DCS

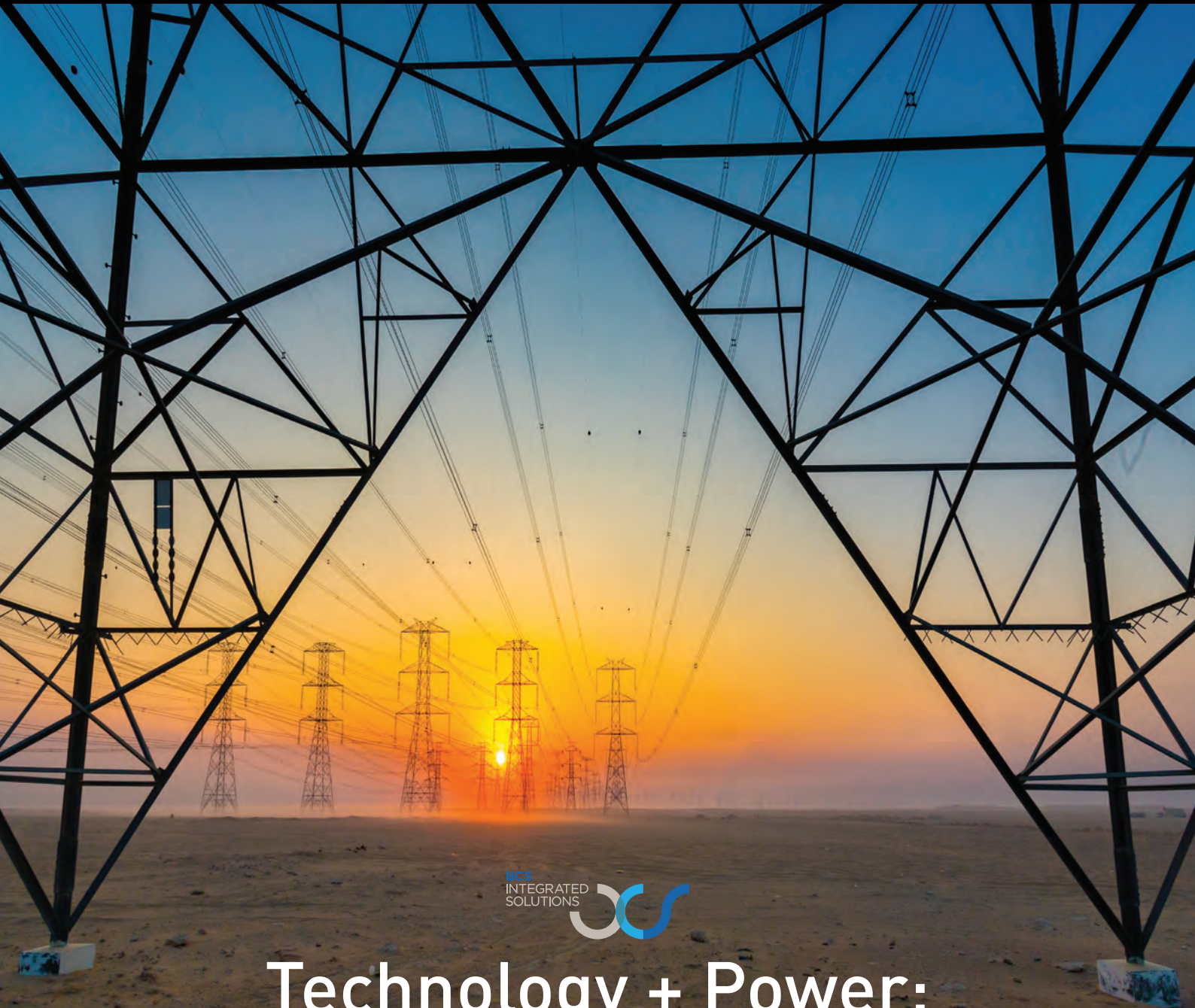# DATACENTRE SOLUTIONS

Developing digital infrastructure in a hybrid world

Technology + Power:
The Energy Conundrum

AI + Automation | Architecture + Connectivity | Cloud + Managed Services
Colocation + Hosting | Design + Infrastructure | Energy Optimisation
Management + Maintenance | Physical Security | Power + Cooling

SEAGATE

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ROUNDTABLE
WITH ERIK SALO AND ANDY PALMER

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In this exclusive roundtable, tech celeb Erik Salo and Seagate enterprise solutions specialist Andy Palmer discuss the latest intelligent storage solutions to optimize data centers.

They go into depth on Seagate Corvault, Salo's invention, and reveal the key trigger that led to it. Afterwards, they will be addressing questions.
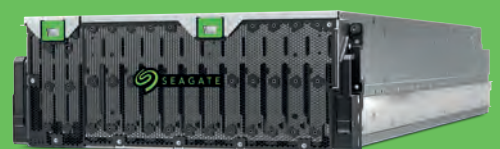
Erik Salo
Sr. Director
Worldwide Systems
Distribution

Andy Palmer
UK Channel Lead
Enterprise Data
Solutions

A New Category of Intelligent Storage

Exos CORVAULT is a high-performance, self-healing block storage system that delivers multi-petabyte capacity, five-nines availability, and hyperscale efficiencies for data center and macro edge environments.

Editor's View

By Phil Alsop

A SICC solution?

I'M NOT SURE if the younger generation still use the term 'sick' to describe something that's actually really rather excellent (and some of us no doubt remember certain individuals who used the word 'excellent' as their catchphrase a generation or two previously!), but I would like to make the case for Sustainability, Intelligence, Cloud and Colocation (SICC) as a powerful combination which can drive forward the data centre industry well into the future.
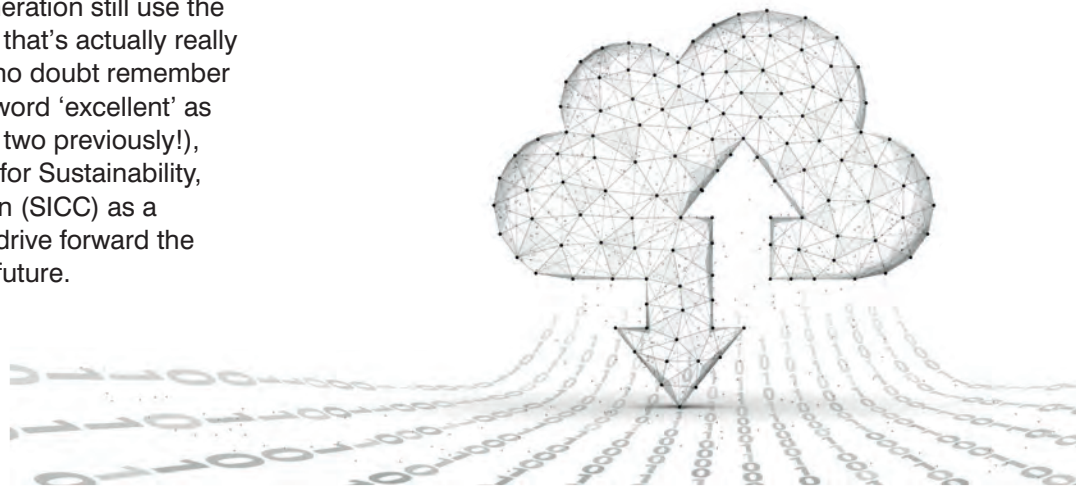
Sustainability – is the major driver right now, and the data centre industry is no different from any other in that it has to make some radical changes in the next few years to help address the major climate crisis that threatens to engulf the globe.

Intelligence – smarter data centres, smarter decision making, contributing to optimised, energy efficient facilities. Plenty has been done already in this area, but there's a long way to go.
Cloud – a major change in approach to provisioning/accessing IT resources, leading to better use of infrastructure.
Colocation – dedicate data centres, run by specialists. As with cloud, colo offers a much more efficient use of infrastructure than on-prem facilities.

Now every business will have its own set of priorities and beliefs when it comes to digital infrastructure drivers, but the SICC approach is a fairly good place to start. I could add in a further C word – collaboration – as, without this, much of the work required to optimise the provisioning and operation of data centres will be inefficient and dogged by internal politics and disagreements. So, maybe it should be SICCC…

This issue of DCS will provide you with plenty of ideas and encouragement when it comes to developing your own SICCC policy, with plenty more to follow as we publish our DCS InnoVision magazine in the summer, run our Change Management event in the autumn, along with more DCS magazines.

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A cohesive utility strategy is a critical requirement for unlocking potential cost opportunities and mitigating risk, according to James Hart, CEO at BCS (Business Critical Solutions), the specialist services provider to the digital infrastructure industry.

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Uptime Institute releases 3rd Annual Outage Analysis

UPTIME INSTITUTE has published the findings of its Annual Outage Analysis, an important industry indicator, noting that while improvements have been made with technology and better management of availability, outages remain a major industry, customer, and regulatory concern.

The report also shows that the overall impact and direct and indirect cost of outages continues to grow. COVID-19 was a huge influence in 2020, causing major changes in the way IT was used. Although there were significant disruptions affecting financial trading, government services, internet and telecom, the outages that made headlines in 2020 were often about the impact to consumers and workers at home, with interruptions to applications such as Microsoft Exchange and Teams, Zoom, fitness trackers and the like.

The costs of outages are often high; when asked about their most recent significant outage, over half of the respondents to Uptime Institute's 2020 Global Survey of Data Center and IT Managers who reported an outage in the past three years estimated its cost at more than $100,000 (of which almost a third reported costs of $1 million or above).

"Resiliency remains near the top of management priorities when delivering business services," said Andy Lawrence, executive director of research, Uptime Institute. "Overall, the causes of outages are changing, software and IT configuration issues are becoming more common, while power issues are now less likely to cause a major IT service outage. The fact is outages remain common and justify the increased concern and investment in preventing them. Because of the disruption and high costs that result from disrupted IT services, identifying and analyzing the root causes of failures is a critical step in avoiding more expensive problems."

Findings include:
- Almost half (44%) of data center operators surveyed think that concern about resiliency of data center/mission-critical IT has increased in the past twelve months
- Three-quarters of data center operators/enterprise IT managers said they have experienced an IT service outage in the past three years. Three in ten said they had experienced an outage that had "significant impact."
- Serious and severe outages are less common (one in six reported having one in the past three years) but can have catastrophic results for stakeholders. Vigilance and investment are necessary.
- More than half (56%) of all organizations using a third-party data service have experienced a moderate or serious IT service outage in the last three years that was itself caused by the provider.
- Networking and configuration issues are emerging as two of the more common causes of service degradation while power outages are becoming somewhat less of an issue – historically, caused by failures in UPSs, transfer switches and generators.

Human Factor:
Humans very often play a role in outages, but the exact nature of the failings can be difficult to pinpoint. In Uptime's 2020 annual survey, 75% of respondents who had an outage in the last three years said their most recent significant downtime incident would have been preventable with better management or processes.

In Uptime's 2021 data center resiliency survey, 42% of respondents said they had experienced an outage in the last three years due to human error. Among those, 57% cited data center staff execution (e.g., failure to follow procedure) and 44%, incorrect staff processes/procedures, as root causes. From the research, it is clear a better focus on management and training will produce better service delivery performance.

"Uptime Institute's M&O Stamp of Approval program is a great complement to our industry-leading operations playbook in driving efficiency, business continuity, and reducing human error," said Mike Casey, Chief Data Center Officer of STACK INFRASTRUCTURE. "Our clients' peace-of-mind is our top priority, and Uptime Institute's insights augment the consistent delivery of our award-winning service."

Hybrid cloud needs to evolve

CLOUDBOLT SOFTWARE has published findings based on a global survey of IT leaders from a range of industries. CloudBolt's inaugural Industry Insights report, "The Truth About Hybrid Cloud and Digital Transformation," conducted in partnership with Pulse, a social research platform trusted by 30,000 verified CxOs and global tech leaders, showed widespread agreement on several key issues related to digital transformation (DX).

Survey respondents included directors, VPs, and other executive titles among IT professionals across the Americas, EMEA, and APAC. In the survey, 94% of respondents agreed that hybrid cloud is critical to digital transformation. Specifically, they cited three top initiatives most critical for DX through hybrid cloud: enabling self-service IT, accelerating automation initiatives, and optimizing cloud spend.

In these areas, the majority of IT leaders also agree that there are specific challenges that currently exist in today's approaches:
- More than half (56%) believe that their self-service IT is too difficult, requiring expertise in clouds and infrastructure tools
- 76% still rely on some form of custom coding when it comes to integrating different tools to advance their IT automation initiatives
- 78% say they lack the visibility necessary to optimize cloud deployments, while 54% say they lack automated ways to optimize cloud costs

The good news is IT leaders have a clear understanding of of what they need to move forward when it comes to self-service IT, automation acceleration, and cloud cost management:
- 71% want self-service IT to be a true "easy button," without the need for end-users to understand underlying cloud-native tools and technologies
- 62% want integration approaches that don't require deep domain knowledge or special expertise typically found in custom coding projects
- With cloud cost management, 56% want the ability to continuously notify stakeholders of cost overruns and automated methods for optimization

"The industry clearly understands the value that hybrid cloud plays in digital transformation, especially around the importance of areas like self-service IT, automation, and cost optimization," said CloudBolt's Chief Executive Officer Jeff Kukowski. "Unfortunately, although the industry has focused on these pillars of cloud management for a decade, they struggle to make them a reality. Our research indicates the need for a new approach if leaders want to achieve their digital transformation goals."

The findings released today mark the launch of an ongoing research series dedicated to providing timely, actionable, and essential hybrid cloud technology trends and insights. While the focus of this study was digital transformation, future installments, to be delivered two to three times annually, will drill down into issues surrounding DevOps, cloud operations, security, and governance. The goal is to provide IT leaders with continuous insight into broader industry trends, allowing them to benchmark their own progress as well as identify solutions to common challenges faced by their peers.

Bridging the energy gap for data centre delivery and growth in APAC region

DATA CENTRES facing longer lead time for sufficient grid capacity. The speed and concentration of data centre investments in the APAC region is a huge task for supporting infrastructure, according to a new report by global temporary power specialists Aggreko.

A recent report from Digital Realty and Eco-Business suggests that the APAC region is set to be the biggest market for data centres by 2021, with expected market size to reach US$28bn by 2024 for colocation facilities. With hundreds of mega-watts of IT load coming online, there are concerns on whether local power grid supply will be able to keep up with demand.

Energy supply across APAC data centre hotspots are facing a critical juncture, with grid companies and power networks moving at slower speeds than the technology infrastructure investments. And while focus may turn towards upgrading existing networks to withstand the demands of this growing industry, the cost and time required is simply unattainable.

Ravindra Bapat, Head of Data Centres – Asia - at Aggreko, said: "It is clear that there are a number of significant opportunities for the region to capitalise on in this lucrative industry, but with opportunity comes challenges. Grid network reliability, power

availability and last mile connectivity is known to be inconsistent in many regions, particularly for all up-and-coming markets such as Tokyo, Jakarta and Mumbai.

"Adding to the challenge is the location of such data centres, with many increasingly positioned inside the major metropolitan locations and, as such posing difficulties for local utilities to upgrade the infrastructure due to space constraints and huge cost. While there are a number of valuable investment prospects in the region, operators and developers must understand the existing infrastructure gaps and have a bridging solution to cope with probable power supply challenges while delivering projects against tight timelines."

Another challenge, according to the report, is the pledge to utilising renewable energy among the new data centre facilities. The APAC region is synonymous with its high energy use and accounts for more than half of the global energy consumption.

With more data centres coming online, energy consumption is set to grow and at a faster pace. While the sector looks to drive up their energy use, globally, weak grid supplies could hinder hopes of progress of a sustainable energy future in the APAC region, according to Aggreko.

Powering a data centre - it's a (bio)gas!

ECHELON DATA CENTRES and Biocore Environmental Ltd agree to co-locate biogas facility at Echelon DUB20 (Arklow) data centre site.

Echelon Data Centres, the Irish-owned data centre owner and operator, and Biocore Environmental Ltd, an Irish company generating renewable power from biosolids, have reached an agreement to co-locate a biogas production facility on the Echelon DUB20 data centre site in Arklow, Co Wicklow, Ireland.

Biocore specialises in producing methane gas through the anaerobic digestion process, gas which can be used to power combined heat and power (CHP) generators producing electricity, or which can be processed further and supplied directly to the national gas network. Echelon, which has six sites in Ireland and the UK with up to 500MW of capacity, is committed to sustainable operations, one element of which is exploring ways in which its facilities can be powered cleanly and sustainably. Niall Molloy, CEO of Echelon Data Centres, believes that as demand for data processing, management and storage facilities continues to increase, driven by society's increasing reliance on tech and its application in everyday life, data centre operators must focus on, and facilitate, the provision of clean and sustainable power to their facilities. "The inconvenient truth is that data centres are huge consumers of power – but equally inconvenient is the fact that without them, we would not be enjoying – relying on – the benefits of 5G, e-commerce, the Internet of Things,

artificial intelligence (machine learning) and virtual reality. Given, therefore, that data centres are here to stay, it's up to us – the facilities' owners and operators – to make provision to power them sustainably, cleanly and with least impact on the grid.

"Our agreement with Biocore, which would see a renewable biogas facility co-located with a 100MW data centre on our DUB20 site is a landmark initiative which could assist in providing a renewable back-up power solution for the facility, while also making productive use of organic material and returning value in terms of fertiliser stock for Irish agriculture. We recently signed an agreement with SSE Renewables to co-locate a substation on our DUB20 (Arklow) site which will facilitate the development of Ireland's largest off-shore windfarm, supplying some 520MW of renewable power through the substation to the national grid. The substation will also supply power to our data centre.

"On our DUB10 (Clondalkin) site, we have planning permission for a 100MVA gas-fired energy centre, which will help smooth the flow in the grid (enabling the transition to 100% renewable energy),

while providing back-up power for the facility thereby doing away with the need for diesel generators."

Declan Murray, Managing Director of Biocore Environmental Ltd, welcomed the agreement with Echelon, highlighting the mostly untapped potential in biogas production, both as a completely sustainable and eco-friendly method of producing fuel and also as a way of solving problems associated with the recovery of biodegradable material.

"Biogas production is a virtuous circle – we take organic materials that can, themselves, become environmental pollutants, and transform them into gas either for supply to the gas network, or for use in generating power.

"The residue from the production process is dried and re-supplied to the farms from which much of our organic feedstock can be sourced. This residue makes an excellent fertiliser – and means that none of the organic material goes to waste. Our relationship with Echelon will be a symbiotic one – we can use the heat that is generated by the data centre to maintain our biogas production process, and the biogas produced can assist the data centre in terms of producing power for storage in back-up battery arrays.

"One of the by-products of the gas cleaning process – before it is introduced to the gas network, for supply to homes and businesses – is carbon dioxide. This is an effective fertiliser for plant products cultivated under cover and, of course, the Echelon DUB20 site has the space to host such enterprises in the future."

Demand for data centres in major European cities to rise by a third in 2021

JLL FORECASTS 21% increase in new data centre capacity with 438 MW to be added to established markets this year.

JLL's Data Centres report reveals that increased cloud migration and technology adoption drove unprecedented activity in the data centre industry in 2020. Take-up in Europe's main data centre markets of Frankfurt, London, Amsterdam, Paris and Dublin (FLAP-D) increased 22% yoy reaching 201.2 MW (megawatts), with this pace of growth expected to continue for the rest of 2021. This year alone, JLL forecasts 438 MW of new supply being added to the FLAP-D markets, a 21% increase on the total market size.

Despite a slow start to 2020, enterprise colocation demand picked up in the second half of the year across Europe. Take-up in London increased 72% with 87 MW seen throughout the year. Frankfurt also had a record year for absorption with 69 MW of deals and 124 MW of headline signings. And significant growth in new supply placed Frankfurt as the largest mainland colocation provider in Europe.

"Widespread lockdowns, social distancing, and home-based working have transitioned many everyday activities from the physical to the digital. This has boosted demand for digital infrastructure, including data centres with many organizations needing to accommodate elevated consumer demand and expectations like never before," said Jonathan Kinsey, Head of EMEA Data Centre Services, JLL. "The growth of Europe's data centres will continue to accelerate, largely driven by hyperscalers and technology players and we project that take-up will rise by around a third in 2021."

The construction pipeline in Europe is also expected to see significant growth following record levels reached in 2020. Frankfurt will lead with 119 MW of new supply, following the 83 MW new inventory added in 2020. The Paris market is forecast to have 71 MW of new supply in 2021, having grown by 72 % over the last four years. Amsterdam will benefit from 53 MW new supply following a subdued 2020 owning to restrictions on data center development, which were lifted in July.

London set a record number of planning applications in 2020 and is forecast to see 133 MW of development. As the smallest of the main European hub colocation markets at 161 MW capacity, Dublin has a huge self-build market with over 670 MW of hyperscale data centers and is expected to see 62 MW of new supply this year. When combined with the colocation supply, this makes Dublin the largest market in Europe.

Data centres have been one of the top-performing asset classes in REIT markets around the world since the onset of the pandemic. A growing number of investors are now hunting for defensive strategies, and the surging online demand has boosted the resilience of data centres.

"In 2021, we expect to see traditionally non-data-center investors and developers actively explore opportunities in the sector either to back start-ups with good management teams, or in some form of M&As and partnerships," commented Tom Glover, Head of Data Centre Transactions, EMEA, JLL.

"Demand in major European markets has continued to outstrip supply and the opportunities to enter the market will be varied. Most investors tend to focus more on the hyperscale segment, given its scalability."

With investment in the expansion of 5G technologies by communications service providers and sustainability, including a focus on improving data centres' energy efficiency and carbon footprint, playing an increasingly crucial role in development, activity in the sector shows no signs of slowing.

Data centre infrastructure market to reach $100 billion by 2027

ACCORDING to a recent study from market research firm Global Market Insights, The need for data center infrastructure market management among organizations to offer higher energy-efficiencies will be positively driven by the influx of cloud computing, Big Data, and AI solutions. The surge in internet infrastructure activities has led to the generation of large quantities of data by individuals and connected devices.

The rising levels of data traffic have placed an immense power burden on data centers on account of the significant jump in the usage of IoT devices. This has in turn pushed data center operators to increasingly adopt efficient and cost-effective data center infrastructure solutions.

As per a report by Global Market Insights, Inc., the global data center infrastructure market could reach USD 100 billion in annual revenue by 2027.

Owing to the adoption of data analytics, cloud computing, and emerging technologies such as AI, machine learning, and IoT, hyper-scale data centers have seen huge demand lately. Big tech giants like Facebook, Amazon, and Google are investing heavily in the construction of hyper-scale data center facilities.

These data center infrastructures need high capability and modernized infrastructure for supporting critical IT equipment and offer enhanced data protection. High-density networking servers in these data centers demand security management, power and cooling combinations for enabling energy-efficient operation.

Increasing government initiatives regarding the safety of customer data are encouraging businesses to establish their own data center facilities in the Asia Pacific. For instance, China's Cybersecurity Law states data localization requirements on Critical Information Infrastructure Operators (CIIOs). The Law guides network operators to analyze, store and process customer data within the country. With

this, it is estimated that the Asia Pacific data center infrastructure market may speculate sturdy progress over the forecast period. Multiple initiatives such as Smart Cities, Made in China, and Digital India, may also boost the adoption of IoT and cloud computing in the region. Mentioned below are some of the key trends driving data center infrastructure market expansion:

1) Growing demand for hyperscale data centers
Expansion of hyperscale data centers owing to the usage of cloud computing, data analytics, and emerging technologies like IoT, AI, and machine learning is fueling industry outlook. Hyperscale data centers need high capability and modernized infrastructure to improve protection and support the critical IT equipment.
High-density networking servers in hyperscale data centers demand cooling, security management and power solutions in order to facilitate energy-efficient operation. Major cloud service providers like Facebook Inc., Amazon, and Google LLC are making huge investments in the construction of hyperscale data center facilities.

2) Increasing adoption of data center services
The service segment is anticipated to account for a substantial market share on account of surging demand for scalable infrastructure for supporting high-end applications. Data center services

such as monitoring, maintenance, consulting, and design help operators to better manage data centers and their equipment.

Enterprises often need professional, skilled and managed service providers for the management of systems and optimization of data center infrastructure to obtain efficiencies. Professional service providers having the required technical knowledge and expertise in IT management and data center operations allow streamlining of business processes. These services help to significantly decrease the total cost of operations and maintenance of IT equipment.

3) Robust usage of cooling solutions
There is a proliferation of AI, driverless cars, and robots which is encouraging data center service providers to move strategic IT assets nearer to the network edge. These edge data centers are in turn rapidly shifting towards liquid cooling solutions to run real applications having full-featured hardware and lessen energy consumption for the high-density applications.

Key companies operating in the data center infrastructure market are Panduit Corporation, Hewlett Packard Enterprise Company, Black Box Corporation, Vertiv Group Co., ClimateWorx International, Eaton Corporation, Huawei Technologies Co., Ltd., Cisco Systems, Inc., ABB Ltd, Schneider Electric SE, Degree Controls, Inc., and Dell, Inc.

Increasing investment in private cloud and multi-site data centre network transformation

RESEARCH CONDUCTED in late Q121 shows conventional thinking around mass migration to the public cloud is overstated, with private clouds continuing to fuel global expansion of more agile and automated data center sites.

Pluribus Networks and Enterprise Management Associates have released a new research report, titled "The State of Data Center Networking Annual Report, 2021."Commissioned by Pluribus and to gather data around the top drivers behind organizations' hybrid and multi-data center investment strategies on a yearly basis, the report confirms a number of industry trends regarding application architectures while challenging several assumptions around the rapid shift to the public cloud.

Among the key findings of the research, which surveyed global enterprises in March/April of 2021:

The Public Cloud is Not Retiring Data Centers: while the overall share of applications living in the public cloud will grow modestly over the next two years, approximately 75 percent of applications continue to live in the private cloud, including on-premise data centers, colocation data centers and hosted private cloud. The key motivations for keeping applications within data centers were: security (48 percent), performance (40 percent), control over compliance (37 percent) and cost (29 percent.)
More Data Center Sites, Less Consolidation: not only is the private cloud holding onto a large share of applications, when measuring enterprises with at least two data centers, the majority already have 3-5 data centers locations and 34 percent of large enterprises have 11 or more data centers. Plus, more than half (56 percent) of the enterprises surveyed were planning to

add new data center sites in the next 24 months, as compared to 12.5 percent that planned to consolidate sites.

Private Clouds are Moving to High Availability Architectures: when asked to describe their multi-data center strategies, enterprises signaled that broad deployment of active-active and active-hot standby architectures would nearly double over the next two years from 44 percent to 81 percent. Not surprisingly, network complexity is the biggest obstacle to the adoption of these architectures.

Network Virtualization and Automation Will Go Mainstream: to address the challenges around multi-site architecture, deployment of network automation components will grow from 37 percent to 69 percent over the next two years, while deployment of virtual network overlays is expected to grow from 38 percent to 81 percent. Shamus McGillicuddy, vice president of research for EMA, and Jay Gill, senior director of marketing for Pluribus Networks, will host a free webinar to discuss the report and its conclusions on Tuesday, May 25 at 8 a.m. PST. Registration for "The Future of the Data Center Network in a Multi-Cloud World" is currently open.

"Digital enterprises are embracing hybrid multi-cloud architectures with private clouds as the anchor," said McGillicuddy. "This latest research confirms that a majority of applications and workloads will continue to run in private cloud data centers for the foreseeable future, whether on-premises or in a colocation or hosted environment. As enterprises continue to invest in private cloud infrastructure, they are rapidly modernizing their networks to support high application availability and agility, including increased deployment of network virtualization and automation."

"The data from this research quantifies what Pluribus has observed when speaking with enterprise customers over the last year, namely that data centers are still a key strategic asset and the demand for agile, high-performance and high-availability private clouds will continue to drive expansion to more locations and investment in multi-site fabrics," said Gill. "If private cloud is to continue to improve application availability and performance, enterprises will need to abandon legacy approaches and virtualize and automate their networks using overlay networking and stretch those virtualized networks across geographically separated data centers.

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Pluribus Networks and Enterprise Management Associates have released a new research report, titled "The State of Data Center Networking Annual Report, 2021."Commissioned by Pluribus and to gather data around the top drivers behind organizations' hybrid and multi-data center investment strategies on a yearly basis, the report confirms a number of industry trends regarding application architectures while challenging several assumptions around the rapid shift to the public cloud.

Among the key findings of the research, which surveyed global enterprises in March/April of 2021:

The Public Cloud is Not Retiring Data Centers: while the overall share of applications living in the public cloud will grow modestly over the next two years, approximately 75 percent of applications continue to live in the private cloud, including on-premise data centers, colocation data centers and hosted private cloud. The key motivations for keeping applications within data centers were: security (48 percent), performance (40 percent), control over compliance (37 percent) and cost (29 percent.)

More Data Center Sites, Less Consolidation: not only is the private cloud holding onto a large share of applications, when measuring enterprises with at least two data centers, the majority already have 3-5 data centers locations and 34 percent of large enterprises have 11 or more data centers. Plus, more than half (56 percent) of the enterprises surveyed were planning to add new data center sites in the next 24 months, as compared to 12.5 percent that planned to consolidate sites.

Private Clouds are Moving to High Availability Architectures: when asked to describe their multi-data center strategies, enterprises signaled that broad deployment of active-active and active-hot standby architectures would nearly double over the next two years from 44 percent to 81 percent. Not surprisingly, network complexity is the biggest obstacle to the adoption of these architectures.

Network Virtualization and Automation Will Go Mainstream: to address the challenges around multi-site architecture, deployment of network automation components will grow from 37 percent to 69 percent over the next two years, while deployment of virtual network overlays is expected to grow from 38 percent to 81 percent. Shamus McGillicuddy, vice president of research for EMA, and Jay Gill, senior director of marketing for Pluribus Networks, will host a free webinar to discuss the report and its conclusions on Tuesday, May 25 at 8 a.m. PST. Registration for "The Future of the Data Center Network in a Multi-Cloud World" is currently open.

"Digital enterprises are embracing hybrid multi-cloud architectures with private clouds as the anchor," said McGillicuddy. "This latest research confirms that a majority of applications and workloads will continue to run in private cloud data centers for the foreseeable future, whether on-premises or in a colocation or hosted environment. As enterprises continue to invest in private cloud infrastructure, they are rapidly modernizing their networks to support high application availability and agility, including increased deployment of network virtualization and automation."

"The data from this research quantifies what Pluribus has observed when speaking with enterprise customers over the last year, namely that data centers are still a key strategic asset and the demand for agile, high-performance and high-availability private clouds will continue to drive expansion to more locations and investment in multi-site fabrics," said Gill. "If private cloud is to continue to improve application availability and performance, enterprises will need to abandon legacy approaches and virtualize and automate their networks using overlay networking and stretch those virtualized networks across geographically separated data centers.

Bring digital to every person, home and organization for a fully connected, intelligent world

Technology and power: The energy conundrum

A cohesive utility strategy is a critical requirement for unlocking potential cost opportunities and mitigating risk, according to **JAMES HART, CEO AT BCS (BUSINESS CRITICAL SOLUTIONS),** the specialist services provider to the digital infrastructure industry.

TWICE A YEAR, for the past 14 years, we have commissioned an industry survey which captures the views of over 3000 senior datacentre professionals across Europe, including owners, operators, developers, consultants and end users. It never fails to be both insightful and informative, as is evidenced by the fact it is downloaded hundreds of times from our website. It has enabled us to track key trends within the industry and share them with our peers and clients.

Arguably the most important reports have been those during the pandemic – providing valuable insight during very uncertain times and helping us to start to really understand the lasting impact of the pandemic.

Our latest survey (July 2021) highlights the promising news that confidence in future demand levels in the sector is still on an upward trajectory, with developer and investor respondents being the most positive since the start of this survey. Because of this, we are witnessing a strong growth in the sector with an increase in efficient power infrastructure spending as well as an increase in electricity demand accelerating the emergence of a new electricity intensive industry.

The availability of power

However, the challenge is increasingly around the availability of power, which remains the most important factor in the decision-making process for a new data centre according to our survey, Indeed, according to the EU commission, by 2030, electricity consumption of data centres will rise to in the region of 500 TWh of electricity, which will represent over 3% of the world's total energy consumption. Together with the recently reported record take up for the 1st quarter of this year, this has prompted renewed concerns about the pressure this will put on the electricity grids in several of the continents' hubs.

In the coming decade, a significant risk exists that rapidly growing demand for information services—and compute-intensive applications like AI in particular—will begin to outpace the efficiency gains that have historically kept data centre energy use in check.

Potential remains for substantial efficiency gains, but investments in next-generation computing, storage, and heat removal technologies will be required to avoid potentially steep energy use growth later this decade, and parallel investments in renewable power sourcing will be required to minimize the climate implications of unavoidable data centre energy use.

BCS Utilities Launches

In response to these developments we recently launched BCS Utilities, as part of the BCS Group, which operates internationally on offsite utility procurement and delivery strategies, offsite generally referring to the project utility networks adopted, owned and operated by statutory regulated undertakers or third-party independent network providers.

We often refer to utilities as being the umbilical cord to the magnificent buildings and infrastructure around us. Any development would be a lifeless unusable shell without adequate utility provision, capacity, and connectivity. Yet the reality is that utilities are often overlooked by organisations who seem unaware of the opportunities within a deregulated marketplace that can generate a real competitive advantage on a project and whole lifecycle benefits that include CAPEX efficiencies and significant OPEX benefits to the consumer.

BCS Utilities is focused on creating cost savings and efficiencies for organisations through specialist advice on the choice and delivery of utilities including power, water, telecoms and district heating. Services include the creation of a bespoke Utilities Strategy, the project management of subsequent deployments and ongoing review for both new and legacy buildings. Key considerations include commercial models, legislative regulations, technical capabilities, as well as the drive for sustainability and decarbonisation and we are confident in delivering cost efficiencies as high as 80% with the right solution.

High stakes

And these are high stakes. The location of a datacentre is dependent on the availability of utility services and the feasibility of an upgrade project can be dependent on the utility infrastructure available to service a site. This is especially true for where connections into high-capacity power and water networks are required with power and telecommunication infrastructure availability and where resilience is critical to the operation of the facility.

Having a strategy

Therefore, an infrastructure strategy is key as is specialist support. Utility networks evolve and develop as does the demand put on them and we can therefore deem these networks to be dynamic in nature with no two sites ever being the same, even if upon inspection networks appear similar in capability. When considering a development during the master planning or feasibility stages of a project, the focus is not just on how the development will be served but also the land legacy and any residual utility infrastructure residing within the redline development area. This infrastructure is categorised by the project team as being a site constraint, that will often require disconnection, diversion or where highway boundaries alter, stopping up.

To create the greatest impact on a project, the utilities strategy must be considered as a whole lifecycle process that factors in existing utility constraints, temporary construction requirements and the demands of an 'in use' operational facility. To maximise the opportunities available on each project it is important that utilities strategies are developed during the preparation and briefing stages and refined through RIBA plan of works stage 2 and 3. However it is also possible to develop 'value add' opportunities in the later procurement and delivery stages of a project.

Missed Opportunities

We often talk about the 'missed opportunities'. These arise in the absence of a cohesive utilities strategy, where utilities are not considered until the later RIBA plan of work design stages or where a client developer procures the packages using traditional means. The latter can often be referred to as linear utility procurement and this type of procurement offers little in the way of benefit to the client, the project, or future tenants.

Put simply, a major failing of procured utility packages is the absence of choice to the client. A dynamic strategy will not only provide the client and project team with options but will develop contingency to meet the demands of a developing design. Other indicators that a utility procurement and delivery strategy is not working hard enough for a project include costs estimates and costs plans that comprise £/m² pricing or cost assumptions benchmarked on previous projects. A good utilities strategy should deliver CAPEX efficiencies or below the line rebates, resulting in pure outlay to the client and non-contestable costs are unchallenged and attracting variations.

Conclusion

In conclusion a cohesive utility strategy is a critical requirement for unlocking potential cost opportunities and mitigating risk on a project. It also addresses key issues relating to corporate and social responsibility, providing clients with a true competitive advantage in the marketplace. Currently many organisations are unaware of the flexibility that is a result of deregulation and that efficiencies that can be achieved with the right solution. Realising that unique strategy on a scheme can sometimes be the determining factor as to its viability. With power costs and availability increasingly becoming a key focus for the datacentre industry alongside sustainability and decarbonisation this is increasingly key.

Green data centres: the key to driving sustainable strategies

As we become more environmentally conscious as a society, it is of paramount importance that we push for more sustainable business practices.

BY JACK BEDELL-PEARCE, CEO & CO-FOUNDER AT 4D DATA CENTRES

FOR THE AVERAGE INDIVIDUAL, being more sustainable may amount to taking on more eco-friendly habits, such as recycling and reducing water consumption, or investing in electric or hybrid vehicles. It's all about the small adjustments that will amount to bigger results in the long run.

For businesses and more specifically larger corporate entities, it's a more challenging and decidedly nonlinear task. In recent years, there's been noticeable public and shareholder pressure on corporations to prove they're taking the necessary steps towards tackling climate change, mainly by publicly setting goals on how they plan to reduce their carbon footprint.

One good example is the IT industry, which is actively seeking ways to minimise electrical power generation from fossil fuels, as well as improve waste management and water conservation. However, IT also happens to be a sector that is in constant expansion, predominantly due to our increasing reliance on digital tools and platforms, which means that reducing energy consumption presents something of a conundrum, especially when it comes to data centres.

The role that data centres have to play

For the data centre industry, which is single-handedly responsible for at least 1% of global energy

consumption, sustainability takes on a more intense and innovative path. Based on the sheer size and scope of its business, data centres, like enterprises, have an obligation to implement and promote more sustainable choices and solutions.

If we think of these hubs as the epicentre of connectivity, data storage and processing, as well as a variety of business-critical applications, it is only natural to believe that data storage and internet use will continue to increase in the years ahead. This does mean however that there is an expectation to keep energy consumption at sustainable levels using green technology in data centres. After all, we're growing ever more dependent on the kind of technology that's driving innovation, such as 5G, IoT and machine learning, all of which require data centres to operate.

It could even be argued that data centres have an ethical responsibility to be champions of change, and therefore take on the crucial role of implementing measures that minimise the impact that data storing is having on our ecosystem. Some businesses are already making pledges to reduce environmental footprint and invest in more sustainable energy solutions as part of their long-term green strategy. But what can be done to drive change in this space?

What can data centres do to effect change?

There are many steps being taken to address the energy usage of data centres, but this process will need to be accelerated if consumption is to be kept to a minimum, especially when considering that data usage increased by 47% just in the first quarter of 2020, during the first COVID-19 lockdown.

Data compression is one example, which allows for far greater levels of efficiency especially when incorporating advancements in cloud technology. The process involves the reduction of a file's size by re-encoding the file data to use fewer bits of storage when compared to the original file.

The main advantage of data compression is that a compressed file requires less time for transfer and consumes less network bandwidth. By diminishing file size, data transmission time and communication bandwidth, less storage capacity is required, which results in decreased energy consumption, increased productivity, as well as significant cost savings.

Immersion cooling, on the other hand, represents a more practical measure for addressing challenges around energy inefficiency. The process sees computer components or even full servers being immersed in a dielectric liquid that enables higher heat transfer performance than air.

This solution was recently embraced by 4D, which installed a highly energy efficient "pod" at its Gatwick site that uses immersion cooling technology. The

"pod" uses a biodegradable dielectric fluid – that has half the density of water – and heat exchangers to cool down IT equipment. The fluid is kept cool by using intercoolers and water, via an internal heat exchanger that extracts heat from the fluid and redistributes it into chill water, which is subsequently pumped away and cooled down again in 4D's adiabatic cooling towers, a similar process is used in the automotive industry. Another way data centres can be more sustainable is by harnessing renewable energy sources. With electricity being the primary source for running daily operations, a single data centre's environmental impact will be largely determined by where it gets its electricity from. This means that, depending on their resources and location, there is scope for data centres to implement a set-up that relies more on environmentally energy sources, such as wind, solar or even tidal.

Next steps

Data centres have a real opportunity to drive change by embracing sustainability. Committing to a green agenda is obviously a step in the right direction for any organisation but, to become a truly sustainable company, business owners need to ensure energy efficiency is at the heart of every aspect of how a data centre is run.

By sourcing the most sustainable materials and technologies for designing and maintaining these energy-intensive hubs, business owners are able to run their data centres in a smart and clean way, ensuring that their impact on the environment is minimised as data consumption continues to thrive.

Can data centres be more sustainable than you think?

Ahead of the upcoming UN climate conference COP26, hosted in the UK, the expectations on businesses to be at the forefront of the net-zero transition is growing, and it's critical time for those operating in the technology sector to not only lead by example but help their customers bring about positive change too.

BY SCOTT BALLOCH, DIRECTOR OF ENERGY AND SUSTAINABILITY AT COLT DATA CENTRE SERVICES

THERE ARE MANY FACTORS that data centre companies need to take into consideration when mapping out initiatives and setting goals for their green vision.

On the one hand, planning data centre capacity is often difficult. As traditional planning cycles account for requirements that last around a decade, it makes it challenging to balance long-term goals given lightning-speed of technological innovation. Nevertheless, a greater emphasis on sustainable and social responsibilities associated with running scalable estates means efficiency gains at data centres are a top priority for operational management teams and data centre operators at large.

Furthermore, the processes of measuring carbon emissions produced by data centres might often be opaque and it can be difficult to collect tangible numbers. These challenges in monitoring and collecting information about the actual footprint can lead to making unrealistic or nonfactual corporate sustainability pledges.

With that being said, as part of the net-zero journey, businesses should aim to set science-based targets that are accredited and regarded as the industry standard. Indeed, to become a truly green organisation, they should be able to measure the actual carbon footprint as well as monitor the progress they're making towards those targets.

The methodology should be designed to align with commonly agreed goals such as those from the Paris Climate Agreement. This approach prevents sustainability efforts from being purely a market positioning initiative and drive an authentic change within and outside the organisation.

Collective action

Championing climate initiatives within the organisation can have immense positive impact on the environment. However, as businesses operate within ecosystems with different stakeholders, suppliers and partners interacting on different levels, organisations are influenced by each other's green policies and actions. Therefore, one of the main obstacles for companies with green ambitions is being reliant on these other organisations' commitment to Environmental, Social and Governance environmental, social, and corporate governance (ESG) goals.

For instance, a company might need to source parts, material, and labour from elsewhere. Business leaders would like to source this from organisations that are also driving a sustainability agenda so the carbon footprint of their supply chain is lower, but that requires other stakeholders to also make that decision and drive collective action.

Powering the cloud

Technology, and the data centre market in particular, has been seen as part of the climate problem due to its perceived high energy consumption. Especially with the mass move online caused by the pandemic, the demand for large-scale solutions, such as hyperscale data facilities, to support seamless remote working has surged. Some might say that the power

usage these centres generate means it is not the most environmentally-friendly method. However, data centres only store technology tools that otherwise would have been kept elsewhere. In other words, companies need physical space for their servers and cloud storage to run necessary applications such as internal drives and virtual communication. For example, many large corporations would require dozens of server rooms spread across different buildings to sustain their daily operations. This would potentially cause great harm to the environment, as many facilities wouldn't have been designed for the purpose, making them much less efficient and much less sustainable than one all-encompassing purpose-built site.

These purpose-built sites are often designed to be much more sustainable and resource efficient. It is vital to understand that data centres are not an incremental source of power consumption. It's a solution focusing the needed power into a single building, rather than distributing it across a number of other sites. Creating such purpose-built facilities also increases the possibility of applying self-generation of renewable power.

The future is green

Although sustainability should be at the top of the agenda of every business - not only on Earth Day - this event should serve as a reminder to all forward-facing leaders that now is the time to take action. Creating an ecosystem that delivers responsible supply chains as well as implementing science-based methodology to meet green targets are the vital steps for the data centre industry to contribute to better, more sustainable future.

What it takes to deliver a
sustainable data future

One of the most pressing questions we face is how to deliver a sustainable data future? In the last two years alone, 90% of the world's data has been created and it's not likely to slow down any time soon.

BY GARRY CONNOLLY, PRESIDENT AND FOUNDER OF HOST IN IRELAND

A DIGITAL EVOLUTION is well underway as the past 12 months have proven. Businesses and individuals have implemented creative and innovative solutions using data and digital tools to adjust to a life online, both at home and at work.

Sustainability should be ingrained in all aspects of our lives. Our digital lives should be no different and companies are beginning to recognise the same. IDC recently predicted that "by 2022, the majority of companies will realize greater value by combining digital and sustainability, giving rise to digitally-driven and sustainably-enabled projects as the de-facto standard." You see this playing out in business decisions from venture capitalists making decisions on renewable vs fossil fuel-based investments to companies like Microsoft ensuring their entire supply chain is carbon negative by 2030. It's no longer enough to merely advocate for change, action is now the expectation.

There is an urgent need for continents, countries, and companies who believe in climate science to play a part in changing human behaviour. When you take that commitment and combine it with insights, intelligence and action driven by data, a tremendous opportunity emerges to decarbonise the planet. In this regard, data centres have a unique role to play in accelerating the adoption of sustainable practices.

One way the industry is doing so in Europe is through the Climate Neutral Data Centre Pact. More than 30 companies and 20 associations have agreed to a Self Regulatory Initiative to make data centres climate neutral by 2030. This is a good initial step in

addressing the serious climate challenges we face as individuals, an industry and society. When you consider carbon emissions don't respect borders or company balance sheets, collaboration on a global scale becomes even more important. The commitment of data centre owners, operators and trade associations to work as a whole to achieve these goals provides the strongest foundation for success.

However, there is an additional layer that needs to be considered. Given the fact that data "centres" are currently using 1% of global electricity and account for .25% of global emissions, even a 50% reduction of their emissions will only garner a very small percentage of the targets that need to be achieved. This is why the "data" in the "centres" will play a leading role.

Take, for example, a smart thermostat. Using the devices, homeowners can make optimisations that reduce energy consumption in the home. Many also have learning features that read behaviour data in the house to automatically adjust temperature accordingly. The more data that is collected and transmitted back to a data centre, the smarter it becomes.

On an individual basis, the data collected from smart thermostats enables savings of up to 20%

> We need to begin looking at actions that collectively will have the greatest impact. Yes, data centres need to continue to evolve and become carbon neutral in operations by 2030

on their energy bills for homeowners. When you take into account buildings are responsible for approximately 40% of energy consumption and 36% of CO_2 emissions in the EU, the bigger picture impact becomes even more apparent. There are real environmental gains to be had through the data generated by the device and processed in the data centre.

We need to begin looking at actions that collectively will have the greatest impact. Yes, data centres need to continue to evolve and become carbon neutral in operations by 2030. And while the data itself may become the tool that has the biggest impact, growth cannot come at the expense of the planet. Host in Ireland has always believed in the power of the collective, and now more than ever, we all need to play our part in making a more sustainable future.

Continuous innovation the key to ongoing success

Huawei's 30 year+ engagement within the data centre sector shows no sign of slowing. Indeed, there are many new products, services and issues on which the company plans to focus in the coming months and years, as this exclusive DCS Q and A reveals.

DCS: *Please can you provide some brief background on Huawei's involvement in the data centre space?*

H: With the rapid development of cloud, AI, and 5G, data center, as the foundation of the intelligent world, are becoming larger, while there are more edge DC. As data center carries more high-performance computing and storage services, their power consumption increases as the data center scale increases and the power consumption of per single cabinet increases. Currently, the global data center power consumption accounts for 2% to 3% of the global total power consumption. If this is not controlled, the power consumption will increase.

In addition, the world's major economies have made commitments to carbon neutrality targets, and more than 200 countries have formulated National Determined Contributions (NDC) to reduce emissions.

Among them, the EU, Japan, and South Korea have proposed to achieve carbon neutrality by 2050, while China has proposed to reach a carbon peak by 2030 and achieve carbon neutrality by 2060.

As an active participant in the carbon neutral action, Huawei continues to innovate and adheres to the "modular + intelligent" concept in the data center field. By reshaping architecture, power, cooling, and O&M, Huawei solves the long construction period and high energy consumption of data center. Facing with challenges such as difficult O&M, Huawei builds simple, green, smart, and reliable next-generation data center to help reduce data center energy consumption and achieve the global vision of carbon neutrality.

DCS: *Please can you gives us an overview of the Huawei data centre technology portfolio?*

H: Traditional data center construction faces many challenges, such as outdated construction models, lengthy construction periods, high energy consumption, and O&M difficulties. Huawei uses a modular and intelligent design approach to build next-generation data center that are simple, green, smart, and reliable by focusing on the following four areas:

- **Reshaping architecture:** A modular and prefabricated approach enables simplified delivery, cutting construction periods from 20 months to 6 months and ensuring rapid service launches.
- **Reshaping cooling:** Our digital iCooling technology and indirect evaporative cooling solution, which maximizes the use of natural cooling, reduce the power usage effectiveness (PUE) of data center by between 8% and 15%.
- **Reshaping O&M:** Digital and intelligent technologies enable fully automated O&M of data center, cutting O&M costs by around 35%. In addition, refined and intelligent asset capacity management improves resource utilization by approximately 20%.
- **Reshaping power:** End-to-End power supply and distribution systems are now visualized and manageable. Digital technologies enable predictive maintenance, transforming passive maintenance into proactive prevention and ensuring reliable data center operations.

Huawei continuously innovates in the data center facility domain to help carriers build green data center and accelerate their push towards carbon neutrality. By the end of 2020, Huawei's data center facility products and solutions had saved customers approximately 4,500 GWh of electricity and reduced CO_2 emissions by around 2.15 million tons.

DCS: *In more detail, can you tell us about your smart modular data centres?*

H: Huawei Smart Modular Solution is designed with the concept of simple, green, smart, and reliable. It integrates power supply and distribution, cooling system, cabinet aisle, cabling, and monitoring into one module, making data center construction as simple and efficient as building Lego blocks. The delivery period is reduced by 50%. In addition, the modular design can meet on-demand deployment and phase-by-phase flexible capacity expansion requirements, reducing customers' initial investment. Intelligent methods are used to reduce system power consumption, simplify O&M, improve resource utilization and O&M efficiency, and improve system reliability. Build a new smart module solution with digital and intelligent enablement to maximize the value of data center infrastructure.

In Qinghai, China, Huawei help build China's first big data industry demonstration base that 100% uses clean energy to operate. Huawei Smart Modular Solution was introduced to improve energy efficiency by more than 30% compared with traditional data

center, saving 10 million kW·h of electricity, reducing 5,955 tons of carbon dioxide per year.

DCS: *And you also offer prefabricated modular data centres?*

H: As a leader in prefabricated modular data center, Huawei adheres to the concept of prefabricated, modular, and intelligent, leading the industry innovations continuously. Huawei innovatively integrates multiple advanced technologies in many aspects, including prefabricated modular buildings, AI, intelligent power supply and distribution, intelligent temperature control and heat management, and full-lifecycle digital management, to build a future-oriented next-generation prefabricated modular data center solution.

With full modular design, Huawei FusionDC prefabricated all core subsystems and modules in factories. Supported by onsite Lego-style fast construction, 1000-cabinet high-level data center are delivered within six months, achieving quick service rollout.

- **Simple:** Based on the "one-layer one-DC" architecture, Huawei FusionDC supports flexible power density upgrade and vertical capacity expansion, and flexible deployment by phase, enabling one-generation infrastructure to adapt to the upgrade and evolution of two-generation IT devices.
- **Green:** Huawei FusionDC is compatible with the intelligent wind wall temperature control system and indirect evaporative cooling system. Adapting the raised floor architecture and diffuse air supply, it features low PUE, high power density, and high cabinet output rate. In addition, the full-chain converged power modules and SmartLi smart lithium batteries reduces the power supply and distribution area by 30% compared with traditional solutions.
- **Smart:** Digital technologies are integrated into the entire process of Huawei FusionDC in planning, construction, operation, O&M, and optimization,

which simplifies data center planning and design, builds visualized management, and delivers excellent full-lifecycle experience.

- **Reliable:** The converged AI feature implements full-link predictive maintenance, end-to-end energy efficiency optimization, and optimal O&M efficiency and resource utilization. Huawei FusionDC integrates the prefabricated modular building technology, uses the patented rock-rock steel structure interconnection technology to support five-layer stacking and 9-intensity earthquake resistance.

Treated with proprietary anti-corrosion technology, the prefabricated container supports a lifecycle of 50years,.The pre-fab. module is protected against fire and water, meeting the requirements of permanent building design specifications and class A equipment room standards. It can run for a long time without worrying about future problems.

DCS: *Alongside smart cooling products?*

H: Huawei's FusionCol Indirect Evaporative Cooling Solution uses natural cooling sources to minimize the energy consumption of the cooling system in the data center by up to 17%, significantly improving the energy consumption of the data center and helping build a green data center. In China Ulanqab data center, Huawei FusionCol Indirect Evaporative Cooling Solution was introduced to reducing the annual average PUE to 1.15. Compared with the traditional solution, the annual electricity cost of the entire data center is reduced by 12%.

In addition, Huawei FusionCol Fan Wall Smart Cooling Products, together with chillers, water pumps, and chilled water pipes, form a complete cooling system. With the support of iCooling intelligent energy efficiency optimization, the PUE in the Middle East is lower than 1.45 and the annual power saving of $88,000 is achieved.

Huawei Air Cooled Smart Cooling Products adopting DC inverter compressor and high return air temperature design. It can match heat load intelligently. These products use unique algorithm construct a precision management and intelligent O&M system, building an efficient, reliable and simple data center. With these products, a data center in northwest China save 1.74 million kwh of electricity per year, equivalent to 1,036 tons of carbon dioxide per year.

DCS: *And I believe that you also offer UPS technology?*

H: Huawei FusionPower series power supply solutions introduce Lithium-based in and lead Acid -based out to achieve ultimate high density, reducing the end-to-end footprint by 50%, and achieving ultimate efficiency of 97%. The digitalized iPower provides visualized and manageable power supply and distribution links and supports predictive maintenance, enabling passive maintenance to proactive prevention, ensuring reliable operation of the power supply and distribution system in the data center.

In January 2021, Huawei officially released the new-generation of large and medium-sized UPS5000-H series products. The modular UPS allows high capacity configuration of 1MW power per cabinet with installation of 10 modular UPS 100KW@ 3U modules in one cabinet.

The UPS product series are hot swappable ensuring maintenance activities extremely easy for the O&M personal. It takes just 5 minute for replacing the UPS modules.

DCS: *And the portfolio also addresses data centre management?*

H: Digital technologies are integrated into the entire process of Huawei FusionDC in planning, construction, operation, O&M, and optimization, which simplifies data center planning and design, builds visualized management, and delivers excellent full-lifecycle experience.

In addition, digital intelligence features are integrated to achieve full-link predictive maintenance, end-to-end energy efficiency optimization, optimal O&M efficiency, and resource utilization, reducing O&M costs by 35% through automatic driving of data center infrastructure. Huawei innovatively proposes i3:

- **iManager,** to implement refined and intelligent asset capacity management, effectively improving resource utilization by 20%.
- **iCooling,** the iCooling intelligent energy efficiency optimization system reduces the PUE by 8% to 15%.
- **iPower,** the power supply and distribution system provides functions such as component life prediction, node temperature prediction, and

link disconnection analysis. The functions range from passive maintenance to proactive pre-warning, ensuring system security and reliability.

DCS: *Huawei has produced some thought leadership on what the data centre might look like in 2025. Can you talk us through these predictions:?*

Trend 1: Zero Carbon DC
Carbon neutrality has become the most urgent mission in the world, triggering a green revolution. Green power, such as wind energy and solar energy, will be more widely used in data centers. It is an inevitable trend to maximize resource saving (such as energy saving, footprint saving, water saving, and material saving) in the entire life cycle of data centers. In the large data center facility, thermal energy recovery is a new energy saving solution. Data center PUE will enter the 1.0x Era, and "zero carbon" DCs will be a reality in near future.

Trend 2: High Density
In next five years, IT devices will continue to evolve to high computing power and density, and the CPU and server power will continue to increase. In addition, as the demand for AI applications grows, the AI computing power will increase. To balance efficiency and cost, data centers will develop to high density. It is estimated that by 2025, diversified computing power collaboration will become the mainstream, and mainstream cloud data centers will form a hybrid deployment of 15–30 kW/cabinet.

Trend 3: Scalable
The lifecycle of IT equipment is generally 3 to 5 years, and the power density is roughly doubled every 5 years. The lifecycle of data center infrastructure is 10 to 15 years. The infrastructure must support elastic architecture and phased investment, and meet the power evolution requirements of two to three generations of IT devices with the optimal CAPEX. In addition, the data center must be flexible to support hybrid deployment of IT devices with different power density, achieving on-demand capacity expansion scalability and space saving.

Trend 4: Fast Deployment
While Internet services have a rapid outbreaks in a short period of time, rapid deployment becomes essential In addition, data centers need to shift from support systems to production systems to meet the diverse application requirements of the cloud and need to be rolled out as quickly as clouds. In the future, the data center TTM will be reduced from 9 to 12 months to 6 months or even 3 months.

Trend 5: Simple Architecture
To address the disadvantages of slow construction of traditional data centers and high initial investment costs, simplified system-level and data center-level architectures will become the mainstream. The DC power supply and cooling architecture evolves from the traditional architecture to integrated link-level converged products. With the prefabricated and modular design, the data center features fast deployment, elastic capacity expansion, simple O&M, and efficient energy saving.

Trend 6: Lithium for All
Traditional data center power supply systems have issues such as complexity, high footprint, frequent accidents such as fire breakout and difficult maintenance. With the trend of lithium for all we are reshaping the traditional batteries with lithium-based batteries in and lead-acid based batteries phase out. Eventually with the decreasing cost of lithium batteries, data centers will be all lithium-based. Compared with traditional lead-acid batteries, lithium

batteries have twice the life span, occupies 1/3 footprint and have enhanced visibility. Additionally, with three level BMS and LFP material lithium batteries ensures high security and reliability.

Trend 7: Air In and Water Out
Driven by complex O&M and higher PUE and aligning with carbon neutrality goals, traditional chilled water systems will be replaced. In addition, cooling systems with less or no water will become the mainstream. The modular Indirect Evaporative Cooling system adopts an integrated product design, which shortens deployment time and simplifies O&M, while fully utilizes natural cooling resources, it greatly reduces the power consumption of the cooling system.

Trend 8: Fully Digitalized
With the increasing digital transformation, digital, communications, and AI technologies are increasingly applied. Digital twin technologies will become more widely used throughout the lifecycle of the data center from planning, construction, maintenance and optimization, making All-DC visible, manageable, and controllable, delivering excellent full-lifecycle experience.

Trend 9: AI Enabled
With the continuous improvement and widespread application of IoT and AI technologies, data centers will gradually replace manual operation such as repetitive work, expert experience, and business decision-making to AI based autonomous driving. Data centers will gradually evolve from single-domain intelligence such as O&M, energy saving, and operation to full-lifecycle digitalization and autonomous driving, including planning, construction, O&M, and optimization, AI energy efficiency optimization and real-time parameter adjustment; AI O&M, 24/7 non-stop inspection, and predictive maintenance; AI operation, online simulation, and automatic service design.

Trend 10: Secure and Reliable
As data center infrastructures become more intelligent, network security threats are multiplied. The data center must implement system-level, component-level, and device-level predictive maintenance. The data center must have six features: hardware reliability, software security, system resilience, security, privacy, and always online availability. Hierarchical defense ensures data center security and trustworthiness.

DCS: *What can we expect from Huawei's data centre business in the next 12-18 months?*

H: Huawei has been deeply engaged in the data center field for more than 30 years. As an important part of digital infrastructure, what we need to do is to improve our products and solutions.

Therefore, we continue to innovate in our products and technologies and to introduce innovative solutions. In January 2021, we launched our ultra-high-density modular UPS series. Next, we will launch a series of innovations, including the next-generation intelligent indirect evaporative cooling product EHU, the next-generation prefabricated modular data center solution FusionDC3.0, and the smart lithium battery SmartLi3.0, to build a simple, green, smart, and reliable next-generation smart data center.

In addition, to promote the healthy development of the data center industry, we will work with industry customers, partners, and third-party organizations to build an open, cooperative, and win-win industry ecosystem and create more value. More importantly, under the global vision of carbon neutrality, energy conservation and emission reduction are imminent. We will live up to the concept of green and sustainable development, fulfil our social responsibilities, and continuously innovate around digitalization and intelligence to help build green data centers.

Making the next 10 years more cost-effective than the last

The key question that any datacentre manager asks is: 'How can you make the next ten years more cost effective than the last'?

BY LOUIS MCGARRY, SALES AND MARKETING DIRECTOR, CENTIEL UK

RUNNING a more efficient operation means higher levels of profitability. A better bottom line means increased budgets to play with for further investment and expansion plus the opportunity to work with a larger, more diverse client base. Increased efficiencies can also result in reducing carbon footprints for the benefit of our whole planet.

Data centre overheads are influenced by multiple factors, but for the UPS system, they need to include the purchase price of any new equipment, maintenance packages and remedials plus energy bills for cooling batteries which can be significant when calculated over time.

To take a look into the future with insight, we need to look at the past. All the information should be easily available for analysis. To be more cost-efficient over the next decade, a more flexible approach to the future is required.

What do I mean by this? Well, updating obsolete UPS equipment can certainly save on escalating repair bills over time. However, simply replacing like-for-like is rarely the best option. The key is understanding the load profile of the past, the present and future, and ensuring any UPS solution can be flexible enough to protect the critical power in both the short and long term, without incurring any unnecessary costs.

Infrastructure

More often than not, we find datacentres have historically been designed with oversized UPS systems. Oversized systems cost more to purchase, install, run and ultimately more to maintain. Along with the associated batteries, they also take up far more space which could be being used for other revenue generating avenues.

Therefore, it is necessary to calculate the size of the UPS needed in relation to the actual load requirement. By adding a scalable true modular UPS, a critical power protection system can be both right-sized, flexible and futureproofed for the short and long-term. Modules can easily be added on a pay-as-you-grow basis ensuring the system continues to match actual load requirements from day one, day two and as we step far into the future.

Successful rightsizing necessitates the correct infrastructure to be put in place from the outset. In this way, a modular, flexible, well specified UPS can ensure any growth in power protection requirements can be accommodated easily. By installing a UPS frame which can, for example, accommodate up to ten UPS modules but can initially house just two, means you have the flexibility to add additional UPS modules when needed.

The historic behaviour of your load profile could help you understand your future load increases or decreases, and therefore can help you select the right path to your power protection. Using a modular approach allows you to tailor your UPS system and

select the appropriate module rating to best suit your load changes. It can also help manage expenditure. For installations with a lower growth profile, adding a 20kW module at a time is much less expensive than buying one which is double the size. As well as reducing CapEx, a 20kW module only weighs around 25 kilos, meaning that it is lightweight and easy to exchange or redeploy to another area of the facility if needed.

True Modular UPS systems are designed with intelligent technology that uses as many modules as needed to match the load demand. This Maximum Efficiency Management (MEM) mode looks for the most optimised energy efficient point of your overall system and uses active-sleep modules to ensure the system is always operating at its maximum efficiency. Put simply, as the load decreases modules hibernate, and when the load increases the modules become instantly available, while maintaining the overall system resilience. With legacy or oversized systems optimum efficiencies are generally at the upper end of the system's capacity, so when being underutilised they waste energy and can have a significant impact on OpEX.

When replacing a system, right-sizing is not just about the UPS. Battery bank configurations should also be optimised and it is likely that if a legacy UPS was over-sized so was the battery requirement. Originally a system may have been purchased with a runtime designed for just minutes. However, as a result of system over-sizing, there may now be hours that are not needed.

When right-sizing a UPS, it is important that the batteries are also right-sized. Specify the actual runtime requirement to your new supplier as the price of a like-for-like battery replacement could equate to the price of a new UPS.

As a bi-product of right-sizing your battery configuration you will also make savings when it comes to valuable floor-space. You could take this a stage further by looking into other available battery options such as li-ion.

Li-ion batteries, while more expensive to purchase can last twice as long as VRLA and don't require the same cooling. They also take up much less room. For facilities with limited room or datacentres which want to sell that space to generate additional revenue, they can offer a potentially more efficient approach over a 20-year period.

In this way, numerous small but carefully calculated steps can reduce both CapEx and OpEx and result in a more efficient overall system.

Maintenance

UPS systems require regular maintenance checks which should be undertaken by factory trained specialists. These checks ensure that internal components are monitored for signs of aging and preventative actions can be taken before failures occur, removing risk and improving overall system availability.

Availability is the most important aspect of your UPS system; every second that your UPS is unavailable may cause significant financial losses. Maintenance and support packages are essential to ensure your system remains available and shouldn't just be about

Li-ion batteries, while more expensive to purchase can last twice as long as VRLA and don't require the same cooling. They also take up much less room

Preventative Maintenance Visits (PMV). It should also include valuable 24/7/365 technical support, guaranteed response time and first level response training.

The architecture of true modular UPS systems has also been designed with self-isolation and self-diagnostic capability. Technical support and first-level response training can give clients the ability to understand why their system is in alarm and to exchange UPS modules safely in a live system (safe-hot-swap) when needed.

Keeping service modules on site can increase availability further as the mean time to repair (MTTR) is only as long as the time it takes for you to make the exchange. Clients can be given the flexibility to regain resilience in their own system.

I know it's controversial to say, but a deeper understanding and closer management of your own systems can be advantageous and removes the fear factor surrounding the equipment protecting critical loads. The latest UPS technology has been designed to be user friendly, which means that the maintenance and support packages should also be the same. Our maintenance and support packages are tailored specifically to individual clients and offer more value for money as they are more than just a PMV.

Review and Plan

By looking at the past and re-thinking the decade in detail, it is possible to ensure the next ten years are more efficient and cost effective. Design UPS systems with flexibility in mind for future capacity but only buy what's needed for day one and have a plan in place to scale up as and when needed. Combine this with education and tailored maintenance packages and we can positively influence the future.

Digital twin technology:
An idea transformed to reality

From risk mitigation to fighting the climate crisis, organisations that use a digital twin have an increased potential to address both practical and high-level issues on a global scale. But what is a digital twin, and how does it deliver on these benefits?

BY DAVID KING, PRODUCT MANAGER, FUTURE FACILITIES

PUT SIMPLY, a digital twin is a digital representation of a physical system or object. It has the ability to be studied, altered and trialled to assess the impact of changes to its real-life counterpart. This means ideas can be safely tested in the digital realm before they're introduced into the real world; offering a steep reduction in risk.

For over fifty years, the concept of the digital twin has demonstrated its capabilities across a number of industries, from aeronautics to healthcare. Now, its adoption within the data center industry is accelerating, as it empowers design and operations teams to establish the best possible configuration of their data centers to maximise space and energy efficiency. But before we take a deeper look into the technology's modern uses, let's reexamine the inception of the digital twin.

An Idea Transformed to Reality

The concept of the digital twin is commonly thought to have been developed in 2002, when the term was publically introduced by Dr. Michael Grieves of the Florida Institute of Technology. However, the origins of the approach actually date back to the 1960s. At this early point in time, NASA engineers used basic digital twinning ideas for space programming. They physically duplicated systems that were in space with replicas on Earth. This allowed them to understand how problems, such as those faced on Apollo 13, could be rectified from afar.

In today's world, it's not only NASA who's embracing digital twins. The life cycle management methodology is also being used in healthcare, to predict how a patient will respond to a procedure, as well as in urban planning to model cities and the data chains within them. Not to mention within the data center industry.

Managing Challenges and Future-Proofing Modern Data Centers

Within the context of data centers, digital twins provide the extra layer of visibility that stakeholders need to optimise asset performance and utilisation, while minimising the chance of an outage.

For example, a frequent challenge facing operators is the deployment of high-density racks. Without a digital twin available, engineers often find themselves relying on spreadsheets, experience and human judgement to accommodate these loads. This approach will be time consuming, resulting in project delays and increased costs. By contrast, with a digital twin in place, IT and Facilities teams can collaborate to understand the consequences of deployment and reduce risk. This can happen while procurement is still negotiating prices with the vendor, enabling those involved to work collaboratively towards an effective solution.

This combination of visibility and collaboration is key to controlling project costs and preventing unintended, but significant impacts, including data center outages. In fact, an independent report commissioned by Future Facilities found that businesses using a digital twin were three times less likely to experience a data center outage over 12 months than their counterparts who had not implemented the technology. This is because the digital twins' built-in Computational Fluid Dynamics (CFD) engine identifies problems that could arise from new deployments - for instance around airflow and temperature distribution - before they have a chance to develop in the real-world.

The Role of the Digital Twin Towards a Sustainable Future

The capabilities unlocked by the digital twin can also
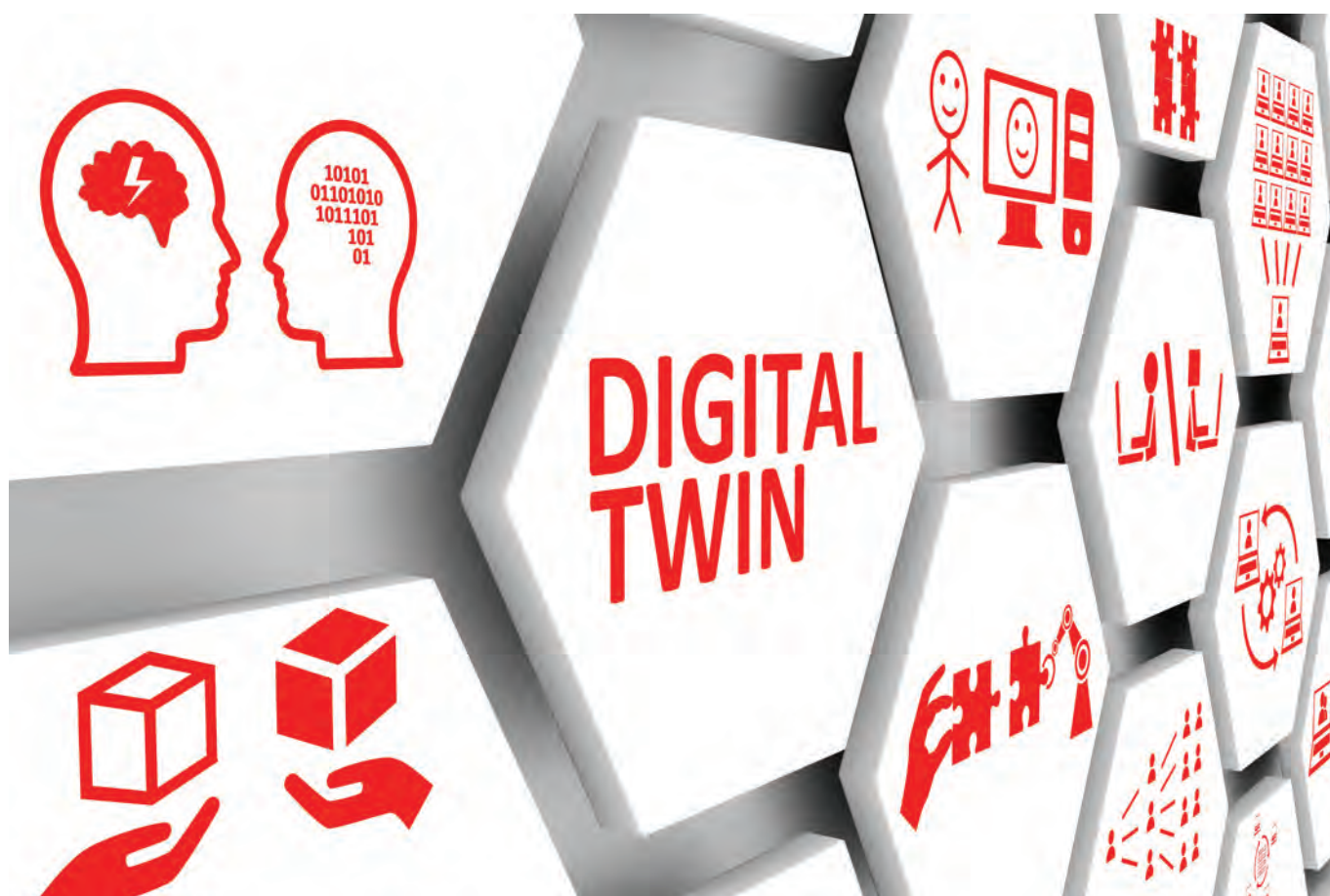
play a role in tackling high-level challenges, such as our transition to a more sustainable economy. This is vital as, across the globe, environmental concerns are now at an all-time high. Research has demonstrated that we must get a grip on climate change otherwise the next generation will face a lifetime of irreversible damage. In recognition of this, President Biden has laid out the American Jobs Plan which promises clean infrastructure, while the UK government has established a Ten Point Plan for a Green Industrial Revolution. The data center industry must also evolve to create a more efficient and sustainable world, particularly as demand continues to grow thanks to everything from accelerating data accumulation, application complexity and on-demand streaming applications, like Amazon Prime and Apple Music.

These services utilise significant amounts of energy to ensure data flows continuously. At present, the industry cannot support the current levels of energy consumption required by these facilities without using sources that are detrimental to our carbon footprint. This will need to change if the ICT industry is to reduce greenhouse gas (GHG) emissions by 45 percent from 2020 to 2030, in compliance with the Paris Agreement.

In order to achieve and exceed these goals, operators must rethink their capacity planning to ensure that

their facility is as energy efficient as possible. By using the digital twin, they can ensure that the data center is maximising use of its available capacity meaning they can delay or even abandon plans to build the next one. It can allow power-hungry cooling systems to be adjusted to more sustainable levels, and support the safe introduction of more efficient server configurations.

Taking greater control of the facility can lead to significant, long term strategic and environmental outcomes. As the business benefits from a more robust infrastructure, it can simultaneously reduce its overall carbon footprint, propelling the organisation closer towards meeting its Sustainable Development Goals (SDGs).

The Potential Unlocked by the Digital Twin There are no quick wins in tackling climate change, but, with the European Commission's goal of reducing greenhouse gas emissions by 40 percent by 2030, businesses must begin to take meaningful steps in the right direction. The data center industry has a significant opportunity to contribute to the path towards a more environmentally friendly future - and the capabilities offered by the digital twin will deliver a safer, more predictable means to do this. Harnessing this technology will facilitate innovations in sustainability, just as it enabled NASA to push the boundaries of space travel almost half a century ago.

Relieving data centre pressures

In co-location data centres, space is a commodity and facility managers are at their most content when it is truly at a premium.

BY RIT TECH.

THE LESS ROOM AVAILABLE in cabinets, on racks and in cages, the greater the occupancy rate and profits. Consequently, the ability to access a real-time inventory of every asset in a co-lo – down to the last spare port – and accurately assess available "stock" is a sales team's dream.

For those responsible for marketing space on behalf of Bezeq International, it is a reality.

The Israeli telecommunications giant has accelerated its sales processes at five of its data centres through the procurement of XpedITe – a next-generation data centre, network, infrastructure and operations management solution which federates previously disparate systems and environments to create a single source of truth.

Delivered as a managed service by automated infrastructure specialist RiT Tech, the next-generation tool has been integrated with Bezeq International's Customer Relationship Management (CRM) platforms, enabling those selling data centre capacity to do so with a comprehensive and up-to-the-minute picture of available space and the power available to it.

In addition to negating the need for sales staff to contact, query and await for a response from a co-lo manager before fulfilling an order, XpedITe has expedited communications and improved the ability to accurately identify any additional space for new and existing clients.

While the constantly refreshed record of remaining stock it affords is an obvious advantage of XpedITe,

Bezeq International is also benefiting from the tool's detailed auditing of the stock being consumed. This knowledge ensures co-locations do not pass up on previously unclaimed revenue, according to Daniel Simis, who is responsible for strategic project management at the telecommunications company.

"XpedITe's application programming interface talks to our CRM, which means every action related to payment is tracked," he said. "We know how space is used by customers and can bill them accurately today rather than having to chase money for any unseen and unexpected charges months down the line.

Previously, tedious audits – of thousands of pieces of equipment and services – were needed to synchronise the billing possess, which led to significant losses in revenue."

An increase in productivity is another major boom for both supplier and consumer. Within a co-lo, XpedITe's advanced algorithms problem-solve and plan, generating automated work orders that mean that technicians are deployed in an efficient manner.

The smooth-running of services is further enhanced by a client-facing, self-service portal, which Bezeq International can tailor and brand to suit the needs \of specific customers.

As well as providing a panoramic porthole through which clients can manage assets in the racks and monitor the health of their digital real estate, the remote access offers a greater degree of control and connection to customers than was previously possible.

The self-service portal gives customers an advanced means to directly communicate with data centre staff and the ability to quickly action everything from standard trouble tickets to requests relating to remote "hand and eye", firewall changes, back-up and restore and physical access.

A ticketing system diaries all approved visitors, preventing the disruption posed to co-lo staff of having to host multiple guests at any one time. External engineers, for example, are only granted access to the site following approval of their identification on the portal by a customer manager.

Similarly, any changes in configuration – such as the addition or removal of servers – are automatically captured and reflected in the system.

"This is a huge advantage – for both Bezeq International and its customers – as it keeps the record of in-rack assets up to date," Daniel explained. "This in turn helps us to manage requests, such as a remote reset of a specific server, and eliminates the need to use Excel spreadsheets to help customers visualise their system set-ups and allocation. Instead,

they can instantly see the power and space used and what is available to them.

"Another key feature is improved communication with co-lo clients. You can send planned maintenance work notifications, server failure reports and trouble ticket updates directly from the system via SMS and e-mail."

This round-the-clock clarity of customer activity also provides an insurance policy against structural issues within data centres boasting multiple floors.

"Weight management is a key issue in such facilities," added Daniel. "Without an accurate inventory of assets and their weight, you may only know there is a problem when the floor starts to move. An automated system that alerts operators when the weight goes above the tolerance threshold allows for space to be better managed."

The pressures involved in running data centres is significant, but for Bezeq International and its co-lo customers much of the analytical and administrative burden is now being lifted by XpedITe.

As a solution that evolves to keep stride with the evolution of the networks it serves, it is delivering a tangible return on investment through visible efficiencies.

Flicking the switch

exhausted efficiency gains within your data centre design?

There is increasing pressure on data centre Operators to make their facilities as energy efficient as possible with global drive towards carbon neutrality. To support this journey **GRAEME SHAW, TECHNICAL APPLICATION MANAGER AT ZUMTOBEL,** explains how lighting can not only help data centres achieve their sustainability based objectives, but also make them more safe, secure and operationally efficient.

THE FACT that the data centre sector is one of the largest consumers of energy is no secret and governments around the world are ramping up pressure on it to lower its carbon emissions. While the focus has been on adopting measures such as more efficient cooling systems, renewable energy and heat reuse, as well as constructing facilities in regions with either colder climates or with the ability to harness hydroelectric power. Attentions are also turning towards other, perhaps less obvious elements of data centre infrastructure where operational efficiencies can, and should, be made.

Under the spotlight
Responsible operators take their sustainability based obligations extremely seriously, while striving to deliver resilient infrastructures that consumers and businesses expect for supporting their increasing internet usage. This is just as well, as in 2020 the European Union (EU) Green Deal suggested that data centres 'can and should be carbon neutral by 2030'. To meet this challenge, over 20 leading data centre companies and cloud infrastructure providers, along with trade associations from across Europe, recently joined forces to form the Climate Neutral Data Centre Pact (CNDCP).

With the 'low hanging fruit' already being addressed, the challenge to lower Power Usage Effectiveness (PUE) ratings by looking into other areas of a data centre's operation are increasing. Despite the advantages offered by LED technology and lighting management systems, data centres have traditionally been slow to adopt them. Perhaps because lighting only comprises 3-5 per cent of a facility's energy

load, some data centres simply haven't had it on their radars. However, they will need to refocus if they expect to thrive in the long-term.

The bigger picture
Reducing both short and long-term capital and operational expenditure (CapEx and OpEx) relies upon looking at a data centre as a whole – how they operate and what's housed within. Installing an intelligent lighting system comprising of LED panels, tubes, battens and high bay lighting devices that are flexible, easy to install and future proof will ensure that they last for many years, however, to gain real efficiencies it's also important to take into account the overall design and distribution of light.

We are some way from truly 'lights-out' data centres, so providing area specific task lighting precisely when and where it is needed is an important design consideration. A lighting management system can therefore prove beneficial and energy savings of an additional 10-15 per cent are possible when luminaires are integrated with sensors to manage how, when and where light is used. Just as significantly, lighting must be specific to a particular aisle layout, so installing luminaires that offer enhanced vertical illuminance means intensity can be focused on the task area (face of server racks and cabinets) rather than over lighting the floor to reach the desired vertical lux levels. In addition to enhanced vertical illuminance adopting the appropriate lens technology for the area helps create a safer, more efficient work environment, enabling data centre technicians to carry out changes, maintenance and upgrades to servers quickly and accurately.

Lighting infrastructure must also be able to withstand specific environmental conditions often found within a modern data centre. The use of LED luminaires and lighting systems that are tested and approved to operate within higher ambient temperatures is a must – this not only lowers the running costs of the lighting system when compared to traditional compact fluorescent lighting technology, it also operates seamlessly in higher ambient temperatures supporting the drive to reduce data hall cooling, which in-turn plays an essential role in achieving a low PUE rating.

Boxing clever

A lighting design strategy should be considered in relation to other data centre components. For example, the colour of cabinets and racks has a direct impact on energy consumption, this is where the light reflectance value (LRV) comes in. LRV is the total quantity of visible and useable light reflected by a surface in all directions, and at all wavelengths, when illuminated by a light source. Essentially, it tells you how much light a colour reflects and/or absorbs.

The LRV scale runs from 0-100 per cent. In practice, the average blackest black has an LRV of five per cent and the whitest white 85 per cent, so above the 50 per cent mark more light is reflected than absorbed. To put this into context, white RAL 9300 has an LRV of approximately 83 per cent, so the amount of reflected light means that a data centre could use fewer luminaires with a lower connected load than it would with black cabinets and racks, whilst maintaining the required lux levels. Zumtobel research has found that savings can be realised throughout a whole data centre's lifecycle simply by taking in to account various environmental factors. In fact, the energy consumed and the number of luminaires installed within a data hall lighting system could be reduced by up to as much as 37 per cent. See our full study here.

Although they still represent a small proportion of the overall number installed, the use of white cabinets and racks is now recommended best practice. The EU Code of Conduct for Data Centres (Energy Efficiency) states, 'Use pale/light colours on walls, floor fixtures and fittings including cabinets etc to reduce the amount of lighting required to illuminate a data hall and therefore the energy consumed in lighting. This will also ensure good levels of visibility both throughout the hall and within cabinets, creating a better lit environment and therefore improved life safety'.

Safety first

We can be under no illusion about the absolute necessity of keeping data secure and being alert to all the potential risks posed. But such risks are not just about the potential for cyberattacks – natural disasters, vandalism and terrorism can all lead to downtime, so implementing measures that minimise the chances of any physical attack occurring should be a high priority for data centre operators.

Security should take a multi-layered approach and include high grade perimeter fencing, obstructions such as anti-ram bollards and vehicle monitoring, as well as thorough access control procedures. As part of a security strategy, high quality external lighting can help to fortify a facility's defences. Illuminating the outdoor space surrounding a data centre also provides a sense of safety for employees and visitors. It can also help with wayfinding, as a lighting design can shape and define the perimeter of a space, whilst providing guidance from one part of a campus to another.

Life safety is also important, so a data centre must have a robust and reliable addressable emergency lighting system in place. Data centres can present challenges in terms of battery life due to high ambient temperatures, so the recommended central battery systems, can be located in a plant room where temperatures are either naturally lower or cooled to around 20°C. As well as enhancing battery life, this also reduces maintenance time, maintenance frequency, physical interaction within the data hall and costs.

Every little helps

Increasing energy efficiency, lowering their carbon footprint and reducing operational expenditure continue to be key objectives for data centre Operators. This does not stop at purchasing renewable energy, investing in solar and wind power and implementing the latest cooling technologies – it also means looking at how innovative lighting solutions can help to make data centres more sustainable, while minimising maintenance and maximising security. In order to achieve the most appropriate lighting infrastructure, it is advisable to engage with a solutions provider that has proven expertise in this area and understands the competitive advantages of data centres that are fully energy optimised, automated and environmentally friendly. Zumtobel recently completed a data centre lighting study to understand the impact cabinet and rack colour, as well as lens technology, have on CapEx, OpEx and the ability to carry out tasks. To support this research it has developed a Data Hall Virtual Reality Experience to demonstrate the key findings in an immersive and interactive format.

To find out moreand to arrange a private virtual experience please visit **https://discover. zumtobelgroup.com/data-centre**
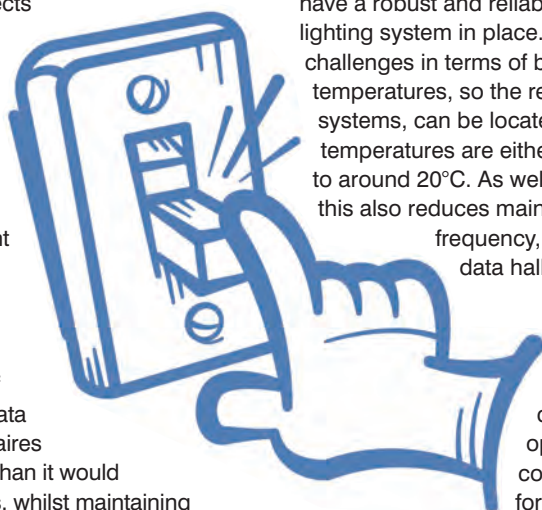
Access denied:

why physical protection is key to data security

There are many different working parts to an effective physical security system.

BY NEIL KILLICK, LEADER OF STRATEGIC BUSINESS (EMEA), MILESTONE SYSTEMS

DATA is fast becoming one of our most valuable resources. Some have dubbed it the new currency of business and it's easy to understand why. Data is powering many important processes and decisions, from changing the layout of our cities to deciding what advertisements are shown to people as they browse online. This makes data centres, as centralised locations for data storage and processing, an attractive target for criminals, spies, and other malicious actors.

A growing target
Recently, data centres have experienced explosive growth, driven by advances in artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and 5G — technologies that all rely on powerful, fast, computing power. Likewise, the pandemic has played a critical role as more people went online to work, socialise, shop, game, watch TV, and more.

Evidently, data centres are becoming a mainstay of every modern-day organisation, and this means they must be protected with best-in-class solutions to ensure data security and business continuity. Threats can come from many areas, from cybercriminals looking to hold a business to ransom, to corporate spies looking for secrets to sell, and even natural disasters like floods, fire, and earthquakes. Data centre leaders must consider every risk for their security to remain impenetrable.

Physical security needed
Foresight is critical to protecting a data centre effectively and many data centres invest huge sums in anti-malware, firewalls, and other security software. Yet, the best firewall in the world will prove useless if someone gains unauthorised access to a building. Physical security must not be underplayed when securing a data centre.

> The final step involves your people. Security staff and control centre teams need training in your security systems and processes to ensure consistent 24/7 coverage of your data centre and short response times during any incidents. Your wider workforce will also need training to ensure they understand their role in protecting the data centre

How to improve physical security

With this in mind, how can you get your physical security up and running?
The physical security of a data centre typically comprises built-in safety and security features to protect buildings and equipment.

1. Audit

Start with a data centre security audit to understand current strengths and weaknesses. This will also uncover the equipment, data, and access points that require protection, and the employees working on-site who require access (and in what areas). Make sure the list of staff members who have access to high-risk areas is updated regularly and anyone who shouldn't have access (due to changes in their role, or if they leave) has their credentials revoked immediately.

2. Internal protections

The second step is to consider internal protections like CCTV, access control, infrared tripwires, mantraps, and other smart devices that can reduce the risk of intrusion, detect emergencies like fire and flood, and preempt equipment failure. Your CCTV footage needs to provide comprehensive visibility of everything happening on-site. You might also want to invest in facial recognition or behavior monitoring tools to increase security further. In the event of a security breach, visual identification of an intruder should be possible through video and audio feeds.

3. Perimeter and access control

Perimeter controls and access control systems will ensure that unauthorised individuals cannot get physically close to a data centre. Anti-tailgating and anti-pass-back facilities will ensure only one authorised individual and vehicle passes into a complex during a specific time. Access lists should also be in place, along with multi-factor authentication, where possible.

Visitor and contractor management needs to be implemented to monitor the movement of all visitors and third-party personnel. Ideally, security teams should be able to pinpoint the locations of contractors and visitors in real-time either through wearable trackers or advanced video analytics. Records should be kept of all visitor and contractor activity on-site, including their entry and exit times and the areas accessed.

4. Redundant utilities

The next stage is looking at your redundant utilities (like electricity and water) to avoid common-mode failures and downtime. It's also worth monitoring and controlling the air quality, temperature, and humidity within a data centre. Specifically within rack areas to ensure air conditioning and cooling systems cannot be exploited and services are not disrupted.

5. Security training

The final step involves your people. Security staff and control centre teams need training in your security systems and processes to ensure consistent 24/7 coverage of your data centre and short response times during any incidents. Your wider workforce will also need training to ensure they understand their role in protecting the data centre.

Open system ensures flexibility

As you can see, there are many different working parts to an effective physical security system. Investing in an open system over a proprietary, closed solution can give greater flexibility in the range of devices and vendors a data centre can work with. This ensures best-in-class solutions are tailored to each data centre's requirements and can be updated easily to protect against new threats.

Testing, testing

How mission-critical testing makes modern
data centres possible

BY JACKY PLUCHON, VICE PRESIDENT EMEA
POWER SOLUTIONS AT KOHLER-SDMO

IN THE MISSION-CRITICAL WORLD of data centers,
backup generators are expected to provide reliable
power in an instant every time they are called into
action. These ultra-high standards of consistency are
delivered, in part, by an unswerving commitment to
testing that ensures every new generator is right first
time.

Reliability is critical in a market that is expanding at a
rapid pace. We now generate 2.5 quintillion bytes of
data daily. With the emergence of megatrends such as
5G, the Internet of Things and cloud computing, that
astonishing figure is likely to keep rising for some time
to come.

Infrastructure spending is increasing, too, with end-
user investment in data infrastructure expected to
reach $200 billion in 2021, according to the latest
research by Gartner, representing an increase of 6%
from 2020.

From edge to hyperscale
The types of data center being built are also becoming
more diverse. From edge through to colocation and
hyperscale, the industry has embraced modularity and
scalability as it looks to provide space, power, and
cooling for network infrastructure in a much broader
range of architectures and configurations.

This growing technical complexity places additional responsibility on the supply chain. Mission-critical generators are now needed in a much wider variety of power nodes, and often need to be built to a bespoke specification. And for applications where backup power must deliver when required, without fail, each generator must be designed, built, and tested to the most exacting standards, meeting all customer requirements for the task at hand.

Investment in testing infrastructure

These market pressures mean that ongoing investment in testing infrastructure is essential to keep pace. At Kohler's main European generator production site in Brest, northwest France, testing capabilities have been significantly expanded in recent years, with test cells now catering for largescale generators up to 4,500 kVA. Technicians use detailed quality and control documentation to cover off all aspects of the production and testing of all parameters relating to the generator's operation.

Additional tests can be performed in a variety of specific areas, including power at specific customer-driven increments up to 100 per cent, fuel consumption, vibration, noise, and other mechanical and electrical parameters. These tests are performed to validate the baseline design, giving the customer confirmation that their complete specification has been met. Emissions testing is also a vital component of the approvals process. Diesel generator exhaust contains a mixture of emissions, including nitrogen oxide, hydrocarbons, carbon monoxide and particulate matter – all of which need to be carefully monitored to adhere to all relevant environmental standards across all markets.

Strict testing regimes of this nature require access to state-of-the-art facilities. For example, some tests are performed on open sets within factory test cells, while others take place with the generators installed inside custom designed acoustic containers. For data centers, reliability is critical: so, durability tests must be conducted over extended periods, sometimes running for up to 200 hours or more.

This means that final inspection can be a much more efficient exercise covering documentation, quality, O&Ms, and other factors specific to the customer, rather than an exhaustive and time-consuming technical process immediately before shipping. Data center customers have strict requirements for standards and specifications, and this approach to the inspection process ensures that final gen sets can meet customer requirements first time.

The development of new technologies

Our extensive test cells also allow for in-house research and development activity. In recent times, engineers have been focussing their efforts within ISO-certified laboratories on important areas such as emissions reduction technologies for Stage V

compliance and the suitability of cleaner and more sustainable fuel types. In each case, individual generator components and wider sub-systems can be designed, prototyped, tested, and refined, as engineers embark on an iterative loop of improvements that might one day feature on a new generator model.

Remote witness testing

Full transparency throughout the testing process is must – with customers invited to the production plant at intervals across a project's lifetime to ensure confidence in both quality and projected timelines. In pre-pandemic times, data centre operators were regular visitors to the Kohler site in Brest, with more than 170 witness tests carried out in a typical year. More recently, with the restrictions in travel, those tests have needed to be performed remotely. That transition has required investment in digital tools to allow specialists from engineering companies and data center operators to monitor testing procedures in real-time, from anywhere in the world. Split-screen video and analytics are relayed from the plant to the customer's PCs, allowing teams to work together and drill into any necessary datasets.

While this shift was a necessary adaptation, it demonstrates how customers can be fully in tune with testing processes, regardless of locale.

No one-size-fits-all to test

Ultimately, data center customers do not want a rigid, one-size-fits-all approach to testing procedures. Engineering companies and end-users prefer a collaborative approach to generator development, whether in person or remotely through their screens. Kohler has invested heavily to ensure that these expectations can be met, with another $6 million being spent on new infrastructure at Brest over the next couple of years. Whatever the customized requirement, our rigorous testing processes ensure that our diesel generators are always fit for purpose - meeting specification first time, every time, whatever the size of the project.

The role of liquid cooling in the world of data centres

At Keysource we have been able to assist many customers with the challenges and demands of deploying liquid cooling into new and existing environments.

BY STEVE LORIMER, ASSOCIATE DIRECTOR AT KEYSOURCE

DEPENDING ON YOUR SOURCES, the Datacentre sector accounts for between 1-2% of all global electricity usage and there is continued pressure for operators to be more efficient. Energy and carbon are high on political agendas and we are likely to see more policy measures particularly if the UK is to reach our legally binding zero carbon target in the UK by 2050. The European Commission, meanwhile, is rolling out a hugely ambitious package of environmental measures and data centres are firmly in the firing line; the sector must be climate neutral by 2030, for instance.

IT aside, the vast majority of this power usage is due to cooling within the datacentre and the need to relocate heat away from the CPU. Traditionally, air cooling is the go-to solution and makes up for the vast majority of cooling solutions in the data centre world. Existing air-cooling systems are usually firmly embedded into the physical infrastructure of a data centre and are largely effective and still the best option for 60-70% of set ups.

However, where IT densities require some organisations are looking at the option of liquid cooling solutions either as an alternative or as a complementary element. The reason is simple – liquid cooling is much more effective at removing heat than air cooling. To put this into context, currently air cooling has 60kW/rack limitation, direct liquid cooling 70kW/rack limitation and full immersion/fanless liquid cooling 120kW/rack limitations. This is important as we are seeing rack densities continue to increase driven by consumer demands for faster and more complex services in certain applications. However, it is also fair to say that alternative cooling methods doesn't need to exclusively sit with high performance compute and presents a great opportunity.

What is the difference?

Although both air and liquid solutions meet the objective of absorbing heat from a CPU, the process for both is worlds apart. Most air-cooling systems take in cold air via the front of the unit and then exhausts hot air from the back. In the hot aisle/cold aisle arrangement, the rows of server racks are oriented so that the server "fronts" face each other in one row and the server "backs" face each other in another row. Cold supply air is then delivered directly to each cold aisle and can be matched to the server airflow requirements for maximum efficiency.

A direct liquid cooling system, circulates a liquid through a heat sink attached to the processor. As the liquid passes through the heat sink, heat is transferred from the hot processor to the cooler liquid. The high specific heat capacity of the cooling liquid/water means it is much more effective than air at removing the heat enabling higher densities to be achieved Finally, immersion cooling involves complete servers being submerged into a thermally conductive dielectric liquid or coolant. Heat is

removed from the system by circulating liquid into direct contact with hot components, then through cool heat exchangers. Fluids suitable for immersion cooling have very good insulating properties to ensure that they can safely come into contact with energised electronic components.

Other Benefits of Liquid Cooling

In simple terms a liquid-cooled system can reduce a data centre facility's overall power consumption and improve its power usage effectiveness (PUE) resulting in environmental benefits, including improved power usage, reduced emission and overall less waste. The higher grade of heat rejected (70°C+) compared to air systems (<40°C) also opens the doors to heat reuse/recovery opportunities; through symbiotic relationships with industries that require continuous hot water for their industrial processes and produces less noise than air cooling.

The increase coolant supply and return temepratures mean that full cooling is possible without the need for chillers and in most UK cases without adiabatic cooling – this can mean a lower cost to deploy and maintain cooling infrastructure. In addition, the stranded electrical capacity reserved normally for chiller use could be re-purposed into additional IT capacity.

It's not for everyone

The physical space requirements and layout of a facility that is liquid cooled, can require a different type of datacentre design than an air-cooled facility. This means that for many legacy datacentres the addition of liquid cooling may not be a realistic option. In addition currently not everyone needs the IT that systems that require direct liquid cooling, air cooled servers can be more than adequate and may represent a lower total cost of ownership, now. For many facilities it may not always be possible to implement wholesale changes in a live environment with inherent space, power and environmental constraints.

However, many hyperscale cloud operators, such as Alibaba, Google, Amazon, Apple, Baidu, Microsoft and Oracle are reportedly already investing in this technology since they need to address their high-performance computing (HPC) applications along with their AI customer demands. Colocation operators that are also competing in this HPC sector and attracting hyperscale cloud clients, are allocating raised-floor areas dedicated to liquid cooling racks.

The Keysource 2020 State of the Industry Report, which surveyed over 100 senior IT professionals, highlighted the continuing importance of the green agenda with over three quarters of respondents stating that sustainability will have a medium or high influence on IT decisions. Liquid cooling could play a much bigger role in helping companies meet their targets and reducing the carbon and energy footprint of an operation and reusing hot water to

> In simple terms a liquid-cooled system can reduce a data centre facility's overall power consumption and improve its power usage effectiveness (PUE) resulting in environmental benefits, including improved power usage, reduced emission and overall less waste

help unrelated industries meet their green initiatives are just two of the obvious benefits of a liquid cooling solution. And though the scale of changing from air cooling to liquid cooling might be too off-putting for leaders within the date centre world today, it might well become more of a pressing issue as the task of saving energy on a significant scale starts to become more apparent during the next few years.

Increasingly relevant

At Keysource we are seeing a growing uptake of liquid cooling solutions in specialist institutions and universities In many cases existing users are asking us to assist to adapt existing air cooled rooms with chilled water infrastructure to address small scale deployments. This can provide a good opportunity to re-use or supplement existing free cooling chlller capability and then to further optimise existing air cooled systems and infrastructure. Larger scale deployments in specialist facilities are more often scalable and optimised deployments (row and room based), modular and packaged solutions.

So, whilst uptake is steady and we do not expect a widespread commercial shift from an air-cooled system to liquid cooling in the near future, it is becoming increasingly relevant.

Conclusion

In many cases Direct Liquid Cooling has traditionally been developed by server manufacturers who, in most cases, do not have the in country skill sets available to support deployment or optimise existing and new M&E/data centre infrastructures to best utilise the equipment.

At Keysource we have been able to assist many customers with the challenges and demands of deploying liquid cooling into new and existing environments. Our significant experience and skills in energy efficiency/sustainability, facility design (large and small), existing facility optimisation, operation and live upgrade enables us to assist organisations with new and supplementary HPC deployments of all sizes. We are also keen to play our part in tackling the issues of climate change and supporting our clients' green agenda, whatever that might be.

Data centres under the spotlight
why experience matters

For those working in technology, it's long been recognised that data centres are the backbone of the digital economy, but Coronavirus saw the industry thrust into the public eye on a much wider scale. We've seen data centre operators deemed to be critical workers, and witnessed debate into whether all data centres should be classed as Critical National Infrastructure.

BY DARREN WATKINS, MANAGING DIRECTOR FOR VIRTUS DATA CENTRES

AS A GLOBAL COMMUNITY, our reliance on technology during the pandemic has brought the industry into sharp focus, and data centres are now firmly on the boardroom agenda. Organisations have realised that they can't take any risks with their data centre strategies and have set about the task of finding the best-in-class operators with whom they should entrust this critical requirement. Organisations of all sizes are now looking for data centre partners that can be trusted to deliver robust, efficient, scalable facilities and cope with any situation.

So how do companies go about selecting a reliable data centre partner? And how can they make sure that the provider is able to serve their needs not just now, but as they scale, grow and potentially change their business models to meet market demand?
Under the current circumstances, the ability to cope with any situation is key and the primary indicator is experience. Businesses must ensure they choose a data centre partner that has a solid and relevant track record in delivering consistency in product and service, over time and in the regions that are important

to them. While there are plenty of eye-catching new builds and new names in the market, it's knowing what really works that makes the critical difference. This article will now look at how the most experienced providers are harnessing all of this know-how for their customers, large and small, locally and globally.

The big capacity challenge

When it comes to the explosion of ecommerce and widespread remote working, the business world isn't in a hurry to put the genie back in the bottle when life gets back to "normal". We're likely to see remote (or hybrid) working embraced for the long term, by companies who appreciate the flexibility, productivity and cost saving benefits it brings. And the "Amazon generation", who are used to getting goods and services quickly and easily are unlikely to return to relying solely on in-store shopping.

However, all this extra online traffic puts intense pressure on the infrastructure - security, servers, storage and network - of any organisation. IT departments need to deploy more forward-looking capacity management if they are to proactively meet their current and future needs. This means selecting a data centre partner that can provide enough capacity for the digital world and its demands, and adapt and flex to their customers' constantly changing needs.

A brighter shade of green

While the pandemic has brought the direct and indirect economic benefits of data centres into sharp focus, we can't get away from the fact that the industry is power intensive. The power demands of the sector are being increasingly scrutinised, but the good news is that a close look reveals an industry that is leading the charge to a more energy efficient world. Many forward-looking providers are moving away from fossil fuels and harnessing renewable energy. And some are committing to using 100 per cent zero carbon power – benefiting from increases sustainability, reliability and cost effectiveness. Power hungry elements like cooling are fast evolving too. Trailblazing operators have been using techniques like indirect adiabatic cooling for some time, which provide the cooling functionality data centres need, but with very low energy use.

However, in assessing providers' sustainability promises, experience is once again crucial. It's the data centre providers with ambitious sustainability targets that can simultaneously deliver on customer demands that are best placed to provide the service needed today.

The most experienced providers are committed to delivering a "cradle to grave" sustainability strategy, where environmental ambitions are built into every step of data centre construction and operational management including maintenance - rather than trying to retrofit or bolt on discrete initiatives, or just buying certified power.

Learning from the past and looking to the future Experience really shows its value when things go wrong. No matter how much planning has been done, how innovative the design of the data centre is or how good the people and technology are, something will inevitably go wrong and equipment will fail for one reason or another. It will be the monitoring, reacting and operating procedures - evolved over years of learnings - that ensure customer experience isn't negatively impacted when these events occur. Only with experience and longevity can providers build robust processes, tried and tested in live scenarios, to ensure the best possible levels of service.

When looking to the future, as with most sectors, the data centre industry is fast evolving and constant price pressure affects businesses across the board, so it is the responsibility of all organisations to invest time and money in research and development. For data centres, every aspect of their solutions must be considered - from cooling systems, to security, to monitoring. Data centres are the sum of many parts and each supporting industry must constantly use their knowledge and experience to innovate and improve. It is only the most experienced data centre providers that are in a position to take the learnings of every design, build and operations project they have undertaken and develop best practice and new strategies, based on years of learnings.

Trends like immersion cooling, back-up power and generator solutions are all interesting areas for the future. Whilst sustainability will continue to be an important concern to be reviewed and addressed by all businesses, it will be the responsibility of everyone to continue to investigate what can be done to help mitigate climate change; for example, carbon neutral is the stated position of many providers, but the more forward thinking are looking to go further and become carbon zero. Other areas under review include alternative sources of back-up power and the wider adoption of fuel cells as a standby energy source.

To date nothing is workable at the scale needed for large data centres, but research continues. Innovation must be a priority not just now, but also in the future. Data centre providers must keep using their experience to innovate if they are to meet the needs of both new and their longest serving customers.

It is clear that there has never been a more critical time for data centre providers, but arguably there has also never been this level of scrutiny and pressure to deliver. As we move through an extended period of post-pandemic uncertainty, it's the digital infrastructure that is going to keep most if not all businesses, and ultimately, the economy running. The relationship between customers and their data centre partner is crucial. Selecting an expert provider that can not only meet your demands – but that can prove its credentials based on past experience – is now, more than ever, a business-critical decision.

Three guiding principles to

establishing data resilience for a hybrid cloud strategy

According to the 2020 Dell Technologies Digital Transformation Index, 7 out of 10 U.K. businesses accelerated their adoption of transformational technology programs due to the pandemic.

BY STEPHEN GILDERDALE, SENIOR DIRECTOR, DELL TECHNOLOGIES

FOR THESE ORGANISATIONS, 89% said that the virus highlighted the importance of investing in a more agile, scalable I.T. environment with multiple cloud environments featuring among the top five technology priorities over the next one to three years.

These figures show how a hybrid cloud strategy is rapidly becoming the I.T. strategy of choice. This is mainly due to its capability to offer enterprises the best of private and public clouds, along with edge technologies and greater choice and flexibility. Such a strategy also presents an opportunity for businesses to rethink their data protection and resilience approach.

Adopting a hybrid cloud strategy offers several advantages regarding data protection:

⦿ **Cost optimisation:** A hybrid cloud offers flexibility and choice as to where to store data to optimise costs

over the lifecycle of the data.

○ Right-sizing recovery and availability: Cloud computing has driven organisations to think comprehensively about what data is necessary and how to treat each workload, taking the time to understand what storage is needed at any given time.

○ Minimise risk: We know that diversifying investments is a sound strategy to avoid losing everything. A hybrid cloud approach provides location diversity for data, minimising the risk of data loss and cloud-vendor lock-in.

Three guiding principles to establishing data resilience There is no one-size-fits-all solution. However, we recommend these three broad guiding principles that can enable organisations to establish a long-term hybrid cloud data resilience strategy:

1. Architecture matters
We suggest advocating for scalable and efficient architectures, technologies, and products built with a hybrid cloud in mind. The reason being that data resilience is a long-term strategy. The more costly your organisation's data is, the riskier it is to protect it. Making sustainable investments to support data resilience will reduce risk over the long term. This includes:

○ Storing data efficiently: Storage costs, cloud or not, are usually equal to or increasing at a rate faster than data is growing. Backup data offers an opportunity to leverage data deduplication efficiencies to ensure that the most data can be stored in the smallest footprint. It's also true that efficiently stored data enables efficient data mobility. Data can be transferred across clouds to allow restoration anywhere and allow strategic direction changes quickly and cost-effectively.

○ Optimising hybrid cloud infrastructure costs: Assess all hybrid cloud infrastructure components required, including compute, block and object storage, egress and transfer costs, and API call costs. This will ensure no surprises when it comes to the run costs to enable an I.T. strategy.

○ Leveraging cloud economics: Choose capabilities that deploy technology as a utility service so that infrastructure does not become an expense when it is not in use. Ideally, look for ways to consume I.T. where you only pay for what you use via a subscription-based or consumption-based model. The architecture should be modular, starting with a minimal resource footprint and growing with the organisation's needs.

2. Develop well-defined data protection policies
For many organisations, data is their competitive advantage. This data should be protected by considering these options:

○ Responsibility: Public clouds generally operate under a Shared Responsibility Model, meaning an organisation maintains some responsibilities for their data and

workloads. At the same time, the cloud provider may also take some responsibility. Data protection and availability typically falls on the customer to implement and manage. Consequently, it's essential to ensure that the corporate data protection policies extend across the hybrid cloud strategy.

○ Reviewing the data protection strategy regularly: It is best to ensure the data protection strategy is up to date with the changing technology and the ever-evolving regulatory landscape.

3. Simplifying your data protection solutions
According to our survey mentioned earlier, nearly four in ten respondents used solutions from multiple data protection vendors. Organisations using multiple vendors are likely to experience almost 5x higher data loss costs and 2x higher downtime related costs. These enterprises are likely investing more in time, money and staffing resources to protect their data and applications, and yet their annual data loss and downtime costs are significantly higher than those working with a single data protection vendor. While thinking through a data protection plan for a hybrid cloud strategy, CIOs should look to data protection solutions that protect data wherever it resides.

Organisations are becoming well-versed in the benefits of a hybrid environment. By adopting these three guiding principles, they will be able to effectively manage and protect their data and workloads and begin to reap the rewards of a robust hybrid cloud strategy.

Data centres and dirty fuel – the forces pushing facilities to back away from diesel

Customer demands, regulation and the outcry against GHG emissions may make a switch from diesel standby to gas generation a timely move for data centres.

BY ED ANSETT, CHAIRMAN, i3 SOLUTIONS

ON AN ALMOST DAILY BASIS media reports speak of changes to the global energy mix to deliver the electricity on which we all rely. Airwaves and websites are full of stories about countries reporting how much of their power for a previous quarter or month came from renewables. Government and non-government agencies regularly update forecasts on how much power will come from solar PV, wind or tidal by 2023, 2025, or 2030.

In essence, what they are all covering is the transition that is happening in the energy sector as it shifts from dirty, high CO_2e content fossil fuels to zero or low GHG-emitting energy sources. This represents a revolution for the entire energy sector.

The energy used to power everything, including data centres, will increasingly come from renewables. In terms of the fuel mix for generating electrical power, many countries have already committed to phasing out the use of coal in favour of an increasing reliance on nuclear, gas and renewables.

"We can expect increased use of electricity in buildings, industry and transport to support decarbonisation. Investors are already shifting away from fossil fuels. Proven technologies for a net-zero energy system already largely exist today. The total

energy transition investment will have total US$131 trillion between now and 2050." said the IRENA (International Renewable Energy Agency) World Energy Transitions Outlook Report.

For a high-power use sector such as data centres, the same forces that are changing attitudes to diesel as a fuel for transportation – air quality and emissions – will also drive the sector to evaluate alternative technologies rather than persist with a continued reliance on diesel fuel for on-site back-up and standby or secondary power generation.

Any shift away from a reliable, proven back-up solution has many implications. But as the grid supply shifts to renewables, it will be the data centres themselves that must find clean ways to ensure that an intermittent method of power generation can be handled by on-site equipment. There are two imperatives at play:

- Power must continue to be made available for traditional back-up, while data centres evolve as demand-side response suppliers of power back to the grid.
- Any kind of data centre energy generation for grid support will need to be low or zero carbon.

We need to talk about diesel

The question then becomes what should data centre operators do about diesel and diesel generators? This is not theoretical. The forces that will pull data centre operators away from diesel are growing.

Regulations covering the use of diesel generators have always existed and the use of diesel is already covered by directives on carbon emissions, air quality and noise. Now the scope of regulations are being expanded through directives such as the Medium Combustion Plant Directive (MCPD) and Specified Generator Controls.

"MCPD applies to all combustion plant between 1 and 50 MWth (equivalent to generators with output from 300kW to 20MW electrical). So, if you have any generators with an electrical output above about 300kW, then you are in scope. If you are a large installation where the aggregated generating capacity is over 50MWth, approx. 17MW electrical, then diesel power generation is considered under an Industrial Emissions Directive (IED) environmental permit (EP) which will relate to the generator combustion activities

and the associated diesel storage. A bespoke EP will be required for operation of the generators and for the associated diesel storage," says the TechUK Road Map for Data Centre Operators, Understanding Compliance Obligations for Combustion Plant Emissions.

Already the use of diesel is being restricted to make it less economically attractive. The latest UK budget made use of red diesel, which carries lower tax than white diesel, prohibited by cutting the type of industries where it can be used. Data centres are off the list. (Source: Emma Fryer, Red diesel and data centers in the UK - DCD (datacenterdynamics.com)

According to the TechUK road map on using diesel generators the regulations are already complex and many of the requirements are new territory for data centre operators. For example, it says Thermal input (MWth/MW thermal): "Thermal input means the rate at which fuel can be burned at the maximum continuous rating of the appliance multiplied by the net calorific value of the fuel and expressed as megawatts thermal. This is an unfamiliar concept to many data centre operators because they think of generating capacity in terms of electrical output and not thermal input. We need to know the thermal input to understand the emissions associated with the generator."

Depending on the location of the data centre, it is unlikely that running diesel generators for hundreds of hours per year for on-site generation is a viable option. Diesel engines have high emission factors and therefore are unsuitable as an environmentally sustainable energy source for grid support.

Data centres moving from diesel to gas

Transitioning to gas engines may become the preferred option for data centres. Although gas-based engines are relatively new in the data centre sector, it is evident the industry is beginning to move towards gas as a replacement for diesel engines.

"Substituting diesel engines with low-carbon alternatives such as gas reciprocating engines or turbines in conjunction with sustainable energy storage devices will enable many data centre owners to reduce their carbon footprint, and gain additional income derived from the various grid support schemes. Gas-driven generators have low NOx and

> Depending on the location of the data centre, it is unlikely that running diesel generators for hundreds of hours per year for on-site generation is a viable option. Diesel engines have high emission factors and therefore are unsuitable as an environmentally sustainable energy source for grid support

SOx emissions, so they are generally permitted for unlimited use. Conversely, standby diesel generators are generally required to operate for only a few hours a year." (Source: Infrastructure Sustainability Options and Revenue Opportunities for Data Centres – i3 Solutions Group).

There is a need to find ways to store sufficient energy for many hours of operation or invest in on-site generation with direct access to a low carbon fuel. Or both.

Battery technology is usually implemented to provide ride-through power during short duration utility power events, or minutes of UPS back-up power to support the transition to emergency power in the event of an outage. To scale battery storage to make it a primary back-up power source would have significant cost, operational and environmental implications. Whether Li-Ion or VRLA, battery chemistries in the main have a significant environmental production cost, while end-of-life disposal and recycling challenges remain. Transitioning to natural gas (including blended NG and H2) can provide comparable levels of reliability and availability to diesel for load support. Gas can also be used to generate low-carbon power which, when fed back into the grid, can reduce the strain at times of high or peak demand. Of-course, where the data centre wants to use its power generating capacity to deliver bi-directional power flow and sell low carbon energy back to the grid, it must comply with local grid codes.

According to a white paper published by Caterpillar, a leading manufacturer of industrial diesel engines: "Direct replacement of diesel generator sets with gas generator sets is an ideal solution. While it's a common perception that gas units would fall behind in their load acceptance capabilities compared to their diesel counterparts, recent developments in gas engine technology have led to numerous breakthroughs in engine performance and have significantly improved their ability to accept load." *Source: Caterpillar*

Caterpillar also suggests that a hybrid solution where gas generation supports base loads while critical load back-up remain diesel based. Any conversion could be incremental, leading to either a hybrid diesel and gas environment or a full diesel to gas conversion.

The global context

The use of diesel as a vital fuel for freight and commercial transportation as well as other industries won't end overnight. But diesel and even petrol driven cars will eventually all but disappear. The direction of travel is clear.

In terms of its future as a standby source of power for data centres, the roadmap for diesel looks like one of increasing restrictions on use, tougher tax regimes, lower emissions targets, improved air quality requirements and lower noise regulations.

All point to a complete re-evaluation of diesel

Given the continued need for availability that demands provision of the same level of back-up protection enjoyed today, and the new opportunities to be part of the broader energy revolution, the transition from diesel to gas in the data centre should be considered.

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CONNECTIVITY

Single-Pair Ethernet expands IoT infrastructure capabilities

Power and data to remote devices over single twisted pair up to 1000-metres; compact cable (18AWG) and connector format increases flexibility and ease of use; converging corporate, factory and distribution information networks increases productivity,

BY STUART MCKAY, PANDUIT

ORGANISATIONS of various sizes and resources are facing the challenge of converging corporate and industrial networks to standardise infrastructure, reduce complexity of multiple-protocol architectures and increase productivity. The latest development in Ethernet data communications is extending its capabilities over single-pair cable. Single-Pair Ethernet

(SPE) allows building automation systems and legacy industrial networks to migrate to single Ethernet network technology whilst delivering power and data to and from edge devices.

Increasing demands on automation infrastructure interoperability means that SPE is the enabling

platform that allows the migration from various legacy networks to one universal physical layer. The connectivity between the corporate and Industry 4.0 is a step closer to being delivered through a single technology from the edge sensor, plant floor, data centre monitoring devices, to the corporate desktop. SPE expands the resource of the Industrial Internet of Things (IIoT) providing the accelerator for organisations to migrate to Ethernet based operational technology (OT), offering common communications protocols compatible with the information technology (IT) network. This expansion encompasses end-to-end solutions including, switches, valves, cables and sensors, which have been developed by numerous organisations collaborating to effect the changes necessary to harmonise OT and IT operations, on the most effective protocol.

Ethernet has gained share in the Industrial market and is available in a variety of forms including PROFINET, EtherNet/IP and EtherCAT and together with complementary IP-based protocols it is now the dominant data communications platform.

SPE Speeds Migration

The capabilities of SPE increases the commitment to an all-Ethernet networking solution, advances are making the network easier for organisations to implement and manage. The single protocol network will provide for data transparency and increase security. The growth of the IIoT and its requirement to seamlessly connect to corporate information systems as well as industrial processes will drive the convergence onto the Ethernet platform.

The initial single-pair IEEE standard 802.3cg-2019, was announced in early 2020, and device chips were launched to support all SPE applications in process automation, industrial automation and building automation within that timeframe.

The reduced number of pairs used for data communication, allows for a reduction in cable and connector size, while the technology delivers both power and data to edge devices within a single connection. The IP20 SPE Connector (see Image 1) is a small format module with half the footprint of a RJ45 port, and it features positive latch engagement for secure connection. Integrated power and data eliminates the need for local batteries or power supplies at the edge, and saves on transformers and circuit protection, while reduces installation time and simplifying maintenance.

Compared with terminating 4-pair cable to TIA-568A/B standards, field terminating one-pair cable with the LC-style connector is fast and simple. Using common tools, a technician is able to perform an SPE termination in half the time taken for a 4-pair termination. It also utilises 18 AWG cable offering lighter, smaller cables. The SPE connector termination will be less prone to error, minimising any rework.
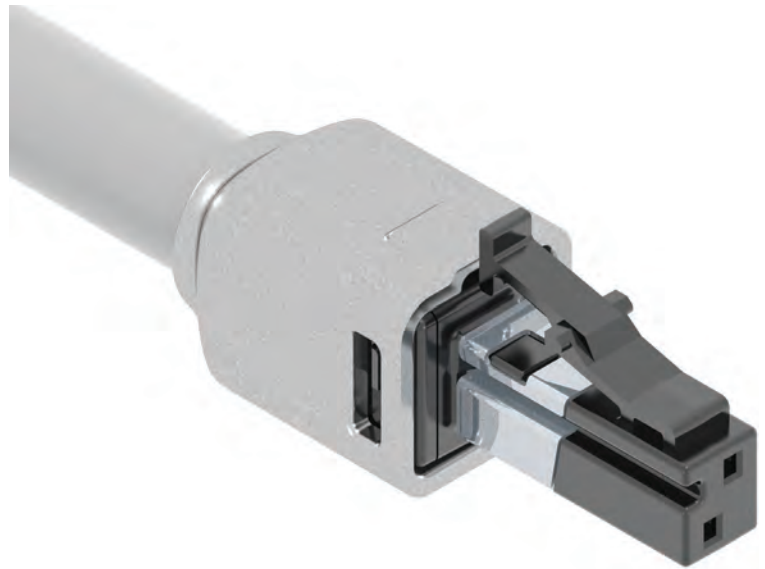
Above: IP20 SPE Connector

Given the decreased weight and size, more cable runs can be pulled together, simplifying implementation The importance of data and power over SPE to remote devices cannot be overstated. The IEEE 802.3bu standard provides for remote DC power over the SPE connection, called Power over Data Line, or PoDL. PoDL is akin to the Power-over-Ethernet (PoE) technology for standard Ethernet, which is transforming smart building electrical and data communications infrastructure.

A further positive attribute of SPE is the potential to reuse existing cable media. Many factories and plants have legacy single-pair twisted cable, that can possibly be reused as SPE cable media, subject to qualification. For instance, much RS-485 cable in use or redundant is 18 AWG gauge making it a viable alternative to new cable runs. The cables will need to be tested to ensure they meet electrical performance relative to the TIA-568.5 standard for 10BASE-T1L link transmission.

A colleague, Bob Voss, Senior Principal Engineer for Panduit Corporate Research and Development, and Chair of Single-Pair Ethernet Subcommittee, at the Ethernet Alliance, recently stated, "Gains in capability of Single-Pair Ethernet and its ability to support proven Operations Technology topologies in industry and manufacturing is bringing real value to organisations." The sub-committee Bob Voss chairs has the role to drive the development of a coherent roadmap for BASE-T1 Ethernet, as the preferred network implementation in a single network infrastructure incorporating industrial networks into the Ethernet environment. This development will significantly increase network security and replace vulnerable older protocols with robust IP networks offering higher data speed, transmission distance and data security benefits.

Consolidating on SPE environments reduces or eliminates non-Ethernet challenges whilst extending

Right:
Single-Pair
Ethernet 18AWG
Cable

Consider that against legacy protocols based on RS-485, where the link speed is only 31.2kbps for the same 1,000 metres. That is 300 times faster! SPE's convenience, cost and relative functionality provide low-cost access for either migration or incremental deployment of SPE within an industrial environment. The technology cost aligns with extending data capture capabilities out to multiple edge devices, where previous access was cost prohibitive.

Expansion of IIoT is dependent on cost effective technology coupled with inexpensive sensors to drive scale. High volume automation products are likely to change first, while specialised legacy protocol devices will take longer to replace. Once organisations understand the market advantage they can gain from SPE the implementation of associated devices will increase dramatically, which in turn will reduce complexity of the network as it converges on Ethernet.

SPE is expected to be a key enabling technology for manufacturers and industrial plants to:
- Achieve a seamless network with visibility from cloud to edge
- Increase bandwidth at the edge for implementing advanced diagnostics
- Simplify edge networks by eliminating protocol translation gateways
- Transform and simplify DC control power infrastructure
- Improve cybersecurity by extending Manufacturing IT defence-in-depth technologies
- Connect miniaturised micro-IoT and otherwise constrained form factor devices
- Lower TCO for the OT network

the advantages of Ethernet and IP-based networking. Ethernet networks are faster, offering enhanced techniques like Time Sensitive Networking (TSN) and Software Defined Networking (SDN). And while Four-Pair Ethernet is already well established supporting higher levels in industrial networks, it is not cost-effective for many lower value edge devices. SPE is designed to be the solution at the right price point, providing the entry level for far wider implementation of price sensitive IIoT devices. Systems that currently use RS-485 serial communications can be upgraded with little change to the media and therefore brought into the Ethernet network.

Fast and Friendly

SPE provides increased bandwidth allowing higher data rates at the edge, with up to 10 Mbps transmission speeds up to 1,000 metre distance.

Single pair Ethernet is a transformative technology for organisations that encompass corporate offices running Ethernet and manufacturing and industrial plant facilities. For standalone manufacturing space and other market segments such as rail transportation and building automation, these will also increasingly adopt SPE networks as IIoT develops into a major market segment in the coming years.

Ethernet networks are faster, offering enhanced techniques like Time Sensitive Networking (TSN) and Software Defined Networking (SDN). And while Four-Pair Ethernet is already well established supporting higher levels in industrial networks, it is not cost-effective for many lower value edge devices

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Safeguarding
Iceland's financial services backbone

With solutions operated in multiple data centres and in a shared multi-bank environment, Reiknistofa bankanna sought a flexible technology partner that could ensure the highest levels of operational security, cost efficiency and resilience.

REIKNISTOFA BANKANNA (RB) is a provider of mission critical IT systems for Icelandic financial institutions, responsible for the country's central clearance and settlement system and a number of multi-tenant core banking solutions.

It also operates an e-invoicing and e-payment system for corporates and consumers. It is jointly owned by the three main Icelandic banks, two saving banks, the Icelandic Savings Bank Association and the three main payment card processors in Iceland. RB's clients are these banks, the Central Bank of Iceland and other financial institutions as well as the government and public entities. With solutions operated in multiple data centres and in a shared multi-bank environment, RB sought a flexible technology partner that could ensure the highest levels of operational security, cost efficiency and resilience.

RB had traditionally protected its datacentres and offices via disparate video and access control systems. These siloed technologies must be operated and maintained separately, creating a convoluted and inefficient user experience. They were also very old, and maintenance was becoming both a financial and an operational issue. Sourcing reliable technical support and compatible hardware when something went wrong was becoming increasingly difficult, with replacement parts often taking at least two weeks to arrive. Something needed to change to prevent the corresponding disruptions to security and operations. Upon inheriting responsibility for the security infrastructure Geir Sæmundsson, Datacentre Manager at RB set out a clear vision for the requirements across all of RB's faciliites. "I wanted a unified all-in-one system that wouldn't restrict my hardware choices going forward. The system needed to deliver long-term value so I wasn't prepared to limit RB's options to just one manufacturer of security cameras or door readers."

Moving to a single pane of glass

RB required a modern, reliable system which brought video and access control into a single solution – all displayed easily for operators to understand what was happening, when; to provide business-wide

value. Mr. Sæmundsson therefore approached Hafliði Jónsson, a security consultant he had worked with for many years, to advise on the enabling technologies that could best support these ambitions. Upon consultation it quickly became apparent that a Genetec solution, driven by Security Center 5.9 was the optimal choice. As an open platform, with native video and access control capabilities, it could simplify daily security operations and allowed for further integration with other tools such as RB's heating and cooling systems.

Furthermore, it would enable RB to undertake a phased evolution of its infrastructure, relieving budget pressures without delaying implementation timelines. For example, RB initially retained all of its existing security cameras and is upgrading to newer more sophisticated Mobotix devices over a period of 3 years.

"From day one we wanted a unified system which could help our teams understand the situation, quickly; alerting them if anything required their attention. The Genetec solution does just this, and is allowing us to build in customised alerts so we gain business intelligence – providing us with better ROI." – Geir Sæmundsson, Datacentre Manager at RB Since bringing its security solutions under one system, RB has been able to provide operators with customised dashboards that quickly alert them to matters requiring their attention.

For example, an unauthorised access attempt or sudden rise in temperature inside the data centre generates a notification within Security Center for an employee in the monitoring room to respond to and investigate. The ease of the transition, and the ease of use of the solution means that RB is planning to install the Genetec solution into its offices soon also, as the business is keen to have one solution across all of its buildings – yet is compatible with a range of integrated technologies.

Direct communication fuelling a brighter future
The solution has been immensely successful, and RB is looking ahead to a bright future with Genetec. The process of implementation and configuration was shorter than anticipated and as a fully cloud-based system the process of adding new devices or facilities to the network has proved very straightforward. One year in to its operation RB is running its system autonomously with little need to call in external support. One of the key reasons for this is the ability for RB and its system integrator Hafnes Ehf to communicate directly with Genetec rather than having to go through a third party – as was the case with its previous security platform.

 "Given the high security requirements of RB's data centres I was keen to cut out any middlemen to ensure any integration issues could be more quickly and esily resolved" commented system integrator

Hafliði Jónsson. "RB has saved a lot of time and money as this direct relationship gives RB much more control."

Geir Sæmundsson, Datacentre Manager at RB, commented: "The time savings delivered by Genetec has been immense. The fact it's plug and play, and therefore up and running in a matter of hours is fantastic. Added to the fact it's easy to install and we get lots back from the system, it's been a worthwhile investment, especially as it can evolve with us, and allows us to move at our chosen speed."

Appetite for more
With the initial requirements met, RB is now exploring ways to extract further value from its unified platform. Next on the roadmap is the introduction of Genetec ClearID that will streamline the process of managing facility acess requests and automate the creation of montly client access reports. Making use of the access control infrastructure already in use throughout the facility, Genetec ClearID allows authorised visitors to easily request and be granted appropriate access in line with RB's security and compliance policies and the individual's access rights.

With the roll-out of the unified Genetec platform also expected to extend to future datacentres and RB's offices, it seems the partnership is set to go from strength to strength. "RB is the backbone of Icelandic Financial Services. We can't afford to have security breaches or downtime, as it's not just us that will be affected. We needed a failsafe solution, and so far, Security Center and Genetec has enabled this. Considering its ease of use, deep integration and leading analytics, we look forward to continuing the partnership over years to come", concluded Sæmundsson.

Data centres will become hubs for the medical research and development

The world jumps forward in times of crisis. World War One gave us stainless steel and wristwatches, World War Two gave us penicillin and duct tape. Whilst it is impossible to look back on the current crisis with any real clarity, it is clear that a huge amount of innovation has been initiated by the COVID-19 pandemic.

BY DAVID BLOOM, PARTNER AT THE NOÉ GROUP, FOUNDER OF GOLDACRE AND INVESTOR IN KAO DATA

MEDICAL RESEARCH, not just in treating coronaviruses, but also for a range of other diseases and illnesses, has taken a quantum leap forward in the past 12 months. This trend is only likely to increase as supercomputers enable scientists and researchers in the pharmaceutical sector to reach to previously unachievable hights in R&D. Data centres will play an essential role in supporting this innovation.

Supercomputers have opened up new avenues in medical research At the beginning of March it was announced that the Oxford University team responsible for developing a COVID-19 vaccine were deploying the same technology to revolutionise cancer treatment. The work uses harmless modified viruses to train the body to fight off the real thing. Although theoretical mRNA vaccine technology has existed since the 1960s, its development as a real-world solution to COVID-19, in less than a year, was supported significantly by supercomputers. This is one of countless examples of how supercomputing is shaping to play a defining role in medical research. Indeed, we now stand on the precipice of a dramatic expansion in medical research for a whole host of new medical developments.

For their part, supercomputers have been hailed for a number of years as the future of R&D across a range of sectors. From fighting climate change to discovering new, lifesaving drugs, many experts view High-Performance Computers (HPCs) as the solution to many of the world's most challenging problems. Since the start of the pandemic, supercomputers have played an integral role in speeding up research,

enabling researchers to develop and model dozens of vaccines in mere months, an achievement that would have been widely deemed impossible a few years ago.

At the beginning of the pandemic, the US Government announced a consortium of government agencies and technology companies would make supercomputing resources available for R&D during the pandemic. Speaking to the Wall Street Journal, Kevin Esvelt, assistant professor at the MIT Media Lab, who were part of the project, said that supercomputing resources were able to accelerate COVID-19 research dramatically. "Using only the lab methods, it would take many months longer, if it was possible at all," Esvelt suggested. Supercomputers continue to play an integral role in developing vaccines and responding to new mutant variants of SARS-CoV-2.

Supercomputers enable high-intensity research to be conducted at a fraction of the time it would have taken even at the start of the century. Thousands of processors working together to make trillions of calculations per second, allowing vast amounts of data from a variety of sources to be analysed quickly. Then, a little over a decade ago we developed petascale computing and now we can deploy AI analytics on a variety of data at scale.

In the context of COVID-19, computational analysis and machine-learning facilitated by supercomputers allowed researchers to compile colossal amounts of information about the virus and its structure. This allowed scientists to understand what elements of the virus will produce an immune response. This research

has ultimately helped scientists to develop new types of vaccinations.

Data centres have an integral role to play in both the present and future of COVID

For data centres, which house these enormous systems, this moment in time represents an opportunity. Demand for data centres has increased rapidly in recent years. With so much of our work and social lives now taking place online, it is unsurprising that demand has taken off. We have seen the importance that cloud computing can play during the pandemic, not least for the billions of people around the world who have had to work remotely for the best part of the last year. According to a recent report by Knight Frank, capacity in London in 2020 increased by 412MW to a total of 1,539MW. From remote working to other pandemic phenomena, such as the increase in demand for gaming, video streaming boom, or growing popularity of videocalls, COVID-19 has changed the way we interact, pushing us towards the digital world. These side effects are likely to be felt for a long time after lockdowns are lifted. With these changes in behaviour, demand for data centres is only likely to increase.

However, it is perhaps not what is taking place already that is most exciting for the data centre sector, but the promise of what is to come. Supercomputers, housed in data centres, promise a new age of ground-breaking research. Understanding data centres not just in terms of the capacity, but also in terms of the research they can support, is essential for conceptualising the future of data centres.

Location, location, location

Kao Data Park, based in North London, is an example of a data centre that is putting research at the forefront. The Harlow campus sits on 15 acres of land and supports more than 40MW across 32,000 square feet of technical space. Kao Data is state-of-the-art by design – it supports one of the largest supercomputers in the world but is also built to be environmentally sustainable. This means that the supporting infrastructure is capable of both sustaining incredibly high levels of processing while remaining incredibly energy-efficient.

Kao Data was set up with the future of supercomputing in mind. The Cambridge-1 supercomputer will be an NVIDIA DGX SuperPOD™ system capable of delivering more than 400 petaflops of AI performance and 8 petaflops of Linpack performance, which would rank it No. 29 on the latest TOP500 list of the world's most powerful supercomputers. It will also rank among the world's top 3 most energy-efficient supercomputers on the current Green500 list.

The location of a supercomputer matters; they are stars and innovation must be able to easily gravitate towards it. For medical innovation, the Cambridge-London corridor is second to none. Not only is the supercomputer at Kao Data conveniently located near the University of Cambridge, it is also now able to serve the renowned pharmaceutical sector in the region.

The intersection between supercomputers, medical research and 5G will also play an important role for future considerations. As a recent PwC report suggests, 5G allows communication to flow more freely across the globe. This means that researchers can work with colleagues in different parts of the work; someone based in Cambridge could use 5G technology to work with a fellow researcher based in Massachusetts. In order for this to happen successfully, edge computing will play an important role, which in turn means that more data centres must be located closer to the areas that innovation and research and taking place.

The location of a data centre is therefore paramount to the success of medical research in the future. Data centre owners have an integral role to play in securing this future.

Conclusion

Data centres will play an essential role in the future of medical research. As we have seen during the pandemic, there has been a quantum leap forward in the capability of medical research, not just for coronaviruses, but also for cancer, rare diseases, neurodegenerative conditions, influenza, and a whole range of other diseases. As has been observed by many, the coming decade will be dominated by scientific and medical innovation, with children idolising doctors alongside actors and footballers. Whether or not this comes to fruition, it is clear that scientific research will reach new heights in the 2020s. Data centres, and the supercomputers they support, will play a starring role in this future.

Bryland Fire Protection designs 1,000 fire detector system to safeguard 10MW data centre

A global leading data centre company has recently enlisted the support of Bryland Fire Protection Limited to design and install an engineered solution to safeguard their 1,600-rack facility in Slough.

THE NEW 10MW centre which took two years as a phased completion, features three individual fiber cable lead-ins, and will significantly step-up international telecommunications services to carriers connecting China with Europe.

Due to the delicate and sensitive equipment being used by the client, careful consideration had to be taken when designing the fire detection and protection system. Graham Turner, Bryland Fire Protection's Managing Director explains, 'As this client specialises in providing telecommunications, protecting 'uptime'

which is the amount of time servers stay operational, was critical. Water sprinklers may be one of the most economical solutions, but not appropriate for these sensitive data cabinets, and server rooms.

We had to design a solution that would not only provide early warnings, sample air purity, and prevent contamination to the data hall air supply, but also consider how we could minimise any post event downtime and damage. Continuity of supply to this client's customers is both critical and crucial.'
This was a multi-million pound project for award

winning Bryland Fire Protection who have a wealth of experience designing fire protections systems for data centres in the UK and Europe. Their clients include other major telecoms companies, but this project was significant due to the quantity of equipment that was used.

Graham Turner continues, 'This was a major project in many respects. It was the client's first data centre in Europe, and so a showcase for potential future developments. Our involvement consisted of 34 areas across the two-storey building. To put this into context, our solution included over 1,000 fire detection devices, networking around analogue addressable fire alarm control panels, a Gent WINMAG Graphics System and 34 Kentec Sigma XT+ extinguishant control panels.'

Sapphire Novec 1230 gas suppression product was the obvious choice to protect against higher hazard 'Class A' fires to cover the data cabinets, switchgear, and communications equipment. It is a non-toxic, fast acting, clean agent, that is stored as a liquid but discharged as a gas and therefore mitigating the damage that sprinklers or water systems can pose. Over 6,500 kgs of Novec 1230 was used on this project.

Multi Point Aspirating Smoke Detection Systems (MASDS) were installed and integrated throughout

> ### This was a multi-million pound project for award winning Bryland Fire Protection who have a wealth of experience designing fire protections systems for data centres in the UK and Europe

the building, to sample air for pollution and prevent contamination to the data hall air supply. In addition, a site-wide Emergency Voice Communication System (EVCS) was designed and installed to safeguard the occupants in the event of an emergency or evacuation.

Turner concludes, 'This was a great project to work on. It used all of our team's collective talents, including our designers who engineered the bespoke solution, project managers who oversaw the installation, and our manufacturing partners who include Honeywell, 3M, and Johnson Controls. This is exactly what Bryland Fire stands for; a great team effort with a fantastic result that will protect and safeguard this client's significant assets.'

As easy as CFD

As data center cost-efficiency and environmental performance come under intense scrutiny, Computational Fluid Dynamics (CFD) plays a major role in ensuring facility optimization.

BY GORDON JOHNSON, SENIOR CFD MANAGER AT SUBZERO ENGINEERING

SINCE 2015, we've kept track of the various savings we have achieved for our customers through the careful, considered optimization of their data center environments. The numbers are impressive: our customers have saved just under 3.5 billion Kilowatt hours, reduced water consumption by one and a half billion gallons and have a total carbon reduction of over 3.2 million tons - the equivalent of planting 17 million trees.

Along the way, we've also been able to help customers achieve up to a 29% energy cost reduction, and been able to reduce PUE (Power Usage Effectiveness) by an average of 0.4 and WUE (Water Usage Effectiveness) by an average of 0.3. Much of this success has been due to the strategic importance we place on carrying out an Environmental Impact Evaluation during the initial customer engagement process which consists of a complementary CFD.

This evaluation is designed to provide recommendations for improving   efficiency and includes solution cost analysis (annual $ energy savings and ROI with containment).

We believe that the CFD is essentially an MRI of the data center, and when it comes to informed decision-making, the mantra 'if you can't measure it, you can't manage it' still holds strong. However, in the case of CFD, 'if you can't measure it, you can't improve it' may be more appropriate.

Turning customer pain into gain

The current and growing industry focus on sustainability has highlighted the need to work towards energy efficient data center designs, which, in turn, should provide the perfect combination of sustainable operating conditions. The end result being truly optimized data center performance.
CFD plays a vital role when it comes to data center construction, retrofit, and helping improve the efficiency and performance of legacy data centers. It allows the owner or operator to simulate endless combinations of racks, cabinets, cabling, and mechanical and engineering (M&E) equipment for greater optimization.

The owners and operators of these facilities may not be aware that they are literally blowing a lot of (unnecessary) cold air into the aisles in order to keep the servers, switches, routers, and the storage units cool. What they will know, however, is that this wasted air is wasted money. Worse still, emissions will be increased, hot spots will remain an issue, and they will eventually experience equipment failures.

Many data center managers know that something has to change to overcome this unsustainable situation, but they may not have a plan or strategy. This is where CFD is critical.

What is a CFD?

CFD software creates a 3D model of the physical attributes within a data center, as well as the location and performance characteristics of the cooling units, IT equipment, power systems, and other significant components of the data center.

This 'data center MRI' provides a complete, detailed thermal understanding of the data center, providing insight relating to the physical layout of the space and equipment; the power equipment thermal dissipation and rack power density; environmental conditions; cooling capacity and air distribution effectiveness. This is the Baseline model or the "as is" snapshot of how the data center is currently operating.
From the information obtained, additional CFD modelling will recommend how to optimize the operating environment while reducing energy and maximizing efficiency.

Many key benefits of CFD analysis include assessment of the data center layout and its performance; validation of proposed design changes, considerations for efficiency and reliability; accurate prediction/simulation of the cooling design process; the ability to assess temperature and airflow modelling; and reconditions for a cost-effective and energy efficient design.

CFD provides clarity

A data center CFD analysis provides the visibility that is essential when it comes to understanding both your existing operating environment and any potential design changes. CFDs can also be used to test out 'what if' scenarios when it comes to new data center construction or modernization projects.

In essence, a CFD provides detailed, data-driven analysis of the cold supply air and the hot exhaust air throughout the data center, and the identifies of potential overheating of IT equipment "hot spots". Such analysis highlights the way in which energy costs can be reduced by optimizing and maximizing data center cooling. CFDs are a tool to virtually test legacy (and new) data center environments for active temperature, pressure and airflow, and to optimize the mechanical system directly to server heat loads (kW). Armed with data from the CFD analysis, Subzero Engineering can advise customers on impactful data center design changes, upgrades, or tweaks to improve operating improvements - all of which will help optimize and reduce energy usage.

For example, CFD modelling can demonstrate what impact a cold aisle containment (CAC) system will have versus a hot aisle containment (HAC) system. It will advise which method will save more energy, full or partial containment. After containment is installed, it will show if computer room air conditioning (CRAC)

Temperature in F

55.0 65.0 75.0 85.0 95.0
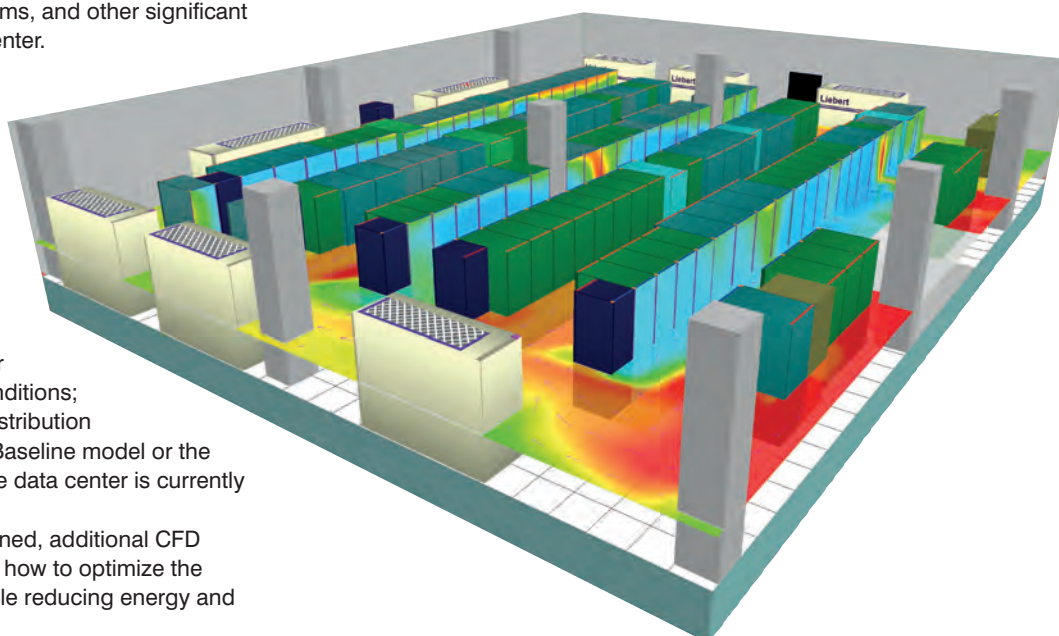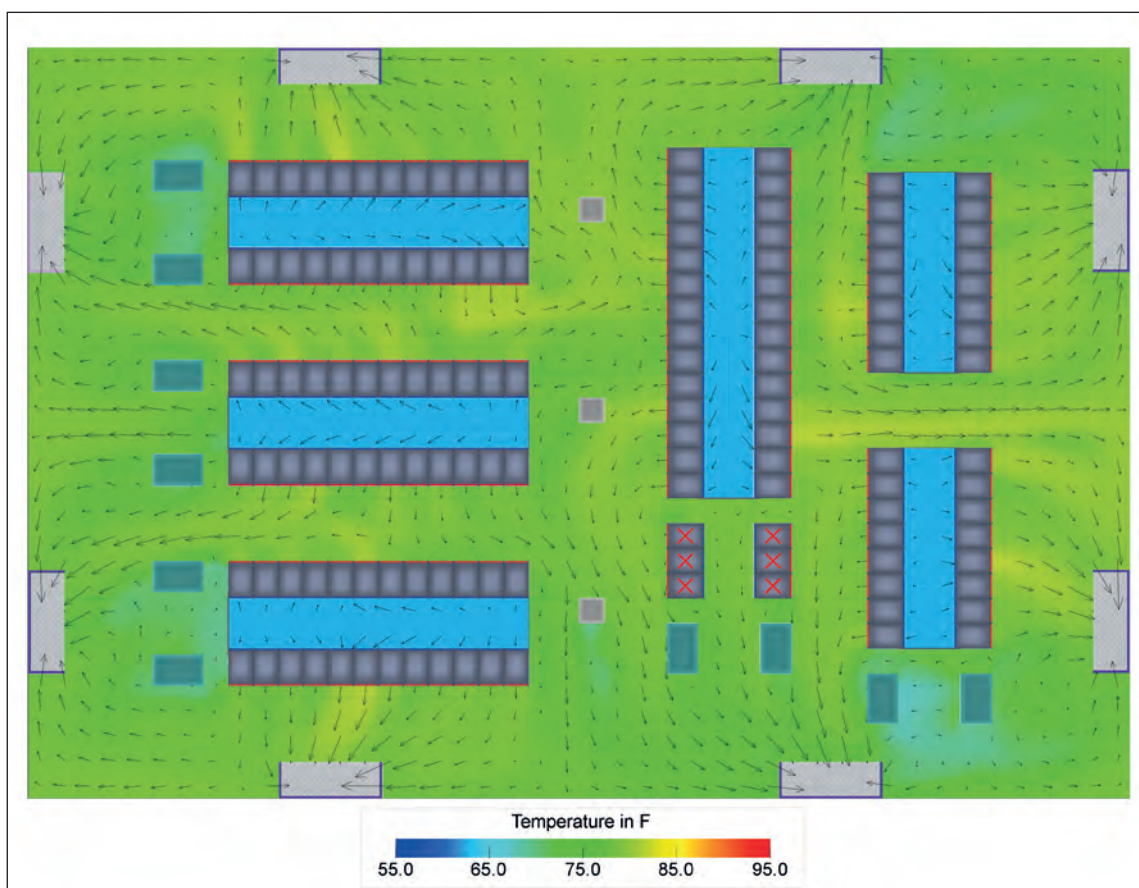
units can be turned off and how low fan speeds can be reduced on computer room air handlers (CRAHs). Finally, it will also inform the user on how high the operating temperature can be increased, while following the recommended thermal guidelines from AHSRAE. The end result is that CFD based design improvements will provide customers with significant PUE, WUE, KW, kWh, carbon, and water reductions.

A logical conclusion

One of the major benefits of using CFD modeling and analysis is that it can quickly demonstrate how a containment solution will immediately reduce a data center's energy cost and lower its environmental footprint. Regardless of which type of containment is used, large energy savings can be achieved by optimizing the airflow and raising the supply temperature, while simultaneously eliminating hotspots. Additionally, containment improves the benefits and economic feasibility of other efficiency measures, such as digital scroll compressors, electronic commutation (EC) and variable speed drives, data center infrastructure management

(DCIM) software, and building controls. Further, by separating the cold supply air from the hot exhaust air, containment saves energy, thus reducing operating costs. Yes, there is the initial investment cost of installing the containment solution, but the potential return on investment (ROI) of 10-14 months means that, very quickly, end-users will achieve payback. What's more, from that point onwards, they'll be saving energy, reducing operating expenditure (OpEX) money, and reducing carbon emissions to become more sustainable.

Today Subzero Engineering has built its industry-leading reputation as a specialist in data center containment and airflow management by placing a major emphasis on the importance of CFD as the starting point for data center airflow and energy efficiency optimization. We believe that a data-driven approach to digital infrastructure is essential and thanks to the use of CFD, we can simultaneously help our customers increase data center density, operating efficiency, and environmental sustainability by implementing optimized containment solutions.

By separating the cold supply air from the hot exhaust air, containment saves energy, thus reducing operating costs

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Reliable power for a sustainable world

Creating critical power systems to meet demands for resilience and sustainability

Today energy efficiency is considered one of the key pillars of data centre sustainability. However, a challenge that runs in parallel is the need for mission-critical reliability.

BY MARC GARNER, VP, SECURE POWER DIVISION, SCHNEIDER ELECTRIC UK&I

OFTEN when a battery backup system becomes more resilient, take, for example, an Uninterruptible Power Supply (UPS) deployed in an N+1 configuration, efficiency is the first aspect sacrificed.

Owners and operators, therefore, need not just consider the types of infrastructure they are deploying more carefully, but also the design of their data centres, the circular attributes, and the ability to integrate with both renewables and the grid.

Having a well rounded, highly-efficient or holistic approach is not only good for reducing operational expenditure (OpEx), total cost of ownership (TCO) and carbon emissions, it's fundamentally good for the environment.

Why sustainability matters

In recent years data centre operators have come under increasing pressure to make their facilities more efficient, environmentally friendly, and sustainable. A growing global awareness of the effects of climate change, combined with end-user demands for sustainability, has seen a number of transformative initiatives take place within the sector, including the emergence of the Climate Neutral Data Centre Pact, setting ambitious targets to help operators become carbon neutral by 2030.

In response, trade associations such as the European Data Centre Association (EUDCA) and Cloud Infrastructure Providers in Europe (CISPE) have helped to create a Self Regulatory Initiative that sets standards for sustainability and a drive to meet EU targets. Both of these bodies have members who operate both inside and outside the EU, so

their regulatory initiatives will apply to data centre operations across the continent as a whole.

Among the measures agreed is a commitment to ensuring that all new data centres in Europe will meet an annual Power Usage Effectiveness (PUE) ratio of 1.3 or 1.4, depending on the climate region in which they are located. Best practices mandated by the Initiative include commitments around energy efficiency targets, carbon-free energy generation, water conservation and the circular economy.

By some estimates, energy is responsible for over 80% of the world's CO_2 emissions and data centres are estimated to represent between 1-2% of global electricity consumption. Add to that the tremendous growth of data centre capacity, commercial property giant CBRE anticipating that Europe will see a surge of over 400MW of new data centre space built in 2021 - approximately 20% more than recent years - efficiency and sustainability are, therefore, more critical than ever.

Customers are also looking to align with organisations embracing sustainable business practices. A recent survey by 451 Research found that 97% of colocation customers are demanding contractual commitments to sustainability, and of the +800 global operators surveyed, more than half believe that efficiency and sustainability will be important competitive differentiators within three years.

A colocation provider who ignores or diminishes the importance of efficiency and sustainability can rest

assured that their competitors will not. Yet, while 55% of surveyed operators were already taking some action in this regard, yet there is still more work to be done.

Efficiency and resilience

The evolution of today's digital economy has meant that application uptime and uninterruptible power are in-essence, business-critical. Power protection systems that safeguard against service disruption are paramount, but the need for sustainable backup solutions is also abundantly clear.

Data centre UPS systems must incorporate features that provide assurance against downtime without placing unnecessary additional burdens on overall power consumption. From a conceptual point of view, modular UPS' that can be right-sized or scaled to match their load, ensure that the risk to IT infrastructure is mitigated by just the 'right' amount of battery backup.

Another key aspect is the operating mode, which can boost the efficiency of a UPS while barely compromising on the level of redundancy offered. Modes such as this can enable users to enjoy the highest level of energy savings without sacrificing load protection. Schneider Electric's patented ECOnversion mode, for example, offers UPS efficiencies of 99% and alongside pioneering safety features, such as its 'Live Swap' function. This allows power modules to be added or replaced while the UPS is online and fully operational - ensuring unscheduled downtime is kept to a minimum during the replacement process.

UPS systems with longer battery lives, especially if they can withstand a much greater number of charge and recharge cycles, also offer many advantages in terms of sustainability. Those powered by Lithium-Ion (li-ion) can offer users longer battery life, a lower TCO over the lifecycle and reduced carbon emissions. Further, the greater number of charge and recharge cycles offered by use of li-ion chemistries provides the possibility of collaborative measures such as peak shaving and micro grids - allowing stored energy to be utilised efficiently to reduce the demand on mains power. Peak shaving applications can also ensure that higher tariffs, designed to encourage operators to remain within agreed power-consumption levels, are avoided by switching temporarily from mains to battery supply as limits are approached. Such capabilities, therefore, offer the user a means of both integrating with renewables and the grid, while delivering sustainable power protection.

Sustainable, circular considerations

A final aspect to consider is the circularity attributes of an uninterruptible power supply. Schneider Electric is committed to providing data centre operators with the technology to combine efficiency and sustainable operations with needs for maximum resilience. To achieve this, products labelled as Green Premium can ensure vendors are crystal clear about the sustainability impact of their hardware systems, further helping end-users to truly gain a greater understanding of their embodied carbon footprint.

Such aspects include transparent environmental information about products, minimal use of hazardous substances and compliance with regulations such a Restriction of Hazardous Substances (RoHS) and the European Union (EU) Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH).

Further, environmental disclosures such as a Product Environmental Profile (PEP) or circularity profiles provide end-users with guidance on responsible product end of life treatments along with circular value propositions, Such measures enable owners and operators to take a step further in their sustainability considerations, and build upon their energy efficiency considerations.

Today, balancing the need for needs for sustainable power protection alongside demands for resiliency are paramount. Yet by carefully considering the type of UPS technologies deployed, the design of the system, and by broadening the sustainability conversation to include renewables and the circular economy, data centre operators now have the means to ensure operational continuity, while minimising impact on the environment.

DCA Data Centre Commissioning SIG
An introduction from DCA CEO Steve Hone

As the Trade Association to the Data Centre sector the DCA understands that it is imperative that key issues affecting the sector have a point of focus. The DCA SIG's (Special Interest Groups) / Working Group regularly come together over shared interests to discuss issues, resolve problems, and make recommendations.

Outcomes can result in best practice guides, collaboration between group members, participation in research projects, this includes clarification and guidance for decision and policy makers. Members find these groups are a great way to ensure their opinions and views are considered in a positive and cooperative environment.

The DCA currently facilitates nine Special Interest or Working Groups. DCA members can join any of the groups and contribute find out more here: https://dca-global.org/groups

The Data Centre Commissioning Special Interest Group (SIG)
All buildings undergo commissioning or tenant checks prior to the new owners taking possession or new tenants moving in, these checks ensure that all building systems (fire, security, environmental and IT systems) are working and meet the required specifications; in a mission critical facility such as a data centre these IST checks are of paramount importance. The Data Centre Commissioning Special Interest Group (SIG) has therefore been formed to increase awareness of the best practices which should be adopted to mitigate risk of failure and optimise the chances of project success.

Items under discussion in the last meeting included:
- Election of a Chair
- Suggestions of suitable experts to join the group
- Ways the group can work
- A Best Practice Guide

At present group members include representatives from:
- Hillstone
- Rentaload
- HeatLoad
- Critical Facilities Consulting
- Carbon3IT
- Acton Consulting
- Operational Intelligence

TTo request to join this group please contact the DCA - **mss@dca-global.org**

How many load bank companies does it take to write a datacentre commissioning best practice guide?

The Datacentre Alliance also welcome other brands of loadbanks

BY PAUL SMETHURST, SIG COMMISSIONING GROUP ADMINISTRATOR, PREVIOUS TEMPORARY CHAIR AND LONG SERVING LOAD BANK COMPANY OWNER

DATACENTRES have a long history of load bank dependency. This can be traced back to an era where datacentres were called computer rooms.

Today we call load banks heatload, but the benefit of load testing remains the same and so do the challenges of making sure everything runs according to the commissioning plan.

Under the guidance of the Datacentre Alliance, three European load bank companies have put any differences aside to form a DCA Special Interest Group of Datacentre Commissioning.

With a wealth of experience spanning collectively more than 50 years of load bank power testing and supplying many hundred datacentre tests across the globe, we have created a unique opportunity to create a best practice guide for testing datacentres.

To publish a non-partisan best practice guide we have extended the group to include veterans of UPS System design and manufacture, Commissioning Agents and datacentre industry experts from within the DCA membership.

However, the 3 load bank companies,

dca | The data centre trade association

will without doubt, contribute from all the experience we have all gathered being in and around data halls white spaces, over the past 15 years.

To rent or to buy? Now that's an expensive decision.

Without doubt the decision to rent or to buy is a datacentre Marmite question.

From the project delivery perspective, the decision to buy or to rent load banks becomes a circular cost discussion.

'Get it wrong and the consequences will financially break the delivery program.'

With level 5 Integrated System Tests having many multi-dimensional factors, the Best Practice Guide will explore fundamental project issues and help avoid datacentre testing from going wrong.

When datacentre testing goes wrong!

A datacentre IST using hair dryers Datacentre load bank companies retain a passion and a pride of being part of an industry that holds such importance to the modern world.

While 2020 was really a strange year in so many ways the creation of the DCA SIG Commissioning Group would in normal times raised questions such as:
- Why do we need a best practice guide for commissioning?
- Why do we need three small independent load bank companies creating a best practice guide to use their load banks?
- Why do experienced commissioning agents need to advise on how to do their job?

In 2021 we have a great opportunity

to deliver the best practice guide to help further promote the DCA and deliver a knowledge transfer to the next generation of up and coming datacentre professionals.

From the load bank perspective, the guide will breakdown the different stages of datacentre testing and will explain where testing can go wrong and why cost cutting and the use of 'alternative equipment' - such as hair dryers, might not always be the best idea!

The DCA best practice guide - needs you!

The progress made so far in 2020 Collectively we have held meetings, we have utilised the excellent DCA stand at Datacentre World exhibition, ran video conferences, and created the framework for starting the Best Practice Guide.

In 2021 the opportunity to join in and help on this guide is open to everyone.

We do however have a couple of conditions that we would like to caveat;

- The DCA is a not for profit industry trade organisation and membership helps Steve Hone deliver the year on year success that the DCA is today.
- The best practice guide needs contributors, people that want to share experiences and help write the guide in a non-partisan way.

The objective for 2021 is, now that we are all video conferencing experts, to achieve at least the release of a draft guide onto paper, but this needs time, effort and collective cooperation.

Load banks - an industrial electrical heater, used for testing UPS Systems, Gensets, Batteries and Busbars in datacentres

Heatload - a smaller load bank with electrical connections to busbar tap-off boxes

Server Simulator - 19" rack mounted heatload devices, used in IT cabinets prior to server deployment

IST (Integrated System Testing) - Level 5 commissioning of all mechanical cooling systems and electrical infrastructure supporting the datacentre white space.

The Best Practice Guide will cover decisions such as:		
Size of facility	vs	Stage of electrical fit out
Project Planning	vs	Commissioning timeline
Risk of load bank availability	vs	Investment and asset maintenance

The time of virtual and remote commissioning for data centres is coming!

BY DAVID GUEDES, SALES DIRECTOR, RENTALOAD

THE COVID-19 global pandemic had a huge impact on all our lives, including our way of working. All sectors of activity have had to adapt and opt for a remote way of work - in order to comply with the measures announced by the government but also in order to continue their activity during shutdowns and lockdowns.

Unfortunately, the impact of this new reality has been felt across all industrial sectors of the global economy, including the construction industry.

One of the biggest effects of this situation, has been a large increase in the number of people working from home all over the world. This was made possible thanks to the Cloud & Data Centre industry.

Indeed, Data Centres are the core infrastructure that allows virtual workforce to remain productive, while away from the office. Big cloud players and global IT companies are spending billions on building and equipping new Data Centres in order to meet this huge demand of teleworking. This is not easy in these rather troubled times. It becomes challenging for the owners of these infrastructures to manage constant moves, adds and changes all over the world. Let's not forget that many owners of critical sites have restricted on-site access as a result of global and local guidance around social distancing. This means it has become difficult to perform some commissioning tasks which require site visits, face-to-face contact and functional testing. A new form of commissioning is becoming more prominent - virtual and remote commissioning! Contrary to what one might think, this new form of commissioning has a lot of advantages.

Before identifying the benefits, do we know exactly what commissioning is?

According to the National Conference on Building Commissioning here is the closest definition of total building commissioning: « systematic process of assuring by verification and documentation, from the design phase to a minimum of one year after construction, that all facilities perform interactively in accordance with the design documentation and intent, and in accordance with the owner›s operational needs, including preparation of operational personnel ». This is what Commissioning is all about.

The verification of the correct functioning of a new Data Centre is also made possible thanks to virtual tools. Many operators can still, in this situation, perform virtual inspection of their critical assets with tools that provide visibility into cooling, power, network, security and other functions. They can see virtually what works and what doesn't (including "faults"), they know what they need to improve next to increase the performance of their data centre. We know these digital solutions help to reduce the number of personnel on site as well as the duration of tests (up to 30% time saving). Which is very positive in this COVID-19 period!

The Uptime Institute (the global Data Centre certification centre) recommends by the way that facilities use remote monitoring, remote management and remote automation software when it's possible. As for the industry insiders, they report that after using these systems, the results of virtual and remote commissioning have exceeded all expectations this year. A very positive outcome!

These solutions seem to be validated and recommended by professionals for Data Centres to the extent that they are efficient and meet a need.

SMART Connected loadbanks for successful virtual and remote commissioning!

Loadbanks are used in the Commissioning phase to demonstrate the proper functioning of the electrical and thermal infrastructure of a new Data Centres and to validate the good adequacy between the construction and the original design. They can provide firm validation!

Connected loadbanks also exist to optimize significantly the "Test & Commissioning" phase of Data Centres. They are increasingly used by these infrastructures, particularly to limit the number of people on site during this period of global pandemic.

Rentaload, the leader of IST Commissioning solutions in Europe offers SMART & Connected loadbanks from 0,5 kW to several MW to the Data Centres industry (the first fleet of connected loadbanks in Europe). Rentaload allows Data Centres to carry out tests in a different way, closer to the current reality and very efficiently.

These smart & connected loadbanks can be remotely controlled by a computer

- up to 200 loadbanks at the same time which limits the number of people on site and saves time. Instead of pressing 200 buttons individually you only have to perform 1 manipulation via the computer. These connected load banks will also collect specific measurements both electrical and thermal of the IT room.

The virtual commissioning, thanks to the connected loadbanks, provide more recorded data than we would have had with the traditional process which is a considerable advantage for the end customer. These measurements are recorded and processed, then forwarded to the end customer in a full test report.

These reports collect data to support conclusions of final commissioning reports. They provide real added value during testing and help to optimize the performance of the Data Centres and limit possible risks.

- Cconnected loadbanks appear to be the future of data centres commissioning: reducing on-site personnel, reducing test duration (up to 30%), saving money, checking

data centre equipment and installations, collecting & recording data and finally drawing up a final commissioning report for the end customer

That's why we talk about « Virtual & Remote Commissioning »!

A new vision on how testing Data Centres

For more information or for all IST Commissioning projects in your Data Centre you can contact us at:
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T: +44 (0) 20 3034 0553
M: +44 (0) 7388 334295
Mail: david.guedes@rentaload.com

You can also download for free our Commissioning Guide on rentaload's website : www.rentaload.com as well as our White Paper
Load banks and Data Centre Commissioning : tips, field notes and best practices!

DATA CENTRE ALLIANCE

DCA data centre energy efficiency SIG: An introduction from DCA CEO Steve Hone

AS THE Trade Association to the Data Centre sector the DCA understands that it is imperative that key issues affecting the sector have a point of focus. The DCA SIG's (Special Interest Groups) / Working Group regularly come together over shared interests to discuss issues, resolve problems, and make recommendations. Outcomes can result in best practice guides, collaboration between group members, participation in research projects, this includes clarification and guidance for decision and policy makers. Members find these groups are a great way to ensure their opinions and views are considered in a positive and cooperative environment.

The DCA currently facilitates nine Special Interest or Working Groups. DCA members can join any of the groups and contribute find out more here: https://dca-global.org/groups

The DCA Energy Efficiency SIG
The DCA Energy Efficiency SIG has members that sit on the EU and UK Standards Development Organisations and provides a two-way conduit for the discussion and

development of the ISO TS 22237 series, the EN 50600 series and the ISO 30134 series of data centre design, build and operate standards and data centre key performance metrics.

The Energy Efficiency Steering Group is chaired by John Booth. John is also an author and committee member of the EU Code of Conduct for Data Centres (Energy Efficiency) best practices and requests applications from members for new, amended or deletion of best practices on an annual basis for discussion at the European wide EUCOC best practices meeting held in September/October every year.

This SIG looks at emerging concepts for the sustainability of the data centre building in terms of energy flexibility and waste heat reuse as well as alternative on and off-site energy generation for primary and backup purposes.

The group work very closely with the sustainability group to provide DCA members with an entire overview of data centre energy efficiency and sustainability.

To request to join this group please contact the DCA: mss@dca-global.org

DCA energy efficiency SiG update

All Data centres use energy, in some cases significant amounts, and globally there is an increasing focus on data centre energy consumption and as a result, pressure from consumers, business and governments to do more to reduce data centre energy use.

THE Energy Efficiency SIG (one of the longest standing DCA SIGs) has in the past kept a close eye on ISO standards (ISO30134, ISO22237), European Standards, (the EN 50600 series) and the EU Code of Conduct for Data Centres (Energy Efficiency) best practices. Committee members represent the DCA on the appropriate standing committees for all the standards mentioned.

The Energy Efficiency SIG used to also have Sustainability in its title but due to its increasing importance this has now become a separate group. So, the Energy Efficiency SIG focus has changed somewhat and, in the future, will maintain its watching brief on the Standards, but also look at heat extraction and cooling solutions in the data centre where they touch on smart cities, waste heat re-use options and energy flexibility solutions.

The EE SIG is in the process of developing an energy efficiency guide that will be published by the DCA.

The Energy Efficiency SIG is the first port of call for all thing's energy related in the Data Centre and works closely with

other SIGs such as the Sustainability, Thermal Management, Commissioning and Certifications Groups.
In this update we'll provide the latest information on current standards, impending standards, an overview of the recently announced Climate Neutral Data Centre Pact and its relationship with the EU Code of Conduct for Data Centres and the European Commission, the impending EE SIG Energy Efficiency Guide, a statement on the split of the energy efficiency and sustainability group into two separate entities and a look forward.

Current Standards
The EE Chair maintains seats on the EU Code of Conduct for Data Centres (Energy Efficiency) and the BSI TCT7/3 committees, and as such communicates pre-publication draft documents to the membership for comments and dissemination.

The Current Published Standards portfolio is listed below but is also contained in the forthcoming DCA Energy Efficiency Best Practice Guide, as is our usual practice, standards are listed

globally, regionally and then nationally, additional guidance such as industry best practices are listed at the end.

It should be noted that standards development has not been curtailed by the Coronavirus pandemic, but activity has definitely slowed, most meetings now take place virtually and it would be safe to say that the process has slowed down somewhat.

Global
- ISO 30134 Series – Data Centre KPIs
- ISO TS 22237 Series – Data Centre, Design, Build and Operate (EN50600)

Regional
- EU Code of Conduct for Data Centres (Energy Efficiency) – 12th Edition

EN 50600 Series
- EN50600 – 1 General Principles
- EN 50600 -2 Building Construction Power Supply and Distribution, Environmental Control, Telecommunications Cabling, Security systems
- EN 50600-3 Management & operational information
- EN 50600 -4 Data Centre KPIs (ISO 30134 Series)
- EN 50600 Technical Reports
- TR-99-1 Energy
- TR-99-2 Sustainability
- TR99-3 Guidance to the Application of the EN 5060 Series

Impending Standards
Standards are in a constant phase of development, normally on 5-year refreshment cycles, so work to review and edit a standard commences in year 3/4 of its life ready for the next edition, the following standards are in either in public consultation phase, the last phase before publishing, or in development.

ISO 30134 -6, 8 & 9 Energy Reuse Factor, Carbon Utilisation Effectiveness, and Water Utilisation Effectiveness.

Some of the earlier EN 50600 are in the process of being updated.

Climate Neutral Data Centre Pact
The Climate Neutral Data Centre Pact was announced in late January and at the time of writing consisted of 20 European Data Centre Trade Associations and 34 Data Centre or Cloud operators agreeing to adhere to 5 pillars, being energy efficiency, clean energy, water, circular economy and circular energy systems. The methodology and reporting requirements are yet to be agreed with the European Commission, but the DCA has input into these discussions via the EU Code of Conduct for Data Centres (Energy Efficiency) committee and via the DCA's relationship with the EUDCA and will report progress at the next EE SIG meeting or via the Newsletter.

DCA SIG Energy Efficiency Guide
The energy efficiency guide has been published internally to the DCA executive and we'll be publishing it more widely at our next meeting, all DCA members are free to contribute or comment on the contents in order to achieve a comprehensive concise and useful document that all members of the DCA and the wider data centre community can use.

John Booth
John Booth is a well-known figure in EU data centre circles, primarily for his role as reviewer for the EU Code of Conduct for Data Centres (Energy Efficiency) (EUCOC) programme and his work with the Certified Energy Efficiency Data Centre Award (CEEDA) which assesses data centres to a subset of the EUCOC best practices.
He is also the chair of the Data Centre Alliance's (DCA) Energy Efficiency & member of the Sustainability steering group, shaping the DCA's policy on these topics as well as providing support to the DCA in other steering groups and the Alliance's wider activities.

He is the V Chair of the BCS Green IT specialist group. He also represents the BCS/DCA/Carbon3IT Ltd on the TCT7/3 committee that works upon the EN50600 Data Centres Design and Build Standards and KPI's (PUE ETC) He runs his own Green IT consultancy, Carbon3IT Ltd, providing support to organisations that are preparing to adopt various data centre standards including the more general standards such as Quality, Environment, Business Continuity, Information Security, and Energy Management. They also provide specialist niche consultancy in the field of Green IT.

Carbon3IT Ltd has recently completed work on the EURECA project, www.dceureca.eu , this EU funded project was rated as "exceptional" by the EC and dealt with the procurement of green data centres and services for the EU public sector.
John has worked with Green IT Amsterdam to provide programme management for the CATALYST project http://project-catalyst.eu/

John is a lead auditor for ISO50001: (2011/2018) Energy Management Systems and ISO 22301 Business Continuity Management Systems, is a Certified Data Centre Audit Professional CDCAP TM (Recert 2018) and is an ESOS registered Assessor.

He is also the Technical Director of the National Data Centre Academy, which hopes to provide practical technical training to the data centre community in the near future.

The "Split" – Energy Efficiency & Sustainability
Energy Efficiency, Sustainability and Data Centres are the hottest of hot topics at the moment and it was becoming clear that one group could not keep up with the varying aspects of the subjects, which cover Data Centre construction, energy efficiency (building) materials usage, energy efficiency (ICT), skills development, workforce retention, standards, and guidance etc.

So, the DCA split them into 2 new groups, the first, the Energy Efficiency group will maintain its focus on global standards, the EU Code of Conduct for Data Centres (Energy Efficiency), waste heat reuse and energy flexibility and where interactions

are required externally to the data centre boundary, whilst, The Sustainability Group, led by Astrid Wynne looks mostly at the ICT side of things, material usage, energy efficiency of ICT equipment, skills development and workforce retention. Both groups will work closely together any topic which crosses the virtual boundaries. The EE group also maintains close links with other SIGs including Thermal Management, Commissioning and Certifications.

Looking forward
Data Centres and Electricity have a unique, almost symbiotic relationship, data centres certainly cannot exist without electricity in some form, but in the future, where the electricity comes from will be an interesting debate, will it be on-site generation using renewable energy (wind, solar, biomass) or hydrogen networks with the associated fuel cell plant or the old fashioned direct utility connection or something else, no one

knows for sure, but you can rest assured that the DCA EE SIG will be keeping an eye on it.

We have the revised version of the Climate Neutral Data Center Pact (CNDCP) to look forward to, and of course the core data that the reporting will provide, will give us, the policy makers and the supply chain a very accurate view of the state of the sector in Europe in terms of the 5 pillars.
The CNDCP and the EUCOC together could make the future of data centres in Europe a very interesting place to be.

Conclusion
The EE SIG is one of the oldest groups in the DCA SIG portfolio, which clearly represents the importance of energy efficiency to not only the Alliance, but to its members, those that run data centres and those that supply products and services into data centres, and the future is bright.

Lesser known data centre efficiency metrics and their contribution to Net Zero

By Nour Rteil, KTP Associate at University of East London and Techbuyer and Lead Researcher and Developer at Interact

ACHIEVING a PUE close to 1 and attaining a CUE close to 0 is great, but how sustainable would the data centre be if its IT energy consumption is twice as it should be? Imagine a data centre that has done everything right to sustain a PUE of 1.1 by optimizing its cooling infrastructure and power distribution, whether it be by utilising free cooling, effectively managing the airflow, or switching to efficient chillers and

UPSs. It all sounds great, but would you consider this data centre energy efficient if it had an abundance of servers that are either sat on idle or are not being optimally utilised? Or, if most of these servers are inefficient or misconfigured models?

PUE and CUE are not designed to capture the efficiency of IT load, which is the main energy consumer in data centres. Given

this, we are shifting the focus in this article on other great KPIs that are specifically designed to measure servers' inefficiencies and are unfortunately less popular than PUE in the industry.

The International Standard ISO/IEC 30134 for data centres defines a total of nine KPIs that cover different sustainability aspects, from renewable energy down to energy reuse, considering the energy, water, and carbon efficiencies within the data centre. Of these nine KPIs, two target server inefficiencies:
- **IT Equipment Energy Efficiency for servers [ITEEsv]**
  This metric quantifies the energy efficiency of servers in a data centre by measuring the maximum performance per kW of all servers or a group of servers in the data centre.
- **IT Equipment Utilization for servers [ITEUsv(t)]**
  This is the average CPU utilization of all servers or a group of servers in a data centre at a given time t. It can be improved by reducing the number of operating servers with virtualization techniques.

Model	Idle power (W)	Max. power (W)	Max. performance (ssj_ops)
A	90	300	3,000,000
B	50	300	2,700,000

ITEEsv requires benchmarking servers to determine their performance and power consumption (at full load). The process of benchmarking servers is time-consuming. Running a commonly popular benchmark such as the SPECpower_ssj2008 or SERT to determine the server's performance per kW, requires several hours between setting up the testing environment (controller, the system under test, power analyser, etc.) and executing the test.

Though SPEC has published a list of all the accepted benchmarking results, tested by several manufacturers and hardware vendors, not every server model can be found in this repository. Also, energy efficiency differs significantly for the same model with different hardware configuration (for example more RAM capacity), as demonstrated in this recent IEEE paper about optimizing server refresh cycles. Therefore, server benchmarking, in this case, is required to determine the ITEEsv.

It is important to mention that the ITEEsv metric does not reflect the energy effectiveness of servers in a real operating situation. The actual server energy consumption and efficiency need to be evaluated at a realistic load taking into consideration the idle consumpti on. Consider this example of calculating the server's power and energy efficiency, at maximum load and average load

assuming 25% server utilisation rate (estimated utilisation among service providers in 2020 according to the United States Data Center Energy Usage Report). For the sake of this example, the two server models A and B with the following power and performance values are evaluated. Performance in this example is measured in ssj_ops, which is defined by SPEC as the number of server-side JavaScript operations per second.

Looking merely at the max. performance per watt, you might think that server B is less energy efficient than server A because it executes fewer operations per watt at full load:
- Performance per watt at max. load for Model A: $3,000,000/300 = 10,000$ ssj_ops/W
- Performance per watt at max. load for Model B: $2,700,000/300 = 9,000$ ssj_ops/W

However, considering the actual load and the idle consumption, the average power for the servers should be determined as demonstrated in A Comprehensive Reasoning Framework for Hardware Refresh in Data Centers, and is calculated as follows:
- Average power for Model A: $(300*0.25) + (90*0.75) = 142.5$ W
- Average power for Model B: $(300*0.25) + (50*0.75) = 112.5$ W

The actual performance per watt for two

servers should then be determined as shown below, which makes Model B more energy-efficient than Model A in a real-life scenario:
- Performance per watt at 25% utilisation for Model A: $3,000,000 * 0.25/142.5 = 5,263$ ssj_ops/W
- Performance per watt at 25% utilisation for Model B: $2,700,000 * 0.25/112.5 = 6,000$ ssj_ops/W

Ideally, we'd like to see hardware vendors and manufacturers work on establishing a common server label that indicates how efficient the server is, under specific operating conditions and workload types, to help purchasers make the right sustainable choices from the start. We'd also hope to see them declare the embodied environmental impact associated with manufacturing and transporting the server. But while we wait for these labels to be established, Interact offers a practical solution that is based on machine learning, trained using the SPECpower_ssj2008 published results, to predict the performance and power for any server configuration. It can be used not only to assess the data centre's ITEE and the actual servers' energy consumption but also to guide procurers in choosing the best energy-efficient server models and configurations available in the market, with more than 400 pre-configured models, within their budget and other business considerations.
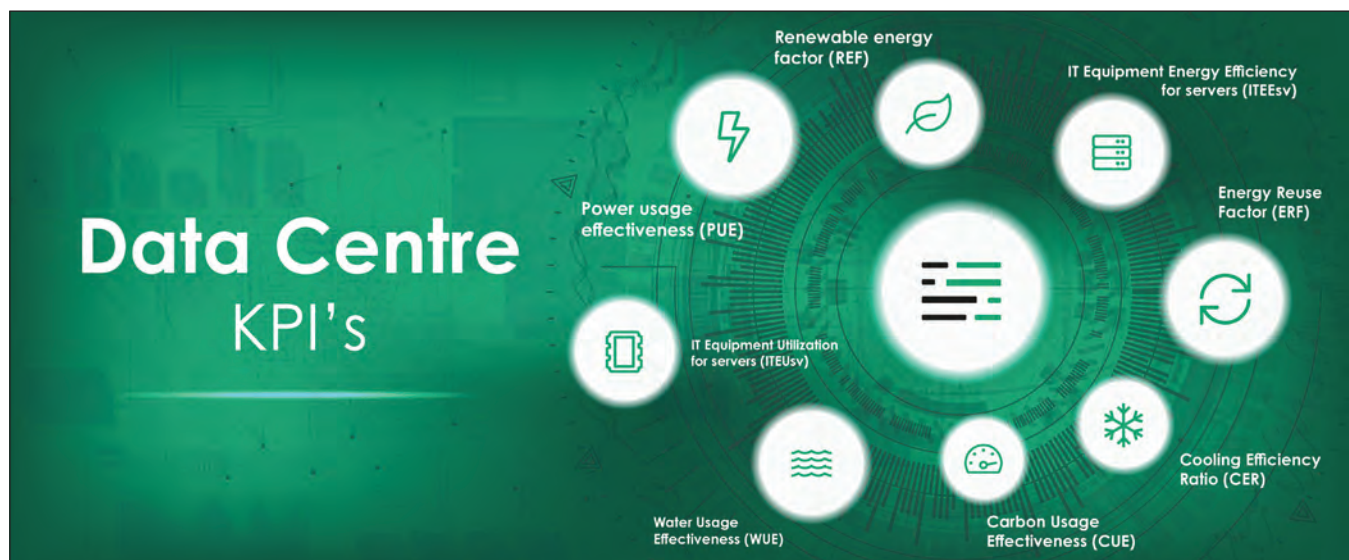
Teledata; powering businesses forward - responsibly

By Anna's career in tech marketing spans 15 years, having worked with brands including Microsoft, BlackSpider and Seagate. Anna now heads up the marketing for Manchester-based colocation and cloud provider - Teledata.

ESTABLISHED IN 2004, Teledata has grown to be one of the best-connected data centres in Manchester, offering premium colocation and cloud hosting solutions to customers across the UK, from its 70,000sq ft facility close to Airport City.

As an intensive energy user Teledata had always followed good practice, but as the business grew, the firm decided it was time to make investments not only into improving infrastructure, but into energy efficiencies and well, and approached the GC Business Growth Hub for advice.

With the advice and support of a specialist energy management partner and one of the Growth Hub's Energy Efficiency Advisors, the firm was able to take steps towards its goal of reducing the amount of energy it uses, in line with Manchester's pledge to become a carbon neutral city by 2038.
The firm has since invested over £1.5

Million into cutting edge technology – including a number of industry firsts. Initially, Teledata began extensive energy logging of the site in order to measure consumption in the various different areas of the facility. This helped the firm to understand its energy profile on a very granular level and to monitor exactly where all the power was being used.

The next step was to install submetering so that certain areas of the building could be switched off when they weren't in use. This led to some behavioural changes such as turning things off in the evening and at weekends. Because of the size of Teledata's building - some 70,000 sq ft - this process alone saved the firm £2,000-3,000 a month from the outset, in addition to the directly related carbon emissions savings.

Next, Teledata upgraded the fans and motors in the air conditioning units so they could operate at variable speeds.

By putting temperature sensors into the cold aisles in the data centres, the firm was able to use software to tell the air con units how hard they needed to run to maintain an acceptable temperature.

Previously, and without this data, the units had always run at 100%. This process took Teledata to the point where the system could turn two out of every eight air conditioning units off completely, and still maintain the right temperature.

Teledata then rolled out a larger, two-part project. This involved installing an ultra-low loss transformer to minimise waste electricity coming in from the mains, combined with some cutting-edge voltage optimisation technology to regulate incoming voltage. Through this, the firm could set the voltage level and stop it from fluctuating, reducing both energy wastage and wear and tear on the equipment. This project alone created an 8-10% efficiency saving.

Finally, Teledata installed a 2MW battery storage system which is charged up on a daily basis and discharged according to need. When the grid is struggling with demand during busy periods – which is when electricity is at its most expensive, the firm can now pull power from the batteries instead of pulling it from the grid. Teledata was the first co-location provider to do this in the UK.

Matt Edgely, Director of Teledata commented; "As we grow, power use is constantly increasing, which is a real challenge from an energy management point of view. The more efficient we can be, the more capacity we have to grow within our existing infrastructure. We had always been energy aware, and followed best practice to the best of our abilities. Now however, we can even narrow it down to the kitchen on the 7th floor and see when the table-top coffee machine has been left running!

"Our project has had a big impact from an efficiency savings point of view, but also from a capacity point of view.

Without these investments our expansion as a business would have been limited because our supply from the grid would have been limited, so the benefits are three fold - better for the environment, better for our bottom line and better opportunities for growth."

The technology deployed by Teledata carries a number of advantages;
- The low loss transformer, with voltage optimisation is proven to save between 8-10% of annually consumed kwhs and therefore carbon emissions.
- Customers are insulated against increases in power pricing at the most expensive times of day/year as Teledata can intelligently switch its power source to battery storage during these periods. This saves a huge amount of cost on the annual electricity bill of an intensive user.
- Voltage optimisation allows the firm to regulate voltage at 225v at the transformer level, reducing energy wastage and extending the lifespan of equipment by up to 40%. Eliminating spikes in power delivery also reduces the likelihood of under

or over voltage 'tripping', meaning more reliability and less outages.
- As a power generator, Teledata can participate in Firm Frequency Response (FFR) and as a service provider to the National Grid, can use the firm's approved storage assets to quickly reduce demand or increase generation to help balance the grid and avoid power outages. The current UK power network is becoming increasingly challenging to balance and so this is a huge benefit to the grid.

To date, Teledata's energy efficiency projects have resulted in a 700 tonne carbon saving, and earned the firm the title of Data Centre Energy Efficiency Project of the Year at the 2020 DCS (Data Centre Solutions) awards.

Now, armed with the knowledge to make fully data driven decisions, the firm has plans to continue to improve its efficiencies where required, as it carries out its mission to make data green, and to support Manchester in becoming a carbon neutral city.

DCA Data Centre Sustainability SIG
An Introduction from DCA CEO Steve Hone

AS THE TRADE ASSOCIATION to the Data Centre sector the DCA understands that it is imperative that key issues affecting the sector have a point of focus.

The DCA SIG's (Special Interest Groups) / Working Groups regularly come together over shared interests to discuss issues, resolve problems and make recommendations. Outcomes result in best practice guides, collaboration between group members, participation in research projects, this includes clarification and guidance for decision and policy makers. Members find these groups are a great way to ensure their opinions and views are considered in a positive and cooperative environment.

The DCA currently facilitates nine Special Interest or Working Groups. DCA members can join any of the groups and contribute find out more here: https://dca-global.org/groups

The DCA Sustainability SIG is chaired by Astrid Wynne, Sustainability Lead at Techbuyer
The purpose of the Sustainability Special Interest Group is to develop best practice in the UK data centre industry with respect to materials usage, energy efficiency, skills development and workforce retention in an operational data centre environment.

The group aims to achieve this through:
- Optimising energy efficiency at use phase
- Expert insight into IT hardware and the effect on energy draw
- Insight into the role of IT load with respect to this, including:
  a. the effect of full utilisation on efficiency as measured by compute power over energy.
  b. the ability of software to dematerialise hardware.
  c. minimising data transfer and storage, potentially leading to a sector Code of Conduct
- An understanding of the importance of Scope 3 emissions (also known as embodied energy) in the hardware, facility and building.
- Circular solutions for the IT hardware and other infrastructure
- Circular solutions for heat, power and IT load
- Use of renewable energy in the sector.
- New technologies that can aid this.
- Existing and upcoming standards relating to this.
- Education of workforce with respect to sustainability insight and practice

The group work very closely with the Energy Efficiency SIG to provide DCA members with an entire overview of data centre energy efficiency and sustainability.

To request to join this group please contact the DCA:
mss@dca-global.org

Sustainability SIG Overview
By Chair Astrid Wynne

THE DATA CENTRE remains the beating heart of our digital world. Businesses and society rely on these facilities to keep connected, informed and entertained. However it is important that we all recognise that these services come at a price not just on the pocket but also to the environment.

With every GB of data processed, transferred or video streamed just that little bit more energy is consumed, and even more technology is needed to service it, and this is something every one of us needs to recognise and own. The COVID-19 pandemic especially has given business the impetus to consider their buying choices and habits. It seems now more than ever people are willing to participate in sustainable practices or work towards improving sustainability. For the past 7 years the DCA has included Sustainability as part of the DCA Energy Efficiency Special Interest Group remit. Despite both subjects being intrinsically linked they have now both become such big issues in their own right that the decision was made to separate them out into two dedicated working groups, with John Booth remaining Chair of the Energy Efficiency Group and Astrid Wynne becoming Chair of the newly formed Sustainability Group.

John Booth, chair of the Energy Efficiency and Sustainability explained, "The conversation is changing because the world is changing. Climate change, energy and resource scarcity are now further up the agenda than ever before, and governments around the world are slowly but surely beginning to address these problems. Data Centres are complex, "systems of systems" involving ICT equipment, servers, storage and networking, resilient power supplies, cooling as well as the actual buildings themselves. We must look at raw material extraction, processing, manufacture, transport, in use and disposal for all elements within the system and if necessary redesign all of this to be more sustainable."

Why and why now?
Co-founder of the DCA Steve Hone said,

"Continuing to simply consume more and more data without taking into account the impact we are having on our environment is irresponsible and unsustainable. We all have a moral duty to try to leave this world in a better condition than we found it."

He added, "The UK Government's commitment to a sustainable future includes a pledge that the UK is to be carbon neutral by 2050. The headline is wonderful, but it is a near impossible target to reach unless everyone is pulling in the same direction. A commitment such as this demands a "cradle to grave" approach, which needs to address not only energy production and consumption but also the technology needed to deliver these services."

Group member Dr Jon Summers, from the RI.SE Institute in Sweden says that this needs to include everything from the "chip to the cloud" alongside a serious look at the consumption and storage habits of consumers. With so many of us recycling household plastics and cardboard, we need to do the same as an industry with our historical data and the hardware it sits on. Not all ones and zeros need to be saved in triplicate or stored forever. Older technology can still be repurposed to extend its life.

What is in it for data centre managers?
In a sector beset with all kinds of critical issues, sustainability has in the past

seemed like a lower priority for data centre managers. However, there is a lot of evidence that performance on people and planet plays to the bottom line too, particularly in a sector that is responsible for high energy use.

Writing as a guest blogger for Schneider, IDC Research Director Jennifer Cooke said, "Organizations are setting aggressive goals to reduce their carbon footprint and impact on the earth by 2025 and 2030 and beyond. Colocation providers that understand the critical role IT and data center resources have in this journey are making investments today to prepare for their customers' needs in five years."

According to the IDC, 55% of organizations believe that a colocation provider has a better ability than they do for monitoring environmental conditions and power consumption in white spaces. In other words, they are buying into the cloud as a solution to their data transfer and storage energy optimisation. 43% said energy efficiency and green initiatives was a top driver in their choice of colocation provider.

There are benefits for those hoping to attract investment too. In 2019, the Harvard Business Review interviewed 70 senior executives at 43 global institutional investing firms, including the world's three biggest asset managers (BlackRock, Vanguard, and State Street), giant asset owners, and the government

pension funds of Japan, Sweden, and the Netherlands. It found that environmental, social and governance issues were almost universally top of mind for these executives.

Finally, in a sector for which attracting and retaining skilled personnel is a focus, demonstrating best practice in sustainability is a real asset. A global survey conducted by LinkedIn in 2016 revealed that 74% of candidates want a job where they feel like their work matters.

What does the Sustainabilty SIG hope to achieve?
With the UK leaving the European Union, there is a need for domestic legislation with respect to Zero Carbon, Circular Economy. The DCA hopes to help with this process by collecting expert insight from across the value chain as well as from academics and researchers in the field.

The scope of the SIG is wider than just energy efficiency. It also spans circular economic approaches to infrastructure refresh, mitigation of scope 3 emissions in the building, how smaller data centres can achieve renewable power supply, facilities and IT hardware, relevant standards and suggested regulation, education of the wider sector with respect to this. Ultimately this will lead to best practice guides for the sector which can then be shared with the UK government.

The circular life of data centre hardware: Future predictions

SEVERAL DCA PARTNERS are now working within the concepts of the 'Circular Economy' – here at the DCA we thought we'd find out a little more about this and have been reading more about this subject.

The definition of the circular economy made us realise that the it's a very simple concept – a little bit like the 'Circle of Life' in the Lion king. Every manufactured product on its demise returns to its creator to be re-purposed and contribute to the next version of the product.
A circular economy follows the principles of 3R: reduce, reuse and recycle.
- Resource use is minimized – Reduced.
- Reuse of products and parts is maximized – Reuse.
- Raw materials are reused – Recycled

During our investigations we read an interesting case study that we would like to share with you. Written by Deborah Andrews, Associate Professor of Design and Beth Whitehead Associate Sustainability Engineer, Operational Intelligence Ltd; here are the first few paragraphs, a link to the entire case study can be found at the end.

The case study provides predictions for Data Centres in ten years' time, key areas covered include:
- Post-use infrastructure
- Current and future growth in Connectivity and the Data Centre Industry
- The Data Centre Industry in 2030
- Future Scenario One: No Change
- Future Scenario Two – Change towards the Circular Economy
- The Role and Importance of Design in Future Scenarios 1 and 2
- Conclusion

Data Centres in 2030: Comparative case studies that illustrate the potential of Design for the Circular Economy as an enabler of Sustainability

By Deborah Andrews, Associate Professor of Design and Beth Whitehead Associate Sustainability Engineer, Operational Intelligence Ltd

Introduction
During the 1980s the British engineer and computer scientist Sir Tim Berners-Lee developed a digital information and communication language and network, which subsequently evolved to become the World Wide Web in 1989. Since then the user group has expanded from 'geeks', researchers and academics and over 4.2 billion people and 55% of the global population are now 'connected'.

While 'devices' (desk and laptop computers and mobile phones) serve as human-digital data interfaces, the hidden but critical enabler of connectivity is data centres (DCs). These facilities may be cupboard-sized or, like the largest in the world, equivalent in area to 93 football pitches, but all house digital data processing, networking and storage (ICT) equipment. Such is the popularity of the internet that since its launch the number of DCs around the world has grown to

8.6 million (Infiniti Research, 2015) with a total floor space of 180 million m2; 10 million m2 of which is in Europe with 70% concentrated in North West Europe (NWE). The main concern of the DC industry is 100% uninterrupted operation for customers and consequently, focus within the sector has been technical and product development, manufacture and operation with limited consideration of treatment at end-of-life. This paper considers two potential scenarios and their impacts for the data centre industry (DCI) in 2030; the scenarios are speculative and are based on past and present trends in and experience working with this unique sector.

Current and future growth in Connectivity and the Data Centre Industry
Such is the popularity and success of the internet that in Europe and the USA 85% and 95% of the population are connected respectively and more and more businesses, education and other service providers are becoming increasingly reliant on connectivity; in Africa and

Asia even though the percentage of connected individuals is lower (36% and 49% respectively) population groups are much larger and consequently many more people are connected due to cheaper mobile devices (Miniwatts Marketing Group, 2018). Patterns of internet use vary according to user age, location and affordability: in developed countries such as the UK typically adults spend 4.75 hours per day online (IPA, 2018). In addition, data consumption has increased exponentially and concurrently with the number of work and leisure services on offer: for example, in 2016 the demand for data centre storage capacity increased by 1 Petabyte every day (Brewer et al, 2016). Growth will continue in order to process the increasing volume of data that will be generated by expansion of services via the Internet of Things (IoT), and commerce, healthcare, education, leisure services alongside population and economic growth in countries such as China and India.

It is apparent that there are differences in

connectivity according to geographical location but there are even more extreme examples: in Iceland 98% of people are connected while in Somalia and Eritrea

connectivity is limited to 2% and 1% respectively. There is also a disparity among demographic groups and women, the rural poor and residents of remote islands 'are substantially excluded from education, business, and other opportunities that the internet can provide'. Sadly, since 2007 growth in many developing countries has slowed due to a number of factors including: limited and/or no 3G, 4G and wi-fi infrastructure, and the cost of network access, smart phones and computers (A4AI, 2018). As a result, the connectivity gap between different social and national groups is growing.

Reliance on and demand for data centres will increase as more people, smart products and services are connected. In NWE alone capacity will increase 15%+ per year (300%) by 2025 and a global increase of 500% is predicted by 2030. DC operational energy consumption will rise concurrently to facilitate this growth and even though DCs are becoming more energy efficient it is predicted that by 2025, 20% of global energy will be consumed by the sector (Andrae, 2017).

Environmental and social impacts

At present the largest environmental impact from DCs derives from operational energy; this is being addressed by improved operational efficiency and the use of renewables.

However, in view of the above growth the embodied impact of DCs must not be ignored. During overall DC building life (60 years) 15% of embodied environmental impact derives from the building and facilities while 85% derives from IT equipment (Whitehead etc al, 2015). Impact is high because equipment is regularly refreshed (servers every 1-5 years, batteries every 10 years and M&E equipment every 20 years).

Although specific sectoral data has not been published, the DCI is a significant contributor to the global total of 11.8 Mt/year of Waste Electrical & Electronic Equipment (WEEE), which is one of the fastest growing waste streams across Europe and the world.

DC equipment is typically composed of 'common' metals (steel, copper, aluminium, brass and zinc), polymers (ABS, HDPE, PUR, PVC, GPPS, PBT, EVA) and 10 critical raw materials (CRM) - Sb, Be, Cr, Co, Li, Mg, Pd, Si, Dy, Nd, Pr, Tb. They are vital for economic growth but risk to supply is high and is affected by: their abundance/scarcity in the earth's crust; their geological and geographical location (which influences technical ease of extraction and political circumstances); current recycling rates; and potential substitution by more readily available materials. DC equipment is comprised of 99%+ 'common'

metals and polymers and 0.2% CRMs; however, their importance cannot be underestimated because electronics cannot work without them.

Gold, tin, tantalum and tungsten are similarly essential to electronic products; they are identified as Conflict Minerals because they are produced in central Africa and specifically the Democratic Republic of Congo where their (unethical) mining and sale funds armed conflict and political instability.

The extraction processes of many of these and other materials also involves hazardous substances (e.g. arsenic, mercury, sulphides) and because a lot of their mining is unregulated and/or illegal the associated negative environmental and social impacts are high.

Read the full case study here: https://www.cedaci.org/publications

Gold, tin, tantalum and tungsten are similarly essential to electronic products; they are identified as Conflict Minerals because they are produced in central Africa and specifically the Democratic Republic of Congo where their (unethical) mining and sale funds armed conflict and political instability

Extending the product lifecycle: The first step towards circular IT

By Steve Mellings, CEO and founder of ADISA

THE WARNING from Cisco that chip shortages will impact supply throughout 2021 is a further reminder that our ability to feed the never-ending demand for new electronics is not sustainable. With the environmental impact of business now a boardroom topic renewed focus is placed on our use and consume approach to technology both in the domestic and work environment.

ADISA runs a certification scheme for companies who recover redundant equipment from businesses and after over 500 audits worldwide we perhaps have a unique appreciation of how businesses view end of life infrastructure. In our experience the way in which businesses manage asset retirement varies dramatically with many simply viewing it as a waste stream with the infrastructure being handled with almost wilful distain. Others view it as an afterthought with little appreciation of it as a genuine business process and for some it is a seen purely as a data security risk.

Why is this important you might ask?
Like all processes the starting point can shape the direction which it runs. Asset retirement and in turn, asset recovery, are 2 critical business processes which can help extend the product lifecycle and, further down the processing line, present viable technology back to the procurement teams to create a genuine alternative to buying new.

For businesses when disposing of redundant equipment, the first thought should be to the data on that equipment. A failure to fully understand how storage media can be securely overwritten leads many organisations to adopt the risk avoidance process of destruction. To destroy perfectly serviceable devices is a very credible way of protecting data but it also has a huge negative impact on component recovery and product reuse.

If we also add recent law changes regarding Persistent Organic Pollutants (PoPs) and how a failure to processing redundant equipment properly can lead to an enforced position of incineration, then perhaps we can see that the decisions made at the very beginning of the retirement and recovery process are critical if we are extending the product lifecycle.

Professional IT Asset Disposal / Disposition (ITAD) companies are well versed in managing data sanitisation and are (hopefully) well briefed on how to manage the risk of PoPs in the process and so the selection of the correct partner to help businesses manage their end-of-life assets is the first crucial part of extending the product lifecycle.

The next step is the realisation that this is a service industry providing data protection and compliance services with the by-product being potential revenue from material recycling and product resale. This is again critical when we are looking at extending the product lifecycle because the cost of recovery and processing should be borne by the company releasing those assets in return for a data protection compliant service.

Cost recovery
Once the cost of recovery is covered, the asset is on a bench at a cost zero point to the processor. This enables that processor to then invest more time and cost into that device to test it properly, repair it and upgrade it to make more appealing to the next users. If the asset is already carrying a negative cost to the processor, then their ability to extend the lifecycle is blighted by the diminishing margins associated with the preparation for reuse. Where these margins are tight, a range of negative actions can occur as the processor will either recycle the device without considering repair, sell a minimally tested product into trade OR sell a device to a user which has had a cheap process applied thus providing the next user with a poor experience.

So, the first stage in extending the product life cycle is how to retire those products in the first instance.

The next stage is for the industry to up their game and to invest in understanding technology better than merely seeing it as something to broker to the highest bidder. There are some fantastic refurbishers in the UK who can take devices back to "as new" and to present them to procurement teams as genuine viable devices. They are not the norm however, and it is this part where the sector needs to improve otherwise, we will not overcome the final challenge – PERCEPTION.

Despite us being used to buying second-hand houses and second-hand cars, to suggest to procurement teams that they should adopt a buy refurbished strategy is something for many they couldn't even consider. And the simple reason for that is that for many second hand is second rate due to negative experiences when purchasing second hand equipment. That, however, is changing.

Within the past 12 months as new devices have become scarcer, refurbished equipment has become the only option for many despite reticence to embrace it wilfully. This demand has led many refurbishers to now deal directly with business buyers and as a result they have been forced to up their game.

From a small handful of excellent refurbishers in the UK there is now the beginning of a professional channel being created. With new standards and collaboration happening in 2021, the refurbishment channel is coming out of the shadows and with the help of those companies releasing assets, is presenting itself as viable environmentally friendly alternative to new.

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DCA Colocation Working Group –
An introduction from DCA CEO Steve Hone

AS THE Trade Association to the Data Centre sector the DCA understands that it is imperative that key issues affecting the sector have a point of focus. The DCA SIG's (Special Interest Groups) / Working Group regularly come together over shared interests to discuss issues, resolve problems, and make recommendations. Outcomes can result in best practice guides, collaboration between group members, participation in research projects and much more. Members find these groups are a great way to ensure their opinions and views are considered in a positive and cooperative environment.
The DCA currently facilitates nine Special Interest or Working Groups. DCA members can join any of the groups and contribute.

The purpose of the DCA Colocation Working Group is to provide a unified voice for the UK Plc data centre colocation and Data Centre Provider community. The Group is chaired by Dan Scarbrough, with Leon O'Neill acting as Deputy Chair.

The Groups Objectives:
Educating international buying community to the operators present in the UK, and the services offered. Increase awareness of the importance of the data centre sector in an ever growing and reliant digital world. Drive the debate for increased inward investment to support the growing and mission critical data centre sector. Promote UK colocation capacity by arranging
DC Tours for overseas customers.

Develop closer collaboration between the Telco with Colo sectors in terms of Network and Compute Capacity. Continue to work with fellow Trade Bodies in Europe to ensure the DC sector has a unified voice to policy makers. Coordinate stronger working relationships with external international organisations such as OCP, ONF. Lobby to develop incentives to make the UK the destination of choice for hosting overseas customers digital services.

To request to join this group please contact the DCA - **mss@dca-global.org**

Conquering the next challenge for colocation providers: Speed

By Ashish Moondra, Senior Product Manager, Power, Electronics & Software at Chatsworth Products (CPI)

AS THE TRANSITION from the Information Age to the Age of Artificial Intelligence gives way to heightened significance of connectivity, cloud service providers and the IT industry work around the clock to ensure the life most of us know today, high-speed internet, mobile connectivity, self-driving cars and machine-to-machine (M2M) learning. A recent Cisco Annual Internet Report confirms this reality.

By 2023, for example, nearly a third of the global population is expected to have Internet access – that is about 5.3 billion users. Meanwhile, the number of IP networks is projected to be more than three times that number. Within the data centre space, the colocation market may see the most growth, with an estimated CAGR
of almost 11% from 2020 to 2025. Faster

time to market- in lieu of undertaking an on-premise data centre project that may take months to complete – is the primary reason for the attention toward this segment.

Needless to say, delays in bringing up a new customer within a multitenant environment directly translates into lost revenue. Therefore, it is no surprise that colocation providers are challenged to scale up with solutions that are quick to deploy, manage and service.

The following are two key points for colocation vendors to consider when looking to quickly get new customers up and running.

Vendor Selection
Within colocation environments, end customer requirements generally vary

based on budgets, functionality required and the IT equipment that will be housed within the cabinets. Service-level agreements (SLAs) require colocation facilities to be able to quickly provide the infrastructure equipment that meets the needs of their end customer.

Partnering with equipment vendors that have local manufacturing capabilities and a build-to-order model provides colocation vendors with the ability to quickly procure products aligned with end customer requirements. In-region manufacturers typically have a wide breadth of standard solutions and the ability to create and deliver custom solutions in a short timeframe.

While evaluating equipment vendors for their ability to deliver products in short lead times, it is critical that data

centre professionals ask questions related to location of the supply chain as well as their risk mitigation plans. With the booming demand for more things to be connected to the Internet, some electronic components as well as populated, printed circuit board assemblies can have lead times spanning several months.

Equipment manufacturers in North America that rely on in-region sources for long lead time components will have a better ability to scale quickly to meet demands of larger projects. The common denominator within the date centre white space is the equipment cabinet. Dealing with vendors who can preinstall all infrastructure solutions within the cabinet, including power distribution equipment, cable management solutions, access control and environmental monitoring per the end customer's needs will save colocation vendors significant time, effort, and money.

Additionally, preconfigured solutions that are tested together before they leave the factory minimizes any surprises that could otherwise delay schedules when multivendor equipment is received separately. Finally, consider that preinstalled solutions require minimal packaging, helping reduce waste and the tie required to deal with it.

Product Considerations

To allow remote manageability of the off-premises equipment, colocation vendors provide intelligent hardware solutions that allow monitoring and control of power and environmental parameters within the cabinet. Growing regulatory and security demands also require end customers to control physical access to the cabinet and maintain an audit log of all success attempts.

While these solutions provide significant advantages to the end customer, the challenge is to deploy them speedily over the network and quickly configure them to be fully operational. Intelligent power distribution units (PDUs) that also integrate environmental monitoring and access control provide a unified solution that require just one single network connection. The speed of deployment can be further enhanced by utilizing intelligent power distribution units with Secure Array IP Consolidation that allow up to 48 intelligent PDUs to share one

primary IP address and an alternate one for failover capability.

This setup allows the white space infrastructure for complete rows of cabinets to be managed by one or two ports on a network switch. The alternate and inefficient solution would have been to first install, wire and configure extra network switches purely for infrastructure monitoring, connecting them to every monitored device and then taking a crash cart to each device to perform their IP setup. Once the PDUs are deployed on the network the next step that could take a considerable amount of time is the configuration of every monitored device that includes network access, threshold, and notification settings. In this scenario, choose PDUs with bulk configuration capabilities over the network. However, the preferences of end customers for mass configurations can differ.

For example, while a data centre operations group may prefer bulk configuration through a data centre infrastructure management (DCIM) software solution, network professionals or developers may prefer automated configuration using a Command Line Interface (CLI) or Application Programming Interface (API), This means colocation vendors that deal with multitude of end customers will be ahead of the competition if they

provide a solution that supports most types of bulk configuration methods. All these capabilities not only make initial deployment and configuration easier, but also simplifies ongoing management.

Another important and usually overlooked aspect to consider is the serviceability of the products. The most common maintenance to be performed on Intelligent PDUs is timely firmware upgrades. The products chosen should allow for these upgrades to be easily performed over the network or through UB ports on the equipment. A field-replaceable controller on the unit also allows for seamless serviceability and upgradability.

These upgrades should be capable of being performed while the units continue to provide basic power distribution to connected equipment. Finally, consider that intelligent products such as PDUs should include warranties with an advanced replacement coverage as a norm rather than exception. With data consumption growing faster than ever, speed of deployment and delivery is the most pressing challenge for colocation providers. The ones who consider the two recommendations above will be able to have a competitive edge that will ultimately allow them to grow their top line revenue faster and be ahead in the race.

Ashish Moondra
Ashish Moondra has a total of 20 years of experience developing, managing and selling rack power distribution, uninterruptible power supply (UPS), energy storage and Data Centre Infrastructure Management (DCIM) solutions. Ashish has previously worked with American Power Conversion, Emerson Network Power and Active Power, and has been an expert speaker at various data centre forums.

Colocation, colocation, colocation

By Anna Nicholls Head of Marketing, Teledata

WHEN YOU'RE CHOOSING a colocation provider, you need to think about a lot more than just the location. Sure, location is important. You'll need to be able to access the data centre fairly regularly, so it's helpful if your provider is commuting distance for your technical engineers - although a decent data centre provider should offer a remote hands service, making location less of a deal breaker - but there are other points to consider when you make the decision on which colocation provider is right for you.

What is colocation?

Colocation (also known as colo) is when you put your equipment - servers, storage, switches, software - into somebody else's data centre. You provide the kit, they provide the space, power, rack and connectivity. That's usually where the provider's involvement ends. Upgrades, monitoring and backups will be handled by you and be the responsibility of your IT team, while the data centre provider concentrates on keeping the lights on, and the buildings secure and connected. Basically, you're renting space in a data centre.

Why colocation?

So why would a business choose colocation? What are the benefits? Well powering and cooling servers is expensive. With colo, you're using the data centre's power, at a much lower cost due to economies of scale. Data centres give you access to a wide range of connectivity options offering both resilience and competitive choice, so ultimately you'll have increased availability compared to an on-premise set up. You still maintain complete control of your hardware and network, but with a reduced TCO (Total Cost of Ownership) compared to on-premise. So other than location, what else do you need to think about when choosing a colocation data centre?

Access

We've talked about access from a location perspective, but check whether the data centre will be accessible to your engineers at the times they need it. Will they need to make appointments in advance, will access be available out of hours - evenings, overnight and weekends - without an appointment in emergency situations? What about bank holidays? Are there any restrictions on access which might impact your team's ability to maintain your network?

Security

In a world of increasing threats to digital data, this is probably one of the biggest decision points when choosing a colocation provider. Your colo provider will be responsible for keeping your data physically secure, so it's critical that whichever data centre you choose takes appropriate measures to protect itself. Look for a facility that goes above and beyond. From the obvious perimeter fences, access cards and security guards, to the higher levels of security and access control such as mantraps, virtual tripwires, SOCs (Security and Operations Control Centres) and links to police control centres. If compliance is a requirement, check that your data centre provider is ISO accredited.

Connectivity

Connectivity is king, and a data centre is only as good as its connectivity. Some data centres are carrier neutral, which will give you both choice and resilience. TeleData is carrier neutral, with multiple carriers offering diverse points of entry plus dark fibre availability. We also offer direct connections to major Manchester and London data centres, giving customers a broad range of options and a wide reaching, robust connectivity network.

Resilience

We'll start by talking about power - but resilience covers a wide range of eventualities which need to be considered. It's the data centre provider's job to keep the lights on, so you need to make sure you're happy with their procedures for keeping the facility running in the event of a power outage. Power outages simply cannot happen in a data centre, but they do happen, so what processes are in place to make sure that the cogs keep whirring? Ask about UPS, backup generators, battery storage options and be absolutely certain that you're confident that your colocation provider will not suffer an unexpected power down.

The same goes for other events and disasters - floods, fires, attempted break-ins and anything in between. What has your provider done to pre-empt these situations and therefore, provide contingencies in case the worst happens?

Choosing a colocation provider is a big decision for any business, and if you're going to be tied into lengthy contracts, you need to make sure your decision is a good one. Not all data centres are created equal, but what's important is that the one you choose meets the needs of you and your customers, hits your SLAs and offers the right level of resilience, at the right price.

> Choosing a colocation provider is a big decision for any business, and if you're going to be tied into lengthy contracts, you need to make sure your decision is a good one

The DCA Colocation Working Group

By Leon O'Neill

LEON O'NEILL is the Deputy Chair of the DCA's Colocation Working Group in this article he provides his thoughts on how Covid is affecting the DC Sector and the responses he has seen from the industry. Leon also talks about why the Colocation Working Group was formed and how he hopes it will promote co-operation between UK based operators.

At the start of 2020, who would have thought the world would have changed so much? From a global pandemic forcing businesses into enacting their business continuity plans (or finally implementing one), to accelerated remote working adoption and even global political leaders acknowledging the importance of digital infrastructure, thus promoting our peers to the proud and prestigious position of "key worker". It's been a very tough year for everyone, and I mean everyone. Yet our industry rose to the challenge and proved, beyond a doubt we have the expertise, technology and wherewithal to meet these unique challenges AND had one of the best years for customer acquisition in a long time.

 I would say (not out loud, of course), we (The DC industry) have been preparing for some kind of attack for many years, preparing ourselves for some form of legislation, or red tape dreamt up by someone that has very little knowledge of what it is we actually do, has far too much time on their hands and is preparing legislation after watching a YouTube video posted by someone with a user name like "technology-will-kill-us" who hasn't spotted the irony that the poster is utilising technology to get their message out. However, nobody expected that an attack would come from a microscopic, airborne virus. Except Homer Simpson, yeah, seriously, he called it in 1993. – google it.

What we did learn, is we are willing and very able. But now we need to talk about how we sustain our growth, how we maintain profitability whilst adopting/promote new agile technologies that operators can leverage to overcome whatever legislation might come in the
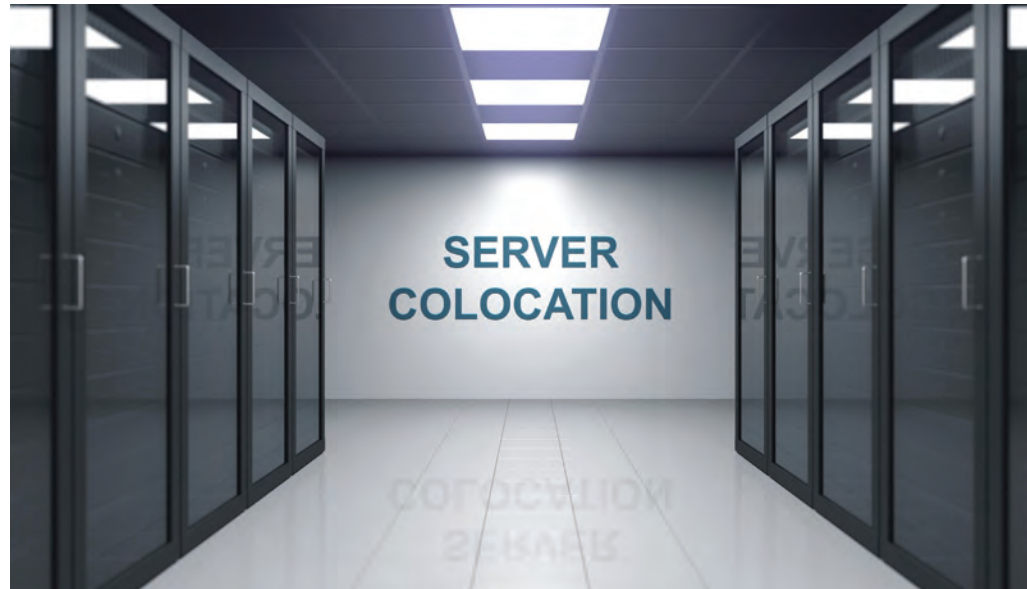
future and achieve that all important target of net zero carbon emissions. After all, those pesky politicians are starting to take notice, realising we are not just digital infrastructure, we are critical infrastructure. It may have taken Zoom calls for them to learn this (which in itself is funny to watch when you realise that the leaders of the world don't know how to use the mute button!) but hey ho, we will take what we can get. Perhaps now the Politicians can put some effort into education programs to attract youth and diversity into our industry, but I promised myself I wouldn't get into that here…..moving on then.

From an activity perspective, we have seen a huge increase in demand for colocation and cloud services, compared to the steady growth of previous years. Akin to dropping an Alka Seltzer into a bottle of coke (definitely google that), the rise in demand has been driven both by the pandemic and hyperscale activity but what excites me and the DCA the most is the activity away from hyperscale/webscale providers. We have multiple instances of new build and expansion plans with the likes of Ark, NTT, Telehouse and Virtus working to increase capacity/availability contributing to the prediction that London will hit 1.2GW of power usage within the next two years.

And it's not just London: with a significant acquisition in Wales, Hyperscale developments in Manchester, the Midlands experiencing increase absorption rates, Northern Ireland building a brand-new world-class data centre and large investment in the network infrastructure of Scottish data centres. Our industry is on the tip of every investors tongue with M&A activity rampant and investment opportunities growing.

Operators are adopting additional revenue streams above and beyond the real estate conversation such as cloud and financial services. Hardware leasing is increasingly more attractive and an appetite to join the circular economy as OCP hardware becomes more accessible helps the operator to promote themselves as a "one hand to hold SLA". It's very exciting time to be in the data centre game right now.

I regularly speak to UK operators about the challenges they face in their day-to-day operations and as this pandemic continues to invade every aspect of our lives and environments, what strikes me the most is how each operator have adapted so quickly, their willingness to share methods around new ways of working and the support they have provided their staff in that adaptation. It's

that sharing that is at the heart of what the DCA UK Colocation Working Group is all about.

Our purpose is to promote co-operation between UK based operators over competition. So how do you bring the operators together to promote the UK as a leader in digital infrastructure? Firstly, let's give the operators a platform on which to communicate, develop partnerships and share ideas. The DCA UK Colocation Group is purposed for all of the above, but it's only as effective as the participation of its members. So secondly, join in.

It's that simple. This isn't a club or a clique or a hierarchy. It's an opportunity to develop/grow your business, get access to information not often in the public domain and promote your business as part of a shared vision of UK operators on an international stage. We will not only talk about, but act on collaboration, new technologies, financing, staff acquisition, thought leadership, just about anything that your business deems relevant for the group,

with maybe the odd alcoholic beverage or two, or three, go on then, maybe one more…..perhaps one for the road…. and finally a night cap. (when the pubs re-open of course – mustn't defy those social distancing rules now, mustn't we….. Kay Burley?)

And as we move into 2021, we still have many challenges to overcome, including staff shortages, supply chain challenges, attracting youth and diversity into the industry, that 2030 carbon neutral target and lest we forget the now tangible impacts and opportunities of Brexit. And whilst all of those challenges appear daunting, I would argue they represent an opportunity.

So, lets follow the lead of the British people as they clap our brave NHS in an act of support, let our Data Centre Operators unite to promote the UK as a sustainable, profitable and agile location to house international companies' data.

To join the DCA UK Colocation working group for more information contact: **mss@dca-global.org**

Leon O'Neill Deputy Chair, DCA Colocation Working Group

Leon O'Neill has been involved in the Data Centre, IT and Construction sectors for over 25 years.

He has built a vast network of partners to encourage the industries adoption of agile, sustainable and profitable solutions. Closely aligned with Technology Real Estate Investment Funding partners, Leon aims to bring together their unique skill sets to support the development of the digital infrastructures of the future.

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