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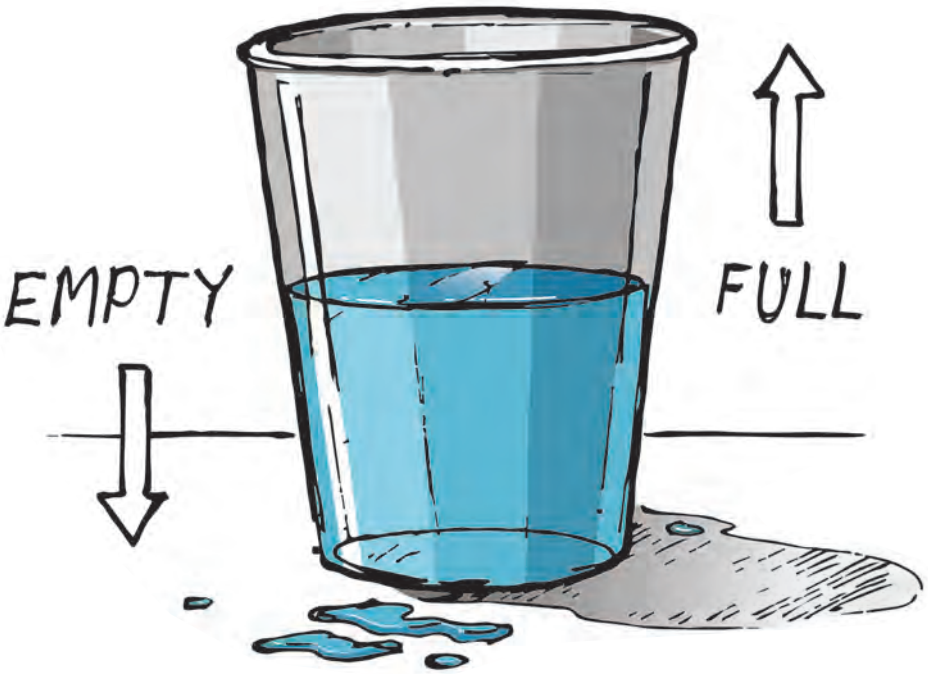
Editor's View

By Phil Alsop

Is the glass half full, half empty, or shattered?!



AT THE TIME of writing, COP26 is almost upon us. The time for can-kicking is passed, but the increasingly volatile climate conditions witnessed across the globe in recent times (and the striking environmental improvements witnessed during the various lockdowns) are unlikely to galvanise world leaders into making the tough decisions required to halt the global meltdown.

The choices to be made are incredibly complex, but there seems no avoiding the fact that many of them will be political 'dynamite' – requiring massive lifestyle changes, and not a little expense. The optimists believe that technology will solve everything; the pessimists that it will solve very little; and the real gloomsters think it's already a case of too little, too late.

Data centre power consumption is predicted to rise in Europe from 3GW currently to 5.4GW by 2030. On the face of it, no matter how, where and when this power is provided, that doesn't sound great for the environment. True, many of the virtual activities powered by data centres have a much smaller carbon footprint than their physical alternatives, but they still have a significant carbon footprint.

On this basis, it's difficult to see how the IT industry can become truly sustainable for as long as digital consumption demands continue to increase at the current, rapid rate. And the same is true across almost all other industry sectors. Environmental damage is unavoidable in an era of unchecked consumption.

However, in a global economy, which governments and countries will be brave (or foolhardy) enough to legislate to reverse this trend?

One small silver lining. The current pressures on global supply chains, coupled with the sharp increase in gas prices, might just encourage some bold new thinking, whereby political stability, as well as the environment, demands much more local self-reliance.

IT's role in such a changed landscape is difficult to predict, but it will be fascinating to watch!

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Hybrid workers have dangerous habits

BUSINESS LEADERS must strike a balance between flexibility and security to address risky behaviours and evolving expectations of today's tech-savvy workforce.

After years of responding to the needs of Gen X and Gen Y, a new study from Aruba, a Hewlett Packard Enterprise company, suggests employers have a whole new generation to grapple with post-pandemic – with 85% of hybrid workers saying they identify with the traits of the emerging Generation Novel (Gen-N).

Coined by digital anthropologist Brian Solis, Gen-N describes a cross-generational cohort of people who thrive on digital-first experiences, and place greater value on personalization, customization, and transparency from the brands they buy from, work for, and support. Above all else, they also understand, use and demand more from technology than ever before – both at home and work.

According to the study of 5,018 hybrid workers across Italy, France, Spain, Germany and the UK, 78% of respondents say they use technology more now than they did before COVID-19, and 75% consider themselves to be 'digitally savvy'. Sixty-nine percent of respondents agree they now have more of an opinion on the technology they use at work and 71% feel it's important to be able to customize their workplace tech set-up to suit their individual preferences.

The survey also revealed the risks this new generation will bring to the workplace if their expectations continue to go unmet. As it stands, only 38% of respondents say they have any significant choice in their workplace technology. Without the right technology, workers indicated they will experience decreased productivity (35%) and a poorer work/life balance (23%).

Gen-N's expectations around increased flexibility and confidence in their technical abilities also opens businesses up to a number of security risks relating to where, when, and what employees connect to the network – with 50% of respondents, for example, claiming they are more likely to try to resolve a tech issue themselves now than they would have been before the pandemic.

Additional key findings from the report reveal:
Hybrid workers have a new perspective on the role of workplace technology:

- 80% of our respondents say their company must maintain policies that encourage healthy technology use.
- While 73% believe technology has a role to play in fostering an inclusive environment in the new hybrid workplace, 44% believe it is not currently doing so.

Hybrid workers bring new risks to the workplace if their needs go unmet:

- When encountering a tech issue at work, nearly three quarters (74%) of hybrid workers say they expect it to be resolved in 20 minutes or less – and over two fifths (42%) in under 10 minutes.
- Over half (55%) of our survey respondents admit to connecting to a non-password protected public network at least once a week, but only a third (33%) consistently think of the security risks in doing so.
- Meanwhile, as many as 82% are still using their personal mobile device to access work information.

"Our research suggests that this emerging generation of hybrid workers, with its evolving behaviours and heightened expectations, will put new demands on employers when it comes to workplace technology," said Morten Illum, Vice President, EMEA for Aruba, a Hewlett Packard Enterprise company.

"In order to mitigate the security risk that Gen-N poses, as well as boost efficiency within their workforce and support their employees, businesses must address these new needs. Striking the balance between an open but secure network will afford employees the flexibility, freedom and personalization they now seek, without compromising on security."

Hybrid workers embrace anytime working and say office culture has 'changed forever'

POLY HAS RELEASED a new report outlining the evolution of the workplace and changing employee attitudes to the 9-5. The Poly Evolution of the Workplace report provides analysis on the findings of a survey of 7,261 hybrid workers from the UK, France, Germany, Spain, Sweden, Poland and the United Arab Emirates. It examines how attitudes and behaviours have evolved – looking at everything from working patterns and culture, to frustration and noise, right down to what we wear.

"Almost two third of hybrid workers (64%) believe office culture has changed forever," says Paul Clark, senior vice president of EMEA sales at Poly. "Our research found that workers (58%) felt that the rise in remote working has meant they are 'always on' and always available, leaving them unable to relax or switch off from work. And while many are enjoying the benefits of hybrid working – the work-life balance, lie ins, and family time – others are feeling side-lined and disconnected. For example, 52% think hybrid or home workers could be discriminated against or treated differently to employees in the office full-time. Equally, people are feeling anxious about the return to the office, with 42% admitting they will be prone to 'noise rage' if colleagues are too loud. Sadly, the younger generation – many of whom entered the workforce during all the upheaval – are feeling the strain particularly strongly. Of the 62% who reported that they have not been to their new office, 72% say the idea of going in is keeping them up at night. For hybrid working to be a success, these issues must be tackled head on. Companies need to continue to put their employees at the centre of all that they do and provide them with the tools they need to accomplish their jobs in this new environment."

Always On vs Anytime Working – Why employers need to set clear boundaries to prevent employee burnout

The research suggests hybrid working is here to stay. 82% of respondents intend to spend at least one day a week working from home in the future, with 54% planning to split their time evenly between office and home. One of the drivers for this shift is the emergence of 'anytime working' – whereby employees have greater autonomy over when they do their work – with over two third of employees (69%) saying the 9-5 has been replaced by anytime working. When asked about the benefits of working from home, the top three responses given were: avoiding lengthy commutes, achieving a better work-life balance and feeling less stressed. Similarly, when asked what they would miss about working from home, people highlighted lie ins, time with family and finishing on time.

However, while many workers have reaped the benefits, working from home has not been a smooth transition for everyone. Worryingly the lines between anytime working and being 'always on' are blurring: more than half of workers (58%) felt that the rise in remote working has meant they are 'always on' and always available, leaving them unable to relax or switch off from work. Added to this, being expected to work outside of their hours was listed as the second biggest drawback of working from home – after having less fun with colleagues.

"Anytime working should not be confused with being always on," says Paul Clark, senior vice president of EMEA sales at Poly. "The organisations that promote a healthy work environment and empower anytime working will see a much happier and more productive workforce. This is especially important as we are experiencing the 'Great Resignation' phenomenon, where people across industries are leaving their jobs due to the pandemic. Businesses cannot afford to lose talent so must offer the best working experience possible to all its employees, no matter where they are located."

The Future Role of the Office and the Rise of 'Noise Rage'

The research suggests that there are very mixed feelings about the return to office. While many have missed the camaraderie and connection of seeing colleagues and clients, others are feeing anxious and worry their performance will suffer. What is evident is that for many, the changes of the past year are here to stay – with 64% of workers saying that office culture has 'changed forever'. As a result, while many intend to return to the office, the role of the office and office etiquette are likely to evolve.

Despite the concerns, workers are looking forward to having more person-to-person interactions. Office banter, going for lunch with clients/ colleagues and office camaraderie are listed as the top three things workers miss about the office. The findings also highlight how the role of the office will evolve. When asked how people would see themselves using the office in the future, results tended to be practical and task oriented. The 'top three reasons to go back into the office' were brainstorming / collaborating with colleagues, attending meetings and access to better equipment and technology.

Corporate image has also changed. Even industries such as financial services that have always expected employees to maintain a certain standard of dress are now becoming more relaxed. 61% of workers in finance think that hybrid working has brought about the death of the suit, and that wearing suits might go away for good – eight points higher than the average of 53%.

"The role of the office and what people want to use it for is changing. It's evident that people have craved human interaction since working from home and are looking forward to getting back to the office," says Clark. "However, noise is a legitimate concern for many, particularly for those younger workers that are new to the workforce or a new environment.

To address the rise of 'noise rage', organisations need to provide employees with the right technology, such as noise cancelling products, to reduce distractions, improve productivity and ensure equality of experience. Where possible, organisations should also look to create dedicated quiet spaces (booths, more rooms, spacing out desks) equipped with the right technologies."

Study reveals state of secure remote work

74 PERCENT of security decision makers across US and Europe say procedures and controls have become more complex; 73 percent struggle to manage increase in threats.

"It was like changing an engine on a plane while it was in flight." That's how one security decision maker described the shift to remote work the pandemic forced last year. And as revealed by The State of Security in a Hybrid World, a survey of 1,250 security decision makers across medium to large organizations in the US, the UK, France, Germany and the Netherlands conducted by Citrix Systems, Inc. (NASDAQ: CTXS), things haven't gotten any easier.

Securing the Future of Work

With end users working from anywhere – in some cases using personal devices to access cloud apps and corporate resources - the attack surface is larger than it has ever been. And many IT organizations are struggling to defend it. As the Citrix study found:

- 74 percent of security decision makers say procedures and controls have become more complex as their organizations transition to remote and hybrid work
- 73 percent are fighting to keep up with the increased volume of security threats that the models create.

Enhancing the Employee Experience

Employees today want the flexibility to work when, where and how they want using the applications and devices of their choice. In addition to security decision makers, Citrix also polled 3,603 knowledge workers, and 66 percent said it is "extremely" or "very important" to be able to work remotely or from home, on any device.

Savvy organizations recognize this.

- 86 percent of respondents to the Citrix survey say it is "extremely" or "very important" to create a seamless employee experience, and
- Around nine in 10 measure information security's impact on employee experience and productivity

Changing the Game

"IT organizations are realizing that as they embrace hybrid work, their security posture needs to evolve," said Kurt Roemer, Chief Security Strategist, Citrix. "Rather than traditional command and control-style strategies, they need to take a more intelligent, people-focused approach to security that protects employees without negatively affecting their experience."

Most participants in the Citrix survey are taking actions to do this. In fact, 79 percent of decision makers polled say the pandemic has created an opportunity to completely rethink their long-term information security strategy with these objectives in mind.

Yet challenges remain. Among the top three cited by workers who participated in the Citrix research:

- Poor connectivity (43 percent)
- Navigating technical problems virtually (34 percent)
- Inability to get IT support quickly/easily (32 percent)

Investing in the Future

The news isn't all bad, however. While only 46 percent of security decision makers felt "somewhat prepared" for remote work when the pandemic hit, 84 percent now feel "very" or "somewhat" prepared to secure a hybrid, remote or at-home workforce.

- 58 percent say investments in security have increased over the last 12 months by an average of 40 percent
- 71 percent say their company's IT environment is now more secure than it was before the pandemic struck

And that's critical, because as The State of Security in a Hybrid World also makes clear, 52 percent of security decision makers believe most of their workforce will be permanently remote or hybrid. "Hybrid work is the future of work, and IT will play a critical role in delivering it," Roemer said. "With the right technology, they can provide consistent, secure and reliable access to the resources employees need to get work done, wherever it needs to get done, and empower them to be and do their best."

Citrix provides a complete digital workspace platform that is uniquely designed to enable secure hybrid work.

Customer experience maturity leads to business resilience, revenue growth and agent retention

COMPANIES that have continued to invest in their customer experience (CX) over the past year are 16 times more likely to have maximised their resiliency during the pandemic and three times more likely to have grown their customer base year over year, according to new research released by Zendesk, in partnership with Enterprise Strategy Group (ESG).

07 Oct 2021 Posted in Digital Business
"This research confirms what our customers across industries, sizes and life cycles all tell us: that customer experience requires continuous investment and innovation to truly set their business apart," said Jeff Titterton, Chief Operating Officer, Zendesk. "The way the customer service function is viewed is changing - it's the hub of your customer relationships in this digital-first economy. Having the tools for proactive service, information sharing, and cross-selling are now just as important as issue resolution. These are the skills that will shift your call centre from being a cost centre to a revenue driver."

The 2021 State of CX Maturity Report surveyed more than 3,000 CX decision makers globally to understand the characteristics and benefits of customer experience leadership. ESG built a CX maturity scale to identify common patterns and behaviors that separate high-maturity CX organisations - what ESG calls the "Champions" - from three levels of less-mature ones: "Starters", "Emerging", and "Risers". The report outlines what businesses need to do to move up the maturity scale.

The research found that the number of Champions within midsized and enterprise companies has increased from 5% to 8% since 2020. The UK had one of the highest proportions of Champions, at 8%, second only to Spain leading the way with 13%. The greatest gains in the region were seen in France - shifting from 0% in 2020 to 5% in 2021.

"The findings indicate that the shift to digital and remote work during the pandemic served as a trigger for companies to accelerate their adoption of new technologies, policies and processes to benefit from a higher CX Maturity," added Adam DeMattia, Director of Custom Research at ESG. "Across UK & Europe, Champions recognise that service excellence can be a differentiator, and are actually accelerating investment in CX projects."

There also continues to be a clear correlation between improved CX maturity and the benefits of increased customer satisfaction (CSAT), faster response times, and effective customer service. Notably, the study also calls out the connection between CX maturity and greater business growth and revenue.

- Related to their peers, midsized and enterprise Champions in Europe were 2.9 times more likely to have grown their customer base over the past six months, and 5.5 times more likely to have increased per-customer spend over the same time period.
- Champions are also changing how the customer service function is viewed across their organisation. With digital interaction being the main connection point with many customers, Champions in Europe are 2.7 times more likely than Starters to operate profitable service teams, where direct revenue exceeds the cost of customer service.

Other key imperatives for CX Maturity that the research identified include:

CX-led innovation is a competitive differentiator

- Champions are 8.5 times more likely to be using service data extensively.
- When used, that data is delivering results - Champions are 9.4 times more likely to identify the impact on sales success as "game changing".
- Champions in Europe are also two times more likely than Starters to have accelerated major CX projects over the past year, with half of all midsized and enterprise-sized companies in the UK accelerating their CX initiatives in the last 12 months.

Conversations, not transactions, create stronger customer relationships
Nearly all Champions in Europe (94%) agree that pivoting to a more conversational experience with customers is a key goal for their teams - signalling the shift away from transactional service focused purely on resolving tickets.

- Champions are three times more likely to prioritise delivering conversational customer experiences that can build deeper customer relationships.
- Organisations in Europe have increased the number of service channels year-over-year from an average of 6.4 to an average of 7.6.
- Many anticipate that preferences and changes will continue to shift as well: 75% of UK organisations predict that chat and social channels will be most used by customers in the future, up from 52% who say this is the case today.

Investment in CX leads to better agent retention

Agent turnover, training, flexibility and wellbeing all emerged as areas of investment and focus for teams over the course of the past 18 months. This led Champions, in particular, to move quickly to implement tools to support overwhelmed service teams.

- Between accelerating CX investments and adapting service policy changes earlier in the pandemic, Champions in Europe are 16 times more likely to believe they made the right investment and policy decisions during the pandemic to maximise their resiliency.
- Champions across the region are nearly 9.8 times more likely to have excellent agent retention.

Decision-makers rethink IT investments

TERADATA study reveals 9 out of 10 respondents look to modernizing cloud architecture and improving data capabilities as top areas of investments. Organizations know that having the right IT in place and leveraging a cloud-first and data-centric mentality is essential in today's digital economy.

However, to advance their digital transformation initiatives and fully realize the possibilities that emerging technologies – like AI, IoT and multi-cloud – offer, organizations must first reevaluate how they invest in IT.
A new research report, commissioned by Teradata and conducted by independent research firm Vanson Bourne in August 2021, explores global sentiment around data-driven transformation investments this year and beyond, and reveals where organizations are placing their bets to set themselves up for success in the years to come.

Market Volatility is Shifting 2022 IT Investments

In the wake of the pandemic's economic impact, 87% of companies are reportedly rethinking IT investments for 2022 and beyond, mainly due to the recent, significant shifts in consumer spending and market uncertainty.

- 93% of respondents agreed that when re-evaluating their IT investments, modernizing cloud architecture, improving data management and analytics were among the top investment areas to accelerate their transformation efforts.
- Although 50% of IT decision-makers reported that their organizations had no plans to increase data governance investments at this stage, 89% felt their organizations should still prioritize data governance/responsibility initiatives more.

Emerging Tech is a Global Priority

Looking three years ahead, IT decision-makers also identified emergent technologies, such as multi-cloud infrastructure, IoT, 5G, edge computing, AI, and data analytics, as critical areas for increased future spend. This was a globally held view, with IT leaders from the U.S., Europe, and the Asia Pacific Japan regions citing emerging technologies as a top investment priority.

- 90% of respondents felt that emergent technologies, such as automation, would have a transformational impact on their organization in the next three years.
- 3 out of 4 IT decision-makers also agreed that their organization's digital transfrmation efforts or lack thereof could be a roadblock to realizing the full benefits of key emergent technologies, such as AI and machine learning.

"Today, organizations understand that they must leverage key emerging technologies such as AI and multi-cloud infrastructure to maintain a competitive advantage. In fact, 87% of IT decision-makers felt they would be at risk of lagging behind the competition if they didn't," said Steve McMillan, President, and CEO of Teradata. "To realize their full potential, companies must modernize their architectures to leverage the cloud and dial-up investments in other emerging technologies initiatives, like achieving AI at scale or leveraging the intelligent edge. In doing so, they can combine new innovative sources of data with their own to gain the necessary insights to pivot on a dime and continue to fuel innovation at scale."

Lack of Cloud-Readiness Undermines Digital Transformation

As IT leaders move forward with plans to pivot their digital innovation strategies in the wake of the pandemic, they also grapple with how quickly they make their leap to the cloud.

CIOs prioritise innovation to improve digital customer connections

THE ROLE of the CIO is evolving with an increased focus on unlocking customer connections through service innovation, according to the 2021 Global CIO Survey from Logicalis, a global provider of IT solutions. The study, which questions 1000 CIOs from around the world, reveals the shift in the role of the CIO with the majority of respondents stating innovation, operational efficiency, and customer experience as their top priorities.

Over the last 12 months, there has been a notable shift in the defining aspects of the CIO role, with most respondents noting a significant increase in the time they now spend on innovation (79%), strategic planning (77%) and productivity (62%). This is a stark contrast to previous years, where the majority of CIOs reported a lack of time to spend on both innovation and strategic planning.

CIOs are now tasked with revolutionising business infrastructures to tackle the modern world and increasingly digitally based interactions. Customers now expect to engage with businesses digitally as standard, and as a result companies need to innovate to redefine and elevate their customer interactions to stand out from the competition. Over the last year, 73% of CIOs state the importance of customer experience has increased and this isn't slowing down any time soon. Additionally, 4 in 5 (81%) respondents believe that their focus on redefining the customer experience will grow over the next 5 years.

CIOs should innovate to build agile and adaptable infrastructures which unearth hidden insights in the digital customer journey to empower closer customer connections. As IT leaders, they have the technical expertise to interpret customer engagement data and unearth hidden insights to improve the customer experience, optimise operations and achieve their business objectives.

Mark Benson, CTO Logicalis UKI comments: "Increasing choice, access to unlimited information, and fewer loyalty incentives are just a few reasons why the modern B2B customer is firmly in control of their relationship with companies. With growing customer expectations, a personalised digital experience is crucial to retaining and attracting customers and prospects. To stay abreast of customer expectations, and compete with competitors, CIOs need to build an agile and adaptable infrastructure that can shift according to customer needs."

Data centres to double power demand in Europe

HYPERSCALE and colocation data centers can be an important source of flexibility in Europe's power system, helping to integrate higher renewable energy penetrations.

Large data centers in the U.K., Germany, Ireland, Norway and the Netherlands are projected to draw 5.4GW (gigawatts) in 'live IT power' demand in 2030, up from 3GW at the end of 2021, according to a new study published today by research company BloombergNEF (BNEF) in partnership with Eaton and Statkraft. That figure is based on a central scenario; the report also outlines a more aggressive growth scenario, which sees live IT power exceed 7GW by 2030. While generally seen as only a source of demand on the power system, the report finds that data centers are also a largely untapped resource to support the grid and the integration of renewables.

The study, Data Centers and Decarbonization: Unlocking Flexibility in Europe's Data Centers, explores the growth of data centers in the five markets and how data centers could provide flexibility to the power system. Across Europe, wind and solar power are projected to approach 60% of total power generation by 2030. With these rising penetrations will come a greater need for flexibility. The study highlights the need for greater awareness of data-center flexibility not only among data-center operators and users, but also utilities and regulators.

Data centers could provide 16.9GW of flexibility in total across the five markets examined in the report from their on-site uninterruptible power supply (UPS), back-up generation, back-up batteries and load-shifting. This is greater than the amount of power demand expected from the facilities themselves, because these resources in principle can each independently provide flexibility to the power system, either by reducing the amount of power the data center draws, or by exporting power.

Michael Kenefick, lead author of the report and decentralized energy analyst at BNEF, commented: "Data centers can be part of the solution for achieving higher renewable energy penetrations in

Europe. Their on-site energy resources, such as uninterruptible power supplies and back-up generators, could in future be brought to bear to help support the grid. And computing tasks could also be shifted to times – or locations – of high wind and solar resource."

Of the resources considered, UPS systems appear to be the most promising source of flexibility in the immediate term. Based on battery technology, they are universally installed in data centers, and are particularly well-suited to the task of providing fast frequency response (FFR), a service designed to help grid operators maintain a stable operating frequency. In the U.K., Ireland and Norway, data center UPS systems could be more than enough to meet total FFR needs. Some data center operators are already experimenting with providing such services using their UPS systems.

However, the report finds that data-center operators remain hesitant to bring these resources to bear to support the power system, citing service-level agreements with customers, a lack of visibility and transparency on the benefits of providing flexibility, and a lack of know-how. For this reason, BNEF estimates that only 3.8GW of flexibility might materialize from data centers in these markets by 2030. This is less than a quarter of the 16.9GW potential capacity, and equates to 1.7% of the expected peak load across the five markets in 2030.

Karina Rigby, president, Critical Systems, Electrical Sector at Eaton in EMEA, said: "Data center facilities are unique and comparable to microgrids in the opportunities they offer through their computing power and physical infrastructure, particularly the vast amounts of battery energy storage attached to their existing back-up power systems. This study highlights the huge untapped potential of data center flexibility to deliver economic, regulatory and climate benefits. We are calling on grid operators, regulators, data center operators and users to collaborate to unlock data centers' grid stabilization technology."

When comparing the five countries in question, each faces different challenges and opportunities regarding data centers and the power system. Driven by growth in demand for computing and data storage services, both from businesses and end users, hyperscale and colocation data centers could account for as much as 24% of electricity demand in Ireland in 2030; 8% in the Netherlands, and 5% in the U.K., in the central scenario. In Norway and Germany, there is more headroom for growth, with data centers only projected to account for 2% of each country's power demand in 2030.

Ireland is a mature market, where hyperscale operators have been investing for years, and is likely to keep growing despite some challenges integrating data centers into the power system. Ireland, the U.K., the Netherlands and Germany are each expected to post 80-104% in data center capacity from 2021 to 2030.

Norway, starting from the lowest base, is projected to see 205% growth in data center power demand from 2021 to 2030, thanks to its competitive industrial power prices and very high proportion of clean power in comparison with other markets, which make it an attractive destination for data center operators looking to run a 'green operation'.

Albert Cheung, head of analysis for BNEF, added: "Data center operators have already been leaders in pursuing renewable power purchase agreements to green their operations, and are increasingly looking for further ways to demonstrate their commitment to climate goals. As the wider power system adopts more renewables, they will have even greater opportunities, not only to buy renewable power, but also to be part of the solution for integrating them onto the grid."

Rise in supply chain security breaches

VENDOR risk visibility and continuous third-party monitoring remains concerningly low despite heightened awareness of the risk and substantial budget increases to tackle the problem.

BlueVoyant has released the findings of its second annual global survey into third-party cyber risk management. The study reveals that 97% of firms surveyed have been negatively impacted by a cybersecurity breach that occurred in their supply chain. Ninety-three percent admitted that they have suffered a direct cybersecurity breach because of weaknesses in their supply chain and the average number of breaches experienced in the last 12 months grew from 2.7 in 2020 to 3.7 in 2021 – a 37% year-over-year increase.

The study was conducted by independent research organization, Opinion Matters, and recorded the views and experiences of 1,200 CIOs, CISOs and Chief Procurement Officers in organizations with more than 1,000 employees across a range of industries including: business services, financial services, healthcare and pharmaceutical, manufacturing, utilities and energy, and defense. It covered six countries: U.S., Canada, Germany, The Netherlands, the United Kingdom, and Singapore.
Other key survey findings include:

- Only 13% of companies said that third-party cyber risk was NOT a priority, a drop compared to last year when 31% of companies said that supply chain and third-party cyber risk was not on their radar.
- 38% of respondents said that they had no way of knowing when or if an issue arises with a third-party supplier's cybersecurity, compared to 31% last year.
- 91% say that budget for third-party cyber risk management is increasing in 2021, compared to 91% who said this in 2020.

Adam Bixler, Global Head of Third-Party Cyber Risk Management, BlueVoyant, said: "Even though we are seeing rising awareness around the issue, breaches and the resulting negative impact are still staggeringly high, while the prevalence of continuous monitoring remains concerningly low. Third-party cyber risk can only become a strategic priority through clear and frequent briefings to the senior executive team and the board."

While budgets rise, firms are still experiencing multiple pain points
Reports of the scale of budget increases almost exactly matched figures from last year. 29% of companies reported budget increases from 26-50%; 42% reported increases of 51-100%, and 17% reported increases of 100% or more. Overall, 91% are planning budget increases.

However, the effectiveness of these rising investments is limited by increased adversary attack activity. Surveyed companies report an almost equal distribution of pain points: managing false positives, managing the volume of data, prioritizing risk, and knowing their own risk position, among others. The fact that companies are reporting so many issues suggests that larger budgets are not yet resulting in sufficient risk reduction.

Adam Bixler added: "Budget increases demonstrate that firms are recognizing the need to invest in cybersecurity and vendor risk management. However, the wide, yet consistent array of pain points suggests that this investment is not as effective as it needs to be. This, tied to the lack of visibility, monitoring and senior-level reporting, underscores a need for further improvement when approaching third-party cyber risk, in order to reduce the exposure of data before attackers take advantage of this."
Variations across industry sectors
Analysis of the responses from different commercial sectors revealed considerable variations in their experiences of third-party cyber risk:

- The business services sector had the highest headcount in its cybersecurity or risk teams and correspondingly were most likely to be monitoring third-party risk daily.
- The healthcare sector exhibited the highest rate of third-party cyber risk awareness and 55% said identifying risk was a key priority, compared to an average of 42%. However, this sector also reported high breach figures, with 29% reporting six to 10 breaches in the last 12 months, compared to a 19% average.
- Manufacturing respondents were least likely to identify supply chain/third-party cybersecurity risk as a key priority and were most likely to be reporting on an annual basis only.

Adam Bixler said: "Our research shows that there are large concentrations of unknown third-party cyber risk across vertical sectors, supply chains and vendors worldwide, and organizations are regularly experiencing vendor-originated breaches. While budgets are rising, the critical question is where funds should be directed to make a tangible impact to reduce third-party cyber risk, helping to close the gaps in visibility, strategy, and monitoring."

Jim Rosenthal, CEO at BlueVoyant, concluded: "Auditing or sending questionnaires to your supply chain is important, but not sufficient, to stay ahead of agile, persistent attackers. Continuous monitoring and quick action against newly discovered critical vulnerabilities is an essential element for effective third-party risk management."

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European Big Data spending to reach $50 billion

European spending on Big Data and business analytics (BDA) solutions is forecast to reach $50 billion this year, an increase of 7% over 2020, according to a new update to the Worldwide Big Data and Analytics Spending Guide from International Data Corporation (IDC)

THE FORECAST also shows that BDA spending will gain strength over the next five years as the European economy recovers from the COVID-19 pandemic. The compound annual growth rate (CAGR) for European BDA spending over the 2021–2025 forecast period will be 11%.

"To move toward the hyper-automated enterprise model, investments in BDA will continue to accelerate across all industries as the technologies help to achieve key business outcomes and increase customer experiences," said Andrea Minonne, senior research analyst at IDC U.K. "Big Data gives enterprises a competitive edge and has become a game-changer that is helping all industries achieve their business priorities."

Most European companies are very familiar with the tech, and big enterprises in particular have many Big Data–related use cases in place. Big Data remains a key tech to enhance customer journeys, reduce costs, and streamline complex business processes. Despite

the COVID-19 pandemic, the Big Data and analytics market continued to grow in 2020, highlighting that Big Data is not just a nice-to-have technology but a must-have asset that can help companies fuel digital resilience to move out of critical situations faster. In 2021, banking and discrete manufacturing will account for a quarter of overall spending on BDA. This is due to continuous interest in use cases such as fraud analysis and process automation. If we look at the long term, industries such as professional services and healthcare will have the fastest five-year CAGRs. Healthcare in particular owns a lot of patient data and will use BDA to gain insights from data, optimize and improve their performance, and understand their patients.

Cloud Infrastructure spending on track for growth
According to the International Data Corporation (IDC) Worldwide Quarterly Enterprise Infrastructure Tracker: Buyer and Cloud Deployment, spending on compute and storage infrastructure products for cloud infrastructure, including dedicated and shared environments, decreased 2.4% year over year in the second quarter of 2021 (2Q21) to $16.8 billion. This decrease comes after six quarters of year-over-year growth, and most notably compares to the 39.1% annual growth seen by the market in 2Q20, when the world just entered the pandemic with the first wave of business and country closures causing a spike in investments in cloud services and infrastructure. Investments in non-cloud infrastructure increased 3.4% year over year in 2Q21 to $13.4 billion recovering from a 7.2% decline in 2Q20.

Spending on shared cloud infrastructure reached $11.9 billion, a decrease of 6.1% compared to 2Q20, and a 17% increase from 1Q21. Weakness in year-over-year demand from public cloud service providers comes after an exceptionally strong 2Q20, in which spending increased 55.5% driven by the spike in demand for cloud services in the first months of the pandemic. Such discrepancy in growth rates

Top Companies, Worldwide Cloud Infrastructure Vendor Revenue, Market Share, and Year-Over-Year Growth, Q2 2021 (Revenues are in Millions)

Company	2Q21 Revenue (US$M)	2Q2 Market Share	2Q20 Revenue (US$M)	2Q20 Market Share	2Q21/2Q20 Revenue Growth
1. Dell Technologies	$2,614	15.5%	$2,365	13.7%	10.5%
2. HPE/H3C (a)*	$1,911	11.4%	$1,773	10.3%	7.8%
T3. Inspur/Inspur Power Systems (b)*	$1,438	8.5%	$1,917	11.1%	-25.0%
T3. Lenovo/Lenovo NetApp Technologies (c)*	$1,225	7.3%	$1,107	6.4%	10.6%
T5. Huawei*	$439	2.6%	$573	3.3%	-23.4%
T5. Cisco*	$362	2.2%	$423	2.5%	-14.4%
T5. IBM*	$343	2.0%	$491	2.8%	-30.2%
T5. NetApp*	$293	1.7%	$263	1.5%	11.3%
ODM Direct	$6,166	36.7%	$6,832	39.6%	-9.8%
Rest of Market	$2,033	12.1%	$1,492	8.7%	36.2%
Total Vendor Revenue	$16,824	100.0%	$17,238	100.0%	-2.4%

IDC's Worldwide Quarterly Enterprise Infrastructure Tracker: Buyer and Cloud Deployment, Q2 2021

Notes:

* IDC declares a statistical tie in the worldwide cloud IT infrastructure market when there is a difference of one percent or less in the vendor revenue shares among two or more vendors.

(a) Due to the existing joint venture between HPE and H3C, IDC is reporting external market share on a global level for HPE and H3C as "HPE/H3C" starting from 2Q 2016. Per the JV agreement, Tsinghua Holdings subsidiary, Unisplendour Corporation, through a wholly owned affiliate, purchased a 51% stake in H3C and HPE has a 49% ownership stake in the new company.

(b) Inspur revenues include revenues and server units for Inspur Power Systems. Inspur is reported as a separate company with revenues including Inspur OEM systems and Inspur Power Systems locally developed and branded systems revenue. Per the JV agreement, Inspur Power Commercial System Co., Ltd., has total registered capital of RMB 1 billion, with Inspur investing RMB 510 million for a 51% equity stake, and IBM investing RMB 490 million for the remaining 49% equity stake.

(c) Lenovo/Lenovo NetApp Technologies revenues include revenues from the joint venture which is comprised by Lenovo with a 51% equity stake, and NetApp with the remaining 49% equity stake

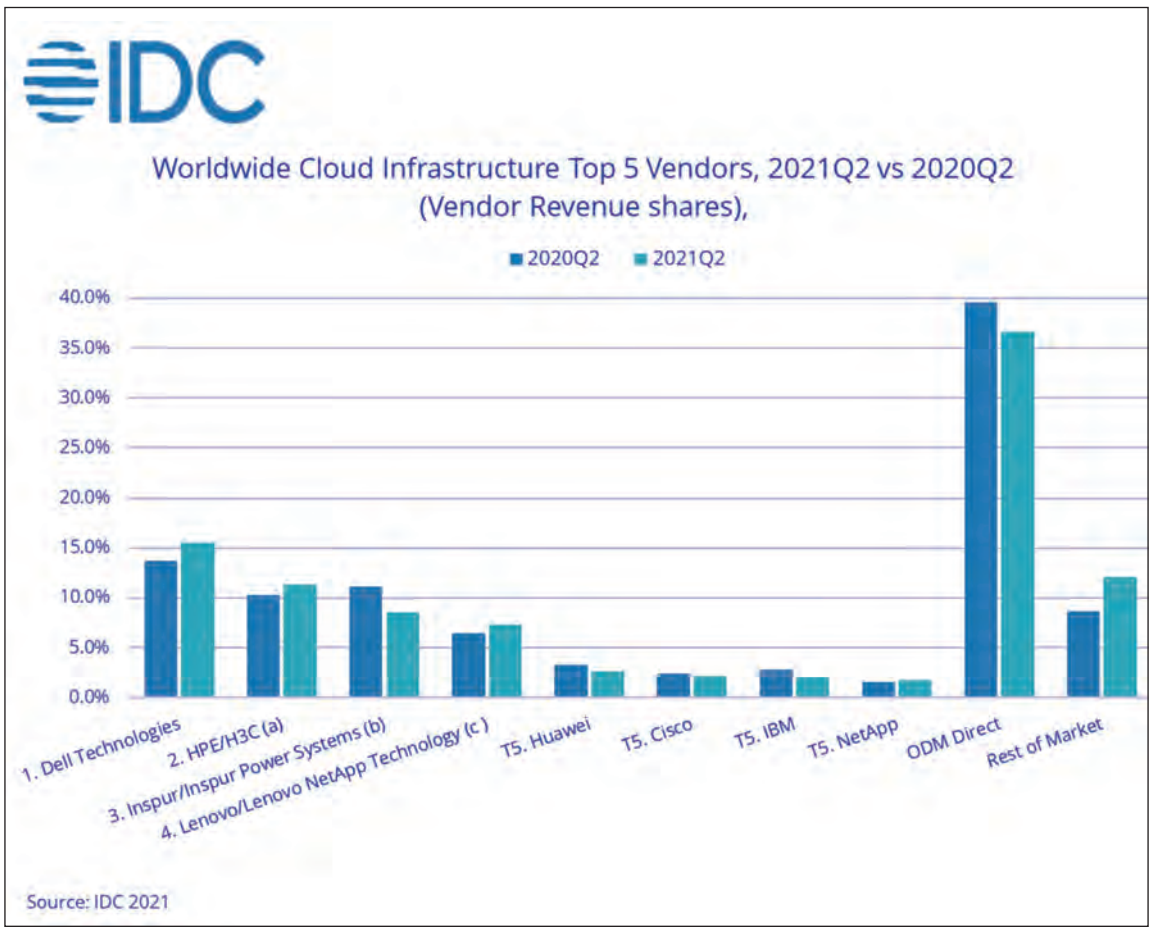
attributable to exceptional events creates "hard" comparisons that don't reflect long-term trends. IDC expects to see continuously strong demand for shared cloud infrastructure with shared cloud infrastructure spending surpassing non-cloud infrastructure spending by 2022. Spending on dedicated cloud infrastructure increased 7.8% year over year in 2Q21 to $4.9 billion with 46.5% of this amount deployed on customer premises. IDC expects that cloud environments will continue to outpace non-cloud throughout its forecast.

Despite weakness in 2Q21, IDC is forecasting cloud infrastructure spending to grow 12% to $74.3 billion for 2021, while non-cloud infrastructure is expected to grow 2.7% to $58.9 billion after two years of declines. Shared cloud infrastructure is expected to grow by 11.1% year over year to $51.4 billion for the full year. Spending on dedicated cloud infrastructure is expected to grow 14.1% to $22.8 billion for the full year.

As part of the Tracker, IDC tracks various categories of service providers and how much compute and storage infrastructure these service providers purchase, including both cloud and non-cloud infrastructure. The service provider category includes cloud service providers, digital service providers, communications service providers, and managed service providers. In 2Q21, service providers as a group spent $17.1 billion on compute and storage infrastructure, down 1.9% from 2Q20 and up 13.6% from 1Q21. This spending accounted for 56.5% of total compute and storage infrastructure market. IDC expects compute and storage spending by service providers to reach $74.6 billion for 2021, growing at 10.5% year over year.

At the regional level the year-over-year changes in spending on cloud infrastructure were mixed: spending increased across the Asia/Pacific subregions, in Latin America, Canada, and Central and Eastern Europe, and declined in the United States, Western Europe, and the Middle East and Africa. Canada showed the strongest year-over-year increase in cloud infrastructure spending in 2Q21 at 25.6% while Western Europe recorded the strongest decline at 8.8%. For the full year, spending on cloud infrastructure is expected to increase across all regions compared to 2020.

At the company level, major vendors showed mixed results in their cloud infrastructure revenue in 2Q21, with Dell Technologies, HPE/H3C(a), and Lenovo/ Lenovo NetApp Technologies(c) increasing sales while Inspur/Inspur Power Systems(b), and Huawei experiencing declines compared to 2Q20. Long term, IDC expects spending on compute and storage cloud infrastructure to have a compound annual



growth rate (CAGR) of 12.4% over the 2020-2025 forecast period, reaching $118.8 billion in 2025 and accounting for 67.3% of total compute and storage infrastructure spend. Shared cloud infrastructure will account for 69.9% of this amount, growing at a 12.4% CAGR. Spending on dedicated cloud infrastructure will grow at a CAGR of 12.3%. Spending on non-cloud infrastructure will rebound in 2021 but will flatten out at a CAGR of 0.1%, reaching $57.7 billion in 2025. Spending by service providers on compute and storage infrastructure is expected to grow at a 11.2% CAGR, reaching $115 billion in 2025.

Worldwide IT and Business Services forecast improves
Worldwide IT and business services revenue is expected to grow by 3.4% (in constant currency) in 2021, according to the International Data Corporation (IDC) Worldwide Semiannual Services Tracker. In nominal dollar denominated revenue based on today's exchange rate, the market will grow by 6% year over year, due to FX fluctuation.

The services market is forecast to top $1.1 trillion in 2021. This year's recovery is more or less in line with IDC's forecast from April. This has been consistent with what major vendors have been reporting in the first and second quarters of this year.

IDC believes that the market will continue to expand through 2023 and 2024 with growth between 3.8% to 4.0% annually. The mid-term and long-term market growth have also increased slightly by 20—50 basis points each year, pushing the market's long-term growth rate to 4.3%, up from the previous forecast of 4.1%. A better economic outlook has contributed to the improved optimism, but the main driver was the stronger demand for IT and business services across several regions outside the U.S., particularly where large government-led digitalization programs and schemes are taking place (i.e., in Europe, APAC, etc.). The Americas services market is forecast to grow by 2.4% in 2021, down slightly from the April forecast in constant currency. The outlook for the U.S. remains largely unchanged with projects, managed services, and support services recovering in 2021. Even though U.S. GDP growth has softened in recent months, IDC continues to project the U.S. market to grow more than 2.3% this year and 3.7% in 2022.

Both Canada and Latin America's mid-to-long-term growth (in constant currency) have been adjusted downward marginally. Both are still forecast to see continued recovery well into 2022 and 2023. The changes largely reflect the timing of local recoveries. The near-term outlook for Europe remains sanguine and unchanged. As previously forecast, Europe's recovery this year will fuel global recovery for the IT services market, accounting for around 30% of annual growth worldwide. Western Europe's annual growth rate over the next few years has been adjusted upward again by around 25 basis points due to an improved outlook across the major continental

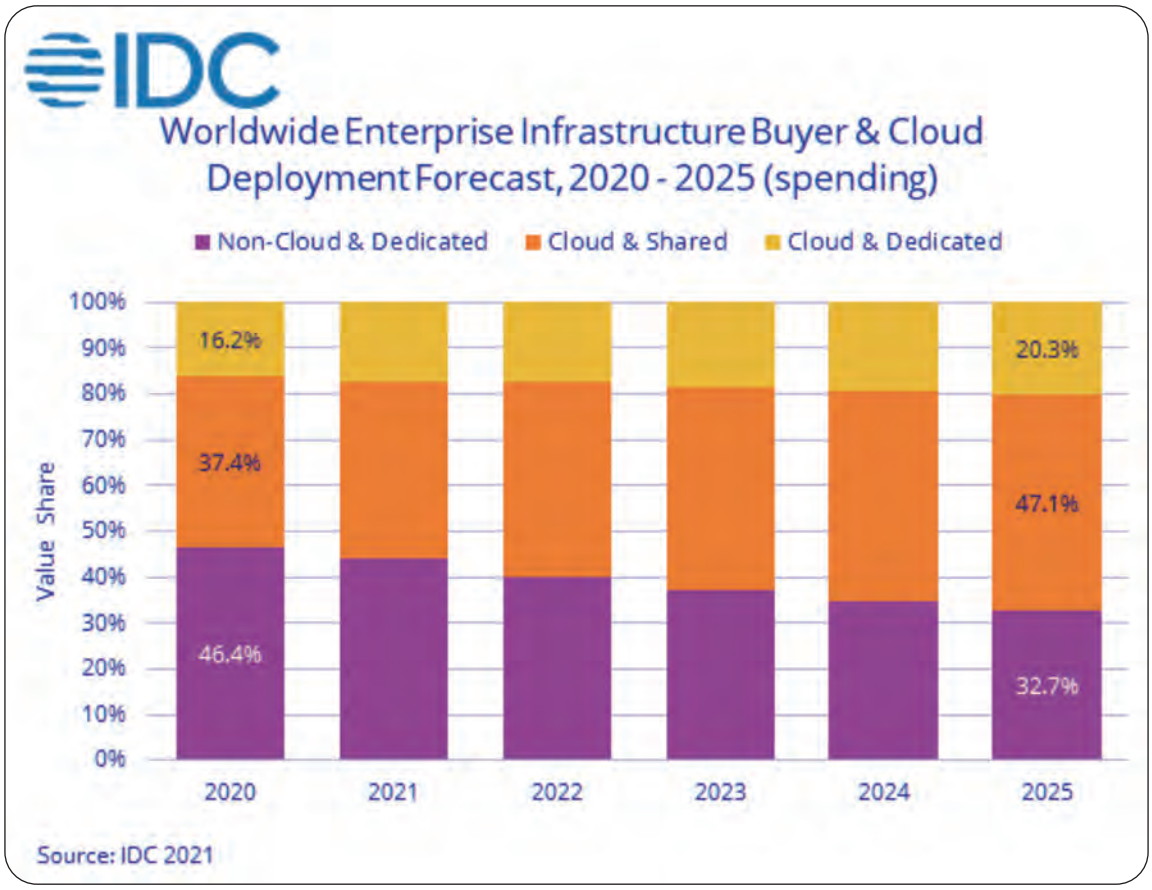
The services market is forecast to top $1.1 trillion in 2021. This year's recovery is more or less in line with IDC's forecast from April. This has been consistent with what major vendors have been reporting in the first and second quarters of this year

European economies. IDC is confident that the region will continue to grow above 3% in the following years, which will markedly outpace GDP growth, thanks to European governments' stimulus spending and long-term investment policies to target "digital transformation" and "new industries." The Central and Eastern Europe (CEE) growth rate was also adjusted upward accordingly: IDC estimates that CEE's growth rate will return to its pre-pandemic level (9%+) by the end of this year because of its relatively small base and the fast rebound from Russia.

The short-to-long-term growth rate for Middle East & Africa (MEA) was adjusted downward by 40 – 50 basis points compare to the April forecast. As energy and commodity prices soar again and large national projects are set in place to drive infrastructure and digital spending, IDC expects the region will return to its pre-pandemic growth of 6.5%+ by 2025. However, given the pandemic-related challenges MEA countries still face (slow vaccination rates, restrictions on travel, etc.), IDC remains cautious about the timing of the region's recovery.

Asia/Pacific's growth outlook did not change significantly. Mature markets continue to recover steadily: the growth outlook for the larger economies, such as Japan, South Korea, and Australia, remains in the 2 – 3% range while the smaller economies are clocking faster growth, particularly in this cycle. IDC has lifted the near-term and long-term growth for New Zealand and Singapore by 15 – 20 and more than 30 basis points, respectively.

Additionally, because certain markets are recovering slightly faster, IDC has shifted more mid-term growth rates to the near term to reflect this. For example, China's projected market size for the year has been adjusted upward to almost 11% (across most foundation markets) as buyers are more "squeezed" on the supply side. However, as this is driven partially by one-time "pent-up" demand from 2020, and thus



not sustainable, 2022's growth rate will fall to just 4%, before eventually tracking back to its normal growth path.

As for the other emerging markets in the region, IDC's outlook remains largely unchanged: they still enjoy better growth outlook than most other regions/countries, but short-term growth is more susceptible to extraneous factors.

"The need for digital transformation and the demographic squeeze on (the right) talent pool, expedited by the pandemic, global supply chain disruptions, and lose monetary policies, have created the perfect push and pull for enterprise buyers; therefore, our long-term growth outlook for the IT and business services market remains sanguine," said Xiao-Fei Zhang, research director, IDC Global Services Markets and Trends. "Additionally, we are seeing large services providers also making big bets, both organic and inorganically, on the operations and product side, which enjoys more than twice the market growth of the existing IT/business services market, according to our latest Digital Engineering & Operational Technology Tracker's latest figures."

European AI spending to reach $22 billion in 2022

LONDON, October 7, 2021 – The new Worldwide Artificial Intelligence Spending Guide from International Data Corporation (IDC) forecasts that European spending on AI systems will jump from $17.3 billion in 2021 to more than $50 billion in 2025. The compound annual growth rate (CAGR) for 2021–2025 will be 26.7%.

Banking and manufacturing will spend the most on AI solutions over the five-year forecast period, with healthcare spending growing the fastest in the long term. Retail AI spending will largely focus on automating customer service and implementing sales process recommendation and automation engines.

Manufacturing **will allocate much of its AI investment to quality management and investigation solutions and systems that help manufacturers carry out predictive maintenance.**

"European spending on AI will reach $22 billion in 2022, and the market will grow significantly, meaning that European companies will consider AI as a priority tech that will bring significant impacts across different industries," said Andrea Minonne, senior research analyst at IDC UK.

"European companies are increasing investments in intelligent solutions as they recognized the value of implementing intelligent and automated approaches during last year's COVID-19 pandemic in terms of business efficiency and digital resilience."

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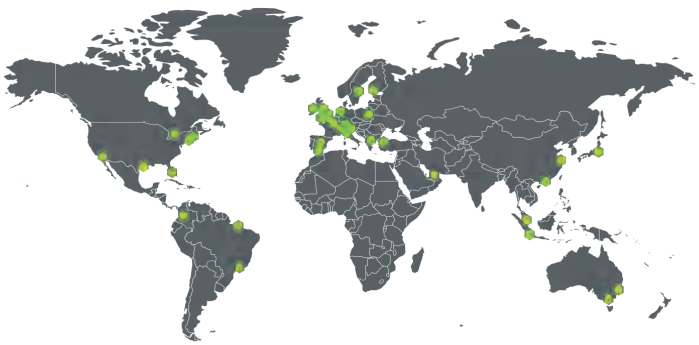

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FPT brings Vietnam digital transformation services to Europe

To function optimally, enterprises need access to a wide portfolio of options for IT and operations talent. Enterprise leaders are looking at all business and talent models to get what they need, especially where emerging technologies are concerned.

BY MOHAN NAIDU, FPT UK MANAGING DIRECTOR

VIETNAM thoroughly embraced this shift and emerged stronger in the pandemic economy by virtue of its ambition, vision, and willingness to pivot quickly. Vietnam has made rapid strides in the last few decades to embrace emerging technology and cultivate a smart, able, and future-ready workforce. Now the challenge is to get word of Asia Pacific's best-kept secret out to global enterprises.

Software outsourcing is set to explode in Vietnam as its standing grows as an IT development destination. In recent years Vietnam's IT industries have been moving up the value chain and offering more value-added work. Vietnam, a nation that at first might not come to mind as a global software exporter, but just like South East Asia in general, is behind some of the world's leading providers.

Founded in 1999, FTP Software is part of the FPT Corporation and has built its services from the ground up over the last two decades and is today a global technology and IT services provider with more than US$513 million in revenue and 20,000 employees in 26 countries, including Vietnam, Japan, Myanmar, Indonesia, India, Singapore, Germany, the UK and the USA. Its parent company, FPT Corporation, reports revenues of nearly $1.3 billion with a workforce of 30,000.

The Hanoi-based corporation's software business arm has served 700+ customers worldwide, a hundred of which are Fortune Global 500 companies in the industries of automotive, banking and finance, logistics and transportation, utilities, and more. Its growing reputation recently merited inclusion in Gartner's 2020 Market Guide for Public Cloud Managed and Professional Services Providers (MSPs) Asia/Pacific.

Intercontinental expansion

FPT Software is investing in its intercontinental expansion, with Europe targeted as a first port for capital commitment in the value of $100 million that includes organic and inorganic growth over the next three years.

The software company established itself in the EU market and in the UK with its first global client more than 20 years ago. European growth was steady but its focus and trajectory took it into Japan and the US, where it now employs thousands of local and international experts and engineers, reaching revenues of hundreds of millions in USD annually. The focus has now returned to UK and Europe, where there is a high demand for digital transformation and innovation projects.

Providing the bridge between Europe and Asia
While many new ideas may come from the EU, Asia provides an ideal testing ground to trial concepts. Regulation is more flexible with the freedom to explore solutions; people are open to new ideas and ways of thinking. As a software business, FPT has not only assisted its customers with technical implementations but also helped them bring innovative ideas to life. Asian firms have found they can act as the bridge between Europe and Asia in many digital initiatives. One of the challenges facing the UK and Europe is a dearth of resources in emerging technologies. A digital talent shortage has forced service providers to step in to plug up some of the gaps while in-house teams are being hastily expanded to cope with the workloads. Companies that have previously relied on their offshore delivery centres or captives are now trailing behind with many of their digital transformation projects. Endemic across all industries the fallout has meant some are reconsidering their service delivery location strategies (part of business continuity and disaster-mitigation planning) to rebalance some of the risks.

The answers may lie in building a dedicated delivery team or a captive delivery centre (under your ownership) in a collaborative partnership. Not only could the risks be mitigated with a more cost-effective model and a highly-skilled talent pool but there is also a shared responsibility for business operations and continuity. This approach returns the bandwidth that companies may have lost during COVID, giving businesses the freedom to refocus on their core activities such as the development of products and strategy.

Could and AI the next IT services powerhouse come out of Vietnam?

Vietnam is a rising digital nation. With 70% of the population under 35, Vietnam is seen by many big international companies as a new opportunity to be the next key service delivery location and/or captive centres. Its digital economy is the second-fastest-growing market in Southeast Asia, according to a recent report by Google, Temasek, and the US-based global management consultancy Bain. The challenge it faces is a need to grow the digital workforce by an additional 190,000 IT engineers by the end of 2021. The Government has also shown its commitment to reinventing the country. The National Program for Digital Transformation, aims to grow the digital economy to 30% of GDP, deploy universal fibre and 5G, build 100,000 digital businesses and employ 1.5 million people in the digital workforce by 2030. Vietnam is listed in the Top 5 most attractive destinations for IT Outsourcing (According to AT Kearney, 2019) while Gartner considers Vietnam as the Tier 1 Emerging offshore outsourcing location in APAC. Vietnam also ranks #9 in Top 10 Digital Nation (According to Tholons).

Vietnam tackled this digital fluency challenge head on. A foundation of the attractive talent market in Vietnam is its robust, digitally oriented education

system. Currently, Vietnam has 236 universities, 149 of which are training IT professionals, delivering more than 50,000 IT engineers to the workforce annually. This lands Vietnam on the list of the top 10 nations in the world for the highest number of IT students. FPT already established an AI centre in Quy Nhon City, and it partnered with the world's leading AI research institute, Mila, making FPT the first Southeast Asian corporation to be a strategic Mila affiliate. With these moves, FPT aims to turn Quy Nhon into Vietnam's AI valley.

Vietnam continues to promote business reform and cultivate digitally fluent talent; it is poised as a rising star in the global services market. The country is full of young, talented people and a culture that promotes innovation, and it is quickly becoming a hub of technology expertise. While the barriers continue to be Western perceptions and lack of mindshare among global executives, today's executives seek multiple levers to pull to find ample talent. Vietnam is building on a solid foundation to be a viable option for enterprises to leverage for years to come. The digitally-enabled future for Vietnam is just beginning—and it is looking very bright.

FPT brings Vietnam digital transformation services to Europe

FPT has demonstrated it has an unswerving focus on technology that accelerates the process of digital transformation. Over the last few years, it has concentrated on the core technologies that are driving transformation such as AI, Big Data, Blockchain, RPA and IoT.

It is also on track to build a comprehensive ecosystem of world-class software to transform businesses all around the world. In Europe, it currently works with RWE, E.ON, Allianz, Siemens, Schaeffler, Airbus on its digital transformation programme and projects requiring emerging technology capabilities (Data Platform, IoT, Cloud and Automation).

A HYBRID APPROACH:

Achieving infrastructure cost optimisation

Achieving infrastructure cost optimisation has become a business priority for many organisations around the world. The rapid growth in demand for digital services in recent years has forced companies to modernise their IT infrastructure and move to the cloud. Here, they were promised optimised costs, more agility and efficient operations.

BY TYTUS KUREK, PRODUCT MANAGER, CANONICAL

IT TURNED OUT, however, that cloud migration is not that simple from an economic point of view. Many companies that initially enthusiastically embraced a cloud-based strategy and moved all of their workloads to public clouds have experienced cost increases over time. According to the IDC Cloud Pulse 4Q19 Quarterly Summary, 85% of organisations are repatriating workloads from the cloud and back to on-premise, in order to regain control of their budgets and finally achieve long-term cost savings.

Therefore the search for cost optimised infrastructure continues, with hybrid/multi-cloud emerging as a popular architecture choice. According to 451 Research's report about cloud trends in 2020, 62% of enterprises are pursuing a hybrid IT strategy. This approach leverages the best of public and private clouds, ensuring workloads always run where it makes the most sense from an economical standpoint. But, how can businesses ensure they are choosing the right cloud approach for them?

Public cloud vs private cloud: the challenges

When it comes to choosing between private and public clouds, each business will have its own unique reasons for choosing one or the other. However, one of the most common deciding factors is cost. We can break down cost into two categories, capital expenditure (CAPEX) and operating expenses (OPEX). CAPEX is a company's major, long term expenses, while OPEX is a company's day-to-day expenses. Both play a big part in optimising cloud cost.

The main reason behind the initial success of public clouds was the ease of use and the near-zero CAPEX cost. In the public cloud world, all you need to do is to create an account, attach your credit card to the billing system and you can start using public cloud resources right away. But when you compare this to private cloud platforms, CAPEX costs are relatively high. This is because implementing a private cloud requires specialist knowledge and the purchase of hardware and, usually, software licenses that have to be paid upfront.

Looking at OPEX costs, the numbers speak in the favour of private clouds. This is because public clouds tend to suffer from the lack of pricing transparency and their fees are expensive, especially when handling long-term and large-scale workloads. Meanwhile, private cloud OPEX costs are fairly static and in the case of cost-efficient private cloud platforms, such as OpenStack, much lower compared to public cloud OPEX costs. Thus, optimising infrastructure costs should always involve looking at the total cost of ownership based on the current number of workloads and their growth prediction. It's up to a business and its individual needs as to whether it chooses a private or public cloud infrastructure. But we often

see businesses find the most success when they use aspects of both and adopt a hybrid approach into their operations.

Adopting a hybrid strategy

Since both public and private clouds have their own economic advantages, adopting a hybrid strategy sounds smart. This is because the complexity of businesses today generally necessitates a mixture of on-prem and public, no matter if you are a start-up, medium or larger enterprise. While some may see hybrid as overkill, many aspects of businesses and our everyday lives are now hybrid anyway, so why should the cloud be any different?

For example, a mid-size software company based in London with two small satellite offices in the US and China may not need its own office in all of these regions. It may only own the London office while renting the satellite ones until the number of employees in these regions grow. This is hybrid accommodation. Or let's take a big transportation company as another example. Such a company may have its own fleet of vehicles, but may also rent some during periods of increased demand. This is hybrid transportation. Hybrid makes sense because it marries the best of both worlds together, offering businesses flexibility and choice in how, and where they operate.

Businesses have known for a long time that the implementation of a hybrid strategy enables cost optimisation. But over the past 18 months, hybrid strategies have demonstrated their value for another reason – how well they equipped and supported businesses in the shift to remote working. Overnight, once office-based workers found themselves at home working remotely. For some businesses, this transition was easier than others because they already had hybrid strategies in place, or could quickly implement them. As a result, there was little downtime and employees were able to work as efficiently as before. Ultimately, this is the beauty of a hybrid approach – its benefits extend far beyond cost. It can help businesses maintain operations, even in the most testing of times.

The benefits of hybrid/multi-cloud architecture

There are many benefits available to businesses who embark on a hybrid/multi-cloud architecture. For instance, it enables organisations to always run their workloads where it makes the most sense from an economical standpoint. They can start small in the public cloud and build their own cost-efficient cloud infrastructure when the number of workloads grows. Once they own the cloud they can migrate the majority of workloads to their own resources, instead of renting them.

At the same time, businesses can continue using highly scalable public cloud resources during heavy load periods. They can also leverage them occasionally when they need to execute compute-intensive tasks, such as data analytics. Using both flexible public and cost-efficient private cloud infrastructure at the same time enables them to monitor their spendings and always pay less for the same amount of resources, while ensuring scalability and flexibility.

Finally, since the hybrid/multi-cloud model means consuming services from more than one cloud service provider, this enables organisations to avoid vendor lock-in and negotiate prices. Thus enabling optimisation of infrastructure costs even further. While hybrid as a concept isn't new, it has been thrust in the spotlight over the past 18 months. Businesses that adopt a hybrid approach have lots to gain, from taking back control over their cloud expenditure, to ensuring their employees are working efficiently, no matter if they are in the office or elsewhere. So is the future of infrastructure going to be hybrid/multi-cloud? We don't know yet. But it is certainly an area organisations will be exploring in the years to come.

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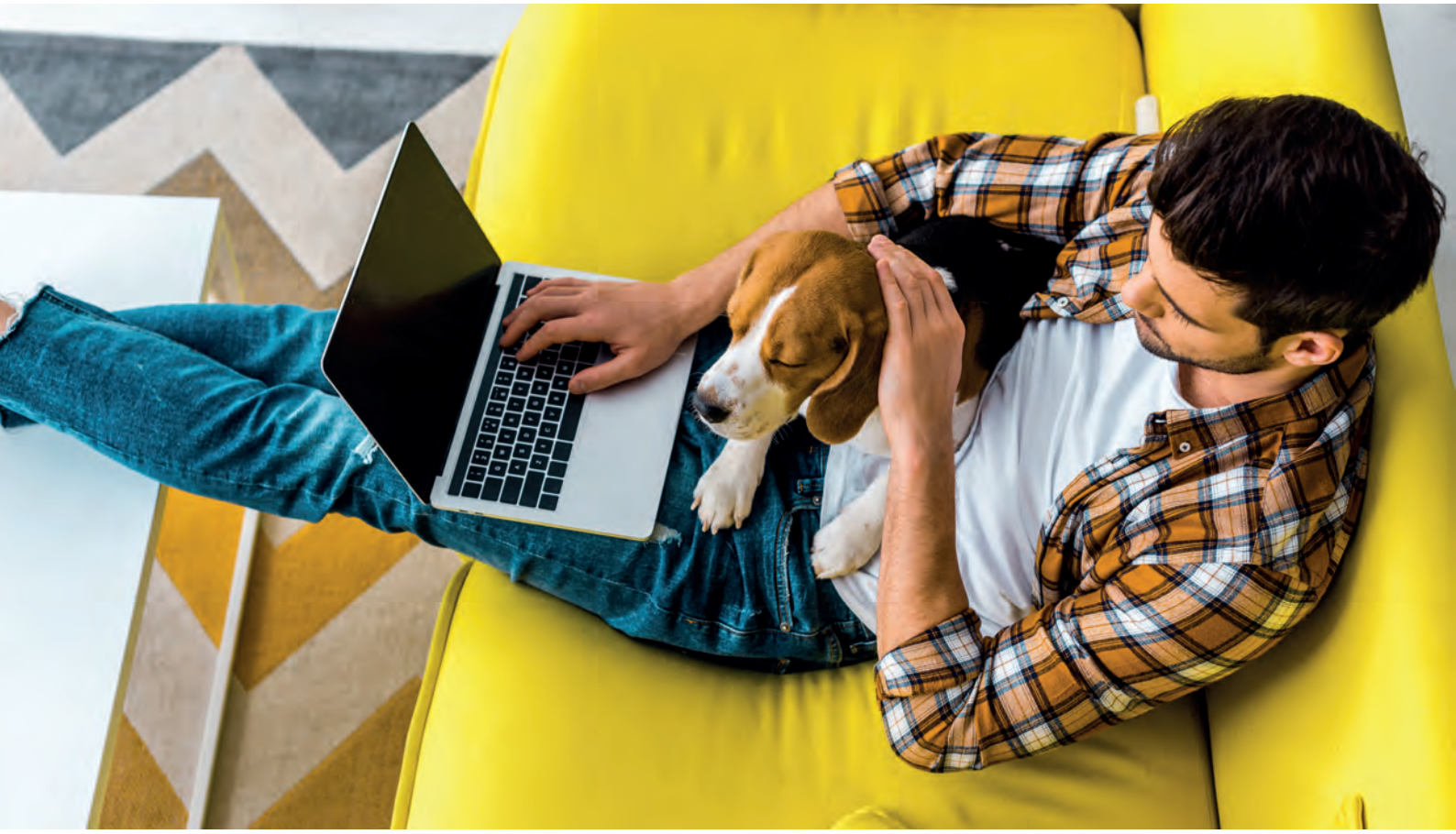


The 'new normal' means a new dependence on the public Internet - so how can IT teams prepare?

If you could tell employees all over the world back in 2019 that in just two years, expectations and understandings about the way we do our jobs would do a 180 degree turn, they probably wouldn't believe you. But we now know that to be true, as workers across the globe adapt and learn to live with a new hybrid working model.

BY ALEX CRUZ FARMER, GROUP PRODUCT MANAGER, END-USER EXPERIENCE AT CISCO THOUSANDEYES

ALTHOUGH the majority of organisations had to scramble to quickly adapt to this new model, many of us have now settled into the rhythm of hybrid work. This means that businesses now have the opportunity to get to grips with running a successful hybrid work technology stack, enabling workers to feel supported and continue to work productively and collaboratively - even while physically apart.

This new way of working comes with a myriad of benefits, offering flexibility and the ability to spend more time at home with loved ones, but there's a lot of uncharted territory to explore - bringing with it the promise of several bumps in the road. For IT teams, hybrid work means transitioning from looking after one central office hub to many distributed 'home offices' potentially all over the world, each with its own individual factors which could impact an employee's ability to effectively do their job.

Cloud collaboration tools, business-critical apps and VPNs are now an essential component of many organisations' everyday procedures, and they bring a new world of business opportunities - but these components must work together successfully in order for organisations to benefit.

For IT teams, this means learning to navigate these tools within an increasingly complex Internet ecosystem, where workers are connected via both home broadband and corporate networks. They must therefore implement end-to-end visibility from user to application in order to spot and remediate issues as efficiently as possible, in turn enabling their businesses to feel confident and informed in the new hybrid world.

The enterprise tech stack without borders

While by no means an easy task, IT teams had a much simpler job to tackle when employees all worked together in one central office. They were able to look within their own internal network and data centres to locate, fix and even prevent issues - but with workers now dotted around multiple locations, this presents new challenges to IT. Their data centre is now the cloud, their enterprise network the Internet, and their app stack SaaS apps.

Public cloud adoption is one such development that organisations can hugely benefit from, offering more stability than ISPs. In fact, from January 2020 to August 2021, cloud provider networks accounted for just 5% of outage incident volume, with ISP networks accounting for the remaining 95%. However, as with any new technology implementation, this doesn't come without IT considerations. As businesses add more cloud-based services to their technology stack, they face less visibility into performance and availability within different areas. Cloud also means that organisations lack ownership and therefore control of these networks, which adds further complexity to the monitoring environment.

The public Internet now also holds up the enterprise network - but it is not fit for this purpose, and for many network engineers has become a 'black box' which they struggle to understand. It's therefore more important than ever for organisations to gain visibility in order to maintain the health of the Internet and deliver quality connectivity to employees, allowing them to work uninterrupted.

Additionally, workplace collaboration apps have taken off since the pandemic - in fact, they are now the #1 most monitored application type globally, and are viewed by many organisations as the most critical application type for hybrid work success. However, IT teams' lack of ownership of these apps alongside their growing importance means that teams now depend even further on external third-party providers outside of the four walls of their business.

With all of these factors at play, understanding how outages occur and resolving them has never been more important in ensuring business continuity. After all, outages are inevitable. Without the right insights, companies can lose valuable time and money while their IT teams frantically work to resolve an issue - but this can all be avoided with actionable Internet intelligence.

Powering the hybrid workforce with actionable intelligence

In order to build a digitally connected workplace and run the new technology stack, businesses need to explore up-to-date and intelligent network monitoring tools. Using a combination of real-user monitoring alongside synthetic proactive transactions, they can detect and respond to performance bottlenecks not only reactively, but even in pre-production before disruptions impact employee experiences. By implementing end-to-end visibility of the entire ecosystem - from the user's device, across the network, and into the cloud infrastructure - businesses can ensure visibility and performance across all components of the supply chain.

Hybrid working is now a long-term and strategic decision for organisations, many of which are investing in this model all over the world. They therefore require this visibility, now and in the future, to allow them to garner instantaneous and workable intelligence into their own networks - whether or not they own them. This knowledge means that they can ensure that employees can seamlessly access the business-critical applications and collaboration tools they require to effectively do their jobs, keeping workers, customers, and therefore businesses happy.

Building a hybrid infrastructure- how contact centres can benefit

Over the past 18 months, moving at least some of their infrastructure to the cloud has become a necessity for many customer-facing organisations. As workforces switched to home working at the start of the pandemic, businesses had to find a way of migrating to the cloud or, at a minimum, virtualising their contact centre.

BY GARY BENNETT, VP OF EMEA, ENGHOUSE INTERACTIVE

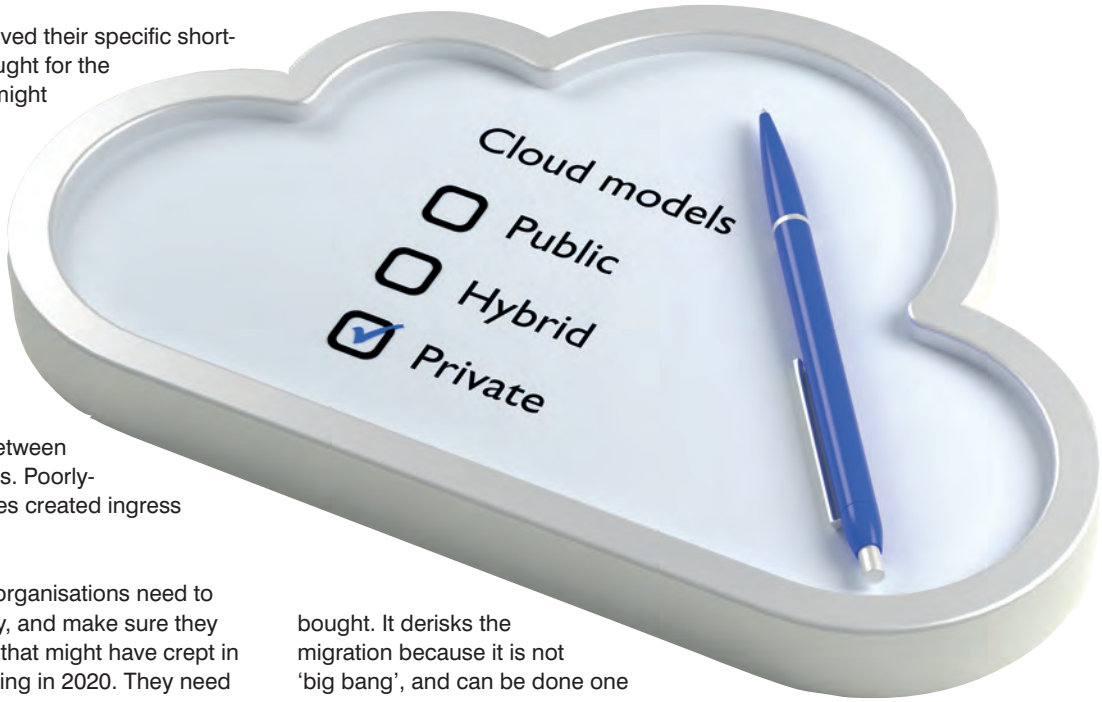
THAT MEANT bringing in technologies like unified communications as-a-service as the platform for their contact centre operations.

By so doing they joined the growing ranks of organisations benefiting from cloud-based contact centres and reaping the rewards from being able to work in a hybrid or virtualised way, to flex and scale and pay only for what they use. These are among the potential benefits of cloud. But tap into these benefits organisations must both implement cloud in the right way and tailor their version of cloud to their own specific business needs

A rushed migration

At the beginning of the pandemic, many organisations fell foul of a rushed implementation process. Often they brought in 'point and shoot' cloud-based

software applications that solved their specific short-term problems, with little thought for the longer-term challenges that might result.



They soon realised, however, that a using a disjointed, poorly-connected cloud infrastructure was not the most effective way of supporting highly-automated, sophisticated customer journeys. Agents ended up having to toggle between more systems rather than less. Poorly-crafted integrations sometimes created ingress points for hackers to exploit.

In resolving these problems organisations need to take a holistic view of security, and make sure they fill in the gaps for any lapses that might have crept in during the rush to homeworking in 2020. They need to secure all their applications, not just their core infrastructure. They need to secure their data and they need to make sure staff have a secure set-up when they are working from home.

Alternative approaches

For some organisations also, pure cloud is never likely to be the answer and a hybrid approach may work best. Banks, for example, take security especially seriously and are therefore never going to put ingress points outside of their main firewall. Moreover, larger companies can afford larger IT departments, and are therefore more likely to be comfortable running an infrastructure which is partly private cloud, partly public cloud and partly on premise.

The smaller the business concerned, the easier and more comfortable it may be to push more of the infrastructure 'out of the door' onto Microsoft Azure, or an alternative public cloud and let the relevant provider worry about running the IT systems.

Some organisations also may have grown through acquisition. They may have several legacy PBXs in their environment and therefore be keen to connect up with contact centre solutions that are open from an API perspective, and that make it easier to create a new clean intuitive agent experience and deliver optimum customer service. That could all be created virtually and yet, at the same time, still allow the company to sweat down the investments they have in legacy equipment.

Some businesses may favour a phased migration. They may have contracts that expire in three to five years' time. And they want to do a controlled migration and switch legacy systems off in a way that they extract maximum value out of what they have already bought. It derisks the migration because it is not 'big bang', and can be done one phase at a time.

Cloud composition

In terms of the cloud composition, ultimately too, businesses also need to think about what kind of data they are handling and what data have they got that they are processing. For some organisations, GDPR is a consideration. So, they need to think about where their servers and customers are located and where the data is being processed. All these elements are factors.

Organisations might also want to opt for a private cloud implementation, located within a public cloud. If they were on Microsoft Azure, for example, they would be in the public cloud, but they could also access a private cloud space within Azure. They could access a piece of the cloud server that is gated to them and is likely to be highly secure.

Other businesses might want to opt to keep some legacy systems on-premise even as they migrate other applications to the cloud. They may have certain old applications that are integral to their business that can't be migrated to the public cloud or easily be integrated with other systems that are in a public cloud.

In this scenario, they may end up having to take that difficult decision either to scrap their old applications and start again, or run them on-premise on a server in the office and then through that, create a gateway to the public cloud.

There are no right or wrong answers here. The benefits and risks for every approach are well known and each organisation needs to take a look and say 'this is our strategy, this is how we are going to market it and this is what we need to make it a success.

How businesses can transition to hybrid working, without compromising on cybersecurity

As the world begins to open up after a year of intermittent lockdowns and remote working, IT and security teams are set to face a new landscape created by hybrid working. While the majority of restrictions have been lifted in the UK, and what has become known as "Freedom Day" has come and gone, not everyone will return to the office five days a week.

BY KEITH GLANCEY, SYSTEMS ENGINEERING MANAGER, WESTERN EUROPE, INFOBLOX

ALTHOUGH the government is no longer advising people to work from home, many businesses don't plan on rushing back to the office. In fact, 84% of UK businesses plan on making a permanent change to their way of working, implementing a flexible or fully remote strategy moving forward. With companies like Adobe, Deloitte and Asda allowing their employees to work from wherever they like, it's clear that, for many of us, the future of work will be hybrid.

Many organisations have been looking beyond their on-premise infrastructure for years, and so while hybrid working isn't a wholly new concept, its popularity has been accelerated by the pandemic. The rapid pace at which this change has taken place, however, has left many security teams struggling to keep up. Securing a clearly defined IT landscape can be a challenge, but securing a landscape without clearly defined boundaries is even harder.

Adapting security to a hybrid workplace

In a typical office-based environment, all IT infrastructure tends to sit in one or more regional or centralised data centres, which makes it simpler to secure with centralised security solutions. But when we expand the environment from the office to incorporate employees' homes or chosen places of work, we also expand the digital attack surface. This means that IT teams need to ensure that employees are set up with systems that are optimised for the cloud and that all devices they are using are also secure. The adoption of new, cloud based solutions and systems to support hybrid working raise their own set of unique challenges, largely centering around visibility.

When employees are not working from an office location, they're more likely to use their work devices for personal use, such as browsing social media, online shopping or streaming entertainment services. What many don't realise, however, is that connecting to unsecured Wi-Fi, unsanctioned applications or browsers with unsecured plug-ins has the potential to compromise the entire corporate network.

Whether it's by choice or due to a lack of resources, hybrid working is also likely to encourage some employees to use their own personal devices to access corporate networks. Using personal devices which are unknown to the system can be a significant threat. Since IT teams can't easily enforce corporate security policies for devices and applications that sit outside of their infrastructure, each device is a risk.

It's not just the personal device that employees are using for work that poses a threat to corporate networks, either. The average home today has 11 IoT devices connected to its network. Each of these personal devices will be unknown to the IT team and corporate system and each can provide a vector through which malware can enter an employee's home network and then move laterally to infect the corporate network. Since businesses can't easily enforce corporate security policies on devices that sit outside of their infrastructure, use of personal devices opens up the floodgates and puts businesses at increased risk from attacks such as phishing and malware.

Secure networks in a hybrid world

It's evident that instead of hanging on to a network model that isn't compatible with this new, hybrid environment, that organisations need to embrace a more strategic approach to security. IT administrators can no longer afford to look at networking and security as two separate entities, but must consider them in tandem with one another. IT management and security go hand in hand and can have a significant impact on the way architecture is viewed from a security standpoint. Businesses should constantly be reviewing their security policies to ensure it best suits their current and future needs.

Businesses also need to consider their entire borderless network, and modern security technologies, such as DNS (Domain Name System), can help. DNS enables companies to increase visibility and prevent intruders, no matter where employees are based. It is a core network service, which means that it covers every device that connects to a company's network and the wider internet. This means that it doesn't rely on a device being authorised or known to the IT team. As a result, DNS has the power to see every connection point in the network at all times. By merging DNS with DHCP (Dynamic Host Configuration Protocol) and IPAM (IP Address Management), DDI helps IT teams detect threats at the earliest stages, identify compromised machines and correlate disparate events related to the same device.

For businesses that want to make a success of their move toward hybrid working, defending the network edge must be a priority. Security and networking teams need to work together to implement technologies and policies that will offer flexible, "best in class" protection against cyberattacks.

THE UPSKILLING EVOLUTION: How organizations can prepare their hybrid workforce

The events of the last year have underlined the importance of being a digital-first business. According to one study, executives now understand "technology's strategic importance as a critical component of the business, not just a source of cost efficiencies." But becoming digitally driven is not just about implementing new technologies; to be truly effective, it requires an employee base with the right skills.

BY PAUL BARTH, GLOBAL HEAD OF DATA LITERACY, QLIK

BUT DO THEY have the appropriate capabilities? We often hear about a skills gap holding back businesses. But a lack of skills can also be detrimental to people's health and their ability to do their jobs.

In early 2020, Qlik and Accenture's Human Impact of Data Literacy report highlighted how not having the right skills when working with data left workers feeling stressed and overwhelmed. Just one-fifth of the global workforce reported that they were confident in their data literacy skills, yet 75% of them were required to read and interpret data as part of their roles. It's little wonder then that three-quarters of these employees felt overwhelmed or unhappy when working with data. In fact, procrastination and stress-induced sick leave resulting from information, data and technology issues costs companies an average of more than five working days (43 hours) per employee each year. That extrapolates to a loss of US$ 100 billion for the US economy alone.

Clearly, overlooking employee data literacy skills hampers organizations' abilities to perform, particularly in a digitally driven, data focused world. The impact of hybrid working on upskilling With a new global report finding that 72% of business leaders anticipate embracing the "emerging hybrid model", this critical upskilling now needs to be done in a more location-flexible working environment. In fact, a hybrid workplace will require a more literate workforce, as employees will need to be self-sufficient as they make data-driven decisions in their virtual office.

For businesses, this training investment must go beyond just levelling-up their employees so that they can tackle the digital and data-related tasks that already make up their day-to-day jobs. There also needs to be a focus on the future and supporting their longer-term professional development in areas that will improve their employability. Why? Training is becoming the new recruitment battleground and leaders need to show their workforce that they are actively investing in their careers to avoid losing talent to organizations making greater investments.

At the same time, employees need to be investing in themselves. Many of us took the chance during lockdown to gain a new skill or complete on-demand courses. There's no reason why this can't continue, and I would encourage self-directed learning, especially since there are lots of great free digital modules out there. The hybrid model has given workers a greater say than ever before in how they work. Employees should go further and advocate for training that aligns with their long and short-term career goals.

How businesses can upskill in a hybrid world
But what are the best ways to train and teach hybrid workforces? While it will vary for every business, there

are a set number of principles that can be applied to most organizations:

- **Determine your training needs –** First, businesses to need ascertain what skillsets are needed to empower their workforce. Of course, some training needs are more on an ad-hoc basis such as for those in leadership positions or specialist job functions. However, training in cross-functional skillsets should be ongoing. Given we're all working in increasingly digital and data-driven workplaces, there is a need for regular upskilling in areas such as data literacy and cyber security so that the entire workforce is equipped for this new world of work
- **Align training with your hybrid model –** Once the training needs are confirmed, they need to be optimized for the hybrid model. For example, leadership candidates might need to combine in-office group sessions with one-to-one mentoring catch ups that can be conducted remotely, while graduate training may need to start with onsite instruction, before progressing into on-the-job development
- **Find the tools to enable it –** Having established what is needed, and how it fits with a hybrid model, businesses now need to find the tools to enable it. That might be virtual classrooms, self-directed learning through on-demand modules, instructor-led face-to-face training sessions – whatever it is, it will be determined by the best way to improve the necessary skillset while operating a hybrid model. What businesses need to be conscious of, however, is employees' working patterns – asking someone that's already had back-to-back Zoom meetings to do a two-hour virtual classroom may not be conducive to focused, productive learning

Upskilling to seize the hybrid opportunity

As we look to apply learnings from the past year to inform our road back to the office it's clear that we cannot revert to how things were. The hybrid workplace will become the norm for many and requires rapid upskilling for it to succeed.

By integrating training opportunities into new operating models, and by understanding that responsibility for individual development lies with both the business and worker, companies can build capabilities, employees can improve skills and progress, and both parties can take a step towards making the post-pandemic workplace a success.

The future of cybersecurity: **Edge, Cloud or both?**

The cloud is the backbone of digital cybersecurity.

BY WALTER HECK, CTO, HELECLOUD

DUE TO THE STARK INCREASE in cyber-crime over the last 18 months, data security has never been more important for business survival. IT leaders not only face scrutiny over potential cyber breaches, but they must also follow strict rules and guidelines and are subject to increasingly severe punishments from regulators and governments regarding large-scale breaches. As the number of cyber-attacks continues to increase, and costly ransomware continues to put companies out of business, IT leaders must take steps towards protecting their business's digital data.

Although this can be a challenging and complex task, IT teams have one saving grace – the cloud. Gartner research has shown that up to 60% fewer attacks occur on Cloud infrastructure when compared to on-premises alternatives. In addition, the cloud provides IT security teams with a wider overview of all digital operations. Further to this, a recent IBM study found that 95% of security failures occur due to human error, with data being stored and managed remotely, the Cloud offers fewer direct contact points between employees and valuable company data. Thus, reducing the risk of security failure and potential cyber-attacks.

The importance of AI and automation

AI and automation are the foundations of many more recent cloud security solutions. They both fall under the "Data Science" (DS) umbrella are predominantly

When security teams have DS and machine learning technologies handling routine tasks and first-level security analysis, they are free to focus on more critical or complex threats

used to shift practices from prevention to real-time threat detection, putting businesses and cloud service providers a step ahead of savvy cyber criminals. DS can be used with a company-wide data-driven approach to detect and proactively alert present and future security weaknesses and digital vulnerabilities. DS analyses data coming in and out of protected endpoints, detecting threats based on known behaviour and spotting yet unknown threats based on predictive analytics.

When security teams have DS and machine learning technologies handling routine tasks and first-level security analysis, they are free to focus on more critical or complex threats. This is particularly important given the current skills shortage in cyber security. With 51% of organisations claiming to have a problematic shortage of cyber security skills, companies can relieve some of the pressure by delegating the first level of analysis to bots, allowing security professionals to focus their efforts on combatting more difficult attacks.

DS-based cloud security solutions might never replace human analysts. However, they allow analysts to prioritise their workload, get their tasks done more efficiently and ultimately increase business productivity.

Securing the remote workforce

Since early 2020, employers have been forced to quickly shift to remote work and now employees everywhere are working from just about anywhere. However, remote working or even hybrid working brings with it many security challenges, as cyber actors now have countless entry points to choose from. From cloud to an endpoint, supporting numerous off-campus workers puts pressure on IT and security teams to verify users, enable secure access, and defend the remote work environment from a wide range of threats.

To work remotely, companies need employees to have access to corporate resources through cloud technologies, and major cloud service providers have recorded higher sales numbers to support this increased demand. Cloud applications and services allow organisations to support remote workforces, regardless of their geographical location.

In the future, businesses leaders will need to prioritise cloud security and governance spending and other digital tools and strategies, such as virtual desktop infrastructure, to securely support their remote workforce.

Does the future lie at the edge?

There is great potential waiting “at the edge”. Edge computing enables businesses to offer faster response times, reduced costs, as well as provide a comprehensive IoT strategy that allows organisations to stay competitive and innovative. Recent Grand View Research found that the value of the global edge computing market skyrocketed to $3.5 billion in 2019. As we emerge from the disruption of 2020, many businesses will plan for extensive IoT deployments, and edge computing promises to improve and replace one of the most influential technology trends of the last decade, cloud computing. This shift to edge computing has the potential to further disrupt the digital landscape whilst increasing business revenue. The size of the global edge computing market is predicted to explode to $43.4 billion by 2027, reaching an annual growth rate of 37.4 per cent.

How and why? - Unlike cloud, computing, edge can shift much of the critical processing over to the devices connected to them instead of cloud data centres. In addition, the growing demand for digital security over the last 12 months had resulted in a greater need for more intelligent devices and applications that can process data directly at the edge of the network. While edge computing has been on the IT and operations radar for a long time, it has now moved into the corporate mainstream. The accelerated rollout of 5G will only increase demand and need. Edge computing is lucrative and has the potential to be very good for virtually every industry as there is “money to be made at the edge.”

Why sustainability and digitiSation go hand-in-hand

The climate crisis we face today is the result of how we, as businesses, organisations, governments, and individuals, make decisions.

BY PETER WECKESSER, CHIEF DIGITAL OFFICER AT SCHNEIDER ELECTRIC

TO REDUCE CARBON EMISSIONS, we must decide to consume less energy and use energy more efficiently. It sounds simple, but we all know that this involves often unpopular decisions making it challenging, especially without the right data.

Digital transformation at the service of sustainability

The pandemic has been an intense accelerator of digital transformation. In addition to ensuring digital customer experiences to fuel the new normal, companies have been forced to digitise infrastructures to bring about greater efficiency, agility, and resiliency. Today's digital technologies can help us make decisions smarter, faster, more precisely – all of which is ultimately better for the planet - there are three key enablers:

1. Transparency of Consumption

The Internet of Things (IoT) allows us to collect and analyse energy and resource data, providing insights across systems, buildings, and plants, all the way up to the enterprise-level. With this visibility, electricity and other resources stop being "commodities" that are simply delivered and used when needed. We can measure what we use and control what we measure, matching consumption to actual demand, grid performance, forecasts, and targets. This is the starting point for decarbonisation.

2. Analytics and Artificial Intelligence (AI)

With data-driven insights we can make smart

decisions based on measurements and learnings that are based on facts, rather than on intuition. With the right quality and structure of data, AI has the power to automate, or to assist us in making those decisions in real time, changing traditional business processes.

3. Digital Ecosystem Collaboration

No-one can fight climate change alone, just like no-one can innovate alone. Finding the right technology partner is often the fastest, easiest, and most profitable way to achieve ambitious sustainability goals. This is where digital ecosystems can make a big difference. They empower end-users, technology providers and integrators to come together and share data to create more insights, develop new solutions and solve efficiency and sustainability challenges. Sustainability and digitisation: converging transformations

These three key enablers have one thing in common: They have the potential to change the way businesses operate, and the way people work – in any role, at any level.

This is the crux of digital transformation. The role of a digital leader is to drive that change across the organization. The same goes for sustainability: A successful corporate sustainability strategy needs to be designed and implemented end to end, to accelerate the delivery of concrete results across the business.

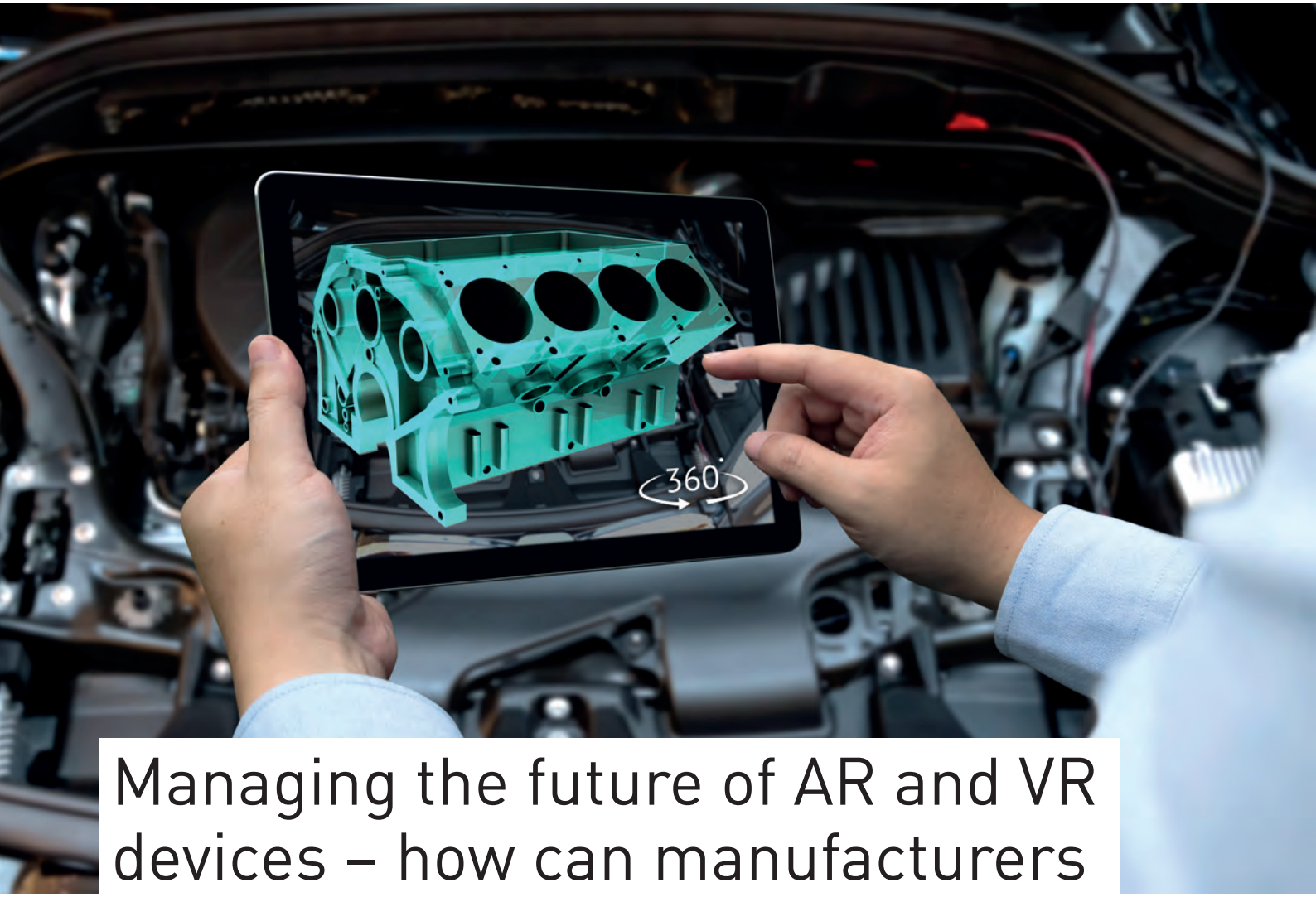
What's more, the two strategies – sustainability and digitisation – must be joined at the hip. If they are, benefits will accrue: According to Accenture, companies that integrate digital and sustainable transformations into their operations and value chains are 2.5 times more likely to be among tomorrow's best-performing businesses than those who don't.

The time to act

Electrification and digitisation are inseparable and critical parts of the fight against climate change. Open IoT platforms, leverage digitisation to optimise energy and resource use for its users. Ultimately, that helps us all to accelerate our sustainability and digitisation agendas.

To address this urgent crisis, businesses need to develop and deploy bold, actionable roadmaps and solutions that allow lower energy-related emissions while still meeting world's demand for energy.

The power of today's digital technologies, data, and AI can help businesses turbocharge this sustainability transformation. All major economic players, companies such as have an important role to play. The faster and more holistically we act, the better.



Managing the future of AR and VR devices – how can manufacturers drive longevity

Until recently, augmented reality (AR) has been widely regarded as being in its infancy

BY DR. STEPHEN COULSON, CHIEF SCIENCE OFFICER AND FOUNDER, P2i

HOWEVER, having rapidly matured over the last year and with a number of AR projects underway across wide range of industries – from manufacturing to healthcare – there is a genuine consensus that this technology might be the next big thing. So much so that its potential to transform business processes as well as day-to-day lives is expected to match and even exceed that of its sister technology, virtual reality (VR).

Big tech companies are making rapid progress with both VR and AR devices. HP is building a VR headset in partnership with Microsoft and Valve, while Apple is said to be developing AR smart glasses and an AR headset set to launch as early as next year.

The evolving AR and VR markets

Both the AR and VR markets have been gathering pace as businesses have seen more applications come to the fore. These are mainly indoor applications but many outdoor applications are beginning to emerge too. From a commercial perspective, outdoor beneficiaries might include engineers working at powerplants who want to interact with equipment as they tour the plants.

We are also seeing a growing number of outdoor applications in the military as well as the leisure and recreational sectors. This has resulted in greater exposure to humidity and environmental impacts; including threats from rain, devices being accidentally dropped in water, and, in some coastal regions, damage from sea spray.

The water ingress challenge

The way AR and VR devices are designed and built – and the capability that needs to be incorporated – makes it impossible for tight mechanical seals to be added like they often are on mobile devices. This means liquids getting inside these devices present a significant threat. This is problematic because AR and VR devices are expensive to buy and their cost naturally leads users to assume they will be durable and long-lasting.

The returns mechanism and reverse logistics process for devices that are damaged by the elements will inevitably be costly for the device manufacturers. Device failure will also negatively impact the brand and that's likely to be further magnified in the social media age as people spread the news to colleagues and friends on social networking platforms.

Miniaturisation and moving parts

Adding to the aforementioned challenge, there is a growing market trend towards the miniaturisation of printed circuit board arrays (PCBAs). As a result, AR and VR manufacturers need increased reliability and repeatability from their liquid protection solutions which liquid-based conformal coats do not typically provide.

If dropped accidentally, for example, the gaskets and O-Rings used for protection are likely to be dislodged, which in turn is likely to let water into the device. It is also often the case that these coatings only protect certain components and are not applied to the full board. This can create a serious issue in many of these devices which are open in design and include multiple moving parts such as joysticks and fans which become vulnerable to water ingress.

Another issue is these devices are expensive and therefore often need to be shared by multiple people, and through the pandemic have therefore needed to be regularly wiped with anti-bacterial wipes, adding to the threat of liquid damage.

The role of nanotechnology

In response to the water ingress risks, engineers naturally do not want to be spending time increasing the weight and bulk of these devices to physically prevent water from entering them. End users expect these devices to look visually appealing, be satisfactory to hold and feel comfortable to wear, and engineers want the freedom to fulfil these expectations in their designs.

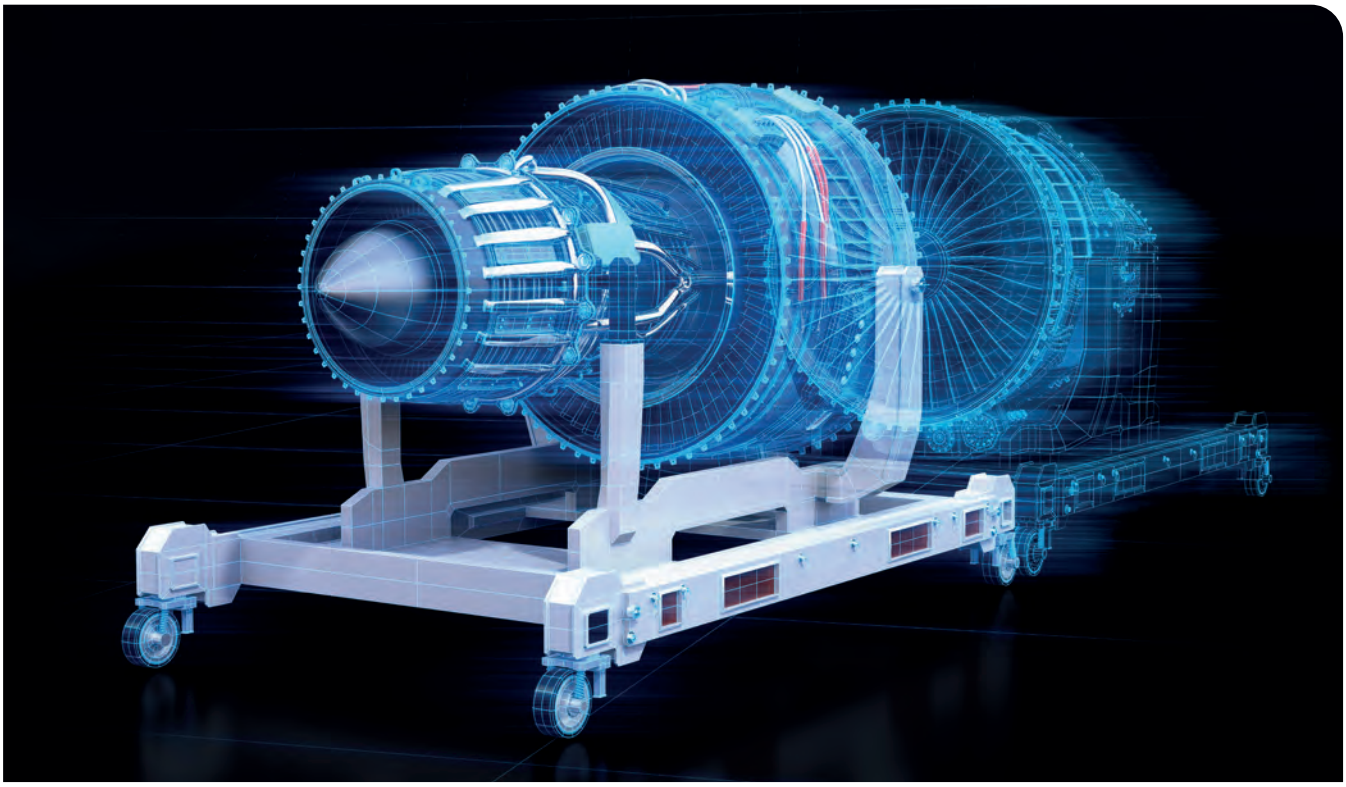
To achieve this, they need technical solutions that can support those design requirements and at the same time, prevent water and corrosion damage. This is where the latest nanotechnology solutions really come into their own, providing complete device protection to any of those AR or VR devices.

Rather than battling vainly to prevent liquid ingress in the same way that conformal coatings would, nano-coatings can allow water freely into the device, from where it can drain out later and not cause any corrosion damage to the internal parts.

The future of device protection and design

In the future, it is likely that AR and VR devices will become ever more miniaturised and lighter in weight. This will mean removing gaskets, O-Rings and seals which might have previously been used to protect them. It could also mean moving to more natural materials such as wood, for example.

As a result, engineers should not be focused on preventing liquid from entering devices, which is likely to be a vain endeavour. Instead, the challenge should be preventing the electronics from corroding when they come into contact with water, and this where nano-coatings can help to move device design and protection forwards.



Why aren't more businesses taking advantage of simulation-based digital twin technology?

In 1970, the Apollo 13 mission suffered a terrible mid-flight malfunction. To diagnose and remediate the problem, NASA engineers built a 'mirrored' system to simulate the spacecraft and test various courses of action before deciding what to do next. The astronauts were saved, largely thanks to what many believe is the first instance of a 'digital twin' being employed to solve a problem.

BY FRANCES SNEDDON, CTO AT SIMUL8

THANKS TO INNOVATIONS in artificial intelligence and simulation modelling, today's digital twin technology looks a lot different. Enabling something of a virtual testing laboratory, a digital twin will run alongside and in constant sync with a live system and offers the prospect of real time monitoring and improvements in process efficiency. The model will be fed by data from across an organisation's workflow and ERP systems to create an accurate replica of operations and processes, and from there planners can run simulations that play around with configurations to test different scenarios and outcomes, effectively fast-forwarding to find out the impact of any decision before it is implemented in the real world.

Surely this level of insight can offer benefits to every single type of business? So what's holding them back?

There is a persistent myth that digital twins are the preserve of large-scale companies requiring huge investment in IT and technology to produce

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complicated and futuristic models of their operations. The good news, however, is that this is not the case. In fact, the technology has now been democratised to a point that just about any business can tap into the benefits of these tools. It's not about creating a large and complicated replica of an entire organisation, but about zoning in on individual processes to find ways to streamline and improve them, or to plan ahead to deal with any possible contingency. And it's not the IT department that needs to drive this centrally either, but any level of planner can create, update and manage today's digital twins.

Given how affordable and accessible they are, it's baffling that digital twins are not treated as the core driver of efficiency within businesses of all shapes and sizes, and across multiple sectors. With such gains to be made, we should expect to see organisations creating a multitude of digital twins to cover every key operational process to ensure that it's being delivered to its optimum and can be updated quickly with any changes in circumstances, such as a late supplier, a fault in the production line or a sudden surge in demand.

The imminent boom following the democratisation of digital twining

The accessibility of digital twins has been opened wide up, meaning that they can be used to assist everything from hospital capacity planning to how to upscale a distribution business or optimise a production process.

According to Gartner, nearly 8 in 10 businesses are now readily exploring simulation-based digital twin technology, and just one glance at the potential use-cases and benefits we'll outline shortly makes it very easy to see why.

A digital twin simulation provides a risk-free environment for organisations to test new layouts of services and foresee bottlenecks and other potential problems before they arise. What's more, some of this simulation can be carried out in real-time, allowing businesses to not only uncover inefficiencies as part of a discovery process, but achieve round-the-clock improvement as part of their day-to-day decision making. It gives them unlimited access to ground-level observation without needing to be there in person at all, which can be particularly helpful for any organisation with processes that span different teams, sites or even countries.

Digital twins in action

You don't have to be NASA to take advantage of digital twins. Take the grocery sector, for example. Typically, if a supplier wants to win a contract with a supermarket to supply several thousand bananas, being able to demonstrate that it can fulfil the order is going to put it head and shoulders above the competition during the bidding phase. A digital twin could mirror the entire supply chain along with all potential variables and delays, and simulation technology could be used to demonstrate the supplier's likelihood of being able to fulfil an order in a range of different scenarios. What happens in the event of a delay? What happens if one of the logistics companies goes belly-up? How might these events impact a supplier's ability to fulfil an order? How dependable are they? Logistics companies, retail suppliers, hospitality venues and all manner of other industry sectors could benefit from being able to prove their 'viability' through a digital twin simulation when bidding for contracts.

Or how about manufacturing. Chrysler was able to create a digital twin of one small aspect of its assembly line which it called TCF (trim, chassis, final) in order to run scenarios and experiment in a risk-free environment with the ultimate goal of increasing its throughput without increasing costs. Off the back of its findings, it saved over $5 million and eventually designed a 'line speed reduction' tool that could then be rolled out to several of its other plants. By leveraging real-time simulation, companies like Chrysler could optimise their assembly lines and other processes on-the-fly in accordance with demand. What would happen if Chrysler decided to decrease the price of one of its vehicles by, say, $5,000 and then suddenly experienced a surge in demand? Could it double its throughput without increasing costs? Would that be a reasonable request? Simulation-based digital process twinning software could give decision-makers the answer they sorely needed within seconds.

Even hospitals are now benefiting from the technology. Using simulation, hospitals are able to forecast demand for patient beds in real-time, helping them to increase capacity and reduce wait times for patients against their own benchmarked targets. If a digital twin can give a hospital an idea of what number of patients to expect in the next 24-hour period, staff can allocate beds accordingly. This is crucial in an environment that could require certain patients to be isolated or have access to a particular ward. In other words, where hospitals choose to place a patient today can have a huge impact on their bed management tomorrow, and forward-running simulations can help staff make these decisions with confidence. The same technology can also help hospitals long-term by allowing them to run trial scenarios to see how their current operational setup might cope in the event of, say, a pandemic.

This is where simulation and digital twin technology really come together to great effect. Simulation is nitro fuel for digital twins, and things are about to accelerate - fast. When it comes to replicating business processes, the potential applications are seemingly endless. If a business values rapid-fire decision making and the ability to visualise, enhance and optimise all manner of processes within their organisation with demonstrable value, they simply cannot afford to ignore digital twin technology for much longer.

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Vision AI is the future of connectivity

With the realisation of 5G, Industry 4.0 and the aggressive expansion of the Internet of Things, many might be inclined to think that the 'future of connectivity' has already arrived. As we find new ways to connect our devices in the home, on our streets, and within entire networks in smart cities, innovation is rife.

BY TAAVI TAMMISTE, CHIEF TECHNOLOGY OFFICER AT FYMA

HOWEVER, I argue that many organisations have jumped the gun with one important element of their IoT strategy; by adding unnecessary sensors to their already expansive arsenal of connected devices. Both the public and private sector have queued up to rollout a whole range of sensors that promise to increase public safety, illuminate revenue opportunities and improve customer service. In fact, the market is even expected to be worth $34.4 billion by 2024.

There are a whole range of sensor solutions on the market to choose from, too; sensors that use WiFi, sensors that use infra-red, sensors that detect proximity, images, motion, temperature - you name it. There's only one problem with this: vision AI can make them work so much better.

In fact, vision AI makes a lot of sensors redundant. Unfortunately for most urban planners, real estate companies, and other big investors, sensors that once appeared revolutionary are actually quite limited in terms of the data they can collect, meaning businesses and organisations are not getting the level of insights they really need to make a difference. Vision AI has come up trumps, not only for being cheaper and more sustainable, but for deriving deeper and more actionable insights.

The Limitations of IoT Sensors

IoT sensors have proved a valuable tool for CTOs in a range of sectors including healthcare, automotive, and process manufacturing, but we can see the growing appetite for these sorts of solutions most clearly in towns and cities where developers, local councils, and

businesses want to look at and analyse the public's behaviour.

Earlier this year, Dutch Railway company NS was looking for new ways to manage crowds and flows of traffic from local train stations to the Dutch Grand Prix circuit, for example, while organisers at shopping malls and on private business estates are constantly occupied with managing parking.

Sensors most commonly use infrared signals to detect objects and people in motion like this, and have been around for the last decade. The key thing to understand is that data collected by sensors only really becomes useful when cross-examined with other data such as time of day, time of year, and so on - this is where IoT comes in.

The combination of these datasets allows us to think about how to improve spaces - how introducing a roundabout might reduce the flow of traffic, how pedestrianising certain areas can improve public safety, or even how altering business opening hours can entice more people into stores.

This is all very well and good, but there is a significant level of inaccuracy that is reducing the return on investment for those using the technology.
Think about it this way; what can you tell about a room with your eyes closed? You might be able to feel the chair you're sitting on, and hear the voices of your colleagues across the room. If you're really tuned in, you might feel a slight breeze and clock that the window is open. But think about how much more you can tell about a room with your eyes open, too.

Vision AI empowers users to learn far greater things about the people and objects they're observing than sensors could ever, purely by adding the visual element. The Dutch Grand Prix organisers figured this out and added drones with embedded AI into their network, taking the operation to a new level.

AI Vision for Deeper Insights

With high levels of IoT maturity predicted to be present among around 61% of enterprises, businesses are leading the charge on connectivity. Now is the time for new and innovative solutions to be adopted across all sectors, with vision AI being recognised as an indispensable tool for meeting rising customer expectations with deeper insights and analytics.
AI vision can offer deeper insights into objects, people, and behaviours, without the need for new, costly sensor infrastructure. The tech adds a critical human element by collecting demographic data. These insights allow us to understand what sort of people are where, who they go with, how long they spend in particular areas - and although it uses video footage, it doesn't need to compromise on privacy, either.

Vision AI can be input into existing infrastructure - for example, networks of CCTV cameras. And although the camera can see faces, the AI can be trained never to recognise them. Fyma is one of few companies taking a privacy-by-design approach in this space and achieving 100% compliance with existing data protection regulation.

This opens up a world of opportunity, since users are free to garner data about people without ever knowing who they are. It also creates a massive opportunity for organisations to cut costs and be more sustainable, since they don't need to purchase any new devices to take their data and analytics to the next level.
Technology is the key to improving the everyday experiences of the individual, and with vision AI, we are being empowered to respond to behaviour in real time, and get better at predicting behaviours in the future, so that problems are solved instantaneously.

The rise of Banking as a Service in banks and fintechs

Brick and mortar banking is becoming a thing of the past. A recent study found that a bank's physical location is far less critical than a decade ago, with only 10 per cent of today's customers citing it among their top criteria for choosing a bank. We are now in the age of the API — the age of Banking-as-a-Service (BaaS).

BY DIMA KATS, CEO AT CLEAR JUNCTION

BaaS is an ecosystem in which licensed financial institutions provide access to their services to non-banking businesses using APIs. Because of the pandemic and an accelerated need for instant and remote finance, this market has seen exceptional growth, as we are relying heavily on BaaS to deliver products and services.

BaaS is a new frontier for financial services. It simplifies many tasks and removes the barriers institutions face when launching or integrating financial products, services or solutions, including sticking to complex regulations, remaining compliant, and innovating legacy institutions and technologies. Ultimately, BaaS encourages new partnerships between non-financial organisations and banks to improve their services and offerings.

Why is Banking-as-a-Service Useful?

BaaS can prove extremely useful for financial

institutions as it solves several fundamental problems that modern-day financial services face daily. BaaS also brings with it new opportunities and opens the market to new players and sectors. The reality is that legacy banks need help accelerating their digitalisation efforts to compete with tech-native financial players who have capitalised on the tech boom during the pandemic.

Other banking and finance models are inherently risk-averse. This has meant that many emerging financial players have struggled to access the banking services they need to penetrate and impact the market. However, BaaS is more agile, nimble and familiar with many of the most exciting new markets and technologies. BaaS facilitates better service for clients with specific needs, including providing top-class service and support.

As the world becomes increasingly digital, customer experience is increasingly important and is a top priority for Finance Executives. Customers now expect a great deal of personalisation from financial institutions and they are hungry for improved experiences and service.

The next step for BaaS is for players to improve the customer experience and understand consumer context. Financial institutions that understand that finance needs to show up as part of the broader customer journey are likely to reap the rewards.

Other banking and finance models are inherently risk-averse. This has meant that many emerging financial players have struggled to access the banking services they need to penetrate and impact the market. However, BaaS is more agile, nimble and familiar with many of the most exciting new markets and technologies. BaaS facilitates better service for clients with specific needs, including providing top-class service and support

The Benefits of BaaS

BaaS provides financial institutions with a cost-effective way of reaching a wider audience. This is because legacy banking models are based on expensive, outdated technology and operations. In fact, according to an Oliver Wyman report, with traditional models, the cost of reaching a customer can range from $100 to $200. In contrast, newer and BaaS-based technology can reduce the cost to between $5 and $35.

BaaS is not only cost-effective and timesaving, it also boasts superior security, which is a vital feature in the current climate of rising ransomware attacks. As businesses continue to work remotely on a semi-permanent basis, purchasing BaaS solutions is a wise decision to ensure all data produced, both on and off-premises, is secure and protected from potential cyber actors looking to monopolise on hybrid working vulnerabilities.

Another component of business's software that is in high demand due to the pandemic is scalability – something BaaS can easily provide. This is extremely useful as the financial sector continues to grapple with the digital age and presses on with digital transformation. Flexibility and scalability are needed to deal with the mercurial nature of the industry, which is where fintechs comes in. They are uniquely placed to implement their financial solutions within tight timelines, on a reasonable budget, with a great deal of scalability and without having to get a banking license.

The Future: Accelerating Market Growth

BaaS will undeniably play a crucial role in our recovery from the COVID-19 pandemic. Our spending habits, and therefore our banking and financial habits, have changed forever. As consumers, we are increasingly using BaaS platforms to access services such as e-commerce, travel, retail and healthcare. To stay ahead of the curve, banks will need to embrace a service-oriented architectural approach.

In the future, BaaS will bring together more digital technology platforms and finance to change the shape of our future economies. Using BaaS, financial institutions have a clear opportunity to capture new revenue growth at a low cost. It is also highly scalable and agile, making it suitable for entering, innovating and expanding new market segments.

Partnerships between fintechs and banks can act as a shortcut to prepare for the future of BaaS. It is also beneficial for both parties.

Fintechs offer an innovation mindset, agility, consumer-centric perspective and an infrastructure built for digital. Conversely, most banking institutions have scale, stronger brand recognition and established trust with many prime and super-prime consumers. They also have proper licensure, adequate capital, knowledge of regulations and an established distribution network.

Finding the business value in data governance

According to the Data Governance Institute, "Data Governance is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods." That simple definition, however, obscures the difficulties many organisations face in developing a coherent plan, let alone uncovering its transformational business value.

BY MICHAEL QUEENAN, CO-FOUNDER AND CEO OF NEPHOS TECHNOLOGIES

THE MOST COMMON MISTAKE organisations make is to immediately focus on governance outcomes without first addressing the need for effective data discovery and classification. For example, teams with the responsibility for delivering data governance will often assume that there are tools out there that can be given access to data sources to analyse and identify governance violations instantaneously. In reality, this process is impossible without first understanding what you are looking for in the first place.

The net result is that you are unlikely to reveal the business value you're looking for. In fact, a recent Gartner report entitled "The State of Data and Analytics Governance is Worse Than You Think" found that a quarter of those surveyed achieved nothing they set out to accomplish with data.

Therefore, it's vital that data governance best practices should first define what data classification looks like for each unique situation. Customer data, for instance, will be held in different locations /9and databases in every organisation.

Whether it's public, private, confidential or restricted, good governance is only possible if this data is correctly identified and classified. From that point onwards, it becomes practical to apply gap analysis

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to understand whether there are violations, such as restricted data sitting on public sources. Without it, any attempts at data governance cannot hope to succeed.

Good Governance Delivers Real Value

Best practice is also about understanding the difference between corporate risk and data governance risk. In reality, most companies focus on the corporate risk of data in the mistaken belief they are addressing governance.

Think of it this way; if a large multinational is among my biggest customers, where am I holding their data, who has access to it and in what ways might it be vulnerable? These are vital considerations, but they are not rooted in governance or compliance - they are examples of corporate risk. If a central server is hacked, that's a huge corporate risk and while organisations have to protect the data belonging to other people in the course of their work, they must not confuse these efforts with good governance.

At the C-level, the corporate risk of data governance is much more relevant to the leadership mindset - it's an issue they can relate to because they encounter it regularly. The way most businesses and their leaders approach GDPR underlines the point - the issues keeping executives awake at night revolve around their corporate risk rating, not their actual levels of GDPR compliance. When there is a data breach, for instance, how many of the victims even know what has been lost? If good data governance was the priority, this would be a much easier question to answer.

As a result, part of the challenge organisations face in determining their approach to good data governance is understanding what value looks like. To an extent, this is understandable in that its inherent impact often only becomes evident when something goes wrong, there is a regulatory breach or they are fined. From a leadership perspective, this is an investment that potentially never delivers a return, so they kick it down the road in favour of more immediate priorities.

Instead, good data governance requires a different mindset, because viewed in the context of corporate risk, there is a much more compelling value proposition. Identifying the risks in an existing data governance strategy can drive business value and put governance projects on the road to success. For instance, organisations might be storing restricted data on public sources - good governance identifies and eliminates those potential violations, and in the process, addresses corporate risk.

In doing so, businesses are more likely to benefit from a win-win scenario where not only are their levels of corporate risk minimised, but they also significantly enhance their approach to governance. In a world where data growth continues at an unprecedented rate, and where regulators are being given wider and stronger powers, this will only become more important.

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How can data help universities to create – and maintain – an effective blended learning model?

Blended learning is a concept which surged in adoption alongside the onset of the coronavirus pandemic in the UK back in March 2020.

BY CAROLINE LEWIS, FROM WORKPLACE DATA ANALYTICS FIRM, TIGER

FOR STUDENTS AND TEACHERS, it is the education-sector equivalent of hybrid working – seeing more teaching and studying taking place virtually than in physical classrooms.

And while many schools, colleges, and universities have now returned to in-person teaching, there are still institutions that are making the most of remote operations – or planning to make this a core part of their strategy as they look ahead to 2022. Here, Caroline Lewis, sales director at workplace data analytics organisation, Tiger, explores how data can help universities to create – and maintain – an effective blended learning model, and how harnessing vital data insights can help to enable this.

The digital transformation scene in higher education
In today's ever-evolving digital landscape, reliance upon technology to help complete daily tasks – both in and out of a learning or working environment – is greater than ever. However, rewind to the start of 2020 and perhaps this was not as prevalent in the education sphere as it is today.

In fact, March 2020 acted as a wake-up call for many schools, colleges, and universities alike – seeing digital transformation projects soar and teaching make the overnight transition from face-to-face to completely virtual. While some higher education (HE) institutions were more au fait with delivering part of a course online, few were geared up to do this for every lesson or seminar – new processes and habits therefore had to be formed.

It was a steep learning curve which saw high numbers of education establishments make investments in unified communications and collaboration (UC&C) solutions – such as Zoom and Microsoft Teams – at pace. They did this not only in order to bridge the physical divide between teachers and pupils but equally to help learning continue seamlessly.

Despite it taking time for all sites to adapt to this new style of teaching and studying, it quickly became a crucial part of the education puzzle during the various lockdown periods, and has since become a mainstay for many within the sector.

In May 2021, it hit the headlines that a third of Russell Group universities said they intended to carry on with a blended learning model in the next academic year. And this is followed by a recent freedom of information (FOI) request which has revealed 69% of the 61

universities that responded are 'actively planning to implement a blended learning model in the new year'.

The FOI request also uncovered that 82% – of the 46 universities that has access to the data – said they are seeing increasing demand for blended learning. In addition, 48% have 'considered blended learning as an opportunity to reach more students around the globe', and just 11% haven't considered it at all. It is clear the appetite for blended learning is not going anywhere fast – from both a student and staff perspective – but the real question is how can sites get the most out of their tech investments, and use the data from these platforms to drive positive change forward?

Data analytics to streamline operations and enhance experiences In the same study carried out by Citrix, it emerged that 90% of universities believe 'they have the necessary technologies in place to operate a blended learning model today'. And while on the surface, this may be great news for the sector, it's vital to note that the tools needed to ensure maximum return on investment from these technologies should not be overlooked. It is important for universities to revaluate and truly understand how much their UC&C tools are being utilised.

While obtaining an accurate picture of how such investments are performing can benefit universities' bottom line, it can also help them to understand which tech is necessary to keep and where else funds can be dedicated, alongside providing valuable evidence to help drive institution-critical decisions.

In addition, measuring adoption and engagement with tech can be a pivotal part of the puzzle when gauging the truth behind staff and students' wellbeing, too. But, it's difficult to determine any of this without the intelligence to back it up.

Insight can help university staff to not only measure the user adoption of software, such as Teams, but analyse how many students are engaged in online lectures, and how many of them have their cameras on during seminars. This isn't to enforce a 'Big Brother' environment though, rather to provide an effective way to identify the success of online teaching methods, measure collaboration success, and also flag up any potential engagement concerns.

For instance, a student who frequently misses lectures or always has their webcam off is not necessarily disinterested in the content. It could be indicative of wider technological or wellbeing support needs – something that could be easily missed without data-led visibility. As a result, if staff are able to utilise customisable dashboards to identify trends in attendance and lesson input, this provides them with the evidence to warrant early intervention – helping to mitigate any course drop-outs and offer additional help where needed. Moreover, IT teams can harness this insight to see the number of unsuccessful connections and pinpoint infrastructural weaknesses. This helps to foster a more informed approach to blended learning – allowing staff to assess what's working well and which areas, or which students, need greater attention. Ultimately, having this level of insight available to dip into at any point can also contribute greatly to determining – and enhancing – both the student and staff experience.

And with noise in the headlines recently surrounding how some UK universities have been advised to repay tuition fee loans to disgruntled students who weren't happy with the experience provided with online lessons, it's never been more important for institutions to have oversight of their UC&C data – and an understanding of the stories this tells. Additionally, by supporting universities to understand true engagement of their student base, data can be used to identify the individuals who have recorded minimal attendance and interactions, therefore further evidencing if refunds are applicable.

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The role of data in the future of education

There's no denying that the pandemic has transformed the 'look and feel' of education – and this tech-first mentality does not show any sign of slowing down.

Providing the same digital experience to students and employees both on and off campus is naturally a priority for in-house tech teams. And with hybrid studying seeming like a permanent fixture, it's clear that data holds the key to helping institutions have more insight into how successful or not this is. In essence, with the right analytics tools in place, establishments within the education sector can avoid operating in the dark – channelling data intelligence to find out what investments would fine-tune their blended learning operations and further support staff and students in creating a productive, collaborative, and educational environment both in the present and into the future, too.

High performance computing and the changing climate

If you're involved in the world of High Performance Computing (HPC), you'll know that governments and research groups are currently working to reach the next exciting milestone, incorporating exascale computing.

BY JACK BEDELL-PEARCE, CEO AND CO-FOUNDER OF 4D DATA CENTRES

USING EXASCALE will mean that systems are expected to be able to complete a quintillion calculations every second, which is a thousand times more than the first petascale computer. An exascale machine is likely to have similar processing power to the human brain, and will potentially be able to support advances in AI.

While a lot of HPC experts are striving for this next milestone, we must not forget how HPC has been instrumental in addressing some of the biggest issues in the world, many of which are now far beyond the reach of traditional computers.

As a Tier-3 data centre, we have seen first-hand what these powerful systems are capable of. From helping in the fight against climate change to assisting scientists in quickly diagnosing serious illnesses, we take a deeper look into how HPC's capabilities are tackling some of the most important issues of our time and what could be coming to the fore as the technology continues to develop.

Data and climate change

Climate change is now a huge part of our daily lives, with its effects and challenges becoming more prominent every day. Consequences are now

more profound than just hot weather, with extreme conditions becoming common, which has led to countless deaths across the world.

With the weather notoriously difficult to forecast, improving the level of accuracy depends both on processing power and the volume of data available. A way of doing this is through the incorporation of machine learning (ML).

When partnered with HPC, ML allows scientists to look at climate data more flexibly, using figures from past events to more accurately predict what will happen in the future. This approach helps researchers to analyse the complexity of climate systems, and allows them to better understand how subtle interactions can influence weather.

ML models can also be helpful for multiple imputation, creating similar or synthetic data that will accelerate climate science research even further. When pieces of information are difficult or impossible to retrieve, ML can make predictions about items that are unknown and educate users on climate science and producing more accurate models.

In short, HPC will be a vital tool in enabling us to live with the changing climate in the years ahead, with much of this already underway.

Future-proofing systems

HPC's density of parts and power consumption requires specialist power and cooling infrastructure, which can make it difficult to plan for what is to come. So it's essential to work with a data centre that can support you in years to come and is able to provide the infrastructure needed to expand in the future. When choosing a data centre, even if they have the capacity to host your HPC system right now, it is important to make sure they have enough spare capacity so that you'll be able to expand in the future. Without that assurance, your business growth could be stifled further down the line if a delay arises and prevents the growth of your high-performance computing system.

A HPC system is also significantly more complicated than traditional computing, so it's essential that it is hosted in an ideal environment so it can run it at its maximum capacity and get the greatest return on investment. And with the world looking to soon reap the benefits of exascale supercomputers, we must consider how this can be done in the most energy efficient and sustainable way as the UK works towards achieving net zero in the coming decades.

The growth of HPC

With the current acceleration in technology advancements, it's predicted that exascale systems will become a reality in the next decade, with industries all over the world already racing to hit the milestone, something that is especially prevalent in the wake of COVID-19.

But while the future may be exciting, it's also important to remember that HPC is already tackling critical global issues, and is excelling in coping with climate change, diagnosing diseases and sustainable energy consumption.

These applications represent exciting and progressive milestones for numerous sectors, and we are already seeing what could be possible in the future. With technology now much more advanced than it was even two years ago, the future for systems such as HPC is bright, exciting and sustainable.

These applications represent exciting and progressive milestones for numerous sectors, and we are already seeing what could be possible in the future. With technology now much more advanced than it was even two years ago, the future for systems such as HPC is bright, exciting and sustainable

When fast food meets data speed

By processing data close to the source, in ways that are agile and don't require complex coding, Clarebout can ensure its high-tech production plants deliver on-time.

BY CROSSER

THERE'S DEBATE over the origins of the French fry – did it originate with English fish and chips, French steak-frites or Belgian frieten with mayonnaise? Many have laid claim to the fried potato. What cannot be denied, however, is the dish's popularity as a staple of the modern Western diet. But this global demand requires intense processing, and data management, from food manufacturers. That's why, when a world leader in frozen potato products, Clarebout Potatoes, sought to do more with its data, it turned to Crosser, a pioneer in edge analytics for the Industrial Internet of Things (IIoT).

Clarebout Potatoes is one of the world's largest producers of frozen potato products for private labels. Working closely with restaurant chains, retail giants and other major players in the food industry, Clarebout exports its products to more than 60 countries and produces almost any shape, size and style of French fry imaginable.

With manufacturing plants in Nieuwkerke and Waasten, both in Belgium, and plans to open another facility in France, Clarebout works tirelessly to manufacture enough potato-based goods to meet the demand of its global clientele. In fact, its facilities never switch off.

Always on

Continuous manufacturing can be overwhelming for any plant – whether it's smelting metal, processing paper or producing food and beverage products. For Clarebout, handling a constant flow of potatoes – which require de-stoning and washing, peeling, sorting, cutting, baking and freezing – is a repetitive and time-intensive process. When there are lots

of steps in a production line with no chance for downtime, streamlining can be difficult.

"A lot happens at our facilities, all at once," said Frederik Beun, leader of digital engagement and innovation at Clarebout. "Many of our processes are repetitive, and we found that this can increase the number of manual errors being made by workers." This constant stream of activity also made it difficult to sync-up operations, with manufacturing data kept in silos. As a highly-automated producer that's always keen to upgrade its equipment, Clarebout wanted to solve this issue – particularly as both its plants produce such a lot of data. However, this would prove especially challenging with data from multiple origins being siloed, including from customer relation management (CRM) systems, sales reports and plant equipment.

Any enterprise that struggles to connect data from different sources lacks interoperability. That means it can be difficult to see the bigger picture.

"We needed visibility, to see exactly what's happening on our production lines and how that activity relates to the entire business," Beun explained. "We knew what we wanted to do with our data, but we were lacking a glue to unite our systems and form a rich, seamless snapshot of our production."

Edge analytics: a manufacturer's glue

Contrary to what many manufacturers think, you don't always need cloud providers or platforms to run an enterprise IIoT project. For Clarebout, the answer to its challenge would be found at the edge. Specifically, Clarebout sought a solution that would act as one, central data management platform. It wanted to transform its systems from being reactive to proactive – and accessing data in real-time would be a key ingredient for that change.

Clarebout is no stranger to data management, and had been using a widely available flow-based programming tool for some time. To level up, Clarebout needed access to a scalable platform that could bond its systems together – a data management glue. That's why the company reached out to Crosser at the beginning of 2021, and wasted no time in getting a new platform up and running.

"Clarebout got stuck-in from the start," said Andrea Magnago, director of international sales at Crosser. "The team wanted a tool that could deliver, and were keen to start testing. A major benefit of using Crosser is that no downtime is required to get the platform up and running – so Clarebout could continue its operations without a hitch."

The first requirement from Clarebout was to capture all the data running through its shop floor, including data on machine health and status, the amount of ingredients being used and wasted, and the time taken to complete certain plant processes. Then, its next goal was to link all this production data to a manufacturing execution system (MES) and enterprise resource planning (ERP) system. The MES and ERP would make the data available to the entire business, from shop floor to top floor. With this insight, Clarebout's team can ensure any spotted errors or inefficiencies are not made again.

How does edge analytics software benefit this? It allows data produced by sensor-rich assets, like factory equipment, to be pre-processed in real-time closer to where it is created. When it is deployed on-premise – typically the shop floor – Crosser's edge analytics software is installed on a server, or virtual machine, where it can process sensor data from multiple on-premise machines and data sources. Clarebout and Crosser began the onboarding process right away with an initial trial period, before Crosser's platform was adapted to suit the customer's needs. It took just a matter of weeks to fully integrate Crosser's technology into Clarebout's production line.

Low code, low hassle A major driver in the speed of the roll-out was low code. Because Crosser's system is a low code platform, it provides reusable actions that users can drag-and-drop into processes for rapid development. Low code development platforms enable teams to quickly assemble new processes and build applications without having to research, write and test new scripts.

"Low code guarantees a low learning curve," explained Magnago. "This makes it possible to design modern enterprise software more intuitively, and doesn't require extensive training and programming capability."

However, implementing IIoT use cases can still be challenging – even for a company like Clarebout that's already experienced in data analytics.

"While low code makes the process much easier, our team still needed to adjust," revealed Beun. "Crosser's platform unlocks a far more granular way of managing data, as nodes are handled in smaller blocks. What's more, because we were so reliant on coding and reprogramming each time we wanted to install a new process, we were constantly reinventing the wheel. Now, with Crosser's drag-and-drop function, we are adapting to a more streamlined way of data management. But it's still a learning process."

"We have an expression in Sweden, home of Crosser's headquarters, elephants need to be eaten in small pieces," said Magnago. "That means you can't master huge tasks in one sitting, and it's the same with IIoT. You can start with small, simple use cases, which can be built up into more complex cases with time.

"This was a key lesson for Clarebout's team. We encouraged them to begin small, for fast implementation, and to grow in complexity over time. Low code makes that possible."

Adding value

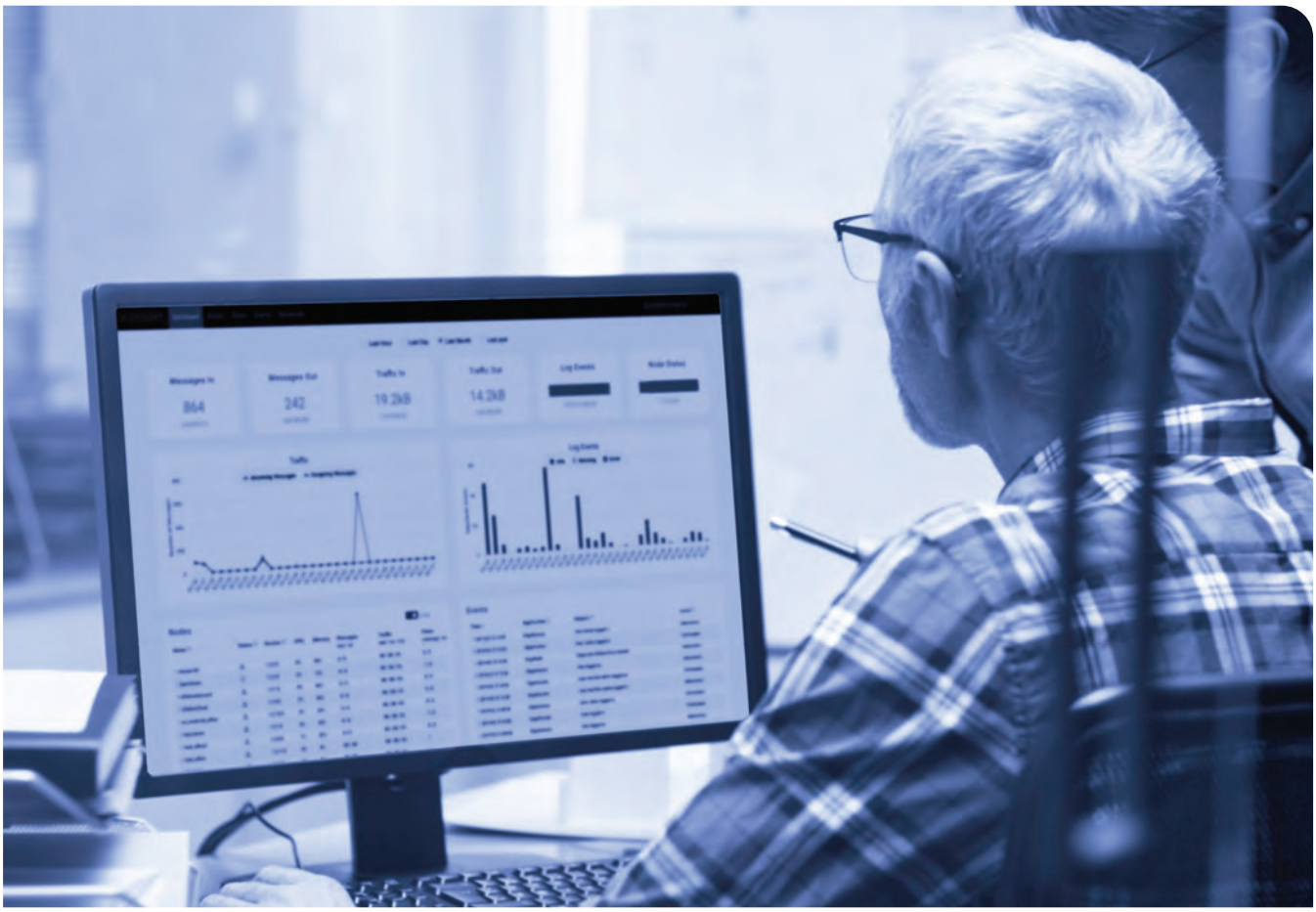
Since integrating Crosser's platform, there has been no stopping Clarebout, according to Magnago: "When Crosser's agility met Clarebout's own dexterity, change happened fast.

"What's great about this speed is, with Crosser, the team can continue to test out new processes and experiment with the technology as they connect new machines. The simulation element of the platform allowed Clarebout to get things right from the start, but the value-adding journey never really ends."

Beun agrees that the agility of edge analytics has been a key ingredient in the project's success: "We are no longer daunted by data that is so vast, it cannot tell a story. Now, factory data is not only smaller and more meaningful, but also joined together. We have found our data glue, and now all our plant data forms a rich insight into exactly what happens inside our fast-paced, always-on facilities."

We may not know the true origin of the French fry. But Clarebout's story shows us that manufacturers' efforts to meet global appetites for potato products are evolving with the IIoT.

Although it takes many manufacturing processes to transform a humble potato into its frozen final product, with zero downtime, managing this data needn't be chaotic. By processing data close to the source, in ways that are agile and don't require complex coding, Clarebout can ensure its high-tech production plants deliver on-time.



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Dr Richard Stevenson is a seasoned science and technology journalist with valuable experience in industry and academia. For almost a decade, he has been the editor of Compound Semiconductor magazine, as well as the programme manager for the CS International Conference

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IT without limitations

Össur innovates a 'life without limitations' supported by technology that offers best in class efficiency, security and agility.

ÖSSUR, an innovator enabling 'life without limitations', uses Citrix and Microsoft to innovate its IT services, gaining agility, security, and best-in-class efficiency.

Recognised by the World Economic Forum (WEF) as a technology pioneer, Össur is dedicated to 'life without limitations'. The business was founded in Iceland, in 1971, by prosthetist and amputee Össur Kristinsson. Today, it has revenues of over $600 million and more than 100 locations in 26 countries around the globe. This includes dozens of clinics where patients are fitted with and trained in the use of prosthetic limbs.

Key challenges

Össur's entire IT infrastructure is managed by a central team of just five people, based in Iceland and headed by the Infrastructure and Cloud Architect Einar Dagfinnur Klemensson. This small department is responsible for IT decision-making and deployment and is augmented by local support staff around the globe.

Össur has made many acquisitions in recent years, which had led to a complex IT environment. The business wanted to eliminate complexity and provide a single, simplified user experience.

The Solution

To support its fast-growing business, the Össur team selected Citrix and Microsoft Azure, partnering with UK-based Platinum Plus Citrix Solution Advisor Ultima Business Solutions to deliver an unparalleled experience for its 4,000 employees. 'One of the reasons we chose Microsoft Azure is because they have a longstanding relationship with Citrix. Likewise, we have a strong partnership with Ultima because of the level of trust. We use them to augment our small team,' says Klemensson.

Effortless working

'Simplicity is key,' Klemensson explains. 'We want our staff to be able to work as effortlessly as possible, wherever they are. That means ensuring they have access to the apps and data they need along with the speed and performance to work effectively.'

Because Citrix delivers a secure desktop to any device, the team can innovate in the endpoint hardware they deploy. Citrix also simplifies IT management – the team manages only three desktop images for the entire company.

Össur uses Citrix Workspace to provide a single login for staff on any device, wherever they are. Resource-

hungry apps like 3D CAD software are allocated the resources required to run effectively, even on mobile devices. Performance is underpinned by Citrix SD-WAN, which optimises network traffic across all available channels to ensure consistent, high performance for users.

'We're looking to reduce the cost of end-user equipment wherever we can,' says Klemensson. 'We're exploring how we can use cell phones as a primary end-user device, deploying Raspberry Pi devices and looking at Google Grab and Go Chromebooks.'

Prioritising security

Össur works closely with healthcare organisations around the world and has responsibility for protecting confidential patient data. Össur's products are so advanced; the business even builds the machinery that makes its products. Protecting the business's intellectual property (IP) is a top concern for Össur and another reason for prioritising security.

'We're looking at Zero Trust in a big way,' Klemensson says. 'We're securing the endpoint, securing the user identity, and we're looking to be an early adopter of Citrix Secure Internet Access (SIA).' Citrix security features, like session watermarking and the prevention of screenshots, also help protect confidential information on user sessions. Protecting the business's IP is a top priority for Össur and another reason it chose Citrix.

Technology to support growth

Scalability is key for enabling smooth acquisitions and also helped Össur scale up when COVID-19 hit. 'We have a lot of mergers and acquisitions each year, and Citrix helps us a lot because it's a scalable solution,' adds Kaernested, 'In the same way, when COVID-19 hit us, it was easy to scale up because we were already in Citrix Cloud,' he continues. 'In almost one click of a mouse, we increased our environment by five times, from 250 to 1,800 remote users.'

'We have a distributed workforce around the globe, and they all need consistent and secure access to our data. We are boosting mobility within our workforce so they can use any device anywhere and securely access our data,' says Kaernested. 'We want to move everything to Azure and Citrix cloud services within the next six months. Then we'll close the physical data centre, and we'll be a cloud-only company. In Citrix, we have the scalable, reliable and secure platform that we need to move forward in our business.'

Importance of partnerships

Gareth Meyer, Ultima Commercial & Operations Director, comments, 'Ultima, along with Citrix, has been in a position to help Össur deliver a solution in line with their business values' Life Without Limitations'. It has allowed their remarkable team to continue delivering such pioneering innovations and critical support to customers. It's an example of how technology is a crucial driver for their organisation and a way to provide real value back to their customers. 'Citrix is a big part of our strategic technology focus, allowing us to support Össur at all levels by enabling business transformation through technology. The partnership between customer, solution advisor and leading technology vendor is key when building a business strategy with no limitations and to continue delivering innovation,' concludes Meyer.

We have a distributed workforce around the globe, and they all need consistent and secure access to our data. We are boosting mobility within our workforce so they can use any device anywhere and securely access our data

Life without limitations

Bjarni Kaernested, Director of IT Operations, Össur, summarises, 'We're so lucky at Össur because we have such future-focused people – scientists and engineers – who are evolving new technology, new products for our customers. There's a lot of smart people working here, and that's inspiring. Össur believes in life without limitations, so we're inspired to build IT without limitations.'

DCA Thermal Management SIG

An Introduction from DCA CEO Steve Hone

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

The DCA currently facilitates nine Special Interest or Working Groups. DCA members can join any of the groups (although the Chair has final say) and contribute find out more here: **https://dca-global.org/groups**

The DCA Thermal Management SIG is chaired by Dr Jon Summers, Research Lead in Data Centres at Research Institutes of Sweden

Today there are literally millions of traditional air-based cooling systems in data centres and server rooms of all shapes and sizes around the globe and given their prevalence this is unlikely to change for many years to come. There is no shortage of research going into the optimisation of these air-based systems as the pressure to increase performance and energy effectiveness continues to grow. This has resulted in the development of not only free air cooling, which increases in popularity where external environmental conditions allow, but also a comprehensive range of indirect hybrid solutions that offer even greater flexibility and potential cost savings. Increased environmental pressures have also seen research and development increase into the prospects of harvesting and reusing the waste heat produced by the server/compute components.

Simple physics dictates that at some point an air-based system, irrespective of however efficient you make it, will be challenged by implementation practicalities. As processing speeds and power densities continue to steadily rise, there is an increasing interest in the adoption of liquids as the thermal energy transfer medium, which includes technologies based on direct to chip/CPU cooling through to fully Immersed and double immersed liquid cooling solutions.

One thing you will quickly learn is that "No one solution fits all applications" and as a result, unless you know exactly what you need, the landscape quickly becomes confusing. The Thermal Management Special Interest Group has been formed to assist consumers with understanding their options so more informed decisions on what is best for your own business needs can be made.
To request to join this group as a guest or to find out more please contact the DCA - **mss@dca-global.org**

Inaugural DCA Special Interest Group on Thermal Management

Chaired by Dr Jon Summers

MINUTES of the meeting on Monday 27th September 2021 at 2pm UK time
There was a round table introduction from of all the parties that joined the virtual meeting. There was representation from entities involved in air and liquid cooling thermal management of data centre ICT infrastructure.

Discussion focussed on the purpose of the thermal management SIG prompted by the tabled document on the "How, What and When" document provided by the chair. It was felt that the SIG should not be restrictive in terms of focussing on only air or liquid to the data centre rack, but that all technologies should be discussed. It was recognised that there would be overlap with the SIGs on Energy Efficiency and Sustainability. Whilst it was also recognised by those who have interacted with other SIGs that there are some best practice documents being created, perhaps this thermal management SIG should create some "sign posting" for the members since the topic is very broad and there is already a significant number of guides already available.

Since there are some interesting developments in cooling approaches that reduce water consumption or reduce the level of refrigerant needed and situations where heat recovery becomes an important aspect of thermal management, it might be worth putting together a series of 30-minute seminars as part of the SIG to get some interest going around the various topics.
The SIG scope was also discussed, and it was agreed that heat recovery and reuse should be an integral part of the SIGs remit as well as the various methods of managing the thermal envelopes and temperatures of the digital infrastructure.

The frequency of the SIG meetings was agreed to be 3 months with the next meeting being in January 2022 with a couple of presentations to get the group warmed up for 2022.

What is Thermal Management and why is it important?

Dr Anthony (Tony) James ROBINSON, Associate Professor,
University of Dublin, Trinity College

IF ONE PUTS ENOUGH electronic heat problems together, it creates an energy problem. The core solution for both is thermal management.

Thermal management not only defines the first interface where heat energy is exchanged from electronic components and devices to a coolant medium, but also the means by which the energy is transported and dissipated to the eventual heat sink.

In the context of data centres, thermal management is of course critical, as it dictates the operating temperature and thus performance and reliability aspects of the electronics. With ever increasing component and server power, compute density, and level of integration, simply pushing more air is not envisaged as being the viable long-term technical solution. New methods (based on old ideas) of direct, indirect and hybrid cooling are required, new coolants such as liquids must be considered, and thermal management must be fully integrated into the server design from the onset.

Fortunately, clever and innovative thermal management solutions are emerging, leveraging the advanced state-of-the-art of simulation-driven design, engineering optimization, high performance computing and manufacturing technologies. The level of technology of thermal management hardware is, in a way, beginning to play catch-up with the level of high technology of the electronic components they are deployed to cool. On the other hand, is the consideration of data centre energy.

It is no longer new-news that the energy and environmental footprint of data centres is so large as to not be ignored, being in the hundreds of TWh annually. Thermal management will play a pivotal role in the future of data centre energy dynamics. In as much as thermal management hardware and systems are deployed to keep energy-hungry electronics components cool, the cooling comes at an energy cost which must be minimized.

With global average PUE values are still hovering around 1.6, this energy cost minimization is absolutely vital. As importantly, and potentially more urgent considering the times in which we live, is the potential for data centre thermal management hardware and systems to facilitate heat recovery in such a way that the thermal energy can be reused in neighbouring sectors that currently rely on fossil fuels for heating. This circular economy approach, where data centres become energy borrowers, again centres on novel approaches to thermal management.

We must not only consider the effectiveness of cooling the electronics, but also the quantity and quality of the energy that leaves the servers.

As the above discussion suggests, thermal management will play a central role in the evolution of data centres. Thermal management is not a new topic, it has become a hot topic (pardon the pun) as heat fluxes, power densities and data consumption are all increasing it is key point of discussion for the data centre sector and one where the DCA's special interest group can offer a platform for improved awareness and signposting for this key area.

The level of technology of thermal management hardware is, in a way, beginning to play catch-up with the level of high technology of the electronic components they are deployed to cool

Thermal Management SIG Overview

By Chair Dr Jon Summers

PUT THE TECHNICAL and commercial aspects of designing, building and operating a data centre aside for the moment, it is a fascinating aspect of our digital infrastructure that to process, store and transmit binary information, energy is transformed, and heat is generated that needs to be managed.

It was 60 years ago the IBM research engineer, Dr Rolf Landauer (a physicist), wrote his article on "Irreversibility and heat generation in the computing process", and today the thermal problems are more challenging than ever. It has led to a myriad of solutions whereby the heat is removed from the microelectronics, but we have become profligate with energy and as technicians, engineers and researchers we are more focussed than ever to unearth and validate methods that are both energy efficient and sustainable.

Good thermal management of the digital infrastructure will naturally improve the energy efficiency and potentially the sustainability. It is therefore clear that a special interest group on thermal management intersects both the Energy Efficiency and the Sustainability SIGs and under the DCA we are aiming to encourage a good level of dialogue and synergy with these groups.

Our take is first and foremost to look at solutions to what is regarded as a mechanical engineering problem and there we are not fixated on the fluid medium, whether it be air or liquid, but on the engineering solution and such solutions embody digital control, sustainable materials and processes that are energy efficient and energy saving. Therefore, the purpose of the SIG is to encourage vendors, suppliers, end users, researchers, and technology developers to build awareness, understanding and shared knowledge around this old nougat of "managing the heat" from the digital infrastructure as digitalisation grows at an unprecedented pace.The Thermal Management SIG is an open group and comes under the auspices of the Data Centre Alliance (DCA) and as such the group is for members, which gives access to content. However, the group is open to all who register as a guest member with the DCA – contact the DCA team for information on how to do this.

As a group of interested individuals, we are required to navigate perhaps the broadest range of technologies, approaches, solutions, and methods that are core to digital system deployments. Thermal management involves the three stages of thermal energy transfer, namely from the heat generating microelectronics to the edge of the IT whitespace, then from inside the IT whitespace to the exterior of the building / data centre and then via its final transfer to the environment or to any heat consuming processes. Each of the three heat transfer stages can be achieved in a multitude of ways, which will be dictated by the different technologies that make up thermal management.

The SIG scope is decided by the group members to serve the group members in an appropriate way. The SIG is expected to have topics of the day out for general discussion, but also specialist presentations by the member group or from externally invited experts in the relevant fields. Aspirational in providing the content via presentations, but also through outputs such as whitepapers, informative sign posting materials, best practice guides or discussion documents.

Getting all holistic with air-cooling control

By Dr Jon Summers, DCA Advisory Board and Scientific Lead in Data Centres at Research Institutes of Sweden

Getting all holistic with air-cooling control
Dr Jon Summers
DCA Advisory Board and Scientific Lead in Data Centres at Research Institutes of Sweden

When it comes to data centre operation, the control system and strategy that is adopted to keep all the IT systems humming within their desired environmental envelope is a prime focus. It is therefore not surprising that the providers of cooling equipment for data centres highlight their control systems as one of their principal unique selling points. Digital control of cooling systems has grown to become elaborate and can be seen as the differentiator when acquiring a supplier.

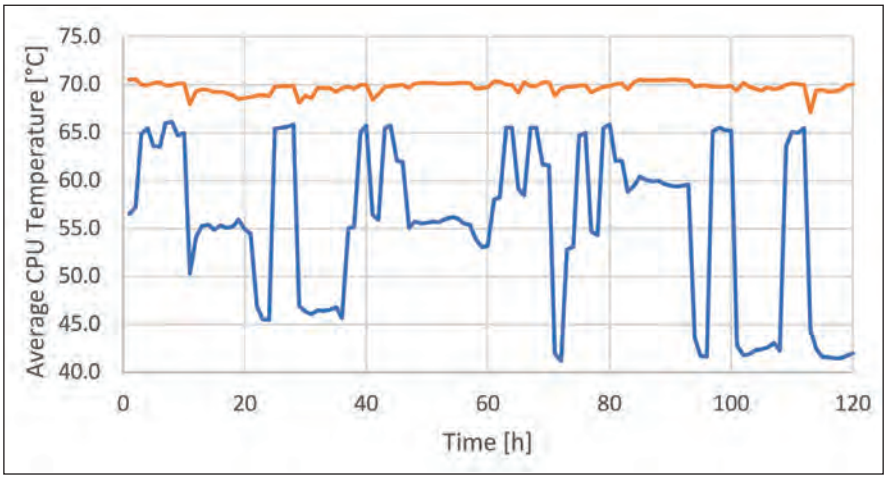
Data centres draw power from the electrical grid that is transformed and propagated to ultimately be "pumped" into very many small volumes at up to 200A of current, only to be converted into the thermal energy at rates of up to 1MW per square metre, where the heat is transferred away from these small volumes and ultimately rejected or used to displace other sources of primary thermal energy generation. Principally, for data centres, heat is transferred by convection – where the thermal energy is picked up by a fluid (liquid or gas) and propagated by a flow. The heat transfer has three parts to it. First from the servers to the edge of the data hall and then secondly through the walls of the hall, again this is done using a fluid to the point where the heat is transferred for the third time into the environment. This is also achieved by the convection of the external air or alternatively the heat can

be carried away by convection to another heat transfer point for thermal energy applications.

In the north of Sweden, the three highlighted heat transfer processes can be performed using an approach called direct fresh air cooling, where the outside air, which is usually cool, is carried directly into the data hall via convection, using large cooling supply fans, where it is pushed towards the fronts of the air-cooled servers. The server fans then draw this cool air over their internal hot surfaces (where the electrical current stops in its tracks) by convection to the back of the servers, where the (now hot) air is pulled out of the data hall by extract fans with some of the air being drawn back to the cooling units and mixed with the incoming air to warm up outside air that during part of the year is too cold to operate with the servers.

Of course, warm outside air can be cooled using water and very low relative humidity outside air can be humidified with water, so the cooling system requires an evaporative function that serves to both humidify and cool. As part of an EU H2020 funded project called BodenType DC (project number 768875), a direct fresh air data centre was constructed in Boden, Sweden and operated for 1.5 years where cooling control strategies could be developed and tested together with the collection of operation telemetry. Two partners, RISE AB and EcoCooling Ltd, respectively an expert in server operations based in Sweden and a direct fresh air cooler manufacturer based in the UK, managed to create a holistic cooling control strategy simply by taking control of the cooler supply and extract fans synchronously with control of all the server fans.

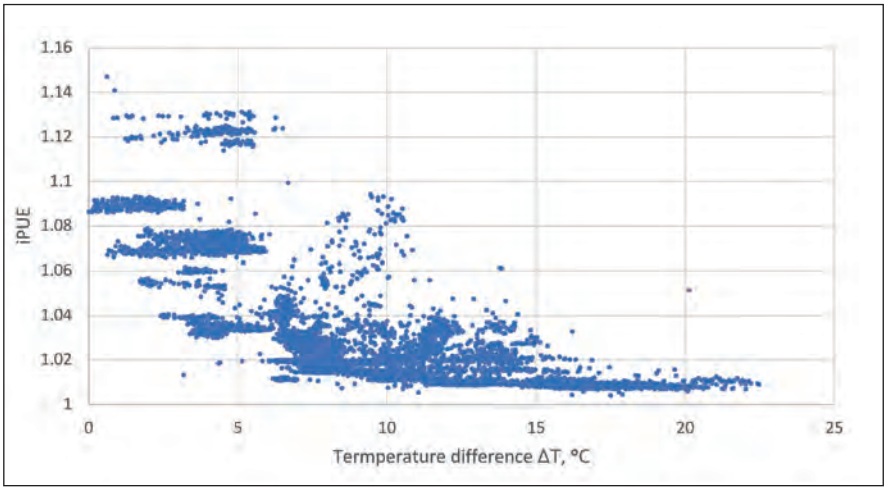
The holistic cooling control strategy makes use of the affinity laws of fans, half the speed of rotation of the fan uses only one eighth of the fan power – the so-called cube law. Slowing down the server fans was achieved at the server level using a small PLC that interrupted the fan signal communication with the server and imposed a slower speed to target a predefined constant CPU temperature. All 480 servers in the BodenType DC data hall were operated with a targeted CPU temperature and the same 120-hour server digital workload profile was operated first with native server fan



control (blue curve in the figure) and then with the targeted CPU temperature of 70°C (orange curve). The servers reported all fan speeds to a Modbus server along with individual power consumption of each server that was constantly read by the EcoCooling direct fresh air-cooling control system, which in turn tuned the supply and extract fans to match the accumulated air consumption of the 480 servers.

Taking over the control of the server fans is perhaps not regarded as mainstream, but modern servers do offer some degree of control over their fans at the BIOS level. However, the holistic cooling control strategy even without the overridden server fan control does produce a more responsive cooling system as has been demonstrated by the BodenType DC project and it can be simply achieved by collecting aggregated server data that the cooling control system can use to set their fan cooler supply and extract speeds.
One consequence of targeting a constant CPU temperature is an interesting relationship between the interim Power Usage Effectiveness (iPUE) and the temperature increase between the cold and hot aisles, the ΔT, in the data hall as is demonstrated by the following figure of hourly operational data for the 480 servers operating over a complete year in the BodenType DC project.

Finally, holistic cooling control is not only restricted to direct fresh air-cooling systems, but the approach can also be readily applied to Computer Room Air Handling units on a chilled water loop and it is a vehicle to lower the (annualised) ISO PUE simply by improved fan speed control.



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