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VIEWPOINT

By Phil Alsop, Editor

Skills shortage – another sustainability crisis?

THE HIGH TEMPERATURES being witnessed in mainland Europe this summer are just one more reminder that climate change, sustainability and Net Zero cannot be too high up government and corporate agendas right now. The relatively good news is that most industry sectors and most countries do have some kind of a plan as to how to get to Net Zero by 2050, even if many of these strategies do look as if they might be carried away on the next flood waters, or shrivel to dust in the next drought.

Those who continue to highlight the lack of skills available to the technology sector – data centres, digital infrastructure, IT disciplines and the like – would be delighted if their cause attracted the same level of attention and action, however imperfect, as the sustainability issue. Put bluntly, the predictions as to just how many millions more people across the globe will be required to fuel the ongoing digital development – as the sector expands rapidly and also loses a whole tranche of senior professionals over the next few years – seem to me a reason for alarm not far short of the climate crisis.

As of now, the suggestion seems to be that the business world is fighting over the same limited resources, with scant regard as to how all companies maybe need to work together to develop tomorrow's technology workforce. And, of course, governments have a critical role to play in shaping the digital future. It's maybe not enough to suggest that all school children need to study Maths to A-level, as the UK Prime Minister has done. Nor to assume, without any concrete knowledge, that automation will somehow make good the workforce short fall. Recent conversations I have had with data centre folk suggest that the chronic lack of skills coming into the sector, and the wider IT industry, could well lead to something of a technology bottleneck. And also see the development of some significant digital inequalities across the globe.

Yes, individual companies and some industry initiatives are attempting to address the situation, with varying degrees of success, but they are perhaps only marginally more useful than re-arranging the Titanic's deckchairs. The numbers involved (or rather not involved in the industry as of now) are similarly incomprehensible to the climate change statistics that warn as to how much of the world might end up under the sea if global temperature rises are not halted. However imperfect its response, the world seems to have woken up to the sustainability imperative. What will it take for similar awareness and action when it comes to digital skills?

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Data centre decarbonisation represents a top priority

The State of Data Infrastructure Sustainability report shows data center decarbonization represents a top priority, though organizations are struggling to make progress.

U.S. BUSINESSES have made sustainability a priority, with nearly four in five companies saying that they have developed plans for achieving carbon neutrality (78%) and net zero carbon emissions (79%), according to the State of Data Infrastructure Sustainability, a new report from Hitachi Vantara. However, despite this and the fact that 85% of respondents claim to be "on plan" or "ahead of plan" when it comes to their carbon reduction goals, the survey revealed that actual progress may not be as robust as many businesses believe.

The global survey of 1,000 IT leaders and C-level business executives, including 250 in the U.S., sought to shed light on the importance of sustainability for organizations and the steps being taken to address today's data sustainability challenges. Key U.S. findings include:

- Two in five (40%) organizations said they lacked a sustainability strategy and implementation plan.
- The timing for achieving their goals is still decades away; on average, organizations do not expect to be at net zero emissions until 2048, 25 years from now.
- The biggest challenge cited was keeping up with regulations (45%), however, 38% also noted that they had inadequate access to critical sustainability data.

Complying with regulations was also cited as the primary driver of organizations' sustainability efforts with 64%, while ethical obligations (54%) and talent acquisition/retention (41%) rounded out the top three.

Four out of five respondents (80%) said that their data center carbon footprint had either stayed the same or increased in the past two years; less than two in five (19%) said it decreased at all, with only 2% saying it decreased more than 10%.

In looking ahead two years, still more than half (51%) expect the carbon footprint of their data center will either stay the same or increase; only 12% expect it to decrease more than 10%. "To get to net-zero, firms must establish a concrete strategy and implementation plan, with leadership buy-in, that takes a data-driven approach to emissions across the entire IT estate, including edge, on-prem, and off-prem," said Mark Ablett, President, Digital Infrastructure, Hitachi Vantara. "As the survey found, too many companies are allowing their strategies to be dictated by regulation, which can be a hinderance because it focuses on the needs of the day instead of the business case for sustainable operations. However, sustainability efforts can lower energy costs, save storage space, and help streamline operations and data management for greater productivity."

The Critical Role of the Data Center in Reducing Emissions

Despite the lack of progress in reducing the data center footprint, 60% of respondents said that creating an eco-friendly data center was a top priority for the organization, and when asked what steps they had taken already to reduce their carbon footprint, data center decarbonization was the top response at 56%. However, data center decarbonization was also most commonly cited as the area where firms need outside assistance, with 42% saying they needed third-party help. The second-most common step taken involved using the latest technological solutions to reduce carbon footprint at 48%, with 44% saying that they had created a corporate culture to support sustainability goals.

"The fact that data center decarbonization was the only area to gain more than 50% agreement suggests that there is still largely a lack of consensus about what steps to take," Ablett added. "Broadly speaking, these disparities underscore the need for greater knowledge sharing and involvement of company leadership across the C-suite."

In fact, part of the problem appears to be that executives across the C-Suite are not fully aware of the importance of data center modernization to achieve their overall sustainability goals. CEOs, Chief Digital Officers (CDOs), and CTOs appear better informed, with 58% of CEOs and CDOs and 50% of CTOs saying that an eco-friendly data center is one of the most effective ways to reduce their company's carbon footprint; however, only 14% of CFOs and 31% of Chief Sustainability Officers agreed.

A Closer Look at Keys to Sustainability Success

Survey respondents were designated as being leaders, advanced, early implementers, or beginners, based on their level of progress in creating an eco-friendly data center by implementing eight key sustainability initiatives.

Overall, leaders were more likely to say they had started taking steps to decarbonize their data centers, with nearly three-quarters (73%) of leaders saying they had started, compared to only 39% of beginners who said the same.

However, when it came to goals for net zero carbon emissions, there was not as big of a gap, with leaders targeting 2048 for net zero compared to 2049 for beginners.

Software-Defined Data Centre market to hit $1 Tn by 2035

Software-Defined Data Center Market report, from Research and Markets, delivers a detailed competitor's analysis and a detailed overview in terms of market segmentation by component, enterprise size, industry, and by region.

SOFTWARE-DEFINED Data Center Market size is expected to reach ~USD 1007.19 Billion by 2035 & growing at a CAGR of ~25.40% over the forecast period, i.e., 2023 – 2035. In addition to this, in the year 2022, the market size of the software-defined data center market was ~USD 66.61 Billion.

Growing Number of IoT-Connected Devices to Promote Global Market Share of Software-Defined Data Center
The global software-defined data center market is estimated to grow majorly on account of the increasing number of Internet of Things (IoT) connected devices worldwide together with the rising need to control the network in a unified manner using rule-based management.

As per estimations the number of IoT connected devices is expected to almost double from 13 billion in 2022 to approximately 26 billion by 2030. Hence, the advent of advanced technologies such as IoT, 5G, and others as well as increasing adoption of multi-cloud strategy together with the rising demand for enhancing infrastructure resiliency and service uptime is further anticipated to propel the market of software-defined data centers. Furthermore, a software-defined data center (SDDC) was introduced to overcome the inefficiencies of traditional data centers and to deliver greater value to businesses with dynamic configurations that could meet the needs of any application workloads, all operating at peak levels of efficiency and automation, hence its market growth is expected to boost with rising automation and adoption of cost-efficient business models.

Some, of the major growth factors and challenges that are associated with the growth of the global software-defined data center market, are:

Growth Drivers:
- Rise in Adoption of Cloud

Storage Architecture
- Growing Revenue of SaaS Companies

Challenges:
The rising concern for risks associated with data security in software-defined data centers owing to the growing number of security breaches is some of the major factors anticipated to hamper the global market size of software-defined data centers. As data centers are one of the most important parts of an organization's IT infrastructure, disruption of the operation of a data center has a significant impact on the business's ability to operate.

Moreover, the lack of universally accepted standard virtualization is responsible for the interoperability and integration issues, impacting the overall growth of the software-defined data center.
By enterprise size, the global software-defined data center market is segmented into large enterprises and small & medium enterprises (SMEs). The SME segment is to garner the highest revenue by the end of 2035 by growing at a significant CAGR over the forecast period. The growth of the segment can be attributed to the upsurge in the number of SMEs worldwide. For instance, it was observed that there were about 330 million SMEs in 2021 worldwide depicting a small increase from the approximately 325 million expected in 2019. Moreover, the increasing number of start-ups globally as well as the growing support programs by various governments for small businesses together with the growing digital transformation of businesses, products, and services are anticipated to boost the growth of the segment over the forecast period. By region, the North American software-defined data center market is to generate the highest revenue by the end of 2035. This growth is anticipated owing to the existence of most large data centers in the region together with the strong existence of many giant software companies.

Additionally, the increasing investment in it sector to develop the strong IT infrastructure along with rising investment in computers and software is also anticipated to boost the market growth. As per recent data predictions, the overall value for private investment in computers & software is anticipated to hit ~USD 1274 billion in the United States by the year-end. Furthermore, the rising research and development by software-as-a-service (SaaS) companies as well as increasing adoption of SaaS, infrastructure-as-a-service (IaaS) together with the rising trend of adoption of software with automated storage with a tremendous focus on hardware cost reductions in the region is expected to propel the regional market growth.

Core European data centre markets set for record growth in 2023

Frankfurt and London lead the way, with strong activity in Madrid.

ACCORDING TO JLL's latest EMEA Data Centre report, 2023 will be a record year for data centre growth in Europe. The total size of the region's leading data centre hubs of Frankfurt, London, Amsterdam, Paris and Dublin (FLAP-D) is set to grow by 17% year-on-year, with an additional 432MW of supply added. This year is also seeing strong demand for data centres, with 392MW of take-up expected, a 32% increase from 2022.

The shift towards hyperscale development, rising to 83% of all transactions in 2022, is also expected to continue throughout 2023. JLL forecasts strong growth following 482 MW of pre-lets signed in 2022, with the majority of these schemes due to come online over the next 12 months.
Of the major markets, London will retain its position as the largest and most mature data centre hub in Europe and will see 122MW of new supply added. Frankfurt is set to continue to grow rapidly with 118 MW forecast to be added in 2023, a 20% increase year-on-year.

Tier two markets coming to the fore
While new supply will continue to be added to the FLAP-D markets, Madrid and Berlin are emerging as popular locations for developers and operators. JLL forecasts that total supply in Madrid will double in 2023, with 35 MW to be added. Demand will also increase threefold to 28 MW underlining the city's exceptional growth. Berlin will continue to see high levels of activity, with 52 MW of new supply to come online later in 2023 and 42 MW of take up.

Tom Glover, Head of EMEA Data Centre Transactions, JLL, said: "The data centre industry continues to show incredible resilience in what is a very challenging market. Demand across Europe's core markets continues to outstrip supply,

but challenges in securing prospective sites and sustainable power sources are leading growing interest in the region's secondary markets."

Daniel Thorpe, Senior Research Analyst, EMEA, JLL, added: "2023 is set to be another record year for activity in the market. Data centre growth will be underpinned by continued enterprise transition to the cloud, growth in new technologies such as AI, growing user demand for low latency streaming and gaming; and the further expansion of 5G networks."

DC physical infrastructure market grows 18 percent

ACCORDING to a recently published report from Dell'Oro Group, Data Center Physical Infrastructure (DCPI) market revenue growth accelerated for the fifth consecutive quarter to 18 percent in 1Q 2023.

This elevated level of growth was supported by a combination of easing supply chain constraints, resulting in increases of unit shipments, as well as continued price realization as vendors passed on higher costs of raw materials, components, and logistics. Despite this growth, vendor backlogs did not come down from historic levels, prompting upward revisions from DCPI vendors and to our 2023 DCPI forecast.

"Discounting the market rebound in 2Q 2021, related to the soft Y/Y comparison brought on by Covid, I've never witnessed such elevated growth in the DCPI market since I began covering it in 2015," said Lucas Beran, Research Director at Dell'Oro Group. "Even as new orders expectedly declined in 1Q 2023, vendor backlogs did not, with many vendors reporting book-to-bill ratios at or near 1.0x. This was certainly a surprise, and increases my confidence in the 2023 market outlook and overall health of the DCPI market," added Beran.
Additional highlights from the 1Q 2023 Data Center Physical Infrastructure Quarterly Report:
Vertiv and Mitsubishi Electric notably gained revenue share in 1Q 2023.
North America, Asia Pacific (excluding China) and Europe, the Middle East and Africa (EMEA) were the fastest-growing regions in 1Q 2023, at double-digit growth rates. The Caribbean and Latin American (CALA) revenue growth slowed to a single-digit rate, while China was the only DCPI market with revenues to decline Y/Y.

Product growth was broad-based, but thermal management and cabinet PDU and busway grew at the fastest rates as a result of easing fan and breaker supply chain constraints. IT racks and containment was the only market segment with revenue growth to meaningfully decelerate.

New report questions the carbon reality behind 100% renewable energy claims

Global study finds 42% of business respondents that can claim to be powered by “100% renewable energy” using mainstream emission reporting standards have not signed any electricity contracts that can be considered carbon-free using an alternative metric.

A NEW GLOBAL REPORT, published by FlexiDAO, has found that businesses may be drastically underestimating their emissions. 42% of respondents in the study that can currently claim to be powered by ‘100% renewable energy’ following today’s guidelines from leading environmental reporting standards (GHG Protocol Scope 2 market-based) and leadership programs (RE100, SBTI, etc), are not signing any contracts that can be considered carbon-free following more granular Scope 2 guidelines, which accounts for both the place and time energy is being consumed with more accuracy.

The study found that most respondents (67%) purchasing renewable energy contracts do not have clear oversight of where their electricity comes from. This prevents businesses from accurately tracking their energy supply and measuring their emissions on a location and time-sensitive basis.

Without understanding the origin of consumed electricity, organisations cannot take the necessary actions to drive decarbonisation within their operations and, more importantly, the broader economy. As a result, respondents in the study report 13,000ton CO2 less on average in each country of operation. This discrepancy can threaten companies’ ESG ratings in time, potentially posing a significant financial risk.

FlexiDAO, a signatory of the UN 24/7 CFE Compact, has produced The Carbon Reality Behind 100% Renewable Claims report to highlight the gap between reported emissions reductions made by leading organisations following today’s guidelines and those that could be achieved by moving to 24/7 Carbon free Energy (CFE) approach.

Organisations risk miscalculating the actual reduction in carbon emissions they are making as most renewable energy contracts are currently underpinned by energy attribute certificates (EACs). In the contractual phase, the majority of corporate electricity purchases use EACs to account for electricity consumption on an annual basis without looking at the actual source of electricity received from the grid or the emissions reductions being made near real-time.

While current accounting metrics have been a highly successful tool for developing a community of corporate buyers contracting renewable energy, technological advances mean businesses can switch to hourly 24/7 CFE now. This means companies are incentivised to increase the amount of local renewable energy they use and match their hourly consumption. FlexiDAO’s technology provides the data and insights companies need to report the scale of emission reductions accurately.

As Scope 2 reporting becomes mandatory for many businesses across the EU and US, adopting 24/7 CFE strategies can protect businesses against potential upcoming changes in carbon regulation and empower them to communicate decarbonization progress with more confidence and transparency, ultimately helping us accelerate towards a clean energy system.

Simone Accornero, CEO, FlexiDAO, said:“We are at a pivotal moment in the clean energy transition. New regulations include energy-related carbon emissions reporting in mandatory non-financial disclosures, while a growing crackdown on greenwashing and misleading

corporate claims is underway. “Now is the time for businesses to change how they measure and report energy use, enabling organisations to prepare for upcoming mandatory carbon reporting while achieving internal climate goals and ultimately become the leaders of a new carbon-free economy.”

24/7 CFE is becoming a reality in the market and is being scaled globally. While reports do exist that look at the projected benefits of 24/7 CFE, none provide quantifiable evidence on how organisations are performing on this metric today.

Killian Daly, Executive Director at EnergyTag, said: “This landmark report illustrates how today’s lax “100% renewable” standards allow organisations to claim “job done” on paper while remaining fossil fuel reliant in practice.

“It’s time to fix things. Luckily the data and tools now exist to create the robust standards that can truly leverage the power of companies to meet the urgent need of delivering decarbonised grids - every hour, everywhere.”

Data centre market ready for the adoption of grid-interactive UPS

Advancements in UPS and batteries enable interaction with smart electric grid, contributing to pursuit of more efficient and sustainable data centres.

DRIVEN LARGELY by the need for energy demand management and greater sustainability, the data centre market is ready for the adoption of grid-interactive uninterruptible power supplies (UPS), according to a white paper, commissioned by intelligent power management company Eaton, from Omdia, market-leading data, research, and consulting business.

The white paper, UPS Interacting with the Electric Grid can do more for Data Centres, is based on the results of a survey of 380 qualified IT decision makers across five regions (North America (the US and Canada), the UK and Ireland, Western Europe (France and Germany), Nordic countries (Sweden, Finland, Norway, and Denmark), and Australia) to better understand the adoption of UPS systems that interact with the grid. Among its findings, the survey reveals that 90% of respondents expect to deploy grid-interactive UPS within the next four years, with more than half (54%) expecting interaction within the next two years.

The main function of UPS systems in data centres is to increase reliability by protecting against power disturbances. UPS and batteries are used only in power outages, which means they can be available for other applications. Grid-interactive UPSs, such as Eaton's EnergyAware, however, incorporate technologies that enable the equipment to sense and interact with the grid, thereby contributing to the pursuit of a more sustainable data centre.

Marco Nardi, product manager, EnergyAware UPS & Lithium batteries at Eaton commented: "Enabling a UPS to interact with the grid is an innovative way for data centre operators to do more with existing assets. It can enable them to integrate renewable energy resources into their power portfolio, balance energy supply and demand, reduce or defer grid infrastructure investment, and even create new revenue streams."

Sustainability was identified as the top driver for grid-interactive UPS adoption, followed by recognition as technology innovation pioneer, reputational and competitive advantages, and managing energy demand response. Omdia suggests that these results can be seen as an indicator of how sustainability tops the agenda for most companies and that it can be perceived as a competitive advantage. The white paper also reports that the grid-interactive UPS market is accelerating. Omdia forecasts that ongoing improvements to the technology's feature set will cause revenue to grow at a 44% CAGR, reaching US$376m in 2026. While Western Europe currently has the highest demand for projects deploying grid-interactive UPS, Omdia expects most of this growth to come from North America, due to successful case studies, regulation, and policy incentives.

Lead author of the white paper, Moises Levy, PhD, senior principal analyst, Data Centre Physical Infrastructure at Omdia concludes: "The use of renewable energy is becoming the new normal in the data centre industry. However, the integration of variable renewable energy resources into a more dynamic electric grid comes with new challenges and technical requirements. Fortunately, data centres are uniquely positioned to contribute to the grid's reliability, stability, and flexibility. It's encouraging, therefore, to see that the market is ready to adopt UPS systems that interact bidirectionally with the grid and that can contribute to even more efficient and sustainable data centres."

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Angel BUSINESS COMMUNICATIONS

Cloud complexity calls for observability and security convergence

81% of CISOs say they will see an increase in vulnerability exploits if they can't make DevSecOps work more effectively.

DYNATRACE has published the findings of an independent global survey of 1,300 chief information security officers (CISOs) in large organizations. The research reveals that CISOs find it increasingly difficult to keep their software secure as their hybrid and multicloud environments become more complex, and teams continue to rely on manual processes that make it easier for vulnerabilities to slip into production environments. It also finds that the continued use of siloed tools for development, delivery, and security tasks is hindering the maturity of DevSecOps adoption. These insights highlight the growing need for the convergence of observability and security to fuel data-driven automation that enables development, security, and IT operations teams to deliver faster, more secure innovation.

Findings from the research include:

More than two-thirds (68%) of CISOs say vulnerability management is more difficult because the complexity of their software supply chain and cloud ecosystem has increased.

Only 50% of CISOs are fully confident that the software delivered by development teams has been completely tested for vulnerabilities before going live in production environments.

77% of CISOs say it's a significant challenge to prioritize vulnerabilities because they lack information about the risk these vulnerabilities pose to their environment.

58% of the vulnerability alerts that security scanners alone flag as "critical" are not important in production, wasting valuable development time chasing down false positives.

On average, each member of development and application security

teams spends nearly a third (28%) of their time – or 11 hours each week – on vulnerability management tasks that could be automated.

"Organizations are struggling to balance the need for faster innovation with the governance and security controls they established to keep their services and data safe," said Bernd Greifeneder, Chief Technology Officer at Dynatrace. "The growing complexity of software supply chains and the cloud-native technology stacks that provide the foundation for digital innovation make it increasingly difficult to quickly identify, assess, and prioritize response efforts when new vulnerabilities emerge. These tasks have grown beyond human ability to manage. Development, security, and IT teams are finding that the vulnerability management controls they have in place are no longer adequate in today's dynamic digital world, which exposes their businesses to unacceptable risk."

Additional findings include:

- 75% of CISOs say the prevalence of team silos and point solutions throughout the DevSecOps lifecycle makes it easier for vulnerabilities to slip into production.
- 81% of CISOs say they will see more vulnerability exploits if they can't make DevSecOps work more effectively; however, just 12% of organizations have a mature DevSecOps culture.
- 86% of CISOs say AI and automation are critical to the success of DevSecOps and overcoming resource challenges.
- 76% of CISOs say the time it takes between the discovery of zero-day attacks and their ability to patch every instance is a significant challenge to minimizing risk.

"Despite a widespread understanding of the many benefits of DevSecOps, most organizations remain in the early stages of adopting these practices due to siloed data that lacks context and limits analytics. To overcome this, they should use solutions that converge observability and security data and are powered by trusted AI and intelligent automation. This is what we architected the Dynatrace platform to do. As a result, our customers have reduced the time they spend identifying and prioritizing vulnerabilities by up to 95 percent, helping them deliver faster, more secure innovation that keeps them at the forefront of their industries."

The age of the autonomous enterprise is approaching

The next 10 years will see a significant shift towards adoption of AI and automation to improve enterprise agility, driven by inefficiencies in legacy technologies.

THE MAJORITY of global decision makers say they plan to fully embrace the autonomous enterprise within the next 10 years, according to new research from Pegasystems. The study, conducted by research firm Savanta and unveiled at PegaWorld iNspire, the company's annual conference in Las Vegas, surveyed 600 business decision makers worldwide on their understanding of the autonomous enterprise, their plans for implementation, and some of its drivers.

The autonomous enterprise is an organization which comprehensively applies AI and automation to engagement, servicing, and operations across the organization to operationalize agility and create a business that can become self-optimizing. The study found that 58% of respondents expect to define themselves as an autonomous enterprise within the next 10 years. With just 15% saying they feel they are already at this stage today, and 36% projecting they will reach this point five years from now, the upward curve of autonomous enterprise adoption is clear. Tellingly, three quarters (73%) of respondents said they already have some sort of plan to start becoming an autonomous enterprise. When asked what they expected their position to be 10 years from now, an overwhelming 96% said the same.

One of the leading drivers of this new age of self-optimizing technology is a growing understanding of issues caused by old, inefficient ways of using technology to solve one-off problems. These include:

No such thing as a 'quick fix': When asked what their primary technology investment strategy was, almost half (46%) of respondents pointed to either 'quick fix' technology solutions to resolve specific issues, or off-the-shelf software solutions that provide pre-packaged capabilities for specific applications. Forty percent admitted that such 'quick fixes' had resulted in operational inefficiencies within their organization, with more than one third (35%) saying it has increased risk. Forty percent also cited their belief that such 'band-aid' solutions were quicker to implement as their rationale for using them, with 31% saying their options were limited because they must stick to an approved list of vendors. Only 4% of respondents said they do not invest in one-off, disconnected 'band aid' technology solutions at all.

Increased costs: One quarter of all respondents say they spend between 51 and 100% of their annual IT spend on maintaining solutions that are no longer fit for purpose. Forty-one percent say that investments in disconnected legacy systems have resulted in increased costs.

Where are our customers going?: More than one in three (36%) respondents say they are kept awake at night worrying that customers aren't getting a good enough experience and that they risk losing them to a competitor. One quarter of respondents also pointed to concerns that siloed legacy technology, systems, and channels had already led to disjointed customer experiences (30%), poor customer service (26%), or loss of customers and revenue (26%).

Eighty-four percent of respondents agreed that unified platforms that connect systems and channels to automate, self-optimize, and align workflows and decisions to business strategy will be either 'extremely' or 'very' important to improve their operational efficiencies.

RO technology will allow DC's to cut water and energy useage

WHAT IS SAID to be he world's most efficient reverse osmosis (RO) technology, the SAM50 RO system, is now available to data centres. Manufactured by Te-Tech Process Solutions, the SAM50 delivers significant advantages over competing RO technologies.

Data centres have seen a steady shift away from air cooling to more efficient liquid immersion technology. However, rejecting the heat from the coolant into a recirculatory cooling system with an evaporative cooling tower consumes a lot of water, typically about 1.8 L/kWh. In hyperscale data centres this could be as much as 2000 m^3/day. Now signatories to the EU's Climate Neutral Data Centre Pact will prioritise water conservation with an aim of a maximum usage of 0.4 L/kWh by 2030.

One way of minimising water consumption in recirculatory cooling systems is by increasing the concentration factor, which is limited by water chemistry. Treating the cooling tower make-up water by RO allows concentration factors to be increased by up to 10 times, reducing blowdown and helping to minimise scale, corrosion and microbiological problems. But RO is traditionally energy hungry and, increasingly, expensive to operate. SAM50 was developed by University of Birmingham spin out Salinity Solutions. It is a batch RO system with a unique energy recovery pressure exchanger and in comparison to conventional RO systems; it can reduce energy consumption by up to 50% as well as reduce wastewater by up to 80%. The small footprint, modular units use standard 8" RO membranes and feature "plug and play" installation.

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Gartner predicts substantial data centre sustainability take-up

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

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

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

1. Reduced Costs

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

2. Innovation

Organizations are using sustainable strategies to drive innovation and growth through new products and business models. Technology hardware vendors are rapidly releasing new products and services based on AI technology, analytics insights and circular business models that can be leveraged for innovation. For example, open telemetry platforms may be deployed to track and improve energy efficiency, while simultaneously offering critical insights for IT staff to understand usage patterns that can be optimized for greater, more consistent performance of systems.

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

3. Better Risk Management and Mitigation

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

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

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Data centres – the good neighbour

What if 'Next generation Edge' involved these datacentres being integrated into local community where they would be perfectly situated to reuse the heat they generate for good?

By Richard Clifford, Director of Solutions at Keysource

FOR MANY YEARS our sector was very much in the background with little interest from those outside it, despite its increasing role across the globe. Then the pandemic came and suddenly we were being hailed as heroes facilitating working from home, Netflix and online shopping. Our role in helping to develop the vaccine (through HPC processing) was also acknowledged. Suddenly data centres were, dare I say it, sexy?

However, the spiralling cost of energy and issues with the UK power supply has put the sector in the spotlight again but this time for all the wrong reasons. The term Vampire Datacentres has rapidly gained traction alongside accusations that we are 'sucking the grid dry' and 'causing housebuilders to face a decade-long wait to start new developments.' And there is no getting away from it – in broad terms data centres do use a considerable amount of power - estimated to be responsible for up to 3% of global electricity consumption today and are projected to touch 4% by 2030. The average hyperscale facility consumes 20-50MW annually – theoretically enough electricity to power up to 37,000 homes.

Yet the demand for computing power and digital services is growing fast. In the last decade, global internet traffic increased ten-fold and data centre energy use is likely to increase accordingly by 2030. So how do we solve the dichotomy? And how do we change the negative narrative that surrounds us?

Firstly, it is important to note that the industry is not only very aware of the power constraints and the implications for cost and sustainability – but is also taking strong action to mitigate them – for everyone. For example in 2021, 25 operators and 17 associations in the data centre industry pledged to be net zero by 2030, when they signed up to The European Data Center Association's Climate Neutral Data Center Pact (CNDCP). They committed to three-quarters of the energy used by their data centre facilities to be renewable or carbon-free by 2025, and completely carbon-free by 2030. The question is - will this be enough?

One man's waste is another man's commodity

As well as using considerable amounts of power – data centres also generate a lot of heat that can be reused in a number of ways. Probably the most beneficial is district or community heating which is all about taking energy released as heat from a range of energy sources (this could be data centres), putting it into a system of highly insulated pipes, delivering a supply of low carbon heat using heat pumps to homes, businesses and public buildings. In places like Denmark and Norway this is commonplace with the energy source often coming from waste handling facilities where they burn thrash to generate heat, whilst in Iceland the heat is harnessed from its volcanoes – enough for the whole population. There is no doubt that heat re-use applications in the UK lag behind other parts of the world and just over 2% of UK homes are currently connected to a district network.

Proof of Concept

However, there have been some initiatives that provide a proof of concept in the UK. In 2020 a new energy centre was launched in Islington, London to enable waste heat from the London Underground to provide heating and hot water to more than 1,350 homes, a school and two leisure centres in the borough. This warm air is used to heat water, which is then pumped to buildings in the neighbourhood through a new 1.5km network of underground pipes. The fan also has the potential to operate in reverse to supply cooler air to the tube tunnels during the summer months.

In addition to this, the centre's combined heat and power technology means it also generates cheaper, greener electricity that is fed into the London Underground network and an adjacent tower block, powering its communal lighting and lifts.

Saving our swimming pools

Another great example is the work we have been doing with start-up Deep Green to enable heat generated by a data centre to heat a Devon public swimming pool. In simple terms computers are put inside a white box which is surrounded by oil to capture the heat - enough to heat the pool to about 30C 60% of the time, saving Exmouth Leisure Centre thousands of pounds. This approach utilises small pockets of 'spare' and already allocated grid capacity to deliver edge and HPC capabilities within the fabric of society. The energy recapture model saves pools at least 63% on their energy requirements to heat the pool. In exchange, the pools provide space, power and connectivity to support the deployment.

Albeit on a small scale, this example shows how the heat generated by a data centre can benefit the local community. So, if we agree that district heating and/or any form of heat reuse a good thing and that it needs a reliable heat source which data centres can provide and need to do so - what is holding us back.

Location, Location, Location (Channel 4)

Well, whilst some datacentres in the UK are repurposing the heat they generate, often they are not in an ideal location for this type of approach as they are generally isolated or in a vast industrial estate. Yet this could change. I believe that the increasing demand for fast data and the limitation of power availability will mean that edge data centres will become more prevalent and in the future the industry will move away from hyperscale datacentres – not least because there is not the power to support them. In essence, rapidly growing industry energy requirements and carbon footprint represent an existential threat to existing data centre business models and so change must happen.

Next Generation Edge

Edge is a classic term that can mean anything from a computer under the desk or a hyperedge 100MW site and anything in between. So, what if 'Next generation Edge' involved these datacentres being integrated into local community where they would be perfectly situated to reuse the heat they generate for good? Moving forward this approach also addresses the Grid limitations and energy requirements that are significantly limiting opportunities to develop new data-centre capacity and creating significant negative publicity for the data centre industry which is manifesting itself in moratoriums on new project development.

Education, Education, Education (Tony Blair)

So, what needs to change? First up we need some education. Companies will need to think differently about their compute and break it up into more manageable chunks but should be open to the obvious benefits of spreading the demand for power out and reducing carbon. Another benefit is that if the power is distributed it would make any Cyberattacks less likely to cause national disruption. The downside is that a larger number of smaller facilities can be more time consuming to maintain and operate – but this can increasingly be addressed with smart technology.

Also, in the past, planning officers have been naïve and lacked an understanding of data centres, tending to treat them like warehouses. Now we will be expecting them to understand their importance to new towns and any lifecycle refurbishment of local areas and the role they will play. They will need to overcome the preconception that data centres are huge, ugly eyesores - after all a 200KW datacentre would be the size of a single-story club house. We will also need to dispel the myth that data centres use epic amounts of water against a background of global climate change and water scarcity. Today most chilled water systems are closed loop so just need the occasional top up.

Overall, there will need to be a whole new mindset about data centres that need to be viewed as a key utility – the next emergency service – responsible for the smooth running of hospitals, satellites, the military, national security cars, and games consoles to name just a few, all of which are reliant on data. And, the closer the data centre the better the latency for these vital services.

We could take this a step further and store some of this heat in hydrogen fuel cells and export the excess power to help the reinforcement of the national grid. Data centres would then become part of the national critical infrastructure; a utility; and a positive contributor to the community helping to support the UK as it transitions to net zero over the coming decades. The possibilities are plentiful.

After all, for those of us old enough to remember – "Everybody needs good neighbours' – and a data centre could be exactly that.

Security at the edge

How to protect your distributed IT and networks from the threat of downtime

By Nick Ewing, Managing Director, EfficiencyIT

WHEN IT COMES to protecting critical infrastructure across a modern distributed IT network, there's often enough servers, switches, and storage assets to make even the most experienced CIO's head swim.

The challenge of securing your network can be overcome, however, by modernising legacy systems and harnessing the latest software capabilities, from AI and machine learning to cloud and data analytics. In this blog we've created a three-step action plan – based on the key themes of monitoring, maintaining and mitigating business and mission-critical issues – to help you put a comprehensive security and services programme into action and ensure your physical security is bulletproof.

MONITOR critical infrastructure in the data centre and at the edge

The first step towards effectively monitoring your network is to carry out a full review and asset inventory. This includes on-premise and distributed IT environments, right down to individual wiring closets and the smallest edge computing locations. To protect your applications, you need to establish what assets you have, where they are and the associated risks, such as whether they are cyber secure and the level of routine maintenance they require.

With 60% of attacks on critical infrastructure carried out by insiders, it also pays to monitor who is accessing your physical hardware and whether your equipment is being housed or hosted in the best possible environment.

This is often easier said than done, however. Thanks to the existence of long-serving legacy systems alongside a proliferation of new IT resources, monitoring a physical, distributed network is likely to be complex, time consuming and cost-prohibitive if you attempt to do it manually.

However, open and vendor-agnostic data centre infrastructure management (DCIM) software, such as Schneider Electric's Ecostruxure IT platform, can help overcome this challenge - providing autonomous real-time insights and anywhere monitoring that ensures a high level of physical security, without breaking the bank.

Proactively MAINTAIN your critical infrastructure

Increasing network complexity leads many IT teams to adopt a two-phase approach to network security. Leading DCIM software solutions designed for edge infrastructure, for example, will provide real-time visibility of critical assets. They can also deliver proactive alerts regarding security issues and vulnerabilities. It is advisable, however, to establish a strict regime of patching and applying firmware updates, locking down SNMP protocols and regular penetration testing to increase security.

Reputable manufacturers should be able to offer details of the patching and firmware support needed to keep their products secure. This isn't always cheap, so it may be tempting to turn to third-party patch providers, but this comes with significant additional risk.

Third parties don't and won't always have access to the manufacturer's core software, so they may not be able to address specific threats, apply critical patches in a timely fashion, or carry out the very latest firmware updates.

It is vital you inventory the infrastructure that comprises your network before you can maintain it effectively. Without visibility there will inevitably be gaps in your maintenance programme, creating weaknesses for malicious actors to exploit.

The good news is that developments in DCIM software have made it easier to maintain remote, distributed IT sites and edge computing environments, and gain granular information about their performance. This information can include the status of maintenance schedules, software and firmware updates, as well as flagging up early warnings of possible malfunctions.

A comprehensive DCIM solution also enables you to make changes to the configuration of devices, such as uninterruptible power supplies (UPS), racks, and intelligent power distribution units (PDUs). SNMP settings, including authentication, and administrator credentials can easily be changed across a range of devices, without the need to manually log in to each device and make the updates individually.

When a manufacturer delivers a new firmware version with the latest security patches, DCIM software allows you to save the file and roll it out to user-selected, supported devices.

Leverage data to MITIGATE security risks

Taking proactive steps to mitigate risk and keep your distributed infrastructure safe can be difficult but there are some powerful ways that DCIM and management software can help. They include:

- **Automated door locks and card access control**
  Enabling IT teams to remotely monitor when doors and server cabinets are unlocked and opened, and by whom. They can also flag up unsuccessful attempts to gain access. Having a single, centralised system for door-access management enables you to save time, eliminate the stress and hassle of keeping track of keys or cards, and even meet certain data security compliance requirements.

- **Role-based permissions**
  DCIM software's ability to grant granular, role-based permission can help you mitigate the biggest data centre and edge security threats of all: employees and the risk of human error. DCIM software tools make it easy to maintain permissions and prevent unauthorised changes by assigning different roles to users and user groups at a granular level. The software will also integrate with your existing active directory and lightweight directory access protocol (LDAP) systems for an additional level of authentication, so only authorised users have access to your critical infrastructure, wherever it is located.

- **Surveillance feeds**
  Legacy CCTV feeds are a thing of the past. Advanced DCIM platforms will support IP and USB cameras. This means multiple feeds can be added to an HTML5 dashboard so you can monitor multiple areas or sites remotely at the same time. As a result, you'll be able to keep an eye on what's going on at a remote site – such as a server closet or edge environment – even when you're miles away.

- **Reporting, auditing, and alerts**
  Unfortunately, you often only discover a security breach after the event. High-speed, granular data shared in real-time can help you stop that unauthorised activity in its tracks. It can also provide powerful insights enabling you to tighten security and prevent future incursions.

A comprehensive DCIM solution also enables you to make changes to the configuration of devices, such as uninterruptible power supplies (UPS), racks, and intelligent power distribution units (PDUs)

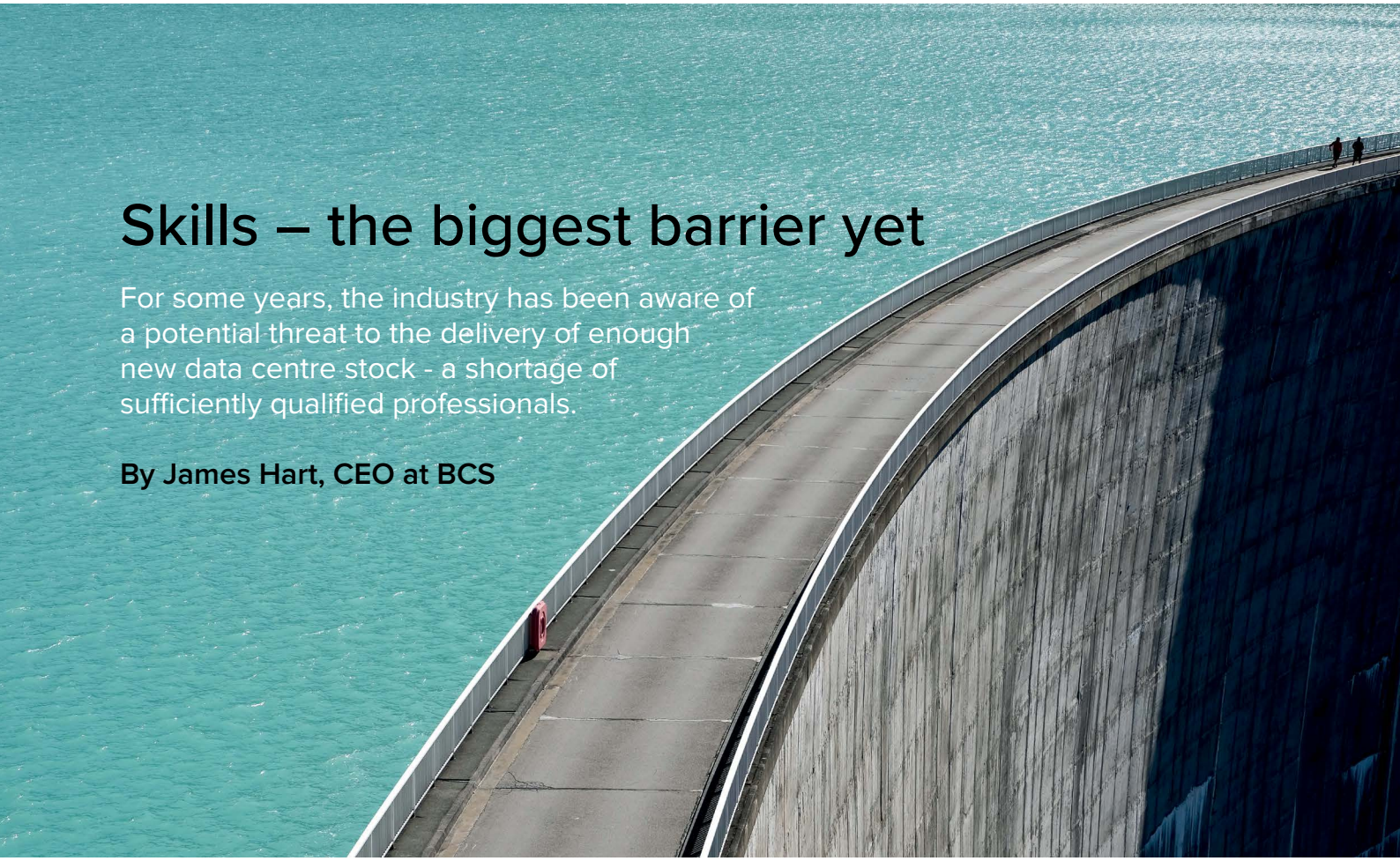
For example, Schneider Electric's Ecostruxure IT, can alert you in real time when the doors to your cabinets are opened and if access attempts are unsuccessful so you can identify unauthorised personnel in your data centre or IT environment, and act accordingly. This information can also be captured in your DCIM software audit log and security reports – the reporting of which will help you spot access trends in different areas of your infrastructure, so you can pinpoint and investigate suspicious activity.

Furthermore, you'll be able to grant secure access to external experts, who can proactively address unwanted faults before they impact your critical systems – providing services that will increase reliability, efficiency and help prevent downtime.

Modernise and automate in the face of increasing security risks

It's become a well-known mantra across the IT sector that in the face of an exponential rise in complexity, modernisation and automation are key. In the case of securing distributed IT and edge networks, IT teams are increasingly focusing their efforts on modernising legacy infrastructure and automating the "monitor, maintain and mitigate" process. Essential to this process is the use of leading software and DCIM solutions.

Organisations that put this mantra into practise will most likely be able to leverage critical infrastructure security as a competitive advantage and ensure reliability and efficiency remain central to their operations.



Skills – the biggest barrier yet

For some years, the industry has been aware of a potential threat to the delivery of enough new data centre stock - a shortage of sufficiently qualified professionals.

By James Hart, CEO at BCS

INITIALLY CONCERNS appeared around the design and build of new facilities but has also emerged in the fields of operations of data centres. Whilst these threats have been given more prominence in the last few years in the wake of international lockdowns and the imposition of restrictions on the movement of skilled labour to areas of demand, they are long-standing having emerged from the dislocation of the pace of growth of the industry and the pace of growth of attracting and training skilled labour resource.

These concerns are highlighted in our most recent survey that gathers the views and insights of over 3000 senior datacentre professionals from across Europe. In fact, 96% of respondents believe that the coming year will see a decline in supply of staff, an uplift on the 91% reporting this in summer 2022, and slightly above the 93% who reported the same in Winter 2020 arguably at the heart of the COVID-19 crisis across Europe. And, to further exacerbate the problem, some 90% believe that this will be accompanied by a rise in demand for such staff.

Certainly, in the case of build and design professionals, the debate around potential shortages of skilled labour is centred on the potential impact for the delivery of new data centre space and subsequent consequences for the end-user. When questioned on this, our respondents are unequivocal in their assertions that these impacts are real and are being keenly felt. Indeed, most respondents noted a multitude of factors when quizzed on these impacts.

The most cited impact is that these skills shortages have placed a greater workload on existing staff, nearly nine-out-of-ten noted this as the case, the same proportion recorded six months ago. The shortage of staff has inevitably led to increasing operating/labour costs recorded by 87%, a rise from the 83% reported last summer. Such shortages also can be seen as a contributory factor in the increasingly popularity of the use of outsourcing options, with around 52% citing it as such, marginally up on the previous survey – 51%.

Encouragingly, it appears that fewer respondents are finding it difficult to resource existing work this year than was the case earlier in the year with just over 43% stating that they had experienced difficulties in meeting deadlines or client objectives, down from 52% six months ago and well down on the 70% who cited it as factor at the beginning of the pandemic in Summer 2020.

In addition, around 48% stated that shortages had led to delays to developing new products/innovations, marginally up on the 44% reported in our last survey, whilst the proportion that noted they

had ceased offering certain products or services has also risen to 14% to 17%.

However, the more extreme consequence of skills shortages is lost orders, with 8% of respondents still believing that this happened, this is in line with the levels identified six months ago, but well down on the 20% who recorded the same a year ago.

Our survey suggests that respondents are increasingly seeing shortages amongst design professionals with 72% stating concerns six months ago to over 81% which is back in line with the levels expressed toward the end of 2021. This increase is echoed when it comes to build professionals - up from 78% to 83%. There was however some improvement with regard to sourcing operational staff for their data centres where the problem seems to be less acute with a decrease in numbers stating their concern of 7%.

Most suppliers of data centre services appear worried about this balance between supply and demand of labour with the majority of colocation providers carriers/network operators and IT integrators believing the coming year will be characterised by falling supply and rising demand. The findings of our survey are reinforced by the Uptime Institute who have forecast that staff requirements will grow globally from about 2 million full-time employees in 2019 to nearly 2.3 million by 2025 which makes availability of skilled professionals the most significant and prevailing barrier to the industry's ability to meet demand.

So, what can we do? At the very least we need to raise awareness of the opportunities in our sector at an early age and make sure it is at least on youngsters' radar as a possible career path. This needs to be supported by readily available STEM and apprenticeships like the one we have operated at BCS for several years. We are passionate about building a learning culture that gives apprentices the opportunity to shine from the outset and our BCS' Assistant Training Programme is designed to give them the technical (office based) and practical (site based) knowledge, skills, and experience they need whilst supporting their studies. We also find that their fresh thinking, enthusiasm and passion is good for our business as it can reinvigorate the way we look at and approach things. Our recruitment policy also targets the right people and industries where the skills are transferable, such as Project Management, and also promotes diversity and inclusion.

In conclusion, we all have a responsibility to continue to invest in the skillset of the next generation of engineers and project managers and without this type of action there are very real risks to the words continuing digital transformation.

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Start building collaboration across CTOs, CIOs and Data Center Ops for greater sustainability

Ending the silo effect for CIOs and data centre leaders tasked with tackling sustainability and decarbonising digital.

By Arun Shenoy, SVP Sales and Marketing, Serverfarm Llc

DATA CENTER LEADERS provide infrastructure, CIOs set strategy and CTOs invest in technology, but no one group has the full sustainability picture. When it comes to addressing a topic as big as Green House Gas (GHG) emissions there is a strong argument that the only viable solution begins with gaining an understanding of the carbon profile of the full digital infrastructure stack.

However, as we seek to build bridges it is important not to underestimate the challenge of building collaboration across IT and data center operations.

Given the hybrid nature of where IT resides, an assessment of the power use and GHG profile and of physical infrastructure must be done across legacy on prem data centers, directly purchased commercial colocation and across multiple cloud platforms (which themselves may be hosted in colocation data centres.) This can only be achieved through collaboration, setting a common set of goals, agreeing standards, measurement procedures, processes, and even platforms. That relies on the accuracy and timeliness of data.

Roles and responsibilities

In terms of roles and responsibilities CIOs and CTOs who need to gain an understanding of the energy and carbon emissions profile of their digital infrastructure and operations have traditionally evaluated the top few layers of the IT stack. These include the apps, development methodologies, software architectures, processor architectures and server, storage and networking infrastructure.

CIO and CTO thoughts might then turn to the best cloud strategy for their business. In today's world in addition to costs, SLAs, flexibility and lock in considerations, carbon tracking and power use have now been added to the requirements and evaluation list.

In sustainability terms this also requires an understanding of the power purchasing and power profile of data centers where workloads will be hosted. This spans the cloud provider's owned and operated and third-party commercial colocation data centers.

But often these latter considerations usually fall outside the responsibilities of the CIO or the CTO. Traditionally in most organizations a different department has responsibility for evaluation of the physical infrastructure layers of the digital stack. This team may live within FM or within a dedicated data center cohort of Mechanical and Electrical Engineers (M+E). The data center folk.

These experts look after the physical infrastructure on which IT runs. The building in which it is housed, the power infrastructure (switchgear, UPSs, power generation, energy storage, racks and power distribution units) and the cooling infrastructure on which it depends to keep operating.

In sustainability and energy efficiency conscious times this all needs management, monitoring and measurement of where the electricity originates, grid distribution, the behind the meter power chain, where it goes, how it gets to the IT load and how much is used or goes to waste.

For a CIO or CTO this is often uncharted territory. Collaboration driven by ESG and sustainability

This means a basic requirement for collaboration is, wherever possible, using a common approach to measuring everything from the carbon impact of the data center building, how it is powered at a MW level and how its power and cooling infrastructure is operated down to calculating server performance per watt.

A combined top down and bottom-up approach to measuring the sustainability impact of each layer of the stack can start to deliver tangible results.

For each layer of the stack consideration must be given to understanding power performance and carbon footprint of its underlying infrastructure.

Gathering and understanding such data will inform strategy while saving resources used in energy, water, space and time.

To reduce carbon emissions smart CIOs and CTOs and data center leaders need to create deeper engagement between IT and DC engineering teams.
Failure to do so will hold back digital sustainability strategies at the opportunity cost of cutting GHG emissions through digital transformation.

The end goal is cutting digital carbon footprint while opening the way for broader digital services that will drive business growth while improving corporate sustainability.

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DCS DATACENTRE SOLUTIONS
DEVELOPING DIGITAL INFRASTRUCTURE IN A HYBRID WORLD

Sustainability must roll forward faster

At last, almost everyone agrees that the world's environment is in crisis. Governments, industries, corporations, down to individuals are now taking steps towards better environmental stewardship. We must all take responsibility for our actions and help reduce the CO_2 emissions we create and work to achieve Net Zero.

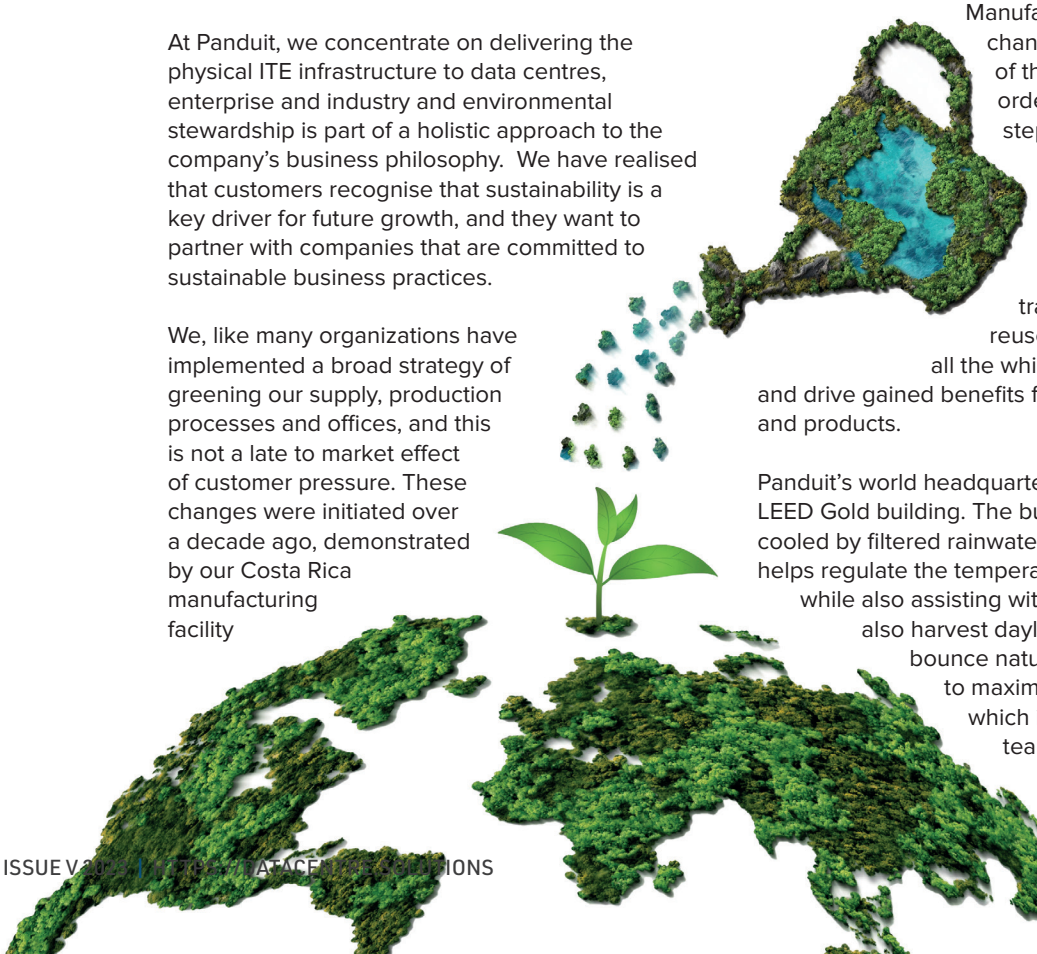
By Michael Akinla, Business Manager, Northern Europe, and Ireland

SUPPLIERS, customers, investors, and employees all understand that this is not an easy path, but it is an essential one. We have all witnessed, over the past decade, how the data centre industry has grown from an obscure market to a key economic engine for every developed and developing country. The data centre industry continues to grow and with it the need to reduce the negative environmental impact generated, from the construction phase, through fit out, to resource utilisation, such as, water and energy and back through the supply ecosystem.

At Panduit, we concentrate on delivering the physical ITE infrastructure to data centres, enterprise and industry and environmental stewardship is part of a holistic approach to the company's business philosophy. We have realised that customers recognise that sustainability is a key driver for future growth, and they want to partner with companies that are committed to sustainable business practices.

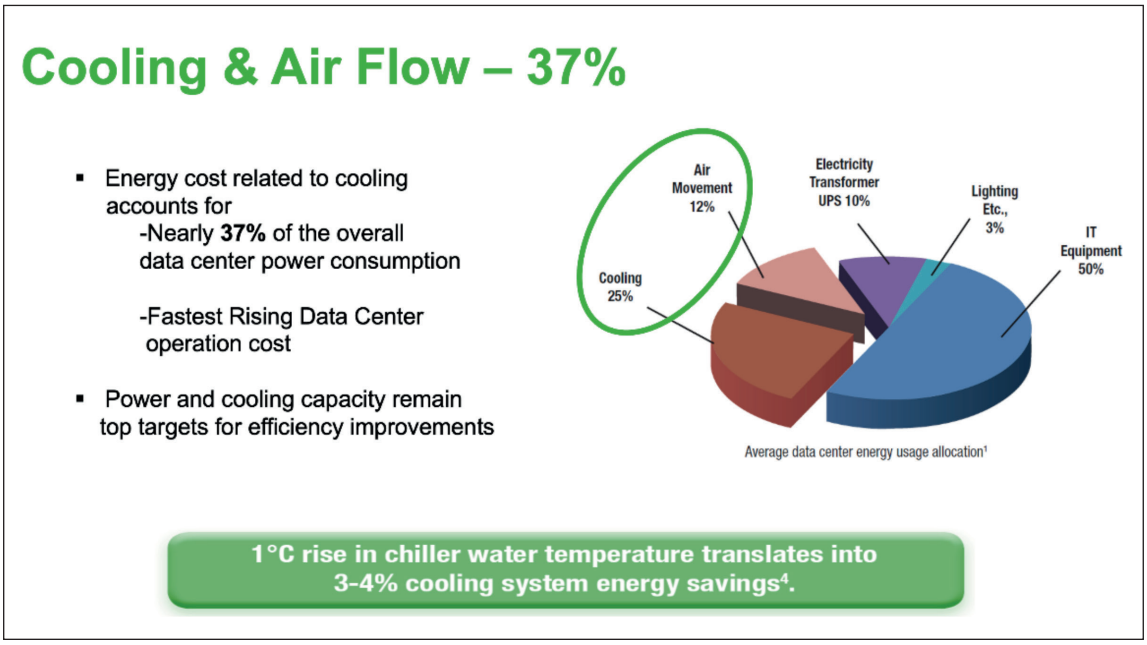
We, like many organizations have implemented a broad strategy of greening our supply, production processes and offices, and this is not a late to market effect of customer pressure. These changes were initiated over a decade ago, demonstrated by our Costa Rica manufacturing facility which has been carbon neutral certified since 2014. The plant was recognised as a pioneer in CO_2 reduction at the 2019 PreCOP25 International Climate Conference.

A key goal is to recycle thousands of metric tons of manufacturing waste per year and reduce Panduit's carbon footprint by 20% by 2025. A further manufacturing goal is to reduce energy intensity (kWH/Earned Hours) by 10% by 2025, across our facilities.



Manufacturers must make changes in every aspect of their business flows in order to achieve meaningful steps towards Net Zero. We have been reviewing processes across the board, from base materials, manufacturing, transportation, product reuse, recycling, and disposal, all the while innovating to capture, and drive gained benefits forward with new policies and products.

Panduit's world headquarters was certified as a LEED Gold building. The building's data centre is cooled by filtered rainwater, and the green roof helps regulate the temperature of the rooms below, while also assisting with rainwater capture. We also harvest daylight using light shelves to bounce natural light into the building to maximise light distribution, which is a subject our R&D teams are very aware of. All these activities generate data, which is used to



➤ Data Center Energy Allocation (Panduit)

benchmark, evaluate, and improve the operation of the building's systems in order to conserve energy, improve occupant comfort, maximise productivity and enhance operations.

Recycling for all

Organizations must be strident in material sourcing. We are RoHS and REACH compliant and have implemented recyclable material packaging. We work with our suppliers to upgrade packaging increasing renewable wood and cardboard products as well as recyclable plastic materials.

We, like many organisations, measure, analyse and report the environmental and health impacts of copper cable and connector materials as part of the Environmental Product Declaration (EPD) and Health Product Declaration (HPD) process.

Current investigations include recycling excess fluorinated ethylene propylene (FEP) back into base material and the reuse of copper waste generated from the manufacturing process to achieve 100% waste recycling.

E-Waste is a major challenge according to the Global E-Waste Monitor project. 53.6 Megatons (Mt) of e-waste was generated around the globe in 2019, of this only 9.3 Mt, or 17.4% was disposed of or recycled properly.

Panduit's R&D Labs have been investigating product efficiency for almost 60-years. We are helping data centre customers be more sustainable, whether on-premises or standalone sites, by sharing our knowledge and research concerning the amount of energy wasted within infrastructure environment. Up to 40% of data centre energy is used in cooling and lighting, therefore, increasing energy efficiency is important in improving sustainability and reducing carbon emissions.

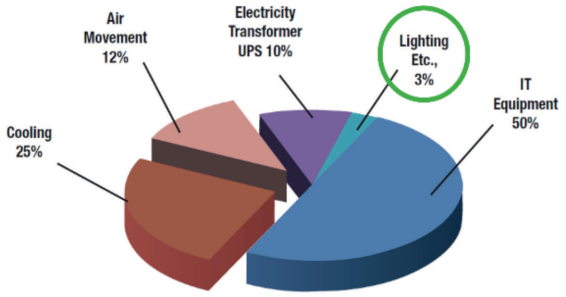
White is right

A number of years ago, our labs undertook research into the benefits of white cabinets compared to black. It found that white cabinets provided a Light Reflective Value of 80% verses black cabinets that offered 5%, this equates to a light energy saving of up to 30%, (1.5-3% of data centre energy), and requiring fewer light fittings in the area. Panduit's research also found that the reflective light allowed easier working in and around the cabinets for installation and MACs.

An even bigger opportunity to increase energy efficiency is around the servers. ASHRAE TC9.9 has encouraged operators to raise temperatures in technology spaces and introduce environments such as Hot/Cold Aisle Containment Systems that eliminate hot air recirculation. Improving cold air direction into cabinets intake fans reduces inlet air temperature and improves cooling and equipment reliability. Ensuring cabinets are air sealed ensures empty rack spaces and gaps around cable inlets are covered to reduce air leakage by up to 20% and

Lighting – 3%

- White Cabinets
  - Light Reflective Value (LVR) 80% vs.5% for Black
    - 25 to 30% light energy savings
  - Increase Visibility inside the cabinet
    - Ambient light sufficient for most work



Average data center energy usage allocation[1]

preventing hot air contamination. These measures can reduce energy use by a staggering 40%, a demonstrable sustainability win.

Today, monitoring devices and DCIM systems ensure that data in and around cabinets is collected and reportable to ensure cabinets operate at maximum efficiency, which is good for the data centre, good for customers and good for the environment. Panduit continues to review product materials and sourcing strategies. Vari-Matrix HD 28AWG patch cords offer the industry's smallest diameter Cat 6A cable, which uses less material in its manufacture, and maintains the quality and capability of its characteristics. This also allows more cables per bundle around the site and in distribution more reels per pallet, increasing shipping efficiency by reducing the number of traffic journeys.

Companies looking to evaluate potential suppliers should ask for ESG policies and evidence they contribute to internal efficiencies and drive lower energy use, reduction in base materials usage and reduced packaging. Also key, is what internal practices are suppliers taking to drive internal efficiencies to improve sustainability drives, such as EPD/HPD certification on euroclass rated cables which help with LEED and BREEAM and demonstrate a cradle to grave measurement approach.

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Life Is On | Schneider Electric

NVMe is gaining speed in the data centre

As enterprises struggle to balance performance and sustainability in their data centre, NVMe flash is gaining popularity and is replacing disk-based storage for high-performance workloads.

By Eric Bassier, Senior Director Product at Quantum

THE TREND is already slowly squeezing HDDs out of the market, which might soon become irrelevant as tape storage is gaining traction for cost-effective storage of cold data. To reap the benefits NVMe promises, enterprises need a new storage platform on the software layer that is designed specifically to take advantage of new technologies like advances in NVMe.

The new era of data

Unstructured data - things like video and imagery - is growing exponentially, resulting in trillions of files and objects and exabytes of data, all moving fluidly within and between data centres and the cloud. Organisations are grappling with how to deliver the performance, the management, and processing of these types of data require. Legacy storage systems, based on HDDs and/or SSDs, often run on inefficient Serial Advanced Technology Attachment (SATA) and are not performant enough.

To meet the performance requirements of modern unstructured data workloads like AI/ML, VFX animation, and modern data lakes, organisations are increasingly looking at the advantages of NVMe flash based storage.

HDDs are already being phased out

It is expected that the cost per gigabyte of flash storage will, in 2023 and for the first time, be cheaper than the cost for higher end HDDs. The price trend for flash has pointed down for more than 15 years and 2023 seems to be the year when the cost for flash and HDDs become more in line. Shipped flash-capacity grew at 37% in 2022 and will overall account for 32% of all storage capacity shipped by 2026. Price is an important factor for the choice of storage medium and certainly a cheaper price point for flash storage will accelerate the adoption of flash-based storage technologies. As organisations look for ways to improve their storage

system's performance, they are looking at NVMe-based storage as it has the highest performance potential of all storage mediums. Paired with RDMA, NVMe can also reduce cost for networking infrastructure and complexity as it does not need Fibre Channel but runs on easy and inexpensive ethernet.

NVMe: designed for solid state memory

Most SSDs used in the data centre today still use SATA. The protocol was once designed to work with mechanical HDDs and, as SSDs have become faster and faster, has become increasingly inadequate, as enterprises try to squeeze every bit of performance out of their storage systems. The NVMe protocol is an advancement over traditional SAS and SATA protocols as it was specifically designed for solid-state memory. This design allows host hardware and software to calculate processes simultaneously, which reduces I/O-overhead, improves performance, and reduces latency. With NVMe it is possible to process not only thousands but millions of concurrent operations, which is an order of magnitude of performance improvement versus legacy architectures using SAS or SATA.

This increase of performance is already utilised in use cases to increase read-/write-speeds for large files or lower rendering times for higher resolution content like 4K and 8K video. As performance requirements keep on rising for emerging use cases like AI and ML, business intelligence, data analytics, DevOps, imaging in healthcare and life sciences, or modern data lakes, the demand for new NVMe all-flash architectures is consistently growing. Next to performance, ESG has also become an important factor for many enterprises. Compared to hard drives, NVMe flash can reduce not only a system's footprint by up to 80% percent, due to the reduced amount of hardware required, but also use much less energy. This reduces not only energy cost but also carbon emissions.

HDD is getting squeezed out of the market from both ends

With the need for more performance, ESG-considerations, and potential savings for networking technology, it is not surprising that organisations are shifting more and more of their active workloads to NVMe flash storage. At the same time, as more data is being generated, organisations need a secure, cost-effective, and "green" way to archive that data, which increasingly is tape storage.

In 2022, for the first time ever, the amount of shipped HDD-capacity has decreased, whilst the ratio and capacity of flash and tape have both increased. The trend is undoubtedly going into a direction where HDD is getting squeezed out of the market by flash from the top and by tape from the bottom. Today the vast majority of total HDD capacity is already shipped as slower high-capacity HDD drives - only confirming the trend that organisations are moving away from disk for their higher performing workloads and archive data.

Innovation is in the software

Without question, NVMe flash offers many advantages over legacy storage solutions. To utilise those advantages fully, however, it needs to be paired with a modern storage platform on the software layer. Current storage solutions on the market utilising NVMe often require custom hardware. As a result, these products will not run in the cloud. And as they are custom-built, customers are unable to benefit from falling costs for flash hardware and cloud services.

Next to performance, ESG has also become an important factor for many enterprises. Compared to hard drives, NVMe flash can reduce not only a system's footprint by up to 80% percent, due to the reduced amount of hardware required, but also use much less energy

A software-defined storage solution (SDS) developed for NVMe can solve this problem. It separates hard- and software layers and gives enterprises the possibility to benefit from the best possible solutions on both. The ideal solution would be a modern cloud-native distributed file and object storage platform built for the latest flash and memory technologies like NVMe and RDMA. These protocols unlock the true performance potential of flash by enabling more parallel reads and writes, as well as dramatically reducing network latencies for flash storage nodes communicating via an NVMe fabric. Truly distributed storage architectures also eliminate bottlenecks related to metadata management and overhead, providing consistent low latency performance for both high bandwidth and high IOPs applications.

Organisations are facing a deluge of unstructured data and need more performance out of their storage systems. They also need to take costs and ease of use into consideration. As flash prices continue to come down, NVMe-flash storage systems are increasingly replacing disk-based storage for high-performance workloads. Organisations with digital transformation initiatives require faster performance, more scale, and more flexibility to operate in hybrid and multi-cloud environments; legacy NAS platforms will never meet these requirements. An investment in a modern NVMe flash storage platform will provide the performance, scale, and simplicity to power the unstructured data applications of the next decade.

Great expectations

High Performance Computing is disrupting conventional data centre wisdom.

By Arpen Tucker, Senior Business Development Manager, Vantage Data Centers

SELF-BUILD on premise data centres has been the preference for many High-Performance Computing (HPC) applications. However, the tide is turning. The demand for more compute power and relatively short refresh cycles is now proving difficult for many when it comes to financial returns and logistics (parallel build) as well as upgrading of plant and utilities to site (power).

Additionally, increasing dependence on the availability of platforms is driving towards critical services environments making it operationally intensive for in-house teams to maintain and upgrade these platforms – the facilities required often cost as much as the computers themselves. However, finding alternatives can be challenging. Colocation providers capable of providing suitable environments, especially when powering and cooling of these highly-dense and complex platforms, are few and far between in the UK and many parts of Europe. Furthermore, the majority of colocation providers have little experience of HPC and their business models do not support the custom builds required. The cooling required demands bespoke build and engineering skills. The public or private cloud or using a combination of both offer further possibilities. The public cloud is growing in popularity as a delivery model for certain HPC applications such as manufacturing and life sciences and may be fine for standard workloads: Highly parallelised codes or ensembles and where there is a high tolerance for individual job failure and execution locality is not a prerequisite. Nevertheless, administrators will still need to have in-depth knowledge of the cloud provider's architecture on a case-by-case basis to ensure it's the right fit for the application concerned.

Additionally, cloud may present issues with data protection, control, privacy and security for HPC use cases. There could also be compute performance, I/O and communications limitations. HPC is considerably more complex as there is a need for different CPU and GPU server capabilities; highly engineered interconnects between all the various systems and resources; storage latencies to be maintained in the low milli, micro or even nanoseconds. All this requires highly specialised workload orchestration.

New HPC considerations

Power

The ultimate limitation for most on premise or commercial data centres will be the availability of sufficient power. Highly concentrated power to rack in ever smaller footprints is critical as dense HPC equipment needs high power densities, far more than the average colocation facility in Europe typically offers. The average colocation power per rack is circa 5kWs and rarely exceeds 20kWs, compared to HPC platforms which typically draw around 30kWs and upwards. However, Vantage is seeing densities rise to 40, 50, with some installations in excess of 100kWs.

While it is unusual to have a data centre which is overprovisioned on power versus space, that's exactly what's needed for HPC. Typical data centres will quickly exhaust their power and be left at low space occupancy.

It is essential to check if the colocation facility can provide that extra power now – not just promise it for the future – and whether it charges a premium price for routing more power to your system. Furthermore, check the multi-cabled power aggregation systems required include sufficient power redundancy.

As the HPC market grows, so do the implications of running such energy-intensive and complex infrastructure. To achieve sustainability, data centre industry leaders such as Vantage and HPC vendors are prioritising ways to reduce CO_2 impact and even decarbonize HPC

Critical Services
While previously many HPC users were happy to tolerate outages on their early generation platforms, organisations are becoming increasingly reliant on HPC for mainstream activity - implying a more urgent need for critical services hosting to accommodate them. This is not necessarily provided in typical colocation facilities looking to move up from general purpose applications and services to supporting true HPC environments.

There will always be some form of immediate failover power supply in place which is then replaced by auxiliary power from diesel generators. However, such immediate power provision is expensive, particularly when there is a continuous high draw, as is required by HPC. UPS and auxiliary power systems must be capable of supporting all workloads running in the facility at the same time, along with overhead and enough redundancy to deal with any failure within the emergency power supply system itself.

Cooling
Increasingly, inhouse solutions will have constraints as densities continue to go up. HPC requires highly targeted cooling and simple computer room air conditioning (CRAC) or free air cooling systems (such as swamp or adiabatic coolers) typically do not have the capabilities required. Furthermore, hot and cold aisle cooling systems are increasingly inadequate for addressing the heat created by larger HPC environments which will require specialised and often custom built cooling systems and procedures.

In reality, many data centres are 'productised' to a single plant architecture or are simply not laid out to support successive bespoke builds. This makes implementing HPC a challenge when each compute platform has different and specialised cooling requirements.This places increased emphasis on having on-site engineering personnel on hand with knowledge in designing and building bespoke cooling systems such as direct liquid cooling for highly efficient heat removal and avoiding on board hot spots. This will reduce the problems of high temperatures without excessive air circulation which is both expensive and noisy.

Sustainability
As the HPC market grows, so do the implications of running such energy-intensive and complex infrastructure. To achieve sustainability, data centre industry leaders such as Vantage and HPC vendors are prioritising ways to reduce CO_2 impact and even decarbonize HPC.

Fibre Connectivity/Latency
The majority of commercial data centres have far higher levels of diverse fibre connectivity compared to 'on-premise' campuses. Basic public connectivity solutions will generally not be sufficient for HPC systems.

Ensuring connectivity through multiple diverse connections from the facility is crucial along with specialised connections to public clouds, especially in the case of hybrid cloud solutions. These bypass the public internet to enable more consistent and secure interactions between the HPC platform and other workloads the organisation may be operating.

Location
The physical location of the data centre will impact directly on rack space costs and power availability. In the case of colocation there are often considerable differences in rack space rents between regional facilities and those based in or around large metro areas such as London. Perhaps of more concern to HPC users, most data centres in and around London are severely power limited.

Energy procurement in the data centre industry

Properly managing energy procurement can help data centre providers to reduce their operating costs, improve the reliability and quality of their energy supply, and reduce their environmental impact.

By David Watkins, solutions director at VIRTUS Data Centres

BECAUSE THE WORLD relies on technology and society's use and appetite for digital applications is rising, demand for data centre space is also increasing. According to JLL's Global Data Centre Outlook, the hyperscale market alone (facilities that manage very large data processing and storage needs), is expected to grow 20 per cent from 2021 to 2026. ChatGPT is a topical example of an application using artificial intelligence (AI) that will increase the need for data centre storage and processing. However, as data centres continue to grow in importance, so too does their need for energy. Consequently, how data centres procure energy has a critical role to play in decarbonising the UK's energy supply sector and supporting the delivery of the national net zero target.

And when it comes to energy procurement, data centres have a lot in common with energy suppliers; both are in the business of supplying power to their customers, and both must balance the need for sustainability with the need for profitability; energy suppliers are under pressure to reduce their carbon footprint and invest in renewable energy sources, similarly data centres are under pressure to reduce their energy consumption and choose sustainable energy sources.

A key difference between the two industries is that data centres have a closer relationship with their energy provider. It is common for data centres to have long-term contracts with one or more energy providers and / or brokers, and they often work closely with them to ensure a reliable and cost-effective supply of power. In contrast, with regards to non-data centre customers, energy suppliers typically have a more distant relationship and may not have the same level of control over their energy supply.

Making the relationship count

To make this close relationship count, data centres work hard to procure energy responsibly so they can operate efficiently and sustainably. This means having an energy procurement strategy that involves buying the required volumes of energy from the various resources available such as renewables, natural gas, coal and nuclear.

Properly managing energy procurement can help data centre providers to reduce their operating costs, improve the reliability and quality of their energy supply, and reduce their environmental impact

Although the goal is clear - to find the most sustainable energy source to power data centres to benefit their customers, operators and plant, whilst being environmentally responsible - it is a complex process, involving careful consideration of multiple factors such as energy efficiency, carbon emissions, reliability and cost-effectiveness.

It is also important for commercial reasons; as data centres grow, they consume more energy. This, as well as rising energy prices, has led to facilities' increasing energy expenditure, which can have a significant impact on the provider's bottom line, and the cost to the customer. By choosing reliable, sustainable energy sources, data centres can reduce their energy costs and increase their competitiveness in the marketplace.

Not all renewables are equally sustainable

However, energy sources can differ in how sustainable they are, so it's important to look beyond carbon emissions. For example, biomass and nuclear energy might be considered as sustainable energy sources because they don't produce carbon emissions directly, but they can have negative impacts on the environment in other ways; biomass requires large amounts of crops or trees used for fuel, which can lead to deforestation and habitat destruction; nuclear energy is very expensive to produce and also has long-term waste disposal issues; and both produce other by-products.

In comparison, hydro, solar and tidal energy have a minimal impact on the environmental as they harness the power of natural resources; they don't require land or resources beyond the initial construction and maintenance of the infrastructure. However, because of their dependence on weather conditions, they aren't 100% reliable. This is a key factor for data centres to consider when choosing energy providers because it is critical for them to avoid difficulties such as power outages. Data centres that use 100% renewable energy mitigate this risk by having a balanced 'basket' of sustainable energy resources within their portfolio to ensure availability at all times.

It is also important to be able to prove that sustainable energy purchased is what is says it is. Renewable Energy Guarantee of Origin (REGO) certification verifies that the energy being used is truly renewable and sustainable. This certification can be easily checked by looking at the energy company's annual fuel mix report, which is available online for public viewing. This information can be useful for data centres as they make decisions about their own energy procurement and strive to do their part in achieving the UK's net zero goals, as well as for customers who need to include energy usage information in ESG reports.

Cost matters

However, regardless of how sustainable the energy is, how much it costs remains a deciding factor. If the cost doesn't make commercial sense to both the data centre and its customers, it won't be viable. The good news is that cost of renewable energy is actually decreasing as technology improves and economies of scale are reached.

Fortunately, as more and more companies and individuals prioritise sustainability, it makes sense for energy companies to invest in and produce renewable energy. This is making it increasingly competitive with traditional fossil fuel sources, and a more viable option for data centre providers providing the opportunity to access more sustainable energy options at competitive prices. If the energy prices are cost effective, then the data centre should ensure that any benefits are passed directly onto its customers in the form of competitive prices and improved services.

Properly managing energy procurement can help data centre providers to reduce their operating costs, improve the reliability and quality of their energy supply, and reduce their environmental impact. It is also becoming increasingly important as customers aim to meet their own sustainability goals and comply with regulatory requirements. And with the rise of renewable energy, energy procurement is an opportunity for data centre providers to support the growth of sustainable energy generation.

Energy procurement is a multi-faceted process that requires careful consideration of both commercial and environmental factors. Sustainability is a key business driver for many organisations, so being able to provide evidence of sustainable energy and practices can assist customers with their own sustainability goals. By adopting responsible energy sourcing strategies, data centres can maximise efficiency and minimise their environmental impact whilst reducing costs and enhancing their corporate reputation.

Service as a game changer: Why it matters in UPS selection

In today's digital age, businesses rely heavily on technology to stay connected, informed and productive. From small startups to large corporations, mission-critical systems are essential for daily operations. As our reliance on technology continues to grow, the need for reliable power protection becomes increasingly important for businesses.

By Flora Cavinato, director, global service product portfolio, at Vertiv

POWER OUTAGES, brownouts and other power disturbances can cause significant financial losses for businesses and safety implications for organisations such as hospitals and airports due to data loss, hardware damage and system downtime. Therefore, selecting the right uninterruptible power supply (UPS) that protects against power disturbances and helps maintain electrical continuity in the worst-case scenario becomes crucial.

Choosing the right UPS can be a daunting task, given the numerous options available in the market. Factors such as capacity, runtime requirement, efficiency and scalability should be taken into consideration; selecting a UPS that is right for the equipment and application is essential. When businesses invest in the right UPS, they can rest assured that their critical systems will remain operational even in the event of power disturbances, leading to uninterrupted operations and avoiding financial losses.

A focus on service

When selecting the right uninterruptible power supply (UPS) for a business, it's important to consider more than just the technical features such as the UPS technology (offline, line-interactive or online), runtime requirement (internal battery only or extended battery cabinet), form factor (rack or tower) and innovative technology elements such as insulated-gate bipolar transistors (IGBTs), Digital Signal Processors (DSPs) or peak shaving capability.

Service is a crucial element to take into consideration as the reliability of the UPS strongly depends on it. Service encompasses all the activities

that occur before starting up the UPS, such as delivery, positioning and installation. It also includes the start-up process itself to verify that the electrical installation has been performed correctly and to regulate all necessary UPS settings in the proper way. These are all project services, supporting the deployment at site.

Once the UPS is set up and running, it's crucial to maintain its optimal functionality.. This is where subscribing to a service contract becomes key. Service contracts typically include regular UPS maintenance to verify that all components are working properly and trigger immediate or scheduled replacement if they are not.
They may also include digital services such as remote monitoring and diagnostics and incident management to identify critical conditions early enough to correct them before they become major issues. This can provide valuable information on how the UPS is being used, which can be leveraged to optimise its performance.

Taking a comprehensive approach to UPS selection, including consideration of the available services, can improve equipment uptime and reliability, lower operating costs, increase energy efficiency, and ultimately reduce the environmental impact of the UPS. Therefore, it's important to recognise that technical features and services go hand in hand when selecting the right UPS for a business's critical applications.

Choosing the right partner

Choosing the right UPS vendor is an important decision that businesses must make to keep their critical systems operational in the event of power disturbances. We've already covered service levels, but there is more to consider too.
Firstly, expertise and experience should be at the forefront of your mind. A vendor with extensive experience in designing, deploying and maintaining UPS systems can offer valuable insights and advice to help you choose the right solution for your business. Look for a vendor that has a team of certified professionals who can provide ongoing support.

A good vendor should also offer a range of UPS solutions that cater to different business needs and budgets. They should provide customised solutions that meet your specific requirements. Moreover, the solutions should be reliable, high-performance, and scalable to meet your business needs as they evolve.

Considering the environmental impact

In addition to technical features and services, businesses should also consider the environmental impact of their UPS selection. The energy efficiency of the UPS and its power factor correction can have a significant impact on energy consumption and costs.

The energy efficiency of a UPS is determined by its efficiency rating, which measures how much energy is converted into usable power for connected devices. A higher efficiency rating means less energy is lost as heat, resulting in lower energy consumption and costs. In addition, UPS models with power factor correction (PFC) can improve the UPS's efficiency and reduce the amount of energy wasted.

Of course, managing the environmental impact of a UPS involves more than just purchasing an efficient unit. A holistic approach to its management is necessary, from initial purchase and installation through regular maintenance, repair and eventual decommissioning and responsible disposal.

A bright future for those who get it right

Investing in a reliable UPS system is essential for businesses to thrive and safeguard their operations. Selecting the right UPS, partnering with a reputable vendor or partner, and leveraging professional services for maintenance and support are critical factors in safeguarding your business from any power-related challenges. Taking a holistic approach to UPS management is also essential to achieve the highest level of performance, stability and resilience for businesses in the face of potential power disruption.

In today's hyper-competitive world, the stakes have never been higher for businesses to protect the continuity of their critical systems. By investing in the right UPS system and taking a lifecycle approach to UPS management, businesses can achieve the level of performance, stability, and resilience necessary to thrive in today's digital age. Moreover, choosing the right UPS vendor is also critical to the success of businesses. A vendor that can offer customised solutions, high-performance UPS systems and comprehensive services and support can make the critical difference in achieving uninterrupted operations.

Overcool or Overheat...

What is the temperature of your data center? Do you know? If someone asked, what would you say? “Where? It’s a big data center.”

By AKCP

TRADITIONAL DATA CENTERS are over cooled, focussing on uptime. This is because they have limited or poorly designed containment, little understanding of the air flows, air temperatures and air pressures at key points in the heating and cooling cycle.

The trend has been towards more efficient cooling architectures. These typically use hot or cold aisle containment.

So what temperature should you be aiming for in your data center and where should you be measuring this temperature?

Since 2005 ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) recommends operating anywhere between 18°C to 27°C (64.4°F - 80.6°F) with a humidity between 40-55%. This gives a starting point, but how do we decide where within this range to operate, and where to place sensors?

Overview of ASHRAE temperature recommendations for data centers

The safest option is to aim for 18°C. However, the safest option is not the most energy efficient. Modern servers operate at higher temperatures, such as 23°C - 24°C (73.4° - 75.2°F) server inlet temperature. There may be a slightly reduced lifespan of the components but this will be more than offset by the energy saving.

Data centers can save 4-5% in energy costs for every 0.5°C (1°F) increase in server inlet temperatures. Going from 18°C to 24°C (64.4°F to 75.2°F) could save up to 43% of OpEx. This also reduces the carbon footprint of the data center, and the amount of water you need. Increasing the capacity of your existing facility without needing to outlay CapEX for additional cooling equipment is also possible.

There is a trade off that comes with this. There is less margin for error. When you run your data center at an average of 18°C, a failure to properly measure server inlet temperatures is not critical. The closer to the upper temperature limits you run, the more you save in energy but the higher your risk of thermal overload.

What factors influence the operating temperature of a data center?

The below factors can have an impact on your server rack inlet temperatures and energy consumption :-

- The local climate
- The number of racks, other equipment and how much heat they produce
- The size and shape of the room
- Power dissipated
- Cooling system design

If any one of these factors changes, your Data Center may be operating at too high or too low a temperature at some location in your Data Center.

Benefits of monitoring data center temperatures

The closer to the upper limit of ASHRAE recommended temperatures you operate, the more important a comprehensive monitoring system becomes.

Monitoring the temperature of your data center offers several key benefits:

- Minimizes downtime. Proper monitoring of temperatures helps avoid costly downtimes due to thermal overload.
- Detailed analysis of hotspots and cold spots. Identify problem areas before they are critical. Locate where you have stranded capacity and overcooling.
- Safely operate at the upper limits of ASHRAE recommended temperatures.

Technology solutions for temperature monitoring in the data center

There are many options when it comes to monitoring solutions for the data center. From a single temperature sensor in the room, to detailed thermal mapping of the rack inlet and outlet temperatures, with ΔT calculations.

Uptime Institute recommends a minimum of 3 temperature sensors on at least every other rack. The sensors are located at the top middle and bottom of the front of the rack. New technologies such as sensorCFD™ from AKCP integrate live sensor data and CFD (computational fluid dynamics) and real time analysis. This is useful in understanding airflows and temperature distribution.

Here are some important features to look for when selecting a monitoring system for your data center.

1. 24/7 remote monitoring: This feature allows you to monitor your data center's temperature in real time.

2. Automated alerts. Let you know when temperatures in the data center are outside of recommended ranges. Take action before issues rise.

3. Data logging capabilities:. Storing your data on a regular basis to spot long-term temperature trends and make adjustments.

4. Integration with DCIM platforms via SNMP or cloud platforms with MQTT.

Case Study

A TOP HEALTHCARE PROVIDER in the USA recently implemented thermal map sensors from AKCP on every rack in their data center. The sensors are monitored through Sunbird DCIM via SNMP. Sunbird provides data analytics, alarming and visualization tools to show hot and cold spots in the data center.

This has allowed the data center to get an insight as to where they are wasting energy through overcooling, release stranded capacity by increasing server loads and safely manage hotspots when operating the data center at elevated temperatures.

Thermal map sensors consist of 3x temperature sensors at the front, and 3 at the rear of every rack, giving you measurements of rack inlet, outlet and ΔT. DCIM software from Sunbird uses this sensor data to create heatmaps of the data center.

The healthcare provider discovered that they were overcooling servers throughout their data center, and could safely increase their data center operating temperature without creating hot spots. They successfully reduced their energy use by 18% while maintaining safe operating conditions for their servers.

Based on the results achieved, they are preparing to roll out the same setup at their second data center facility.

By using these features, data center professionals can rest assured that their facilities are running at peak efficiency and with maximum safety.

Implementing DCIM monitoring software

To ensure your data center runs at optimal conditions, you'll need to invest in monitoring software. This will allow you to maintain more accurate readings and adjust the temperature as needed.

With the right monitoring software, you can:

1. Monitor temperature conditions in real-time and receive alerts when specific thresholds are crossed

2. Accurately record and capture temperature fluctuations for future reference or analysis

3. Identify changes in temperature so you can take action before a critical situation arises

4. Optimize cooling systems performance by preventing system overloading
   Save energy costs by avoiding unnecessary cooling system operation

ASHRAE recommends implementing a comprehensive, integrated monitoring system. This can automate control of cooling systems and help maximize efficiency. It should generate detailed reports of past events and provide near real-time data on current conditions. With this information operators can make informed decisions.

The difference fire resistance products can make to mission critical projects and data centres

Each mission critical project, including data centre roof design, has slightly different specification objectives. Any nuances will be driven by legal obligations, insurance requirements, and specification needs across geographical zones and countries.

By Chris George MioR, regional technical manager at DensDeck for Europe, Middle East and Asia at Georgia-Pacfic.

DATA CENTRES are designed to house equipment safely. They tend to be cuboidal in shape and generally house a large amount of building services outside the building. This allows the maintenance of the building services to be undertaken without affecting the sensitive interior humidity and temperature levels and doesn't put the invaluable technology at unnecessary risk.

What is the cost of data centre downtime?

Downtime risk mitigation is one of the key design objectives in data centres, and a robust roof that offers maximum protection and requires minimum maintenance is critical. A study into the cost of downtime in data centres by Emerson Network Power (2010) in the US fran griffinincluded data from 41 independent, average sized facilities.

The study found an average financial loss of £4,131 per minute or £247,000 per hour (the original study values are $5,600 and $336,000, respectively). The study also quotes that the main reasons for downtime are uninterruptible power supply (UPS) failure (29%), human error (24%) and water, heat, and air conditioning failure (15%).

Leaks are responsible for 10% of all unplanned service outages. It is worth noting that since 2010 our use of, and dependence on, technology has expanded significantly and therefore, the cost of outages is likely to be higher.

Data centre roof as a platform for building services

As the study above suggests, air conditioning and UPSs are pivotal components of the complex data centre infrastructure. Data centre roofs are frequently used to house a considerable amount of HVAC (heating, ventilation and cooling) plant and building services. This poses multiple risks to the roof build-up during the construction and once the building is finished.

The weight and potential failure of the roof mounted plant and a large number of various types of service penetrations to the roof can play a role in the roof design and specification. Another factor is the intensity of roof traffic during the initial installation.

The frequent roof traffic may remain once the building is finished, as the installed plant requires continuous maintenance. Dropped tools or removing equipment for servicing can pose a puncture risk to the waterproofing membrane.

Is the speed of the data centre roof installation critical?

The cost and the speed of assembly are two of the main drivers for data centre roof assembly specification. Flat or low slope roofs with a build-up of metal decks with single-ply or reinforced bituminous membranes and metal top sheets are the most specified roof types. Adhered attachment is preferred over mechanical as it reduces the number of penetrations and, with it, the risks of failure. The recent proliferation of green roofs closely follows this.

The sooner the data centre is weatherproofed, the sooner it can operate and create revenue. Regardless of the roof type, installation methods, and roof build-up components, products that can help expedite the weatherproofing stage can be crucial to giving the data centre business edge in an incredibly competitive sector.

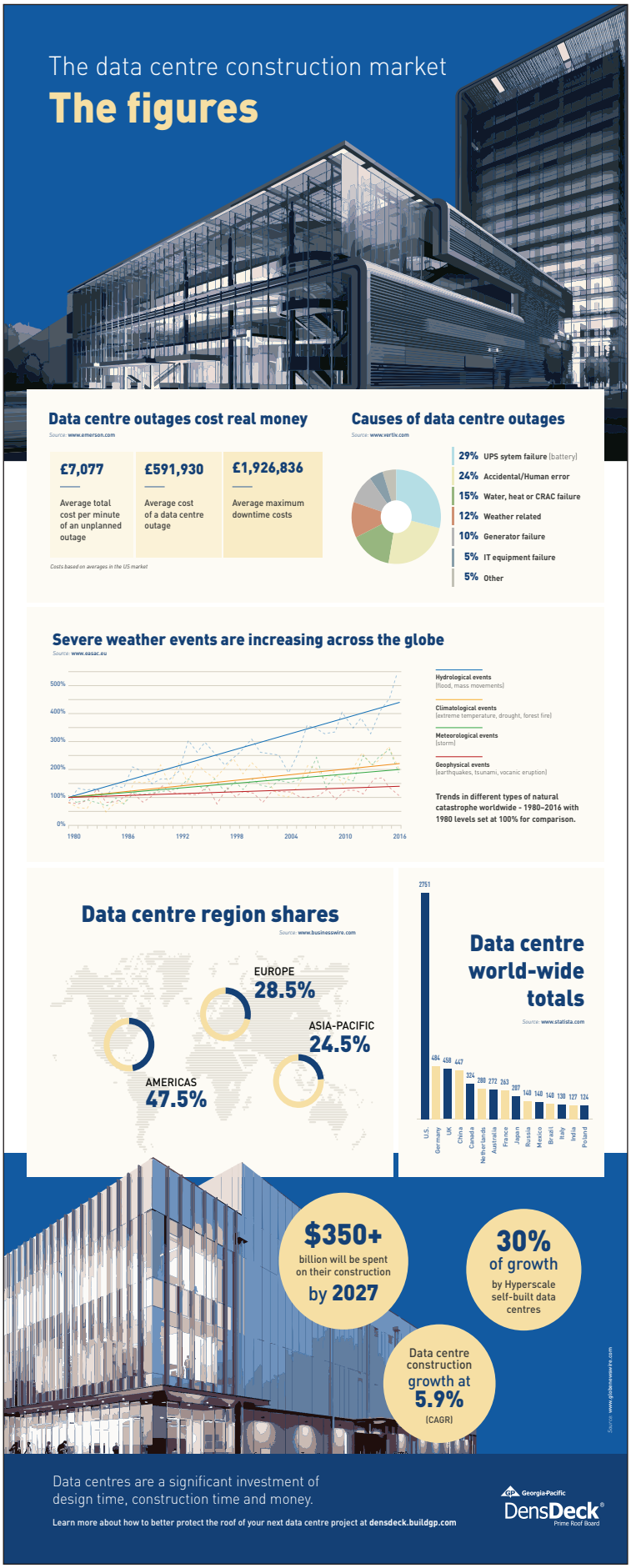
How can gypsum core cover boards help improve roof performance in challenging weather conditions?

Cover boards can increase the dimensional stability of a roof system. Some traditional boards, such as plywood and OSB (oriented strand board), have limited moisture and moisture vapour resistance without additional weatherproofing treatment. These boards require priming and sanding to ensure compatibility with adhered and semi-adhered roof membranes.

Cementitious cover boards can offer improved material compatibility with roofing membranes. However, they are heavy and can be difficult to cut. This can mean more deliveries, manoeuvrability challenges on site and additional strain on labour and resources on site. Most cement cover boards can absorb moisture. This might need to be considered because of the additional weight loading this could pose on the roof structure.

In contrast, DensDeck® Prime Roof Boards are enhanced with the patented EONIC® Technology. The cover board offers the benefit of max 5% total water absorption resistance by weight and 1-gram nominal surface water absorption performance on both sides of the board. Data centres are particularly vulnerable to moisture and vapour ingress that could cause damage to technology within the structure.

Specifiers lean toward flat roof assemblies that can help prevent moisture ingress and are robust enough to ensure a low risk of failure over long periods. It is worth noting that the performance of specific gypsum core boards may differ by



manufacturer.

Strength and durability of gypsum core cover boards

Tests were conducted in October 2016 by Trinity ERD in Columbia, South Carolina, on three types of gypsum cover boards. A standard ½ inch (12.7mm) gypsum cover board, a glass fibre mat gypsum cover board by Georgia-Pacific - the DensDeck® Prime Roof Board with EONIC® Technology - and the third was an alternative mat facer gypsum board. The results show that the DensDeck® Prime Roof Board with EONIC® Technology is 52% stronger than alternative gypsum fibre and 57% stronger than alternative coated glass mat gypsum board.

After a standard 2-hour soak test, DensDeck® Prime Roof Board was 87% stronger than alternative mat face gypsum and 267% stronger than a standard gypsum board. These performance markers show the long-term structural strength and robustness of the boards when incidentally exposed to moisture.

What are the commercial implications of cover board specification?

According to FMI Roof Cover Board Survey 2020, roofs with coverboards were nearly twice as likely to meet the owners' expectations for roof life (86% with vs 52% without). The same survey also showed that single ply roof systems specified with DensDeck® Roof Board extend the median life of the system by four years. The operation and maintenance costs are reduced by approximately £11 per square metre.

A roof board can help improve moisture and wind uplift performance and add strength and durability to the low slope of a flat roof system. The roof cover board can also enhance the acoustic and fire resistance of the data centre roof build up. The low weight of the boards and the relatively easy installation that doesn't require specialist tools are crucial. Construction efficiency is critical for the success of your data centre project.

The data centre construction market is expected to grow at 5.9%, with $350+ billion expected to be spent on their construction by 2027. Measures that protect these mission critical buildings and avoid outages and downtime are imperative.

REFERENCE

[1] Testing was done in accordance with FM approvals 4470, Appendix C: Small Scale Tests, Membrane Delamination Tests for Roofing Membranes and Substrates Using Tensile Loading

BASED around a hot industry topic for your company, this 60-minute recorded, moderated zoom roundtable would be a platform for debate and discussion.

MODERATED by an editor, this online event would include 3 speakers, with questions prepared and shared in advance.

THIS ONLINE EVENT would be publicised for 4 weeks pre and 4 weeks post through all our mediums and become a valuable educational asset for your company

Contact: jackie.cannon@angelbc.com

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Space and power: what's really limiting data centre capacity

Perceptions of limitations in data centres may not be what they first appear, as demand drives new examination

By Markus Gerber, Senior Business Development Manager, nVent Schroff

THE WORLD has seen increasing demand for digital services in recent decades. This demand has only grown since the pandemic when they were not just a boon but a lifeline for many during times of lockdown and isolation.

As we moved beyond the pandemic, work practices were also changed forever, as more and more sought to work remotely, whether from home or different geographies. This combined with developing business models and digital transformation, has seen demand grow even more, as well as new requirements that have seen the likes of edge computing proliferate.

All of this has driven growth in data centres but has also increased pressure to meet demand. These pressures are seeing space, density, and power come under the spotlight as limitations in some cases.

Scale of growth

To get an idea of the scale of growth in digital services in recent decades, data volume is a key indicator. According to Statista, since 2010, the volume of data created, captured, and consumed has grown from 2 zetabytes to 97 zetabytes in 2022, with the figure for 2025 expected to be 181 zetabytes. Despite this near exponential growth, according to the International Energy Agency, energy demand since 2010 has only gone from 194 terawatt hours (TWh) to just over 200 TWh in 2022.

These two contrasting figures show the extraordinary strides that have been made in energy efficiency in computing since then, especially when it comes to pure processing power. With Moore's Law in effect for the period, the benefits are clear. Now though, there are concerns from no less a figure than the CEO of Nvidia, Jensen Huang, that the Moore's Law effect may be coming to an end. While this is disputed, there can be little doubt that processors are likely to become evermore powerful, while producing more heat in the process. To meet that demand towards 2025, and beyond, it is likely that data centre limitations will be encountered, with space being chief among them.

Space and power

Space was often seen as one of the chief limitations for data centres. The space was described in terms of the ability to power equipment in a given unit of measure, such as watts per square foot or square meter. This was a useful rule of thumb for specifications and facility design. Architects would plan cooling and power according to such measures. Under this approach, the data centre has progressively been becoming hotter, using more power, to provide for increasing levels of processing. In an air-cooled data centre this required more and more air pumped through, meaning for every watt drawn, less and less was used for compute.

As a result, data centres in the nineties and early 2000s became less and less efficient in terms of how effective that power was in being used to provide data processing. As the chip power kept going up through a number of different technological developments, and with evermore demand for performance, data centre operators found themselves demanding more and more cooling volume and flow, until they hit barriers in cost, complexity and management. Many experienced a threshold where they simply could not just pump a room full of air to be able to cool those chips, making it increasingly unfeasible for much of what is already deployed.

Equipment management

Management too became an issue. Often as a data centre evolved, equipment was upgraded or altered, moved around or replaced due to failure. Gaps, spaces, and expansions often meant that even carefully implemented methodologies such as hot aisle/cold aisle systems, were left working poorly, as guidelines for airflow management were often ignored in the need for expediency and demand.

This could add to the impression of space limitations when a new project or service was contemplated, when in fact a facility, if properly managed, could take more before reaching the inevitable limit of pumped air cooling.

What is clear from this is that while good management and design are key to ensuring that physical space is not a limitation in meeting demand for digital services from data centres, air cooling is and will be increasingly so in the future. As other architectures also emerge, such as edge computing, new cooling solutions will be required if service demand, physical space, energy efficiency and sustainability needs are to be met.

To meet the emerging demands for digital services in the foreseeable future, data centre operators will need to consider hybrids of air, liquid and direct-to-chip cooling, taking advantage of the specific characteristics of each to appropriately and proportionately provide the kind of cooling that enables density to be deployed reliably and economically.

Inefficient medium

There is a clear reality when it comes to cooling: the closer heat can be captured from where it is produced, the more efficient the process.
Allied to this is the fact that air is a very inefficient medium. A water-based fluid, or another dielectric liquid, is a much more efficient medium to capture and transmit heat.

Even with the likes of hot and cold aisle layouts, with rear door and in-row coolers, blanking plates and efficient cabling, air is still inefficient. While these measures are likely to remain part of the mix for many operators for years to come, other methods must be considered. Liquid cooling solutions can offer greater capability to accommodate equipment density than air cooling, Heat captured through liquid cooling can be more efficiently removed from the immediate environs of the equipment, and brought to potential reuse opportunities, without a state change.

Developments available now in liquid and direct to chip cooling can not only meet today's density demands, relieving physical space limitations, they can also offer a critical upgrade path to allow data centre operators to move towards more efficient methods. This will be crucial as budgets also come under pressure amid the ongoing inflation trends and continuing global uncertainty.

Strengths and purpose

With these new cooling techniques and systems, it is not a one size fits all approach. Each technique and system has its particular strengths and characteristics that must be taken into account ensure the right performance is delivered per requirement. In-rack, in-row, or direct precision liquid cooling all offer differing applications and benefits to achieve and overall density and performance goal.

All the while, ensuring efficiency that contributes to sustainability targets. Data centre operators must be supported in their design and operational objectives by a trusted technology partner that not only has in depth knowledge but also a broad portfolio of solutions to meet each need. Understanding where better managed air cooling can remain, liquid cooling can be adopted and direct to chip cooling leveraged, is key to getting current needs under control, while building a path to future capability.

Improvements and a path forward

By properly examining real or perceived data centre space limitations, data centre operators can determine how best to tackle their density needs. More efficient, precise and controllable cooling solutions will be a key part of that effort. With efficiency as a central strand of sustainability efforts, hybrid systems of air, liquid and direct cooling techniques can build a path to greater effectiveness in data centre cooling that relieves space pressures, while meeting demand and providing a strong base for future growth.

Ten years of growth – ten years of change

What data centre design engineering firm i3 Solutions Group learned in its first ten years of practice and where the industry must go in the next decade.

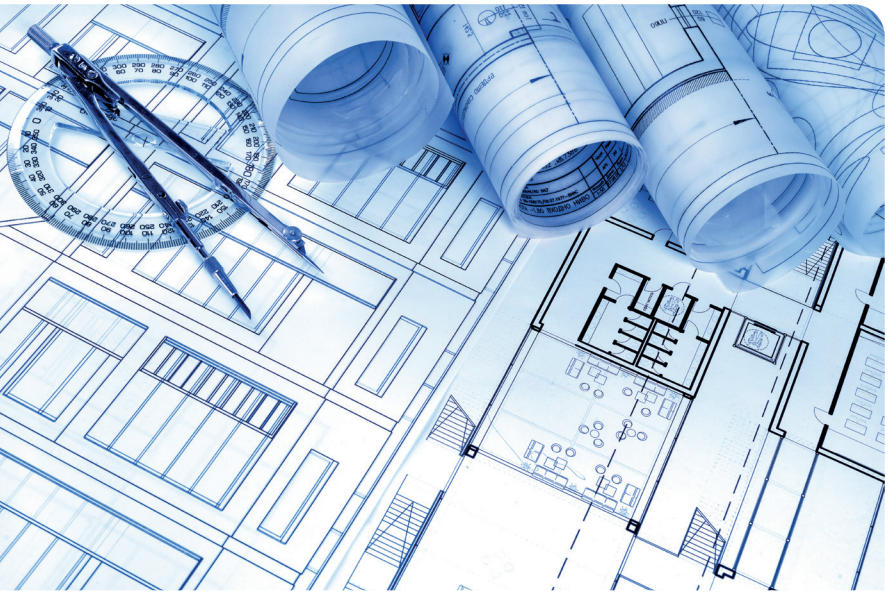
By Ed Ansett, Chairman and Founder, i3 Solutions Group

OVER THE LAST DECADE the data centre industry has experienced a shift in scale that even the most optimistic of players had not foreseen, as well as many other more predictable changes.

Ten years ago when i3 Solutions Group was founded, a data centre design of 15MW - 20MW would be bracketed in the medium-to-large category.

Today, thanks to the hyperscalers and large commercial data centre developers, projects ten times that size are not unusual.

More predictably, data centre developments are moving beyond traditional large metropolitan established markets into every corner of the world. The higher density loads that were forecast have grown from averages of 3 - 5kW per rack ten years ago to 15 - 20kW today.



At the same time the requirement for high levels of resilience has softened. Power fault tolerance at 2N levels have moved to N+1 or N+2 designs, partly due to cost and partly to advances in IT, such as software failover across availability zones.

This growth, driven by an exponential demand for data throughout the globe and touching every commercial, social and government activity, is now challenging the data centre industry to provide long term sustainable infrastructure design, developments and operation of digital infrastructure at vast scale.

While governments tout digitalisation as one answer to economic growth, a raft of regulations to ensure sustainability measures such as carbon reporting and circularity are now being imposed upon the industry.

The game has changed.

From then to now

Building on more than two decades of mission critical data centre engineering experience, Ed Ansett founded i3 Solutions Group in 2013. Based on a desire to do great work for its clients, the company had a clear mission to challenge the status quo and provide new approaches to design thinking for data centre power, cooling and control systems.

“Like all start-ups, i3 had to prove itself. Beginning with securing and successfully delivering relatively small mission critical projects, the company proved its credentials and this led to the number and size of projects delivered growing consistently over our first ten years. From two engineers we are now a global team with offices in the Asia Pacific and the UK, and representation through our partnerships in the US, EMEA and across the globe.

"Today we are delivering major projects at scale with the world's largest and most recognisable data centre brands and global critical infrastructure developers. We continue to work with governments and commercial operators and the leading global infrastructure providers." says Ed Ansett, i3 Chairman and Founder.

In its first ten years of business i3 Solutions Group has delivered multiple award-winning data centre projects for clients, developed entirely new concepts in data centre power provision, and become respected thought leaders helping shape industry approaches to practical sustainability and growing an international client base.

i3's core ability is to build on trusted methods while remaining continually open to new data centre thinking. This has set i3 apart from traditional cross sector consulting engineering outfits. As data centre specialists, i3 is able to table engineering options for its clients to maximise available, space, power and cooling capacity for the most efficient resource use. "i3 Solutions has been at the forefront of data centre innovation since its inception. Their design focus on reliability, energy efficiency and sustainability has set the mark for mission critical facilities," says Peter Gross PE, Managing Partner - PMG Associates Consulting and Advisory.

The next ten years

i3 experts continually scan the horizon for what challenges and opportunities are coming next. These challenges naturally include the application of sustainable technologies to the data centre industry. This is a topic that begins with what happens outside the data centre to what happens at IT level. The data centre sector needs to understand it must behave in a manner that reflects its growth curve over the last ten years and its growth trajectory over the next decade.

This requires the industry to recognise its growing public profile by learning to manage its reputation in a mature manner. It means changing attitudes by embracing practical approaches to design and operation that verifiably tackle sustainability issues with technical, engineered solutions.

For example, there must be an end to any form of greenwashing. The industry must accept and understand the difference between PPA (Power Purchase Agreements) and carbon offsetting versus design and operation that empirically cuts its own GHG emissions.

It must grasp the sustainability nettle in its own and broader economic and national interests by accepting that at scale, data centres will be operating as microgrids. That is, they will become power producers as well as energy intensive users. The industry must embrace demand response (DR) opportunities, designing-in the capability to feed power back to the main grid.

"As countries seek to increase the sustainability of their grids, this is the single most important power issue that we face if we are to maintain the reliable flow of electricity to the IT load. This is not just an issue for the industry, but a global issue as governments force electrical grids to decarbonise," says Ansett.

Within the walls of the data centre (behind the meter), the industry has lowered PUE and WUE and those performing best have proved what can be achieved. But in terms of pure power provision the sector may have hit the limits with these efficiency gains.

Inside the data centre, new sustainability gains must include design and engineering working more closely with IT.

As specialists in data centre MEP engineering services, i3 continuously works on gaining a deep understanding of IT operations and how design can help support workloads through more efficient, reliable and sustainable power provision. One of the company's first detailed technical papers (as part of its Green House Gas (GHG) abatement initiative) was titled: "An Approach to Calculating and Defining Overall Data Centre Energy Efficiency including Compute, Network, Storage and Facilities."

The demand growth for data is accelerating. "No-one, and certainly not a data centre engineer, can stop the data tsunami. But as engineers we want to push the industry to maximise the utilisation of all secured and available power. To do that requires a forward- looking understanding of how the IT load is changing. Not all IT loads are equal, so we cannot continue with low utilisation and monolithic power topologies" says Ansett.

Throughout its first ten years of operation i3 has built its business around a team of experts with an unparalleled commitment to delivering excellence for clients. At the same time, the company has cultivated an ethos of curiosity, critical thinking and enquiry dedicated into creating ever more efficient and sustainable critical digital infrastructure.
It will continue these efforts over the next ten years and beyond.

Collaboration

By DCA CEO Steve Hone

THIS MONTH'S DCA News is a collaboration with the fantastic team at Interact DC Limited.

Just in case you didn't know, Interact are an award-winning organisation focusing on reducing the environmental impacts of Data Centres. By the way, congratulations on being the winners of the **Data Centre Sustainability Innovation of the Year Award** at the DCS Awards last month!

The specialist guest feature comprises of a number of important pieces.

It kicks off with an overview of Interact and their work related to reducing the impacts of DCs, challenges faced and the solutions that should be considered. This is followed by an article by Rich Kenny the MD Interact - **'How do we bridge the gap between environmental legislation and real life?'** Rich highlights the reporting of environmental impacts from the DC sector and the importance of keeping up to date as legislation and regulations are introduced and developed.

We then have a comment from Interact's Senior Developer Nour Rteil related to the measurement of energy usage and efficiency of servers.

Finally, Astrid provides us with an insight into how environmental knowledge and insight can be communicated and shared in the workforce.

I'd like to thank Rich, Astrid and Nour along with Sally Annett for taking the time to compile this informative feature, I hope it will be of interest.

interact.

INTERACT is a world-leading environmental consultancy working to reduce the environmental impact of the world's surging demand for data. We utilise circular economy machine-learning software, industry knowledge and leading research to recommend projects and actions designed to transform data centre efficiency and optimise server estate performance, saving companies in terms of energy, carbon and cost.

We work with globally recognised companies across the financial, technology, healthcare and public sectors.

The challenge

Data centres and server technology are responsible for a large percentage of our planet's energy consumption and its carbon footprint. Globally, data transmission networks consumed 260-340 TWh in 2021, or 1.1-1.4% of global electricity use.

The majority of data centres' energy consumption is from IT, which is responsible for 65% of the energy draw of a data centre on average. IT (specifically servers) are on which Interact have chosen to focus, as this is where we can make the biggest difference on environmental impact.

The Solution

Interact can produce savings of 65-75% of the average data centre's electrical usage, which translates into more than 3.5 million kilos of scope 2 CO_2e per data centre over the course of five years (based on Interact's work with more than 300 data centres).

We offer a transparent grading scale of energy efficiency for any server configuration of any make, model or generation. We combine this server energy efficiency grading with consultancy solutions and sustainability training to increase server estate's energy efficiency, drive digital transformation and help set companies' carbon agendas.

Interact also offers Institute of Environmental Management and Assessment (IEMA) certified sustainability and carbon training for managers and teams, lead by our Head of Sustainability and Chartered Environmentalist Astrid Wynne.

Decarbonising your business

With sustainability legislation looming across the UK and EU, a decarbonisation programme and net zero strategy is not a 'nice to have' any longer. Even the hyperscalers are preparing for this – Amazon Web Services have recently committed to supplying scope 3 carbon data to customers by 'early 2024'.

Interact facilitates two of the key stages in your decarbonisation programme. Firstly, our grading mechanism ensures that you can accurately measure server energy efficiency, one of the first steps in realising an effective Net Zero strategy. Secondly, our environmental consultancy delivers science-based digital transformation projects to increase energy efficiency in your data centre. In tandem with transitioning to renewable energy sources and (as a last resort) using carbon offsets, this forms the basis for a robust 'Net Zero' strategy.

How do we bridge the gap between environmental legislation and real life?

By Rich Kenny, Managing Director of Interact

PRESSURE IS MOUNTING on the data centre sector to report on its environmental impacts as new legislation starts to bite. There is no doubt that this legislation will increase in scale and ambition over the next few years.

One of the most important pieces of ESG legislation in the EU, the Corporate Sustainability Reporting Directive (CSRD), was enacted in January, requiring large companies and public-interest entities operating in the EU to disclose information on their ESG performance annually between next year and 2029. Its scope reaches as far as non-EU companies with significant operations in Europe.

Companies affected will be required to report on their Scope 1, 2 and 3 emissions as well as their materials usage (which includes emissions from their supply chains). These companies will be required to make real reductions by 2030 under the 'Fit for 55 Package' (legislation being brought in to ensure the EU's target of reducing net greenhouse gas emissions by at least 55% by 2030). This requirement for real reductions as well as for reports to be audited by a third party means that your data must be measurable, accurate and evidenced, which is where Interact's rigorous energy efficiency grading scale comes in.

Benchmarking against your peers will also be a key focus for many businesses, as they vie for competitive advantage. As Oliver Pike points out in his excellent summary on CRSD for Reuters, 'Understanding how peer companies are engaging with Scope 3 emissions and how they approach sustainability reporting are a necessary action to stay up to date on where your organization stands against competitors.'

There is also legislation around reducing the environmental impact of data centres, such as The European Union's Energy Efficiency Directive. This directive has set a target to reduce energy consumption in data centres by 20%, but it has faced strong criticism for not being ambitious enough and looks unlikely to be met.

What does this mean for reporting?

Mandatory ESG (environmental, social and governance) reporting has gone mainstream and carbon accounting is increasingly common in company accounts.

Confusingly, there is a bewildering raft of different ESG frameworks providing standards and guidelines for companies looking to evaluate a supply chain's environmental performance, including the Global Reporting Initiative (GRI) and the Carbon Disclosure Project (CDP). Different companies will have to report in different ways, depending on their size and from where they are seeking investment. GRI and CDP relate to large companies.

Mandatory reporting for the financial sector has knock-on effects for the supply chain, including the data centre sector. This will help to ensure that companies are held accountable for their ESG performance and that investors have the information they need to make informed decisions. In addition to disclosing information on their climate change impacts, any data centre seeking investment will have to report on climate change related risks to the business.

Although, frameworks such as GRI and CDSB apply to data centres looking for green investment, the Task Force on Climate-related Financial Disclosures (TCFD) applies to any data centre seeking investment, regardless of type of investment and even if only from a bank. Data centres applying for funding from the bank are required to evidence their impact on the environment and the environmental risks on them. TCFD requirements include the reporting of Scope 1 and Scope 2 greenhouse gas emissions and TCFD also encourages the disclosure of Scope 3 emissions where these are 'material'.

Why you should care about energy

Firstly, as we have seen, you will be required to report on energy use, if not now then soon. There are a number of ways to measure energy efficiency in data centres. The Interact team have written extensively on how PUE is an ineffective metric when used alone, and why hardware energy efficiency is arguably more important (see 'Assessing IT Efficiency' by Nour Rteil). Our energy

efficiency solution Interact was created to help data centres cover off the energy and materials efficiency side of their ESG reports. It allows you to measure energy and carbon usage at machine level and demonstrate improvements for the energy side of your sustainability reporting.

Secondly, macro issues such as energy pricing are becoming increasingly prescient. In recent years, we have witnessed extremely volatile energy pricing, in part due to the Ukraine conflict. Another issue outside the sector's control is the availability of green power. Although strides are being made in the supply of renewables, it will take time to develop these at scale. Whether there is enough renewable energy available is outside the sector's control. What you can control is where you build your data centre. Location and grid intensity play a vital role in the carbon impact of your compute and energy.

Lastly, energy security has become a major issue and one of the main reasons for recent higher energy prices, particularly in the UK where we are reliant on imports for supply. For that reason, in March this year, the UK and French governments signed a deal to move towards greater energy security and towards renewables and nuclear power rather (reducing their reliance on fossil fuels).

There are very compelling arguments around why energy should be measured and reduced. Ultimately, let us not take our eyes off the ball. By reducing the environmental impact of data centres, we can help to protect the environment and help to create a more sustainable and equitable global economy.

Assessing IT Efficiency

By Nour Rteil, Lead Developer at Interact

ALTHOUGH POWER USAGE EFFECTIVENESS (PUE) is the most widely used metric seen in sustainability reports and is often used as a proxy to efficiency, it doesn't reflect the real efficiency of data centers. This is because PUE, when measured correctly, assesses the IT overhead efficiency (cooling, power, etc.) and does not give us any indication on IT efficiency, water usage, heat recovery, carbon impact, and other sustainability aspects. Broadening the scope of efficiency assessment beyond PUE to include these areas has been proposed by the ISO/IEC 30134 standard series, which, in addition to PUE, is composed of 7 other KPIs.

Targeting inefficiencies in IT reduces the overall data centre's energy consumption tremendously, primarily because servers are the main energy consumers in data centres and secondly because the associated overhead and cooling load will also be reduced when the IT load is optimised. For this reason, we limit the scope of this article to analysing some of the existing IT-related metrics and introducing an alternative approach to estimating servers' efficiency. An area that is gaining increased attention from legislators, including the European Commission through initiatives such as the Eco-design Directive.

ISO ITEEsv and ITEEsu metrics

One way to improve IT efficiency is by increasing the utilization rates of servers. The ISO IT Equipment Utilization for Servers (ITEUsv) metric helps data centers measure, track and continuously improve their utilization rates. Higher utilization rates mean better efficiency, and this can be attained by powering off idle servers and consolidating physical servers by increasing the number of virtualised machines running on them.

Another IT-related efficiency metric is the ISO IT Equipment Energy Efficiency for Servers (ITEEsv). Measuring the efficiency of IT equipment proves difficult and poses a few complications. To begin with, IT performance or the actual work done by servers is not straightforward to define. Different data centers run different types of workloads.

These could range, for example, from web hosting to big data analysis. To simplify matters, the ITEEsv metric requires all servers to be tested against a standardised test such as the Server Energy Rating Tool (SERT), which measures the server's energy efficiency based on a set of predefined workloads. Even though these tests have some limitations and aren't representative of all types of workloads, nonetheless they provide a good benchmark for comparison.

The downside of the ITEEsv is that it requires every server model to be tested against SERT following a strict set of rules which takes several hours to setup, and a test that lasts around 4 hours. This procedure is resource-intensive and not feasible for servers in a production environment.

Energy STAR label for servers

Some server models are already tested using SERT by vendors for the Energy STAR label. The Energy STAR label is the US government symbol for server's energy efficiency and has been built into standards and codes of practice worldwide. An ENERGY STAR label is given to servers that get a SERT score above a predefined value. The issue with this labelling system is that it creates a huge range of efficiency between the Energy STAR servers, meaning that a standard rack server with a SERT score of 12 and a high-performance server with a score of 55, both

get the Energy STAR labels with no distinction between the two in their certifications in terms of efficiency.

Another issue is whilst the Energy STAR label was created to help government procurement and corporations make informed server buying decisions and be able to easily assess and compare servers, not every server model is listed on the ENERGY STAR site for comparison. This is expected given the high number of existing models and their possible configurations. SERT scores change drastically with every hardware and/or software modification. For example, the same PowerEdge R7525 server can have a score of 54 and 76 depending purely on its memory configuration. We talk more about the impact of memory configuration and BIOS settings on SERT efficiency scores here. This has implications for how effective ENERGY STAR certification is when assessing server estate efficiency for legislative purposes.

InteractDC

As a solution to the above, by pairing the energy model described in this paper with the right machine-learning algorithms, we were able to come up with a unique tool (Interact) that estimates the energy consumption and efficiency of servers based on their configuration, instantly, and without the need of invasive testing.

The machine learning model behind InteractDC is trained using a dataset composed of hundreds of SPECpower2008 server results. The dataset contains information about the server model, its configuration, and the results generated from the test. The model could then predict, with high accuracy, the power consumption, performance (measured in ssj_ops), and energy efficiency (measured in ssj_ops/watt) for any server configuration based on the following input parameters: number of CPUs, CPU cores, CPU threads, CPU frequency, RAM capacity, server's release year, server's form factor and server's

utilization rate. The models are continuously being retrained with new server results tested in-house by our research team to increase their accuracy.

From these estimations, we developed a grading system (A+ to F) that classifies servers based on their energy efficiency scores, A+ being the most efficient. This solution creates a clear and fair comparison between servers. It helps data centres identify the least efficient servers in their sites and be able to either consolidate them with other servers or replace them with more efficient servers. This grading system also helps procurement by allowing them to make sustainable choices in their server selection process.

Conclusion

Whether managing a colocation or an enterprise facility, data centre administrators will soon have to provide figures on how efficient the hardware they are running is. Existing metrics and labels pose a few challenges and setbacks for data center administrators. Alternatively, by using data and science, servers' energy efficiency can be estimated, on a per configuration basis, without any operational disruptions.

The Ripple Effect

By Astrid Wynne, Head of Sustainability

TRANSLATING complex solutions into a series of practical steps is something we all aim for. Passing on those practical steps to our colleagues, partners and stakeholders is one of the most rewarding aspects of our working relationships. At Interact, we are upskilling all of our staff with a Foundation Certificate in Environmental Management.

This professional qualification certified by IEMA is the equivalent to graduate training in terms of theory and could be used to develop into a Registered Environmentalist going forward.

Why do we do this? Because we believe that it is useful to understand all the aspects of sustainability at every level of the business from development of new products to communications with the market and delivery of our consultancy services.

We also believe in sharing knowledge and expertise, which is why we offer training to our clients as part of the package of working with us. Having a Chartered Environmentalist on the team

has to have some benefits, and training is a big one for the business. It allows our clients to frame the information we give them into the wider picture. It also gives them the tools to maximise the impact of this. Many of our clients have used the training as a launchpad for wider sustainability initiatives and culture change at their company.

The big driver in the market

We are seeing a host of headlines on sustainability reporting for companies in the financial press. Not only do organisations have to report their entire carbon footprint – and prove they are doing something about it – there is further legislation on biodiversity waiting in the wings. This is all new content for businesses that have been focusing on other metrics until now. The fact that you need the whole organisation to act makes it even more challenging.

Everyone understands risk and opportunity, cost and benefits and fiscal control in every department. It is also common practice for departments to control their own budgets, and work with accounts to make sure the books are as they should be by the end of the financial year. People are much less likely to apply these same concepts to sustainability. We are not used to identifying risks their operations pose to the environment and those of the changing environment to the business, but we are going to need to be quickly. That's where training comes in.

What to do about carbon

TCFD, Net Zero, ESOS, SECR, CPD... there are numerous terms bandied around on carbon footprints. All of them are based on a simple count of greenhouse gasses on a company balance sheet. Companies need to understand how to count those gasses and report on them in a standardised way that would pass audit. To do that, they need multiple different departments to know which data they have to collect, where from and how this fits into a bigger picture. They also need to know how to talk about this to investors, government and the wider market. All of these functions need to be trained in how to do this properly because there are legal, financial and reputational implications if they do not.

What to do about the rest of it

The Taskforce on Nature Related Financial Disclosures (TNFD) is a mouthful but will likely inform mainstream business reporting on biodiversity and nature risk. "More than half of the world's economic output – US$44tn of economic value generation – is moderately or highly dependent on nature," according to TNFD. "Better information will allow financial institutions and companies to incorporate nature-related risks and opportunities into their strategic planning, risk management and asset allocation decisions."

Businesses should start understanding what this looks like now. They can begin by understanding the interconnected set of risks that affect the environment. Climate is one of nine in total, six of which are in the red zone. Getting an overview on this, how each risk connects with the others, and how to create a strategy with all round benefit is very powerful.

The tricky bit

Sustainability is moving from an arena of story-telling into something that is a whole lot more measured and exacting. This is clear from the change in the Sustainability reports from large companies, which cover a wide range of environmental risks and contain numerous tables that outline how this are addressed. Alongside this, a whole raft of legislation – EU Taxonomy, UK Taxonomy, CRSD – are demanding that companies evidence the claims they make. Whilst this can be daunting, it is also exciting. With the right training and 360 view of impacts, companies can make a real splash in the difference they want to make.

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