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DEVELOPING DIGITAL INFRASTRUCTURE IN A HYBRID WORLD

ISSUE III 2022

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Editor's View

By Phil Alsop Editor

Rising to the energy challenge?

Carrying out some research on energy prices recently, I discovered what many of you might already know: the average cost of power per megawatt hour across Europe has risen from well under 100 euros in January 2020 to today's near 400 euro price, with 2023 power already being traded at 1000 + euro levels in Germany.

One imagines that many shrewd data centre owner/operators have been purchasing power long in advance of the current cost of living/energy price crisis, precipitated by the war in Ukraine. So, for a little longer, it could well be that data centre customers will be shielded from the huge energy cost rises facing consumers and virtually all organisations, public and private alike at the present time.

However, with no sign of an end to the conflict in eastern Europe, one imagines that these same data centre owner/operators, and their customers, are becoming somewhat nervous. If the owners/operators are forced to pay much higher energy costs, and to pass these on to customers, then we could be heading for a data centre recession?

Unless, of course, the industry reacts with swift, intelligent agility in a number of ways.
Firstly, the cost of power does vary greatly across Europe, with, if memory serves, Sweden having significantly lower prices even now, when compared to almost everywhere else. Industry watchers will already have noted the burgeoning number of Scandinavian colocation providers who are promoting themselves as a truly pan-European option for many end users. One imagines the current energy crisis might just send plenty more customers their way.

More generally, the move to Net Zero, proceeding at a notable, if still slightly sedate pace, will almost certainly pick up significant momentum, as the owners/operators look for alternative, renewable and affordable energy sources.

Linked to this, one cannot imagine anything other than major evaluation programmes being carried out

at data centres across the globe, as their owners and operators seek to ensure truly cost-optimised operation. No easy task, but there are plenty of smart technical solutions and services which can deliver improved data centre performance, hence a better ROI than current data centre designs and day to day operations.

I'll not bore you with my favourite quote about Italy, the Borgias, the Renaissance, Switzerland and cuckoo clocks, rather point you to the well-worn maxim: 'When the going gets tough, the tough get going'.
It will be fascinating to observe the speed and level of data centre innovation which is undertaken over the next few months as a direct response to the multiple challenges facing the industry right now.

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Downtime costs and consequences are worsening

New research details latest digital infrastructure failure rates, increasing outage costs and impacts, top downtime causes, and more.

THE DIGITAL INFRASTRUCTURE sector is struggling to achieve a measurable reduction in outage rates and severity, and the financial consequences and overall disruption from outages are steadily increasing, according to Uptime Institute, which today released the findings of its 2022 annual Outage Analysis report.

"Digital infrastructure operators are still struggling to meet the high standards that customers expect and service level agreements demand – despite improving technologies and the industry's strong investment in resiliency and downtime prevention," said Andy Lawrence, founding member and executive director, Uptime Institute Intelligence.

"The lack of improvement in overall outage rates is partly the result of the immensity of recent investment in digital infrastructure, and all the associated complexity that operators face as they transition to hybrid, distributed architectures," said Lawrence. "In time, both the technology and operational practices will improve, but at present, outages remain a top concern for customers, investors, and regulators. Operators will be best able to meet the challenge with rigorous staff training and operational procedures to mitigate the human error behind many of these failures."

Uptime's annual outage analysis is unique in the industry, and draws on multiple surveys, information supplied by Uptime Institute members and partners, and its database of publicly reported outages.

Key Findings Include:

- High outage rates haven't changed significantly. One in five organizations report experiencing a "serious" or "severe" outage (involving significant financial losses, reputational damage, compliance breaches and in some severe cases, loss of life) in the past three years, marking a slight upward trend in the prevalence of major outages. According to Uptime's 2022 Data Center Resiliency Survey, 80% of data center managers and operators have experienced some type of outage in the past three years – a marginal increase over the norm, which has fluctuated between 70% and 80%.
- The proportion of outages costing over $100,000 has soared in recent years. Over 60% of failures result in at least $100,000 in total losses, up substantially from 39% in 2019. The share of outages that cost upwards of $1 million increased from 11% to 15% over that same period.
- Power-related problems continue to dog data center operators. Power-related outages account for 43% of outages that are classified as significant (causing downtime and financial loss). The single biggest cause of power incidents is uninterruptible power supply (UPS) failures.
- Networking issues are causing a large portion of IT outages. According to Uptime's 2022 Data Center Resiliency Survey, networking-related problems have been the single biggest cause of all IT service downtime incidents – regardless of severity – over the past three years. Outages attributed to software, network and systems issues are on the rise due to complexities from the increasing use of cloud technologies, software-defined architectures and hybrid, distributed architectures.
- The overwhelming majority of human error-related outages involve ignored or inadequate procedures. Nearly 40% of organizations have suffered a major outage caused by human error over the past three years. Of these incidents, 85% stem from staff failing to follow procedures or from flaws in the processes and procedures themselves.
- External IT providers cause most major public outages. The more workloads that are outsourced to external providers, the more these operators account for high-profile, public outages. Third-party, commercial IT operators (including cloud, hosting, colocation, telecommunication providers, etc.) account for 63% of all publicly reported outages that Uptime has tracked since 2016. In 2021, commercial operators caused 70% of all outages.
- Prolonged downtime is becoming more common in publicly reported outages. The gap between the beginning of a major public outage and full recovery has stretched significantly over the last five years. Nearly 30% of these outages in 2021 lasted more than 24 hours, a disturbing increase from just 8% in 2017.
- Public outage trends suggest there will be at least 20 serious, high-profile IT outages worldwide each year. Of the 108 publicly reported outages in 2021, 27 were serious or severe. This ratio has been fairly consistent since the Uptime Intelligence team began cataloging major outages in 2016, indicating that oughly one-fourth of publicly recorded outages each year are likely to be serious or severe.

Largest spend on cloud services expected over next 24 months

Two-thirds of firms find cloud migration easier than expected.

BUSINESSES are accelerating their move to the cloud, with half of enterprises (50%) suggesting that their biggest anticipated spend will span the next 24 months, according to the latest research* from Colt. The research, which interviewed 500 senior IT and C-suite decision-makers across key markets in Europe and the Asia Pacific, is included in Colt's third annual international study of cloud adoption.

Other key findings were that sustainability remains a core component of cloud adoption for decision-makers. In addition, early adopters have found it easier to migrate to the cloud, with 67% of respondents at firms that have already invested in cloud applications finding migration easier than anticipated. Much of this resulted from strong partner support on their cloud journeys.

The report also highlights how IT leaders split their time evenly between the main elements of cloud strategy (planning, testing, migration, and optimisation); however, they felt that more of a focus on optimisation could see firms reap greater rewards. Those respondents who had overseen optimised cloud connectivity saw a range of benefits, including improved performance (41%), more network visibility (39%) and better security (45%), because they could bring in more products or solutions, for example, SASE (Secure Access Server Edge). SASE is also one of the top features decision-makers are considering or will include in future projects (66%), along with hybrid and multi-cloud orchestration (66%).

According to Colt's research, enterprises are also achieving KPIs quicker than expected, with IT leaders believing that they've met almost half (49%) of their goals already, with eleven percent having completed their cloud project KPIs.

In terms of lessons learned, flexible connectivity topped the list of features that IT leaders wished they'd included in previous migration projects (24%). This is because successful projects are often followed by more requests that fixed connectivity might not be able to handle. Planning for flexible connectivity that can scale up with demand during projects and scale down when assessing, testing or optimising mitigates this problem.

Jaya Deshmukh, EVP Strategy and Transformation at Colt, said: "Our annual cloud report helps us to better understand the challenges IT decision-makers face around what companies are moving to the cloud and why, and the part that connectivity plays in delivering benefits of the cloud, so we can provide exactly what customers want and need.

"This year's report highlights that businesses plan to invest heavily in the cloud over the next two years and that some perceived challenges around cloud migration were largely unfounded. This was put down to the key role partners play in delivering successful cloud deployments – both in terms of set up and optimisation."

Planning for flexible connectivity that can scale up with demand during projects and scale down when assessing, testing or optimising mitigates this problem

The looming threat of regulation

Change or be changed is the warning from the latest BCS data centre industry report.

ACCORDING TO the findings of the latest BCS Summer Report 2022, there is a firm commitment amongst respondents to move towards a renewable-sourced future. However, there are also strong concerns that regulation could be placed on the industry to push initiatives for the greater use of renewable sources of power at a more rapid rate, with around 90% of the 3,000 of those surveyed believing that this could be introduced to ensure greater compliance.

James Hart, CEO at BCS, comments: "With ambitious targets to be achieved by 2025 and 2030 under the green deal, it begs the question that if our sector doesn't get ahead of these targets, will the self-regulatory initiative become legislative and regulated? We believe our sector is at a crossroads with one route being proactive, investing in new technologies, self-generation and looking at innovative storage solutions to reach climate neutral targets. The other route is having legislation and regulation imposed on us and having to react to the imposition of energy, water and emission targets that we have no influence over."

However, confidence in the sector continues with a 5% increase in

Disruptions to global supply chains continue to plague the data centre industry and 87% of our respondents stated that they had experienced such an eventuality in the past year

respondents seeing a rising demand against a falling supply (up to 90%) which was further reinforced by a near 100% response that demand will either rise or remain the same over the next 12 months. This is despite the concerns voiced by our respondents around energy supply, skills shortages and sharply increasing costs across the board.

Disruptions to global supply chains continue to plague the data centre industry and 87% of our respondents stated that they had experienced such an eventuality in the past year, a marginal decline on the 91% recorded in our preceding survey. There are also some indications of an easing in the challenge of sourcing of construction raw materials. In 2021 just over half of respondents experienced sourcing difficulties for concrete/cement, steel, cladding materials, and dry lining materials – this has fallen to around 32% in 2022 for the concrete /cement and two-fifths for the other materials.

"The long-term effects of the global pandemic, coupled with new geopolitical issues mean that the world now faces some robust challenges. Whilst an economic slowdown across Europe may have its own consequences for growth in our industry, perhaps the most immediate and stark issue is the inflationary pressures on energy pricing that has already hit consumers and business.

With the backdrop of economic indicators that suggest that stagnation and recession are at the foremost in the thoughts of the markets, the optimism shown by our respondents on the current state and future growth prospects of our sector even more remarkable.

"At BCS we are continuing to help clients navigate these global challenges and undertake the transformation that is necessary to prosper in the Green Deal environment. Our current services include informing clients of Green Deal levies, the financial modelling of impacts and supply-chain transformation that will form the map to reach our green destination," concludes James.

Sustainability initiatives impact data centre infrastructure spend

According to a recently published report from Dell'Oro Group, data center physical infrastructure (DCPI) revenues are forecast to grow at an 8 percent compound annual growth rate (CAGR) from 2021 to 2026, to above $31 billion. Growth is forecast to remain resilient, driven by sustainability-minded data center expansion from cloud and colocation service providers, despite near-term supply chain constraints persisting and macroeconomic headwinds forming.

"DEMAND for data center physical infrastructure remains resilient, despite the developing macroeconomic uncertainties," said Lucas Beran, Principal Analyst at Dell'Oro Group.

"Most importantly, data center sustainability has risen to the top of decision making criteria in the industry, opening the door for significant technology transitions during this forecast period.

The most exciting is the acceleration of data center liquid cooling, as both direct liquid cooling (DLC) and immersion cooling (single-phase and two-phase) are forecast to grow significantly and surpass $1 billion in market revenue by 2026," added Beran.

Additional highlights from the Data Center Physical Infrastructure 5-Year July 2022 Report:

- DCPI revenue growth is forecast to slow to 6 percent in 2023, driven by continued cloud and colocation service provider growth and marginal enterprise growth.
- China is forecast to grow at the fastest CAGR during the forecast eriod, followed by APAC (Excluding China) and EMEA.
- Data Center Thermal Management is forecast to grow the fastest rate of any market segment during the forecast period, surpassing $6 B in vendor revenues in 2026.

The Service Providers (Top 10 Cloud, Rest-of-Cloud, Colocation, and Telco) customer segment is forecast to grow at a double-digit CAGR during the forecast period, while the Enterprise customer segment (Large Enterprise, Rest-of-Enterprise) is forecast to grow at a much lower rate.

Hyperscalers to lift data centre capex to $377 billion in 2026

According to another recently published report from Dell'Oro Group, global data center capex is on track to reach $377 billion by 2026, with the hyperscale cloud service providers accounting for more than half the market total. We predict increasing the adoption of accelerated computing will generate market growth opportunities.

"THE DATA CENTER of the future will continue to evolve, with new accelerated computing architectures on the horizon enabling AI applications that are more automated, intelligent, and immersive for end-users," said Baron Fung, Research Director at Dell'Oro Group. "The hyperscale service providers will lead the market in investing in new accelerated computing technologies, with an emphasis on the cutting-edge server and network architectures, as well as enhanced thermal management solutions.

However, there is much uncertainty in the near term for the overall market. Lingering supply chain challenges, persistent inflationary pressures, and declining economic growth could weigh down on enterprise data center spending in the near term. Despite these near-term uncertainties, our long-term outlook is optimistic, as enterprises undergo digital transformation initiatives, deploying new hybrid cloud workloads, and with the cloud service providers and telecom operators extending their infrastructure to the network edge," explained Fung.
Additional highlights from the July 2022 Data Center IT

Capex 5-Year Forecast Report:

- Worldwide data center capex is forecast to grow 13 percent by 2026.
- Adoption in new server CPU platforms and accelerated computing will be primary capex growth drivers in the data center.
- Edge computing is forecast to comprise 8 percent of total data center infrastructure spending by 2026.

Research reveals post-pandemic risk factors

Economist Impact survey of 2,000 business leaders, sponsored by Cognizant, shows key challenges include competing priorities, deriving value from technology investments, addressing a talent and skills gap, and sustaining action on ESG.

COGNIZANT has introduced The Future-Ready Business Benchmark, research from Economist Impact, commissioned by Cognizant. This comprehensive survey of business leaders across eight industries and 10 countries is aimed at understanding the state of the modern business and how leaders are preparing for long-term success in a post-pandemic world. The research identifies three essential interrelated areas that leaders must prioritise to create a resilient, future-ready enterprise: 1) Realising full value from accelerated technology adoption, 2) overhauling workforce strategies, and 3) closing the gap on thought and action in the face of growing environmental, social, and governance (ESG) challenges.

"Resilience is the new must-have capability for every organisation that expects to thrive in this time of intensifying competition, ever-accelerating digital technology, and unpredictable global events," said Euan Davis, Head of Cognizant Research. "To succeed as a modern business, leaders must be ready for anything, and prioritisation is key when everything seems equally critical. We've shown that savvy technology investment, attention on developing talent with new and expanded skillsets, and embedding and acting on an ESG agenda are core elements of focus on which leaders can build. The successful CxOs will build future-ready, resilient businesses by ensuring their organisations learn, adapt, and continually evolve."

Economist Impact surveyed 2,000 senior executives in 10 countries across North America, Europe, and Asia-Pacific to assess and compare their businesses across a range of metrics.

Survey highlights include these insights: Strategic clarity is muddled. Over 90% of business leaders surveyed say it is a strategic priority to adopt a data-driven approach and create a digital-first business model, with 37% citing both imperatives, along with the need to align operations with these new modes of working, as "business critical."

Technology investment is accelerating beyond what has become the standard shopping list of cloud, advanced analytics, IoT and artificial intelligence/machine learning (AI/ML) even while respondents say they are not yet realising full value of existing investments. In addition to these foundational technologies, of which the vast majority of respondents, 80%, say they have adopted or plan to adopt, there is a growing appetite for an emerging set of technologies; over 60% of respondents say they plan to or are already adopting quantum computing, blockchain, and robotics.

Workforce and talent management strategies need a major overhaul to prepare workers for new ways of work. Nearly half of respondents, at 46%, recognise they lack the skilled talent necessary to make productive use of advanced technologies. When asked about the biggest hurdles to implementing new processes, products, services and technologies over the last 12 months, the two most significant challenges were workforce-related: a lack of knowledgeable staff and a chronic lack of focus on preparing workers for the new ways of work. For example, just one-third, or 33%, of respondents are using data to identify and understand training needs and cultivate talent.

Business resilience is at risk for companies that recognise ESG as a critical consideration but fail to take action to integrate ESG throughout the organisation. Nine in 10 decision-makers, or 90%, recognise attending to ESG issues is an important aspect of being a modern business.

However, there is a massive disconnect between recognition and action, with only 31% having dedicated staff and resources devoted to ESG, and only 35% incorporating ESG into company strategy. A slight majority, 54%, report setting and taking action on specific environmental targets, while only 44% currently measure social impact. "Many businesses today are struggling to prepare for next month, let alone years from now," noted Vaibhav Sahgal, Principal at Economist Impact. "Firms genuinely embedding principles of future-readiness from our Future-Ready Business Benchmark into their operational realities will maintain and grow their competitive advantage. Our data validated the fact that it is particularly challenging to make progress on the matter when juggling a vast array of often competing priorities.

Our guidance is to start where the gaps are most significant and dial up the focus on people; the benchmark offers tangible calls to action for businesses across countries and industries. A failure to embrace the volatility that is here to stay, and prioritise business plans and investments accordingly, puts your business at the risk of losing relevance."

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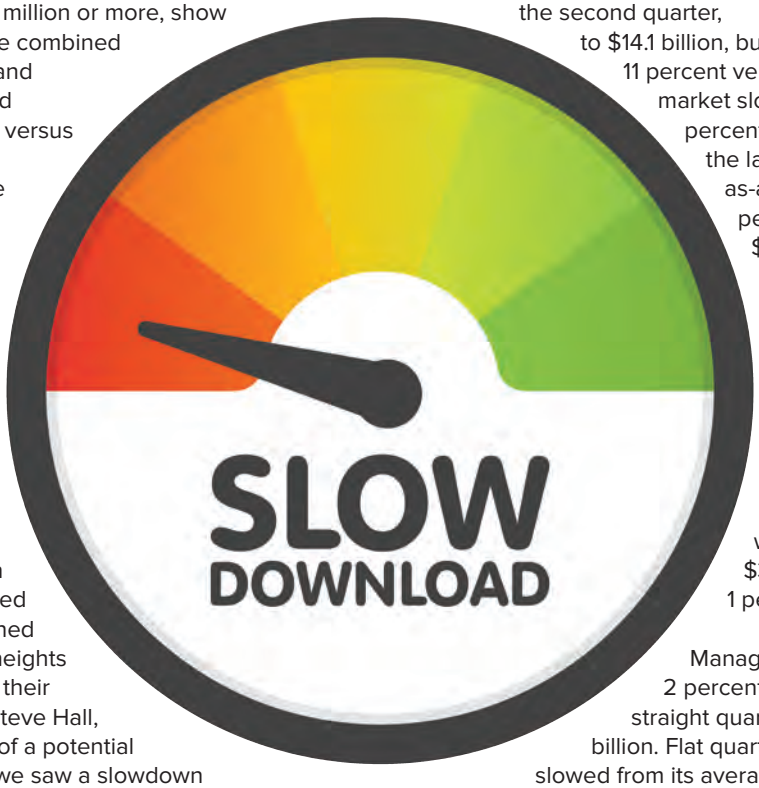
Global IT market shows signs of slowing down

Global combined market up 9%, but registers first sequential quarterly decline since Q3 2020.

GLOBAL DEMAND for IT and business services remains strong, although the market is showing signs of slowing amid recession fears, finds the latest state-of-the industry report from Information Services Group (ISG) (Nasdaq: III), a leading global technology research and advisory firm.

Data from the ISG Index™, which measures commercial outsourcing contracts with annual contract value (ACV) of $5 million or more, show second-quarter ACV for the combined global market (both XaaS and managed services) reached $22.8 billion, up 9 percent versus the prior year, but down 7 percent compared with the first quarter.

It was the first time since the third quarter of 2020 that the global market did not grow sequentially – a period of six straight quarters in which quarter-over-quarter growth averaged 7 percent.



"We have been through an 18-month period of sustained high demand that has pushed the global market to new heights as companies accelerated their digital investments," said Steve Hall, ISG president. "With fears of a potential recession on the horizon, we saw a slowdown in the second quarter and expect the market to be more volatile in the second half of the year."
Hall said market demand remains high, as companies continue to embrace cloud computing and leverage technology to improve productivity, lower costs and get closer to customers to drive revenue growth. Yet the market faces headwinds, he said, including rising interest rates, lingering supply chain issues, a tight labor market and higher energy prices.

Results by Segment

The cloud-based XaaS market grew 13 percent in the second quarter, to $14.1 billion, but was down 11 percent versus the first quarter, as the market slowed from its average 44 percent quarterly growth rate over the last 12 months. Infrastructure-as-a-service (IaaS) rose 11 percent, to $10.2 billion, but was down 14 percent sequentially, reflecting weakness in China, which was impacted by extended Covid lockdowns and a tighter regulatory environment for the country's technology sector. Software-as-a-service (SaaS), meanwhile, was up 20 percent, to $3.9 billion, and off only 1 percent from the prior quarter.

Managed services spending rose 2 percent, to $8.8 billion – the fifth straight quarter it exceeded ACV of $8 billion. Flat quarter over quarter, the market slowed from its average 16 percent quarterly growth rate over the last six quarters.
For the second quarter, IT outsourcing (ITO) declined 8 percent, to $6.0 billion, although it was up 5 percent sequentially. Business process

outsourcing (BPO), meanwhile, rose 33 percent, to $2.8 billion, but declined 9 percent from the first quarter.

With the historically strong data center business in decline, demand is shifting from large, legacy infrastructure deals to smaller application development and maintenance (ADM), engineering, and industry-specific BPO awards. A total of 600 managed services contracts were awarded in the second quarter, up 5 percent versus the prior year, though down 4 percent from the first quarter. The awards included nine mega-deals (contracts with annual value of $100 million or more), the highest number in the last three years.

First-Half Results

The combined market reached ACV of $47.3 billion in the first half, up 19 percent over the prior year. XaaS advanced 27 percent, to $29.8 billion, and now accounts for 63 percent of the combined global market, up from 51 percent three years ago. Managed services produced a record $17.5 billion of ACV, up 8 percent, on record volume of 1,225 contracts, up 12 percent versus the prior year.

2022 Forecast

ISG sees continued economic uncertainty impacting the second half of 2022, even as market demand remains high.

We see this segment coming under pressure due to Covid and regulatory headwinds in China, leaving the big three hyperscalers – AWS, Azure and Google Cloud – to support market growth

"We are lowering our growth forecast for managed services to 3.5 percent for the year, down from 5.1 percent last quarter, reflecting the negative impact of foreign currency translation and inflationary concerns," said Hall.

On the XaaS side, ISG is lowering its growth forecast to 18 percent, compared with its previous forecast of 22 percent. "We see this segment coming under pressure due to Covid and regulatory headwinds in China, leaving the big three hyperscalers – AWS, Azure and Google Cloud – to support market growth. China is down almost $1.5 billion year to date, and we don't see cloud providers there fully recovering this year."

European Companies to spend $100 billion on human augmentation

According to International Data Corporation (IDC), the European Human Augmentation market, including augmented and virtual reality, biometrics, exoskeletons, wearables, affective computing, and other human augmentation technologies, will reach over 62 billion dollars by the end of 2022 and more than 100 billion dollars by 2026.

INTERNATIONAL DATA CORPORATION'S (IDC) newly published European Human Augmentation Forecast, 2021–2026: How AR/VR, Biometrics, Wearables, and Other Augmentation Techs Will Elevate Human Skills and Transform Businesses shows that businesses are increasing their investments in augmentation tech, and the overall human augmentation market will grow 37 percent in Europe by the end of 2022. Companies are adopting a digital-first model and adapting to new realities and work policies that require support for use cases such as remote collaboration, virtualized presence, and employee augmentation.

"As the work culture changes in Europe, many companies will accelerate their digital transformation efforts and we will more frequently hear about human augmentation and its benefits," said Andrea Minonne, research manager, Data and Analytics, IDC Europe. "We live in an era when skill and staff shortages, supply chain disruptions, security concerns, and hybrid workspaces are part of our daily life. Human augmentation will be crucial to bridge these gaps and address industry needs, and European companies will use technology to unlock new skills and elevate existing ones, while also creating digital-based employee experiences."

Human Augmentation Technology	2022 Spending ($B)	2021-2022 Expected Growth (%)
Smart devices	36.62	0.65
Wearables	18.56	0.03
Biometrics	3.28	0.20
AR/VR	2.41	0.66
Ingestible, injectable, and implantable devices	0.64	0.22
Exoskeletons	0.30	0.33
Brain computer interfaces	0.04	0.04
Affective computing	0.01	0.29
Total human augmentation market	**61.86**	**0.37**

European human augmentation market forecast 2022

European spending on smart devices that users can activate using voice commands and wearables will reach 55 billion dollars this year. These technologies are fully established in the market and although they aim to elevate consumer experiences rather than targeting business needs, they will support most of the investments in human augmentation.

Other tech including biometrics, AR, and VR are at an emerging phase, with several projects rolled out in at least a couple of business lines across enterprises targeting multiple use cases. Finally, tech including ingestible, injectable, and implantable devices, exoskeletons, brain computer interfaces, and affective computing are still niche and at a nascent phase, with many projects still at a trialing phase.

The Human Augmentation market has been affected by several factors in the past couple years, including the conflict in Eastern Europe. The Russia-Ukraine war has generated a 200 million dollars spend loss in AR headsets, as many companies have pulled out of Russia, slowing down augmentation-oriented projects in the country but also drastically decreasing product availability. Human Augmentation will also play a role in supporting the metaverse. IDC's Market Perspective The Metaverse Tech Ecosystem: How and When Human Augmentation Technologies will Support the

Metaverse shows that although much tech, such as affective computing and brain computer interfaces, will take more time to become a key component of the metaverse tech ecosystem, AR and VR will be the foundation stones for the metaverse and companies already deploying these techs will find themselves a few steps ahead in the metaverse game.

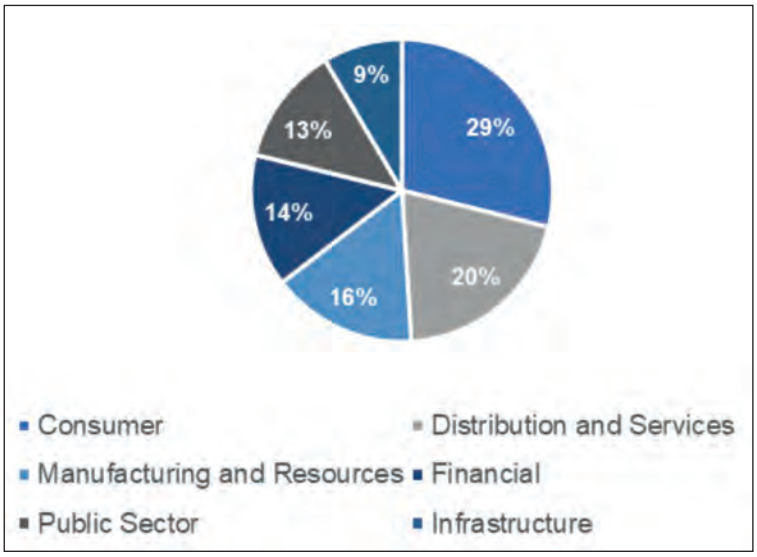
European ICT investments to reach $1.1 trillion

According to International Data Corporation's (IDC) Worldwide ICT Spending Guide Enterprise and SMB by Industry, ICT spending in Europe will reach $1.1 trillion in 2022 and will get close to $1.4 trillion by 2026, growing at a 5% five-year 2021–2026 CAGR. Investments in software will drive most technology spending in Europe in 2022 and software will be the fastest-growing technology group by year-on-year growth, supported by fast growth in artificial intelligence platforms, collaborative applications, and software quality and life-cycle tools.

With investments in cloud-first solutions, the software market has remained resilient to factors that impacted the hardware market, which is expected to decline 0.1% this year. Inflationary pressures, an expected recession, and the Russia-Ukraine War are dampening demand for hardware in Europe. Spending on devices will be the most impacted by the increasing cost of living, product shortages, and suspended shipments.

Consumer, banking, and discrete manufacturing will be among the top spenders in ICT, absorbing almost 46% of overall ICT spend in 2022. Europe is affected by supply chain disruptions, many of which are linked to the war in Ukraine.

This is affecting many industries, which are turning to automation to optimize processes and minimize disruption. Banking will be focusing on transformative processes that focus on automation and customer-centricity to redefine how financial services deliver employee and customer experiences, supporting and reimagining core banking services, risk management, HR and talent management, and audit and compliance through automation. On the manufacturing side, a shortage of skilled staff is wreaking havoc in the supply chain. Many companies will invest in tech to reduce pressure on existing staff, automate processes, and reduce their reliance on human-based labor when resources are not available.



➤ 2022 European spending in ICT by sector

The situation in Russia is less bright, with an overall 23% decline in ICT spend expected for 2022. This will be driven by a strong reduction in hardware spending related to many hardware-supplying companies pulling out of Russia. Nonetheless, software and IT services will continue to grow due respectively to the resilience of the technology and the reliance on domestic businesses.

"European companies are caught in a series of challenges including skill shortages, supply chain disruptions, post–COVID-19 recovery, high inflation, rising costs of living, and armed conflict in Eastern Europe. Technology has proved to be a solution to many of these challenges as organizations are looking at automation and real-time decision making to maximize their performance in such challenging times," said Andrea Minonne, research manager, IDC UK.

Consumer, banking, and discrete manufacturing will be among the top spenders in ICT, absorbing almost 46% of overall ICT spend in 2022. Europe is affected by supply chain disruptions, many of which are linked to the war in Ukraine

Small can be both beautiful and powerful!

The benefits of microgrids in building a new generation of sustainable and resilient data centres

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

THERE ARE MANY REASONS why Ireland has become a popular location for data centres in recent years. In the first instance, its geographical location makes it an attractive destination for submarine communications cables—a fact that has been evident since the first ever transatlantic telegraph messages were sent between Newfoundland and Valentia Island, Kerry in 1858. Today's underwater cables, now comprised of optical fibre, also provide copious direct links between the island and Great Britain, the European continent, and North America.

Added to this is the long-term industrial policy of encouraging high-technology industry clusters around pharmaceuticals, software, web development, and other digital-centric industries, both through inward investment and indigenous growth. This strategy inevitably requires the availability of resilient IT and data centres, and excellent connectivity to the cloud.

However, there is a downside to having so many large data centres in Ireland, namely the electrical power that is needed to keep them running reliably and efficiently.

The industry has also been under great scrutiny from environmental groups who have questioned their energy demand in line with the country's environmental goals. Set also within the context of households facing higher energy bills due to a global surge in wholesale power and gas prices, there has been a growing backlash against new developments. Following a public consultation earlier this year, for example, EirGrid announced that they will no longer accept applications for new data centres in Dublin for the foreseeable future, and that any new applications for other parts of the country will be assessed on a 'case-by case basis'.

Providing a solution

I believe that the data centre industry can play a key role in Ireland's sustainability ambitions, using innovative technology approaches to design, build and operate sustainable digital infrastructure, enable greater resilience of the grid and generate new green, electrical energy.

For example, one such connection measure required by the Commission for Regulation of Utilities (CRU) is that new data centres must have onsite dispatchable power generation capacity equal to, or greater than their demand, to be connected. This means the ability to integrate with the grid, to store energy on site and the use of innovative technologies, such as microgrids, present key opportunities for Irish data centre operators to underpin the country's sustainability ambitions and build greater resilience into the grid.

Microgrids are onsite networks of distributed energy generators and storage systems that are intelligently coordinated with the utility grid to optimise costs and power stability. In some circumstances they can be temporarily removed from the grid to avoid exposure to outages and disturbances, using stored energy to ensure operational continuity.

Typically, most mission-critical facilities, be they data centres, hospitals, or other critical infrastructure, will have emergency onsite backup generators that come online in the event of a prolonged grid outage. Microgrids, on the other hand, encourage the use of renewable energy sources to supplement power from the grid, both to offset the cost of the utility and provide stores of energy.

These may be called upon in an emergency but may also be used temporarily to implement cost-saving strategies such as peak shaving, which is the practice of using stored energy in place of utility power to keep within agreed usage limits and avoid cost penalties for exceeding tariffs.

Microgrid components

A true microgrid can make use of several energy-generating and storage systems. Many installations use onsite generators to produce heat. As these are based on reciprocating engines, they can also be used to generate electricity, a process known as cogeneration or combined heat and power (CHP). In the case of data centres, given the requirement to cool the IT equipment, an alternative system known as combined cooling heating and power (CCHP), or trigeneration, makes use of waste heat to produce chilled water for the cooling function.

CHP and CCHP systems are a very efficient way to combine energy required for ancillary functions like heating and cooling to produce electricity. However, they usually have a significant carbon footprint because they burn fossil fuels. A second component in a true microgrid would be some form of onsite renewable energy production. The optimal type of renewable used would depend on local conditions and might comprise a wind turbine, solar panels, biomass or hydrogen fuel cells to produce energy to supplement the grid.

Along with electrical generation, a microgrid makes use of stored energy to reduce demand on the grid. Although all critical installations will have uninterruptible power supplies (UPS) to provide immediate cover in the event of an outage, additional batteries can be used to store the excess power generated. This can then be used to supplement the UPS systems or to realise demand-management strategies such as peak shaving.

Microgrid control

Critical to any microgrid is the software that collects, coordinates and analyses its demand and generation requirements. Typically this is a three-layer architecture, the first of which comprises smart sensors based on Internet of Things (IoT) technologies, gathering data on the status of all components of the microgrid. The second layer allows localised, real-time control of the assets via software, which monitors them, makes critical decisions and takes cost-optimised actions to control both power generation and consumption to maximise resilience and efficiency.

The third and final software layer includes applications, analytics and services that enable high-level strategic decision making. This combines technical data obtained from the equipment with external information such as weather predictions, including the assessment of conditions favourable to wind or solar generation, energy market pricing or costs for grid electricity, as well as the fuel needed to drive onsite generators.

Not only does such software enable more efficient and sustainable operation of a single site, but it opens up the possibility of microgrid clusters, where several businesses can collaborate or combine their own microgrids to drive economies of scale and share power sources for even operational efficiency. This, in turn, makes sophisticated energy-sharing programs possible, including energy as a service in which participating sites can outsource management of a microgrid cluster to third-party operators who will coordinate and arbitrate between the power generation and consumption according to demand.

A digital, electric future

The potential of microgrids to deliver more efficient use of energy, and increased use of renewable resources will be a significant tool in delivering a thriving data centre sector, while minimising the burden on the national grid.

However, the challenge of providing adequate power to all parts of an increasingly digital economy is one that requires a coordinated response from all stakeholders including government, energy suppliers, distributors, and consumers of electricity. At Schneider Electric, we believe that our vision of sustainable data centres, and of Electricity 4.0 can play a key role in helping Ireland decarbonise its digital economy. Through the convergence of digital and electric technologies we can make both data centres, and the energy grids of the future, more efficient, sustainable, and resilient.

Furthermore, through this collaborative approach we can unite key stakeholders across the industry, including governmental bodies such as the CRU, national energy grid operators such as EirGrid, and data centre operators, to deliver a green and net zero future.
Looking forward this approach will be essential to build a sustainable and resilient future, and minimise the environmental impact of data centres.

What is driving developers and investors in the data centre sector?

An important component to ensure a well-balanced European data centre market is not only the provision of new supply to satisfy future levels of demand, but to ensure that this is the right product in the right location.

BY JAMES HART, CEO AT BCS

IN OUR LATEST survey of 3,000 senior datacentre professionals across the UK and Europe we asked the developers, and investors that fund and build that supply pipeline, what the key factors are that are driving them and what the major considerations are.

Firstly, it is worth noting that our respondents continue to provide evidence of the on-going confidence in the European market, with almost all developers and investors reporting an expansion in their portfolio of technical real estate in the past six months. Indeed at 95%, it is now the highest proportion that we have recorded since the survey began over 13 years ago.

Power challenges

The fact that power availability and cost heads the list is perhaps no surprise. It has been well documented that the European power markets have entered a period of change, with prices touching new highs in a number of European countries; up to four times the average historical level. Electricity demand is expected to increase steadily in Europe, with some predicting a CAGR of about 2% until 2035, driven in part by the surge in electrification of areas such as transport and the production of green hydrogen through electrolysis.

This means that navigating these power markets will be a key challenge for data centres, driven by

a demand from environmental savvy, but cost-conscious, corporates. Since we began this survey 13 years ago, power has consistently been ranked as the single most important factor in the ranking of the drivers of new data centres. The results of our latest analysis suggest that this remains the case, with over two-thirds of respondents choosing 'Availability of Power' as their top influencing factor. Indeed, the proportion of those ranking it in either of the top two positions remains at a high of 90%.

As a side issue, there is also a real requirement for participant companies to evolve their power strategies to accommodate this demand. The challenge is to ensure a sufficiency of supply whilst meeting the needs posed by a political and social environment increasingly demanding that such power must be from a cost effective but sustainable source.

Location remains top two

Location is the second most highly rated factor, with over half of all respondents ranking it in the top two factor choices. When asked about the likelihood that long term supply chain problems could impact in a significant way on future data centre location decisions, 56% of our developer respondents stated that they believed that this would be the case. We would expect this to continue to be ranked highly, particularly against the background of the UK's withdrawal from Europe, the fallout of the COVID-19 pandemic, ongoing issues with supply chains and the effect that this may have on the location of company's data centres relative to the markets that they serve.

There is also little expectation that the current supply chain disruption will disappear in the short term as significant disruption drivers remain; power shortages in China affecting output, the rising price of raw material such as copper, fall-out from BREXIT to name a few, and all are exacerbated by an increase in demand across the world. However, there are some enco uraging signs, with key metrics such as cargo shipping costs falling, congestion at ports easing and reported delivery times across the wider economy for manufacturers worldwide reducing.

Access to fibre has emerged as an increasingly important factor with around 10% citing it as their most important choice. Supply chain difficulties may well be impacting our respondent's views on this issue as the largest concentration of the fibre optics supply chain can be found in Wuhan - epicentre of the COVID-19 outbreak. The Chinese city is home to companies such as Fiberhome, YOFC, and Accelink, amongst others, which together comprise a quarter of the global optical fibre production capacity.

We can also see that political or social stability has become increasingly more important in recent surveys, perhaps reflecting current perceptions and concerns regarding the wider geo-political and economic environments. Whilst the total build-out cost, availability of specialist data centre construction skills and land price are all important factors that are considered when looking at a new data centre build, they are consistently rated behind our top factors by our respondents. However, splitting out our developer respondents shows that these factors are ranked more highly by this group, just behind 'Availability of Power' and 'Location', not surprising given that these would have significant day-to-day consequences for them.

Where are the skills?

An ongoing area of concern within the industry as it has expanded is the lack of sufficiently qualified professionals available, particularly across the design, build and operations disciplines. Highlighted by the COVID-19 pandemic, where movement of labour was particularly restricted, access to the right professionals is vital to the ongoing health of supply and operations in the European data centre markets

Access to fibre has emerged as an increasingly important factor with around 10% citing it as their most important choice. Supply chain difficulties may well be impacting our respondent's views on this issue as the largest concentration of the fibre optics supply chain can be found in Wuhan - epicentre of the COVID-19 outbreak

The results for the latest survey suggest that these concerns continue for our respondents from all areas of the industry. Some 90% of all respondents suggested the market for these skillsets is currently characterised by that of falling availability and increasing demand. Those respondents who are at the face of this - real estate developers/investors or design, engineering, and construction (DEC) professionals - expressed this in the most emphatic of terms, with all respondents from this group sharing the view, a clear sign that they are feeling the imbalance.

Conclusion

There is no doubt that factors such as supply chain, coupled with the on-going global disruption in energy production, distribution and move towards sustainability and carbon-neutrality will impact decisions made by developers and investors in the sector which it seems is entering a noticeable period of change.

Off-site manufacturing – a data centre solution?

OSM is here to stay. The more that it is adopted and its advantages made clear, the greater the exposure and trust in this approach will be.

BY PAUL BUTLER, SENIOR DIRECTOR EUROPE, LINESIGHT

THE BRITISH GOVERNMENT has made much of its desire to 'build back better'. The ongoing deployment of modern methods of construction (MMC) is expected to be a key component in fulfilling this ambition for growth, not least following the launch of a dedicated MMC taskforce following last year's budget. So how much of a difference could MMC, which includes offsite manufacturing (OSM), make to the delivery of data centres in the UK?

While OSM is not for every client, the method lends itself best to situations where clients require a standardised or repeatable structure to a well-defined specification. Data centres are among those sectors leading in the use of OSM, with examples being innovative projects such as Microsoft's Azure Modular Datacentre or Project Natick's underwater data centre. Linesight carried out extensive research with a global client base across a number of sectors to evaluate the key criteria which should

inform whether or not to use OSM on a given scheme. Our research in the data centre industry focused on the hyperscale data centre (5MW) and revealed that while quality and schedule speed are the main drivers in the decision process, early cost and programme certainty are also important. OSM will therefore be better suited for data centre clients who prioritise minimising cost-in-use over construction costs, as well as the certainty of construction date and cost from the outset. Improved health and safety is also an overarching factor across all sectors as offsite manufacturing helps reduce risk through less congested construction sites.

OSM is particularly suited to the data centre sector as developers can harness the standardised design and efficient roll-out approach that suits factory-made components and units such as prefabricated containerised generators, LV/HV switchrooms and UPS rooms. Hybrid models of offsite and stick build are used globally depending on a variety of factors including availability of suitable suppliers, local fire regulations, local infrastructure and in some regions seismic considerations are a factor. In general, OSM is more suited to hyperscalers due to their larger out of town sites with little or no congestion.

With the commissioning phase of a data centre being particularly complex compared to buildings in other sectors, opting for OSM over traditional construction methods means much of the work required during this period can be conducted in controlled conditions rather than on-site, thereby removing some of the time pressure at a critical time in the delivery programme. This approach ensures that the right parts arrive on-site at the right time in the right order, to minimize the time it takes to build the data centre, populate it with the necessary equipment, commission it and put it to work. In this approach, servers, networking equipment and ancillary services such as backup power generation are all built and tested offsite at supplier factories and then delivered to the site for 'plug and play' installation.

Cost consideration is a key factor influencing the decision to use OSM and in this regard, the upfront costs for modular can seem more expensive however the importance of cost and programme certainty provides a different risk profile. Significant risk elimination from a less congested site, a more controlled production environment and improved health and safety risks often outweigh the upfront investment costs.

On paper, it may seem like you are paying a premium for transportation of say an electrical skid but when you factor in the savings of hours on-site and the risk avoided by testing and integrating offsite, there are big savings. OSM is particularly effective for the data centre construction in the UK, as the Great British weather, so much a factor in traditional construction schedules, is far less likely to make its presence felt when construction happens off-site in controlled conditions. Furthermore, the opportunities that OSM provides to reduce waste embodied energy and carbon emissions, in line with the UK's stringent environmental requirements, such as the Climate Change Levy, also stand in its favour. OSM can be applied in various ways to maximise return on investment: many temporary-use projects such as turnkey, modular, all-in-one containerised data centres, utilise a "pure" OSM approach.

Modular techniques can also work alongside traditional methods – effectively a hybrid approach – when a project demands, mostly for large-scale data centres with repeatable design. There will be exceptions when a project may require more design flexibility, but the adaptable design will become more prevalent as the experience of OSM suppliers and their customers' demand grows.

For some applications, where the timing of growth in demand is uncertain, data centre architects may also create the infrastructure for a large facility but then only populate it with the servers and networking equipment needed to serve current demand. Extra equipment can then be added as modules, usually in the form of 40-foot containers populated with the pre-tested server, networking, power, and security equipment. It has the attractive corollary of enabling data centre architects to specify and build the infrastructure for very large data centres, but only populate them with equipment when demand for additional capacity justifies that investment.

What's holding back further adoption of OSM in the data centre market at present?

While the data centre sector has been adopting OSM to a significant degree, it can at times still be difficult to quantify the specific cost/programme benefits. This can hold up design commitment and supply chain engagement at an early stage. To resolve this situation, the overall OSM supply chain needs to mature and develop, while better education is required for developers and clients on the cost, scheduling, and qualitative benefits to make informed decisions. Engaging with the supply chain early in the design process will be a key part of ensuring effective OSM projects. OSM requires that a design is adhered to: changes required onsite could prove costly and getting it right the first time will always be of paramount importance.

OSM data centres are already being used by a growing number of operators and can undoubtedly play a vital role in the UK's economic recovery by "building back better, greener and faster". And for OSM to reach its full potential in the data centre sector, the supply chain's awareness of the benefits and applicability of the OSM approach has to grow. OSM is here to stay. The more that it is adopted and its advantages made clear, the greater the exposure and trust in this approach will be.

Future proofing data centre environments

The required cooling of a data centre is a topic that has gained a fair amount of traction as of late. Mainly down to the fact that newly released technologies are becoming more demanding in terms of processing power, resulting in a substantial increase of heat being generated inside most modern data centres. Environments that were not necessarily designed to handle these ever-increasing power demands.

BY DAVID CHESSUM, PRE-SALES ENGINEER AT OCF

TYPICALLY SPEAKING, most data centres rely on air cooling to maintain optimum server, storage and networking conditions and have done since the concept of data centres came about. The basic principle of air cooling being that cold air is blown across either a single rack, or number of racks, thus exchanging the warmer air with much cooler air – not the most complicated practice, but not the most environmentally efficient one either.

In theory, a single rack inside a data centre should be able to handle solutions of around 20kW, but it seems the market is rapidly heading into an area where the demand is reaching the 40-50kW figure at the very least, with some highly dense solutions requiring even more power per pack.

The market landscape

Both AMD and Intel have already released the finer

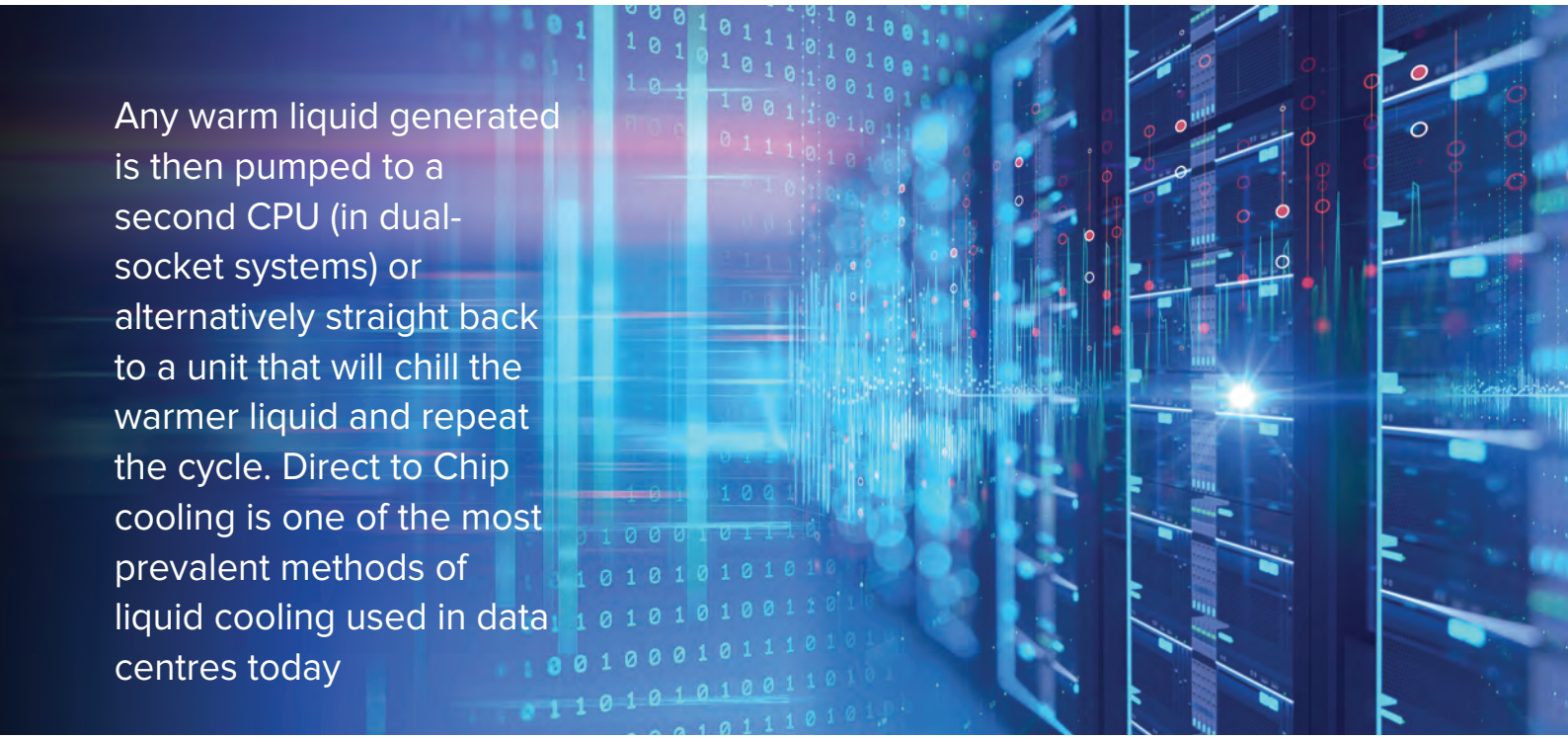
details around their next generation of CPUs, the EPYC Genoa (based on Zen 4 architecture) and Xeon Sapphire Rapids, respectively. The much talked about flagship Genoa CPU packs a punch, delivering 96 cores and 192 threads, but the chip also possesses a staggeringly high TDP of 400W, with the Intel competitor likely to be very similar in terms of TDP.

There is also a sharp increase in demand when it comes to the latest generation of NVIDIA offerings, with the NVIDIA H100 PCIe Gen 5 card stated as having a Thermal Design Power (TDP) of 350W and the alternative SXM form factor having a TDP of 700W. With both CPUs and GPUs becoming more power-hungry as time goes on, the limits of air cooling for data centre solutions may quickly be approaching, especially for those hoping to use predominantly dense configurations.

will sit inside a sealed container that is filled with various types of liquids, with any generated heat being removed through the use of cool heat exchangers. Immersive cooling is seen by some people as the most efficient way of cooling modern HPC servers.

Another technique is that of “Direct to Chip” cooling. This being when chilled liquid is pumped directly into a server chassis using small tubes, directly onto cold plates, which are installed to sit over the CPU, GPU or similar components.

Any warm liquid generated is then pumped to a second CPU (in dual-socket systems) or alternatively straight back to a unit that will chill the warmer liquid and repeat the cycle. Direct to Chip cooling is one of the most prevalent methods of liquid cooling used in data centres today.



What’s next?

If this is to be the case, then what are the feasible alternatives that data centres are likely to be adopting in the near future?

Liquid cooling is a technique that has been implemented over time and shows promise when trying to help tackle many of the challenges that come with the limitations of air cooling. While there are various methods of liquid cooling, three stand out as being the most frequently used – Immersive, Direct to Chip and Rear Door Heat Exchanger (RDHx).

From a very high level, “Immersive” cooling is a method where full systems can be immersed entirely in non-conductive liquid. Normally, the systems

Lastly, the use of RDHx is another practice that could be adopted in the data centre, although typically RDHx solutions are widely regarded as a better form of air cooling, rather than a liquid cooling solution. This is a concept where the rear door of an entire rack will contain both liquid and fans, which combine to exhaust and cool any hot air that is developed from the components within the rack.

Ultimately, whichever cooling solution is favoured, it will typically need to be assessed on a case-by-case basis, but it’s safe to say that if a liquid cooling approach is adopted, then this will have a significant impact on keeping the latest generation of CPUs and GPUs within their ambient operating temperatures, as well as future proofing data centre environments for years to come.

Data centre infrastructure:
Facilitating the migration to faster speeds

There is no doubt that data transmission speeds in the data centre are and will continue to increase. But data centre owners and operators can benefit from a range of new transmission technologies already available to implement those speeds with lower power budgets and at reasonable price points.

BY ALBERTO ZUCCHINALI, SENIOR TECHNICAL MANAGER AT SIEMON

DATA TRANSMISSION SPEEDS in the data centre space have been consistently on the rise over the past decade. Today, enterprise data centre switches are running 1Gb/s or 10Gb/s server speeds with 10Gb/s or 40Gb/s uplink speeds, whilst cloud data centre switches are already at 10Gb/s or 25Gb/s to the servers with 40Gb/s or 100Gb/s uplink speeds. As the overall amount of data is increasing, emerging IoT, AI-intensive, and edge-computing applications are driving larger file sizes and demand additional compute power, bandwidth, and low-latency performance which will see transmission speeds taking the next big jump forward.

This trend isn't just unique to a select few industries. We are seeing these applications emerge across a wide spectrum, such as healthcare and finance, where high-definition MRI imaging, virtual telehealth, high-frequency trading and online banking are demanding higher bandwidths and low latency transmission. Also, demand for uncompressed high-resolution video, computer animation, and visual effects in professional media and gaming is increasing file sizes exponentially.

We are also seeing the need for 400G connectivity in edge data centres and central offices being driven by 5G buildouts, next-generation virtualization and cloud-native applications, whilst in hyperscale and cloud-based data centres, the adoption of data centre interconnect (DCI) technology is also increasing the size of data sets being transmitted. The impact of these applications is being felt in cloud environments, where we are already seeing the need for up to 400 and even 800 Gigabit applications in cloud data centre uplinks and server speeds of up to 50G, whilst in enterprise data centres we are expecting switch uplink speeds of up to 400Gb/s and server speeds of up to 50Gb/s.

In light of these developments, data centre infrastructure professionals need to be aware of the right cabling infrastructure approaches that can best support current speed requirements and that also facilitate the migration to these ultra-fast future speeds.

Parallel optic technology for switch to switch connections in the backbone

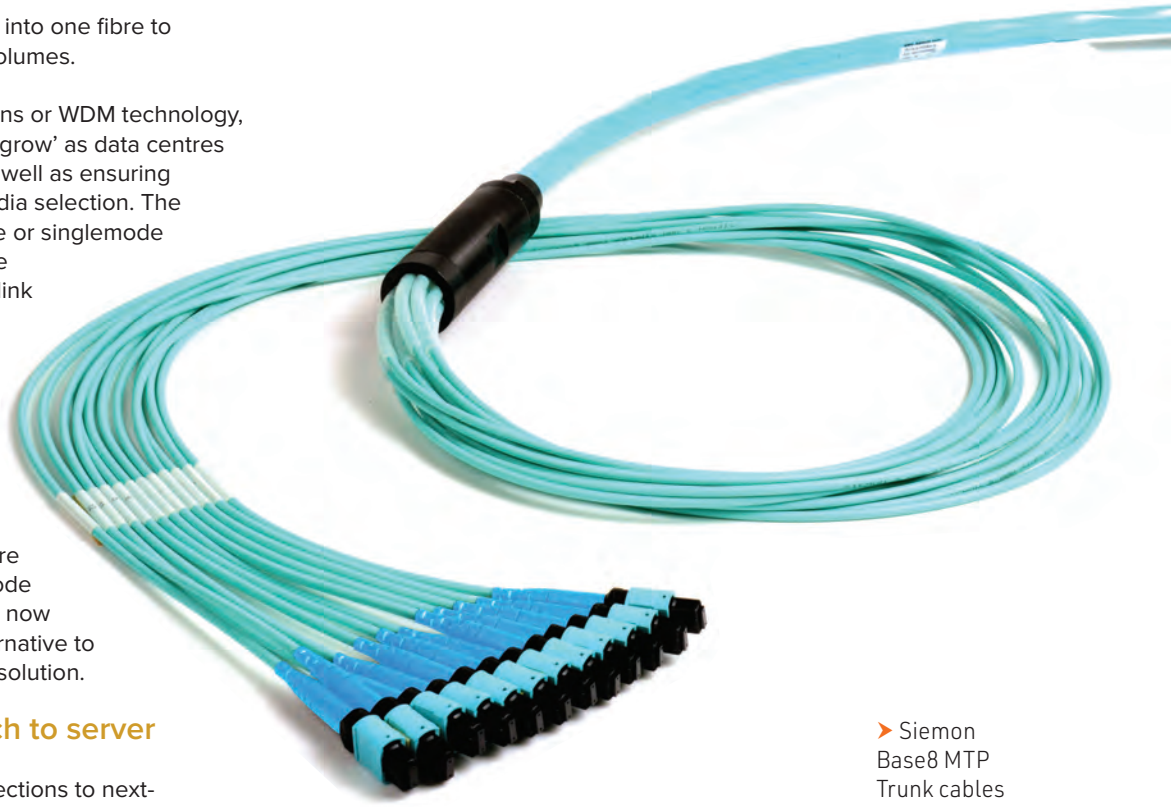
Many of the current parallel fibre optic technology options utilise 8 fibres in connection with multi-fibre push-on connectivity (MPO/MTP fibre connectors) and these Base-8 MPO solutions allow the adoption of either multimode or singlemode fibre. New signalling technologies allow for a reduction in the amount of infrastructure required to support these same transmission speeds.

To provide an easy migration path and take advantage of 100Gb/s and 400Gb/s technologies, enterprise data centres should consider a Base-8 MPO OM4 cabling solution. For an easy migration to 400Gb/s and 800Gb/s speeds in cloud data centres, data centre professionals are advised to select a Base-8 MPO singlemode cabling solution.

Another valuable consideration is the adoption of WDM technology where transmitters introduce

multiple wavelengths/signals into one fibre to increase data transmission volumes.

Whether Base-8 MPO solutions or WDM technology, both options enable links to 'grow' as data centres migrate to higher speeds, as well as ensuring different options for fibre media selection. The decision to deploy multimode or singlemode fibre in the data centre will be determined by the distance (link length) that needs to be covered, with lengths in enterprise data centre environments approximately requiring 100-150m and large cloud facilities requiring up to 500m. For enterprise data centres that historically require shorter link lengths, singlemode 'short range' applications are now also becoming a serious alternative to deploying a multimode fibre solution.

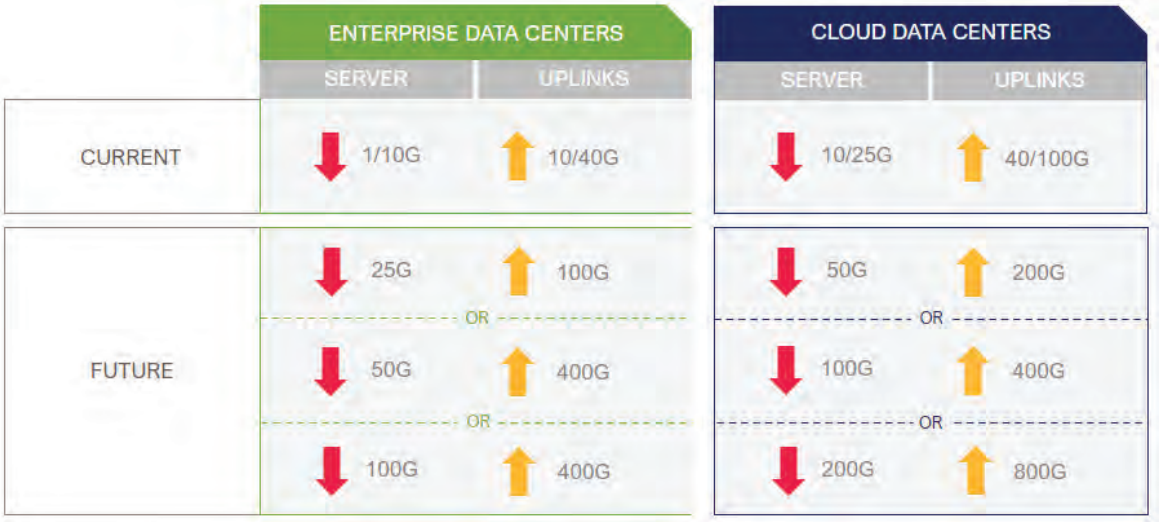


➤ Siemon Base8 MTP Trunk cables

Point to point in switch to server environments

When migrating server connections to next-generation speeds, point-to-point connections using high performance Direct Attach Copper Cables (DACs) or Active Optical Cables (AOCs) are a very valuable consideration. Depending on the size and the overall design of a data centre, point-to-point cables can also be a more cost-effective option in terms of overall material and power consumption, as well as supporting scalability and interoperability. If a data centre operates a Top of Rack (ToR) design for example, where only short server-switch-connections are made inside the cabinet, then QSFP28 DACs for 100 Gig and SFP28 DACs for 25 Gig are ideal. DACs up to 3 meters in length used in a ToR configuration also offer the lowest latency, which is critical in real-time applications such as AI, virtual reality, gaming of financial trading. In Middle of Row (MoR) or End of Row (EoR) configurations where switches reside in a separate cabinet, Active Optical Cables are a suitable option to cover 10-15 metres within a row. If lengths are longer and require more flexibility, data centre professionals might want to consider a structured cabling approach.

From a cost point of view, ToR switches used with passive DACs offer the lowest power consumption per port. When compared to structured cabling with traditional transceivers for 100 and 25 Gig, DACs offer 94% and 97% less port power. AOCs with their embedded transceivers consume slightly more power than DACs but still offer less power



➤ Figure 1: Anticipated migration path for enterprise and cloud data centres

➤ Siemon_ High speed interconnects for point to point connections

consumption per port than a traditional transceiver solution.

In terms of scalability and further growth of the data centre, DACs and AOCs can support 25 and 100 Gig switch connections with backwards compatibility. This means that higher-speed switches can support legacy SFP+ and QSFP+ server connections with DACs or AOCs until server speeds need to be upgraded. This is because SFP28 DACs share the same mating interface as SFP and SFP+ solutions used in 1 and 10 Gig server connections, while QSFP28 DACs share the same interface as QSFP+ solutions used in 40 Gig server connections.

Lastly, it is also important to choose a cabling solution that works with any vendor's switch. Whilst standards-based structured cabling is inherently interoperable with any vendor's equipment, the situation with DACs is different since some switch vendors will produce a warning message when third-party cables are being used.

It's important to therefore select third-party DACs from vendors like Siemon that have tested their products to ensure compatibility across equipment from various switch vendors. Siemon also provides samples of their DACs for customers to ensure interoperability with their configurations before they commit.

There is no doubt that data transmission speeds in the data centre are and will continue to increase. But data centre owners and operators can benefit from a range of new transmission technologies already available to implement those speeds with lower power budgets and at reasonable price points.

Selecting standardised solutions will always protect users against the risks of non-compatibility between the different systems in their data centres and aligning this into your designs from the outset is key. As ever, there is never a 'one size fits all' approach, but the good news is that in 2022 - and despite the constant changes – there are great options available.

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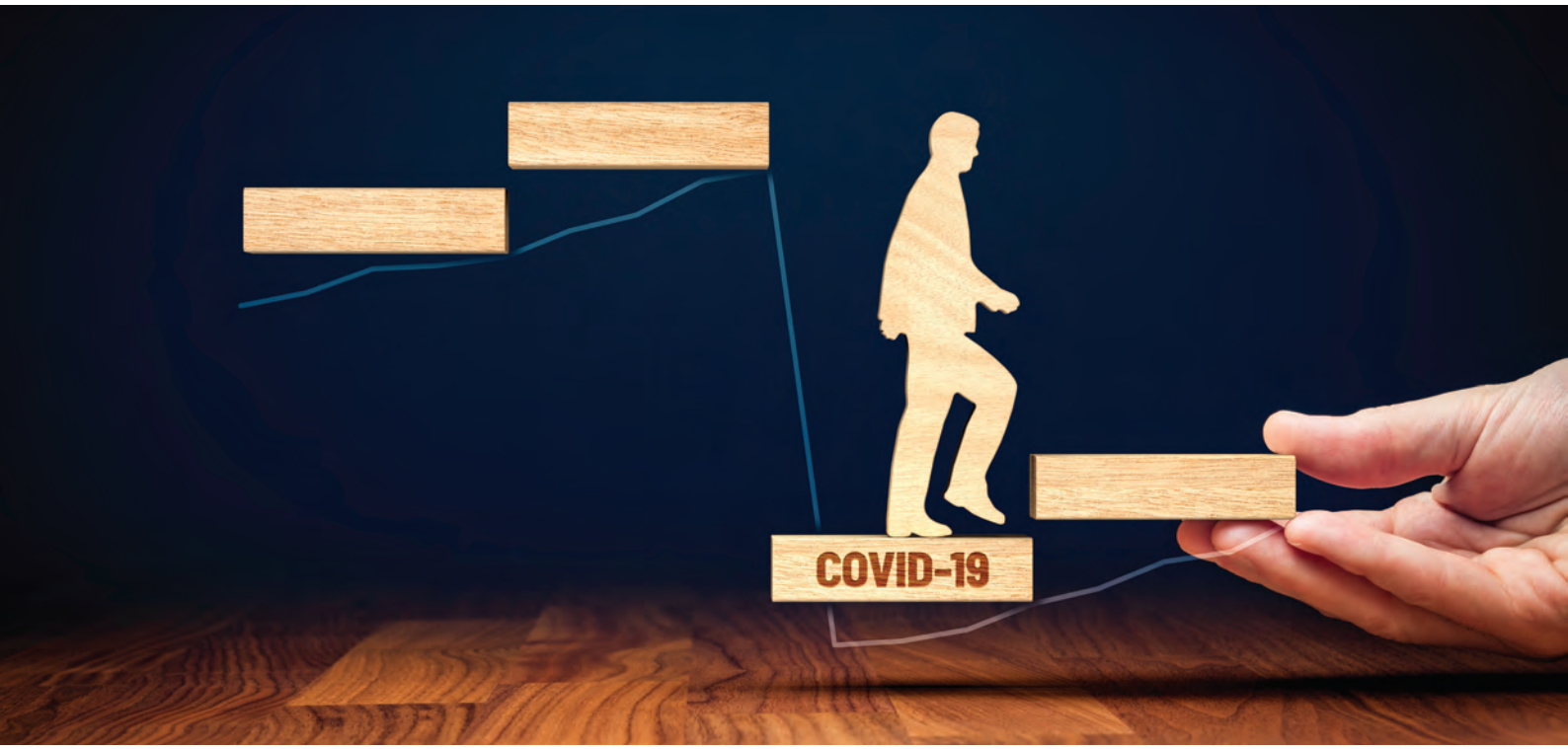


Supply and demand

How data centres are transforming their supply chains.

BY ROWLAND KINCH, CEO, CUSTODIAN DATA CENTRES

AS POST-PANDEMIC supply chains take shape, how can data centres evolve to ensure they have resilient supplies to keep their customers at the forefront of innovation?

Order today for delivery tomorrow. This level of logistical support had become the norm across all industries and sectors, including the data centre space, before the pandemic. The impact of COVID-19 has forced massive change across all supply chains which has led to companies adapting to this new global economy.

Enterprises use technology to drive their businesses forward as a fundamental component of their post-pandemic business strategy. A major part of these strategies is how they manage their data infrastructure. Business leaders are looking to their data centre partners to deliver on-demand bespoke services which in turn are requiring data centres themselves to transform their supply chains. Today, a more holistic approach is required from data centre operators to shape new supply chains, that are more flexible and resilient to change.

Data centre operators have had to carefully assess other aspects of their operations, none more so than their energy supplies. With global pressure on energy generation and delivery, data centres have become creative and strategic, creating new tactics to ensure they have consistent and reliable energy supplies.

As the demand for data centre services continues to expand, new approaches to asset sourcing must form the foundation that data centres can build their new supply chains upon. If a supply chain is unstable, this restricts customers from having the ability to expand their infrastructure.

For example, if additional multiple racks are required quickly for them to grow, supply chain delays could affect this company growth.

Industry Dynamics

One of the starkest impacts of the pandemic on data centres is the drive to enhance their ESG credentials. A greater focus on environmental factors has meant the data centre industry is taking practical action to reduce its environmental impact. One clear method is a root and branch assessment of their supply chains. For data centres, identifying new suppliers with exceptional environmental credentials should be a key driver in order to keep existing customers and to create interest amongst new potential customers.

With the growing supply chain restraints, many operators have had to expand from their existing suppliers to secure the required infrastructure. Looking outside of the usual supply lines can often reveal new potential suppliers that can be highly cost-effective and deliver components via innovative logistical routes. Post-pandemic, data centres must be dynamic and thoughtful in their approach to their supply chains.

Post-pandemic resilience

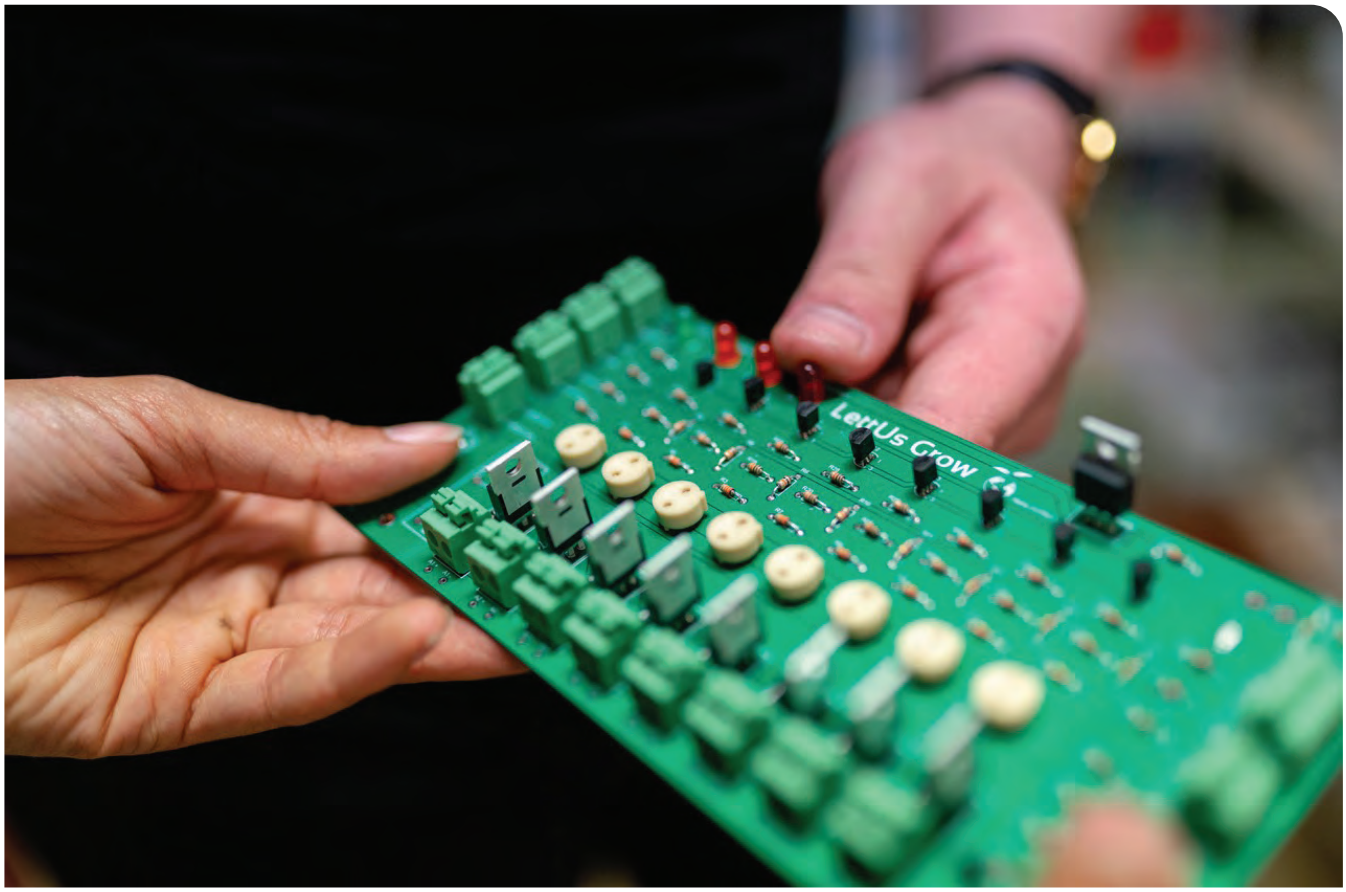
With ordering lead times continuing to lengthen, data centres that may have short-term strategic planning in place now need to think in much longer timelines. Understanding existing and potential tenants' demand curves will enable data centres to become more proactive with their supply chains. A reliance on relatively few suppliers must rapidly change to encompass many more manufacturers and OEMs to create a new supply chain that is far less fragile.

There has been some positives coming through the supply chain delays, with the demand for data and space within data centres so high, customers have taken alternative routes to get their infrastructure live. This has seen a rise in renovated equipment, contributing to a more circular economy and overall less technology equipment waste. Not only will this attribute to the client's overall CSR initiative, but this also allows quick installation, getting their infrastructure live, faster.

There has been some positives coming through the supply chain delays, with the demand for data and space within data centres so high, customers have taken alternative routes to get their infrastructure live

The exploration of suppliers is a practical change data centres can take to improve the resilience of their supply chains. Validating the suppliers that are mission critical to data centres should be an ongoing process, this will reveal any issues with time to react and mitigate the impact of any supply chain breakdown.

The just-in-time approach to supply chain logistics has been a prevailing model for decades. However, as we enter this new period, procurement must be more flexible and dynamic, focusing on a multifaceted approach that will enable data centres to access the supplies needed to remain competitive and deliver world-class services to their clients.



Exploring greener approaches to data centre construction

BILLY DURIE, GLOBAL SECTOR HEAD FOR DATA CENTRES AT AGGREKO, discusses how innovative approaches to temporary power can help mitigate the environmental impact of data centre construction.

IN THE FACE of ever-pressing net zero targets, the European data centre market is redoubling its efforts to move towards greener practice. This has taken the form of a number of innovative developments, such as harnessing renewable energy and free cooling, which have allowed the sector to continue reducing the environmental impact of day-to-day operation.

However, this development has coincided with one of the greatest challenges to date for the wider IT industry. With the recent pandemic serving to usher in a new age of digital dependency, the European population is now more reliant on data than ever before.

Naturally, as demand for data continues to surge, the construction of new facilities is required to support this. Here, it is critical that contractors are aided in their efforts to ensure that data centre construction remains as green as day-to-day operation, in order to promote truly sustainable growth for the sector.

Powering the Build

One of the primary areas of concern during the data centre construction phase is power procurement. Namely, as a grid connection is not always available from the outset, contingency solutions must be deployed to power the build in the interim.
This most commonly takes the form of diesel gensets. However, this raises a number of environmental concerns. The combustion of diesel releases harmful pollutants into the air, including carbon dioxide (CO_2), sulphur dioxide (SO2), nitrogen oxides (NOx) and particulate matter (PM). As establishing a grid connection can often prove a lengthy process, diesel gensets can be used for sometimes months on end, resulting in a substantial cumulative carbon footprint for the project. This poses a threat to the sustainable aspirations of the wider sector.

The Shifting Face of Legislation

The environmental impact of the combustion of diesel is being increasingly recognised by the international community. For this reason, many nations have looked to introduce legislation that places restriction on its usage. The European Commission's Clear Air Package, for instance, was adopted in 2013 with the intention of providing a clean air strategy up to 2030.

At the heart of this development is the Medium

Combustion Plant Directive (MCPD), which aims to limit the emissions of CO_2, SO2 and PM – all of which are primary by-products of diesel combustion. Likewise, the UK has introduced clean air zones or low and ultra-low emissions zones in major cities such as London, Birmingham and Manchester, limiting the use of diesel in both cars and gensets.

Alternative Approaches

The introduction of such legislation has significantly reduced the number of use cases for diesel power in data centre construction. As such, it is critical that contractors are equipped with a wide variety of greener alternatives to continue successfully powering new builds without falling foul of legislation.

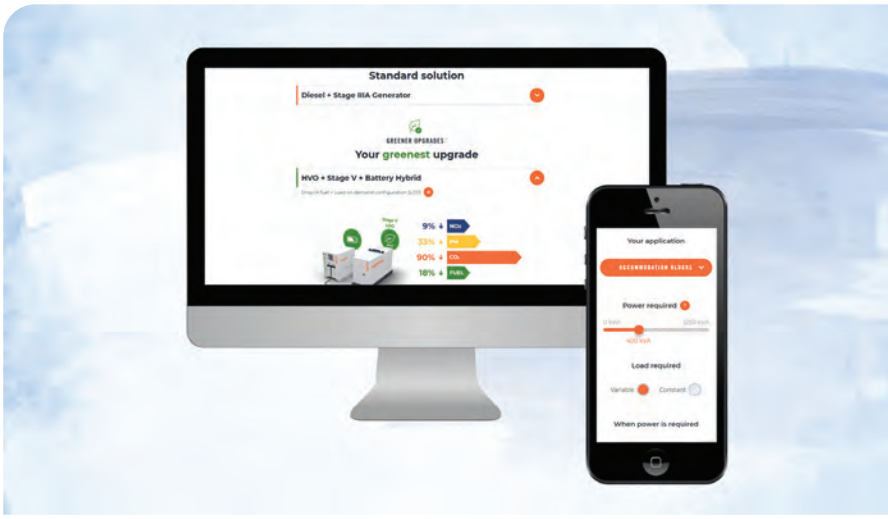
A first port of call here should be ensuring that all generators are compliant with Stage V emissions standards. This technology is equipped with diesel particulate filters, catalytic reduction systems and diesel oxidation systems, facilitating a reduction in all primary by-products of diesel combustion. This makes them fully compliant with the MCPD and fit for use in clean air or low and ultra-low emissions zones.

Moreover, to minimise the use of diesel entirely, contractors can opt to use hydrotreated vegetable oil (HVO) as a drop-in fuel. This can be substituted for diesel in generators, resulting in an immediate reduction in local emissions.

Right Sizing

Another factor to consider here is 'right sizing', which concerns opting for solutions that do not exceed the power demands of the site. For example, research found in Aggreko's Greener Upgrades in Construction: Data Centres, indicates that contingency solutions are often operated at as low as 30% load, with the ideal level closer to 80%. Operating generators at the non-optimal load leads to significantly less efficient fuel consumption, which is detrimental to both the environment and operating expenses. The latter consideration is particularly important, given the rising cost of energy at present.

For this reason, contractors should consider making use of a load on demand system, where a singular generator is replaced by multiple smaller units that scale up or down according to demand. This



allows solutions to be operated at the optimal level despite the fluctuating needs of the site, resulting in significant savings on fuel and energy.

When taking into account a site with power requirements of 200kVA, for example, switching to a hybrid and load on demand package of two 60 kVA Stage V generators can deliver a 50% reduction in CO_2 emissions and fuel consumption.

A Bespoke Approach

Though data centre contractors have been posed with a challenge following the restrictions on the use of diesel gensets, it is clear there are greener alternatives to this technology that will allow the sector to effectively meet demand.

However, it is important to acknowledge that the needs of each site are unique, and that there will not be a one-size-fits-all solution. To support contractors, Aggreko has launched an online emissions calculator as part of its Greener Upgrades initiative. The tool uses the unique power demands of each site to identify a Greener Upgrade™, displaying potential savings in CO_2, NOx, PM and fuel consumption.

By ascertaining the optimum solution for each site, the European data centre market can continue its journey to achieving net zero. Only through an end-to-end approach, spanning construction to day-to-day operation, can the data centre sphere achieve truly sustainable growth.

Moreover, to minimise the use of diesel entirely, contractors can opt to use hydrotreated vegetable oil (HVO) as a drop-in fuel. This can be substituted for diesel in generators, resulting in an immediate reduction in local emissions

How to fast-track the data centre specification process

Today, demands for data center performance, reliability, and sustainability are pushing the boundaries of physical infrastructure designs and with many businesses undertaking complex modernization strategies, the need to simplify the design and specification process has become ever more pressing.

BY ANDY CONNOR, CHANNEL DIRECTOR EMEA, SUBZERO ENGINEERING

KEY DRIVERS of data center modernization projects include the need for greater flexibility, increased resilience or reduced risk, and lower operating costs. However, various legacy deployments lack standardization and need better visibility into the operational environment before such projects begin.

For those that are suffering from high energy costs, stranded capacity, or hotspots, it can often require a complete overhaul of the infrastructure.

For many data center managers, beginning with the end in mind is the simplest way to fast-track the deployment process and by utilizing a data-driven approach, end-users can meet business objectives without risking outages or downtime.

By first assessing the existing infrastructure environment, for example, and utilizing computational fluid dynamics (CFD), operators can identify key areas of concern within their systems and take steps to reduce hotspots, manage poor airflows and address inefficient rack configurations.

Once the existing infrastructure has been assessed, data center optimization initiatives can begin, and end-users may choose to completely replace a legacy system, if the costs of modernization to an old or outdated system outweigh the long-term lifecycle benefits.

Instead, retrofit projects can allow data center operators to re-design the whitespace and improve power and cooling efficiencies within a new containerized architecture. An approach such as this also offers the ability to increase rack densities, optimize performance, and reduce operating expenditure (OpEx).

Key considerations to specify for your infrastructure environment

The truth, however, is that every data center is unique in its design and infrastructure capabilities. Therefore, a key part of any modernization program is the specification process, ensuring that any new mission-critical environment will meet the desired standard from the outset. Here, taking a standardized approach to the data center design and combining it with a detailed structural analysis can pay huge dividends, helping any external partners or consultants to understand the technological choices, and ensure any demanding timescales can be adhered to.

Key areas to document will include the size of the system, its power requirements and its cooling configuration - primarily whether or not the data center will utilize a hot or cold aisle cooling architecture, and the floor type, whether raised or slab, on which it is to be deployed. Specifying containment is also crucial, especially if the project is centered around improving energy efficiency, reducing Power Usage Effectiveness (PUE) and CO_2 emissions, or lowering OpEx.

The benefits of containment systems include improved airflows, maximized whitespace and reduced hotspots within the mission-critical environment. Further, by optimizing a legacy facility with a containment system, end-users can often achieve an average PUE reduction of 0.4, which will have a significant and beneficial impact on operating costs. Other key components to specify will include the number of internal and external support arm tiers, their length, any blanking panels for the racks, and ultimately, any door configurations to accompany the containment system.

Gartner, for example, also predicts that by 2025, data centers deploying specialty cooling and density techniques will see 20% to 40% reductions in operating costs, so optimizing your design and cooling strategy is essential from the beginning of the project.

Build faster and better

The system's structure, ceiling height and type are also important factors to specify, and the width of aisles or any obstructions such as columns within data halls can also influence systems design and configuration. Rack size, height, and color preference must be documented from the outset, and any customized height or color configurations can have an increased lead time. It's essential, therefore, for external consultants to set clear expectations and communicate how any delays to the supply chain may impact deployment times. Many traditional methods for supporting data center infrastructure including containment, power distribution, and cable routing can be costly and time-consuming if not properly designed or specified. They often require structural ceilings, underfloor pathways, and a building that can support the entire weight of the environment. Specifying the load of the system, therefore, is crucial and will influence how the system is designed and configured.

Here pre-configured systems such as Subzero Engineering's Essential Structure can provide a simplified and quick-to-deploy architecture that includes infrastructure conveyancing, support, and containment. Essential Structures such as this can allow mission-critical facilities to be built to scale and in demanding timescales both quickly and efficiently, including all power and cooling components.

Fast-tracking the process

At Subzero, we work closely with customers throughout the design and specification phases, through the manufacturing process and throughout installation and commissioning, ensuring that any data center modernization project meets its business objectives from the outset.

The specification process, however, remains essential to the project. So to help fast-track the process, we've developed a simple questionnaire to start the conversation and to help data center operators specify the critical parameters of their mission-critical environments and overcome supply chain issues.

Following this, our sales team can discuss the specifics of the project with each individual to ensure their needs are being met.
To fast-track your data center specification process and supercharge your mission-critical IT deployment, visit the Subzero website to specify your infrastructure needs.

The vital role Computational Fluid Dynamics (CFD) plays in sustainable data centre design

For data centres to truly succeed at becoming net zero carbon, and become part of the green revolution, their design, directed by CFD capabilities, must be at the core of any energy efficiency strategy.

BY RAMAMOORTHY SETHURAMALINGAM, CFD ENGINEER, BLACK AND WHITE (B&W) ENGINEERING

DATA CENTRES are complex energy-demanding environments. The number of data centres and their energy consumption around the world is growing at a rapid rate. Several trends are shaping future data network electricity use. Global internet traffic, for example, more than doubled between 2017 and 2020 and will possibly double again by 2023 if current trends continue.

By 2025, data centres are forecast to consume more than 2% of the global electricity supply. As such, there's an urgent need to design data centres in a way that makes them as energy efficient as possible, especially as many data centre operators have committed to becoming net zero carbon by 2030. A major part of the total energy consumption in data centres results from cooling servers and related equipment. To ensure cooling can take place in a more sustainable, energy efficient way and help to reduce the total energy consumption of data centres, the complex and critical nature of data centres requires in-depth investigation. One tool that's particularly beneficial in achieving this in data centre applications is computational fluid dynamics (CFD). CFD is the study of fluid behaviour with the help of computers by solving complex numerical algorithms to predict fluid flow and heat transfer. The key role of CFD analysis is to deliver an efficient design solution where a data centre can operate normally and productively at a low Power Usage Effectiveness (PUE).

CFD benefits

By using CFD, engineers can analyse the data centre airflow management and data centre design in much more detail and also at an early stage in the design process. If the airflow and equipment location and selection is not managed properly, this has the potential to result in reduced efficiency of equipment, design capacities not being achieved and possible downtime and, eventually, damaged and inadequate IT equipment.

However, through using CFD in data centre design and particularly early in the design process, data centre operators can save time and money. This is because, through CFD, we can predict the future outcome of design decisions. For example, CFD provides detailed

design insights which can tell you, before the data centre is built and the IT equipment is in place, how key aspects of the data centre and critical equipment will perform. This can enable you to identify potential design challenges to overcome, reduce design mitigations, streamline data centre performance and ultimately assist in improving PUE. At B&W, we have experienced and skilled CFD experts who have tremendous knowledge about the data centre industry which, in turn, has enabled us to deliver very low PUE data centre consultancy projects globally.

The road to net zero carbon

CFD providers understand the urgency of achieving net zero carbon and, this year, they have added additional features to CFD packages which makes net zero carbon targets possible. For example, simulations of the internal and external view of a data centre by using CFD software has become quite common in the datacentre industry, with the rapid developments in numerical models and computational power in the last decade.

Previously, CFD packages only allowed an airflow-management based solver. This year, however, there have been incredibly significant upgrades made in CFD package providers such as 6Sigma. The 6SigmaDCX sets a new milestone in energy efficient data centres by offering a wide range of features to enhance data centre design and operations. At B&W, we've adapted to these upgrades to deliver enhanced view developments which enable users to highlight graphic realistic results in reports, animation creation and faster, more detailed thermal flow analysis of the liquid and air flow routes. Other upgrades in areas such as energy-efficient models and integrated data centre operating systems have also taken the importance of CFD to another level. Energy efficiency should now be the key factor in any data centre design and embedded code for PUE calculation via internal and external CFD simulations are vital to achieving the lowest PUE that is possible. Also, integrating the CFD model into the real-time performance of Data Centre Infrastructure Management (DCIM) is crucial to modifying the head loads location in data centres in order to achieve high energy efficiency within it.

Looking ahead

As computing speeds increase and hardware costs drop, CFD will become more integrated into data centre design and real-life monitoring systems. It will be used in real time analysis to simulate dynamic models of data centres based on the realistic data input from data centres. As the majority of energy consumption in a typical data centre results from cooling equipment, it means CFD plays a vital role in analysing the airflow management within the data centre and reducing the energy consumption in cooling. For data centres to truly succeed at becoming net zero carbon, and become part of the green revolution, their design, directed by CFD capabilities, must be at the core of any energy efficiency strategy.

The time to start your data centre career is now

The need for talented individuals in the data centre industry is only going to grow, as digital transformation and automation continue to become synonymous with the wider professional landscape.

BY ADAM BRADSHAW, COMMERCIAL DIRECTOR AT SERVERCHOICE

DATA CENTRES play an essential role in the digital economy, perhaps best demonstrated by the recent call for industry insights from the Department for Digital, Culture, Media and Sport, to help improve the resilience and security of the data centre industry. Providers underpin the online function of a vast number of organisations and require technical solutions, as well as cutting-edge thinking, to counteract cybersecurity threats and supply chain issues. However, and most importantly, data centre providers also require people.

This reality can often get overlooked. Unlike other businesses where the biggest expense is typically employee wages, data centres spend more on energy bills, but that does not mean there is less of a demand for knowledgeable and talented individuals to help support business operations. The ongoing talent shortage across the board, the increasing demand of organisations to meet digital transformation objectives, and the growing requirement for sovereign data hosting, means there has never been a better time to break into the data centre industry. Many providers are reassessing their recruitment procedures in order to meet all these factors, presenting a huge opportunity for entry-level candidates and those on alternative career paths.

Coming from a non-tech background

Making a career switch is a brave decision for anyone to make, but even more so when attempting to move into the technology sector. Yet the perceived impenetrability of the sector should be no barrier to entry for individuals. There is a high demand for business talent in a variety of positions, from HR to marketing, which can provide a starting block towards a more technologically based role. I began my professional career working in sales but switched early on to start a position as a data

centre engineer at a leading international provider. My current role is more directly focused on the commercial aspect of the business, but the hands-on technical expertise I gained during my time as an engineer greatly heightened my expertise and has driven my career forward.

As digital transformation becomes increasingly intertwined with organisational objectives, the technology industry and data centres now highly value talent with the dual experience of having held wider business positions as well as a technological role in the past. As a result, it is leading to more opportunities for candidates with diverse backgrounds. These individuals are able to share their additional insights, helping to bridge the current skills gap for non-technological organisations looking to take advantage of the rapidly evolving IT sector.

Different career paths

Technical degrees are highly sought after to fulfil many positions, yet the data centre industry is open to applicants from all career paths. Many individuals who have not gone to university have managed to forge a highly successful careers as data centre operators.

University experience is a useful tool for many, but there are higher priorities when assessing a candidate's abilities than a first-class degree. Adaptability is highly sought after, as operators may need to work nights or engage in rapid response disaster recovery, for data centres to continuously underpin their clients' 24/7 digital presence. Similarly, in order to meet uptime standards without affecting a client's experience, capacity for project management is highly sought after.

Seeking expertise

Reaching out to seek advice and mentorship can be a huge asset for entry-level individuals looking to break into the industry. Many in the data centre industry are more than accustomed to watching their family and friends have a blank face when involved in a conversation around data centres, so industry insiders will be more than happy to share their expertise and connections with an enthusiastic individual. There is a lot to be gained by asking to explore the data centre. Witnessing rack configurations or lifting floor panels are highly sought-after experiences that many do not possess. Gaining even a preliminary first-hand insight into how data centre infrastructure works, insights that large portions of society do not have, will make individuals stand out amongst prospective candidates.

By reaching out to seek advice at the preliminary stage of their careers, individuals will also be building their network from the outset. Networks are a huge asset at any stage in someone's career, but any data centre HR professional is far more likely to hire a individual they have spent time with or who comes with a recommendation from another professional, even if they have minimal experience.

Fulfilling demand

The need for talented individuals in the data centre industry is only going to grow, as digital transformation and automation continue to become synonymous with the wider professional landscape. To fuel these demands, the data centre sector is expanding its recruitment criteria and prioritising different capabilities. For entry-level candidates, professionals switching career paths and those without technical expertise, the time to apply for that coveted data centre job is now.

The sustainable path to curbing rising energy prices

Earlier in 2022 marked the beginning of the energy price hike in the UK, when Ofgem announced that prices would increase from the 1st of April this year due to record growth in global gas prices. With much of the UK and central Europe relying heavily on fossil fuels to power heating and cooling, this is a major challenge that businesses both locally and globally are set to face for some time.

BY EYJÓLFUR MAGNÚS KRISTINSSON, CEO, ATNORTH

THE UK is still grappling with how to manage these soaring costs, which are set to impact household incomes at a time when the country is already experiencing a higher cost of living. Data from the UK government's Office for National Statistics has confirmed that the wholesale price of gas was four times higher in January this year than at the start of 2021. And the already limited stocks of natural gas and supply constraints have been exacerbated by social and political unrest in Europe.

The impact of these rising costs will be incredibly widespread and felt from many different directions. In addition to the toll on household incomes, the knock-on effect for UK businesses will be considerable, and the potential this could have on limiting investment and consumer spending could also be demonstrable.

There is no quick fix. While we can't wave a magic wand to increase the supply of natural gas, we can reduce our reliance on fossil fuels. Sustainable and renewable energy infrastructures are critical and the key to curbing the direct impact of rising energy costs.

Examining Both Sides of the Digital Coin

As the great digital transformation accelerates, there continues to be a surge in efficiencies and innovations across all sectors. This move to a more digital world and subsequent increase in the use of digital tech comes with its own energy costs and environmental footprint.

There are currently around 4.66 billion active internet users globally, which will undoubtedly continue to grow in line with increasing population and connectivity. Various analyses estimate that data centres account for 1-3% of global energy production and digital technology represents 4% of all global greenhouse gas emissions.

There is a huge amount of energy needed to power the data centres, servers and networks that sit behind our digital infrastructure and currently, most of these are run on fossil fuels. It's no surprise that there are growing concerns about how power-hungry data centres could be impacted, given energy costs are the common denominator for their successful operation.

As we continue to experience increasing electricity prices across the UK and parts of mainland Europe, we could start to see more enterprises move IT workloads out of the UK to more cost-effective sites. For example, the Nordics offer more favourable electricity prices with better access to renewable energy at stable, cost-efficient prices combined with a colder climate that decreases the amount of energy needed to cool servers and reduce data centre heating and cooling.

The Straw that Breaks the Camel's Back?

This is a much-needed catalyst to drive more sustainable data and IT practices across global businesses today. Sustainability needs to be prioritised by our governments and businesses - unfortunately the growing threat of climate change hasn't been enough to make lasting changes, but the cost savings and operational efficiencies speak for themselves. At atNorth, we try to do our part and support our customers with their sustainability goals through several measures. For example, all our sites use 100% renewable energy, our infrastructure and colocation services are modular so to optimize for cost efficiencies and energy consumption, and our newest data centre in Stockholm recycles the energy outputs to heat the homes in the surrounding local communities.

It is these such measures – big and small – that can make a real difference to the current crisis and more so, the future of our planet. Businesses are wholly responsible for re-evaluating their operations to understand where savings can be made. While it can be difficult to move physical operations such as people and factories, migrating IT operations to sites that have sustainable infrastructures in place is a much more viable option to consider.

The UK Government has set aggressive targets and timelines to transition the country to net zero in the years ahead, but to achieve these goals, it needs to be more forthright in establishing a more resilient and competitive energy infrastructure to underpin this transition. The UK imports almost half of its gas from the international market, but remains one of Europe's biggest users of natural gas - 85% of homes use gas central heating, while gas is also used to fuel around a third of the UK's electricity generation, so rising gas prices equal rising electricity prices.

The Power of Collaboration

As computing power needs increase, we need to work together across our businesses, enterprises, and governments to implement more sustainable business practices. Innovative data centre design, power efficiency, and intelligent colocation and clustering operations can help reduce overall TCO while increasing efficiencies and sustainability in a cost-optimized, environmentally friendly, and scalable and secure way.

These soaring energy prices will have a lasting impact on the sustainability agenda. While businesses may feel unaffected right now due to their ability to bulk buy or hedge against rising energy prices, the reality is that this is not a short-term problem. Sustainability is an issue that our generation and future generations will have to continually manage - it's clear that the UK and Europe need to change their mindset, to be clearer and more aggressive in their actions towards moving away from fossil fuels to avoid being - quite literally - priced out of the market.

Carbon neutral and Net Zero: The new disruptor-in-chief

Bold leadership, new approaches and new results are required.

BY JASON MATTESON, DIRECTOR OF PRODUCT STRATEGY, ICEOTOPE

WHEN WE THINK of market disruptors we typically think of a ride-sharing service like Uber or streaming services like Netflix or Amazon for just about everything else. The term “market disruptor” isn’t limited to products or services but can also include people and ideas. Sometimes it can even be a societal change that forces companies and organizations to reassess how they do business. The climate crisis is creating one such disruption.

Across the financial services industry, global banks and other financial institutions are announcing carbon neutral and net zero initiatives. In simple terms, carbon neutral is the balancing of carbon emissions, i.e. any carbon that is produced is balanced by the carbon that is removed, while net zero is ensuring that no carbon was emitted from the beginning of the process, full stop.

All of the Big Six US banks have announced a variation of carbon neutral and net zero plans in the last 18 months. In addition, the UN-backed Net Zero Banking Alliance was created in 2021. It brings together more than 100 banks from 40 countries to align their lending and investment portfolios with net-zero emissions by 2050. The banks agree to set targets that “identify carbon reductions across priority economic sectors“.

The challenge comes in how to make those targets a reality. One place for financial institutions to begin is in their data center. For any organization looking to meet 2030 carbon neutral targets, decisions being made about data center infrastructure today will have a direct impact on the ability to meet those targets at the end of the decade.

Servers, storage devices, network systems, etc. typically have a three to five year life cycle. Primarily this is to reduce risk and improve performance, but very quickly, the need to meet carbon neutral requirements will come into play. By 2023, data center administrators are going to be trying to figure out what architectures will be required, how their data centers have to be modified to support the next generation, and which technologies will allow them to meet these sustainability goals and objectives.

The good news is there are solutions banks can incorporate today that will make a difference. One solution is precision immersion liquid cooling. Air cooling technologies have traditionally been the default standard for data centers.

However, the limits to air cooling are quickly being reached and air cooling is emerging as a larger portion of a data center's power consumption. Liquid cooling techniques circulate small volumes of a harmless dielectric compound across the surface of the server. This removes nearly 100% of the heat generated by the electronic components. It also eliminates the requirement for server fans and air-cooling infrastructure. As a result, liquid cooling has the ability to reduce infrastructure energy use by 40%, water consumption by 90% and improve pPUE to as low as 1.03.

What happens within the data center, is only one area of concern for financial institutions, however. The Greenhouse Gas (GHG) Protocol is a widely used international accounting tool that divides an organization's emissions into three different scopes. Scope 1 is direct emissions from owned or controlled sources or what the company produces themselves. Scope 2 is indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company. Scope 3 is all other indirect emissions that occur in a company's value chain.

According to Fortune magazine Scope 3 presents the biggest challenge for the financial services industry. "For banks, the most crucial aspect of reaching 'net zero' isn't achieving carbon neutrality in their own operations, known as Scope 1 and Scope 2 emissions, but rather ensuring the businesses they finance are carbon neutral too." The upside is that we are likely to see real, long-term changes occur once investments get tied to these emissions targets.

In some regards, we may be on the cusp of a perfect storm. Carbon neutral and net zero are driving the push towards more sustainable infrastructure. New rules and regulations are likely to be introduced by governments around the world to give these initiatives further weight

In some regards, we may be on the cusp of a perfect storm. Carbon neutral and net zero are driving the push towards more sustainable infrastructure. New rules and regulations are likely to be introduced by governments around the world to give these initiatives further weight. Financial applications, like risk compliance and fraud detection, are pushing the limits of existing technologies and intersecting with these initiatives, opening the door even further for new alternatives, like liquid cooling. All of this requires bold leadership and now is the time for new approaches and new results.

Managing the power

As data centre operators look for better ways to manage energy consumption, **TONY WHITTLE, MANAGING DIRECTOR OF ENEL X UK AND IRELAND,** argues that it is time for data centres to adopt a flexible energy strategy that contributes to grid stability and emissions reduction.

DATA CENTRE OPERATORS have been a driving force for innovation in energy production, management and distribution over recent years. Headline-grabbing predictions about the growing energy demands of data centres have been challenged by the success of the industry in reducing consumption. The fact that energy demand has increased only modestly over the past decade, despite the exponential growth in data and workloads, is no accident. The continued growth of the sector relies on data centre operators satisfying the competing demands of alleviating pressure on the electricity grid, enabling net zero policies, while at the same time responding to the ever-increasing demand for data storage, processing and distribution.

At a geopolitical level, as the availability and price of power becomes increasingly volatile, there is greater urgency to deploy home-grown sources of energy. Implementing a holistic energy strategy that focuses on indigenous renewables can contribute to grid stability and the reduction of emissions. It is also key to achieving national energy independence and decoupling our supply from an unstable external supply chain. The data centre sector has seized on the opportunities to foster innovation in energy management at a scale and speed unmatched by

other industries. Where energy management is not a core competence, working with specialist partners enables data centre operators to develop a more dynamic energy strategy that can mitigate the energy related risks that threaten the resilience of operations. In doing so, data centres support a more secure and sustainable energy future for us all; while establishing a clear path for their own growth.

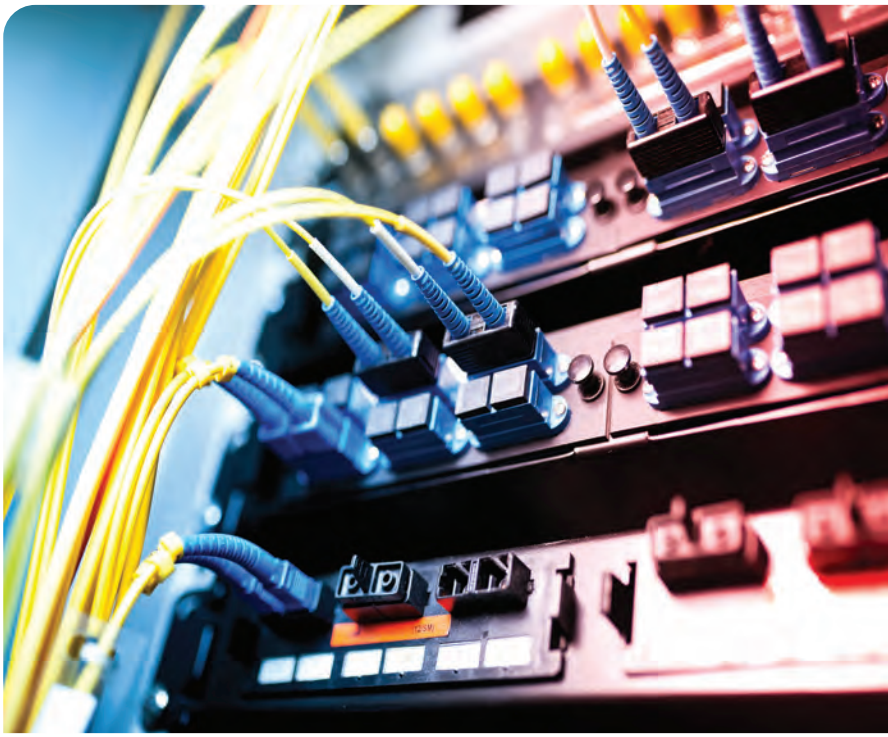
Adopting renewables alone is not the solution. The intermittent nature of renewable energy production can challenge the stability of the electricity grid during times of peak demand. Flexibility has become increasingly important to control the balance between supply and demand and prevent power outages while allowing us to continue accommodating increasing amounts of renewable energy and prevent the need to burn coal or gas when the grid is under stress. In the UK, National Grid's Power Responsive annual report says that demand-side flexibility, implemented through programmes such as demand response (DR), onside dispatchable generation and/or storage are key to a mutually beneficial relationship between data centres and the grid.

Demand response offers data centre operators the opportunity to challenge the prevailing negative media narrative relating to energy consumption by behaving as good grid citizens. The flexibility created by every data centre that participates in DR actively contributes to grid stability and the transition to renewables. While the financial rewards of participation alone make it an attractive proposition, including flexibility in your energy strategy should be considered a prudent measure. DR provides a safe way to test back-up systems while the grid is still available.

As many grid operators around the world threaten, or have already implemented, restrictions on maximum energy use and new grid connections for data centres, preparing now for a seamless transfer to backup systems should a maximum demand threshold be reached, could mitigate any resulting threat to uptime.

Intermittency goes both ways. In the same way as reduced levels of production can threaten the availability of supply, an over-supply of renewable energy being placed in the network can make it more sensitive to sudden changes in frequency and compromise grid stability. Fast Frequency Response (FFR) creates a rapid reduction in demand – under a second in some markets.

Even a very 'short burst' response of a few seconds or minutes helps the grid operator balance the system if it is disturbed. Energy is provided by the data centre's batteries or UPS. Rather than adopting a reactive approach, dFFR (dynamic FFR) takes FFR a step further and continually balances energy between the grid and battery storage. This also maintains batteries and the UPS as a continually functioning part of the data centre – not just a back-up measure, enabling the data centre operator to access the value from the asset.



As commercial, industrial and residential energy use evolves, and ageing electricity grids creak under the strain, data centres can be a vital part of the solution. The adoption of flexible energy strategies that actively contribute towards grid stability and emissions reductions will strengthen the industry's energy resilience and put it on a stronger footing when faced with punitive legislation and energy markets volatility.

Staying cool under pressure: How modern HVAC solutions help data centers avoid downtime

FRANK GRUNDHOLM, VICE PRESIDENT, GLOBAL HVAC AT ABB, explains how today's data center HVAC systems can become more efficient, reliable and intelligent by using modern, data-driven technology.

AVOIDING DOWNTIME is a critical part of operating a data center, as every minute offline costs an average operator around US$5,600, according to Gartner. To reduce the risk of downtime, operators set up multiply-redundant systems and detailed contingency plans – but considerably less attention is often given to heating, ventilation, and air conditioning (HVAC).

Cooling is crucial to data center stability, as overheating – caused by any number of interacting factors from weather to automation or mechanical issues to system faults – can quickly cause data center downtime and even serious damage to equipment and servers. The conventional approach to cooling failure is reactive, leaving businesses at constant risk of downtime, but there's a better option.

Modern, digital solutions enable data centers to address cooling possible failures proactively, leveraging data to understand and adapt the HVAC system for optimal performance. In-depth information on every fan, compressor and pump in the powertrain enables data center operators to overcome vibration, optimize energy usage, cut maintenance costs and avoid fatal failures.

Why efficiency matters

HVAC systems are responsible for keeping the air in the computer room clean and at a consistent temperature and humidity – if it exceeds these bounds for any reason, equipment could trip and the center may face downtime.

In addition to the success or failure of an HVAC system, it is also important to consider its efficiency. Most data center cooling systems are designed to serve peak loads under the worst cooling conditions. However, real world data centers do not operate at these design loads the majority of the time. This means that the system is running unnecessarily hard, wasting energy and wearing out components prematurely.

This inefficiency also has a significant environmental cost. Today, 1% of the world's energy production goes toward data centers, and on average 40% of the energy consumed by a data center is used for cooling. Experts predict that data center energy demand will increase drastically in the upcoming years as more and more daily activities move to the virtual space, so it's essential that operators address data center efficiency issues today. Thankfully, many forward-thinking operators are already taking action to improve the energy efficiency of both IT and HVAC systems.

In an ideal world, the data center's cooling system should adjust to both the load profile and environmental conditions, maintaining high efficiency even at part loads by cooling the computer room using only the required amount of energy.

This efficiency is expressed in terms of power usage effectiveness (PUE), a ratio of the total power consumed by a data center to the power consumed by IT equipment. The more efficient the data center's engineering networks, the closer the PUE is to 1. However, it is important to note that PUE only considers active power consumed by a data

center, and power network inefficiencies caused by electrical harmonics, for example, are subsequently overlooked if using this efficiency evaluation.
The advantages of modern drive-motor packages
At the heart of a data center HVAC system are moving components – fans in computer room air handler (CRAH) and computer room air conditioning (CRAC) units, pumps in chillers and humidifiers, and drives in cooling towers – each powered by a motor. And often there are generators as redundant supply sources should the main utility supply fail.

This is excellent news when it comes to efficiency, as modern variable speed drives (VSDs), motors and generators are significantly more efficient than their predecessors. A VSD enables fine control of a motor's speed and therefore energy use, enabling an operator to adjust it to meet cooling demand at a given time. This is particularly significant for reducing energy use, as operating a motor at half speed only requires one eight of the power.
Simply replacing existing motors with modern equivalents and VSDs can have a significant impact. A modern motor-drive package with efficiency above IE4 or NEMA Super Premium yields an average energy saving of 25% or better compared to using dampers or throttling. In addition to increased efficiency, pairing motors with a VSD provides additional benefits, including protection against overcurrent, overvoltage, motor overheating and overloading, as well as power-loss-ride-through.

A single VSD can also control several fans in array, making the installation more cost efficient and eliminating the need for complete fan unit replacement in the event of a component failure, such as in the in case of EC fans.
We must also not overlook such an important factor in modern drive-motor packages as power quality. Variable speed drives can distort the current and voltage waveform and produce harmonics in the network. This decreases the network reliability and energy efficiency, increasing costs. And as aforementioned, harmonics are not reflected in data center PUE index, which means their effect on the data center's overall efficiency isn't always obvious. Fortunately, advanced ultra-low harmonic (ULH) drive technology eliminates harmonics at the source, leaving the data center network disturbance-free.

Data-rich systems reduce downtime and take efficiency to a next level

To better understand the energy usage, performance and conditioning of their HVAC systems, data center operators are increasingly looking to digital-enabled solutions including motors and drives.

As it operates, the system is constantly reporting detailed information about its condition. Sensors throughout the system collect data on everything from pressure in pipes, temperature, humidity and countless other variables. This data provides an in-depth, real-time picture of the system's performance, and makes it easy to identify the potential for energy savings.

In terms of reducing downtime, it is also significant that this data-rich system provides health indicators for detecting fan pump or compressor bearing failure, increased vibration, blade problems, looseness, unbalance, and drive or motor overheating, enabling the data center operator to take action before a critical system fails.

Maintaining a focus on security

Interconnected systems are naturally more vulnerable to attack than isolated systems, and cloud connection can also add opportunities for malicious actors to gain access – all data center operators are familiar with the risks associated with malware. Targeted attacks on vital systems, such as cooling, can take a data center offline for extended periods of time, so security is paramount.

In line with guidance from data security organizations such as the IEEE and IEC, modern equipment and services should be designed with security as a fundamental feature. For instance, changing a parameter value on modern VSDs requires a password, and remote access tools only establish communication with recognized devices. Data center service providers should also have the ability to store information on system and component performance on local networks. That way this information can be accessed and analysed by the service providers on-site by requesting it from data center facility management, without the need of migrating it to the service provider servers first.

Smart HVAC is the key to uptime

As an essential system within data centers, investing in HVAC is a necessity. Whereas previous systems reacted to cooling load change reactively, modern technology puts data center operators in control. Today, operators have access to in-depth insight into every part of the system, enabling them to reduce energy use, manage equipment condition proactively, and maintain uptime.

How chilled water cooling can help sustainable data centre growth

The good news is that the data centres of the future are set to be even more environmentally friendly, while primed and ready for significant growth. And cooling systems, and in particular, chilled water systems can play an important role in this evolution.

BY ANDREA MOSCHENI, THERMAL MANAGEMENT PRODUCT APPLICATION MANAGER, VERTIV

DRIVEN BY a rise in penetration of high-end cloud computing in enterprises, the rapid digitalisation of all industries and much more, it's predicted that the data centre services market will continue to grow at an unprecedented pace. Indeed, while the market was valued at $187.35 billion in 2020, it is speculated that by 2030 this figure will increase to a massive $517.17 billion.

But in line with this growth, the amount of energy used by data centres also continues to increase at pace. Reports say that the sector now accounts for around two per cent of greenhouse gas emissions globally. So, it's perhaps no surprise that data centres are also looking for new solutions that can meet their ambitious energy efficiency and carbon neutrality targets.

But how do data centre providers align their commitments - to prepare for growth whilst simultaneously ensuring they can meet their green targets? Much of the answer lies in chilled-water cooling systems, which provide a viable way for data centre providers and managers to not only support their growth cost-effectively and with minimal disruption, but also reduce their carbon footprint and help meet sustainability objectives in both the reduction of direct emissions and the reduction of indirect emissions.

An alternative to HFC refrigerants

When it comes to reducing global warming potential of refrigerant, traditional refrigerants are already being replaced by HFO (hydrofluoro-olefin) refrigerants. While this represents some progress, this route isn't ideal for all the data centre applications. Indeed, most of these new refrigerants are classified by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) as mildly flammable therefore requiring a new design for the cooling system, potentially impacting the broader data centre design.

Chilled water systems offer an excellent solution to this issue as the refrigerant is contained within chiller units and, in most applications, these are installed outside of the data centre, thus simplifying the use of flammable fluids.

Chilled water systems are one of the first cooling technologies to apply low GWP refrigerants in data centre applications and therefore are an example of a valid alternative for reducing direct environmental impacts. They also play a vital role in the reduction of the indirect emissions (cutting energy consumption). In recent years, they have applied a range of cooling system efficiency improvements that allow a reduction of electricity usage.

An evolving solution

The good news is that developments in this arena are happening all the time – delivering more efficiencies and greater benefits to providers. For example, over the past few years, ASHRAE has increased the recommended operating temperature of data centre equipment up to 27OC – allowing subsequent increases to the water temperatures within chilled water systems and enabling an extended use of freecooling chillers, even in countries or climates where freecooling was not previously feasible. Freecooling technology has an important advantage as it does not require the activation of the compressor.

Adiabatic technology can also improve the efficiency of a chilled-water system. In these solutions, the ambient air is cooled down by passing through wet pads. The air is then delivered at a lower temperature, achieving a higher freecooling capacity of the chiller and a more efficient operation of the compressor. The core of this solution is the onboard controller of the unit; it enables the use of water whenever strictly needed, according either to redundancy, efficiency or cooling demand needs. The controller has the main responsibility in preventing water from being wasted, improving the WUE (water usage effectiveness) of the data centre. The application of water is always a matter of balancing different aspects and constraints.

And even more improvements to data centre efficiency can be made through the optimisation of chilled-water systems controls. Chilled plant manager technology can coordinate the ope ration of all the units and main components of the chilled-water solution. It allows an integration and coordination of the working mode between units and the main components, enabling improved efficiencies and performance at partial loads or, in the unlikely event of failure, finding the best way to react and grant cooling continuity to the system.

The future is bright

So, the good news is that the data centres of the future are set to be even more environmentally friendly, while primed and ready for significant growth. And cooling systems, and in particular, chilled water systems can play an important role in this evolution.

They allow owners and operators to develop new data centres that are more efficient by addressing both direct and indirect emissions, which are factored into the total equivalent warming impact (TEWI) metric. The ability of a chilled water system to drive down both direct and indirect emissions allows critical facility operators to achieve a low TEWI.

Chilled water systems also effectively balance water and energy usage for efficient cooling systems to support a low water usage effectiveness (WUE). The combination of low TEWI and low WUE makes chilled water systems one of the most sustainable choices for data centre thermal management in terms of energy and water efficiency. These systems have been adapted to follow the evolution of data centres to non-raised floor designs and can help facilitate the transition to liquid cooling.

And we're not alone in this view. Many hyperscale and colocation providers are already embracing the opportunity chilled-water systems present, not only from a cost and speed of deployment perspective, but with sustainability front and centre.

This needs to continue as we move into the next phase of the race for expanding capacity and improving the data centre carbon footprint. With such rapid expansion and increasing pressure to achieve net zero, data centre providers must rely on new technologies to meet the requirements of both today and tomorrow.

DCA Data Centre Energy Efficiency SIG

By DCA CEO Steve Hone

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

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

The DCA Energy Efficiency SIG

The DCA Energy Efficiency SIG has members that sit on the EU and UK Standards Development Organisations and provides a two-way conduit for the discussion and development of the ISO TS 22237 series, the EN 50600 series and the ISO 30134 series of data centre design, build and operate standards and data centre key performance metrics.

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

This SIG looks at emerging concepts for the sustainability of the data centre building in terms of energy flexibility and waste heat reuse as well as alternative on and off-site energy generation for primary and backup purposes. This year the SIG has produce a Data Centre Energy Efficiency Guide which is available here

The group work very closely with the sustainability group to provide DCA members and Partners with an entire overview of data centre energy efficiency and sustainability.
To request to join this group please contact the DCA - mss@dca-global.org

Energy Consumption / Energy Efficiency In Data Centres

By Mike Goodwin, Partner Dunwoody LLP

DATA CENTRES consume power in what is commonly grouped under 2 headings. IT power and Systems Supporting the IT operation.
The primary measure of assessing energy in data centres (Energy Efficiency) is commonly focussed upon the PUE value whilst this can provide an indication, it does not provide the full understanding of a good facility.

The principle consideration is the measure of the parasitic component and not the base 'I' value of IT power, it is also correctly titled as Power Usage Effectiveness and does not call itself an efficiency matrix.

Whilst focusing on the smaller parasitic element, the power consumed by the IT installation also needs to be considered and improved. Most facilities would have improved their IT efficiency by undertaking operational assessments and optimised their systems but an assessment of processing efficiency, processing output per kW consumed would be beneficial. Many ongoing studies are considering this element, one being RISE (the Research Institute of Sweden).

However, significant quantities of energy are consumed in the IT process and supporting the IT process.
Entropy's first law is that power cannot be destroyed, and that it only changes state. For example, lighting installations convert electricity into light and heat and both enter the Universe, and are summarised as Entropy.

The goal is to produce a low energy data centre, highly efficient and emitting no carbon to the Atmosphere and many are focused on the generation of Carbon Free Electricity to achieve this. This generation of electricity by wind farms, PV panels, tri-generation etc is commendable but can be considered as offsetting and not correcting or improving and is therefore a global contribution or tax on operation. Is this the best method of progressing and how do we address the heat rejection that continues to occur, Entropy?
Heat is only waste if you don't use it. Keynes (Economic Thinker) discussed the Neutrality of Money. It is the Store of Value linking different people at different times. It removed the bartering system of one on one transactions and permitted transferable transactions.

Energy should be considered a commodity with value, that needs to be made available as a transferable product.

The most commonly discussed solution considers instantaneous complimentary events e.g. waste hot air – adjacent

green houses and require simultaneous supply and demand. These solutions are few, often of differing magnitudes and only occurring simultaneously on few occasions. The optimum solution is most likely found in developing phase change systems.

Phase change systems are common place in data centre environments. They are present in the refrigeration cycle where refrigerant gasses change from liquid to gas absorbing and releasing energy at different stages of the cycle. They are present in evaporation / adiabatic systems where water evaporates that is liquid to gas, phase change.

Elsewhere there is the development of this concept to the use of Novec within immersion cooling systems. The adoption of Heat pipes (thermal cooling) where heat drives the refrigeration cycle without the use of compressors.

These systems remain within the boundary of the data centre.

However, to address the transferability of energy we need to consider the medium, gas, liquid, electricity, other, the location of the conversion plant and the transfer of energy to that location. Heat to electricity for use on site would be the first choice, this benefits from omitting any distribution losses and links availability and demand, however the likeliness of converting heat to electricity at an on-site conversion plant is currently extremely low.

The way forward therefore requires water or air transmissions – water with its greater density and higher specific heat value leads in the choices. We then need to understand the temperature we can transmit and consider the "grade of heat", the higher the temperature the greater the use and the less water we need to circulate, but potentially introduces high distribution losses.

Capturing the IT process, heat at the highest temperature via water jackets / in rack heat exchanges or by immersion systems is good. Extracting heat from any refrigeration cycle at the hot gas stage of the cycle has the potential for high grade heat recovery, and capturing heat through hot aisle containment is also a possible but a lower grade solution. Elevating the heat to a transferable commodity can require a further process of using heat pumps. Within these actions a number of phase changes are occurring along with increases in grade (quality).

Once hot water is available, it can be applied to further applications – District Heating, a direct transfer, or one day possibly used as part of a Hydrogen production plant, generating Hydrogen from water, a phase change and a more fully transferable solution.

It's only Waste if you throw it away. The issues remain

- Entropy constantly grows.
- Off set electricity still leaves surplus heat
- Use of surplus heat reduces someone else's carbon emissions

Rethinking Efficiency: How Hardware Assessment Saves on Cost, Carbon and Energy

Rich Kenny, Managing Director - Interact

HOW CAN data centre owners and managers assess their energy and carbon efficiency, improve financial performance and report this accurately to their customers and stakeholders? Rich Kenny, Managing Director of Interact, takes us through how accurate analysis of the server hardware can provide valuable savings on energy, carbon emissions and costs.

No-one likes bad press, and no-one likes increasing costs. As a high energy user, the data centre sector seems to be on the receiving end of both at the moment. Rising energy prices are an additional reason to do more with less. This is against the backdrop of the race to Net Zero, which is becoming faster and more intense.

The digital handprint – the carbon and energy savings technology can facilitate – is potentially larger than any other sector. However, growth is increasing its footprint at the same time. We need to demonstrate that we are delivering the highest computational output we can with the lowest energy draw. That begins by measuring what the machinery is doing and carrying out proper analysis of the hardware. By hardware, I mean the servers, which are responsible for the highest energy draw and for too long have been considered the black box no one dares open.

The data conundrum

There is an ironic lack of data in the data centre sector. For example, we have no absolute figures on how many UK data centres there are and no absolute definition of what a data centre is. Given this, there is no agreed upon figure of the exact energy usage of the sector in kWh.

Estimates exist based on the mandatory reporting for large energy users. Small and medium sized facilities, government and public sector data centres, those run by universities, enterprise and telecoms have not been historically captured. Even legislation such as Streamlined Energy and Carbon Reporting only requires an overall energy usage report, not anything that relates to the data centre share of this. The alternative path of estimating by data transfer is no less illuminating. Internet exchanges record spikes and growth in traffic but have no way to capture aggregated network energy as a result of internet use and data streaming, nor internal data transfers within organisations. The macro picture is pretty opaque. So, we need to look at the energy usage of individual data centres and groups for detail on how we make efficiency gains.

Stripping back to first principles

Servers are the machines that power the digital revolution, and their energy draw is significant. The IEA estimates data centres use around 1% of the world's energy. 65% of that energy

draw at least is as a result of the servers; 100% is because the servers exist. The best way to reduce overall energy draw is to reduce the number of servers whilst simultaneously maintaining or increasing compute power.

You do this by analysing the energy usage and energy efficiency of each make and model of server in the estate and either replacing or modifying the worst performers with specific makes and models that improve performance. You can also use this information to select the least carbon intensive location to run workloads if you have multiple sites.

Assessing the impact of software operations within the data centre is a huge challenge and requires understanding the energy draw on the physical servers as a starting point. From there, you can make calculate on energy draw associated with virtualisation, containerisation and the like.

Outsourcing the issue

Cloud service providers are improving their ability to articulate cost and energy savings for customers using their services. They are publicly reporting their own energy and associated carbon usage and demonstrating reductions. However, it is difficult for stakeholders to understand the intricacies of this.

Power Usage Effectiveness (PUE), Carbon Usage Effectiveness (CUE) and water usage effectiveness (WUE) are all ratios across the entire business. However, their data on the server estate is vague and imprecise.

Without understanding how much of the estate is idle, how much is overprovisioned to cater for traffic spikes and how far the facilities are from each other (so how much energy is lost in data transfer), it is difficult for customers to understand the precise impact of their digital usage. If they want accurate data, they need to know the physical server utilisation, efficiency at that level of utilisation and physical location where it is operating. These measurements will give a realistic figure of how much compute the server is giving for the energy that is being drawn. They will also tell users how carbon intensive that energy draw is.
Doing your homework

General best practice on IT is to understand what the hardware is doing first and then build up from there. Hardware draw feeds virtualisation, containerisation and application choices. All of these later will have an impact on the energy draw, but the hardware is the base layer you need to understand first.

The Server Energy Rating Tool (SERT) by SPECpower is the accepted benchmark for energy star rating for server manufacturers. This measures a variety of workloads and applies a geometric mean to them in order to produce a standardised metric of performance per watt. It is a great starting point but does not allow for direct comparisons of real-life server estates.

The next step is to run software that analyses energy draw of each server and collates this into a complete picture of the server estate, where utilisation, configuration and PUE are factored in. Interact is the only solution on the market that does this. Interact combines the published data from SPEC with thousands of hours of benchmark tests carried out by the research team. It identifies the worst performing servers and suggests a series of replacements for energy or cost optimisation over time.

The methodology has been validated by a peer-reviewed study in Elsevier's Sustainable Computing: Informatics and Systems and represents the first opportunity for data centres to ensure hardware is providing the lowest energy usage for unit of compute power. The team, co-funded by Innovate UK, also published a ground-breaking paper in the IEEE Transactions on Sustainable Computing called Optimizing server refresh cycles: The case for circular economy with an aging Moore's Law early in 2021.

Savings are eye watering: Interact analysed over 120 Data Centres in 2021, resulting in recommendations that average 5-year savings of £880,000 and 8.3m kWh per data centre and a reduction of 2,800 tonnes of CO2e emissions during use phase.
Large cloud providers, credit card providers and colocations are beginning to use it to optimise their server estates because the software offers them a scientifically verified method of optimising the hardware whilst at the same time report energy and carbon usage. Applications for data centres include optimisation of sites and consolidation of sites.

Managed service providers can pass on the savings to their customers to increase market share. For large international operations, the application is more around deciding which workload to migrate to which part of the world. Drawing the best value from IT hardware on a single site and across locations is one of the most beneficial things the world can do for sustainable digital growth. Software like Interact enables us to do this.

Cloud service providers are improving their ability to articulate cost and energy savings for customers using their services. They are publicly reporting their own energy and associated carbon usage and demonstrating reductions

Six Simple Yet Effective Ways to Optimize Data Centre Energy Efficiency

By James Giblette, Director of Digital Infrastructure - UK & Ireland, Legrand Data Centre Solutions

IN THE CURRENT DIGITAL AGE, it is expected that data centres will continue to rise in both power consumption and complexity. In fact, it is predicted by IDC that the global datasphere will have expanded to 175 zettabytes by 2025. As the age of big data continues to grow, the challenge for data centre operators will be to discover how they support additional data whilst also meeting targets like those set out in the European Green Deal, an initiative to achieve climate-neutral, high-energy efficient, and sustainable data centres by 2030.

So, what can organizations do to reduce energy wastage in the data centre and meet sustainability initiatives? Here we review six core areas for consideration.

1. Power monitoring and measurement

It's so cliché, yet so true: You can't manage what you don't measure. The growth in data has resulted in an increased challenge for many in how to manage data centre power usage. Intelligent rack power distribution units (PDUs) can help address these challenges by allowing you to identify rack power consumption at the inlet, outlet, and circuit breaker level. Inlet metering is crucial for determining overall server power usage and availability at the rack. Metering at the outlet can help you understand the power consumption of a specific device or server, and metering at the circuit breaker provides early warnings if a circuit becomes heavily loaded and runs the risk of tripping.

Intelligent PDUs offer granular remote power monitoring of current (amps), voltage, power (kVA, kW), power factor, and energy consumption (kWh) to +/– 1% accuracy, providing you with the most critical information to help your data centre remain stable and efficient.

2. Identifying underutilized or idle servers

According to a recent survey by the Uptime Institute, approximately 30 percent of global data centre servers are either underutilized or completely idle. Idle servers are troublesome for the simple fact that they are inefficient and in large numbers can be highly expensive. Fortunately, intelligent PDUs with outlet level metering can help you to determine which servers are currently underutilized or inefficient and better understand how a specific server (or device) is consuming power. Through detailed power consumption metering, you can not only effectively monitor usage, but you can ultimately reduce your costs throughout the entire year.

Locating and correcting an idle server is made easier when you combine a DCIM solution with your intelligent rack PDUs, which will give you real-time insights into your data centre's assets. From owners to location, application information to power utilization trends, the DCIM software allows you to analyse all of your intelligent PDU data through a single pane of glass. By using the DCIM you can easily identify where you have an idle server.

3. Deploy environmental sensors to your racks

With the IT industry's increased focus on remote operations, more rack PDU manufacturers have begun offering environmental sensors. These include sensors to measure rack air temperature at the server inlets, as well as the humidity, airflow, vibration, smoke, water, and air pressure. Some PDUs may have pre-installed sensors; while others provide for optional, plug-in external sensors. Another approach is to deploy a completely independent intelligent sensor management solution, which provides an all-in-one intelligent device, with the minimum change required to the configuration of existing power distribution or IT infrastructure.

Coupling environmental sensors with intelligent PDUs answers the call for efficiency. Here's why:

- Ensure uptime by monitoring racks for potential hot spots
- Save on cooling by confidently raising data centre temperatures
- Maintain cabinet security with contact closure sensors
- Improve data centre availability by receiving environment alerts
- Make strategic decisions on cooling design and containment
- Set thresholds and alerts to monitor onsite or remote facilities

Sensors are an easy-to-install, cost-effective way to reduce energy costs, improve reliability, and increase capacity for future data centre growth. By using environmental sensors, you can optimize your data centre ecosystem to ensure that you are

The cooling setup in a server cabinet has a big influence on the PUE: a lower PUE results in lower total energy consumption of the data centre

meeting equipment guidelines, reducing operational costs, deferring capital investments, and improving your power usage effectiveness (PUE).

Additionally, Asset Management Tags (AMTs) and Asset Management Sensors (AMSs), provide data centre operators an accurate, automated, real-time inventory of all IT assets and their locations, down to the 1U level. Integrated with DCIM software, you can easily track assets, determine capacity in several areas, and manage adds, moves, or changes.

4. Implement remote power control

You wouldn't leave the lights on at home all day while you went to work, so why leave IT equipment that's not mission critical on during nights and weekends if no one is going to be using them? Test and other non-production servers can often be powered off to conserve power during non-peak hours. To begin a remote power cycling program within your organization, start by metering your current servers to determine the most common times during which they are not in use.

An intelligent PDU with the right capabilities will: A) Only perform a graceful shutdown of equipment to eliminate the risk of data loss or corruption, and B) Allow you to power cycle equipment with one or more power feeds on or off in a set order to minimize the risk of setting off a breaker due to an excessive inrush current.

5. Optimize airflow management in server cabinets

The cooling setup in a server cabinet has a big influence on the PUE: a lower PUE results in lower total energy consumption of the data centre. It is therefore extremely important that air leakage and recirculation is minimized so that the cool air is guided exclusively through the IT equipment. To do this, the space between the frame of the cabinet and the steel profiles must be perfectly sealed.

Airflow management packages can be used that consist of a bottom, top, left, and right plate. These plates connect the cabinet with the profiles in which the IT equipment is installed. Special accessories have also been developed by leading cabinet manufacturers to perfectly seal the spaces between the cabinets. Properly applied airflow management will bring forth higher efficiency and will lengthen the life span of your servers.

6. Remote working and the shift to the cloud

According to a recent Gartner report, by the end of 2023, more than 90% of infrastructure and operations (I&O) organizations will have the majority of their staff working remotely. This shift towards 'anywhere operations' challenges the traditional thinking of providing infrastructure and supporting operations from one central location. Enterprises now require remote power management solutions that enable staff to control data centre IT devices from multiple remote locations.

A further Gartner report, states that by 2024, more than 45% of IT spending on system infrastructure, infrastructure software, application software, and business process outsourcing will shift from traditional solutions to the cloud. The result is what Gartner calls 'cloud shift.'

Organizations can often benefit from the cloud provider's more energy-efficient infrastructure and presumably more optimized environment but many also fear the loss of access to their systems. The reality is however that a growing number of colocation providers can provide access to data centre power monitoring software so that clients can be sure they're being billed for actual power usage. Working with a colocation provider that allows clients to build out their racks and include KVM-over-IP switch access for remote administration will give organizations peace of mind that they still have access that's just like being at the rack.

Conclusion

Reducing carbon costs and energy consumption within the data centre is at the top of many organizations' sustainability, CSR, and efficiency agendas, in order to achieve the European Green Deal's goal of making data centres climate neutral by 2030. Adopting one or more of these simple energy-saving initiatives in your data centre can be made quickly and economically and could see your IT energy wastage drastically improve.

James Giblette is Director of Digital Infrastructure - UK & Ireland at Legrand Data Centre Solutions, which includes the Raritan, Server Technology, and Minkels brands. An expert on data centre solutions for the white space, James has 25 years of experience in the IT industry.

DCA Energy Efficiency SiG Update June 2022

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

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

The EE SIG published an energy efficiency guide to coincide with Data Centre World 22 back in March and it can be downloaded from https://dca-global.org/groups/profile/4315/the-dca-energy-efficiency-sig.

The Energy Efficiency SIG is the first port of call for all thing's energy related in the Data Centre and works closely with other SIGs such as the Sustainability, Thermal Management, Commissioning and Certifications Groups.

In this update we'll provide the latest information on current standards, impending standards, an overview of the Climate Neutral Data Centre Pact and its relationship with the EU Code of Conduct for Data Centres and the European Commission.

Current Standards

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

The Current Published Standards portfolio is listed below but is also contained in the DCA Energy Efficiency Best Practice Guide, as is our usual practice, standards are listed globally, regionally and then nationally, additional guidance such as industry best practices are listed at the end. It should be noted that standards development has not been curtailed by the Coronavirus pandemic, but activity has definitely slowed, most meetings now take place virtually but that we expect things to get back to normal by Q4 2022

Global

ISO 30134 Series – Data Centre KPIs

ISO TS 22237 Series – Data Centre, Design, Build and Operate (EN50600)

Regional

EU Code of Conduct for Data Centres (Energy Efficiency) – 13th Edition

EN 50600 Series

EN50600 – 1 General Principles

EN 50600 -2 Building Construction Power Supply and Distribution, Environmental Control, Telecommunications Cabling, Security systems

EN 50600-3 Management & operational information

EN 50600 -4 Data Centre KPIs (ISO 30134 Series)

EN50600-5 Data Centre Maturity Model

EN 50600 Technical Reports

TR-99-1 Energy

TR-99-2 Sustainability

TR99-3 Guidance to the Application of the EN 5060 Series

Impending Standards

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

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

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

Climate Neutral Data Centre Pact

The Climate Neutral Data Centre Pact was announced in late January 21 and at the time of writing consisted of 22 European Data Centre Trade Associations and 72 Data Centre or Cloud operators agreeing to adhere to 5 pillars, being energy efficiency, clean energy, water, circular economy and circular energy systems. The methodology and reporting requirements are still yet to be agreed with the European Commission, but the DCA has input into these discussions

via the EU Code of Conduct for Data Centres (Energy Efficiency) committee and via the DCA's relationship with the EUDCA and will report progress at the next EE SIG meeting or via the Newsletter.

DCA SIG Energy Efficiency Guide

The energy efficiency guide was published in March 22 and to be honest is now out of date, a revision will be drafted and present to the SIG at the next meeting.

EU Taxonomy/Corporate Sustainability Reporting

The EU Taxonomy regulations are now in force and requires an independent 3rd party audit to be carried out every 3 years (EU Member States) to some parts of the EUCOC, this as you can imagine has caused some angst in the DC community, with the result that meetings to discuss the issue were called in May by DG CNCT.

The end result of these meetings was that a "Technical Committee" would be set up under the auspices of the TIC Council, more information on the TIC Council can be found on their website https://www.tic-council.org/ to develop an "auditable" assessment framework for use by auditing bodies to assess applicable data centres against the requirements of the EU Taxonomy regulations, this in turn would be overseen or married with a "Steering Committee" chaired by the EU-JRC. Both committees are expected to have developed an auditable assessment framework by Q4 2022. There is also a revision due to the EU Energy Efficiency Directive, this has been substantially "beefed up" as a result of the EU Green Deal and will no doubt be further amended as a result of the Ukrainian/Russia War, currently there is a proposal for a mandatory data centre registry to be set up in each members state and applicable data centres will be required to report energy consumption, origin of energy (% of renewable energy), water usage, and waste heat reuse. You will note the overlap between these proposals and the pillars of the Climate Neutral Data Centre Pact. The EE SiG will keep a very close eye on the CNDCP, EU EED and EU Taxonomy regulations.

There is also a revision due to the EU Energy Efficiency Directive, this has been substantially "beefed up" as a result of the EU Green Deal and will no doubt be further amended as a result of the Ukrainian/Russia War, currently there is a proposal for a mandatory data centre registry to be set up in each members state and applicable data centres will be required to report energy consumption

Looking forward

Data Centres and Electricity have a unique, almost symbiotic relationship, data centres certainly cannot exist without electricity in some form, but in the future, where the electricity comes from will be an interesting debate, will it be on-site generation using renewable energy (wind, solar, biomass) or hydrogen networks with the associated fuel cell plant or the old fashioned direct utility connection or something else, no one knows for sure, but you can rest assured that the DCA EE SIG will be keeping an eye on it.

The regulatory regime looks to be getting tougher, more reporting and perhaps more carrots and sticks may be in the offing, the collection of data from data centres in terms of energy use, the origin of that energy, water usage and the use of waste heat data will allow policy makers to target the data centre sector like never before, this could develop into something like the Large Combustion Plant Directive (LCPD), essentially allowing a period of operation (LCPD was 20,000 hours) before measures are installed to reduce consumption, in the LCPD, it was the installation of Carbon Capture & Storage, but it did cause older more inefficient coal-fired power stations to close (most of the coal-fired power stations in the UK did close, but it did allow us to meet our climate goals and decarbonise the grid). However, now we are no longer part of the EU it remains to be seen if the UK will adopt or propose similar legislation for our market.

Conclusion

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

The DCA Workforce Capability & Development SIG

Steve Hone DCA CEO

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

The DCA currently facilitates nine Special Interest or Working Groups. DCA members (non-members are allowed at the discretion of the Chair) can join any of the groups and contribute, find out more here: https://dca-global.org/groups The DCA Workforce Capability & Development SIG is co-chaired by Steve Bowes-Phipps PTS Consulting / DCA Advisory Board and supported by Adelle Desouza Higher Hire / DCA Advisory Board.

About the SIG

As reliance on digital services continues to grow our industry needs to become far more effective at promoting Data Centres as a career destination. It is simply not just engineers at the coal face which are needed but a talent pool across the full supply chain; if we are to stand any chance of having the resources needed to match future demand in our sector.

The DCA's Workforce Capability & Development Special Interest Group was formed to provide a collaborative forum for the exchange of ideas and strategies on how the data centre sector can broaden its appeal and attract the skill set it needs. It you would like to contribute by becoming a part of this Group please get in contact.

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

What role does talent play when it comes to building a sustainable data centre industry?

By Adelle Desouza, DCA Advisory Board Member and Higher Hire

ATTENDING last month's DCA Datacentre Transformation Conference was a breath of fresh air (excuse the environmental pun). Not only was it 'in-person' but the desire for the industry to evolve was palpable amongst the delegation. Industry professionals gathered with like-minded academics and local students to discuss, debate and deliberate on what change the UK data centre industry must undergo to future proof itself.

Sustainability was on everyone's minds and this was reflected within the programme. From open discussions on the measures organisations could adopt to debating whether the government needed to step in, I am convinced it was an event that will produce change.

One area that piqued my interest was the understanding and agreement that talent had a role to play. With 85% of delegates stating that their organisation would be the perfect environment to welcome young talent - is young talent the answer to our prayers? The introduction of diversity of thought, from those with fresh ideas and a different outlook when it comes to sustainability, a generation starkly aware of our environmental commitment to the planet. Now if the answer is yes, with less than half of the companies present offering opportunities for those in their early careers, questions quickly turned to barriers and more importantly how to overcome them.

What is preventing young people from joining the data centre industry?

One in three cite awareness as the main barrier to young people joining our industry. So the question becomes who's role is it to promote the industry. With calls for subject matter to feature within the national curriculum. The department of education regularly engages with industry professionals and research academics to ensure a modern and relevant programme of study is available, but how often can we expect this to happen? If we are being honest with ourselves, our industry changes so much in a 5-year period. Having said that highlighting the impact our industry has on the modern world in a classroom setting does create instant awareness, so much so that without it students who joined us just last month, only found out due to a guest

lecturer on campus. With almost every secondary school in the UK engaging with the gatsby benchmarks in line with their OFSTED assessments, could this be the way to start the revolution when it comes to careers education. If so, we must standardise our story to deliver an on-brand message to the absorbent yet inquisitive minds of the next generation.

In defining our story and what it is we want to be known for as a workplace for the future generations, we do have to look inward and ask are we realistic in our expectations? Ranging from career progression and development right through to remuneration and compensation packages. Today's generation are facing a cost of living crisis like no others in recent times, yet more and more companies are offsetting low starting salaries for the promise of training and career progression. May I remind you of Maslow's basic hierarchy of needs, career progression promises do not pay this month's rent, and even if they did, often they do not materialise.

The other factors discussed at the annual event organised by The DCA, gave weight to the role of mentoring, coaching and the prevalence of unconscious biases, of which the former gained 22% of the audience's recognition as a barrier to entry.

We need to create a sustainable recruitment and retention strategy across our industry and in doing so we will produce an industry brand reputation that is like no other. We have a USP, the daily lives of every young person in the UK today relies on the existence of our industry. Without data centres, there is no social media, no online banking, no remote learning and no streaming services. In preparing our brand for the audience we wish to attract we must act now. Einstein famously said that the definition of insanity was doing the same thing over and over again expecting different results. Now is the time to stop just talking about the demographic disparity our industry possesses but rather to act, otherwise things will not change. The talent is out there, leaving school or graduating from university every 12 months.

So, ladies and gentlemen this is a call to arms, for all of those who are members of the Trade Association to let The DCA know if you offer early careers opportunities. You are ahead of the curve, and we want to celebrate and promote that. We have taken your feedback on board, and we will be making moves to connect with the educational institutions and sharing your vacancies to the next generation, awareness is just the beginning. Be part of the change.

Threats To The Industry – Skills Shortage Continues

By James Hart, CEO at BCS (Business Critical Solutions)

AS THE TOTAL amount of data created, captured and consumed in the world is forecast to continue to increase exponentially, few would argue against the importance of the need for a secure, flexible and efficient data centre infrastructure platform to house it. However, once again, a potential threat to the delivery of sufficient new stock is a lack of sufficiently qualified professionals available to the industry, particularly in the fields of design and build.

This has been likely amplified by the effects of international lockdown on the movement of a skilled labour force to areas of demand. In this year's BCS Summer report, which contains the views of over 3,000 senior level data centre professionals across Europe, we have sought to understand who is in short supply and what the likely impact is on the sector moving forward.
All our respondent groups are in agreement
Across all of our respondent groups there remains real concern over a skills shortage in the data centre industry. Over 90% of respondents believe that the coming year will see a decline in supply of staff, around the same amount (93%) reporting this in Winter 2020, arguably at the height of the COVID-19 crisis across Europe. To further exacerbate the problem, some 70% believe that this will be accompanied by a rise in demand for such staff. For the second survey in a row there is near universal agreement amongst our developer respondents, that the coming 12-month period will see a fall in supply of staff whilst the demand for those skill sets rises; the highest degree of assent amongst all our respondent's groups.

In addition, Design, Engineering and Construction (DEC) respondents share an almost identical response profile – a universal belief that the next year will be characterised by a fall in supply of staff whilst the demand for those skill sets rises. This reflects a hardening of attitude on this issue contrasted with the 72% reporting this just six months ago.
In contrast, colocation providers have maintained the same level of concern since our last survey, with nearly 90% predicting increasing demand levels for skilled workers against a falling supply in the next 12 months. Integrators and carriers also expressed a similar degree of concern compared with six months ago. Where they differ is in the degree of concern with 19% of carriers couching their agreement in the strongest possible terms.

Corporate respondents also registered a higher degree of concern over a potential skills gap, albeit more muted than our supplier sections. Amongst end-users, 62% believe that rising supply of skilled staff would be met with falling demand - up from the 40% who shared this view six months ago.
So, who is in short supply?

Over the last six months, we have noted an increase in the number of respondents concerned about potential problems arising from shortages specifically amongst design professionals; from 74% to over 84%. Within this we have seen a more pronounced rise in the number of respondents expressing their belief in the strongest terms – up from 25% to

37%. It should be noted that this level of concern is the highest we have recorded in the last six years, a period where we have seen a slow rise in the overall trend in concern amongst stakeholders in the European data centre industry.

At the build stage, the problem appears to be just as acute, with this survey registering an increase in those that both agreed and agreed strongly. Indeed, nearly 80% of the segmented supply specialists expressed their concerns that a shortage of sufficiently skilled build contractors existed, an increase on the 69% who suggested the same in the second half of 2020. According to our respondents the difficulties in sourcing operational staff are slightly less pronounced than at the design and build stages. Around three-quarters expressed their agreement when asked about the shortages of sufficiently skilled operations staff, an increase on the 69% reporting it in the previous survey.

The strength of agreement does vary amongst the groupings, albeit not as pronounced as in other categories. Perhaps not surprisingly our DEC respondents expressed their concern over skills shortages in the most robust terms, with almost universal agreement that shortages exist at both the design (98%) and build (92%) stages. Amongst our service providers the strength of belief in design and build skill shortages is slightly less pronounced, nevertheless, over 90% of these respondents agreed that shortages are problematic.

For end-user respondents, a belief in shortages of skilled operational staff pose the biggest problem – 72% compared with just 22% for design professionals and 17% for build professionals. Many end-users adopt neutral position on these categories, perhaps not surprising given the increasing popularity of outsourcing solutions meaning many of these are not exposed to the early stages of data centre delivery and as such have limited direct experience of the problems associated with it.

The problem is widespread In terms of job shortage concerns, there appears to be widespread agreement that these are spread across a variety of specific job roles. Indeed, most respondents

identified multiple roles as areas of concern. In the construction sector almost two-thirds of respondents stated that they had experienced shortages of quantity surveyors, site managers and site engineers within the past year.

Within the operational sphere, around 70% of respondents stated that they have had direct experience of shortages amongst operations and network engineers/technicians over the last 12 months, with a slightly lower proportion – around two-thirds - seeing a shortage of infrastructure specialists over that period. Also worthy of note, Mechanical & Electrical project managers were also highlighted as an area of concern around the availability of skilled workforce – just over 60% cited shortages amongst this skill set as problematic.

What is the impact of these shortages? The skills shortage debate is set within the context of the potential impact for the delivery of stock to the end user. Evidence from this survey suggests that these shortages have already had real consequences and directly impacted on respondents.

When questioned about what impacts they had experienced because of these shortages in the past year, most respondents cited multiple factors.

The most cited impact is that these skills shortages have placed a greater workload on existing staff, nearly nine-out-of- ten cited this as the case, an uplift from the eight-out-of-ten recorded six months ago.

The shortage of staff has also inevitably led to increasing operating/labour costs recorded by 86%, a rise from the 70% who cited the same factor in Winter 2020. Such shortages also can be seen as a contributory factor in the increasingly popularity of the use of outsourcing options, with around 60% citing it as such.

Encouragingly, it appears that fewer respondents are finding it difficult to resource existing work this year than was the case in 2020, with just over 40% stating that they had experienced difficulties in meeting deadlines or client objectives, down from 51% six months ago and some 70% who cited it as factor at the beginning of the pandemic 12 months ago.

However, the more extreme consequence of skills shortages is lost orders, with a quarter of respondents still believing that this happened, although this is a fall on the one-third identified six months ago. In addition, around a third stated that shortages had led to delays to developing new products/innovations, marginally down on the 39% recording this in our last survey, whilst the proportion that noted they had ceased offering certain products or services has fallen positively to 10% from 14%.

In conclusion, there is no doubt that the skills shortage is continuing to have a negative effect on the industry – and in my experience has been for over a decade. The question is how long it is sustainable and will the industry respond and find a solution. I hope so.

Reskilling the Data Centre Workforce

Peter Hannaford, Senior Partner, Portman Partners

THE DIGITAL WORLD is expanding rapidly, requiring various technology-related skills in the DC sector.

Can we use a reskilling/training strategy to fill the gap?

The Global COVID-19 pandemic has increased worldwide internet traffic to record levels. As a result, in every region of the world, data center capacity is being dramatically expanded in a buildout of extraordinary proportions. In the recently published, "The people challenge: Global data center staffing forecast 2021-2025," Uptime Institute reported that as data centre capacity expands, the availability and potential lack of specialist staff will be an increasing concern for all types of data centers, from mega-growth hyperscalers to small, private enterprise facilities. As a result, we need greater investment, more training, and more creative approaches to employment. However, they also noted that "although data center recruitment needs are expected to rise steadily to 2025, the growth in demand does not need to represent a crisis. Individual employers can take steps to address the issue, and the sector can act together to raise the profile of opportunities and improve recruitment and training."

So, in the immortal words of Lance Corporal Jones in the British sitcom Dad's Army, "Don't Panic!" Instead, we need a plan.

According to the report, data center staff requirements are predicted to grow globally from about 2.0 million full-time employee equivalents in 2019 to nearly 2.3 million in 2025.

This Uptime Institute estimate covers more than 230 specialist job roles for different types and sizes of data centers, from design through operations and across all regions, primarily in the Asia-Pacific, followed by North America, Europe, the Middle East, and Africa.

While this estimate of absolute growth equates to around 3% per annum, it doesn't consider the number of older, experienced employees retiring during this timescale.

The relative "newness" of the industry, given that data centres as we know them didn't really exist before the mid-1990s, means that traditional paths haven't existed as they have for other professions. Additionally, the nature of the business means that a large number of jobs in the sector demand mobility, and we really have no idea what impact AI and Machine Learning will have on certain roles, especially those in design, engineering, operations, and maintenance, so hiring people with specific skills and experience could be shortsighted.

The CV only tells you what a candidate has done, not what they are capable of doing. More critical are characteristics such as intellect, personality, and motivation. Therefore taking talent from other industries and reskilling and training them should result in more well-rounded employees who are more adaptable and able to change in a constantly moving market.

Data centres are mission-critical facilities, meaning that the applications, networks, and services they support should never fail. A datacentre with "5-nines" availability was always considered the gold standard. That's 99.999% uptime, Or expressed another way, 001% downtime. That's five minutes each year, but no company should aim for that. "Always-on" should be the mantra. A recent Facebook outage is estimated to have cost the company $100m, and at least 80% of failures are due to human error, either in operation, design, or construction.

But data centres aren't the only sector that can't tolerate failures. Failures in the pharmaceutical or wafer fabrication process can be very costly, and failures in space exploration, aircraft navigation and operation, and nuclear industries can be fatal. Employees in these sectors are desirable candidates for recruiters in the data centre industry, and nuclear submariners are in very high demand.

Another item on the "must-have" list for recruiters is academic qualifications, as is the requirement for 'diverse' candidates, but this can present difficulties. For example, some companies are trying to attain a 50/50 gender balance, but if you're seeking qualified engineers, you have a problem in the UK, where just 11% of the UK engineering workforce are women, one of the lowest percentages in Europe.

Meanwhile, Latvia, Bulgaria, and Cyprus lead with nearly 30%, potentially influencing where European talent is employed, especially for international operators. But because diversity should not simply be a matter of ticking boxes,

what's really required is a diversity of thinking – "cognitive" diversity. This type of diversity includes people with different problem-solving styles and can offer unique perspectives because they think differently. Often their viewpoints are informed by their gender, their different experiences, cultural backgrounds, and gender identities they bring to the workplace.

Of course, there are some jobs where specific experience is necessary. For example, a hospital with an urgent requirement for a brain surgeon wouldn't hire a newer med school graduate who'd never operated before. Likewise, pilots, surgeons, and nuclear submarine captains need time and years of training before being let loose. Therefore, getting the right people on board first is of paramount importance – people with the right intellect, behaviours, and values who, with the appropriate reskilling and training, can fill the ever-widening gap in the industry today.

About Peter Hannaford:
Peter's career accomplishments span decades and was recognized when in 2018 he received the Datacloud Congress Lifetime Achievement Award for "outstanding achievement spanning one's entire career." Peter began his pioneering work in Nigeria in the 1970's implementing that country's first on-line banking system, and went on to develop foreign exchange systems for international banks in the 1980s.

In the 1990s, Peter started one of Europe's first datacenter construction firms and founded the company that developed the first water-cooled rack for high-density servers. The company was sold to APC in 2003 leading to APC's development of In-Row Cooling and Containment, which dominated the datacenter market in the 2000's.

In 2010 Peter founded Datacenter People, the first global recruitment firm dedicated to the datacenter sector, and, in 2018 he founded Portman Partners where he currently works. Peter's considerable personal network and reputation helps firms in the digital infrastructure space find leadership talent around the world. He was recognized again in 2019 when he was included in the Power 200 list of personalities around the world who "are leading the datacenter and cloud and sectors through charting new innovations or technological breakthroughs, investment or business acumen or exceptional entrepreneurial skill sets."

Ways to improve cognitive diversity within organisations

By Terri Simpkin, Portman Partners Associate, Associate Professor and MBA Director at the University of Tasmania,

INNOVATION, be it technical, system, or product, is fundamentally reliant on diversity, but diversity is not simply 'box-ticking' surface-level diversity.

Instead, it's strategically driven cognitive diversity. Cognitive diversity goes beyond the common understanding of diversity, which often drives over-indexing on recruitment of under-represented groups (e.g., getting more women in data centres). Cognitive diversity refers to the underpinning notion of diversity of thinking – different perspectives and information processing styles; how people think and make sense of their context, seeing alternatives because they view the world through a different lens.

While cognitive diversity can be related to differences in gender, social background, or age, contrary to popular belief, it's not automatically generated from or calculated by these factors. So, for example, a product or technical team could be comprised of people from different genders and nationalities, but if they've had a similar upbringing and think in similar ways, the team may not deliver better or more creative outcomes than a team that looks, on the surface, more homogenous, but whose members come from different socio-economic backgrounds, cultures or industrial sectors, and who process information differently.

Cognitive diversity is more nuanced and complex to achieve, but research indicates it can improve outcomes where teams and individuals are charged with delivering innovative responses to new or emerging complex challenges in ambiguous circumstances. Cognitive diversity is the secret sauce that, while challenging to identify, adds that special, irreplicable zing of creativity and inspiration to a workplace.

So, if hiring more women and people from international backgrounds will not necessarily deliver cognitive diversity, what will?

First, it's important to note that the drive to populate the digital infrastructure sector with a less homogenous workforce is vitally essential for a raft of reasons. Access to talent, developing a more broadly based pool of potential employees, and generating a more inclusive culture to retain a heterogeneous workforce are all imperative to a robust, vibrant, and thriving industry.

And, without a workforce population that includes different genders, cultures, socio-economic backgrounds, neurodiversity, and vocational backgrounds, cognitive diversity is less likely to be achieved.

Second, while it's not easily identified from the outside, there are ways to improve cognitive diversity within organisations. It's well-documented that people often surround themselves with people who reflect their own image, which is not limited to characteristics like gender, age, or cultural background. Nor is it confined to the recruitment process.

Often people are drawn to team members who think along similar lines, express similar views, and communicate in a similar manner. Thus, teams often find themselves unwittingly becoming more and more homogenous in their

thinking, behaviours, and ways of working. Consequently, the capacity for innovation, which thrives on differences of opinion, creative disruption, and positive conflict, is diminished.

So, to diminish strongly homogenous cultures (often found in data centres, for example), organisations can recruit for differences of thinking, drawing on people from outside the usual pool of candidates.

Doing so not only expands the landscape from which talented individuals can be found but offers the opportunity to invite in people who see the world and the challenges within it differently. Moreover, as the digital infrastructure sector continues to experience labour and talent shortages as well as skills wastage, looking outside the sector for transferable capabilities brought by people from non-traditional backgrounds is one of the smartest ways to generate the capacity for innovation.

That's not the end of the story, however. It's one thing to recruit for cognitive diversity; it's another to keep those people in the business. So often, people are brought into an organisation with all the best intentions to develop a more diverse workforce, but the culture, systems, and ways of working work against the value that difference brings. Instead, people feel pressured to fit in, not make waves, work to type, and replicate the 'way we do things around here.' This implicit lack of support for diversity (in all forms, not just cognitive diversity) negates the value of alternative ideas and increases turnover risk – people leave and look elsewhere for a role where their capacities will be valued.

While different tests can offer an indication of how people think and how they might resist, tolerate or expedite change, and how creative or innovative they might be, fundamentally, leveraging the value of cognitive diversity comes down to culture and leadership.

Encouraging an environment that feels safe goes beyond simple notions of diversity to true belonging and manages differences of ideas, ways of working, and a multiplicity of views is key to innovation.

Leadership has been tilting toward authenticity (i.e., being human and allowing oneself to be vulnerable and authentic) for some time now. This change is welcome, but more importantly, to support creativity, diversity of thought, and innovation, leaders must create a culture of belonging and maintain systems that flex to accommodate differences and modes of operation that build trust. Most crucially, leaders must encourage their teams to bring their authentic selves and divergent ideas to work.

Terri Simpkin, a Portman Partners Associate and Associate Professor and MBA Director at the University of Tasmania, was named one of the 50 most influential women in the data economy. In 2020, she received the IMasons 100 Awards for her work in the digital infrastructure sector, and was awarded the Global Women in Telco and Tech's Brynn Fowler Agent of Change for her commitment to advancing diversity, equity and inclusion initiatives.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