DCS DATACENTRE SOLUTIONS

DEVELOPING DIGITAL INFRASTRUCTURE IN A HYBRID WORLD

ISSUE IV 2023

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dca The data centre trade association

VIEWPOINT

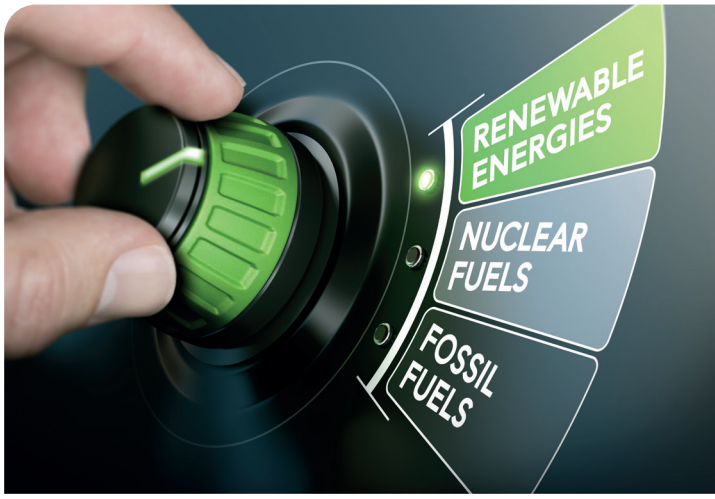
By Phil Alsop, Editor

An electrifying opportunity?

When it comes to the issue of climate change and sustainability, working in both the data centre and environmental sectors, I like to think that I have a reasonably good understanding of the issues and the potential technological solutions needed to back-up the new ways of thinking required to address the challenge ahead. However, it's all too easy to become somewhat pessimistic as to the apparently slow rate of required change and the pockets of resistance which, Canute-like, try to push-back against the idea that the threat of global warming requires any kind of a radical plan.

I won't claim that my interview with Schneider Electric's Steven Brown, featured in this issue and available for viewing on the DCS website, has completely removed my glass half-empty outlook, but there's no doubt that the way he analyses the challenges and, importantly, the opportunities which lie ahead provides plenty of grounds for optimism. There really is a path to a more sustainable future which makes complete sense for all.

Steven uses the analogy of the pandemic forcing a digital re-think to suggest that the ongoing energy crisis will be the catalyst for Electricity 4.0. I have no doubt that it is already helping to open a debate on energy sustainability However, my pessimism kicks in when one considers that, where the digital future was embraced almost universally (other than some old-fashioned attitudes to employees needing to be in the workplace at all times!) and primarily because the IT sector saw only upsides from the change, there is a powerful fossil fuel lobby that seeks to disrupt and misinform as to just how achievable and reliable can be a clean energy future – worried at profits under threat.



I think most understand that there has to be an energy transition, and one that will likely take longer than the fast digital transformation we've witnessed over the past three or four years. However, there do seem to be some worrying mixed messages and difference of commitments when it comes to a similar confidence in a completely green energy future.

As various recent DCS articles and video interviews have highlighted, the data centre industry has a major opportunity to lead on a sustainable energy future - to turn itself from the 'villainous' large energy consumer of current media portrayal into a green energy innovator and champion of the near future. Yes, data centres exist for a very specific purpose, but that purpose can be a force for positive change, rather than being seen as a significant drain on finite energy resources.

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DCS DATACENTRE SOLUTIONS

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Hyperscale and edge drive data centre demand as cloud adoption and AI take centre stage

European data centre market set for further growth as uptake increases by over one third in 2022.

THE MASS ADOPTION of cloud computing and AI is driving exponential growth for the data centre industry, according to JLL's new Global Data Center Outlook. Accounting for 79% of overall demand, hyperscalers – predominantly the global cloud service providers, and edge data centres, smaller facilities located close to the populations and infrastructure they serve, are leading as the fastest growing segments of the data centre space.

The report finds that the hyperscale market is expected to grow 20% from 2021 to 2026, as more major tech companies look to meet surging demand for data processing and storage requirements.

With 314 new hyperscale sites in development globally today, that number is expected to surpass 1,000 by the end of 2024 – up from around 500 sites just five years ago.

The demand for digital infrastructure has accelerated data centre uptake in Europe, which grew 35% to 296 MW in 2022 in FLAP-D markets. A record 533 MW of pre-let deals took place in 2022, with London and Frankfurt accounting for 77% of overall volumes. Frankfurt, which saw an 18% increase in supply is leading the charge in the uptick of data centre activity across western Europe, followed by Amsterdam, Paris and Dublin.

Tom Glover, Head of Data Centre Transactions, EMEA, JLL said: "2022 was a record year for take up and new data centre supply added to the European market.

We saw 300MW of new supply added to the Tier I markets – a 50% increase year-on-year, contributing to the market

size of FLAP-D to reach 2,477MW, almost double in size from the end of 2016. As the reliance on digital technology increases, the data center industry will continue to experience impressive growth."

The turn to sustainability

With the increasing demand for digital infrastructure, sustainability is now a top priority for data centre developers, operators and investors. Legislation and self-regulatory initiatives, including the Corporate Sustainability Reporting Directive (CSRD) and the Climate Neutral Data Centre Pact (CNDCP), are setting the standard to mitigate the climate impact of the industry in the region.

This push for climate-focused regulation is leading many data centre operators to examine reusing excess heat for wider district heating. Specifically, a new draft bill in Germany is calling for nearly a third of energy fed into data centres to be reused. To support this sustainability shift, value-add opportunities such as redevelopment have encouraged data centre managers to start retrofitting old infrastructure across European markets, with two former Coca-Cola bottling plants being repurposed in Frankfurt and Madrid.

Jonathan Kinsey, Head of Data Centre Services, EMEA, JLL added: "With corporations and governments alike focusing on ramping up efforts to close the gap between environmental commitments and action in the race to net-zero, the data center industry is also facing increased pressure for more transparency of climate mitigation efforts and has been working towards more sustainable operations.

"Those who react the fastest and improve efficiency with both energy and water usage stand to benefit as environmental impacts remain top-of-mind for most leading companies."

84% of major firms failing to disclose operational emissions targets

Companies are pledging to reduce their carbon impact but struggling to measure progress across their supply chains.

NEW RESEARCH from global technology and consultancy firm Tata Consultancy Services (TCS) and Microsoft reveals a clear majority (84%) of major firms have yet to set public science-based targets to reduce direct operational emissions from their supply chains, and that only 11% have disclosed science-based targets in reducing emissions in their supply chains.

TCS and Microsoft analysed public data from global companies with combined revenue of $10 trillion to produce the findings, as part of its white paper studying enterprise sustainability, Decarbonization: The Missing Link to Net Zero to evaluate how they are using their supply-chain data in the transition to net-zero emissions.

The research shows most companies are struggling to validate their data and accurately measure their decarbonization efforts, and highlights the importance of regular engagement with extended business ecosystems, including customers, suppliers, and other stakeholders, to improve supply chain transparency and reduce carbon footprints.

Swati Murthy, Director for Strategic Sustainability Collaborations at TCS commented: “Our findings make clear how much innovative work remains to be done to make global business sustainable – and how critically important it is to engage with an extended ecosystem that involves all stakeholders – including customers, consumers, suppliers, service providers and policymakers,” she says.

“Reimagining global supply chains, and using the latest technology and analysis, is a vital step towards more sustainable practices. Therefore, it is absolutely essential to forge stronger strategic collaborations with hyperscalers to share and scale solutions faster, bringing together the latest decarbonization technology and expertise and making it accessible to all stakeholders across the business value chain.

This collaboration is key to unlocking the potential of green transitions and mitigating the environmental and social risks we all face.”

Other key insights within the research include ways in which businesses can make data more accessible, how companies can maximise edge-to-cloud, AI/Machine learning and digital twin technologies for decarbonisation, the sectors setting extended ecosystem targets with vendors and suppliers, and the role of regulatory pressure in Climate-Related Financial Disclosures (TCFD).

The white paper was authored by a team of sustainability experts, including Dr Swati Murthy Practice Head, Strategic Collaborations for Sustainability at TCS, and James Lockyer (Portfolio Management Director, Climate Innovation Fund Environmental Sustainability Team) at Microsoft.

By reimagining global supply chains, enterprises can better measure their true carbon footprints as a critical step towards the UN’s Science Based Targets Initiative (SBTi) for sustainable development.

The anywhere economy is estimated to add $19.4 trillion in cumulative GDP

Two-thirds of executives believe remote work and digitalization has helped diversify the workforce.

DOCUSIGN has released findings from a new report, "Unlocking the potential of the anywhere economy," that examines the opportunities and challenges the anywhere economy brings to people, businesses and countries. The findings of the report reveal we have entered an era that is poised for considerable business growth and the potential to experience new levels of productivity.

The research, undertaken by think tank Economist Impact, reveals insights from two global surveys across ten countries to gauge the sentiments and experiences among consumers and executives in the U.S., Australia, Japan, France, Germany, Ireland, the UK, Brazil, Mexico and Canada, as well as new econometric models that forecast the potential impacts of the anywhere economy in these countries.

The report reveals that both executives (59%) and consumers (47%) expect the anywhere economy will continue to accelerate, with an overall positive impact on job creation, a broadened range of online services, and improved equity and well-being.

"At DocuSign we believe that technology can and should be a force for good, a way to lift people up and bring people together," said Allan Thygesen, Chief Executive Officer, DocuSign. "To realize the extraordinary surge in productivity and expansion of the global economy that's possible over the coming decade, leaders will need to embark on a new journey that's rooted in innovation, transformation, and ultimately trust in our digital future."

Driving Economic Growth Through Enhanced Productivity and Innovation

The report shows the anywhere economy will catalyze economic growth by boosting productivity and spurring innovation. In fact, more than three-quarters of surveyed executives agree that the flexibility to work at any time and from any location has increased productivity.

Innovations, new product demands, and transformation of how commercial relationships are conducted can also improve workers' productivity at the micro level.

According to the report forecast, the anywhere economy has the potential to boost productivity growth, defined as gross domestic product (GDP) per worker:

- As the anywhere economy expands, productivity will grow in all ten countries, increasing at an average rate of 10% from 2021 to 2030.
- The top 5 countries with the biggest increases are the UK (12%), Canada (11%) Germany (11%), France (10%) and the US (10%).
- The anywhere economy is estimated to add $2.6 trillion to the combined GDP of the ten countries in 2030, and add a cumulative amount of $19.4 trillion for the period 2022-30.

Business expenditure on R&D in all ten countries is also estimated to increase significantly, capturing growth ranging from 29% to 51% in 2030 compared with 2021 levels. The top 5 countries with the biggest increase are the UK (51%), France (47%), Germany (44%), the US (44%) and Canada (42%).

Expanding the Talent Pool and Capitalizing on DEI

The rise of hybrid work enabled organizations to consider candidates from a wider geographic range and introduced new opportunities for historically underrepresented individuals. The majority (77%) of executives agree that the anywhere economy has had a positive impact on their ability to hire from a wider pool of candidates, while more than 60% said they hired workers in new locations because of the possibility of remote working.

At the same time, the flexibility to work remotely improved experiences for groups such as women, working parents, older adults, and individuals with disabilities, encouraging them to stay engaged in the workforce for longer.

Two-thirds of executives reported that the adoption of remote work and increased digitalization have contributed to diversifying the workforce, and more than three-quarters agreed that flexible work schedules made their workforce more diverse and equitable. According to the report's forecasts, the anywhere economy will:

- Bring an additional 25 million women into the labor force in 2030 alone, and the average female labor force participation rate will be nearly 60% – up from 55% in 2021.
- Bring an additional 10 million people aged 65+ into the labor force in 2030 alone.

Shifting Economic Power Among Rural and Urban Environments

The anywhere economy is shifting economic power for rural and urban residents, with people aspiring to relocate due to increased flexibility and connectivity.

Workers are now persuaded that moving to smaller cities may give them better housing and comparable access to education and amenities without a consistent time-consuming commute to the office.

MANAGED SERVICES SUMMIT EUROPE

13 JUNE 2023

NOVOTEL AMSTERDAM CITY
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The Managed Services Summit Europe is the leading managed services event for the European IT channel. The event features conference session presentations by specialists in the sector and leading independent industry speakers from the region, as well as a range of sessions exploring technical and operational issues. The panel discussions and keynotes are supported by extensive networking time for delegates to meet with potential business partners. This C-suite event will examine the latest trends and developments in managed services and how they have influenced customer requirements and the ability to create value through managed services for your organisation and customers.

THEMES, TOPICS AND TRENDS

The Managed Services Summit will address the key trends and issues that impact the managed services sector including:

- How to build differentiation within an increasingly competitive market
- Maximise value and increase efficiencies for MSPs and their customers
- Increasing knowledge of new technologies, processes, and best practice
- Analysing trends in buyer behaviour and successful sales strategies
- Changes and trends in regulatory compliance
- Successfully adoption of Zero trust architecture (ZTA)
- Emerging advances in AI, automation and XaaS
- The state of cloud adoption, and hybrid and edge computing
- Hybrid and remote working best practice
- Addressing the growing cyber security skills gap
- Participation with local business community leadership organisations

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First data centre operators certify adherence to Climate Neutral Data Centre Pact

Independent certification demonstrates real, measurable progress towards becoming the first European climate neutral sector by 2030.

TWO MAJOR data centre operators in Europe, CyrusOne and Aruba, have announced that each has successfully audited an operational data centre as compliant with the terms of the Climate Neutral Data Centre Pact (CNDCP or "Pact"). The Pact sets stringent targets for environmental performance and sustainability goals in five key areas covering energy efficiency, use of green power, water use, recycling and reuse of waste heat. Collectively meeting these targets will ensure data centres are climate neutral by 2030.

CNDCP has developed a detailed Auditing Framework to test compliance with the Pact's sustainability goals. This framework was shared with the European Commission at the end of 2022 and it is now available for any independent auditing firms to use with their customers. These first audits, conducted by Bureau Veritas, demonstrate the effectiveness of the Framework and of the Pact as an enforceable commitment to climate action.

All data centre operators that are signatories to the Pact are required to audit their compliance to its goals using data from the 1st January to 31st December following the first anniversary of their signing. The auditing process ensures that Pact signatories provide independent verification of compliance with their commitment to make data centres climate neutral by 2030.

Data centre operators that can demonstrate verifiable environmental credentials may find it easier to access significant low-cost green funding for their developments as part of schemes including the recent European Temporary Crisis and Transition Framework. Audited compliance with the Pact climate neutral targets could be a significant factor in enabling access to such green funding.

The Pact Auditing Framework can also be used to assist data centre operators as they seek to demonstrate alignment with a wider range of existing and planned regulations including the Energy Efficiency Directive and the EU Taxonomy Regulation 2020/852 for Owners and Operators of the Data Centre facilities.

Matt Pullen, EVP and MD Europe, CyrusOne and Chairman of the CNDCP Board, said, "We are delighted that CyrusOne has been able to use the Audit Framework to demonstrate that we are on-track to meet the targets established under the Pact and the directives of EU Taxonomy. Not only is this critical to manage our own progress, but it establishes a clear benchmark of real action for our sector and beyond."

Fabrizio Garrone, Enterprise Solution Director, Aruba, commented; "Climate neutrality is an essential and non-negotiable objective. Auditing ourselves against the Pact requirements proves that we have the processes and measures in place to make it happen by 2030."

Michael Winterson, Chairman of EUDCA and CNDCP Monitoring and Reporting Group Lead, said "When we established the CNDCP we agreed with the European Commission that the progress would be audited on a regular basis. As these first audits come in we're proud to show that this is a sector that delivers on its commitments."

Francisco Mingorance, Secretary General of CISPE, co-founder of the Pact with EUDCA, added: "The data centre industry is under increasing scrutiny. These verified, independent audits prove that our signatories are leading the charge to climate neutrality."

Video promises 'enlightenment' for Europe's data centre users

A new animated video from the European Data Centre Association provides an education in the criticality of data centres, the cloud and digital infrastructure to modern Europe, clearing up potential misconceptions for those curious to know more about the sector.

THE EUROPEAN DATA CENTRE ASSOCIATION (EUDCA) has launched a new animated video to draw attention to the everyday importance of data centres to the daily lives of those living and working in Europe (and beyond). Titled, "Europe's data centres explained - the hidden technology behind modern life," the new video is designed to offer a clearer understanding of what is meant by phrases such as data centre, the cloud, and digital infrastructure, as well as the value of the services for which they're critical.

Lex Coors, Policy Committee Chair at the EUDCA said; "As the world transforms and becomes more digitally connected, data centres have cemented their position as the central nervous system of the digital economy. It's important that we start to raise awareness of this and continue to educate society about the value they provide now and into the future". According to 2022 research by Eurostat, the statistical office of the European Union, the internet has become a key element of daily life with over 90% of people aged 16-74 reporting they'd connected to it for a range of services during a three-month period. Internet use, they report, has grown rapidly in the EU over the years - in 2010 it stood at 67%, and in 2015 at 78%.

However, while individuals access the internet for a range of services, from communications such as e-mail (77%), instant messaging (72%), getting information about goods and services (70%), video calls (66%) and streaming TV and videos (65%), there can be a lack of understanding about the technology which makes all this happen, as evidenced by current affairs reporting which is frequently inaccurate. Michael Winterson, Chair of the EUDCA said; "Data centres were not only pivotal to enabling the world to work from home during the pandemic; they also helped provide the data processing grunt to develop vaccines in a very rapid timescale. Digital services such as videoconferencing quickly became an essential way to keep businesses talking and the economy flowing, at the same time making a valuable contribution to the mental health of those isolated in their homes." "This new video from the EUDCA aims to help people connect the dots and understand that when their GPS re-routes a journey to avoid major traffic, money appears in their bank account moments after splitting a bill with dining companions, or sales goods are delivered the day after they were bought online – none of that happens without data centres or the digital infrastructure that connects them to the world at large."

In modern society, almost everyone and everything relies on digital technology, yet few people know how it all works or where the produced data is stored. Data centres are physical facilities which corporations, hospitals, universities, airports and government ministries – amongst others – all use to house their applications and data resources that enable the internet to function.

For example, there are many different types of data centre, ranging in size from smaller installations in universities and hospitals, to enterprise data centres built by organisations for business use, to the hyperscale facilities usually associated with mega corporations including Google, Amazon, Apple, Microsoft and Meta (Facebook). In addition, colocation data centres or "carrier hotels" provide important outsourced infrastructure to customers

who require power, space and bandwidth.
Data centres interconnect global communication networks through fibre optic cables both under the ground and sea across different continents.

While data centres are an intensive power industry (the video references an EU study that estimates around three percent of European power is consumed by them), they are at the forefront in transitioning to renewable energy by replacing fossil fuels with greener solar, wind and hydro power. Today, over 100 data centre operators and trade associations supporting Europe's Green Deal are signatories to the Climate Neutral Data Centre Pact (CNDCP), an initiative started by the EUDCA and CISPE.

Jointly, their objective is to ensure data centres are an integral part of the sustainable future of Europe, agreeing to make their data centres climate neutral by 2030. The video, which is paid for by the EUDCA with sponsors including CyrusOne, Digital Realty, Equinix, LCL Data Centers, Spa Communications and Telehouse, "Europe's data centres explained - the hidden technology behind modern life" is available to view or download at https://www.youtube.com/watch?v=GGaYZPzjhY8.

Technology key to meeting sustainability goals

Digitalisation and automation top two focus areas for organisations in addressing the growing demand for resources while ensuring sustainability.

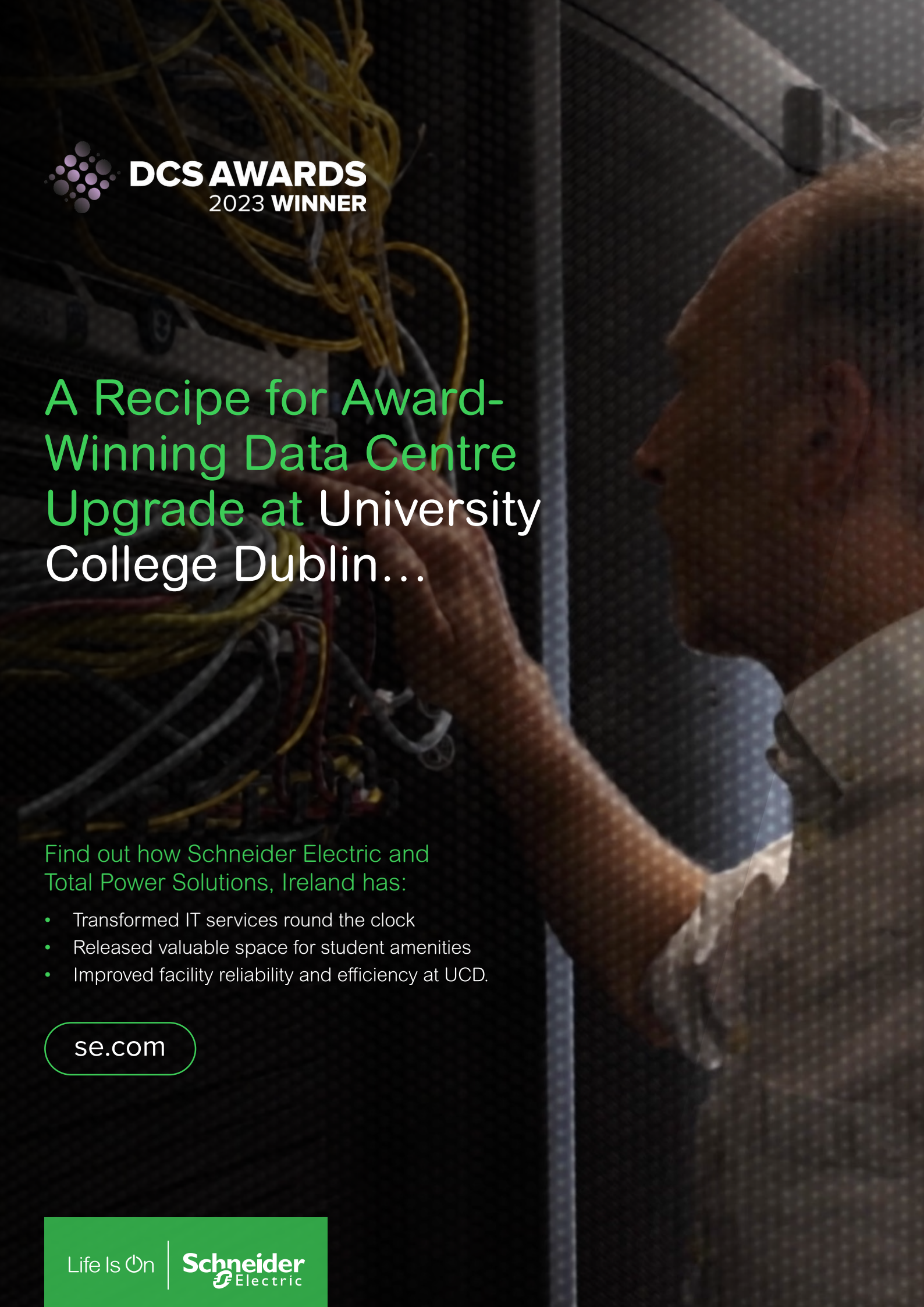
OVER HALF (55%) of asset-intensive companies across Europe believe that technology will be required for their organisation to meet its sustainability goals, making it the top requirement for these businesses overall. Other needs identified include 'tax incentives' (45%), and 'change in policy/laws' (25%).

These were among the key findings of a new, independent study commissioned by AspenTech, which polled the opinions of C-Suite executives working for asset-intensive businesses across the UK, Germany, France, Spain, Netherlands and Italy.

This survey indicates that while asset-intensive businesses across Europe are looking to national or regional governments to support the drive to sustainability, it is ultimately technology that will help businesses achieve their sustainability targets. From predictive maintenance tools to digital twins, digital technology will be key in helping businesses overcome the challenges they face to meet sustainability goals, to cut emissions and to reduce waste. When asked to identify the main barriers to their organisation meeting its sustainability targets over the next five years, 32% stated: 'Complex existing processes are difficult to modify to make more sustainable' and 29% referenced 'use of legacy equipment preventing rapid change'.

There is a perceived need to cut through the complexity with innovative software that delivers streamlined operational processes and drives efficiencies. The survey indicates that the latest advanced technology will also be crucial in enabling businesses to balance the need for sustainability with the rising pressure for resources – the so-called 'dual challenge.' Over half (55%) of executives questioned said their organisation was currently investing more in digitalisation to meet the rising pressure for both resources and sustainability, while 41% said they were investing more in automation.

Yet as this investment plays out, there may need to be a change of focus from asset-intensive businesses. 50% rank renewable power among their organisation's top two investment priorities in terms of sustainability over the next five years, with 44% citing energy efficiency.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Find out how Schneider Electric and Total Power Solutions, Ireland has:
• Transformed IT services round the clock
• Released valuable space for student amenities
• Improved facility reliability and efficiency at UCD.
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Gartner predicts substantial data centre sustainability take-up

Seventy-five percent of organizations will have implemented a data center infrastructure sustainability program driven by cost optimization and stakeholder pressures by 2027, up from less than 5% in 2022, according to Gartner, Inc.

"RESPONSIBILITIES for sustainability are increasingly being passed down from CIOs to infrastructure and operations (I&O) leaders to improve IT's environmental performance, particularly around data centers," said Autumn Stanish, Senior Principal Analyst at Gartner. "This has led many down the path of greater spend and investment in environmental solutions, but environmental impact shouldn't be the only focus. Sustainability can also have a significant positive impact on non-environmental factors, such as brand, innovation, resilience and attracting talent."

According to a Gartner survey of 221 respondents from North America, Europe and APAC conducted in the second half of 2022, environmental performance of IT infrastructure is only one facet of a strong I&O sustainability strategy, with most sustainability benefits being indirect (see Figure 1). "Success in aligning the I&O strategy with critical business outcomes requires a more comprehensive approach that recognizes the indirect benefits that come with sustainable IT operations," said Stanish. "This is true specifically for organizations in which IT is material to the business, such as financial services."

According to the Gartner survey, the top three indirect benefits include:

1. Reduced Costs

The most effective action I&O leaders can take for the environment and their budget is to defer purchasing new equipment and better manage, optimize or redeploy what they already have. According to Gartner, organizations can experience up to 60% in cost savings by simply extending product life spans from three to five years. In addition, optimizing for better server utilization and storage capacity is another way to reduce waste and save money.

2. Innovation

Organizations are using sustainable strategies to drive innovation and growth through new products and business models. Technology hardware vendors are rapidly releasing new products and services based on AI technology, analytics insights and circular business models that can be leveraged for innovation.

For example, open telemetry platforms may be deployed to track and improve energy efficiency, while simultaneously offering critical insights for IT staff to understand usage patterns that can be optimized for greater, more consistent performance of systems.

"The core focus of many enterprises with a sustainability strategy is actually around how they can use it to drive innovation, differentiation and growth through new products and business models," Stanish said. "However, fewer than half of I&O leaders we speak to are currently taking advantage of the business benefits beyond reduced energy costs."

3. Better Risk Management and Mitigation

In a market disrupted by price fluctuations and supply constraints, organizations can achieve greater resilience and better risk management and mitigation by adopting sustainable recycling and resource utilization practices. This includes organizations using renewable energy, generating their own power, and reusing and redeploying equipment as much as possible.

According to the Gartner survey, more than 85% of business leaders agree that sustainability is an investment that protects the organization from disruption.

MANAGED SERVICES SUMMIT LONDON

13 SEPTEMBER 2023

155 BISHOPSGATE
LONDON, UK

The 13th Managed Services Summit London is the premier managed services event for the UK IT channel. 2023 will feature presentations by leading independent industry speakers, a range of sessions exploring technical, sales and business issues by specialists in the sector, and extensive networking time to meet with potential business partners. This is an executive-level event, exploring the latest trends and developments, evolving customer requirements and how to create value through managed services – both for your own organisation and your customers.

THEMES, TOPICS AND TRENDS

The Managed Services Summit will address the key trends and issues that impact the managed services sector including:

- How to build differentiation within an increasingly competitive market
- Maximise value and increase efficiencies for MSPs and their customers
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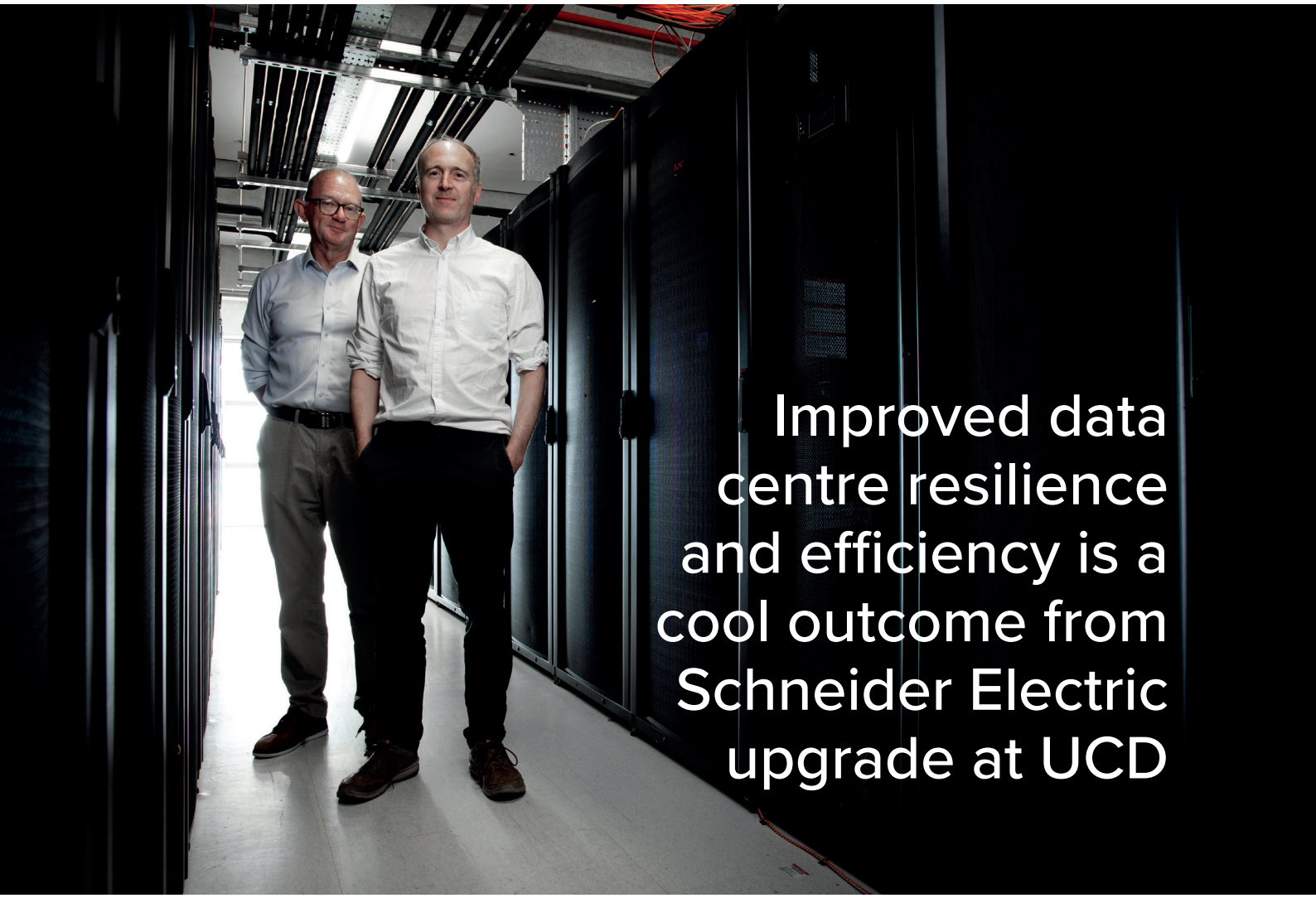

Improved data centre resilience and efficiency is a cool outcome from Schneider Electric upgrade at UCD

The Future Campus project at University College Dublin called for space utilised by facility plant and equipment to be given up for development to support the student population. **Total Power Solutions, an Elite Partner to Schneider Electric,** worked with UCD's IT Services organisation to upgrade its primary data centre cooling system, to provide greater resilience for its HPC operations whilst releasing valuable real estate.

Introduction: Data centres at Ireland's largest university

University College Dublin (UCD) is the largest university in Ireland, with a total student population of about 33,000. It is one of Europe's leading research-intensive universities with faculties of medicine, engineering, and all major sciences as well as a broad range of humanities and other professional departments.

The university's IT infrastructure is essential to its successful operation, for academic, administration and research purposes. The main campus at Belfield, Dublin is served by two on-premises data centres that support all the IT needs of students, faculty and staff, including high-performance computing (HPC) clusters for computationally intensive research. The main data centre in the Daedalus building, hosts all the centralised IT including storage, virtual servers, Identity and Access Management, business systems, networking, and network connectivity in conjunction with a smaller on-premises data centre.

"Security is a major priority, so we don't want researchers having servers under their own desks.

We like to keep all applications inside the data centre, both to safeguard against unauthorised access – as universities are desirable targets for hackers – and for ease of management and efficiency."

Challenges: Ageing cooling infrastructure presents downtime threat and reputational damage

Resilience is a key priority for UCD's IT Services. Also, with its campus located close to Dublin's city centre, real estate is at a premium. There are continuing demands for more student facilities and consequently the need to make more efficient use of space by support services such as IT. Finally, there is a pervasive need to maintain services as cost-effectively as possible and to minimise environmental impact in keeping with a general commitment to sustainability.

As part of a major strategic development of the university's facilities called Future Campus, the main Daedalus data centre was required to free up some outdoor space taken up by a mechanical plant and make it available for use by another department. The IT Services organisation took this opportunity to revise the data centre cooling architecture to make it more energy and space efficient as well as more resilient and scalable.

"When the data centre was originally built, we had a large number of HPC clusters and consequently a high rack power density," said Tom Cannon, Enterprise Architecture Manager at UCD. "At the time we deployed a chilled-water cooling system as it was the best solution for such a load. However, as the technology of the IT equipment has advanced to provide higher processing capacity per server, the cooling requirement has reduced considerably even though the HPC clusters have greatly increased in computational power."

One challenge with the chilled water system was that it relied upon a single set of pipes to supply the necessary coolant, which therefore represented a single point of failure. Any issues encountered with the pipework, such as leaks, could therefore threaten the entire data centre with downtime. This could create problems at any time in the calendar, however, were it to occur at critical moments such as during exams or registration it would have a big impact on the university community. Reputational damage, both internally and externally, would also be significant.

Solution: Migration to Schneider Electric Uniflair InRow DX Cooling Solution resolves reliability, scalability and space constraints

UCD IT services took the opportunity presented by the Future Campus project to replace the existing chilled water-based cooling system with a new solution utilising Schneider Electric's Uniflair InRow Direct Expansion (DX) technology, utilising a refrigerant vapour expansion and compression cycle. The condensing elements have been located on the roof of the data centre, conveniently freeing up significant ground space on the site formerly used for a cooling plant.

Following on from an open tender, UCD selected Total Power Solutions, a Schneider Electric Elite Partner, to deliver the cooling update project. Total Power Solutions had previously carried out several power and cooling infrastructure installations and upgrades on the campus and is considered a trusted supplier to the university. Working together with Schneider Electric, Total Power Solutions was responsible for the precise design of an optimum solution to meet the data centre's needs and its integration into the existing infrastructure.

A major consideration was to minimise disruption to the data centre layout, keeping in place the Schneider Electric EcoStruxure Row Data Centre System (formerly called a Hot Aisle Containment Solution, or HACS). The containment solution is a valued component of the physical infrastructure, ensuring efficient thermal management of the IT equipment and maximising the efficiency of the cooling effort by minimising the mixing of the cooled supply air and hot return – or exhaust - airstream. The new cooling system provides a highly efficient, close-coupled approach which is particularly suited to high density loads. Each InRow DX unit draws air directly from the hot aisle, taking advantage of higher heat transfer efficiency and discharges room-temperature air directly in front of the cooling load. Placing the unit in the row yielding 100% sensible capacity and significantly reduces the need for humidification.

> "The overall effects of installing the new cooling system are therefore: greater resilience and peace of mind; more efficient use of space for the benefit of the university's main function of teaching; greater efficiency of IT infrastructure and consequently, a more sustainable operation into the future"
>
> **Tom Cannon, Enterprise Architecture Manager, UCD**

Cooling efficiency is a critical requirement for operating a low PUE data centre, but the most obvious benefit of the upgraded cooling system is the built-in resilience afforded by the 10 independent DX cooling units. No longer is there a single point of failure; there is currently sufficient redundancy in the system that if one of the units fails, the others can take up the slack and continue delivering cooling with no impairment of the computing equipment in the data centre.
"We calculated that we might just have managed with eight separate cooling units," said Cannon, "but we wanted the additional resilience and fault tolerance that using ten units gave us." Additional benefits of the new solution include its efficiency – the system is now sized according to the IT load and avoids the overcooling of the data centre both to reduce energy use and improve its PUE.

In addition, the new cooling system is scalable according to the potential requirement to add further HPC clusters or accommodate innovations in IT, such as the introduction of increasingly powerful but power-hungry CPUs and GPUs. "We designed the system to allow for the addition of four more cooling units if we need them in the future," said Cannon. "All of the power and piping needed is already in place, so it will be a simple matter to scale up when that becomes necessary."

Implementation: Upgrading a live environment at UCD

It was essential while installing the new system that the data centre kept running as normal and that there was no downtime. The IT department and Total Power Solutions adopted what Tom Cannon calls a "Lego block" approach; first to consolidate some of the existing servers into fewer racks and then to move the new cooling elements into the freed-up space. The existing chilled-water system continued to function while the new DX-based system was installed, commissioned and tested. Finally, the obsolete cooling equipment was decommissioned and removed.

Despite the fact that the project was implemented at the height of the Covid pandemic with all the restrictions on movement and the negative implications for global supply chains, the project ran to schedule and the new equipment was successfully installed and implemented without any disruption to IT services at UCD.

Results: A cooling boost for assured IT services and space freed for increased student facilities

The new cooling equipment has resulted in an inherently more resilient data centre with ample redundancy to ensure reliable ongoing delivery of all hosted IT services in the event that one of the cooling units fails. It has also freed up much valuable real-estate that the university can deploy for other purposes. As an example, the building housing the data centre is also home to an Applied Languages department. "They can be in the same building because the noise levels of the new DX system are so much lower than the chilled-water solution," says Tom Cannon. "That is clearly an important issue for that department, but the DX condensers on the roof are so quiet you can't tell that they are there. It's a much more efficient use of space."

With greater virtualisation of servers, the overall power demand for the data centre has been dropping steadily over the years. "We have gone down from a power rating of 300kW to less than 100kW over the past decade," says Tom Cannon. The Daedalus data centre now comprises 300 physical servers but there are a total of 350 virtual servers split over both data centres on campus. To maximise efficiency, the university also uses EcoStruxure IT management software from Schneider Electric, backed up with a remote monitoring service that keeps an eye on all aspects of the data centre's key infrastructure and alerts IT Services if any issues are detected.

The increasing virtualisation has seen the Power Usage Effectiveness (PUE) ratio of the data centre drop steadily over the years. PUE is the ratio of total power consumption to the power used by the IT equipment only and is a well understood metric for electrical efficiency. The closer to 1.0 the PUE rating, the better. "Our initial indications are that we have managed to improve PUE from an average of 1.42 to 1.37," says Tom Cannon. "However, we're probably overcooling the data centre load currently, as the new cooling infrastructure settles. Once that's happened, we're confident that we can raise temperature set points in the space and optimise the environment in order to make the system more energy efficient, lower the PUE and get the benefit of lower cost of operations."
The overall effects of installing the new cooling system are therefore: greater resilience and peace of mind; more efficient use of space for the benefit of the university's main function of teaching; greater efficiency of IT infrastructure and consequently a more sustainable operation into the future.

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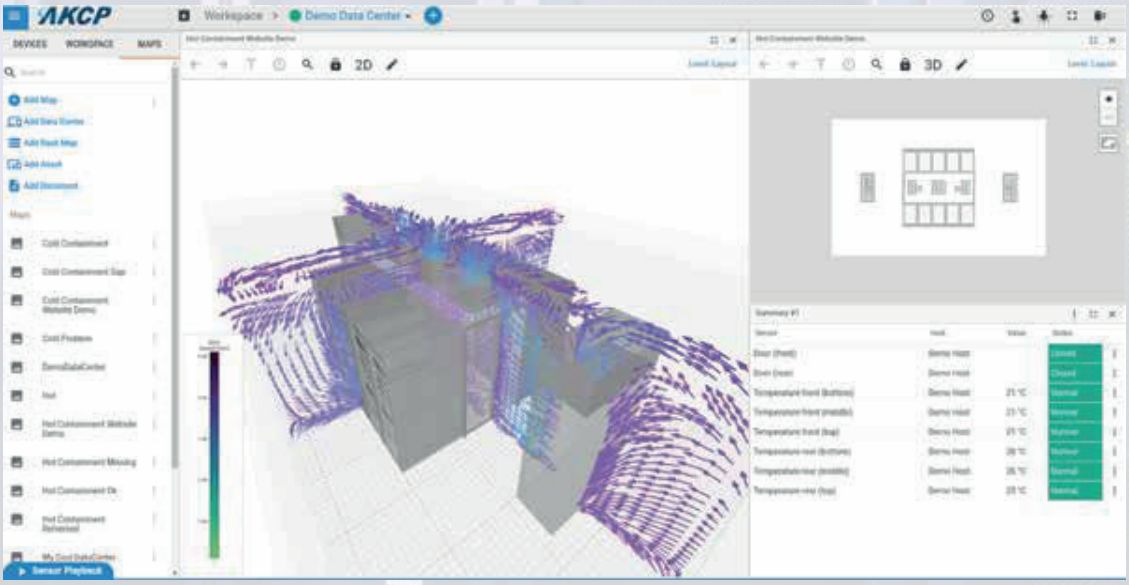

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Is liquid spray cooling the future for data centres?

Liquid Cooling is the next step for the Data Centre industry to achieve their aims of sustainability and Net Zero, and liquid spray cooling is the pioneering next step in the liquid cooling journey. **By Airsys.**

MAINTAINING the temperature of critical infrastructure within Data Centres through the use of air-cooling technology has dominated the industry for many years, whilst the demand in data consumption has increased year-on-year and in turn has increased the amount of electricity consumed. Electricity consumption for IT and Cooling systems accounts for approximately 86 percent of the total energy consumption within a Data Centre, while cooling alone can account for up to 40 percent.

Furthermore, in recent years we have seen server technology evolving at a fast pace, resulting in an increase in heat density. Typically, heat density increases by an average of 1kW per rack every 2 years and we are now starting to reach the point where the effectiveness of air-cooling technology, in some cases, is restricted due to the air's heat transfer coefficient, which limits its ability to remove heat from today's modern chips. Dealing with this issue has been at the forefront of industry debate.

The solution in overcoming these limitations is Liquid Cooling.

Some Data Centres are already adopting Liquid Cooling, but the specific technology that has so far been predominately implemented is immersion cooling. Although it is an efficient method in removing heat from CPUs, the technology still has some reliance on mechanical cooling, which makes it less sustainable, and limits the ability of the Data Centre in moving closer to net zero. Combined with the growing pressures of the global energy crisis and repurposing waste heat from the Data Centre, what could be the solution?

Established in 1995, Airsys is a market-leading cooling solutions provider, who think globally, but act locally. We deliver innovative, high-efficiency, precision control thermal solutions for the built environment. With over 25 years' experience, combined with multiple manufacturing facilities and offices globally, Airsys are able to deliver sustainable solutions for critical environments such as Data Centres and Telecoms environments. A focus on understanding the customers' needs, combined with our technological expertise, has allowed Airsys to develop a liquid spray cooling solution, called the LiquidRackTM which addresses the current limitations of existing technology and moves Data Centres closer to achieving their sustainability goals.

LiquidRack ™is a liquid spray cooling solution designed for multiple types of digital data infrastructures, such as cloud service, telecommunication facilities and more. Differing from immersion cooling, our pioneering approach keeps the dielectric fluid moving, spraying directly onto the CPU. Adopting a liquid spray cooling approach significantly increases the heat transfer coefficient, in comparison to immersion cooling.

Increasing the heat transfer coefficient, allows the dielectric fluid being sprayed on the CPU to be elevated up to a temperature of 65oC, without comprising performance of the CPU. This provides two major benefits. Firstly, the elevated fluid temperatures eliminate the need for chillers, and they can be replaced by dry coolers in environments with ambient temperatures up to 50oC. This means that there are potential free-cooling applications in geographic locations such as the Middle East, for which free-cooling has been traditionally hard to achieve. Secondly, the elevated water temperatures allow for heat recovery.

Heat recovery means that the recovered energy from the Data Centre can be recycled for multiple applications, such as district heating and industrial scale greenhouses to name but a couple. The Data

Centre now becomes an energy producer, helping to achieve Net Zero emission goals. LiquidRack™ can offer a seamless connection for heat recovery to district heating systems, due to the high running temperatures, which is another advantage to the solution.

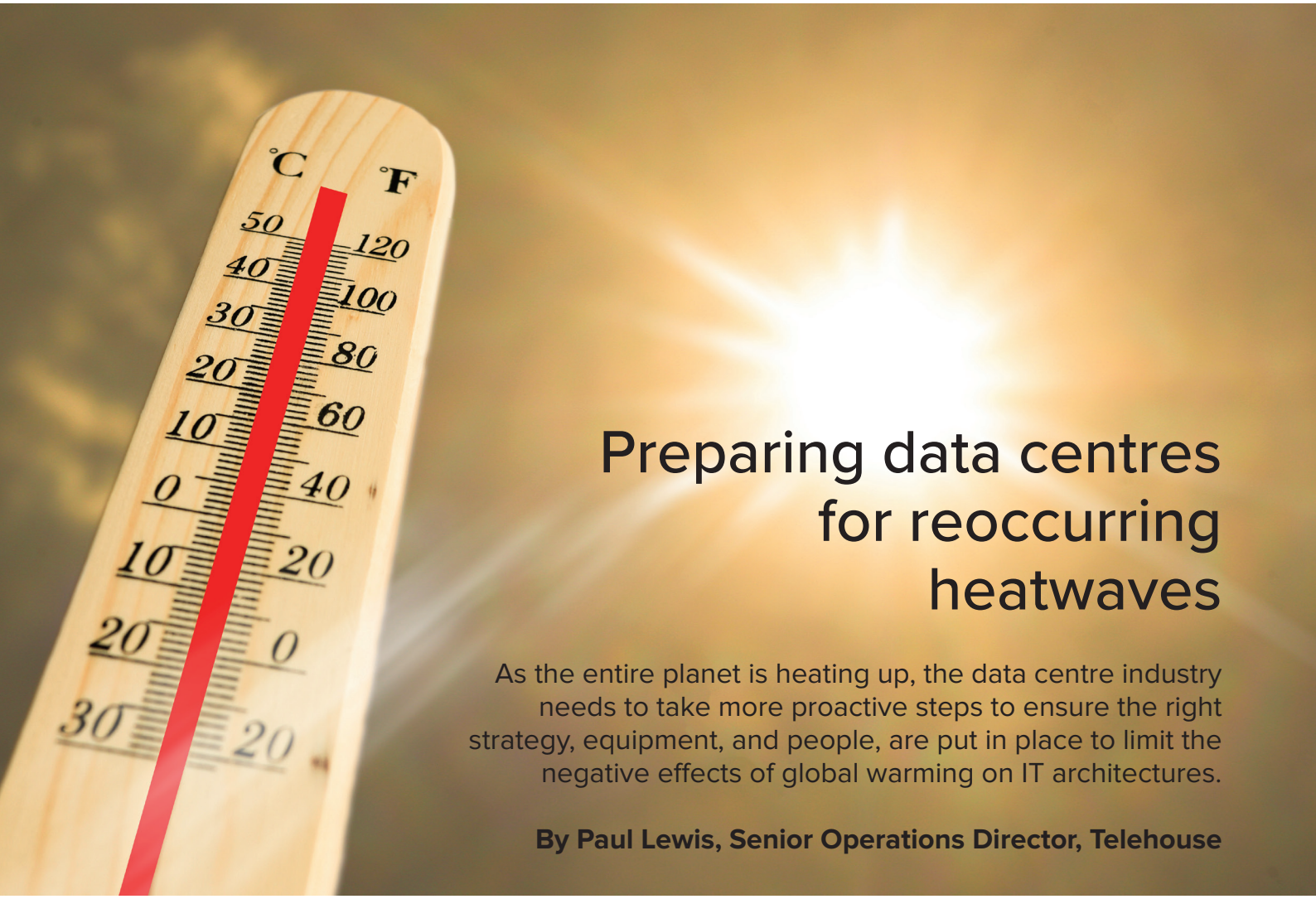
The largest obstacle for the adoption of liquid cooling technology has always been the significant expense involved in transitioning away from air-cooled solutions in existing Data Centre environments. The project complexities and capital expenditure were previously considered to be high-risk. LiquidRack™ changes this, now the transition is seamless. LiquidRack'sTM vertical design, size, and lower operational weight, when compared to immersion technology, allow for easier integration into existing Data Centres. Each LiquidRackTM consists of two drawers, with each drawer, for our standard design, able to accommodate up to 6 x 2U servers, therefore each system can hold up to 12 x 2U servers. LiquidRack™ has been designed to provide a cooling capacity of up to 80kW.

Each server can be slid out and locked into position for hassle-free inspection and maintenance. The system is fully adaptable to different server brands, different server layouts and even a mixture of CPUs and GPUs within the same drawer. Designed as a decoupled system, each drawer contains two low powered pumps (N+1) and a highly efficient heat exchanger. The LiquidRackTM design offers an unbeatable fantastic cooling capacity when compared to its modest footprint. As the LiquidRackTM directly cools the CPU via spray technology, not relying on immersing the server, the dielectric fluid needed is typically reduced by 80% when compared to immersion technology. This provides CAPEX advantages in terms of dielectric fluid procurement and reduces structural issues in relation to weight.

By spraying directly onto the CPU, the LiquidRackTM provides a constant flow and eliminates uneven fluid flow that can occur using other methods of liquid cooling technology, which can result in server reliability issues. Uneven flow can occur when there is a mixture of different servers immersed or if one or more servers are removed for maintenance, resulting in the dielectric fluid following through the path of least resistance, thus starving the CPU of the flow needed to remove heat. Therefore, LiquidRack™ offers a more reliable solution to preserve servers and maintain Data Centre uptime.

As data consumption becomes ever more important in our day-to-day lives both personally and professionally, global Data Centre electrical consumption is predicted to reach 4% of the total global electrical consumption by 2030. A combination of the world's reliance on gas and oil, and the surging costs associated with them, turbulent energy prices affecting operating costs and budgetary planning, and the need to move towards a more sustainable future, are driving change in the industry. The Data Centre community needs to quickly adapt and Airsys passionately believe they have a game changing technology that provides a low CAPEX and low OPEX solution that can turn a Data Centre into an energy producer, whilst achieving free cooling anywhere in the world. Liquid Cooling is the next step for the Data Centre industry to achieve their aims of sustainability and Net Zero, and liquid spray cooling is the pioneering next step in the liquid cooling journey.

Each server can be slid out and locked into position for hassle-free inspection and maintenance. The system is fully adaptable to different server brands, different server layouts and even a mixture of CPUs and GPUs within the same drawer.



Preparing data centres for reoccurring heatwaves

As the entire planet is heating up, the data centre industry needs to take more proactive steps to ensure the right strategy, equipment, and people, are put in place to limit the negative effects of global warming on IT architectures.

By Paul Lewis, Senior Operations Director, Telehouse

IT SEEMS LIKE every UK summer is becoming the hottest one yet on record, with scientists warning 2023 will be no different as the El Niño climate phenomenon is set to return. For the data centre industry, another season of temperatures above 40°C challenges us to keep the data halls cool, ensure uninterrupted connectivity, and ultimately, minimise the risk of downtime for organisations. All whilst considering clients' increasing sustainability requirements. With heatwaves becoming the norm, what should data centre providers be doing to best serve their customers as part of their heatwave mitigation plans?

Taking the lessons from the 2022 heatwave

2022 truly put IT infrastructures to the test, prompting data centres to review their strategies in a bid to prevent disruption in the future. In fact, a recent Climate Crunch research report commissioned by Telehouse revealed that nearly two in five (39%) organisations experienced an average of 10 hours of downtime as a result of the 2022 heatwave, with a further 21% citing 11-16 hours of downtime. Many valuable lessons can be learnt from the events of last year, all of which can help improve processes and procedures for the next hot years ahead. Part of the preparation to ensure resilience throughout very hot summers, and equally freezing cold winters, includes putting the design of data centre buildings under the microscope.

The design of older data centre facilities proves tricky when it comes to minimising service outages during extreme weather. This is because they were built with much lower temperatures in mind, up to 35-38°C, meaning even the smallest of rises outdoors can make a big difference inside. It is therefore a challenge to retrospectively fit and prepare them for extreme heat. It's not just high temperatures that need to be considered though. Events like Sudden Stratospheric Warmings (SSWs), which can cause cold conditions in winter, are also being affected by climate change. The industry needs to be prepared for these colder temperatures in winter too, all the while meeting ESG and sustainability targets.

It's not all doom and gloom, however. There are several solutions data centre operators can implement to prepare older facilities for

With the right infrastructure in place, processes and procedures are the next consideration. Before the start of the summer and winter seasons, it is of course important to double-check whether cooling units are in peak condition, and spare parts available should the need for repairs arise

the conditions facing us in the years ahead. These include reusing waste heat, utilising high temperature liquid cooling systems and low power servers, and leveraging hot and cold aisle containment. Many of today's systems also have a dual purpose making the building more energy efficient. For example, liquid used for immersion cooling as it is a much more efficient conductor of heat than air.

It's not what you do in the summer, but all year round

With the right infrastructure in place, processes and procedures are the next consideration. Before the start of the summer and winter seasons, it is of course important to double-check whether cooling units are in peak condition, and spare parts available should the need for repairs arise. In winter, some of the cooling equipment can be turned down to ensure energy efficiency. However, more focus should be placed towards conducting year-round maintenance, servicing, and testing with changing seasons in mind.

This will help prepare the equipment for the extreme weather stresses, including chillers, glycol systems, and humidifiers. Additionally, having a schedule of regular servicing and preventative maintenance work can help to avoid major works being conducted during extreme weather events, as it's usually during these events that supply issues can occur. A checklist of all available resources and historical faults increases the chances of pre-empting potential failures, giving engineers enough time to diagnose to prevent overheating and outages. The key lies in the right planning and preparation.

Embracing a proactive approach

By now, data centre operators know to expect the unexpected and be prepared for every eventuality. When extreme temperatures strike, a well-rehearsed plan based on a proactive approach helps to swiftly minimise downtime risk and resolve any issues.

With all non-essential maintenance postponed during heatwaves, data centre providers can better and more strategically allocate their emergency reaction teams of engineers. The older mentality of 'business as usual unless something breaks' isn't the right one, as every minute of downtime can have damaging consequences for data centre customers. Teams should be able to jump on issues as soon as they occur, hence where they're stationed does matter. For example, a reactionary engineer should be ready on the roof to fix the cooling systems, if needed. Whilst allocating roles to on-site personnel ahead of the heatwave or arctic blast, data centre providers need to implement extra health and safety measures to help everyone stay productive and safe, with the provision of food and water, appropriate clothing, and of course comprehensive training.

Many colocation data centres have adequate resources available to them to ensure business continuity, even when the wider industry battles skills shortages. For some pieces of equipment, there may only be a handful of engineers deployed by a manufacturer in a certain geographic location. However, more established data centre providers have the size, scale and relationships to ensure priority assistance from these providers in an emergency.

Prevention equals readiness

The importance of prevention and all-year-round servicing can't be stressed enough. As the entire planet is heating up, the data centre industry needs to take more proactive steps to ensure the right strategy, equipment, and people, are put in place to limit the negative effects of global warming on IT architectures. No two summers are the same, so a high level of preparedness is crucial to prevent issues from arising.

The transition to clean data centre power requires flexible control

To meet sustainability targets, you will need to replace fossil power with clean alternatives while ensuring uninterrupted uptime, and you will most probably need to make the transition gradually. This requires flexible power control solutions that can be scaled, redesigned, and upgraded as needed.

By Liam P. Round, Global Business Development Manager for Critical Power at DEIF

AS EDITOR Phil Alsop remarked in the most recent edition of Datacentre Solutions, you may soon be required to make some fairly major changes to improve the sustainability of your data centre. Making the transition to low or no-emission power sources is an efficient way of reducing your site's carbon emissions and making your operations more sustainable. The big question, of course, is how you go about it.

Making onsite generation more sustainable

If your data centre is running on grid power, selecting a power company capable of supplying renewable power is a good place to start, but you also need to make your onsite power plant more sustainable to achieve clean backup power – and even more so if you rely on onsite power for regular operation.

There are many clean alternatives to the diesel generator, including PV panels and fuel cells, and battery energy storage systems let you store and reuse clean energy (in addition to providing instant backup power). However, the need for uninterrupted uptime, and in most cases financial constraints, force you to make the transition one step at a time. Even if you could replace your entire power system overnight, it would not be desirable: Technical

upgrades cannot be allowed to jeopardise reliable operation.

Evolution, one step at a time

So, how can you make the gradual transition to sustainable power? One crucial decision is to select a power control architecture that gives you the flexibility to scale, redesign, and upgrade your plant – and the connectivity and compatibility to ensure full control and redundancy along the way.
This applies whether you are refurbishing an existing data centre or building a new one. Power control devices are not created equal, and you should consider the following when selecting a control solution to support your transition to clean data centre power:

Compatibility: As your journey towards renewables is probably going to be a stepwise affair, your control devices should be capable of controlling all the power sources you could conceivably need (including PV and battery inverters), and of supporting upcoming power technologies. Crucially, they should be compatible with one another, giving you a power control solution that stays integrated even as it evolves over time.

Flexibility: Your requirements will likely change over the course of your journey towards sustainable data centre power, and your power control devices should be easy to reconfigure accordingly. You may opt for devices that can be reconfigured to handle any power source, from gensets to fuel cells, or you may select devices that handle one source extremely well and are compatible with any other devices you add to your power management system. You need the ability to change and expand your plant layout as needed, and your devices need to support this.

Redundancy: Your customers won't care that your power is sustainable if that means their servers are not available. Your control devices should make up a control solution with no weak links in the control chain. Go for an interconnected, intelligent power management system where another controller assumes control if the current master suddenly fails, instead of trusting one centralised controller to keep everything running – and taking the entire control system with it if it fails.

Configurability: While you can program a PLC for anything, it is a time-consuming undertaking. Particularly when you need a flexible solution that supports your transition, you should select control devices with built-in, purpose-designed logic that you can quickly configure and reconfigure for your application. By doing so, you save time and reduce the risk of performance issues.

Support: With renewables on the rise, and new power sources emerging regularly, the power business is in transition. Some of these changes will deeply affect the data centre industry and open up new possibilities in sustainable power and efficient and reliable control. You should work with a power control partner with the experience and know-how to support your sustainable power journey and augment your strategy with ideas, suggestions, and solutions that harness the latest developments in the power control business. Ideally, that partner should also be able to work with any and all design houses, integrators, and OEMs to make the process easier for you as an owner-operator, and to ensure you get the exact solution you require. Not sure which power source to use, how to design everything, or how to proceed with your sustainability transition? Work with a partner who can help you.

How and when you decide to improve the sustainability of your data centre is up to you. Your strategy in this regard will depend on many factors, for example where you are located, and what your customers and society expect from you. But your power setup is an obvious place to start, and a flexible power control architecture from a reliable partner will take you a long way on your journey – at your own pace and in your own way.

Are nuclear powered data centres on the horizon?

Across the globe, activity in the Small Modular Reactor (SMR) space is gathering pace.

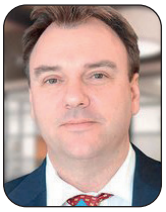
By Ed Ansett, Founder and Chairman, i3 Solutions Group

Small Modular Reactor maker seeks large data centre partner?

Governments, regulators, atomic agencies and authorities, global power manufacturers, research bodies and new market entrants are busy. For the data centre industry, the question is whether SMRs are applicable to the sector? Could they change how data centres are powered?

A look at the output ranges and the different models under development and the different nuclear technologies being proposed as suitable for the sector will tell us more.

The first thing to consider about an SMR is its power output. The International Atomic Energy Agency (IAEA) defines 'small' as under 300 MWe, and up to about 700 MWe as 'medium.' So, a large data centre deployment is at the small end of the SMR market. There are also developments in the micro modular reactor category. However, most of the recent activity in terms of regulations, licenses and investments has been in the SMR category.



SMRs under development and being built tell a story

Rolls Royce says its SMR will generate 470MWe. It says a single Rolls-Royce SMR power station will occupy a space the size of two soccer pitches and power approximately one million homes, supporting on-grid electricity and a range of off-grid clean energy solutions.

In January 2023, GE Hitachi announced a contract for its BWRX-300 – a 300MWe water-cooled SMR. According to the company, this is the first commercial contract for a grid-scale SMR in North America.

A Danish outfit called Seaborg is planning floating SMRs using barges that can accommodate 4x 200MWe reactors. It plans to use existing shipyards in which to create a production line for the barges.

In the UK, the Office of Nuclear Regulation is assessing submissions from several firms for the licensing of their technologies. These include US-based Holtec, which submitted its 160MWe pressurised water reactor SMR-160 design developed in collaboration with Mitsubishi Electric of Japan and Hyundai Engineering and Construction of South Korea.

X-Energy, a nuclear reactor and fuel design engineering company, wants to deploy its high-temperature gas reactor in the UK, saying it wants to tackle industrial decarbonisation as well as electricity generation. "The Xe-100 can deliver reliable 'always-on' electricity," it says, "as well as increase or decrease power levels safely within minutes to respond to varying demand or supply."

UK Atomics is a subsidiary of Danish start-up Copenhagen Atomics, which is developing a containerised thorium molten salt reactor. It says its

technology is “progressing swiftly with the first non-radioactive full-size reactor prototype to be tested in the UK in 2023.” The company expects deployment by 2028.

For future large data centre developments, anyone seeking a clean, reliable, low-carbon producing power generation supply, these systems could be applicable.

Current options to fuel SMRs

The World Nuclear Association (WNA) says there are four main SMR technology options being pursued; “light water reactors, fast neutron reactors, graphite-moderated high-temperature reactors and various kinds of molten salt reactors (MSRs).”

WNA says: ‘Light Water Reactors are moderated and cooled by ordinary water and have the lowest technological risk, being similar to most operating power and naval reactors today.’’

“Fast neutron reactors (FNR) are smaller and simpler than light water types, they have better fuel performance and can have a longer refuelling interval (up to 20 years), but a new safety case needs to be made for them.”

“High-temperature gas-cooled reactors use graphite as a moderator (unless fast neutron type) and either helium, carbon dioxide or nitrogen as primary coolant.”

“Molten salt reactors mostly use molten fluoride salts as primary coolant, at low pressure. Lithium-beryllium fluoride and lithium fluoride salts remain liquid without pressurization up to 1400°C, in marked contrast to a PWR which operates at about 315°C under 150 atmospheres pressure. Fast-spectrum MSRs use chloride salt coolant. In most designs, the fuel is dissolved in the primary coolant, but in some, the fuel is a pebble bed.”
WNA also states many small reactors are being designed for industrial heat applications as well as power generation.

Light water reactors are constrained by pressure limitations and operate in the 300 - 400°C range. Liquid metal fast reactors are in the 400 - 600°C range, molten salt reactors are around 600 - 700°C, and high-temperature reactors are 600 - 900°C.

Possible use cases for SMRs

2022 and 2023 saw a number of large data centre development projects in the 200MWe range, many of them in Southeast Asia.

Last year Yondr Group said it would develop a 200MWe hyperscale campus in Malaysia. The company announced a plan to develop 72.8 acres of land in Johor’s Sedenak Tech Park.

T5 Data Centres announced the planned development of a 140-acre, 200MWe government and enterprise cloud data centre campus in Augusta, Georgia, which it described as the Southeast US cybersecurity hub.

In South Korea, energy and construction firm Bosung Group said it is to build a 200Mwe data centre campus in SolaSeaDo, in Jeonnam Province. The company has partnered with The Green Korea (TGK), a joint venture between South Korean energy investment firm Energy Innovation Partners (EIP) and Diode Ventures.

None of these developments has made any announcement on the potential use of nuclear power as a primary power source. Today, the timeframes for SMR production and licensing stretch to 2028 and beyond, so it could be that none of the currently publicised projects can wait that long.

However, things could change quickly.

Useful sources:
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https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx World Nuclear Association

https://www.nrc.gov/about-nrc.html US Nuclear Regulatory Commission (NRC)

https://www.onr.org.uk/ Office of Nuclear Regulation

The evolution of data centre cooling

Liquid cooling is fast becoming critical for delivering power and energy efficiencies while responding to increased processing and storage requirements.

Iceotope's Jason Matteson explains what has changed the game.

WITH THE RISE of high-performance computing, artificial intelligence and machine learning, data center rack density continues to rapidly increase. The Uptime Institute's 2022 Global Data Center Survey showed that the largest data center facilities – from mostly larger enterprise and cloud service providers – have half of their racks above 20 kW power, with one in five running racks above 40 kW and some even reaching 70 kW. This increasing rack density and compute-intensive workloads are placing strenuous demands on data center cooling. The processing requirements of these applications means that traditional air-cooling technologies no longer suffice.

The journey to liquid cooling

I have been in the electronics industry since 1997 and when I first started, it was simply about using bigger fans and larger heat sinks. However, by the early 2000s, we started architecting solutions for CPUs with up to approximately 80W.

The struggle for power density had begun in earnest and most engineers saw this struggle as a facility cooling problem. Instead of filling a 42U rack with 1U servers, they would half-populate with ~20 1U servers because they were running out of power and cooling. These were thought of as high-density air-cooled solutions. We were continuously challenged with trying to spin the fans faster and faster, which consumed more power to the cube of the RPM.

As densities accelerated, air-cooling because more complex. We were already pushing up against the practical limits of air-cooling technologies,

especially in dense form factors, running up against mechanical, power, and acoustic limits. Once energy efficiency became a prominent issue within the industry and the US government began reporting on how data centers were consuming increasing amounts of global energy, the paradigm began to shift.

Today, where liquid cooling was once an option, it is now essential. Data-driven applications are demanding more high-performance processors at the top end of the market. Current CPU and GPU power of 300/400 watts is all but certain to double or even triple over the next 5-7 years. Intel researchers foresee a way to make chips 10 times denser, paving the way to a trillion transistors on a chip package by 2030. If so, there is an obvious convergence point with industry sustainability and net zero targets.

Driving demand for liquid cooling

New applications are the real catalyst, and this is just a taste of what is to come. All data centers, including colocation facilities, can increase density and efficiency, however there are benefits for all sectors. Within banking and finance, if they can shave off a nanosecond from an electronic trade with an AI, ML algorithm, it can save them hundreds of thousands, if not millions of dollars over a relatively short period of time. They have always invested in the best, and fastest silicon they can get their hands on.

Healthcare is another great example. We're already seeing AI-powered solutions addressing routine, repetitive and largely administrative tasks on a daily basis. Sophisticated AI algorithms are already being developed to access multiple sources of data to reveal patterns in disease and aid treatment and care. Healthcare systems will soon be able to predict an individual's risk of certain diseases and suggest preventative measures.

Oil exploration typically operates in harsh conditions, yet is the classic HPC environment, requiring sifting through massive amounts of data as fast as possible. With edge networking supported by advanced processing and maximum-efficiency cooling, these high-performance applications can be located on the rigs allowing analytics to be carried out at the data source.

Edge compute is also critical for smart cities, where data is generated, collected, consumed and analysed across an internet of things (IoT). For example, autonomous vehicles need IoT sensors to learn from the driver, as well as the car and hazards on the road, communicating with other sensors linked to traffic signals, central control or emergency services in real time. Data processing at the edge requires secure, efficient cooling technology with minimal maintenance.

Efficiency, sustainability and the next era of cooling

The conversations about the limits of air-cooling

for next era of computing are happening now, regardless of politics or geography, and this is resonating with businesses, governments, ecologists and the public as sustainability is where it should be – top of the agenda. Liquid cooling is rapidly becoming the solution of choice to efficiently and cost-effectively accommodate increasing heat loads.

Knowing the types of liquid cooling is essential. Direct-to-chip offers the highest cooling performance at chip level but still requires air cooling. Tank immersion solutions require a complete rethink of data center design. Precision liquid cooling, on the other hand, can remove nearly 100% of the heat generated by the electronic components of a server, while reducing energy use by up to 40% and water consumption by 90%. Precision liquid cooling uses a small amount of dielectric coolant to precisely target and remove heat from the hottest components of the server, ensuring maximum efficiency and reliability. This eliminates the need for traditional air-cooling systems and allows for greater flexibility in designing IT solutions. There are no hotspots that can slow down performance, no wasted physical space on unnecessary cooling infrastructure, and minimal need for water consumption.

The shift to liquid cooling has begun in earnest as the data center industry looks to meet sustainability demands with greater efficiency, flexibility and scalability while delivering the performance requirements advanced computing workloads demand. The question then becomes are we ready to embrace these new technologies to solve the challenges facing the industry? I believe we are, and liquid cooling will be at the forefront of helping us get there.

The liquid future of data centre cooling

With rising demand, and equipment densities, air as a cooling medium is reaching its limits. Developments in hybrid and liquid cooling will allow providers to rise to the challenge sustainably.

By Markus Gerber, Senior Business Development Manager, nVent Schroff

THE DATA INFRASTRUCTURE industry is facing a number of challenges in today's digital world. Demand for data services is growing at a phenomenal rate and yet, there has never been a greater pressure, or duty, to deliver those services as efficiently and cleanly as possible.

As every area of operation comes under greater scrutiny to meet these demands, one area in particular, cooling, has come into sharp focus. It is an area not only ripe for innovation, but where significant progress has been made that shows a way forward for a greener future.

According to some estimates, the number of internet users worldwide has more than doubled since 2010, while internet traffic has increased some

20-fold. Furthermore, as technologies emerge that are predicted to be the foundation of future digital economies, such as streaming, cloud gaming, blockchain, machine learning and virtual reality, demand for digital services will rise not only in volume, but also sophistication and distribution. Increasingly, the deployment of edge computing, bringing compute power closer to where it is required and where data is generated, will see demand for smaller, quieter, remotely managed infrastructure. This one area alone is expected to grow at a compound annual growth rate (CAGR) of 16% to 2026 to a market of more than $11 billion, according to GlobalData, a research, consulting and events business.

This level of development brings significant challenges for energy consumption, efficiency, and architecture. The IEA already estimates that data centres and data transmission networks are responsible for nearly 1% of energy-related greenhouse gas (GHG) emissions. While it acknowledges that since 2010, emissions have grown modestly despite rapidly growing demand, through energy efficiency improvements, renewable energy purchases by information and communications technology (ICT) companies and broader decarbonisation of electricity grids, it also warns that to align with the Net Zero by 2050 Scenario, emissions must halve by 2030.

This is a significant technical challenge. Firstly, in the last several decades of ICT advancement, Moore's Law has been an ever-present effect. It states that compute power would more or less double, with costs halving, every two years or so. As transistor densities become more difficult to increase as they get into the single nanometre scale, no less a figure than the CEO of NVidia has asserted that Moore's law is effectively dead. This means that in the short term to meet demand, more equipment and infrastructure will have to be deployed, in greater density. Added to this, are the recent developments from both Intel and AMD, where their high-end data centre-aimed processors will work in the 350-400W range, further exacerbating energy demand.

All changes will impact upon cooling infrastructure and cost

In this scenario of increasing demand, higher densities, larger deployments, and greater individual energy demand, cooling capacity must be ramped up too.

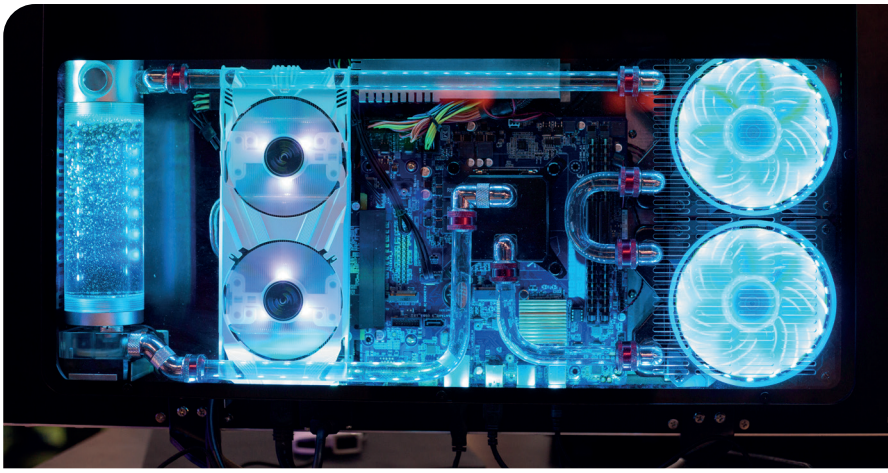
Air as a cooling medium was already reaching its limits, being as it is, difficult to manage, imprecise, and somewhat chaotic. As rack systems become more demanding, often mixing both CPU and GPU-based equipment, individual rack demands are approaching or exceeding 30W each. Air-based systems, at large scale, also tend to demand a very high level of water consumption, for which the industry has also received criticism in the current environment. One estimate equated the water usage of a mid-sized data centre as equivalent to three average-sized hospitals.

Liquid cooling takes many forms, but the three primary techniques currently are direct-to-chip, rear door heat exchangers, and immersion cooling

Liquid cooling technologies have developed as means to meet the demands of both volume and density needed for tomorrow's data services. Studies with different liquid cooling techniques have established that they can be anything from 50 to 1,000 more efficient than air cooling.

Liquid cooling takes many forms, but the three primary techniques currently are direct-to-chip, rear door heat exchangers, and immersion cooling. Direct to chip (DtC), or direct to plate, cooling is where a metal plate sits on the chip or component, and allows liquid to circulate within enclosed chambers carrying heat away. This is a highly effective technique, that is precise and easily controlled. It is often used with specialist applications, such as high performance compute (HPC) environments.

Rear door heat exchangers, as the name suggests, are close-coupled indirect systems that circulate liquid through embedded coils to remove server heat before exhausting into the room. They have the advantage of keeping the entire room at the inlet air temperature, making hot and cold aisle cabinet configurations and air containment designs redundant, as the exhaust air cools to inlet temperature and can recirculate back to the servers. The most efficient units are passive in



nature, meaning server fans move the air necessary. They are currently regarded as limited to 20 kW to 32 kW of heat removal, though units incorporating supplemental fans can handle higher loads in the 60 kW maximum range.

Immersion technology employs a dielectric fluid that submerges equipment and carries away heat from direct contact. Whilst for many, liquid immersion cooling immediately conjures up the image of a bath brim full of servers and dielectric, precision liquid immersion cooling operates at rack chassis-level with servers and fluid in a sealed container. This enables operators to immerse standard servers with certain minor modifications such as fan removal, as well as sealed spinning disk drives. Solid-state equipment generally does not require modification. A distinct advantage of the precision liquid cooling approach is that full immersion provides liquid thermal density, absorbing heat for several minutes after a power failure without the need for back-up pumps. Liquid capacity equivalent to 42U of rack space can remove up to 100 kilowatts (kW) of heat in most climate ranges, using outdoor heat exchanger or condenser water, allowing the employment of free cooling.

Cundall's liquid cooling findings

According to a study by engineering consultants Cundall[1], liquid-cooling technology consistently outperforms conventional air-cooling, in terms of both PUE and water usage effectiveness (WUE). This, says the report, is principally due to the much higher operating temperature of the facility water system (FWS), compared to the cooling mediums used for the air-cooled solutions. In all air-cooled cases, considerable energy and water is consumed to arrive at a supply air condition that falls within the required thermal envelope. The need for this is avoided with liquid-cooling, it states. Even in tropical climates, the operating temperature of the FWS is high enough for the hybrid coolers to operate in economiser free cooling mode for much of the time, and under peak ambient conditions, sufficient capacity can be maintained by reverting to 'wet' evaporative cooling mode.

A further consistent benefit, the report adds, is the reduction in rack-count and data hall area that can be achieved through higher rack power density. There were consistent benefits found, in terms of energy efficiency and consumption, water usage and space reduction, in multiple liquid cooling scenarios, from hybrid to full immersion, as well as OpEx and CapEx benefits.

In hyperscale, co-location, and edge computing scenarios, Cundall found the total cost of cooling information technology equipment (ITE) per KW consumed in liquid versus the base case of current air cooling technology, varied from 13-21% less. In terms of emissions, Cundall states PUE and Total Power Usage Effectiveness (TUE) are lower for the liquid-cooling options in all tested scenarios. Expressing the reduction in terms of kg CO2 per kW of ITE power per year, results saw more than 6% for co-location, rising to almost 40% for edge computing scenarios.

What does the immediate future hold in terms of liquid cooling?

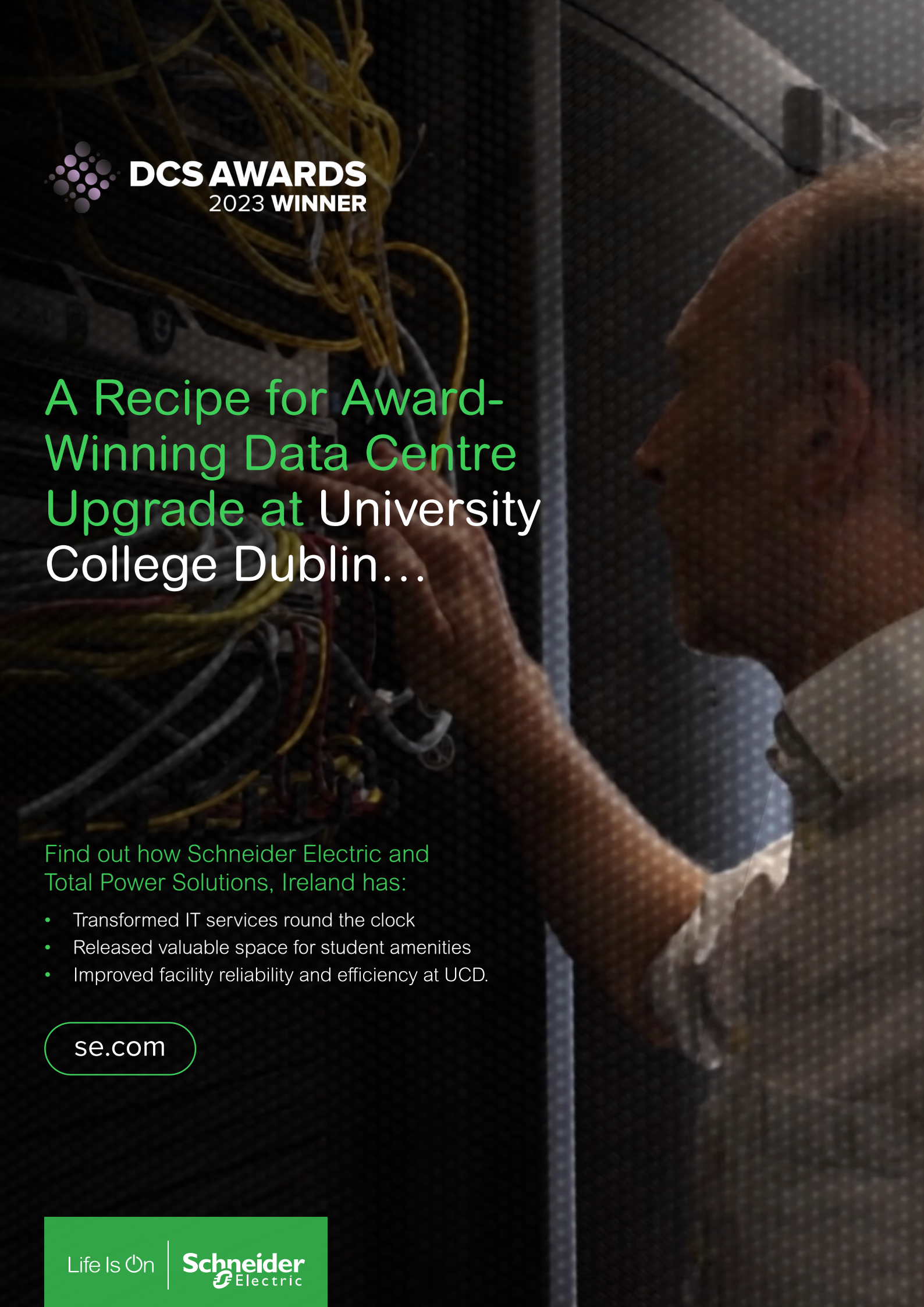
Combinations of liquid and air cooling techniques, in hybrid implementations, will be vital in providing a transition, especially for legacy instances, to the kind of efficiency and emission-conscious cooling needs of current and future facilities. Though immersion techniques offer the greatest effect, hybrid cooling offers an improvement over air alone, with OpEx, performance and management advantages.

Even as the data infrastructure industry institutes initiatives to better understand, manage and report sustainability efforts, such as the Climate Neutral Data Centre Pact, the Open Compute Project, and 24/7 Carbon-free Energy Compact, more can and must be done to make every aspect of implementation and operation sustainable. Developments in liquid cooling technologies are a significant step forward that will enable operators and service providers to meet demand, while ensuring that sustainability obligations and goals can be met. Initially hybrid solutions will facilitate legacy operators to make the transition to more efficient and effective systems, while more advanced technologies will ensure new facilities more efficient, even as capacity is built out to meet rising demand.

By working collaboratively with the broad spectrum of vendors and service providers, cooling technology providers can ensure that requirements are met, enabling the digital economy to develop to the benefit of all, while contributing towards a liveable future.

Endnote

1 "Desktop Study Report - Liquid and Air-Cooling Compared," Cundall, March 2021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Life Is On
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The fresh air revolution

Fresh air free-cooling is certainly a solution that is readily available to lower your operating costs and reduce your organisation's impact on the environment, delivering a more sustainable future.

By Airsys

ALL THAT LIVE on this little blue dot we call Earth are currently witnessing a perfect storm. With the global economic recovery continuing post COVID-19 and extreme weather events, the demand for energy across the globe is increasing, and combined with geopolitical tensions; never in such a way have energy prices been under the global spotlight. Whether you are running a business or a household, no one is immune to the impact of rising energy prices.

A key driver of the surge in inflation across advanced economies and the associated 'cost of living crisis', not seen since the 1970's, has been the huge jump in energy prices. Energy inflation has increased in every major economy, with Europe being particularly affected. Energy alone has been responsible for over half of the increase in Consumer Price Index (CPI) inflation in advanced economies.

In spring 2020, as COVID-19 spread from China around the world resulting in countries going into lockdown, the price of crude oil crashed due to the lack of demand. Oil producers were paying people to take oil off their hands, as they didn't have enough space to store it all. After this, OPEC+ which is made up of 26 oil producing countries, including Russia, who together produce around 40% of the

world's crude oil agreed to slash production by 10 million barrels a day to help drive the price back up. However, some feel these cuts were too deep and since the start of the Ukraine conflict, the price of crude oil soared to well over $100 a barrel because of panic on the markets. OPEC+ are now increasing the supply of crude oil at a slow rate, but this does not take into account the effects of the war in Ukraine.

While liquified natural gas (LNG) can be shipped, similar to oil, most gas is transported through fixed pipelines. This means that prices can differ considerably between regions depending on local demand and supply conditions. Low stocks, a tendency for governments to source short term contracts and the war in Ukraine leading to threatened European gas supplies, have added a considerable premium to market prices, resulting in a gas price rise of over 300% since last year.

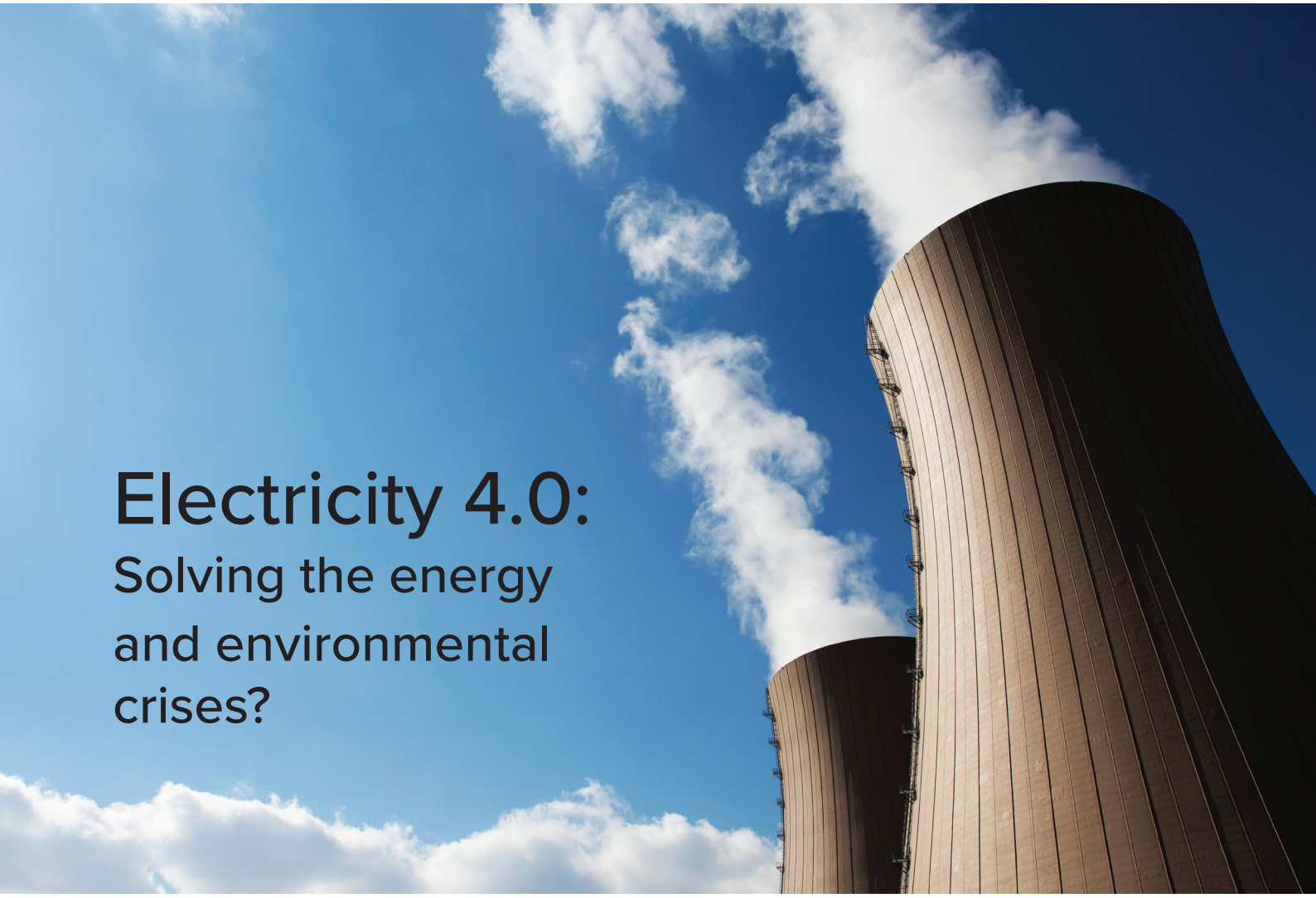
Gas is predominantly used to heat homes across Europe, but also for electricity generation. Germany is particularly reliant on gas to keep its citizens warm and power its factories to keep its economy turning. The inconvenient truth is that western governments have seen the warning signs from countries with emerging hostilities and read the scientific-backed evidence of climate change for decades but have been exceedingly slow to adapt and transition to new means of electricity generation. Instead opting for the reliance of natural resources from questionable countries with different ideologies to our own. The result is that until countries can become energy secure by building their own sustainable energy infrastructure such as nuclear, solar, wind and hydro electrical generation, volatile energy prices are here to stay. Industries that process data and keep the world connected such as the Telecoms and Data Centre sectors have been severely impacted by the increase in energy prices. Colocation providers that offer all-in customer pricing models are particularly affected, bearing the cost of rising energy prices and seeing a deteriorating bottom line. Sungard UK, who were a well-known Data Centre and colocation services company, went into administration last year and their insolvency was partly blamed on surging UK energy prices.

If high energy prices are here to stay in the short to mid-term; what can Data Centre and Telecoms operators do to reduce their OPEX, whilst not comprising the operation of their estate? Well, the two biggest energy demands for a typical data centre are the servers and then the cooling systems that maintain the temperature of the critical environment. AIRSYS are experts in cooling solutions with a pedigree in delivering low OPEX solutions for critical environments, and we believe cooling technology has the solution. However, this relies upon people who operate within these sectors to change their mindset and approach, looking at the problem from a different perspective. The answer lies with fresh air. Fresh air has been overlooked for many years by operators and consultants, who don't believe it is a viable solution. However, AIRSYS have been delivering tried and tested, fresh air free-cooling solutions into Telecom and Data Centre environments for years with great success, substantially lowering our clients' operational costs and carbon footprint. Whether you have an existing facility or are looking to build a new facility, with our comprehensive range of products, we have a solution that can deliver fresh air free-cooling within your environment. All you need is access to an external wall.

Within Northern Europe, for a large portion of the year the external ambient temperature falls within the ASHRAE limits, allowing for fresh air free-cooling to take place, delivering outside air into the Data Centre or Telecoms environment. For the few hours of the year where the ambient temperature isn't suitable, that is the moment when mechanical or evaporative cooling is relied upon. AIRSYS products, whether floor standing CRAC units or wall mounted packaged units, come with integrated mechanical cooling to cover the peak temperatures throughout the year. If we consider London and assume we are looking to achieve server inlet temperatures of 25oC, then a fresh air solution could deliver free cooling for 8,653 hours out of a possible 8,760 hours per year.

Some clients and consultants have been hesitant in utilising the benefits of fresh air free-cooling, with their arguments focusing on humidity levels, pollutants and in some cases opting for a chilled water solution with free-cooling chillers. Firstly, although a good solution, a chilled water design will always transition from free cooling to mechanical cooling at a much lower ambient temperature. Additionally, when free-cooling, a chilled water solution will still need to run indoor fans, outdoor fans and pumps to transfer the cooling medium and cool the environment. An AIRSYS fresh air free-cooling solution only requires the indoor fans to operate, thus requiring less power input. Additionally, our CRAC range when in free-cooling mode bypasses the evaporator cooling coil, thereby lowering the fan power, something a traditional free-cooling chilled water solution cannot provide.

Humidity also doesn't pose a problem. Ambient humidity levels are typically within acceptable ranges for the majority of the year, but when they are outside of scope, our external sensors transition the system into mechanical cooling. Mitigating the risk of introducing pollutants is achieved with correct filtration and adequate maintenance regimes. In recent years, AIRSYS have delivered over a thousand units in the UK, in numerous cities, delivering fresh air free-cooling without incident. Although, it's not the single solution in resolving the issues caused by high energy prices, fresh air free-cooling is certainly a solution that is readily available to lower your operating costs and reduce your organisation's impact on the environment, delivering a more sustainable future. Let the fresh air free-cooling revolution begin!



Electricity 4.0:
Solving the energy and environmental crises?

Steven Brown, Schneider Electric's Global Director - Cloud & Service Provider Segment, discusses with DCS Editor, Philip Alsop, the current energy crisis, as well as the ongoing climate change challenge, in terms of how the data centre industry needs to leverage electrification as the key part of a Strategise, Digitise, Decarbonise approach - with the ultimate opportunity of creating climate positive data centres as part of a successful Net Zero strategy.

PA: *We are in the middle of anmongoing, fairly serious energy crisis. As a starting point, it would be good just to understand or refresh as to all the factors that are at play and is it a short term thing and we'll all go back to normal in six months time, or is it having a longer lasting impact?*

SB: It's obviously a very significant energy crisis here in Europe - felt most acutely here in Europe, but by no means only in Europe, with the cascading effect down into raw materials and everything. So over a period of 24 months, for example, ending last September, we saw the price of natural gas increase 24 times. I mean, truly unprecedented and devastatingly. Energy poverty seems to increase for the first time in decades, those without access to reliable energy. And, I mean, there's a clear correlation between prosperity and health and access to energy, so that's truly a frustrating statistic.

And then even in the data centre industry, which oftentimes pricing is somewhat insulated through power purchase agreements and the way that they've structured their energy contracts, that's by no means fully insulated them from the effects. We're kind of seeing this bifurcation in the market

or on the larger side, just questioning around grid reliability for the first time in a long time, changing the way that we own and operate data centres. So it's definitely been a challenge. And we think of this as a short to medium term crisis, so certainly don't have any prognostications on how long this will last. But we know that we will emerge on the other side of this, which then means we can't lose sight of the longer term challenges associated with climate change in the midst of this crisis.

PA: *The climate change crisis has been going on for quite some time and we can't ignore it in terms of doing nothing. But obviously there's a certain friction. I know, say in the UK, they're looking at firing up or extending the life of coal fired power stations, for example, to get over the energy crisis, but clearly that's not good. So any thoughts as to how the climate crisis clashes or how that can be viewed alongside the energy crisis?*

SB: That's an important point because obviously the climate crisis is real and a daunting task ahead of us if we don't do anything by the end of the century, the consequences of climate change are almost too severe to even comprehend. 40 times more likely for extreme weather events, widespread challenges around food availability and water. So it's really challenging to even forecast not doing anything. But the good news is that we have been making progress over the last couple of decades, , to the point where as a society, it looks like energy emissions, global emissions, might be starting to plateau and shows a path towards 2030 where we're saving perhaps four gigatons of carbon dioxide annually. So progress has been made. There are two challenges. One, it's not fast enough, we need to go three times faster to keep our warming trajectory around 1.5 degree C. But then, to your earlier point, around this short term crisis is two, we can't lose sight of this long term crisis as we are challenged for the first time with just energy availability. And so at first, it looks like, to your point around extending the life of coal, would this derail all of the progress that we've made in our efforts to further accelerate?

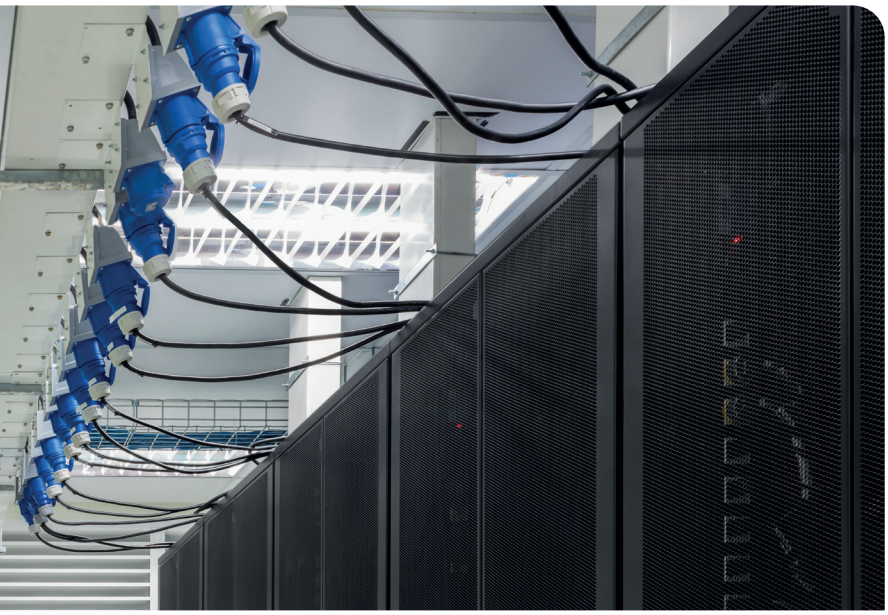
We haven't seen that at scale. Luckily, the deployment of renewables has continued. We need to continue to accelerate and it's an important time to reflect that this short term crisis, this energy crisis, medium term crisis, is in fact very interrelated with this long term crisis. And the process of protecting ourselves from one will help accelerate our progress on the other. And that's really the story around electrification, like looking at how we continue to change our energy supply. One that's too linear and too constrained, with the inability to decentralise supply and manage on the demand side that challenge felt throughout society. But even in the data centre industry, we need to decentralise and decarbonize, really. And that'll solve both the short term and the long term crises.

PA: *Plenty of industries are struggling for various reasons, but the data centre is almost front and centre because energy is massively important to it and therefore they are under pressure from a sustainability point of view and reducing their carbon footprint. They're caught between a rock and a hard place at the moment?*

SB: Yeah, no doubt. And I think there's a good conversation to be had about how fairly that coverage has been in terms of contribution towards constrained energy supply and consumption of energy. Obviously there's a discussion that needs to happen there. But the one thing that we can't ignore is that even data centres have felt those major impacts of the climate crisis already. Whether it's the extreme weather in the UK last summer, which stressed digital infrastructure in some cases, brought data centres offline, or plenty of cases around the world where data centres are struggling due to water supply, due to drought, possibly probably linked to the climate crisis.

And that's either directly for cooling infrastructure or indirectly through hydroelectric power availability. So we are feeling the effects we're definitely, as you point out, in the headlines, and then we have this backdrop of needing to deploy unprecedented capacity, whether it's the sheer amount of data or the secular trends that are emerging internet of things metaverse all of these new demands on our critical infrastructure. We need to continue to deploy capacity while managing this short term and this long term crisis. So continually we're going to have this challenge between speed, reliability and sustainability.

We need to go faster to deliver this capacity. Of course we can't compromise on reliability but for the first time in a long time we're dealing with grid intermittency in many cases and then at the same time we have to continue to be more sustainable. So we're in the spotlight, and it's time - we've done a good job on the supply side, certainly in terms of PPAs as an industry, but we need to continue to drive forward as an industry.



PA: *Decarbonization, I won't say it's the only strategy, but that seems to be the major focus at the moment. You say decarbonizing the energy supply so perhaps you could explain how successful that is and any limitations it has in terms of heading towards net zero sustainability targets?*

SB: You're absolutely right that the supply side, if you will, gets a lot of focus, as it should. We need to decarbonize our supply and there are challenges with intermittency that we're able to manage and get over bringing on wind and solar with still this kind of baseload of foundational energy infrastructure. That's not going to be enough alone, the supply side in fact, that's going to contribute towards our net zero goals by 2050 as society about 45%.

So close to half of what we need, the other more than half, is really on the demand side because no matter how clean and decarbonized that centralised supplies get, if you still have inefficient carbon intensive processes as the endpoints, those will continue to be challenges. And so we want to make sure that the demand side gets enough focus because there are really two major categories that we can influence. The first is around reduction energy management, energy efficiency kind of fell to the backdrop as energy prices were so low, which is unfortunate because that can help reduce that can contribute about 25% towards our net zero goals.

SB: So that's an example where the short term crisis bringing focus to energy efficiency reduction actually may help accelerate our move towards reduction for 2050 targets. So that's the first piece and the second piece on the demand side is really around electrifying - best example is electric vehicles. There are plenty of examples in and around the data centre industry changing from particular fossil fuel powered gen sets to electrical infrastructure that's going to help us move forward towards these 2050 goals. So two sides of the coin, supply and demand. And within the demand side you've got to reduce and you need to electrify.

PA: *You're putting forward, I think, Electricity 4.0 as a the major approach to addressing, as you say, these twin things. It would be good to understand what you mean by that and how it works in practice?*

SB: Electricity 4.0 is this kind of technological evolution of electrical infrastructure. So going back to electric 1.0, that was the earliest experimentation of electricity. 2.0 – that was mass electrification for the first time for a century, where it started to become fundamental to our lives. Electricity 3.0 is really the emergence of distributed energy resources, of course, with some challenges that came in terms of intermittency and managing that on a grid.

And so 4.0 is that next evolution, where now it builds on that history, but adds this ultimate combination of electric and digital. So electric for decarbonization, digital for efficiency, so that we can move from kind of a linear, carbon dependent, supply and demand energy supply to one that's flexible and bi directional. We introduced this concept of a prosumer, a producer and a consumer, someone who can, on the residential side, use rooftop solar and provide that back to the grid. But on the commercial side, even around data centres, micro grids, grid interactivity, that kind of technology, it's only possible through electric and digital. And that maps very clearly to the emergence of industry.

SB: You know, our path to 45 gigatons of carbon dioxide a year that we contribute is paved through industrialization and all the benefits that came with it. So we've gone from industrial 1.0 the earliest days, to now in industry 4.0, the emergence of IoT and connected devices, and just in kind, electricity has evolved, and now our electricity 4.0. So while it may not be the ultimate, we believe it's definitely the fastest path, because electricity time and time again has shown itself to be the most efficient form of energy and it will decouple us both from that short term crisis and that long term crisis that we've talked about.

PA: *Okay, you've talked about electrification a few times. Is that basically the same as electricity 4.0, or what does it mean exactly? And instinctively one thinks electricity, we're back to energy, and it's not necessarily that sustainable, environmentally friendly? So electrification, if you give us an understanding of what it is and particularly the benefits that it's going to bring?*

SB: Yeah, absolutely. So electricity, again, when it's utilised as an energy source, is three to five times more efficient than comparable sources. So whether it's you need to turn a motor or move a vehicle, doing that with electricity is going to be a more efficient process than the equivalent with fossil fuel. And so EVs is again just the biggest

example in society, but by no means the only one. There are plenty of industrial processes that can move from fossil fuel dependency to electrification through motor control and everything else. So that's really that piece of it's a piece of electricity. 4040 is the vision around this digital electric at scale intermittency, being able to manage distribution systems intelligently to optimise demand and supply, being able to introduce consumers.

That is electricity 4.0. But critically, one piece of that is going to be electrifying processes that they are not electrified. So in a data centre, we obviously have for a long time been heavily dependent on electricity. We're primarily in electric infrastructure because we're deploying that to power IT equipment. But if you look at the gensets and some of the other infrastructure around it, and then your upstream supply, there are still plenty of opportunities to decarbonize and electrify those processes in the data centre.

PA: *And in terms of the overall picture, clearly people are moving towards various targets, as I say, and even 2050 net zero. But a lot of it is still people are talking. And then when you actually look at the plans to get there, it seems like we sit on our hands until 2045 and then cross our fingers that somebody's come up with an amazing invention or technology that'll get us over the line. So how frustrating are you finding it? And also, I know Schneider Electric, we're talking data centres, but you cover so many industries - do you lobby on a large scale government? Your thoughts as to how we can get more people on board with this idea you're talking about?*

SB: Yeah, well, and again, we question whether this is a key inflection point, this energy crisis. And just as a parallel, the global pandemic, there was a period of time when that was quite existential for all society and we wondered how society was going to keep moving forward. And the solution to that was digitization at scale. We zoomed into meetings, we went and we deployed digital technology to manage things remotely and we haven't stopped that. It was an inflection point towards digitization. So we are wondering, is this short term crisis, given that it's fundamentally aligned with the long term solutions for climate change, will this be the inflection point that we need to get through some of that frustration that you just pointed out? And on first blush, it looks like that's the case. We have over 80 governments, 80 countries making net zero commitments, covering over 90% of carbon emissions globally, and they've committed to almost $2 trillion of green stimulus in totality. So there are signs, if you look at companies, there are signs that this is a major inflection point.

We've seen the companies making science based target commitments, those verifiable validated commitments towards net zero go from just a couple hundred in 2018 to over 4000 this year.

So at Schneider Electric, we commissioned a report that interviewed over 500 C suite executives at companies with over a billion in turnover, which of course includes a number of data centre companies or digital infrastructure companies. And we were wondering how many are delivering on their commitments. And it turns out that a few actually are hitting their targets. In fact, the number could be as low as 12%, 15%, 8%, depending on exactly how you carve that. But it's certainly low double digits that are delivering on their targets.

And if you look at the challenges, a lot of them are fundamental around understanding of carbon science, the ability to track and report and audit on those. It's kind of what you would anticipate, which is a challenge to make this happen in reality, but not an insurmountable one. So we definitely want to advocate that. The time is now, the inflection point is here, there's not a silver bullet, just as we talked about the supply and demand side, two sides of the coin, but we're running out of excuses to not pursue anything, to not reduce deploy energy management solutions, to not electrify processes and to of course not manage the supply side.

So the infrastructure, the technology, the time is very much, very much now.

So we're lucky at Schneider Electric, our sustainability consulting arm works with half of the Fortune 500, for example, so they have a pretty good perspective on which companies that we discussed earlier are successful versus not, even if they're both pursuing aggressive sustainability targets

PA: *And for the data centre sector, I believe you've come up with a strategy which is strategize, digitise and decarbonize, if I remember correctly. So it'd be good if you can flesh out that approach, what it means again and how that will help companies improve their sustainability or get to their sustainability target?*

SB: So we're lucky at Schneider Electric, our sustainability consulting arm works with half of the Fortune 500, for example, so they have a pretty good perspective on which companies that we discussed earlier are successful versus not, even if they're both pursuing aggressive sustainability targets. And it really comes down to an integrated approach and that's that strategize, digitize, decarbonize piece.

So in data centres, for example, it starts with a comprehensive, bold actionable strategy, the most challenging piece of which is probably establishing baselines. So for so many people, understanding what is the true carbon impact of maybe just UT infrastructure throughout a corporation or in a data centre infrastructure, understanding your scope three emissions, understanding what the status of your PPAs are, that baseline is a key part to that comprehensive strategy.

And then you need to share and communicate that widely. Then you look at that decarbonized piece and it's what opportunities are there to shake out carbon on the demand side today? And there's plenty of examples across the three major domains in the data centre power building and it so whether that's exploring novel solutions on the power side, such as SF6-free switch gear – SF6 is a gas with 23,000 times more global warming potential than carbon dioxide, and it's often featured in switch gear. If you can remove that.

for decarbonization, but also how efficient and how effective are you running this data centre company? Just as an example, we've obviously invested a lot looking at these digital solutions. We think that companies aren't taking advantage of the scale that they need to as to digitising how they own, how they design, build and operate data centres. And one last piece on that, as we think about digital, there's green IT and then IT that can green. You know, obviously we're talking about digital solutions helping companies on their sustainability journey. Data centres are a fundamental piece of that. We're a huge part of the digital infrastructure. So in terms of our impact, of course we're deploying a lot of capacity, but how much of that capacity is saving carbon due to virtual meetings or automating and optimising grid demand in real time using AI that requires quite a bit of computing power? Those are just examples where it's almost like the data centre industry needs to be a little bit prouder of its contributions on that side as we look to deploy capacity to make these things happen.

The idea of a climate positive data centre is gaining a bit of traction. I know there's been district heating reusing waste heat, but there seems to be a renewed impetus

The technology is emerging at Schneider Electric, then suddenly you eliminate a lot of opportunities for leakage and damaging carbon footprint building site and mechanical infrastructure, high efficiency, high temperatures with water systems, and then, of course, plenty of opportunities around it to make sure that you're deploying, our term in Schneider is green premium products, products that are validated to be engineered to reduce an environmental footprint.

PA: *So Decarbonizing today, there's plenty of opportunities that aren't taken advantage of, that folks need to continue to pursue and then finally digitising. And that's that piece that comes back to optimising demand, but through a whole life cycle. So in data centres I alluded to earlier how it seems like we're ahead of other industries when it comes to PPAs. Cleaning up that supply either directly deploying renewables or procuring it virtually as an industry, we've done well on the supply side. Which means then that the bulk of your carbon over the lifecycle of data centre might be scope three emissions - that embodied carbon. How much carbon did it take for the concrete, for the steel, for the frame of the building, for the electrical infrastructure?*

SB: And for the first time, we kind of have the ability to have a digital twin through the whole lifecycle, really understanding from design into build and into operations what trade off you're making, not just

PA: *The idea of a climate positive data centre is gaining a bit of traction. I know there's been district heating reusing waste heat, but there seems to be a renewed impetus, if you like, of actually working out local data centre, maybe the waste heat being used for local swimming pools for example. Also just your thoughts on how much of an opportunity that is and also how radical, because clearly most data centres are on the edge of a metropolitan area, they've been there for donkeys years, so the ability to repurpose the waste heat isn't maybe that easy. But obviously, if you're starting with a blank piece of paper, it's a lot easier to focus on climate positive data centres. What's possible, but how radical will we need to be in terms of the legacy data centres as opposed to new ones?*

SB: That's a great question and obviously climate positivity in any industry, but certainly data centres is the ultimate goal. Can we build and construct and design and deploy and manufacture something that in the end is a net positive on the environment society? There are examples out there. This week we were talking about Eco Data Centre, for example, up in Sweden that's done a really good job of deploying that heat from the data centre so that it can go save energy in another process.

Deploying efficient equipment, driving that PUE down as low as possible. So certainly they stand out as just an example of where it is in fact positive

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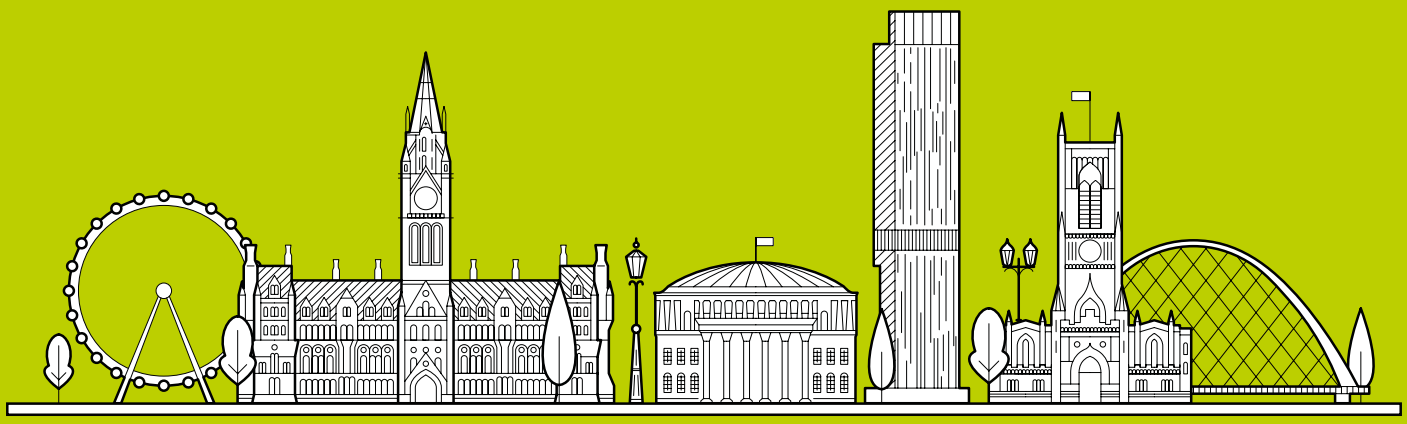

Managed Services Summit North (sister events in London and Amsterdam) are the leading managed services events for the UK and European IT channel. Featuring conference session presentations by major industry speakers, the Summit provides opportune networking breaks for delegates to meet with potential business partners. The unique mix of high-level presentations plus the ability to explore and debate the most pressing business issues with sponsors and peers across the industry makes this a must-attend event for any senior decision maker in the IT channel.

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or possible to pursue climate positivity. I think it's really important, though, to look at those legacy assets and recognise that while climate positivity might not be possible for that particular asset, that's not an excuse to delay or not deploy energy efficient infrastructure for data centres. There are tremendous opportunities, ranging from the deployment of monitoring, where it can help you either manage on a more granular scale tenants' energy consumption and colocation. It can help you optimise how you design or how you manage your data centre electrical infrastructure, whether it's retrofitting containment, some of the fundamentals that we think that perfect shouldn't be the enemy of good in that case.

So in many cases, there's no silver bullet. It's moving very quickly and deploying energy efficient solutions wherever possible. That's absolutely critical in this time, which will save you money on the short term in terms of this energy volatility environment and then, of course, on the long term help you reduce your carbon footprint as a data centre. But I do think that if you have that blank sheet of canvas where you can design from scratch if you're in a favourable environment, I think we should more and more take these into account.

When you're doing site selection as a data centre provider, where can you deploy a truly sustainable solution then, yes, there's almost an emerging responsibility to pursue the most efficient design as possible and that ends up being a big ecosystem play. We spend a lot of time with partners and consultants and contractors. It's really going to be as a community, recognising the imperative, working together to design solutions that are going to be climate positive in those environments.

PA: *Do you have any sort of thoughts or instinct as to whether huge hyperscale data centres, metropolitan ones, are more environmentally friendly than maybe local ones, which, as we say, can become part of a sort of circular economy more easily? And of course, we mustn't forget the data centres are there for a purpose, they're not there just to be environmentally friendly, but they're actually serving critical applications.. Any thoughts as to what a future data centre landscape might look like in terms of balance of huge, great facilities and more distributed ones?*

SB: In the end, if you think about what data centres are serving, it's critical workloads, it's enterprise, it's fun social media, it's a combination of stuff that's really central to our life. So think about the modern CIO, for example, of a large company. They're going to be managing IT that's truly hybrid. They're going to have a significant on premises footprint, whether that's in edge environments or in server closets.

They're going to have a lot of their own IT down to the mobile phones and laptops that they have to manage. They're going to have a significant footprint

in a retail colocation environment and then they're going to, of course, have a a cloud first posture. So they're going to be putting a lot of infrastructure in the cloud and it can be a huge challenge for that person to understand and map not only how much is being used or the assets, but also what is the true carbon impact of this equipment sprawling across these three environments. So more and more we need to think of the ecosystem of IT rather than the four walls of a data centre.

We're heading towards a hybrid world. Centralised, decentralised technology is getting so flexible to move workloads, and increasingly workloads are deployed where they make sense, not necessarily for that particular workload, not necessarily thinking about any downstream impact. And that's where digital can really support our industries top to bottom, from the consumer all the way back towards the electrical infrastructure at the centralised data centre, being able to map and track those assets, understand real time energy consumption and manage that. If you can't measure it, you can't manage it. Classic adage. And this is becoming increasingly difficult without digital.

So digital at scale, I think, will continue to be the biggest solution to understand, map and start your journey towards a sustainable IT infrastructure. But as far as the data centre industry as a whole, the big challenge for us is going to be speed, reliability and sustainability. On first glance, it looks like there are trade offs between those. You can only have two instead of all three. We need to figure out a way to deploy all three because that's what the world is asking of our industry.

PA: *I was going to just ask, in summary, the scale of the environmental challenge, if companies are finding it or they think they're finding it easy to get there, are they doing it wrong? Is there going to be inevitably some pain and some fundamental reengineering of long held beliefs? You have to throw out a certain amount of received wisdom and start again? And on the plus side, when people do embark on this journey and start making maybe significant changes, there are some significant benefits for the data centre industry in terms of heading towards commitments towards net zero? Do you think that is a realistic sort of objective or is it maybe better to take smaller, more realistic steps and then eventually net zero somewhere on the horizon, but not put yourself under too much pressure to get there by 2030, which I think certain people are saying they can do?*

SB: It's an important question. I think we certainly as an industry don't want to blunt any enthusiasm or effort by making bold statements around net zero. And given that, now that we've looked at that, the report I mentioned earlier, where there is a path that's challenging, but certainly doable, there's no one silver bullet. It's a combination of technologies, ecosystem design that's going to get us there. I think we do have a responsibility to continue charging ahead towards that.

As a data centre industry, we won't compromise on reliability, but I think that we can right size reliability for workloads at a bigger scale than we do today. We can look at efficient solutions out there that don't compromise reliability and we'll save you one, two, three, four percent of efficiency in your data centre, which in totality will make a significant impact. No, I don't think we need to dial down our targets at all.

I think we just need to sharpen the pencil and get a little bit more granular around these science based targets, what we're pursuing and how we're going to get there, because I think that's a step that's been missing, but the time and technology is now.

We've seen examples of it and at scale, we certainly can do it despite the challenges ahead.

- *This article is taken from the video interview between Steven Brown and Philip Alsop, which can be viewed on the DCS website.*

Designing for decarbonisation: A whole new species of data centre is emerging

While energy consumption remains a critical element of sustainability, the data centre of the future must consider more than power alone.

By Chris Pennington, Director of Energy & Sustainability at Iron Mountain Data Centres

THE MODERN data centre is the beating heart of the world's economy and demand for data is at an all-time high. With distributed computing increasing annually and the demand for hand-held data consumption and digital transformation across all aspects of modern life continuing unabated, the ways in which new data centres are being designed and constructed is evolving. Further, there is increasing awareness of the impact of digital infrastructure and climate change on our communities. As such, we are now going beyond just location and footprint, and seeing shifts in how data centres and the materials used to construct them are sourced, designed, used and decommissioned. We are creating an entirely new type of data centre, designed with sustainability and scalability in mind. In recent years, data centre operators have taken steps to enhance energy efficiency with the installation of innovative cooling processes, a greater focus on preserving natural resources, better monitoring of their emissions and adoption of renewable energy sources, with some operators already running on 100% green electricity.

However, as the clamour for reducing emissions within our supply chains increases, and with it the likelihood of increased regulation, we must consider how data centre operators can innovate to ensure that every new facility is designed for a decarbonised, interconnected future.

Sustainable by design

Modern construction techniques allow operators to repurpose existing materials and recyclable content, such as steel or aggregates, within site foundations to reduce the waste involved in construction.

Purchasing sustainably sourced materials from local suppliers will reduce an operation's carbon footprint. Focusing your design on energy efficiency and the standard of building materials used, as well as the management of natural resources, will help create a facility that takes the wider environment into consideration.

Closed-loop systems have gone a long way towards reducing the amount of fresh water consumed within data centres, allowing water to be continually treated and recirculated for cooling purposes. Mapping location temperatures and tracking local weather patterns can assist operators in monitoring their systems more carefully, reducing evaporative cooling. Rainwater taken from the vast roof of the data centre to be treated and used for other purposes. There is now no reason modern data centres should need to continually draw on fresh supplies of water in the volumes they once did. This is beneficial for locations affected by drought, and in terms of water scarcity more broadly.

Temperature control is another area of focus for sustainable design. Data centres are now far more likely to be kept at around 26 degrees, compared to the fridge-like conditions that were used previously. Hot and cold aisle containment allows operators to channel and control the heat within a data centre far more effectively. The more densely packed the racks are, the more efficient in-rack cooling will be in comparison to cooling the space around each server.

The rise of data centre activism

As humanity's reliance on digital products and services continues to grow, the need for physical infrastructure to enable this will also need to increase. Yet with restrictions on new data centre builds on greenbelt land, data centre operators must remember that existing brownfield sites are ripe for remediation. Operators have the expertise and capability to ensure that the site is responsibly managed, old equipment is properly disposed of, and any environmental contamination is closely monitored. In this approach, data centre development can set the stage for a net positive impact by remediating existing issues while creating growth opportunities.

Retro-fitting existing sites can be especially beneficial where there is increased demand for Edge Computing services with low-latency requirements, such as industrial IoT and autonomous vehicles. This type of data centre is often much smaller, can be located on the outskirts of cities, and is able to offer the speedy and accessible edge services the modern city demands, without impacting the local community. They can also be combined with other services, such as Asset Lifecycle Management (ALM), offering a way to fill redundant space with a complementary and much-needed service. Of course, with the importance of data sovereignty there will always be a need for those city centre facilities, but operators can take the initiative now to reduce the impact on over-congested locations whilst also achieving the maximum utilisation of their spaces.

Bringing the customer with you

Even if you design and build the most efficient data centre, if customers install old and inefficient servers it will impact the overall efficiency of the facility. Fortunately, customers are more familiar with sustainability these days, and will have their own environmental goals. This creates opportunities for collaboration to ensure the most efficient servers are used. In this way customers can keep costs manageable, and operators can better measure performance metrics and track maintenance requirements. In the case of operators with ALM offerings, customers can often find strong cost-based benefits encouraging them to recycle older equipment, with greener replacements often having far lower running costs due to improved efficiencies and funded in part from the re-sale of older technologies.

There will always be improvements as technology advances and data centres become fully sustainable and self-sufficient, but the roadmap is now firmly in place and taking shape. The data centre of the future will be carbon neutral and powered fully by natural energy sources including wind, solar, tidal, and possibly backed up by battery storage alone, rather than diesel. Self-diagnostic data halls will predict maintenance issues and flag when equipment is due to expire, alleviating the need for preventative maintenance engineering.

Customers will be contracted on their actual loads and with equipment so advanced and modern, operators will be able to accurately predict and project power load requirements, allowing data halls (secure, fully walled spaces within a data centre containing server cabinets of various sizes) to be designed to the actual need rather than oversubscribed with lots of stranded power. The average lifecycle of equipment will also be aligned with the average customer contract length, as design standards improve, aligning commercial terms with the circular economy.

Finally, data centres will provide far more value to their local communities, for example through heat source recovery to improve local grid resiliency or even reduce local costs of electricity. Today, latent heat generated can be piped into schools, hospitals, libraries, leisure facilities and even vertical farms, to ensure that this valuable resource is not wasted. In Sweden for example, waste heat is already being utilised intensively in district heating networks. The data centre of the future is not as far away as we once thought.

Is CFD accurate enough to design a data centre?

Computational Fluid Dynamics (CFD), used by professional designers. It creates an initial representation of the expected airflow within the data center. CFD models the heat exchanges between the IT equipment, the air and the cooling equipment. Designers use CFD to predict the optimal placement and size of cooling systems.

By Gabriel St-Pierre Lemieux, PhD Chemical Engineering, AKCP

CFD utilizes on well-known equations and is precise in simple applications. A useful CFD analysis requires an accurate model of the physical layout, a prediction of the heat loads and validation of the model. The parameters used to create the models are important. They usually include the power usage and cooling capacity. In the traditional approach, while planning the data center, the model relies on estimated values for parameters such as the kW per rack and CRAH capacity. Those values are usually determined by the engineer's best guess. This is fine for checking if the design meets maximum capacity requirements and placing the CRAH units for optimal airflow.

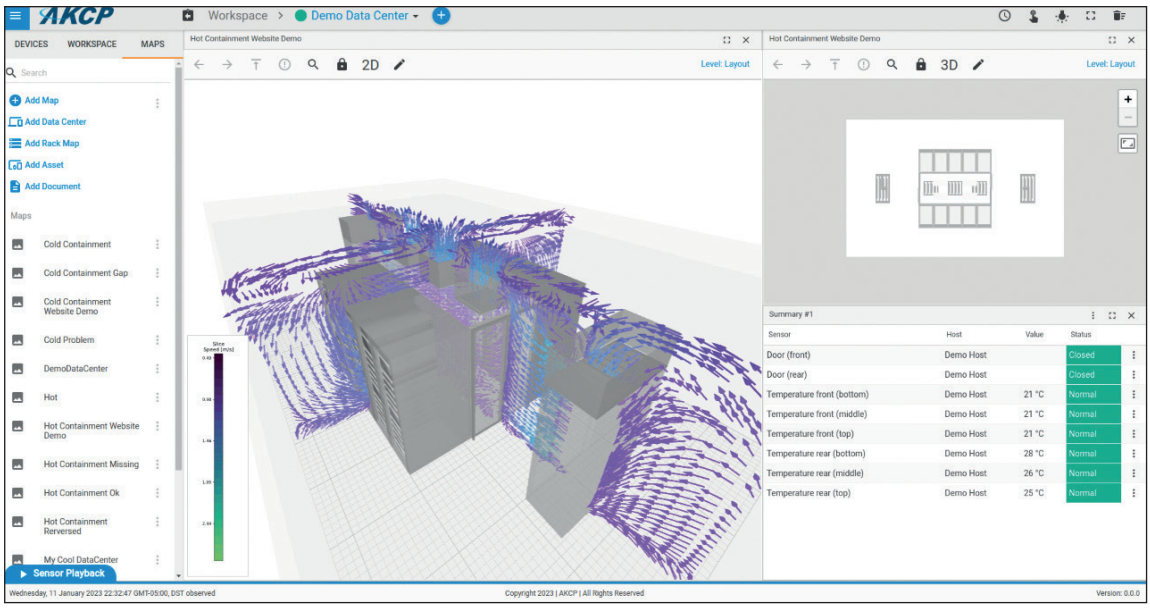
However, an operational data center isn't a static system. It's dynamic. Server loads continually change. CRAH units don't always run at capacity. The fans speed up, slow down or become used and dirty. Blanking panels can be missing, containment not sealed properly, air is pushed in different directions. The built solution doesn't match the CFD parameters. This leads to a model that doesn't represent the actual performance of the data center.

The Difference Between sensorCFD™ and CFD sensorCFD™ doesn't replace CFD. It merges CFD with live sensors for a more accurate model. An ideal deployment begins with CFD, then uses sensorCFD™ in a validation process. sensorCFD™ runs continually, measuring, analyzing, and reporting the health of the data center cooling.

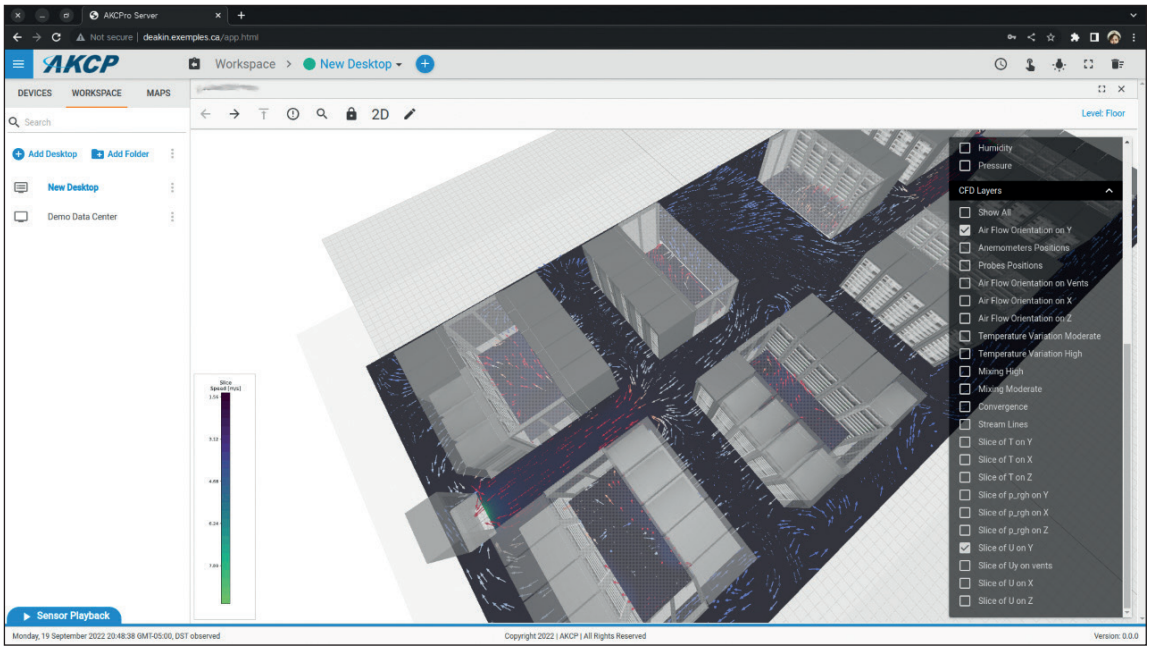
Operational Data Center CFD

The CFD model for an operational Data Center needs to undergo a process known as validation. Sensors placed in strategic locations capture the temperatures, power per rack and airflow. This information verifies that the CFD model is correct. Thermal maps from AKCP are ideal for validation. They monitor the inlet and outlet temperatures of each rack, at the top, middle and bottom. Combined with non-invasive power meters and air flow sensors, an evaluation of the airflow and the heat exchanges in the data center is performed.

Wired or wireless sensors may be used. For extreme security, battery operated, wireless



➤ Figure 1. Hot aisle containment with sensorCFD™



➤ Figure 2. Airflow around a data center in AKCPro Server, produced by sensorCFD™

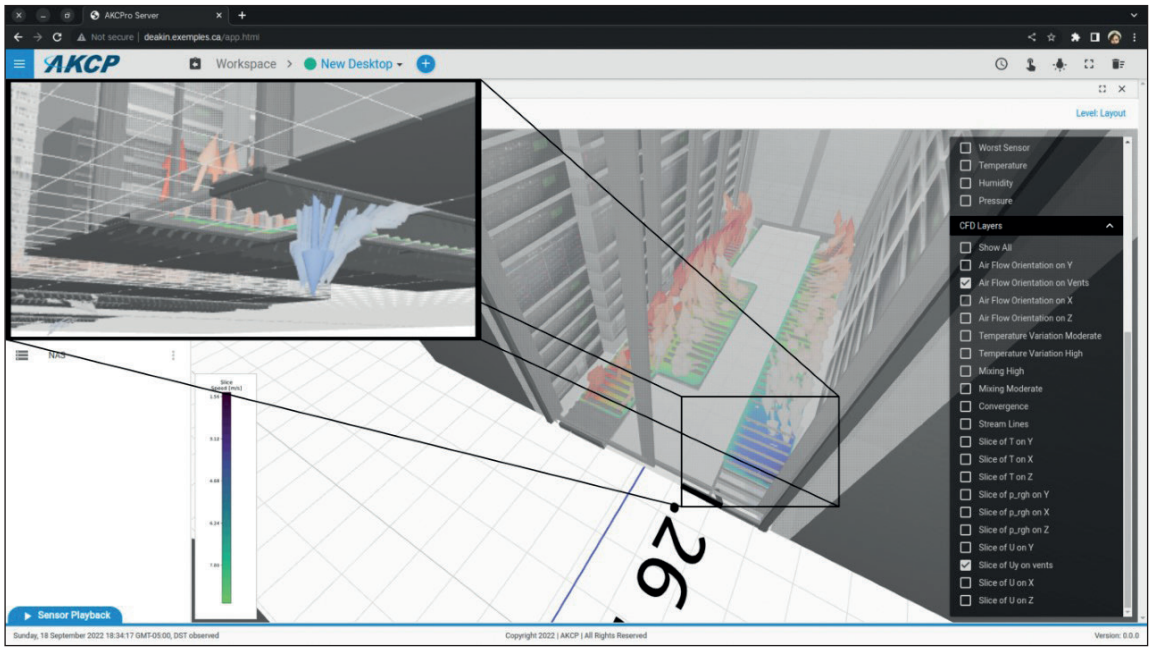
sensors connect directly with the engineer's laptop. Data is recorded without any interaction with the data center network or power. For permanent installations that run continuously, wired sensors are preferred. sensorCFD™ can use servers located in the data center to compute accurate CFD models in a loop. Depending on the complexity of the model and the power of the computer, a CFD model can be completed in under 2 hours. A comparative analysis of earlier models produces a report showing the change of efficiency over time. The CFD model can even locate the problematic area. In real time, data center efficiency is maintained lowering cooling costs.

Identifying Problems and Increasing efficiency

- Locate stranded capacity, areas that are over cooled
- Identify hotspots, and relocating CRAH units
- Incorrect containment, areas of mixing air
- Rebalance the air handling units to improve the airflow
- Observe the impact after a change (eg: after adding blanking panels or changing openings in the floor tiles)
- Compare results with the prediction of CFD analysis

Conclusion

CFD is a powerful design tool, but it needs validation. Professional, wireless validation test kits check and improve CFD models. These test kits should be easy to install and relocate, low cost, and integrated into CFD programs. For temporary installations, secure, battery operated, wireless test kits should be used. For permanent, continuous validation, wired solutions are optimal.



➤ Figure 3. Air mixing, displayed by sensorCFD™

Key network considerations to make your data centre white space fibre network SAFER

This article explores the exponential growth of cloud computing, its impact on data centre infrastructure in the hyperscale and colocation spaces, and how you can best utilize your white space to drive optimal fibre network function.

By Gary Mitchell, Marketing Director for AFL Hyperscale

THE EXPONENTIAL GROWTH and adoption of cloud computing is having a significant impact on the white space infrastructure of hyperscale and colocation data centers. As more and more companies switch to hyperscale cloud computing for its speed, reduced downtime losses, easier management and scalability based on demand, the demand for data center space is skyrocketing.

According to Gartner by 2026 global cloud spending will exceed $1 trillion and will outperform all other areas of IT spending, putting great pressure on cloud hyperscalers to deliver on their promises of cost effectiveness and reliability to the market, whilst still effectively managing their own requirements, with sustainable practices, in a cost-effective way.

The result of this increased demand has driven data center technologies to offer ever increasing compute, network and storage resources in much smaller physical footprints, leveraging virtualisation and automation technology to deliver highly efficient resource utilisation, higher levels of redundancy and a high degree of workload mobility. This requires that data centers implement cabling solutions that are offering higher bandwidth density in increasingly smaller footprints, more efficient cable runs and ever-increasing degrees of modularity, enabling the underpinning white space infrastructure within these environments to meet the growing demands placed upon it, in terms of flexibility, futureproofing and non-disruptive operation.

Essentially, white space infrastructure is becoming increasingly complex to manage through traditional methods, and data centers are looking for new and innovative solutions to manage this complexity and ensure the reliability and scalability of their networks.

Delivering SAFER networks

The SAFER methodology is a comprehensive approach to designing and building white space infrastructure in data centers and offers a guiding set of principles through which data center operators can evaluate their current infrastructure state, whilst guiding planning and decision making as to how they make their infrastructure choices going forward; It stands for Sustainability, Accessibility, Flexibility, Expandability and Reliability.

Sustainability: The design, build and operation of data centers with an emphasis on energy efficiency, minimising waste and the general reduction of environmental impact. This can be achieved using energy-efficient equipment and the implementation of recycling and waste reduction programs. Getting the data center physical layer right will assist sustainability by supporting multiple speed migrations even if active equipment is changed or updated.

Accessibility: Ease of access to the data center's infrastructure, including the ability to easily service and maintain equipment. This can be achieved through the use of modular connectivity and labelling of equipment, as well as the use of innovative patch cord latching and uniboot assemblies.

Flexibility: This refers to the ability to easily add, remove and reconfigure equipment without disrupting existing connections. This can be achieved using high-density network areas and on-rack and off-rack housing options.

Expandability: This pertains to the ability to easily expand the data center's infrastructure as needed. This can be achieved through the use of high-fiber count cable technology and modular connectivity platforms in high-density network areas.

Reliability: This pertains to the ability of the data center's infrastructure to withstand potential disruptions and maintain continuity of operations. This can be achieved through the use of redundant systems and the implementation of disaster recovery plans.

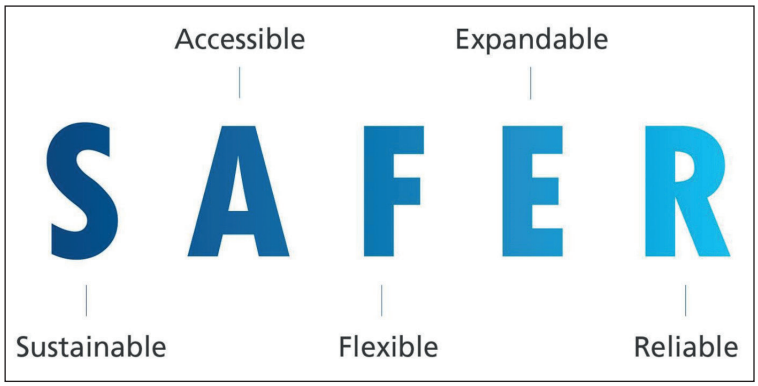
By utilizing the SAFER methodology, data centers can ensure that their white space infrastructure is designed and built to be energy-efficient, easily accessible, flexible, expandable and reliable.

Sustainability

Sustainability is a critical consideration for any modern data center. With the increasing focus on reducing energy consumption and carbon footprint, it is important for data centers to have a comprehensive approach to sustainability that goes beyond just power and cooling. One key area to consider is the passive network infrastructure and supply chain.

A sustainable data center starts with selecting a proactive strategic partner. This means selecting a supplier that not only delivers products on time and at a cost, but also has a strong commitment to sustainability. This includes not only short-term initiatives but also long-term strategies to reduce environmental impact.

When selecting a white space infrastructure supplier and evaluating their proactivity in sustainable practices. There are two key categories we should evaluate:



"Cradle to gate" refers to the environmental impact of a product from the point of its raw materials extraction, through its manufacturing and distribution, up until it reaches the customer or end user. This includes the energy and resources used in the production of the product, as well as the emissions and waste generated during that process.

"Gate to grave" refers to the entire lifecycle of a product, including its use and disposal. This includes the use of resources and energy while the product is in use, as well as the end-of-life disposal methods and the impact of those methods on the environment. This aspect of sustainability focuses on ensuring products can be recycled or disposed of safely and responsibly, rather than ending up in landfills or causing pollution. It's a holistic view of the product life-cycle.

For example, sourcing materials from environmentally friendly suppliers, reducing packaging materials and eliminating single-use plastics from products are all examples of this process. Additionally, the development of modern flexible ribbon technology allows for high-density fiber optic cables that use less materials and have a smaller carbon footprint during transportation. Another important aspect of sustainability in the data center is product optimization to aid sustainable

practices when in operation. This includes designing products that have a longer lifespan and can be easily repaired instead of replaced. High-density modular platforms with interchangeable fiber cassettes, for example, can support multiple technology lifecycles, reducing the need for hardware replacement.

By implementing sustainable practices in the supply chain and product design, data centers can not only reduce their environmental impact but also save money in the long-term. Additionally, as more and more businesses become environmentally conscious, investing in sustainability can also improve public perception and increase brand loyalty.

Accessibility

Accessibility refers to the ease of access to different components and systems within the data center, such as cabling, servers, and other equipment, and it plays a crucial role in ensuring the reliability, scalability and sustainability of data centers.
One of the key considerations for accessible white space cabling infrastructure is effective cable management systems. These systems allow for easy identification and access to cables, as well as organization and routing of cables to minimize clutter and improve airflow. This not only improves the overall performance of the data center, but it also makes it easier to diagnose and repair any issues, reducing the need for costly downtime and maintenance.

Another important consideration is the use of color-coding, labelling and other identification methods to easily identify and locate specific cables. This ensures that any issues can be quickly and efficiently resolved, minimizing downtime and improving the overall reliability of the data center. Additionally, adequate space and pathways for cable runs, including the use of cable trays, ladders and other cable management solutions, are necessary to ensure cables are properly supported and protected.

In order to ensure the long-term sustainability, reliability, and scalability of data centers, it is also important to use modular and scalable cabling solutions such as patch panels, which can easily be added or removed to accommodate changes in infrastructure or future upgrades. High-density cabling solutions that allow for more cables to be run in smaller spaces, while still ensuring proper performance and signal integrity, are also a must.

Flexibility

As data centers continue to evolve and adapt to the ever-changing technology landscape, one thing remains constant— the need for flexibility. With the pace of adoption of technologies such as AI, Big Data and heavily virtualised and automated workloads, organizations must be able to quickly and easily adapt to changing demands, whether it's adding capacity for more complex computing tasks, improving network reliability, or reducing downtime.

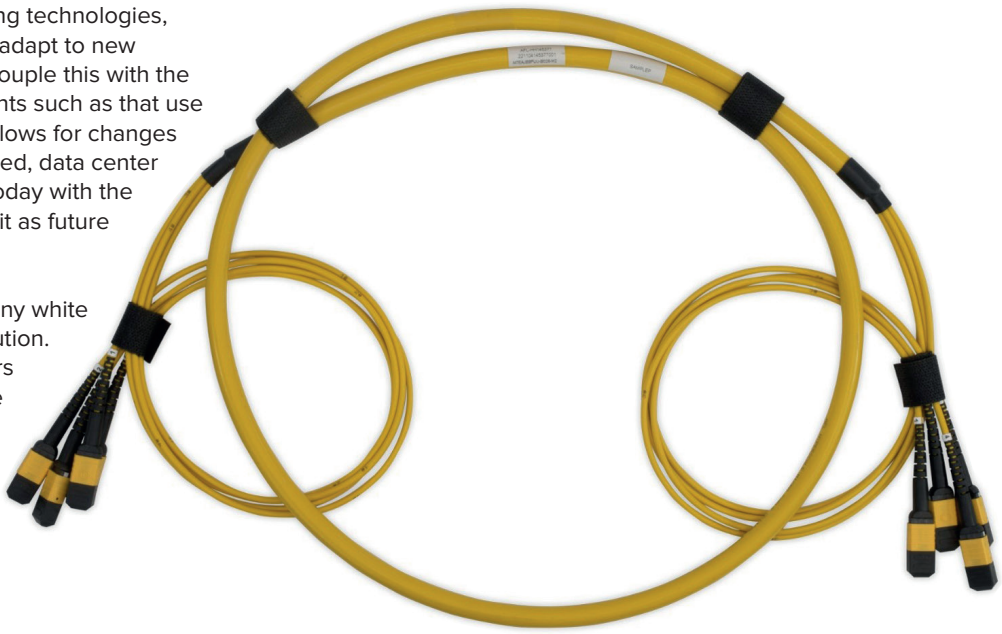
Increasing levels of commoditisation of cloud services mean cloud providers are offering ever increasing degrees of flexibility for on demand services at ever decreasing costs. It is essential to have the ability to easily add capacity and move workloads around within the data hall to ensure the right workloads are being serviced by the right infrastructure at the right time to ensure optimal cost of service delivery. This is where a flexible white space infrastructure cabling approaches come into play, enabling data center operators to ensure they have a high performance and flexible foundation to enable high degrees of workload mobility.

Modular housings that accept different cassettes for different applications or technology improvements ensure that this foundation is minimally impacted by compatibility issues when having to address technology options or cabling form factors. For example, choosing housing that facilitates easy changes and adaptions of different cassettes as networks speed change allows organizations to scale up or down as needed, without the need for additional investments in hardware.

The ability to operate a data hall that is tidy and clutter free also relies on the ability for data centers to have high degrees of flexibility in the length and termination options with respect to cabling options. There also needs to be the ability to specify customized cable and assembly lengths from suppliers to suit specific requirements. This includes high-fiber assemblies with distribution options to push rich fiber interconnectivity across the data hall.

Leveraging small form factor connectors such as MPO or single fiber connectors facilitate high degrees of flexibility whilst ensuring improved density and connectivity speeds that can support

both new and existing networking technologies, allowing organizations to easily adapt to new technologies as they emerge. Couple this with the use of highly modular components such as that use of modern flexible ribbon that allows for changes to the number of fibers' connected, data center operators can build a network today with the confidence that they can adjust it as future demand patterns change.



Flexibility is a crucial aspect of any white space infrastructure cabling solution. By choosing a solution that offers modular housings, custom cable and assembly length, small form factor connectors, and highly modular components, organizations can easily adapt to changing demands, improve network reliability, and reduce downtime.

Expandability

The ability to expand and to do so non-disruptively is becoming increasingly vital within the modern data center. You never know when a new emerging technology is going to disrupt the market and drive a hungry new workload which drives the need to expand your infrastructure capacity. Forward thinking is crucial when considering expandability and is key to being adaptable in the face of new and often unpredictable workloads and with minimal disruption to existing workloads.

There are a few key factors when considering expandability, primarily those factors include modularity and space optimisation. Modularity is a big factor in futureproofing white space infrastructure and the ability to leverage modular housing and cassettes to support increased fiber densities and higher throughput is a critical part of optimising rack space when expanding capacity to support new and demanding workloads on the network. Optimal use of real estate can be also aided through the use of cables and connectors that deliver reduced physical dimensions, reducing their footprint in cabinets and racks, thus allowing data centers to ensure available space can be reserved for future cabling expansion.

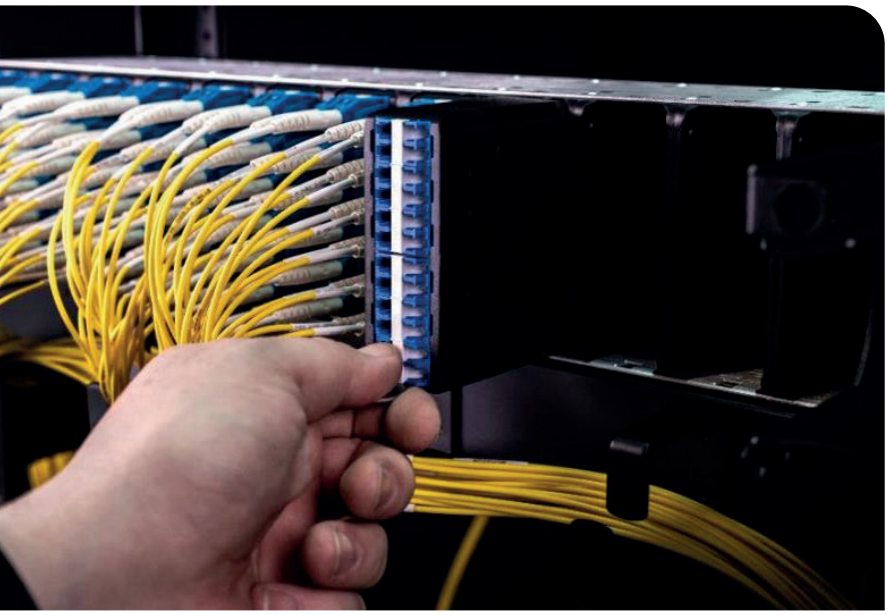
In practical terms, this essentially includes all of or combinations of smaller form factor cable termination such as single cable termination or MPO which allows for higher fiber density within the same footprint as traditional LC termination, reduced diameter jumper cabling where possible and deploying technologies such as MPO Base-16 which can consolidate multiple lower throughput connections over high bandwidth 16 fiber trunk cabling, in doing so, allowing for rack and cabinet interconnectivity of up to 1.6 TB/s within vastly reduced cabling overheads.

Modern cabling solutions with flexible ribbon allow data centers to provide the highest amount of ribbon fibers in the smallest space possible, resulting in more fibers deployed in the same splice frames, cabinets, and racks. This ensures that organizations can add more fiber than they need.

These measures enable data center operators to ensure they are capable and ready when dealing with the ever-increasing demands on network performance without the runaway complexity of managing a reactive, non-optimised architecture that isn't futureproofed and expandable by design. When it comes to data center infrastructure, the ability to expand and scale quickly is essential.

By using a scalable white space infrastructure cabling approach, organizations can easily add capacity, accommodate new customers and services, and be ready for future growth.

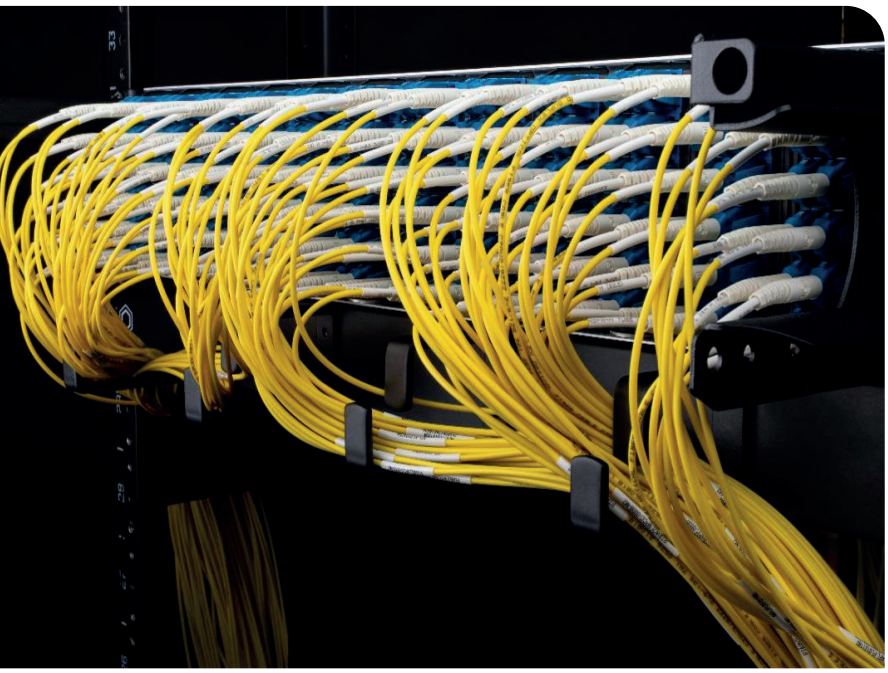
Modern cabling solutions with flexible ribbon allow data centers to provide the highest amount of ribbon fibers in the smallest space possible, resulting in more fibers deployed in the same splice frames, cabinets, and racks. This ensures that organizations can add more fiber than they need



Reliability

Reliability is a crucial aspect when designing for white space cabling infrastructure in the data center. With the increasing adoption of technologies such as AI, Big Data and highly virtualized and automated workloads, organizations must ensure that their data center networks can remain available even in the face of unexpected disruptions, attacks, outages, hardware failures and human errors.

Not only this, as we see higher degrees of virtualisation and automation in the data center, we move ever closer to the reality of AI powered and orchestrated data centers leveraging software defined infrastructure at all levels, all this innovation is rendered useless if the interconnecting fabric that is the white space cabling is the weak link in the chain.



One key consideration for achieving reliability in white space cabling infrastructure is to build in network redundancy. This can be achieved by using multiple redundant paths for data transmission and by using high-density cabling solutions that can accommodate large numbers of fibers within a small footprint. By doing so, organizations can ensure that their data center networks remain available even in the event of a failure or disruption, without causing any loss of service.

Another important consideration for ensuring reliability in white space cabling infrastructure is the use of test and inspection equipment. This equipment is essential for ensuring that everything is clean and tested correctly after initial network commissioning, to ensure a reliable service. By using advanced test and inspection equipment, organizations can identify and address any issues before they lead to network failures or disruptions.

Also consider the use of high-performance cabling solutions in white space cabling infrastructure. These solutions should be high-density yet low-loss, supporting high fiber counts in data center environments while reducing insertion losses.

Additionally, by selecting solutions that have been rigorously tested and certified by industry standards organizations, organizations can have the confidence that their data center networks will meet the high-performance requirements of today and in the future.

Data center operators should ensure cabling and connectivity products have been certified to the highest industry standards and also ensure clean and reliable cabling installation practices are followed for peace of mind.

Summary

The future of data center infrastructure is closely tied to the growth of technologies such as AI, cloud computing and workload virtualization. Organizations must be able to adapt to these changing requirements in a timely manner to ensure the continued availability of their networks.

The SAFER methodology provides a comprehensive approach for organizations to plan, operate, deploy and maintain their white space cabling infrastructure to meet these future demands. It enables organizations to deploy flexible and scalable architectures, avoid costly disruptions, and to do so with sustainability in mind.

In order to stay ahead of the curve and meet the ever-evolving needs of data center infrastructure, it's crucial that organizations partner with innovative cabling solution providers that continuously develop advanced, scalable solutions using sustainable practices. Choosing a partner that innovates will ensure you deliver a SAFER network.

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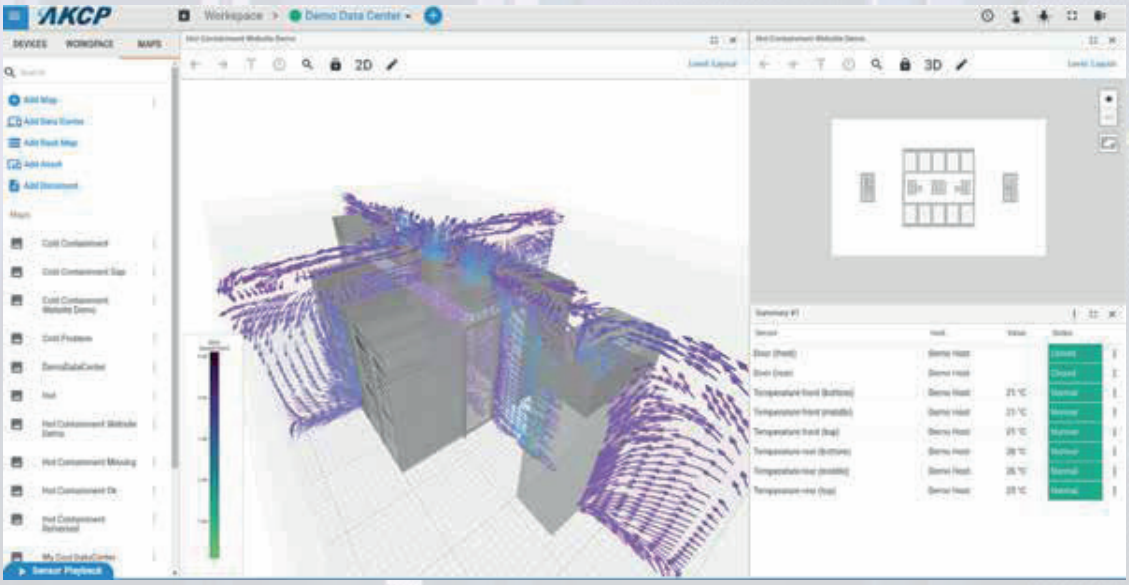

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Catalysts for content

Terrestrial and subsea cables provide the foundation for the development of a digitalised world.

By Brendan Press, CCO at Gulf Bridge International (GBI)

IN MANY WAYS, global society sleepwalked into the digital age without notice. From the way we work, to how we communicate and spend our free time, our reliance on data is ever-increasing. However, we often take for granted the complex technological networks underpinning every click.

Nobody knows this better than over-the-top (OTT) service providers, including the likes of Google, Microsoft, Netflix, Meta, and Amazon, who allow us to access streaming and downloaded content through internet-connected devices.

But as we consume more, we also expect higher speed, uninterrupted connections. To meet these growing demands, OTT providers must strategically consider infrastructure, and the critical role of data centres and global connectivity cables as the missing pieces in the puzzle.

Over-the-top and under pressure

OTT providers occupy a central role in the ongoing transformation of digital communications. As the demand for online streaming services continues to rise, these providers are at the forefront of meeting the ever-increasing expectations of consumers. However, with this comes a tremendous amount of responsibility.

One of the main challenges faced by OTT providers is the exponential increase in demand for data – demand for international bandwidth is nearly doubling every two years. With more people streaming video content than ever before, the amount of data being consumed is growing at a rapid pace.

This is especially true during major events such as the FIFA World Cup, which consistently leads to a surge in streaming and media consumption. For instance, during the opening game of the tournament viewership of the event increased by 109% when compared to the previous two tournaments.

These demand surges place unprecedented pressure on content providers, forcing them to increase capacity to meet the needs of end users across the world.

However, such pressures go far beyond just data quantity. Modern consumers are increasingly tech-

savvy, looking for a hyper-personalised experience when using online services. Not only do they expect their connection to be delivered at high speed, but consumers rely on smooth, uninterrupted connections guaranteed by low latency rates.

To remain competitive, content providers must continually invest in their infrastructure to maximise both the efficiency and reach of their services – of which the size, quantity, and location of their data centres is highly important.

Powering the content revolution

Data centre facilities are responsible for storing, processing, and delivering massive amounts of data across the globe. And, as the OTT media landscape diversifies in line with global trends, data centres have become an integral player in the telecommunications industry over the last several years. This is only predicted to grow – according to research from Gartner, data centre expenditures were up 11.4 per cent in 2022, totalling $226 billion.

A significant factor in this growth is global investments in new technologies such as the Internet of Things (IoT), the Metaverse and artificial intelligence (AI). Such technologies operate best on low-latency connections, which can only be enabled by the availability of data centres located close-by. For this reason, businesses are now choosing data centre operators with a diversity of offerings best suited to their market-specific needs. Evolving global media trends have prompted significant advancements in data centre technology, allowing them to be rolled out closer than ever to the end user. As a result, OTT providers can no longer overlook the competitive advantage offered by data centres.

Equally, variations in demands for data intensity has led to a variety of cloud-based and edge-enabled offerings which, in each case, generates greater demand for these services.

Connection below the surface

As OTT providers seek to gain a competitive edge by closely collaborating with data centres, it's important to note that these centres are intimately linked to the global network of connectivity cables.

These cables traverse vast distances (approximately 1.4 million kilometres) across continents, serving as the backbone of our interconnected world and supporting the digitalisation of societies worldwide.

In addition to enabling global connectivity, such networks also add a vital layer of redundancy to the content ecosystem. This redundancy provides data centres – and the content they hold – with multiple pathways for traffic, ensuring that data processing remain operational even in the event of an outage of one route. In a sector dependent on constant movement of and access to information, OTTs increasingly see the importance of last line of assurance, working with operators offering redundancy tailored to their specific needs.

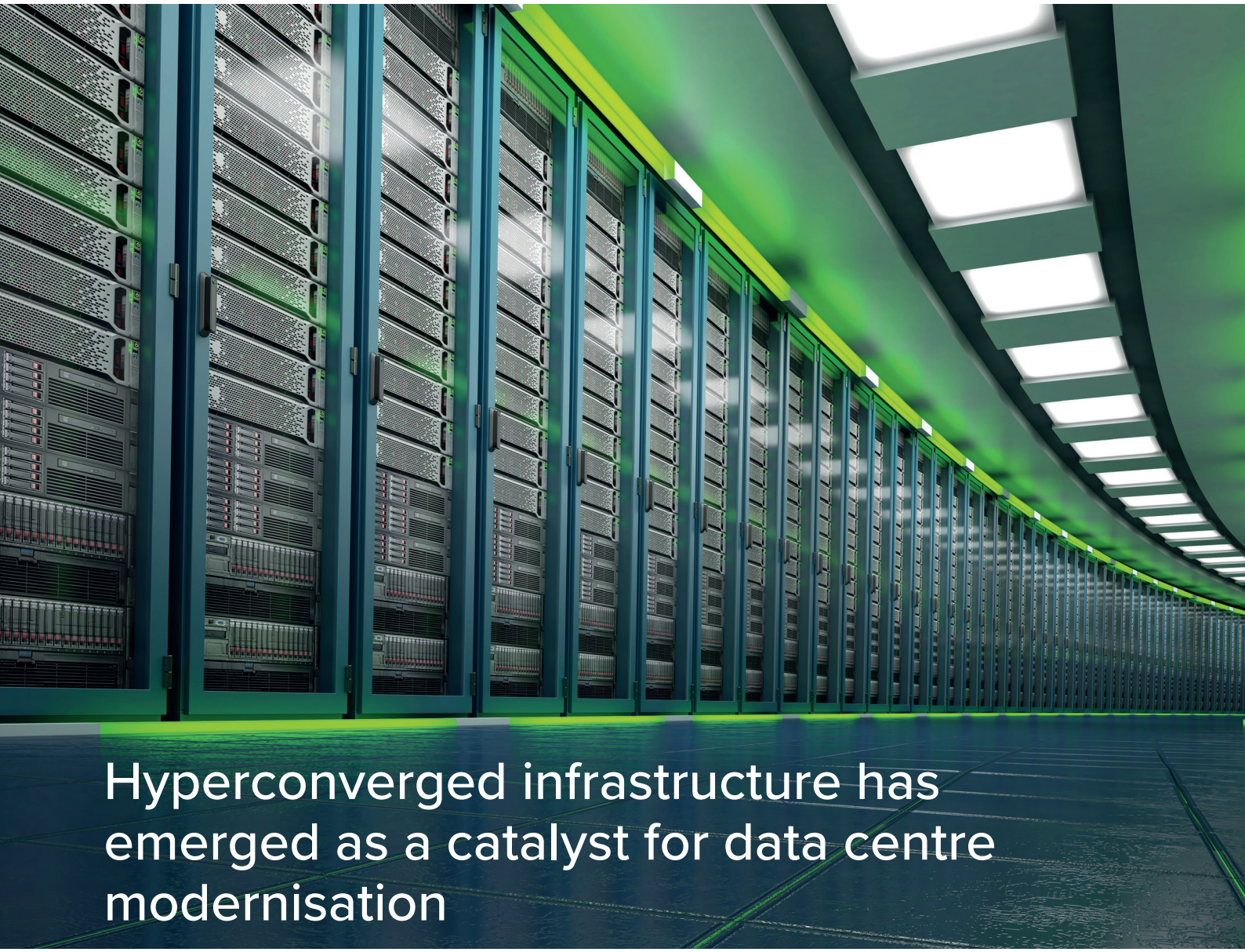
With their ability to safeguard against disruptions, subsea cables are a critical component in maintaining the stability and resilience of our interconnected world. For OTT players and data centres, they form the bedrock of unlocking the next generation of global content creation.

The data triumvirate

Data demands will continue to rise, resulting in the increasing presence of OTTs. In turn, this will generate the need for data centres, especially in regions currently undergoing digital transformation on a massive scale. The future of cable investment and innovation therefore looks ripe, with each player in the carrier industry dependent on the other.

And with the current hype surrounding emerging technologies such as AI, OTTs will face mounting pressures to drive down the latency of their services, advancing their competitive offering even in the most developed markets.

For this reason, we will also see a lateral trend, with cable networks and data centres operating at the edge – providing the glue which hold the data ecosystem together.



Hyperconverged infrastructure has emerged as a catalyst for data centre modernisation

In this data decade, organisations are looking to get the most out of their data, developing technological breakthroughs that, one way or another, everyone will experience and benefit from. The more effectively an organisation can harness the power of this data, the better – to ensure it can adapt to fast-changing markets and customer dynamics.

By Tim Loake, Vice President, Infrastructure Solutions Group, UK at Dell Technologies

TO ENABLE THIS, organisations must simplify and automate their IT infrastructure while consolidating systems and services into holistic solutions that will allow more control and clarity. We cannot enable the digital leaders of the future by using the technology approaches of the past; IT needs to evolve to provide a foundation that accelerates digital innovation.

Hyperconverged infrastructure is proving to be an excellent fit for today's datacenter challenges

Hyperconverged infrastructure (HCI) has emerged as a solution to the slow deployment and complex management of IT in the traditional economy.

According to Fortune Insight, the global HCI market is projected to grow to $32.19 billion by 2028 at a CAGR of 24.9%. This striking growth rate is happening because a large and growing number of companies are deploying HCI solutions to run a

mix of workloads, including those that are deemed mission-critical.

HCI was initially aimed at fast deployment, simplified management and improved IT responsiveness. However, it has since advanced to meet digital transformation needs, delivering efficient modern industrial Internet applications while enabling staff empowerment, global collaboration and clustering across industries.

HCI has evolved and upgraded from the "old three layers" (compute, networking and storage) to the "new three layers" (cross-architecture, hybrid multi-cloud and application innovation).

The new hyperconverged platform integrates the three layers of traditional IT architecture and provides prior configuration and optimisation according to user requirements. As a result, this enables rapid deployment of IT and simplified IT operations and maintenance management procedures and costs.

As organisations arm their on-premises clouds to support and optimise IT infrastructures for multiple cloud types, they are looking for solutions that provide optimal performance, flexibility and, ultimately, management consolidations and simplification - all of which HCI offers. We expect to see more organisations turning to HCI as operational hubs for multi-cloud approaches, prompted by the need to ensure that data and workloads are stored and managed in environments to suit the changing needs of the business.

Additionally, the rapid implementation of 5G, the Internet of Things (IoT), and Artificial Intelligence (AI) is spurring data growth at an incredible rate and changing the data game in terms of speed and accessibility. This growth, however, comes at a cost, as it is expensive and cumbersome to bring the entirety of this data on-premises.

The new hyperconverged platform integrates the three layers of traditional IT architecture and provides prior configuration and optimisation according to user requirements. As a result, this enables rapid deployment of IT and simplified IT operations and maintenance management procedures and costs

Organisations should instead adopt a "hub and spoke approach," where they take in data at edge locations, glean insights and take only those insights back to the core hub to act on them.

The modern HCI systems available today represent a new phase of data centre convergence that fundamentally differs from these early iterations and drives unique business value benefits. Broadly speaking, hyperconverged infrastructure deployments can help drive lower capital costs, increased operational efficiency, reduced risk, and lowered data centre facilities costs.

As more businesses look to modernise their infrastructure, generate IT efficiencies and reduce IT costs, it's no surprise that HCI continues to gain traction. What was once a solution targeted at remote offices and branch locations is now being deployed across core, cloud and edge because of its simplified operating model and ability to address almost any workload. The simplicity, scalability, and agility of HCI continue to be a catalyst for data centre modernisation and helping businesses transform their IT operations.

Hybrid cloud environments require a new security playbook – here's why

The popularity of hybrid cloud is exploding, with the global market for this technology set to rise to $145 billion by 2026. For businesses, hybrid cloud environments bring numerous benefits in terms of agility and scalability, as well as driving cost efficiencies. But when it comes to security, hybrid cloud requires a specific approach to keep on top of possible vulnerabilities, due to the flow of data from both public and private environments.

By Massimo Bandinelli, Aruba Enterprise Marketing Manager

NOT ALL IT decision-makers realise that protecting a hybrid cloud environment demands a different set of considerations than say, securing their public cloud solution. For instance, businesses going down the hybrid cloud route should pay special attention to protecting data in flight, ensuring supply chain security and even preventing physical security breaches.

Let's take a closer look at why addressing these security risks is particularly crucial in hybrid cloud environments.

Protecting data when it's in motion

Data is at its most vulnerable when in motion (being transported either within or between systems). It's at this point when businesses are most likely to suffer 'man-in-the-middle' attacks, ransomware and data theft.

If they're not configured correctly, hybrid cloud environments are particularly vulnerable to these threats. That's simply because data moves between different systems and environments more frequently in a hybrid set-up.

The answer? Encryption. Converting data into an unreadable format before it's either transferred or stored in the cloud is a no-brainer – especially for businesses handling sensitive personal or financial information.

This way, even if bad actors manage to successfully access the data, it remains unintelligible.

It's also widely accepted that simply having encryption in place can make businesses a less attractive target for cyber criminals – as criminals know that they won't be able to use stolen data, even if they do manage to exploit a vulnerability.

Supply chain security

Hybrid cloud environments often include software

applications from multiple vendors, working together in a complex, integrated ecosystem.

This has created a lucrative opportunity for cybercriminals, who are targeting SaaS/IaaS/PaaS vendors with the aim of accessing their customers' networks. This is known as a 'supply chain attack'.

Think about it this way. Why would a criminal spend time trying to steal hotel keys from individual guests, when they could steal the cleaner's master key and gain access to hundreds of rooms? The same logic applies here. One successful vendor breach can offer a 'master key' to thousands of end-users.

Businesses implementing hybrid cloud infrastructure should be aware of supply chain attacks. In general, the best way to prevent these is to adopt a zero trust architecture – which works on a 'never trust, always verify' model. And to give all users the bare minimum level of system access required to do their job. As well as this, businesses can make use of strong authentication to better protect their systems from attacks and exploits.

Physical security

Hybrid clouds are made up of a patchwork of the following environments – public clouds, private clouds, on-premises data centres and edge locations. Businesses shouldn't forget that all these environments need to be physically, as well as virtually secured. The fact is that data breaches do occur outside of the digital sphere. The physical insertion of ransomware, which can lay can remain unnoticed until activated at a later stage, is a prime example of this.

Data centre providers tend to have robust security measures in place at their facilities – such as biometric authentication, CCTV, anti-intrusion sensors, and bollards. But this level of diligence doesn't extend to many on-premises facilities, which tend to be more vulnerable.

And so much more...

Of course, there's a huge range of security considerations for businesses to bear in mind as they implement a hybrid cloud infrastructure. Fundamentally though, with the right strategy in place - such as network segmentation, regularly run VAPT, and usage of EDR software - businesses should be aiming for a higher level of security than with their existing on-premises or public cloud infrastructure.

Looking forwards, we can expect to see the emergence of more managed service providers that specialise in helping businesses secure their hybrid cloud infrastructure.

As a cloud provider, we're already seeing growing demand for this among our enterprise customers.

The Rising Star Programme

By Steve Hone DCA CEO

THE RISING STAR PROGRAMME is an initiative to support those in their early careers within the data centre industry. When recently polled, 85% of data centre professionals commented that their workplace would be the perfect environment for young, fresh talent, but that there were a number of barriers to entry including employer brand, attraction strategies and retention of trained talent.

Things are changing, these issues can be addressed - The Rising Star Programme help can help to do this!
The programme has been devised by Adelle Desouza of HireHigher and as the Data Centre Trade Association The DCA is proud to offer its support.

As the founder of The Rising Star Programme, Adelle has already hosted a number of panels at industry events, initially focusing on the need for an industry initiative of this kind and she has been gaining much support for the idea. The Rising Star Programme was launched a year ago and it is now building momentum. The Global Strategies: People Environment and Innovation Theatre at Data Centre World 2023 enabled Adelle to host a specialist Rising Star panel which allowed the audience to hear the opinions of several young and talented people who now work in our sector. Adelle also masterminded a ground-breaking event in West London for over 60 year 12 students from two local schools on International Data Centre Day. The students were encouraged to recognise what they as individuals could bring to a work environment, they heard from a group of Rising Stars – on their route into the data centre sector and they also had a tour of a 'real live' data centre!

> **"The Rising Star programme is an opportunity for young people to not only connect with other like minded individuals at a similar stage in their career but to form a force to be reckoned with as we propel our industry forward."**
>
> **Steve Hone, CEO, Datacentre Alliance**

These activities have been very well received and the programme is gaining traction – I believe the industry is ready to step up and The DCA will continue to support and encourage this venture.

Find out more about The Rising Star Programme here.
The Rising Star Programme – #StartTheRevolution

Time is not on our side, but we have made progress - are you a walker or a talker?

By Adelle Desouza, Founder of HireHigher and Advisory Board Member, DCA

A year ago, in a previous update article I shared the findings of two interactive workshops at The DCA's annual Data Centre Transformation Conference (DCT 2022). The findings focused on the barriers to entry for new and diverse talent to the Data Centre Sector. In last year's article I concluded that change was coming and in a big way, and so I return to share the progress we have made and what we are yet to overcome...

It is safe to say the talent topic has exploded - primarily on our social media feeds. Whilst the threat is far from neutralised progress has been made. As of October 2022, The DCA formally partnered with HireHigher to present The Rising Star Programme. A dedicated project designed to work a number of initiatives, closely aligned to the very barriers raised at DCT 2022 to future proof our industry.

The Rising Star Programme functions purely as a result of the industry pledging support to the cause. To date, a mere four months at the time of writing, we have enabled a nationwide PR campaign to begin to address the negative brand image of our industry that is perpetuated by the media.

We have created a dedicated community of Rising Stars – these are individuals in their early career. By creating a centralised group on LinkedIN, they are enabled to connect and network. We provide opportunities to build their professional and personal brands, through speaking and writing engagements both to the industry and to students. The programme has also curated the industry's first award category devoted to those in their early career with our industry. This will showcase the value and impact the next generation is already offering the industry.

Finally, we have begun to bridge the gap between our experienced experts, rising stars and current students through the #RisingStarsInSchools

campaign on International Datacentre Day. This event was no small feat. It all came together thanks to working with organisations who 'talk the talk' and 'walk the walk'. Over sixty 6th form students attended a morning of workshops designed to highlight their natural tendencies and personalities and allowed them to understand how best to take these into the workplace. The students also heard from current Rising Stars and heard how they had discovered the Data Centre Sector and secured apprenticeships or jobs after graduation. The day culminated in all students being able to visit a local data centre.

The feedback has been immensely positive, the energy on the day second-to-none and on top of all of that we were able to inspire students to consider a career in our industry. There is no denying the issue the industry faces is one of our own making, and whilst many comment and 'like' the premise of change, bureaucratic inertia still plagues many. From insights from successful early careers programmes from within the IT industry to sharing the stage with current Rising Stars who addressed the barriers to entry within our recruitment processes there is something preventing seismic change in our industry. I can and have commented over the years on why I believe this may still exist, however ultimately we must remain focused and energised by those organisations who have pledged their support to The Rising Star Programme they have clearly identified themselves as walkers and not just talkers.
In just a few weeks, we will again take to the stage at Datacentre Transformation, hosted by The Data Centre Alliance, but this time the rising stars will take the spotlight. Following a successful panel at Data Centre World which looked to address the barriers to entry from the perspective of those new to our industry we intend to hold an interactive session surrounding retention.

A topic that was raised by experienced experts last year as a concern for them to introduce new and diverse talent. So, what better than to hear from the target audience themselves. We hope to discover and share views on the relevance of the great resignation, the impact of hybrid working and the role of benefit packages - in a candid and open way.

The Data Centre Transformation Conference will once again drive change and action in our industry, and we look forward to seeing what the day brings - and no doubt will share with the readers of Digitalisation World. To find out more about the programme and how you can join the revolution I'd love to connect.

Developing a sustainable workforce for the digital infrastructure industry

The need for a sustainable workforce for the digital infrastructure industry has never been greater. Predictions for the future, such as an anticipated 75 billion connected devices by 2025, are so astronomical they're beyond rational understanding. What is widely understood, however, is the immediate need to recruit, train and retain talent in order to meet this huge demand.

A SKILLS SHORTAGE of this scale requires equally ambitious solutions that may only be achieved by collaborative and positive actions. By joining forces, there is the capacity to implement meaningful and effective solutions at every potential opportunity; the good news is there are plenty of opportunities to exploit.

Growing the opportunities for young people to develop their skills and improving access to a quality education are paramount in addressing the skills gap throughout the digital infrastructure industry from the ground up. In order to effect the best improvements, it's vital we create more chances at the beginning of a young person's career pipeline so they can learn about and develop an interest in the industry.

Now is the ideal time to shout about the opportunities that the data centre sector provides while graduates experienced in STEM subjects are in such high demand. Collaboration as an industry is required to make sure that we are shouting loud enough to be heard. Alongside this, general awareness that the industry actually exists is a good starting point, as well as its extensive career opportunities – both of which need to be elevated so that people in positions of influence, such as parents, teachers and career advisers, are initiating discussions about it with young people who are at the point of choosing a career path. Clearly laid out routes through education, that equip young people with the skills and qualifications they need to forge a successful and satisfying career in the industry, need to be established to ensure that talent is able to confidently flow in our direction.

The introduction of T Levels (Technical Levels) in September 2020 positioned them as the main technical education qualification option at age 16, alongside A Levels and Apprenticeships. Widely supported by employers, T Levels are starting to gain good traction and are a definite step in the right direction towards providing more opportunities for young people to choose technical subjects.

Initiatives such as University Technical College (UTC) Heathrow and Partners and the Digital Futures Programme, where students undertake a level 3 engineering curriculum alongside projects and workshops led by industry partners, are forging essential inroads into creating these opportunities. Such initiatives provide young people with the vital skills required to secure a career in the industry along with helping them to make connections with real-life employers, who are actively looking to recruit new talent.

Another key aspect of the UTC initiative is tailoring the opportunities to local employer demand. There are hotspots throughout the UK where STEM jobs are crucial to the local economy and therefore targeted solutions presented at a local level, such as a UTC, can prove individually more effective than

broad national schemes. The good news is that more industry focused UTCs are planned to open in the near future.

Apprenticeship schemes are also proving to be an effective way of nurturing new talent across the board and they're particularly well-suited to the digital infrastructure industry due to their hands-on nature and practical learning opportunities. According to Department for Education apprenticeship data, engineering-related apprenticeship starts increased by 25.8% in 2020/21, a greater rate than all sector subject areas which in comparison showed an 8.6% increase.

The tide seems to be turning, where companies who previously shied away from longer-term apprenticeship schemes in favour of employing ready-skilled employees, have now recognised that there are no quick fixes, and time needs to be invested in order to progress. The first Government funded Apprenticeship for Network Cable Installation is now available; the Network Cable Installer (NCI®) Apprenticeship is a 12-15 month program Level 3 program that is creating the next generation of competent, confident, and qualified network cable installation professionals.

When a skills shortage exists in any industry, the demand for talented, experienced individuals rises and so too do the corresponding salaries, benefits and temptations to jump ship – to another company or sometimes even another sector. Individually, organisations can make some really positive steps towards retaining the talent that already exists within their ranks. Investing in training and ongoing professional development is essential to ensure each and every employee possesses the right skills to succeed.

A company that considers each person's skill set and puts a plan in place to help progress it will engage employees far more successfully, increasing staff morale, improving job satisfaction, all of which ultimately help to mitigate mission critical risk. Companies that are also able to establish productive educational partnerships and promote them to existing and prospective employees can yield higher team retention results, not to mention the increased competitive advantage essential in a competitive marketplace.

Alongside this focus on upskilling, other measures can be employed at a company level. When putting together a job advert, there is a temptation to specify a degree level of education, that may not actually be a necessity. When we home in on the actual required skills, knowledge and behaviours of the type of person we are looking for - and then team this with an individual professional development plan - we can open up an entire pool of people who previously may not have made the cut.

Allowing for flexibility in your workforce also helps keep experienced employees engaged. People's attitudes to work have changed, largely due to the pandemic which provided the opportunity for people to review their priorities and rethink what they want from a job. Relaxing the attitude that employees must be full-time to be effective ensures that those who can provide vital industry skills and experience on a part-time basis remain valued.

Crafting a culture that encourages people to join and remain within a company is a company-wide responsibility, however crafting a culture that encourages people to join and remain within the industry lies on the shoulder of us all. Our ability to sustain our industry to meet the world's increasing demand for digital services relies on our capability as an industry to pull together, not just at company or even country level but in an industry-wide, international effort.

I would like to see more collaborations of industry partners, working together towards the combined goal of identifying and trialling new initiatives to help close the skills gap. Initiatives such as UTC Heathrow and Partners, that provides proof of concept of the industry working together with the common goal of spreading awareness of the industry, educating and nurturing potential young talent, leading to new entrants to our industry are a must. Plus, these proven initiatives can often be duplicated in numerous locations creating scale and multiplying the efforts to really tackle the talent shortage.

These types of collaborations are the key to unlocking the future talent pipeline that the digital infrastructure industry requires in order to develop a sustainable workforce and provide the skills to meet demand, now and for the future.

Iulian Trifan - Hybrid Cloud Engineer (DTS) Apprentice at JP Morgan

I DECIDED that an apprenticeship was right for me when I found out what it is - studying while working and putting your study into practice to solve real-world problems - this motivated me to keep applying until I received an offer.

Applying to apprenticeships isn't an easy task, I started off by searching mainly on the government apprenticeships website, general Google searches and LinkedIn. What stood out to me is the importance of communication and transparency from employers during the application process given that I didn't receive a response from about 30% of applications I made. From the responses I did receive, I found it most useful when I was given a rough timeline of when the next steps are happening and when to expect further communications. Staying on top of communications with candidates I think is one of the best improvements an employer can make to their application process.

The myth I'd like to bust is that "Apprentices don't do 'real' jobs ". This is certainly not the case; I consistently have the opportunity to contribute to any piece of work my team is set out to do. I am treated exactly like any other employee, not as the coffee maker of the team. This makes for a great experience as I feel valued and listened to by the people I work with every day.

Two things I would tell my younger self, if I could, would be to apply to level 5 as well as level 6 apprenticeships and to seek more opportunities to talk to current apprentices. Apprenticeships are getting very competitive, so applying to more would've given me a higher chance of securing an offer to even keep it as a backup. If you've decided apprenticeships are for you, this will help you because once you're in the company, it's very likely that you'll be offered a place afterwards. I also wish that I'd spoken with more apprentices while I was applying, to get a better idea of what it is like. It would've helped motivate me in applying to more, but it would've also helped me understand what to expect once I did start. Another improvement employers can make, is to include apprentices in their recruitment process, to give candidates a chance to ask them questions as well as the hiring managers.

In retrospect, getting an apprenticeship was the biggest and best decision I made to start my professional career, and this is why I'm getting involved in helping the next generation. I'm hoping that by sharing what being an apprentice means students make a more informed decision regarding their future. Also, by sharing the best tips I learned while applying myself, I hope students feel better prepared in submitting their next application.

Laura Allwood – Junior Project Manager, Arcadis

Q. *Share one reality that working and studying for your degree apprenticeship you think would surprise others in our industry?*

A. As a degree apprentice you are able to take on responsibility within the projects you work on as you learn so fast. There shouldn't be a stigma around apprenticeships and business are really beginning to understand the benefits of apprentices. You can quite quickly become a very valuable asset on large scale data centre projects even if you don't have a lot of experience. This responsibility gained through work combined with studying for your degree can be stressful at times especially when university assignments are due and work deadlines are approaching. Although once completed it can be a very rewarding feeling.

Q. *Name one thing you have noticed in the industry that has surprised you?*

A. The one thing that has surprised me about the industry is the lack of awareness for the industry. For something that is used by so many people so regularly it shocks me how many people don't know it exists. I am guilty of this myself, until I was allocated to work on a data centre construction project I had no idea what one was. Working on these projects allowed me to realise the importance of the industry.

Q. *Fast forward a few years, you are now senior management within the datacentre industry, what is one thing you want future Laura to hold on from current Laura when it comes to new/diverse talent?*

A. I want future Laura to make the industry welcoming and encourage new talent to attend conferences and events. Also, to ensure that they have time to participate in more technical training. New talent can hold a lot of value if you give them the time to learn and develop. I want to be able to continue with this mindset in mind to help inspire that new generation. Another point is to remember how I was treated when I first joined and understand that it might take a while for someone new to learn but that is ok, but once integrated into this new talent will be able to provide us with new ideas.