work for them. Attempts to close down the UC environment and restrict users to the corporate platform can backfire spectacularly. The problem is that most businesses have absolutely no idea.

Today, 85 per cent of businesses are using two or more meeting platforms and many companies are looking to reduce costs by consolidating on to one platform. Yet how can an IT team make the right decision when the business is completely blind to the reality of UC usage and adoption? While UC performance is routinely monitored, the information is collected on a system by system basis. There is no visibility of the entire operation and no understanding of the way employees are using the systems.

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favourite shadow IT solutions and sidelining corporate standards. The result is not only an unseen and unquantified operational security risk but also a missed opportunity to understand how employees are adapting to hybrid working and any signs of a lack of engagement with the business.

End to end monitoring of the entire UC environment provides valuable insight to support the evolution of hybrid strategies. Are individuals increasing their use of a certain platform? If so, is that because people prefer that solution or simply due to performance problems with the alternative? Companies cannot blithely assume that growing usage equals preference – the IT team needs to also understand if there are any issues with the solution, the network, even frustration due to the lack of personalisation options. Is there perhaps a change to mandate a single tool if staff can personalise it to suit the way

they want to work?

Hybrid working will only succeed if staff are committed, engaged and able to collaborate effectively, wherever they are located. And that is far from inevitable if IT attempts to impose a solution that simply doesn't work as well as their shadow IT alternative. To offer employees the right choice, it is essential to understand how UC platforms are working at home and in the office, for both individuals and the business.

Jason Barker
IR

Editor's comment

As Jason makes clear, employers need to offer a flexible approach to balance diverse home and office working preferences. But they must also provide a choice of technology options and know how they are being used.

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Call and response

The last couple of years have seen a significant rise in media interest in data centres – and very little of it has been positive. This, combined with environmental campaigners now targeting data centres, means that the sector needs to respond and **Inside_Networks** has assembled a panel of industry experts to discuss what should be done

▶ Is The Cloud Damaging The Planet? was the rather loaded question used as the title for a recent BBC Panorama documentary, which sought to explain how going online isn't a carbon neutral exercise. For those of us who work in the data centre sector, the programme presented very little new information but its negative tone will have undoubtedly sown a few seeds of disquiet amongst its viewers.

For most industry professionals it was only a matter of time until the media spotlight shone on the sector and growing attention from climate activists will have no doubt accelerated this. Environmental campaigners now regularly stage protests

outside data centre based events calling for an end to new facilities being built and highlighting their impact on the environment. They are usually filming their activities and uploading the footage to social media platforms. Go figure.

The data centre sector's approach so far seems to be to ignore the attention and simply hope it goes away. However, that is unlikely to work and if there is going to be a balanced and reasoned debate on the subject, the sector must respond. **Inside_Networks** has assembled a panel of industry experts to discuss the issue and suggest what should be done.

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SHOULD THE GROWING (NEGATIVE) MEDIA INTEREST IN DATA CENTRES, COMBINED WITH THE INCREASED TARGETING OF THE SECTOR BY ENVIRONMENTAL CAMPAIGNERS, ACT AS A CALL TO ACTION? IS THE INDUSTRY GUILTY OF IGNORING THE ATTENTION AND SIMPLY HOPING IT GOES AWAY, AND WHAT SHOULD BE DONE TO HIGHLIGHT THE SECTOR'S SUSTAINABILITY BASED ACTIVITIES AND SUCCESSSES?



MARK ACTON

HEAD OF TECHNICAL DUE DILIGENCE AT FUTURE-TECH

Following the recent BBC Panorama programme and other negative media representation of the data centre sector, it is up to all of us associated with it to help put the record straight and better educate both the media and governments around the world. It is, however, ironic that the BBC now extensively promotes the use of its 'on demand' platform and makes programmes including Panorama available through its iPlayer platform, which requires at least one data centre!

This highlights the point that it is not data centres that are the problem – it is the digital infrastructure residing within data centres that is the issue. The media and government are promoting increased use of digital services, while at the same time criticising data centre energy consumption. As a society we cannot offer or consume more digital services without increasing the energy demand within data centres. We have the responsibility to make these services as energy efficient as possible but we can't have it both ways.

This was nicely illustrated at a data centre conference in Ireland a year ago, when environmental activists disrupted the event to make a point about data centre power consumption. The irony was that nearly every protester was holding up a phone taking photos or videos, oblivious to the fact that they were sharing through a data

centre and being part of the problem they were protesting against!

This is where increased awareness and education comes in. Again, do not blame data centres for the problem, it is the consumption of cheap digital services that is the issue. We need to recognise this by improving inefficient digital infrastructure, which is only belatedly starting to be addressed, and by making the public more aware that if they are consuming digital services of any kind, they are part of the data centre energy consumption issue.

Finally, we should also be making more of the energy consumption and greenhouse gas emissions saved by using digital services from data centres. There is little talk of the reduced travel and face to face meetings that we are now undertaking due to the widespread use of online meeting tools, particularly since the Covid-19 pandemic.



'AS A SOCIETY WE CANNOT OFFER OR CONSUME MORE DIGITAL SERVICES WITHOUT INCREASING THE ENERGY DEMAND WITHIN DATA CENTRES. WE HAVE THE RESPONSIBILITY TO MAKE THESE SERVICES AS ENERGY EFFICIENT AS POSSIBLE BUT WE CAN'T HAVE IT BOTH WAYS.'

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Up until recently, data centres have been a bit of a silent service, housing the internet and the cloud, but very few people really understood how it all comes together.

For example, a few years ago, if you asked

someone outside of the industry how a text message travels from the UK to the US, they'd probably point to the sky. In fact, all text messages, emails, phone calls – whether digital or analogue – travel across the same subsea cables,

and via a number of different data centres. Even now, there are still those who think that the cloud only exists virtually.

Recently, the sector has been growing and we've received more attention from the media, which is a double edged sword. On the one hand, we need people to know about the sector, so that we can continue providing the services that everyone takes for granted, like Netflix or most apps on mobile phones. On the other hand, the media has mostly not reached into the people within the industry in order to report accurately on the sector's progress.

There is a further piece of education that we need to get across, and that is that we are all part of the same problem. A year or so ago, there was a protest at a data

centre event, where the protestors wanted to turn all the data centres off. Some of those protestors were actually recording the action on their phones, probably to post on Facebook or YouTube. This shows

a clear lack of understanding that we are all users of data centres on a day to day basis – shutting them down will achieve one aim, but it will shut down a lot more than that.

Our sector has made so much progress globally in the last 15 years, focusing on renewable energy usage,

efficient building design, new efficiency key performance indicators (KPIs) and metrics, and now sustainability KPIs and metrics in ISO standards. In a lot of ways, data centres lead the way, and this message needs to be communicated via the media as well.

'OUR SECTOR HAS MADE SO MUCH PROGRESS GLOBALLY IN THE LAST 15 YEARS, FOCUSING ON RENEWABLE ENERGY USAGE, EFFICIENT BUILDING DESIGN, NEW EFFICIENCY KEY PERFORMANCE INDICATORS (KPIs) AND METRICS, AND NOW SUSTAINABILITY KPIs AND METRICS IN ISO STANDARDS.'



NANCY NOVAK

CHIEF INNOVATION OFFICER AT COMPASS DATACENTERS

If there was ever an industry that needed better PR, it's the data centre sector. As large power consumers, data centres are easy targets for a media primed to look for villains. Individual organisations like AWS, Microsoft and Google have done a good job of highlighting their work toward carbon neutrality, but as a collective we haven't been successful in telling a story that contradicts this whole 'eco-enemy' narrative.

If we're being honest, the data centre industry was early to recognise the importance of sustainable operations, resulting in the focus on alternative power sources to reduce greenhouse gas emissions in the early 2010s. Wind and solar offsets originally defining early green power efforts have evolved into investments in the construction of dedicated wind and solar farms.

This desire to be a visionary in clean power alternatives is also evidenced by NE Edge and Cumulus Data Centers' recent announcements to build nuclear power station adjacent campuses, and the continued development of small nuclear reactors (SMRs) is expected to result in their use to power data centre locations by the end of the decade.

The data centre industry is also one of the leaders in sustainable construction.

Compass, for example, was the first provider to build facilities with concrete manufactured using sequestered CO2 and

use artificial intelligence to reduce the total amount of cement required in our projects to reduce greenhouse gas emissions by up to 266 tons per facility. As history has demonstrated, we can expect further innovations to be the hallmark of the industry



for years to come.

The data centre industry is no laggard in proactively addressing the globe's environmental concerns. While we need to do a better job of touting our efforts, the bigger question is, 'Although we have a powerful story to tell, is there an audience willing to listen?'

'INDIVIDUAL ORGANISATIONS LIKE AWS, MICROSOFT AND GOOGLE HAVE DONE A GOOD JOB OF HIGHLIGHTING THEIR WORK TOWARD CARBON NEUTRALITY, BUT AS A COLLECTIVE WE HAVEN'T BEEN SUCCESSFUL IN TELLING A STORY WHICH CONTRADICTS THIS WHOLE "ECO-ENEMY" NARRATIVE.'

JON LABAN

RESET CATALYST AT THE OCP FOUNDATION & OPENUK BOARD MEMBER

I'm pleased to see the growing negative media interest in data centres. In my view it highlights the abysmal progress the vast majority of this industry has made towards less environmentally damaging impacts.

I have personally engaged with the actions of environmental activists like Extinction Rebellion at the Data Centres Ireland event in Dublin last year, when I went outside the venue railings to talk with the protesters. I applaud them for their efforts because their activism will ultimately result in tighter regulation for data centres.

The data centre industry suffers from an inward looking groupthink mindset and this can be clearly seen in LinkedIn discussions about the Extinction Rebellion protests in Ireland, the recent BBC Panorama program and other media news stories. I will leave the interested reader to insert the most excruciating LinkedIn quotes here

If the insiders of the data centre industry understood the actual meaning of sustainability – as understood by the outsiders such as women, regulators, environmental activists, new economists and indigenous peoples – as being built on three pillars (environmental, social and economic) then they would realise that

they cannot operate in their narrow inward looking groupthink male dominated reality.

When organisations in the data centre industry reach a critical mass of women, and sustainability and carbon performance

actions are meaningful, then good news stories will permeate into broader society. Until then the men inside shall wallow like pigs in mud playing Power Usage Effectiveness (PUE) volleyball, and later drinking pints in the pub, while patting themselves on backs for a job well done.

In my recent presentation at the Queen Elizabeth Conference Centre

opposite the Houses of Parliament I spoke out on this topic. A video of this is now available in the OpenUK YouTube channel.



'THE DATA CENTRE INDUSTRY SUFFERS FROM AN INWARD LOOKING GROUPTHINK MINDSET AND THIS CAN BE CLEARLY SEEN IN LINKEDIN DISCUSSIONS ABOUT THE EXTINCTION REBELLION PROTESTS IN IRELAND, THE RECENT BBC PANORAMA PROGRAM AND OTHER MEDIA NEWS STORIES.'

STEVEN BROWN

GLOBAL SEGMENT DIRECTOR CLOUD AND SERVICES PROVIDERS AT SCHNEIDER ELECTRIC

The green energy transition and demand side decarbonisation are two of the biggest challenges of our time. Perhaps surprisingly to some, data centres are an essential catalyst for this transition. Sustainability at scale requires digitisation – from enabling green industrial processes and smart grids to helping society reduce carbon through remote work and digital content – and therefore requires more data centres.

Should media and environmental interest act as a call to action for our sector? The answer is yes. More should be done to accelerate the data centre industry's path to net zero. However, our industry has much to be proud of, and should share its progress in regard to efficiency and sustainability.

Since 2002, for example, average Power Usage Effectiveness (PUE) ratings have dropped from 2.5 to 1.55, delivering significant savings in energy consumption, operating costs and associated carbon emissions. Data centre operators are leaders in renewable energy procurement and have pushed technological boundaries to reduce their environmental impact.

It is also important to consider the data centre's role in the broad ecosystem of information technology today. Despite facing comparatively little scrutiny, devices such as laptops and smartphones generate

nearly twice as much carbon as data centres, according to a recent McKinsey study.

Still, our industry should welcome the challenge to move even faster. Key

opportunities include heat reuse, where estimates predict European data centres could provide sufficient heating for three per cent of homes. As digital dependency and computing demands increase, future gains will also be driven by more efficient IT components and innovative liquid cooling technologies.

Microgrids will also drive new opportunities to generate green renewable energy, while tackling Scope 3 emissions will further reduce carbon in operators' supply chains. Clearly, collaboration across the entire digital infrastructure ecosystem will be essential.

Only through a holistic approach, with transparent, measurable and verifiable progress, will carbon neutrality be truly possible. Data centre operators remain committed to leading the way.



'DATA CENTRE OPERATORS ARE LEADERS IN RENEWABLE ENERGY PROCUREMENT AND HAVE PUSHED TECHNOLOGICAL BOUNDARIES TO REDUCE THEIR ENVIRONMENTAL IMPACT.'

Make smarter decisions faster with intelligent power distribution.

In today's hyperconnected world, power demands in the data centre have become more complex and rack power density continues to rise. Now, more than ever, data centre managers must look for power management solutions that enable the highest levels of efficiency, availability and manageability, while also enhancing security. Chatsworth Products' (CPI) intelligent eConnect® Power Distribution Units (PDUs) are the answer.

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DANIEL BURGON

HEAD OF RISK AND COMPLIANCE AT TELEHOUSE EUROPE

Climate change is a pressing concern for us all. As the digital backbone of the world, data centres are at the heart of global connectivity and the processing power behind world changing computations. While meeting the needs of the current generation, we have an important responsibility to ensure we help support a safe and sustainable tomorrow for our planet and our communities.

The sector has been keenly aware of its environmental responsibilities and has been taking action for decades to enhance its sustainability credentials. Data centres are continuously at the forefront of driving efficiency in power consumption, water consumption and carbon emissions reductions, as this motivates competitiveness, retention and attractiveness to customers.

In the UK, the vast majority of operators source 100 per cent renewable generated energy to power their data centre operations. Many are also in a mature stage of securing agreements directly with renewable energy providers. Most are certified to internationally recognised standards as ongoing requirements to maintain management system structures, and continually improve environmental performance. Importantly, most data centre operators have voluntarily elected to be net zero, outdoing the UK's ambitions to decarbonise the economy by 2050 and outpacing many other sectors.

The majority of operators have also pledged to accords and pacts, have aligned

(or are currently aligning) their performance to the Science Based Targets initiative (SBTi), and are already reporting through business sustainability rating structures. UK

data centre operators are required by law to report consumption and emissions to numerous regulators.

When assessing the impact of data centres, it is important to consider that they are established to provide the infrastructure for IT

equipment previously located on-premise, within a dedicated building used for the sole purpose of powering and cooling servers. This all substantially improves power usage efficiencies.

While the data centre sector is moving faster towards sustainability than most, it's fair to say that we, as an industry, have a long way to go to firmly establish and declare our environmental credentials publicly. The industry is on an active journey and only by collaborating and having open dialogue with our stakeholders can we help shape a sustainable tomorrow.



'DATA CENTRES ARE CONTINUOUSLY AT THE FOREFRONT OF DRIVING EFFICIENCY IN POWER CONSUMPTION, WATER CONSUMPTION AND CARBON EMISSIONS REDUCTIONS, AS THIS MOTIVATES COMPETITIVENESS, RETENTION AND ATTRACTIVENESS TO CUSTOMERS.'

Making the most of a significant investment

Test equipment for cable certification is a considerable investment for data cabling companies, exclusively through Mayflex in the UK, AEM offers a diverse range of test equipment to

▶ Most tester manufacturers like to talk about speed but generally they only talk about their headline speeds. Most conveniently, they don't speak about complete tests with ++ results, which are essential for power over Ethernet (PoE) compliance. Why? Because they usually take a lot longer to perform – as long as 19 seconds. However, with an **AEM CV100** you can do this in just six seconds!

Need for speed

Speed of use is not all about how quickly a tester tests once you hit the test button! The CV100 is not only fast, but it also comes equipped with a remote unit that has an identical screen to the main unit, enhancing productivity and communication between engineers. This feature is particularly useful for testing cabling installations – saving both time and labour costs.

The efficiency of the CV100 is backed by testimonials from industry experts. Tim Rycroft and Gavin Glasswell from GCL

Building Technologies praised the CV100 for its cost effectiveness and quick results. With the CV100, they were able to test an existing 7,000 cables on-site, saving time and money. The CV100 enabled them to finish the testing three weeks ahead of schedule, making their job much easier and more efficient.

CLICK HERE to see more about their AEM experience.

AEM Four Year Care Plan promotion

For AEM CV-100

purchases made between 1st May 2023 and 31st October 2023, and where over 10,000 data/fibre points are made on that tester within the promotion period, AEM will provide one year extra of its comprehensive care plan. This means a total of four years of cost free tester ownership (see details below on the comprehensive care plan).

This promotion is a great opportunity for businesses to save money while ensuring that their tester is fully covered. The **AEM CV-100** platform is already an efficient



nificant



MAYFLEX
A Sonepar Company

panies, so making the right decision is crucial. Available
suit all requirements

and reliable option, and with this promotion it becomes an even better investment for companies that need to test large volumes of data/fibre points.

Customer care

AEM's commitment to customer satisfaction sets the CV-100 apart from other cable certification testers. With no extra fees, such as care plans, to worry about for three years, the AEM CV-100 platform offers peace of mind for any business owner. Plus, accidental damage cover is included – ensuring you won't be left with unexpected expenses.

So, if you're tired of dealing with extra costs and hidden fees from your current tester manufacturer, it's time to make the switch to the **AEM CV-100**.

AEM's care plan includes free calibrations for three years and the replacement of worn out adaptors and accessories, which will

be replaced once a year. So, there are no unexpected costs when you invest in AEM certification testers.

Spread your purchase cost

Mayflex can help you spread the initial purchase cost of an AEM tester with a choice of finance options – just talk to our team for more details and a quotation.

Talk to Mayflex to find out more about the award winning **AEM CV100** platform and arrange a demonstration to understand more about its technical capabilities and the numerous features and benefits.

Get in touch

For more information about Mayflex, **CLICK HERE**, call our sales team on 0800 757565 or **CLICK HERE** to send an email.

If you don't already deal with Mayflex, you can **CLICK HERE** to open an account.

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A sense of direction

Michael Akinla of Panduit explains how automated network mapping increases the effectiveness of intelligent infrastructure management (IIM)

IIM has come of age in recent years, as digitalisation has driven the capability to track, trace and continuously monitor networks and their surroundings. There is now the opportunity to choose from comprehensive ranges of hardware, modular software and turnkey services from a range of suppliers – some providing single solutions, others a full suite of capabilities.

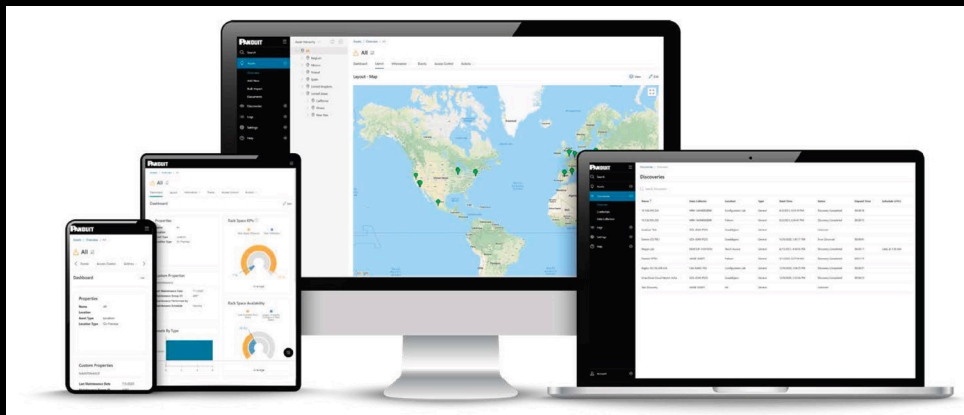
DELIVERING THE GOODS

To meet customers' data requirements and ensure networks deliver the expected performance – high bandwidth, availability and uninterrupted communications –

infrastructure to meet this requirement is creating a massive growth in the application sector. According to BlueWeave Consulting, the global IIM and data centre infrastructure management (DCIM) market will surpass \$3bn, with a compound annual growth rate (CAGR) of 8.6 per cent, by 2028.

MOVING ON UP

Most, if not all, IIM suppliers are driven to improve operational and performance management through a range of functionality including automated device discovery, visualisation, analytics and actionable intelligence. Today's best

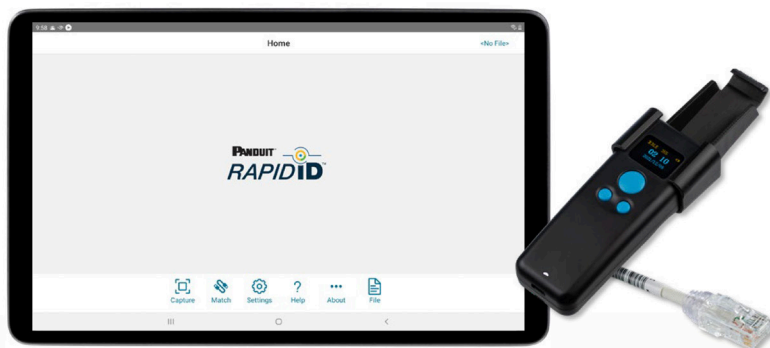


there needs to be real time end to end network monitoring in place. To increase customer confidence this should include at least some provision for automatic and autonomous digital intervention and reporting.

Increasing utilisation of hybrid digital

solutions have been developed to ensure end users receive real time data to maintain optimum performance and generate alerts to flag possible imminent faults or future security risks.

Today's systems offer cloud native connectivity and are highly scalable,



which has added a further dimension to the resource monitoring previously available. They track infrastructure data, providing essential relevant information to authorised users anywhere in the world with an internet connection. Comprehensive capabilities such as vendor neutral, agentless auto-discovery of assets ease installation and have greatly reduced equipment set-up time. These capabilities offer customisable reports and dashboards, which allow engineers, facilities management, operators and customers to gain live updates and pre-empt critical events.

All facilities, whether enterprise, colocation or wholesale, are built around the four pillars of power, space, cooling and connectivity. Therefore, current network solutions need to not only offer real time, integrated and accurate data, but also deliver enhanced data intelligence that concurrently supports IT Infrastructure, operations and facilities management.

LITTLE THINGS COUNT

There are only a few network mapping tool suppliers that are innovators in the realm of physical infrastructure for data centres and enterprise. There are even less that

undertake the research and development of network infrastructure including copper and optical fibre cabling, connectors, cable pathways, cabinets, hot and cold enclosure systems, uninterruptible power supplies (UPS), power distribution units (PDUs) and other connectivity systems. Partnering with such an organisation guarantees that customers benefit from developments that are based on long-term ground-up experience and not simply theory or second hand guidance.

Network mapping is the process of compiling the location of devices and connections of an IT environment, and generating a logical and visual representation of the network. It is essential that the presentation format is easy to compile and understand, while providing a simple layout to follow the interconnections from point to point.

A recent development to support network mapping capability and automate the labour intensive and error prone cable documentation process are pre-labelled patch cords, which when used in conjunction with a handheld Bluetooth rapid ID scanner allows network engineers to quickly, easily and more accurately place and trace cables. The data assigned to

‘Network mapping is not a one-off activity – the evolving nature of any network MACs must be recorded and those changes reflected in a network plan.’

these connections is uploaded in real time directly into the system.

RIGHT FIRST TIME

Accurate physical infrastructure documentation can drastically reduce downtime during an outage, however, this can be extremely time consuming. Over time moves, adds and changes (MACs) introduce possible failures in updates and therefore network maps can often be out of date. Conversely, it is estimated that this new process will reduce the time and cost of patch cord documentation by up to 50 per cent, while guaranteeing accurate connectivity mapping.

Network mapping is not a one-off activity

– the evolving nature of any network MACs must be recorded and those changes reflected in a network plan. If we consider increasing network densification, where physical layer changes are resulting in much higher density cable concentrations, this can mean thousands of fibre and copper connections that need to be additionally managed across the enterprise or data centre. Each connection is a potential point of failure and it is essential that they are discoverable on the network connectivity map and provide active up to date data.

SPEED OF CHANGE

The speed of technological advancement and the growth of access to multi-venue

36



data connections are making network management more complex and customer data increasingly interdependent. This pace of change makes it increasingly important to have access to the tools and systems that allow monitoring and oversight, which is relied on for accurate network optimisation. Understanding the data centre network infrastructure layout offers greater opportunity to address the challenges of how to migrate to higher data speeds and cable densities, whilst retaining control on costs.

Exponential bandwidth growth and the imminent explosion of edge data centre traffic, firmly places fibre densification at the forefront of network design, planning and implementation. This only highlights the requirement for real time infrastructure mapping to monitor organisational and customer needs within the data centre. As the value of each fibre circuit rises exponentially and networks continue to

densify, data centre managers who can demonstrate greater scalability, agility and resilience will gain a business advantage.

OPPORTUNITY KNOCKS

Real time network maps are an indispensable resource, especially when conducting performance monitoring. Visual diagrams are very useful in identifying performance chokepoints and can highlight opportunities for improvement. This is true for internal administrators and customers with access to granular level data now available with these solutions. ■



MICHAEL AKINLA

Michael Akinla is business manager central Europe north at Panduit. He brings over 20 years' experience in the deployment of Panduit's most complex solutions and has extensive experience in working with a number of large global accounts to bring about significant improvements in terms of higher bandwidth deployments, reduced Power Usage Effectiveness (PUE) and lower total cost of ownership (TCO).

Living up to **expe**

▶ Successfully implementing and using automated infrastructure management (AIM), intelligent infrastructure management (IIM) and network management solutions does not mean simply installing software and hardware – some questions need to be answered first. After all, these systems ideally should deliver outcomes that add significant business value.

MORE THAN MEETS THE EYE

If you're installing a monitoring system, you can do much more than just see which ports are available, for example. However, it only makes sense to add a new type of functionality if it brings a genuine benefit. This can be determined by working out how each functionality will support a specific KPI. We will present several possible monitoring aspects and show how they support specific KPIs – depending on which KPIs are most important to your organisation, you can make a more informed choice.

Identifying and monitoring KPIs is essential for ensuring operational efficiency. KPIs are also the basis for an optimised, agile and cost effective deployment, focused on the supported business processes and not on the underlying infrastructure.

MONITOR AND MANAGE

With this in mind, it's important to make a distinction between monitoring and managing. Do you need a system that checks predefined items and provides

alerts if something is out of the ordinary? For example, when a line is disconnected or power consumption exceeds a predefined level. Or does the system also need to be capable of managing changes? If the latter is the case, you need to make sure that monitoring system can 'speak' to surrounding applications and the physical hardware. This requires various integrations and therefore the involvement of process integrators. The integrations aren't always available off the shelf, so it's worth including open and well documented application programming interfaces when specifying a solution.



Expectations

The last thing you want is some sort of vastly complex system with hundreds of dashboards that you can't see and compare simultaneously. Deciding which aspects only need to be monitored, and which aspects need to be (automatically) managed, is a first step to making this easier.

THREE OF A KIND

If we look at a typical data centre network, we see three key areas that can be integrated into a monitoring/management system:

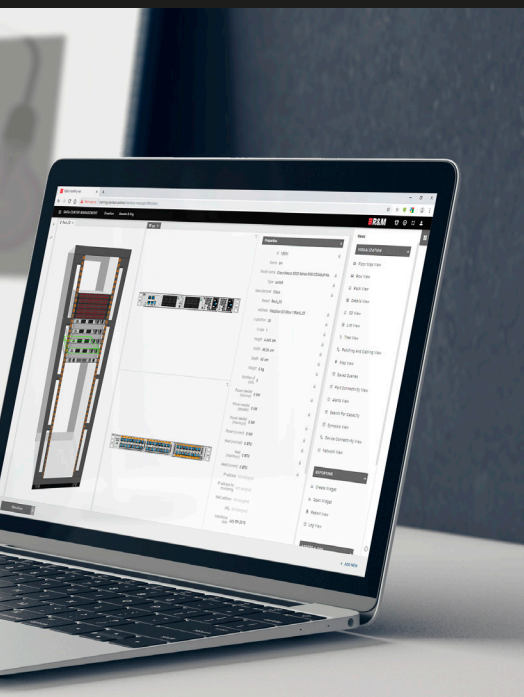
- **Operating software.** This encompasses documentation, supervision and optimisation
- **Active infrastructure.** This includes elements such as power distribution, cooling, UPS, enclosures, racks, panels and housings
- **Passive infrastructure.** This comprises cable systems, optical fibre cables and associated components

Monitoring and managing every single one of these aspects is possible, but it can become complex and might not be necessary. You first need to decide what you need to know and how that data might support your KPIs. Do you want to simply check the number of connections? Do you need information about hosted application types? Do you need to know how data centre facilities are interconnected and whether technical staff are present on-site?

Of course, collecting data isn't enough – do you know how it is to be interpreted and who can best take care of that?

BIGGER PICTURE

When considering monitoring and digitisation, it is vital to take a holistic approach. It's especially important to understand the importance of integrating non-compute items such as power, cooling or access control in the monitoring, and to know how to do this effectively. For example, access control can be an essential part of a colocation solution, where it's



‘Fully documented, monitored and managed data centres have a significant advantage when it comes to increasing capacity, efficiency, energy usage and space utilisation. Supporting KPIs through monitoring and management is vital in allowing data centre managers to make smart decisions at the right time.’

important to relate (unexpected) changes to people that were in a room at a given moment.

Of course, data centre architecture is also a factor to consider. Are you operating a single site data centre or combining facilities across multiple sites?

Where are your operations managers located? By tagging all assets with unique codes and registering them in a single source of documentation, along with relevant

technical data, they can be located and their status is known at all times, making effective operations and audits possible.



problem alerts, including the location of a cable fault.

Integrating live data from power distribution units (PDUs) offers insight into power consumption,

power factor and environmental data such as temperature and humidity. Not only do you receive immediate centralised alerts if critical values are reached, you also build up a history that enables you to find trends and introduce precautions.

Monitoring can also provide constantly updated capacity overviews, which makes it possible to determine where there's room for new builds, while also receiving alerts on upcoming capacity issues. For example, when alerted to an upcoming limit to the number of servers

you can place in an existing facility, you can start looking into alternatives such as increasing density at an early stage.

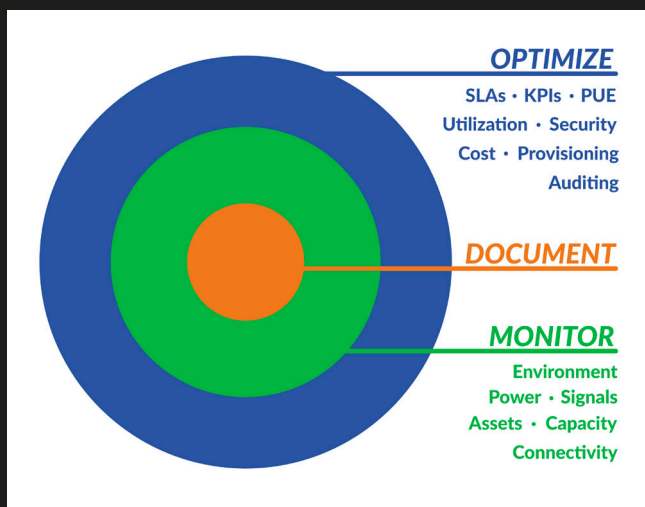
CAUSE FOR ALARM

Continuously monitoring all connectors on patch panels allows immediate alerts on unauthorised changes, rapid fault location and restoration, and neat scheduling and execution of changes. Through signal monitoring, you can constantly supervise traffic and get notifications as well as

TAKING THE ADVANTAGE

Fully documented, monitored and managed data centres have a significant advantage when it comes to increasing capacity, efficiency, energy usage and space utilisation. Supporting KPIs through monitoring and management is vital in allowing data centre managers to make

smart decisions at the right time. However, as with all aspects of data centre design, there's always a risk of over specifying. If you're not quite certain which data centre elements you can best track to support your KPIs, or if you want to make sure you are monitoring the aspects that truly make a difference, it's always wise to check with an expert. ■



REINHARD BURKERT

Reinhard Burkert is product manager smart networks at R&M. Burkert has more than 30 years of experience in the telecommunications industry, holding various positions in development and product management at Alcatel, ABB and R&M.



CARSTEN LUDWIG

Carsten Ludwig is market manager data centres at R&M. An experienced sales and marketing director, leading teams in various market verticals supporting digitalisation, he has previously worked with Siemens, Nokia and Huber+Suhner.

Gina Sanjinés appointed as training consultancy services manager at Alcatel-Lucent Enterprise

Gina Sanjinés has been appointed training consultancy services manager for Europe, Middle East and Africa (EMEA) and Americas at Alcatel-Lucent Enterprise. She will create training plans and coordinate with the company's channel sales teams in EMEA and the Americas to train business partners on the full range of solutions and services offered by Alcatel-Lucent Enterprise.



Enterprise and its partners. 'It's exciting to see how we can fully leverage Alcatel-Lucent Enterprise's capabilities to help our partners continually grow in an

environment where training is increasingly critical to business success,' said Sanjinés. 'I am proud to take on this position and drive strong relationships with our

Business Partner training is critical in transferring knowledge of the company's network, communication and cloud solutions, and contributes substantially to the joint success of Alcatel-Lucent

partners in EMEA and the Americas. I am also excited to support partners in connecting customers with the solutions they need to meet their business objectives.'

Mayflex appoints Jack Foss to its security sales team and announces distribution partnership with Avigilon Alta

Mayflex has appointed Jack Foss in the role of account manager for converged technology, with an emphasis on IP security. He joins Mayflex from Eagle Eye Networks, where he was the southern area sales manager. Prior to that he has worked in various sales and business development roles in technology companies.



Adam Herring, director of sales for security at Mayflex, commented, 'We are delighted to welcome Jack to the team. He has real drive and ambition, as well as good security knowledge and experience,

so we believe that he will be the perfect fit for looking after our customers in London and the east home counties.'

Mayflex is also now distributing Avigilon Alta, formerly branded as Openpath, as part of its cloud based security offering. Avigilon Alta is owned by the Motorola

Solutions Company alongside the recently rebranded Avigilon Unity and Pelco, which are also brands available to buy from Mayflex. Avigilon Alta provides reliable mobile access control with smart video and intercom capabilities, cloud based software and an open ecosystem – providing a fast, flexible and future proof solution.

HellermannTyton acquires Höhle to offer microduct systems for optical fibre cables

HellermannTyton has announced the acquisition of Höhle, a leading manufacturer of microduct systems for fibre optic cables designed for the telecommunications industry.

The purchase of Höhle strengthens HellermannTyton's business and further expands its customer base. 'In addition to the acquisition of Gabocom in 2019, this further enhances HellermannTyton Connectivity's market

position in the fibre broadband market,' said Andrew Leyland, president at HellermannTyton.



Matthew Hunter

Matthew Hunter, managing director at HellermannTyton Connectivity, added, 'By increasing our manufacturing footprint and expanding our market reach, we offer comprehensive, market leading connectivity solutions to the optical fibre sector. Excellent availability of our product offering increases the speed of deployment to both new and existing markets.'

MISSED AN ISSUE?

CLICK ON THE COVER TO READ MORE



Comtec to rebrand as Netceed this year as it shapes the future of communication networks

Comtec is due to rebrand this year and will become Netceed. It marks the company's position as an integrated organisation with an expanded global footprint, as well as offering an enhanced product and value added service portfolio.

Steve Melay, enterprise sales director at Netceed, formerly Comtec, commented, 'The global rebrand to Netceed will bring many benefits to our existing customers. Our scale allows us



to leverage even better terms with our suppliers and smoothly service contracts across multiple countries. We also have our own research and development facility in Portugal that allows our widely experienced team to come up with innovative products that will help to shape the future of communications. With our huge global footprint, along with the move to a much larger distribution facility later this year, we will increase our stockholding to further cement our position as your premier partner and one stop shop for all your network needs.'

CHANNEL UPDATE IN BRIEF

Rackspace Technology has received the 2023 Singapore Microsoft Intelligent Data Platform, Data & AI Partner of the Year Award. This is the sixth consecutive year that the company has received the award. The company has also been awarded the VMware 2023 Lifecycle Services award for the Americas region as part of VMware's annual Partner Achievement Awards.

LiveAction has appointed Luke Millar as EMEA distribution manager.

Invicti Security has partnered with Climb Channel Solutions. With a primary focus on the UK and Irish markets, Climb will deliver Invicti's full product portfolio in addition to having technical, pre- and post-sales support on the partnership roadmap.

One Beyond has announced four new senior appointments to its team. James O'Donovan is appointed as chief operating officer, Paul Green as chief commercial officer, David Harrison as strategic partnerships director and Don Grantham is the new chairman.

Neil McRae has joined Juniper Networks as chief network strategist. In this company-wide, cross functional role, McRae will focus on assisting Juniper's customers, including service providers, cloud providers and enterprises, in developing the next generation architectures leveraging Juniper's products and experience first solutions.

All you need to know

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MEDIA KIT 23

CLICK ON THE COVER TO VIEW THE 2023 MEDIA KIT

Start as you mean to go on

Simon Jacobs of Excel Networking Solutions looks at the importance of designing the data cable management you need and choosing the right supplier.

▶ Data cable management is an essential part of any infrastructure build and choosing the right supplier can make installation projects much easier. A well designed and properly implemented cable management system can improve network performance, reduce downtime, and make it easier to maintain and upgrade a network. There are some key things to consider before selecting products and a supplier for a successful, cost efficient project.

SIZE AND SCALE

The size and type of application will affect what cable management systems and products you

need. Will racks be easily accessible? Will they be stored in rooms? How many racks will you need?

It's impossible to know what the future holds but consider using a manufacturer that has options and products to help with any deployment. If or when sites grow, it is easier to add new products on to a rack by retrofitting a suitable product rather than needing to un-patch the copper or optical fibre leads and using a management bar.

If racks need to be accessed in future, it is important to think about the cable management used in the management arms and ensure that cables are neat and tidy. Then, if the cables do





need to be accessed later for repatching, changing ports or taking a customer offline, it's then very easy to go to a particular unit, find where the bundle is and manage the required cable. Getting cable management right first time has a positive long-term impact.

SPACE RACE

Cable management can take away space from within a rack that could be used for deploying productive or moneymaking products. Products such as V or angled patch panels are intrinsically designed so that the management of cables is within the product design, and therefore the product's footprint needs no extra U space to keep the solution neat and controlled.

These items don't need products to support the cables exiting the patching field and out to the vertical cable management situated outside of the 19-inch mounting profiles. This style of product allows for easy access to patching in any given U without disturbing other

cables.

Retrofit management bars can hold back the hands of time as well as cables. Some fibre installations can be extremely densely populated and, over time, space and patching can become challenging. Instead of needing more expenditure, there are fibre panels available that can have cable managers added directly to the front of the fascia. This can free up valuable space taken up by cable management products and avoid the need for new, extra or larger comms racks.

SELECTION PROCEDURE

The quality of a rack will impact the reliability and performance of your network, so it's vital to ensure the rack you choose is high quality, durable and able to support the weight of any network equipment. Before starting a project, assess what the application is for, as there are several different options and some suppliers will have experienced experts on hand to help and provide advice. The main

rack systems are comms rack, equipment rack, server rack, open rack and colocation rack – each offers solutions for different cable management requirements.

- Comms racks are designed for LAN and security environments, and will generally have a glass front door and steel rear door.

‘The quality of a rack will impact the reliability and performance of your network, so it’s vital to ensure the rack you choose is high quality, durable and able to support the weight of any network equipment.’

- Equipment racks are ideal for server and audiovisual equipment, and will have wave vented front and rear doors – sometimes known as wardrobe style doors.
- If the project includes a high density deployment of copper cabling, use an open rack, which makes managing a large number of cables in its vertical management system much easier.
- Server racks feature split side panels for better access, and they are a great choice for data centres and enterprises.
- If security is key, and the rack space is likely to be shared amongst different clients in the building, then colocation racks are secure, offering lockable compartments for use when keeping equipment safe is a priority. These racks are versatile and can be used by different departments.

Some racks may have shared features, even if they are designed for different uses. Key rack features include removable access panels, large cut-outs in the base for cable

entry, lockable side panels and racks that can be bayed, with or without side panels, and more. These attributes could be useful in cable management and planning for

future changes, so consider using a manufacturer that designs a wide range of racks with additional features.

Sometimes, cable

management will need to run in ceiling voids above where people walk. In these instances, it’s vital to use steel cable ties that are BS 7671 compliant.



SUPPLY AND DEMAND

As well as using a supplier that offers a range of racks that comply with different safety standards, consider choosing one that has options to help with cable management. Some suppliers offer branded hook and loop cable ties showing a manufacturer's logo, which will provide a professional and tidy finish, giving a little more panache to the installation.

There are a lot of different products to choose from but not all suppliers will stock them. If your project requires a range of racks, it will be easier to use a single supplier rather than needing to speak to multiple contacts. Think about what else your project needs – does the supplier stock complementary products from other manufacturers?



SUPPORT STRUCTURE

Finally, consider the level of support that the supplier offers. Look for reputable companies that provide excellent customer service and technical advice. Choosing the right products from the right supplier will make installation smoother and help you be prepared for project changes and expansion. ■



SIMON JACOBS

Simon Jacobs is product manager for Excel Networking Solutions. He joined Mayflex in 2020 to set-up the Aura brand and then went on to become product manager at Excel for copper and cabinets last year. He has a wealth of experience in product development and management, having worked in for many companies in the telecommunications and data space including running his own company manufacturing audiovisual accessories for over 10 years.

EDP Data Centre Solutions

With more than 30 years' experience in the data centre space, EDP Data Centre Solutions (DCS) designs, manufactures and installs bespoke aisle containment systems for use in retrofit, new build and hyperscale projects. Operating out of multiple locations in the UK, Netherlands and USA, EDP DCS can support its clients across the world.

Aisle containment is a recognised solution for optimising data centre airflow management and cooling systems, and plays a central role in operational performance and energy efficiency. Custom engineered hot aisle containment and cold aisle containment

systems are designed to be supported from the raised floor or suspended from overhead structural ceiling grids. Modular designs enable customers to scale with

growth on demand, with solutions integrating with other critical data, power and fire suppression services.

All EDP DCS aisle containment systems utilise our advanced aisle containment doors, which provide greater stability, a synchronised sliding action and full 1200mm aisle opening.

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out more, call our sales team on 01376 501337 or **CLICK HERE** to send an email. www.edpeurope.com/dcs



Excel Networking Solutions

Environ SR racks are the flagship products in the Excel Networking Solutions' Environ range. With a load bearing capacity of 1500kg and split side panels, together with mesh design front and rear doors providing maximum airflow within the rack, they are perfectly suited for housing high density server and equipment installations, particularly in data centre environments.

Excel SR racks can be delivered assembled or flat-packed. When installed

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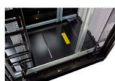
of compatible accessories including the Environ locking solutions, which provide a choice of radio frequency identification (RFID) and biometric locks.

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team on 0800 757565 to discuss your requirements.

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without compromise.

Panduit

Panduit has extended its FlexFusion series cabinet range with the introduction of FlexFusion XGL Cabinets. The new cabinets are ideally suited for network and server equipment, and provide maximum capacity to manage high cable density in data centre, enterprise or colocation deployments.

Available with lockable door solutions, customers can securely house 19-inch rackmount IT equipment, providing extensive cable management options within a cabinet suitable for hot aisle/ cold aisle or thermal containment deployment. Manufactured in welded steel, the cabinets are available in fix configurations of 600mm and 800mm widths, 1070mm and 1200mm depths and 42RU and 48RU heights, increasing the



ease of use of the FlexFusion family to offer customers precision solutions.

The front single hinge door and split hinged rear doors provide 80 per cent open perforation, maximising the cooling airflow to the IT equipment, while maintaining strength and rigidity. Doors with 170° open angle minimise aisle obstruction. The horizontally split side panels allow ease of interconnection of equipment in a side by side configuration, whilst

brush cable top of the cabinet entry points greatly reduce air leakage.

For further information [CLICK HERE.](https://www.panduit.com)
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HellermannTyton

Together, HellermannTyton and gabocom deliver a full end to end FTTX solution, combining a wide choice of quality products and strong industry knowledge.

A winning partnership of quality optical fibre management closures and wallboxes, along with perfectly manufactured 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 and gabocom offer 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, the combination of HellermannTyton and gabocom allows end users and installers to source a full fibre solution from companies with a wealth



of knowledge and experience in fibre connectivity across the global market. Furthermore, the recent acquisition of Höhle means increased microduct production capacity, allowing HellermannTyton

to meet the growing demand in the fibre network deployment market sectors across the UK and Europe.

To find out more [CLICK HERE.](https://www.htdata.co.uk)
www.htdata.co.uk

Opposites attract

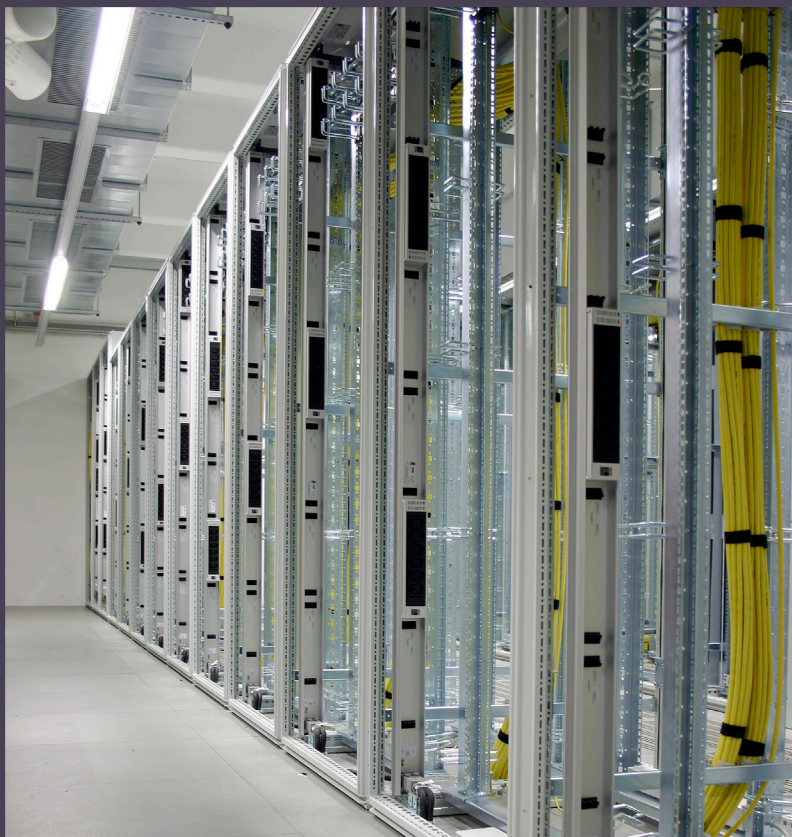
Aisle containment and cable management have opposing needs, so **Andrew Wreford** of Rittal explains how to facilitate the needs of both for a successful outcome



Solving one problem can sometimes create another. Aisle containment seeks to close every hole to keep air where it is needed, while cable management wants apertures for cable entry paths. This means there will always be a compromise when using aisle containment – the trick is to balance this whilst maintaining the ability to route cables without affecting airflow efficiency.

CLIMATE CONTROL

The challenges in keeping IT equipment sufficiently cool are still the same as they have been for many years, but choosing a preferred method takes time and careful



consideration in order to optimise the space available. In a traditional data centre, climate control systems are tasked with supplying cool air throughout the room. This layout can lead to less directed cool airflow to the IT racks and cause the mixing of the hot and cold air, which leads to inefficiency.

To combat this, a rack layout can be arranged into hot and cold areas. This enables the front of the racks to draw in cool air and exhaust it through the rear of the cabinets into the hot aisle. The containment aids the separation of the cool and hot air zones, which avoids them mixing and leads to higher air temperature being returned to the cooling units. This, in turn, makes the data centre more energy efficient.

AIR SUPPLY

Cold aisle containment confines cold supply air within the aisle so that its only available path is through the IT equipment. This stops it escaping above or below the server cabinets. The most common approach to this type of containment is to install roof panels and sliding doors at either end of the rows. These are typically installed on to a raised floor with computer room air conditioning (CRAC) units at either end of the pod.

This type of containment can also be used with inline cooling units. Cold aisle containment can be easily retrofitted into existing sites and

can accommodate existing fire suppression systems with the use of dropdown roof panels. This solution can also be installed below existing cable trays and other cable management systems. Conversely, hot aisle containment focuses on isolating hot exhaust air on its return to the CRAC units. Cold air is typically generated from inline cooling units placed within the row and



‘The challenges in keeping IT equipment sufficiently cool are still the same as they have been for many years, but choosing a preferred method takes time and careful consideration in order to optimise the space available.’

any gaps between the installed equipment with the use of blanking panels to achieve maximum efficiency. Cable management

supplies the whole room with cold air.

The principle is the same as cold aisle containment and separates the hot and cold air paths, although there are downsides to bear in mind. Firstly, in legacy sites that use a CRAC system, it is hard to retrofit because you need to route the hot air to the back of the CRAC via a hot air plenum. This may not be possible in certain sites. The other consideration is by containing the hot air, engineers at the back of the rack could be working in very hot conditions.

SEAL THE DEAL

A company can invest a lot of time and money making sure it has sealed off the aisle containment structure, but it can overlook the small areas such as above a rack or a cable entry point through which wires and cables pass. The air will take the path of least resistance and serious leaks can occur in these overlooked areas as cool air comes through to mix with the warm air.

As well as aisle containment, it is important for server and network cabinets to have the ability to manage the airflow with the use of air baffle kits. These are typically fitted at the front of the cabinets to stop any air escaping along the sides, forcing the cooled air through the servers.

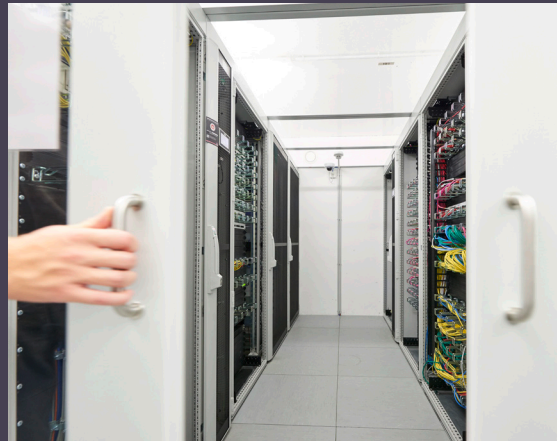
The ideal solution is for these to incorporate brush strips so that cables can pass through from the front to the rear of the cabinet without compromising airflow. It is also very important to block

accessories such as cable trays and cable management rings can be installed inside of the racks – this will help to route structured cabling to exit from either above or below.

FLEXIBLE FRIEND

Hot and cold aisle solutions both need to be of modular design and easily integrated with existing cable management solutions such as high level basket and ladder work to support the structured cabling above. The use of overhead containment that fixes to the top of the cabinet can be used to support cable management at high level but consideration must be given regarding the loading capacity of the rack to support – not just the installed equipment but also the load of the roof panels and containment structure above.

Freestanding cold aisle containment offers flexibility when it comes to removing



existing cabinets. These are sometimes replaced with different sized racks, which means they can accommodate more servers. However, this also means more cables. Cable management must be fastened neatly and securely to the cable trays inside of the rack. This should allow clearance for hot air from the servers to freely leave the cabinet, as otherwise issues can arise in overheating and downtime due to lack of airflow, which must be avoided at all costs.

SPACE RACE

Even if cables are properly managed, sometimes there just isn't enough space. This increases the demand for deeper cabinets to accommodate more cables, however, solutions are available to add extension frames that can be bayed to the front or rear of an existing cabinet to increase the size.

These typically come in sizes of 200mm in depth, giving the end user the possibility of retrofitting without having to swap out the original cabinet. When third-party racks are installed in a row, very rarely is the entire row changed out. Most of the time the cabinets are added to an existing row, which ends in cabinets of different sizes, leading to a 'skyline' effect. This creates challenges for the installation of containment systems, but these issues can be addressed with the use of freestanding containment and can solve the issues associated when moving and replacing cabinets.

The freestanding type solution includes all the components needed to construct a self-supported structure to capture the airflow in the contained aisle. This design accommodates a mix of cabinet sizes and allows IT racks to be changed when required.

MANAGEMENT DECISION

The ever increasing demand for more space to mount IT equipment continues to grow. Although this trend often allows for better space utilisation, it doesn't come without its challenges. To ensure the effectiveness and efficiency of a data centre, a rigorous approach to layout, cable and airflow management must be implemented. ■



ANDREW WREFORD

Andrew Wreford has over 15 years' experience within the IT and data centre industry. He joined Rittal in 2006 as a field service technician covering the south of England. His extensive knowledge led Wreford to become Rittal's product manager for IT – a role that enables him to capitalise on his experience and demonstrate his understanding of how crucial it is to support key data centre infrastructure.



Quickclicks

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

Is Base-16 A Good Solution For The Data Center? is the question posed in a blog by Gary Bernstein of **Siemon**. [CLICK HERE](#) to read it.

Is The Energy Crisis Hurting Enterprise Networks? report by **Arelion** that looks at how escalating energy prices are having an impact on network operations. [CLICK HERE](#) to download a copy.

The Basics Of Selecting A Rack System is a blog from **Chatsworth Products (CPI)**. [CLICK HERE](#) to read it.

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Nutanix has produced its fifth global Enterprise Cloud Index (ECI) survey and research report, which measures enterprise progress with cloud adoption. [CLICK HERE](#) to download a copy.

3 Steps For CIOs Starting Their Sustainability Journey is a blog from Patrick Donovan of **Schneider Electric**. [CLICK HERE](#) to read it.

Uptime Institute has released the latest version of its Tier Standard: Operational Sustainability document. [CLICK HERE](#) to request a copy.

The **European Data Centre Association (EUDCA)** has created an animated video to draw attention to the everyday importance of data centres. [CLICK HERE](#) to watch Europe's Data Centres Explained - The Hidden Technology Behind Modern Life.



Are we ready to walk the walk?

Adelle Desouza of HireHigher examines why the data centre sector is still not successfully combating its skills shortage

▶ We all know the key to addressing the burgeoning data centre talent shortage is for the industry to transition from simply talking about change to taking action. However, it is far too easy to publicly campaign for reform when you're happy to plod along with how things have always been behind closed doors. I believe something is holding the industry back, and

I want to examine the reasons why, as although we know change is essential, much of the industry may not be so keen to take action.

OPEN INVITE?

Deep down, is it possible that we like being a well-kept secret? Working within an industry that is growing but with an ageing





workforce keeps salaries high and job security even higher – do we want an influx of new, fresh talent competing for roles and keeping us experienced professionals

on our toes? Perhaps a call to arms to fight the war on talent is just one that doesn't suit us and our circumstances. However, the reality is we have no choice for the sake of our industry.

Research from the Uptime Institute suggests that half of existing engineering staff will retire by 2025, yet the number of staff needed to run the world's data

centres will grow from around two million to nearly 2.3 million by 2025. This is a talent gap that won't fill itself, so it is imperative that this issue is addressed.

I believe that talking directly with young people in schools and highlighting the crucial impact the data centre industry has on our lives will encourage new talent into the industry. Without data centres and the cloud, there is no social media, online banking, remote learning or streaming services – this is our industry's unique selling point and we should be shouting it from the rooftops. And far from it impacting on the already flourishing careers of current data centre professionals, the encouragement of young talent to enter this important industry will only create a more dynamic and successful sector both now and in the future.

REALITY CHECK

Sadly, despite this issue being discussed for years, still not enough is being done. Research suggests the average age of a data centre engineer is 60. With every will in the world, these individuals cannot see the industry through the next 20-30 years,



‘Research suggests the average age of a data centre engineer is 60 years old. With every will in the world, these individuals cannot see the industry through the next 20-30 years, so who will?’

so who will?

Words are cheap. The industry suffers from a lack of diversity, including age and gender. Many out there are not drafting a job description with realistic expectations, whether it's multiple years of experience required for entry level roles or, at times, arbitrary inclusions such as 'degree preferred'. There is no doubt about it that our unconscious biases creep in when we draft job descriptions.

We need to put our trust in the experts. Our talent teams know better, so if it's solely their role to fix our shortage, then why do we simultaneously reject their feedback when they tell us the market has changed?

WHAT'S THE POINT?

My final thought about why the necessary transition is yet to take place is far less cynical. The fact is, it's tough to know what to do when faced with a problem that is so widespread and profound. It can feel daunting and impossible, much like disillusioned voters wondering what difference their vote will



make. Having one scheme in one company doesn't instantly address the industry-wide issue. However, we must start somewhere, surely?

HireHigher recently hosted 60 sixth



form students from two London schools to come and find out more about the world of work in the data centre and cloud industry. They participated in two practical workshops, the first looking at how their particular style of energy can impact others and potentially help them identify a rewarding career path. They then worked through a typical career assessment scenario to give them an idea of the types of questions and activities they will face when applying for jobs.

EYE OPENER

The students were taken on a data centre tour, which was truly eye opening for so many of them – hearing their follow-up questions when it came to power consumption, green solutions and financial investment was interesting. All the students were engaged and fascinated by what we told them. One student was overheard taking the details of one of the rising stars of the data centre industry who presented at the event, so

they could continue their discussion about possible career opportunities and routes into the industry.

The bottom line is that we can either continue to talk, or we can make tangible

investments and commitments to ensure that 2023 (and beyond) is the era in which the data centre industry positions itself as the career industry of choice for talent. The time for action is well overdue. The talent baton needs to be passed on, not to render the specialists and experts we have now obsolete but to ensure that their legacy can be built upon and developed in the future.

JOINED UP THINKING

Real change can be affected when the industry works together. It is, of course, a problem that is everyone's responsibility to fix – but often not included in any one person's budget or remit. However, there are varying levels at which everyone can do their bit, so individual organisations don't feel like they're trying to boil the ocean alone. ■



ADELLE DESOUSA

Adelle Desouza is founder of HireHigher. She has turned her successful experience within the tech industry and passion for supporting young people into a professional endeavour. Desouza is also launching a podcast series, *Adulthood – A Work In Progress*, where she tackles the issues that young professionals face in today's world.

Colt DCS opens new Osaka Keihanna 45MW data centre

Colt Data Centre Services (DCS) has opened a new data centre in Osaka Keihanna, Japan. It forms part of the Keihanna Science City – one of Japan's main centres for industry and research. This site will meet the needs of Colt DCS' local and global customers that are looking to expand further in the region.

The design of the Osaka Keihanna data centre further builds on Colt DCS' key learnings from its Inzai campus, consisting of three data centres with a combined capacity of 50MW, which is 97 per cent occupied. The latest opening in Osaka Keihanna represents

one of the largest data centres in Japan, with 42,000m² of space and a designed capacity of 45.9MW, of which 75 per cent

has already been committed.

From a technological and environmental perspective, the Osaka Keihanna data centre incorporates cutting edge cooling techniques to minimise the environmental impact

of Colt DCS and its customers. This is in line with the organisation's wider ambition of achieving global net zero emissions by 2045, and desire to be a driver for change in tackling global climate change issues.



Prysmian trials pre-connectorised closure range to speed FTTH applications

Prysmian has trialled its new pre-connectorised Compact Multifunction Joint (CMJ) closure on the rollout of a rural fibre optic installation. Installed by External Reality, the pre-connectorised closure was used to speed up the deployment of fibre to individual properties. Using pre-terminated blown fibre saves up to an hour of installation time per property.

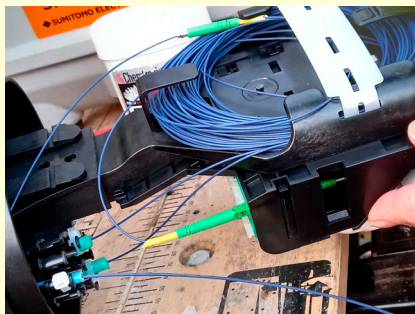
The trial took place on Phase 2 of the project, which involves the installation of over 6km of fibre optic cable to 15 properties in the area south of Forbes,

between the Atyre Estate and Rafford in Scotland. To date, External Reality has

installed over 6km of fibre, complete with fibre closures manufactured by Prysmian.

Prysmian is advancing connectivity by providing a comprehensive portfolio of closures to manage splicing, jointing and distribution of optical fibres. Spliced

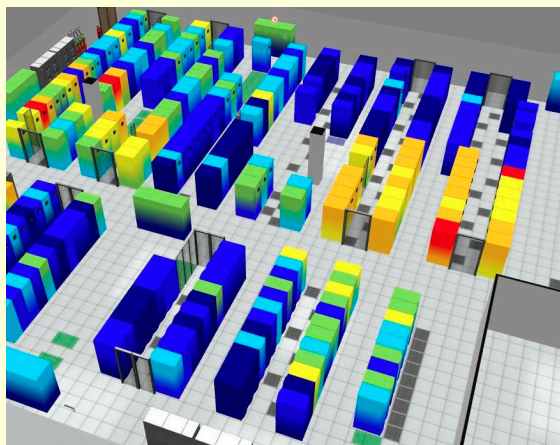
versions of Prysmian's CMJ and Medium Multifunction Joint (MMJ) closures have been used to join lengths of the main optical fibre on this project, while the new pre-connectorised version of the CMJ has been used for customer connections.



Africa Data Centres deploys a cutting edge DCIM solution across its facilities

Africa Data Centres has partnered with TechAccess to implement a data centre infrastructure management (DCIM) solution. TechAccess is responsible for the software, hardware, integrations, project management, professional services and other project deliverables that make up the DCIM platform.

These will come from two vendors. First is the EkkoSoft data centre optimisation software from EkkoSense and next is an asset management platform from Assetspire. The solution will be deployed



in Africa Data Centres' two sites in Johannesburg, and its facilities in Cape Town, Nairobi and Lagos.

Data centre operators such as Africa Data Centres are under pressure to deliver escalating digital workloads, while cutting

energy usage and securing carbon savings at the same time. The goal of the DCIM implementation is to provide Africa Data Centres' site administrators with a holistic view of each facility's performance to ensure that all resources such as energy, equipment and floorspace are used as efficiently as possible.

PROJECTS & CONTRACTS IN BRIEF

With a Wi-Fi solution approaching end of life at its London headquarters, Howard Kennedy has worked with Cision to refresh its core infrastructure to reflect its adoption of hybrid work across the organisation. Through Cision's Cisco Gold Partner status, Cision was able to refresh Howard Kennedy's estate with Cisco's Catalyst 9k solution.

Blue Tahiti has relocated its IT operations to Proximity Data Centres' Bristol based Edge 9 colocation data centre. Blue Tahiti made the decision to move to Proximity Edge 9 from its previous Surrey based colocation facility due to its planned expansion with the launch of a new range of products, including an ecommerce platform that has the potential to service the data analysis requirements of thousands of online traders.

NTT and Cisco have created a private 5G installation for Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen in Germany. The new high performance network – which has been created leveraging ORAN technology – will offer stronger on campus connectivity, as well as complete visibility and control. It will also help to empower the university's teams of scientists and students who are focused on research, providing high bandwidth, real time data transmission and low latency.

Schneider Electric

Schneider Electric's Easy UPS 3-Phase Modular is a robust uninterruptible power supply (UPS) designed to protect critical loads while offering third party verified Live Swap functionality. Easy UPS 3-Phase Modular is available in 50-250kW capacity with N+1 scalable configuration and supports the EcoStruxure architecture, which offers remote monitoring services.

With scalability top of mind, Easy UPS 3-Phase Modular enables you to pay as you grow, allowing you to optimise capital investment. It is a part of Schneider Electric's Green Premium portfolio, which ensures energy efficiency, durability, recyclability and transparency to help reduce environmental footprint. In addition, this system features advanced technology such as a high efficiency design, intelligent battery management, real time monitoring and control capabilities, making it one of the most cost effective and energy efficient UPS solutions available on the market.

To find out more **CLICK HERE.**

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Leave no stone **unt**urned

Nick Smith of Genetec connects the dots between cyber and physical security for data centres

▶ Data centres now account for more than 16 per cent of domestic output, 10 per cent of employment and 24 per cent of total UK exports. This surge in demand has led to a corresponding increase in breaches and intrusions, with criminals exploiting the overlap between physical and cyber vulnerabilities.

SEPARATE LIVES

Traditionally, the two functions have remained siloed – IT is given responsibility for cybersecurity, while the facilities team oversees physical security. These teams often work independently, with little

data centre operators must change their mindset and break down security team silos. Such an approach must account for the entire security context and provide a unified plan to mitigate risks.

SIX APPEAL

Here are the six steps organisations can take to connect the dots between cyber and physical data centre security:

• Shift to a comprehensive security mindset

With criminals employing a multifaceted approach to identifying vulnerabilities, data centre security must be viewed as a



collaboration or communication. However, the failure to integrate cyber and physical security can have serious consequences.

A cybercriminal who breaches a data centre's network can cause physical harm by disrupting critical systems or starting a fire. On the other hand, a physical attack on a data centre could result in the theft of sensitive data or the destruction of critical infrastructure. To address this issue,

collective responsibility. As a result, data centres must employ a comprehensive strategy that addresses both digital and physical security in a unified plan.

This necessitates collaboration between IT, physical security and other departments within an organisation. Cyber threat protection requires a combination of human resources, processes and technology, and should not be limited to

departmental boundaries. Collaboration with colleagues from various departments is critical for implementing effective security measures.

Moreover, organisations must continuously train their staff and contractors on physical security protocols, cyber hygiene and incident response plans. A comprehensive security strategy should also include regular risk assessments, security audits and incident response drills to evaluate the effectiveness of security controls and improve an organisation's resilience.

• Implement a multi-layered approach

Securing a data centre requires a multi-layered approach to defend against potential threats. Controlling access to the facility is only the first step. It's equally critical to manage access to specific data halls, rooms and even individual cabinets. A comprehensive plan that discourages unwanted incursions is essential and can include a combination of technologies such as video surveillance, licence plate recognition, biometrics, light detection and ranging (LiDAR), and fencing. A layered approach ensures that if one method fails, other measures are in place.

• Controlling access

Access control within a data centre is multifaceted. In many cases it's important to control access not just at the perimeter and doors of the facility but on a more granular level – often down to individual rooms, cabinets and

even server racks.

To ensure optimal protection, human resources, physical security and information security professionals must collaborate closely to support the business and mitigate risks. Regular access to restricted areas by employees, contractors and visitors to data centres must be centrally monitored and managed, with clear audit controls in place to establish who had access and when at a moment's notice.

• Centralise security operations

Data centre operators can monitor activity across their networks and physical sites, ensure regulatory compliance and facilitate the smooth flow of individuals by



centralising security operations. Manual access control system operation can result in human error and expose vulnerabilities to social engineering attacks.

‘Data centre operators can monitor activity across their networks and physical sites, ensure regulatory compliance and facilitate the smooth flow of individuals by centralising security operations.’

Deploying a physical identity and access management solution that automates workflows and connects physical and IT security can help to mitigate these risks and save money. For organisations to future proof their security systems, it is crucial to have a scalable and integrated security platform that meets user requirements both inside and outside of the physical security realm.



• Automate alerts and implement a structured process

Security operators can benefit from

automated alerts and a well structured process to detect, investigate and resolve potential security threats quickly. Relying on human operators to manually monitor incoming sensor data for security

risks can be overwhelming and insufficient.

By detecting irregularities on the platform, automation can also help to improve compliance. By combining resources and expertise from across the organisation, a common platform with greater capabilities than any one function could develop alone can be deployed. This simplifies day to day operations and prevents future issues caused by overlapping systems that create operational blind spots because of a failure to integrate.

• Keeping IoT devices updated

While the internet of things (IoT) can help improve productivity, poor implementation can further increase an organisation's attack surface. As a result of vulnerabilities in IoT devices such as security cameras, access control readers and alarm panels, attackers can gain network access.

IoT attacks primarily target routers and connected cameras. To mitigate these risks, preventive measures such as running the most recent firmware version and avoiding default passwords are critical. Security teams must work together to update core business systems and devices while also keeping current hardware.

Automation can be used to reduce employee burden and manage firmware and passwords more efficiently. By integrating physical and cybersecurity measures into a single plan, organisations can ensure a robust cyber and physical



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security framework, prevent potential network entry points, eliminate cybersecurity vulnerabilities and avoid unplanned downtime. To protect data centres from potential threats, a comprehensive security strategy is required.

CRITICAL THINKING

It is critical for data centre operators to recognise the importance of integrating cyber and physical security to ensure complete data protection. Data centre operators can improve their security while adhering to regulatory frameworks by implementing a shared responsibility strategy, consolidating security operations and utilising automated access control and monitoring systems. By combining the appropriate personnel, processes and technology, data centre operators can protect customer trust and minimise loss in productivity resulting from cyber and physical security breaches. ■



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Nick Smith is a business development manager at Genetec. He brings over 26 years of experience in the IT and physical security sectors, having performed technical and sales roles for several leading software houses and manufacturers of IP based solutions.

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