ComputerWeekly

15-21 JANUARY 2019

NHS plans for digital future

We look at how the NHS's vision of a digital-first health service will work and what it will mean for services, staff and patients

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BT faces tussle to keep EU contracts after Brexit

The European Union will likely re-evaluate its telecoms contracts with BT following Brexit, and cancelling them altogether is a real risk in a no-deal scenario, according to leaked documents. *The Guardian* reports the firm's network services business may face a fierce battle to retain control of over £150m of contracts it currently holds with the European Union (EU) after the UK leaves on 29 March.

Germany races to boost cyber defences after breach

Germany is scrambling to improve its cyber defences before the European parliamentary elections after a student leaked politicians' personal data. It is the country's largest data breach of its kind, which exposed the personal data of hundreds of politicians, including chancellor Angela Merkel, federal president Frank Walterand and Green party leader Robert Habeck.

IT pros in London could see roles shipped to EU as result of Brexit

The UK, and London in particular, could see IT jobs in financial services move to hubs across the European Union as a result of Brexit. According to a study from professional services firm EY, around 7,000 jobs in the financial services sector could be moved out of London as the UK prepares to leave the EU. It expects a further 2,000 jobs to be created in the EU as a result.

AWS secures cloud hosting role for Crown Marketplace

Amazon Web Services (AWS) is hosting part of the Cabinet Office's Crown Marketplace portal, which is being built by government IT design consultancy DXW Digital. The Crown Marketplace is part of a push by government procurement chiefs at the Crown Commercial Service (CCS) to overhaul how public sector organisations procure common goods and services.

Mercedes-Benz collaborates with Nvidia on in-car supercomputer

Mercedes-Benz is partnering with Nvidia to develop a complete in-car computer that could replace the multiple systems that exist on modern vehicles. The collaboration will see the development of a single system providing self-driving capabilities and smart-cockpit functions that will replace dozens of smaller processors within current cars, according to Nvidia.

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RSC and Science Museum to lead future audience AR/VR demos

Organisations including the Royal Shakespeare Company, the Science Museum and the Natural History Museum will take part in a series of government-backed demos creating immersive experiences for audiences of the future.

Growth of on-premise tech hit by enterprise cloud demand in 2018

Growth opportunities for on-premise tech are starting to feel the pinch from cloud, claims Synergy Research's 2018 market review, which says 2018 supplier revenues within the cloud market surpassed $250bn last year.

Apprenticeships have to change to be successful, says panel

Apprenticeships are becoming a popular alternative to university, but initiatives to encourage skills development are too disparate, a Harvey Nash Future Skills Programme event heard.

Intel readies 10nm chips for AI, 5G and a new PC platform

Intel used the Consumer Electronics Show (CES) in Las Vegas to present its vision to become a key technology provider in 5G networking and artificial intelligence (AI). The company has introduced what it calls a new class of AI chip.

Exxon joins IBM quantum committee as Q System One goes commercial

IBM has introduced what it describes as the world's first commercially available quantum computer, the IBM Q System One. It also plans to open a Q Quantum Computation Centre for commercial clients in Poughkeepsie, New York, this year.

Protego Labs launches serverless app security tool

Protego Labs has launched an open source tool for security professionals and developers to help them improve the security of increasingly common serverless computing environments. ■

CES 2019: Here plugs Alexa into in-car navigation service

Here, the former Nokia mapping unit now owned by a consortium of German carmakers, is to integrate Amazon Alexa with its navigation and location services.

CES

› *Hyperscale datacentre growth boom to continue into 2019.*
› *Roadside 4G mobile signal availability improves across UK.*
› *UK firms say £6.6bn annual security testing cost too high.*
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Government outlines digital plan for NHS

The NHS Long-Term Plan aims to create a digital-first health service, empowering people through the use of technology by offering virtual outpatient appointments, but how and when will the government achieve this? Lis Evenstad reports

The government's long-term plan for the NHS sets out how the health service will be transformed over the next 10 years, introducing a "service model fit for the 21st century".

A model for the 21st century naturally includes technology, so it's no surprise that the NHS, which has been working to get to grips with digital for many years, is taking a digital-first approach to future healthcare provision.

But what does a digital-first NHS look like, and what does it mean for services, staff and patients? Computer Weekly takes a look at the nitty-gritty details of the plan.

A very appy NHS

Not surprisingly, central to the plan's focus on digital technology is the NHS's all-singing, all-dancing app, which is currently being rolled out across England.

"The NHS App will create a standard online way for people to access the NHS," said the plan. "The app will work seamlessly with other services at national and local levels and, where appropriate, be integrated into patient pathways."

Patients using the app will access the NHS's ID verification platform – previously known as Citizen ID, but now dubbed NHS Login – to verify who they are and to get "easy access to personalised content, digital tools and services".

The app underpins a lot of the digital access work that is going on in the NHS. By 2020, every patient with a long-term condition will have access to their records through the Summary Care Record (SCR), which will be accessible via the app. The NHS App will also offer triage services and will direct people to appropriate care services.

"If needed, patients will be connected with their local services, get an appointment with an urgent treatment centre, out-of-hours services of a GP, or be prescribed medicine to be collected from their nearest pharmacy," the plan said.

"Increasingly, automated systems and AI [artificial intelligence] will make these services smarter, but in-person services will always be there to do what computers can't and provide personal contact for those who need or want it."

By 2021/22, people will also have access to their care plan and communication from care professionals via the app.

Digital first

The plan signals a clear shift in the provision of NHS services, with a focus on prevention and a new era of self-service. "In 10 years' time, we expect the existing model of care to look markedly different," the plan said. "The NHS will offer a 'digital-first' option for most, allowing for longer and richer face-to-face consultations with clinicians where patients want or need it. Primary care and outpatient services will have changed to a model of tiered escalation depending on need."

NHS Digital CEO Sarah Wilkinson said the digital-first approach "will enable more patients to communicate with clinicians and therapists via live video channels, without the need to be physically present where this is not necessary".

"In parallel, we will enable much more sophisticated monitoring of health by a patient or their carer, in their home environment, with the data from those monitors available immediately to their clinicians and their whole care team," she added.

This new way of running the health service means it will not be enough to plug in a batch of digital systems on top – the change needs to be systemic, from the way the NHS works with suppliers, to the way that patients interact with the service, and to the way staff deliver care. It is clear this won't happen overnight, which is probably why there is no mention of the NHS's "paperless 2020" target in the plan.

STURTI/GETTY

From paperless to mainstream digital care

The NHS has long been gunning for a paperless NHS at the point of care, with integrated electronic records in place by 2020. But

that target is becoming more unrealistic. *The Wachter Review*, published in 2016, recommended pushing back the target to 2023. This seemed to be accepted, despite the fact that the official line from the government was still "paperless 2020".

However, the NHS Long Term Plan seems to have finally taken this into account. Instead of mentioning "paperless", the plan said that, by 2024, "all providers – across acute, community and mental health settings – will be expected to advance to a core level of digitisation".

This goes much further than putting in an electronic patient record (EPR) system that can integrate with other systems, but covers "clinical and operational processes across all settings, locations and departments and [will] be based on robust, modern IT infrastructure services for hosting, storage, networks and cyber security", the plan said. "To support this, we will accelerate the roll-out of EPR systems and associated apps, including a spectrum of software-as-a-service [SaaS]/cloud-based variants."

Wilkinson said faster access to records by patients, clinicians and therapists increases safety and efficiency, but a key condition of this is the digitisation of all care providers, which is why the accelerated roll-out of EPRs is so vital.

"We will make life easier for clinicians by enabling them to capture rich and accurate records at the point and time of care," said Wilkinson. "We will standardise, integrate and quality-assure records, using voice recognition, natural language and mapping and reconciliation systems."

Other initiatives set out in the plan include ensuring that, by 2020, five areas deliver a fully integrated health and care record platform across both health and social care, followed by three further areas the following year. By 2024, all secondary care providers in England will be fully digitised.

Another key milestone is that by the summer of 2021, all NHS organisations will be 100% compliant with mandated cyber security standards. This comes after NHS Digital's deputy CEO admitted in February 2018 that all 200 NHS trusts that had been assessed for cyber security resilience had failed their assessments. Since then, the health service has increased its cyber security training and focus.

Reforms to payment and clinical pathways

The long-term plan involves a huge culture change, not just across the NHS, but in society itself. As part of the plan, the government will create primary care networks, consisting of GPs, pharmacists, district nurses and others, financed by a £4.5bn fund, launching what it calls "community-based healthcare".

This will be supported through the ongoing training and development of multidisciplinary teams in primary and community hubs. "Community hospital hubs will play their full part in many of these integrated multidisciplinary teams," the plan said.

From 2019, NHS 111 will start direct booking into GP practices across the country, as well as refer on to community pharmacies that support urgent care and promote patient self-care and self-management.

Clinical commissioning groups (CCGs) will develop pharmacy connection schemes for patients who do not need primary medical services. The aim is to keep people at home longer and to

NHS Digital's standards framework sets out renewed commitment to use open standards.

avoid unnecessary hospital admissions. However, a key success factor hinges on proposals made in the government's social care greenpaper as integration with social care will become more crucial in a digital age.

But not everyone believes the plan will succeed. Norman Lamb, former Liberal Democrat health minister and chair of the House of Commons Science and Technology Committee, said the plan was likely to be "fatally undermined by insufficient resources, a staffing crisis and a failure to address the disastrous situation with social care".

"The government's commitment to a new focus on prevention rings hollow when the very services which help prevent elderly people ending up in hospital are at breaking point and vital public health budgets are progressively cut back," he added. ■

STURTU/GETTY

The NHS Long-Term Plan includes community-based healthcare, made up of GPs, pharmacists and nurses to create a primary care network

High-flying clouds: AWS bucks traditional growth trends with help from enterprise

The Amazon Web Services public cloud juggernaut continues to go from strength to strength from quarter to quarter, but what is fuelling its non-traditional revenue growth trends? Caroline Donnelly investigates

The law of big numbers dictates that it is impossible for large, fast-growing firms to sustain indefinitely the high rates of revenue growth that define their early-stage success.

Although its year-on-year revenue growth rate may have dropped steadily from a high of 78% in 2015 to around 42% during the third quarter of 2017, the financial performance of Amazon Web Services (AWS) seems to buck this trend overall. Particularly as more recent quarters have seen the pace of growth start to pick up again.

Over the course of 2018, the cloud giant's year-on-year revenue growth rate consistently hovered around the 46-49% mark, and AWS is now – as per its third-quarter 2018 results – a $27bn revenue run rate company.

This rebound in growth rate has taken investors, who have repeatedly predicted a sustained slowdown in the firm's pace of growth, by surprise. And for good reason, acknowledged AWS CEO Andy Jassy during a keynote at the AWS re:Invent user summit in Las Vegas in late November 2018.

"Growing 46% year over year on a base as large as $27bn is unusual and that sometimes confuses people," he said, before sharing his thoughts on how AWS is managing to buck these traditional business growth trends.

The enterprise market's growing appetite for public cloud services is certainly playing its part, as AWS now has customers in "every imaginable vertical business segment", said Jassy.

Indeed, 2018 saw a number of high-profile companies state their intentions to shutter their private datacentres and go "all in" on the AWS cloud, including financial services giant Barclays Bank, low-cost airline EasyJet and biotechnology firm Amgen.

"If you look at the FT250, it is really difficult to find companies that aren't doing something very publicly and openly [with cloud] in a very meaningful way," Gavin Jackson, managing director of UK and Ireland at AWS, told Computer Weekly in an interview ahead of re:Invent.

He said this was being fuelled, in part, by a need to keep up with AWS's long-standing competitors and position its businesses so

it could also out-innovate new market entrants. "Cloud provides a level playing field because you see how startups operate that are born cloud-native and they have free rein to innovate really quickly, with nothing [legacy] holding them back," said Jackson.

"If you're an enterprise, you can innovate that way [supported by legacy technology], but you can't work off a bad diet, and if you're consuming high-calorie technology, it will hold you back."

In the UK, specifically, the public sector has emerged as a keen adopter of Amazon's cloud services since the company opened its London datacentre region in December 2016.

And there are still lots of enterprises out there that are yet to move to cloud or are still hammering out their migration strategy, said Jassy. "We're just at the early stages of the meat of enterprise and public sector cloud adoption in the US," he said. "Outside of the US, I'd say they are 12 to 36 months behind, depending on the country and depending on the industry. So it is still early days."

Market share figures

As its market share figures show, when organisations decide to move to the cloud, most are opting for AWS over competing public cloud offerings from Microsoft and Google. Synergy Research Group's latest market tracker suggests AWS has a bigger share than its four nearest competitors combined.

For enterprises that are still working out their cloud migration plans, there may be an element of "if everyone else is using AWS, why shouldn't we?" when deciding which provider to go with, because – considering its market share – the firm looks like a pretty safe bet to entrust your data to.

Andy Jassy, AWS: "We're just at the early stages of the meat of enterprise and public sector cloud adoption in the US"

But it's not just the effect of net new customers joining the AWS bandwagon that is fuelling its growth. There is also a tendency among its users to start out using the Amazon Elastic Compute Cloud (EC2) and Simple Storage Service (S3) to run their workloads and store their data.

Then, as time goes by, the range of AWS services they use starts to broaden, and the amount of data they have stored and being processed within its datacentres ramps up accordingly.

That is certainly true for the technology team at Supercell, a self-confessed "born in the cloud" Finnish mobile game development studio, which has been using AWS technologies to underpin its offerings to gamers since the company's inception in 2010.

"We have grown with AWS," Heikki Verta, services team leader at Supercell, told Computer Weekly at re:Invent. "As we have got bigger and demands from different parts of the company have grown, we have started using more and more services from them."

Database services

The firm uses the compute power of EC2 to run its games and back-end databases, as well as S3 for backup purposes, and is increasingly drawing on AWS's burgeoning portfolio of database services, including its managed NoSQL offering, DynamoDB.

"We use DynamoDB for some of our support workloads and also in the games," said Verta. "Most of the games are running on MySQL, but we do use DynamoDB as well to store the replays, for example, and also in our analytics and support functions."

Supercell also uses Amazon Elastic Map Reduce (EMR) to process and analyse the data generated by gamers, and "a lot of" Amazon Kinesis, said Verta, which allows it to process big data volumes in real time, too.

This data is important for helping to inform some of the decisions its development teams make about the future direction its games should take, as well as which titles should progress from "soft launch" to global release or be retired.

"Metrics are important, but we also believe the metrics [alone] are not what decides if a game will be a hit or not," said Verta. "You need the professional experience of the game designers to make a fun game, but what the data can do is validate your learnings."

Cross-functional team

Each of the studio's games is created by a small, cross-functional team of 20-25 people, he said, who collectively have all the skills and competencies needed to run it. As such, each team has developers with server and client-side skills, artists, designers, quality assurance people, and data scientists.

"The teams are small and independent, so they can move fast because there is less need for hierarchy, processes, politics and all of that," said Verta. "It allows us to move much faster as an organisation, because when the decisions are made by the people closest to the problem, they have the best information and can take the right action."

This philosophy also goes some way to explaining why Supercell decided all those years ago to forgo the hassle and cost of building out its own on-premise infrastructure in favour of using the AWS cloud, said Verta. "Out of the 20 or so people in our teams, only three might be server developers and they have to maintain

Amazon.com CTO Werner Vogels declares the happiest day of his working year.

the infrastructure and develop the game, and we want to minimise the work they have to do there, so they can focus on the game rather than maintenance," he said. "Using the public cloud and AWS has freed us from the operational aspects of running the game, and allows us to be more agile."

AWS is also renowned for is its pace of innovation, which, according to Lydia Leong, vice-president and distinguished analyst at Gartner, is a major point of competitive difference for the firm. "Of the major cloud providers, AWS has the broadest and deepest service portfolio, the best first-party professional services and most organised migration approach," she said.

On this point, AWS has claimed that users of its platform gain access to an average of three new standalone services or feature capabilities per day, such is its pace of product development.

First foray into blockchain

To this end, the week of re:Invent saw the firm debut more than 80 new products and services, including its first foray into blockchain, and a piece of hybrid cloud-enabling on-premise server hardware kit called AWS Outposts.

The show also saw it debut AWS Ground Station, a managed service that will draw on the firm's global datacentre infrastructure to help cut the time and cost involved with processing data generated by orbiting space satellites, and moving it to the cloud.

Depending on the nature of the service, some of these are offered to customers on a try-before-you-buy basis, or their pricing is tiered in such a way that users are charged only when they have used a service for a certain number of hours, for example.

This, in turn, spurs enterprises to experiment with using more products and services in the AWS portfolio, and increase their overall adoption of its technologies.

And it is how cheap and easy the company makes it for customers to experiment that keeps them coming back for more, said Matthew Fryer, vice-president and chief data science officer at Expedia-owned holiday booking site Hotels.com.

> **"A lot of things a technology leader would traditionally have to think about, I don't have to worry about now"**
>
> Matthew Fryer, Hotels.com

The economies of scale at which AWS operates mean it is not uncommon to see the cost of using its services go down from one month to the next, said Fryer.

"It makes you curious because of what you can do with the elasticity of cloud and when the costs keep coming down," he said. "It means you can ask different questions, and people get curious, and that curiosity leads to discovery and innovation, which leads to more business value – and that's incredible."

At re:Invent 2017, Expedia outlined its intention to go all-in on AWS across all its brands, as part of a wider push to refocus its

in-house engineering teams on projects that deliver value back to the business rather than bogging them down with hardware procurement and datacentre management tasks.

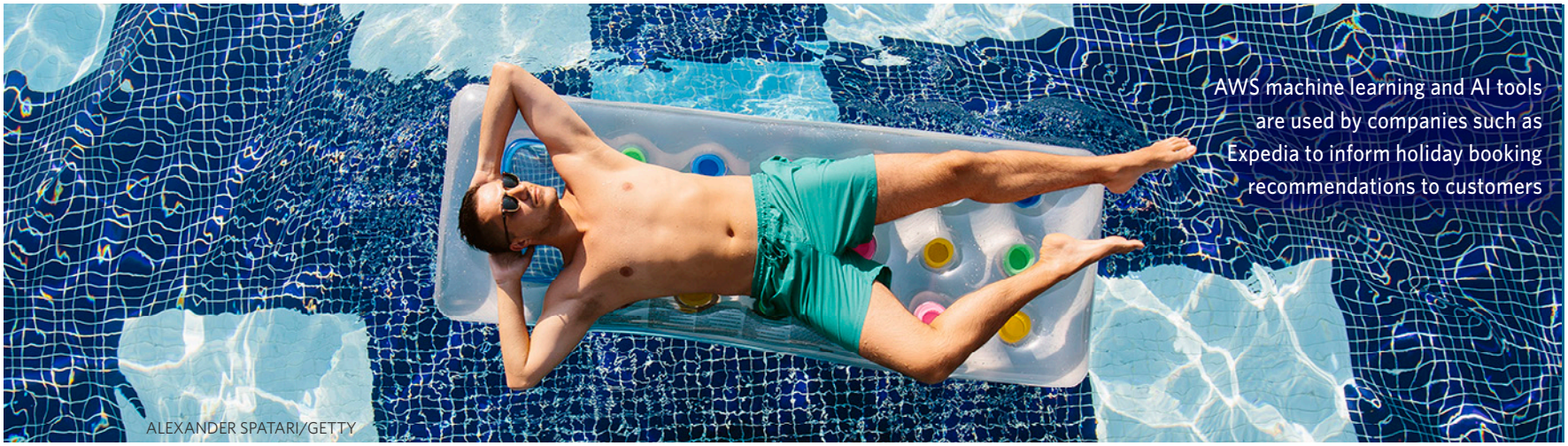
Expedia's all-in pledge coincided with a declaration of intent to migrate several core Microsoft SQL and Oracle databases to Amazon's relational database service Aurora, which, since its 2015 launch, has become the fastest-growing AWS service ever.

As well as Aurora, Expedia is also a power user of various AWS machine learning and artificial intelligence tools, which, on the Hotels.com site, it uses to help inform the booking recommendations it offers customers.

All these services are interoperable with each other, said Fryer, which is another reason why he thinks so many enterprises are choosing to go all-in on AWS. "I haven't got to think about whether that service will work with another AWS service, or worry about how I'm going to get Lambda [AWS's serverless computing platform] to talk to S3 because it all fits together," he said. "A lot of the things a technology leader would traditionally have to think about, I don't have to worry about now."

Speedy product development cycles are all well and good, particularly when being first out of the gate with services, but AWS is not in the habit of creating technology for technology's sake or just because its competitors are, said Jassy during his keynote.

Nicholas McQuire, vice-president of enterprise research at analyst house CCS Insight, told Computer Weekly this was another important point of differentiation for AWS. "It's very hard to poke



ALEXANDER SPATARI/GETTY

AWS machine learning and AI tools are used by companies such as Expedia to inform holiday booking recommendations to customers

holes in the AWS strategy at the moment, because it pays very close attention to customer needs, which drives its investments in new functionality and, above all, improved economics for customers using its cloud services," he said. "This flywheel is why its numbers in 2018 continued to defy gravity."

That said, the pace at which the company is operating currently does pose some sizeable challenges for AWS that it will need to overcome if it is to defy the law of big numbers for a long time to come, said McQuire.

"Some of its biggest challenges are a result of its growth," he said. "How do they hire the right people to preserve the culture? How do they improve customer support, grow their field organisation and professional services to help the less speedier customers migrate to their cloud and consume its services?"

Conflict-of-interest issues

AWS has also encountered some conflict-of-interest issues that will need to be resolved, particularly when it comes to assuring retailers that its close association with Amazon.com will have no bearing on its dealings with them.

The most high-profile example of this is US retailer Walmart, which was reported, in June 2017, to have warned its technology partners not to use the AWS cloud when hosting applications and workloads on its behalf. The firm has since gone on to sign a five-year cloud deal with AWS competitor Microsoft.

"How can it reassure retailer customers, for example, that it is a trusted partner for the long run?" said McQuire. "These are questions it needs to address and areas its competitors aim to exploit."

Also, if AWS aims to ensure the gap between it and its competitors remains as wide as at present, it may need to consider broadening its software-as-a-service [SaaS] play, he added.

While AWS does have a stake in the business productivity-focused SaaS market with its managed desktop service Amazon Workspaces, Microsoft and Google have far larger service portfolios that are already widely embedded in enterprises.

"While assets such as Workspaces, Alexa for Business, Amazon Connect and Chime are foundations, in the long run it will need to have a much deeper strategy in this space in order to fill gaps against Microsoft and Google in particular," said McQuire. "Of course, it will have to tread carefully as many SaaS companies run on AWS and its partner ecosystem and marketplace is a key enabler of its cloud."

Plenty of growing to do

Either way, AWS UK boss Jackson thinks that with cloud still in its infancy, the firm still has plenty of growing to do. And, with ample amounts of enterprise IT spend still to go after, is primed to continue to challenge the law of big numbers.

"What we're talking here across the world is potentially trillions of dollars of addressable spend in the rounds, and we're a $27bn business today," said Jackson. "So there is so much room to grow.

"And I just don't see us slowing down any time soon – even on the law of big numbers. And who knows what tomorrow will bring? The next [tech] unicorn will be born, and the next, and the next, and then the next enterprise goes all into the cloud. It's an exciting place to be." ■

INTERVIEW

Building digital tools for the food trade

Amitabh Apte, global director of digital integration at Mars, talks to Mark Samuels about developing an API strategy, consistency and increasing customer focus

Amitabh Apte, global director of digital integration at consumer goods giant Mars, is on a mission to use big data and application programming interfaces to boost operational efficiencies and customer experiences.

Apte joined Mars in May 2018. He was previously chief technology officer (CTO) at consumer giant Reckitt Benckiser (RB) Group, which owns brands such as Nurofen, Durex and Dettol. Apte established the CTO practice at RB. He had previously held senior IT positions at a range of multinational firms, including Deutsche Bank, Home Retail Group and Fujitsu Services.

At Mars, he reports to the Core Capabilities function, which in turn reports to the firm's global chief digital officer (CDO) Sandeep Dadlani, who was appointed in July 2017 and who quickly identified integration as a key component for digital success. A strategic review in 2017 suggested the firm should create a dedicated integration centre led by an experienced executive. Apte grasped the chance to take this role and leads the integration centre, known as Integration Hub.

"When the opportunity came up, the attraction of building something new in terms of digital integration was massive," he says. "But the biggest draw for me was Mars as a company – it has a strong collection of brands and the business model is attractive. I spoke to colleagues who'd worked for the firm and that provided more evidence. It's been really enjoyable so far."

Creating a strategic approach

Apte is helping the company to hone its digital framework, known as the Mars Digital Engine. This framework intends to

place customers at the heart of operations. The approach is to solve consumer challenges through three core elements – design thinking, emerging technology and data platforms.

Design thinking is about finding and articulating business challenges, says Apte. The focus on big data and emerging technology, meanwhile, is about using analytics, artificial intelligence and machine learning to solve the identified problems. Finally, the concentration on data platforms is about using key foundational technologies – such as data lakes and application programming interfaces (APIs) – to create scalable solutions to business challenges. Apte says the people-focused approach to dealing with these three core challenges produces significant results. "We charge people to go out and come back with solutions," he says. "As a leader, that's something I particularly enjoy. I'm not just enacting technology – I'm activating the whole strategy on API-led integration."

> "What matters is helping the business, not creating APIs for the sake of it. We use design thinking to solve business problems, find the right tools, then move on to the next challenge"
>
> Amitabh Apte, Mars

Variations occur within that approach, too. Apte says the way the strategy plays out varies across Mars brands. His role is to ensure the approach is activated successfully. "I'm accountable for building the APIs on top of the platforms we use," he says. "This stretches from the identification of requirements right through to test, launch and operate. I'm also responsible for integration across a broad suite of enterprise applications, from providers such as MuleSoft, SAP and IBM. I have to look at integration across the stack. It's a great challenge. Because I have access to all these tools, I have to choose the best solution to the business challenges we face – and that may or may not involve an API."

Apte recognises there is a lot of hype about the potential game-changing power of APIs. Yet his key message is that APIs are not always the best technical answer to business challenges. "Sometimes a manual file transfer system is good enough – what matters is helping the business, not creating APIs for the sake of it," he says. "We're focused on using design thinking to solve business problems, finding the right tools and then moving on to the next key challenge."

Developing data consistency

When it comes to using APIs in business, Apte points to four key elements. First, he says the Mars Digital Engine needs data from internal platforms, such as enterprise resource planning (ERP) systems and data warehouses. Second, Mars works with various external partners – Apte and his team must bring in what he refers to as social and market data to help the firm work with its partners. Third, Apte says all these datasets must be fed into information-hungry

applications – his team works to feed these tools with APIs. Finally, Apte and his colleagues work on what he refers to as activating the consumer channel, which is where the team feeds information to asset management platforms, such as those for products, labels and digital assets.

"One of the first APIs we launched was the product master," he says. "Most areas of the business, such as channels and brand websites, need product information and attributes," he says. "If you don't give people the consistent information they need, they'll go off and get the information themselves and they'll create point solutions."

The standardised approach of Apte and his team avoids this spaghetti-like approach to data management and instead creates a master view of information. "We build consistent APIs on top of the data we hold, and people – whether internal users or external partners – can use information and send it to the websites and channels that require data," he says.

Building strong momentum

Although Apte is responsible for setting the direction of enterprise integration, he says solid progress had already been made before he joined the firm. Stage one – in terms of proof of concept and testing the platform for application programming interfaces – had already been undertaken.

The team had selected MuleSoft as its API partner, a firm that Apte had already worked closely with in his previous position at RB. Apte has helped the team at Mars to develop its initial work. "They'd built some initial system APIs, such as

integration into ServiceNow and Splunk," he says. "I helped refocus the team on its priorities. As a leader, that's a key role – and we got them to focus sharply on that."

Two new APIs were put into production in May 2018, and 10 more were launched between May and October. These APIs are what Apte calls crucial elements, including the aforementioned product master and a customer master data feed. "We are seeing real momentum being built now – there's conversation, there's engagement, there's business stakeholder meetings taking place, and that's really helping our cause," he says, before recognising that the integration team needs to continue proving benefits. "There's still work to do, of course. But I think that's OK – the rest of the business has its own work to do; they're not technology specialists. To continue to build momentum, our team shouldn't be talking about APIs – we should be talking about business outcomes, such as saving time and improving service. These are the things the business cares about."

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Leaving a legacy

Apte says re-use is the number one benefit of his MuleSoft-based API strategy at Mars. Instead of everyone around the business building their own feeds time and again, the integration team has created crucial feeds – such as master feeds for products and customers – that can be re-used on demand.

When it comes to other IT leaders who might be thinking of implementing their own API strategy, Apte offers a range of best-practice tips. In terms of general management, he says senior executive sponsorship is essential. "I wouldn't be able to do any of what I'm doing without that support," he says.

Apte says CIOs should focus on ensuring the rest of the business trusts data professionals to work with their information. He also says CIOs would be well advised to consider the overall enterprise architecture and to demonstrate how APIs fit as part of a broader digital strategy.

When it comes to technical best-practice considerations, Apte advises other CIOs to build a sound enterprise data model. That model should provide solid foundations for game-changing work in the area of information management, he says. "APIs are all about data, so having that model – in terms of how you re-use data – is going to be so important."

Finally, Apte suggests other CIOs should be attentive to data skills. "That's my focus at Mars," he says. "I don't want to just leave

a legacy of building hundreds of APIs – what I would like to do is build long-term capability. So we're investing in skills because if you don't have the right people, you just create a bottleneck."

Focusing on the customer

Apte says his wider strategy for enterprise application integration is best thought of as a hybrid approach. Mars has a broad range of technical assets – and those assets, despite the rise of APIs, must be re-used as much as possible. Looking further ahead, he hopes to create an internal marketplace for application programming interfaces.

"That's stage three – and that's something we'll be focused on in 2019," he says. "As the business starts to make use of APIs, the critical mass of re-usability starts to grow. It's at this point that I want to build the concept of an API marketplace. I want a service catalogue where people can go to a store and grab an API to solve the business challenge they face."

Stage four, which is probably two years away, involves an advanced stage where the marketplace holds 1,500-plus application programming interfaces. "That's where governance becomes important and making sure the right people are using the right APIs at the right time," says Apte, who adds that the amount of data being used by a major company such as Mars will only continue to increase. "As a digital leader, you need to know where your data is, and you need to think about how you can create a single view of the customer," he says. "It's about making the most of an integration technology, like APIs, to help our associates at Mars create a single view of the customer." ■

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Will everyone swallow the NHS tech pill?

There has been a lot of excitement over the new NHS Long-Term Plan, which sets out how the NHS will spend the extra £20.5bn a year, gifted to the health service by prime minister Theresa May as a 70th birthday present. With a clear focus on technology and digital, it is obvious that health secretary Matt Hancock has more than had his say.

Offered up as a solution to most of the issues in the NHS, including staff shortages, budget problems, waiting lists and outdated technology, it really does sound like a holy grail. A digital-first NHS where, as a patient, you can get a diagnosis, video chat with your GP, virtually attend your outpatient clinic, get your prescriptions, or have your entire genome sequenced – all at the touch of a button or swipe of a screen. As a hospital clinician, you'll be able to use your handheld device to liaise with social workers, community nurses and other care staff, while getting a full view of all you need to know about the patient. No waiting for records, no "hold the line while we transfer you", and no ridiculously long waiting lists, or 12-hour waits in A&E.

WITHOUT EVEN TOUCHING ON THE MONEY ISSUE, AS WITH MOST TECH PROJECTS, THE KEY STUMBLING BLOCK IS CULTURE

It sounds like utopia – but unfortunately, nothing is ever as simple as that. For a start, the NHS does not have a great history of successful tech programmes, or indeed hitting its targets. The "paperless NHS by 2018" target set by Jeremy Hunt in 2013 soon became 2020 and now we're looking at 2024. But it's not the technology that will be the main issue in executing the 10-year plan. Without even touching on the money issue, as with most tech projects, the key stumbling block is culture.

Transforming staff culture in the NHS to use more technology (and trust it) is one thing, and by no means an easy feat. But the bigger issue is transforming society, so that interacting with the NHS through a "digital-first front door" becomes the norm. Most patients in England have had access to online GP services for a couple of years, but most haven't even signed up to the services, let alone use them. And people shouldn't show up at A&E with a runny nose, but many still do, and it will take a lot more than technology to change that.

So, will a "digital-first" NHS emerge in the next few years? It's a huge challenge and requires buy-in from the entire country – but nothing is impossible. To those doing the hard work of implementing the plan, may the odds be ever in your favour. ■

Lis Evenstad, management editor

SECURITY WITHOUT BORDERS

With an increasing number of devices connecting to internal and external resources, network security is being challenged. Enter perimeterless security – a way of securing each point of connectivity and every device, rather than relying on perimeter protection. Stuart Burns reports

SKYPICSTUDIO/ADOBE

It is fairly well known that most computer networks have a tough exterior, but are actually weak on the inside. Firewalls and anti-intrusion devices make for a hard shell, but the security isn't quite as stringent as it perhaps should be throughout. Administrators often think – incorrectly – that internal infrastructure is more trustworthy.

In reality, once an attacker gets past the hard exterior of the network, either through a phishing attack or by exploiting a known vulnerability in the external infrastructure, the ability to steal data becomes much easier. This is because most companies typically allocate up to 80% of their IT security budget to the perimeter's inbound and outbound security (known as north-south networking) rather than laterally (east-west) across the internal network.

Businesses and administrators often rely on such a hardened perimeter to reduce the workload of having to patch internal servers – server patching consumes work cycles, and some IT administrators may feel that patching takes up considerable time for limited reward.

CHANGING ENVIRONMENT

The risk is compounded by the fact that centralised management, which has served so well in the past, has limited ability to adapt to today's hyper-mobile world and the challenges this brings. The change in business practices and explosion of short-term freelance and external contractors who use their own devices – such as tablets, laptops and smartphones, all with

HOME

different operating systems and masses of different configurations – present an administrative challenge.

It takes just one weakness in one client for the whole system to crack wide open in a centralised management infrastructure.

While any particular device may not be fully patched, it is not always feasible to install a virtual private network (VPN) client and lock down configurations on users' personal devices. As well as security around devices, a substantial amount of infrastructure is now based around supporting cloud applications.

There is also a lot to say about cloud infrastructure, which has changed how users consume data, especially when multicloud providers are added to the mix. But the old way of using a VPN to access a corporate network then jump out to a cloud service on the internet slows down the user experience, as well as increasing bandwidth usage and cost. It makes more sense for the user to go directly to the destination cloud service rather than through a VPN or corporate network.

Perimeterless security

One answer to this conundrum is perimeterless security, which aims to address the shortcomings of VPNs while enabling mobility and access to cloud services. It is about ensuring integrity and security, while enabling the business to do business. Put simply, it is a whole new paradigm that revolves around security at each point of connectivity and every device, rather than relying on the perimeter. Google has been a leader in this field, assuming the associated risks and rewards.

Perimeterless security is about the user and their identity, not the technology. Putting the user at the centre of establishing security is the cornerstone of perimeterless security. Being able to truly identify and authenticate a user on demand is the first step on the perimeterless journey, and this requires a rethink with regard to passwords.

Perimeterless security is about the user and their identity, not the technology. Being able to truly identify and authenticate a user on demand is the first step on the perimeterless journey

Legacy authentication methods, such as a single password-based login to the corporate network, are subject to theft from phishing or from breach incidents. Frequently, users re-use the same passwords, which negates the security measures IT puts in place. This means further security measures are required to be sure that a user logging in is truly who they say they are.

Adopting two-factor authentication (2FA) is a first step into retiring the single-password concept and negating its liabilities. It is also the first step on the perimeterless network security journey.

Google recently reported that once it introduced a 2FA device to supplement its log-in process, the success of phishing attacks

fell to zero. Put into context, that is unheard of in large businesses where sustained attacks are frequent.

Hardware tokens such as those from Yubikey and other hardware 2FA token manufacturers provide the ability for the user to unquestionably prove who they are. Many of the top platform-as-a-service (PaaS) providers, such as Workforce, Microsoft Office 365 and Google for Business, provide native support for hardware identity tokens.

Beyond two-factor authentication, it is also best practice to log everything. Logs are key to being able to understand what is happening on the network at any given time.

Hardware policies

It is also important to differentiate between company-owned devices and bring-your-own devices (BYOD) as they have to be treated appropriately, depending on which category they fall into. Management and control policies applied to corporate-supplied devices and personal devices should differ.

Verifying the user is an important first step, but equally as important is the integrity of the local device. Ensuring the cleanliness of the device can be enforced by management profiles. Enforcing modern virus scanners, anti-malware and minimum software levels help ensure the device is less likely to be compromised.

These management policies should also ensure full disk encryption is enabled on the device, and only approved applications are installed. Unknown and unauthorised devices present a serious risk in any environment, and the infrastructure should have the ability to recognise and react to such issues. Paired with intelligent

SKYPICSTUDIO/ADOBE

Management and control policies should differ between company-issued devices and personal devices

systems, a perimeterless network security set-up can react much quicker than traditional administrators and help block data loss and questionable devices on the infrastructure.

Intelligent management infrastructure

While still in its relative infancy, anomaly detection is what makes the whole perimeterless security scenario possible. For example, a user based in Manchester who suddenly starts logging in from Nebraska would potentially be flagged in such a system as "anomalous behaviour" and would be marked as untrustworthy.

Over time, such systems can establish a "pattern of life" associated with the device and user. The more data such a management system has, the better it gets at making decisions. These systems learn normal behaviour, so any variation from what is considered normal may set off warning signals. The anomaly detection system tests various criteria to ascertain the trustworthiness of the device and the user. This trustworthiness score is then used to grant or deny access to a particular network resource.

This backbone is what most people would recognise as perimeterless security, and rights-based and device behaviour can affect it. Security decisions are based on several variables, such as the trustworthiness, location, reputation and past history of the source network. A simple example of this is that while access to lower-level infrastructure can be trusted from a semi-public network, access to the internal, sensitive infrastructure that contains personally identifiable information or sensitive data would not be allowed.

Physical security is only one piece of the puzzle: perimeterless network security doesn't absolve anyone from the fundamentals of good data and security hygiene

Other examples of how perimeterless security can affect security in a positive way is that external networks have a reputation, so network activity to perform logins from a server farm in a colocation facility, for example, should set alarm bells ringing since a common user would not normally log in from a datacentre.

It's all about the small details that make up the bigger picture.

Planning and execution

In summary, perimeterless security can work well, but it needs to be planned and executed in a controlled and specific manner. It certainly isn't about cost reduction, but more a modernisation of the stance that businesses and users have taken as the default in the past.

Trust is everything, and trusting single tokens of proof is not really an effective solution, especially with accounts of privilege such as an admin account. In the old style of networking, one lost password, used on an internal terminal, could lay the

entire infrastructure wide open. This is less likely with security-aware companies, but still a big risk at those where IT has not yet caught up with the reality of infrastructure security in an internet-connected world.

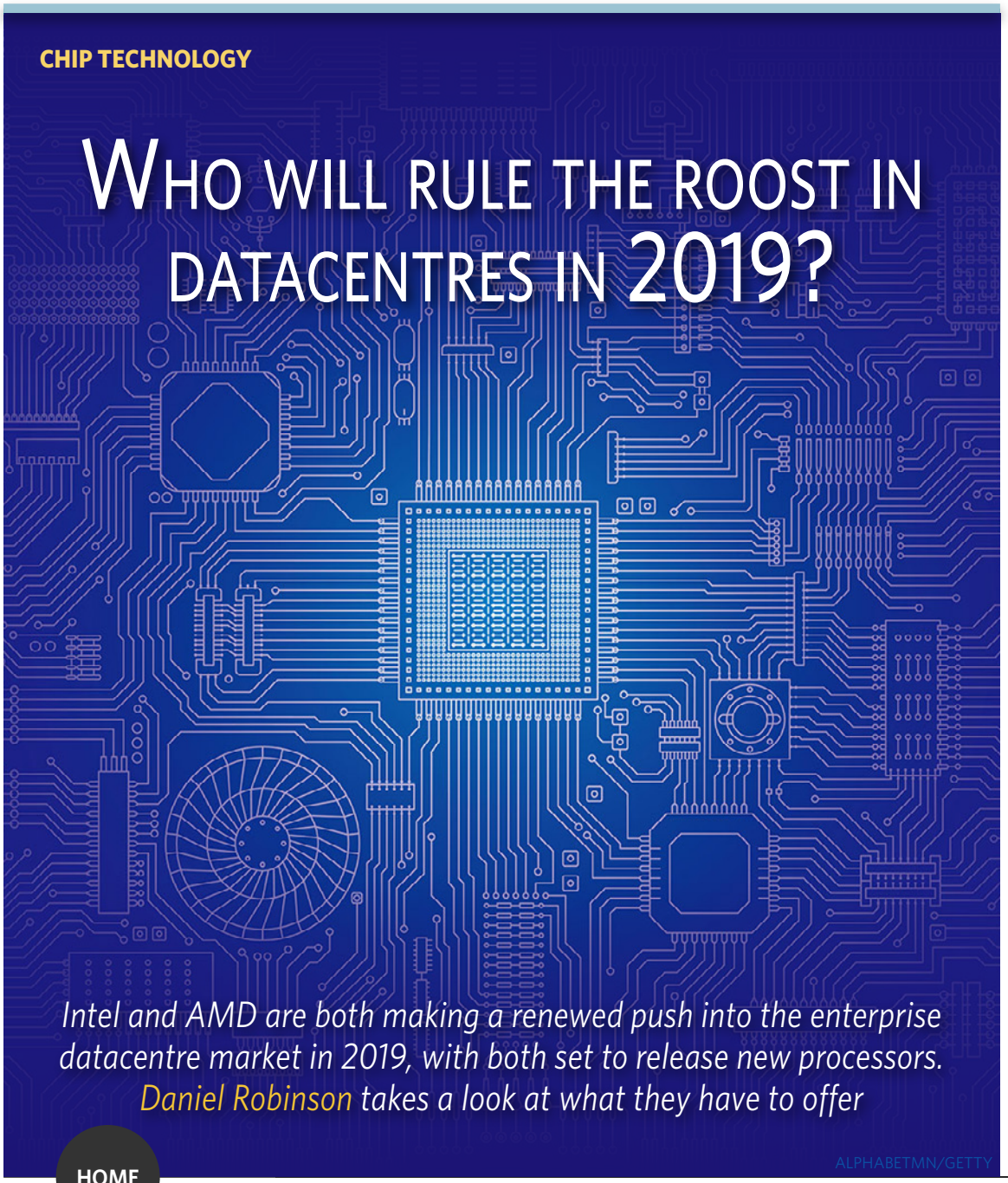
But the technologies to support perimeterless security do not come for free and require a significant amount of training and set-up ahead of time to implement correctly. It will also require a significant level of buy-in from management in terms of support and financial commitment. Once in place, however, IT security management should become far easier.

There are many suppliers in this rapidly expanding area, but all keep the core tenants of perimeterless security as their central theme. Do your research, ask questions, but remember that physical security is only one piece of the puzzle: perimeterless network security doesn't absolve anyone from the fundamentals of good data and security hygiene. ■

TECHNOLOGIES TO SUPPORT PERIMETERLESS SECURITY DO NOT COME FOR FREE, REQUIRE A SIGNIFICANT AMOUNT OF TRAINING AND WILL NEED MANAGEMENT BUY-IN

SKYPICSTUDIO/ADOBE

Who will rule the roost in datacentres in 2019?



Intel and AMD are both making a renewed push into the enterprise datacentre market in 2019, with both set to release new processors. Daniel Robinson takes a look at what they have to offer

ALPHABETMN/GETTY

HOME

The enterprise server market has started getting interesting again over the past year, as AMD returned to the fray with its EPYC platform to go head-to-head with Intel's Xeon chips. Now both firms have detailed new processors that are coming in 2019, which display their respective thinking about the trends that are shaping the modern datacentre.

Things have changed somewhat since the EPYC launch in the middle of 2017. AMD now has its chips in enterprise systems from Dell EMC, HPE, Cisco and Supermicro, and is steadily gaining market share.

Meanwhile, Intel appears to have hit a few bumps in the road, with reports that it is having difficulty supplying enough chips to meet demand, while the introduction of its 10nm chip technology has been delayed yet again until some time in 2019.

Boost performance

As might be expected, both companies have opted to increase the number of processor cores per socket to boost performance. However, each has its own specific improvements, with AMD delivering more instructions per clock (IPC) through a new microarchitecture, while Intel adds new instructions aimed at accelerating deep learning workloads and support for Intel's Optane memory technology to be used in DIMM slots.

Intel's offerings, codenamed Cascade Lake, represent the next generation of the Xeon Scalable family. These are due for an official launch in early 2019, but Intel has disclosed details of one

of the top-end parts, Cascade Lake Advanced Performance (AP), which will boast up to 48 cores and feature 12 DDR4 memory channels, allowing for double the memory capacity of existing Xeons.

Meanwhile, AMD is also readying the next generation of EPYC, codenamed Rome, for launch in 2019, based on updated Zen 2 cores. This tops out with an impressive 64 cores per socket, double that of the existing EPYC family, but retains the eight DDR4 memory channels and 128 lanes of PCIe I/O so that the new chips will fit in the same motherboard sockets as the first generation.

However, PCIe support has now been upgraded to PCIe 4.0 standard, which offers twice the bandwidth per lane compared with existing PCIe 3.0, which should deliver faster throughput when used with devices such as NVMe SSDs and Ethernet adapters that are compatible with PCIe 4.0.

> *To differentiate new chip technology from existing GPUs, mobile tech companies are slapping a "neural" label on their products.*

Under the hood

There are some surprises when you look at what is inside the chip package of these new processors. Both Cascade Lake AP and the Rome EPYC are multi-chip packages (MCPs), which means they are made up of more than one silicon chip, with internal connections tying them together.

In Intel's case, Cascade Lake AP is effectively two 24-core chips joined together, since other Cascade Lake SKUs are going to have six DDR4 memory channels, the same as the current Skylake generation. The chips are connected using one Ultra Path Interconnect (UPI) link from each, with the same type of link used to connect between sockets externally (Cascade Lake AP supports one or two sockets).

THERE ARE SOME SURPRISES WHEN YOU LOOK AT WHAT IS INSIDE THE CHIP PACKAGE OF THESE NEW PROCESSORS

AMD's existing EPYC chips are made up of four separate "chiplets", cross-linked with the Infinity Fabric high-speed interconnect. The upcoming Rome EPYC chips are radically different, however, comprising a single I/O and memory controller chip that is surrounded by up to eight chiplets, each of which carries eight Zen 2 cores.

This separation means that the I/O and memory controller can be manufactured using the same 14nm process used for the first EPYC chips, while the new Zen 2 chiplets are made using a newer 7nm process.

Architectural enhancements

Those Zen 2 cores also boast some architectural enhancements, with the width of the floating point units doubled to 256 bits, plus an improved branch predictor and better instruction pre-fetching. As a result, the new EPYC chips boast a 29% improvement in IPC over the first generation. AMD also claims to have halved the power consumption per operation in Zen 2.

As Cascade Lake is staying put on Intel's 14nm production process, it might seem there are few differences between the upcoming chips and the existing Xeon Scalable family.

However, Intel has added some unspecified hardware mitigations to combat the Spectre and Meltdown vulnerabilities, as well as new Vector Neural Network Instructions (VNNI) to accelerate deep learning tasks, and support for Intel's Optane DC Persistent Memory DIMMs.

With VNNI, also known as Intel Deep Learning Boost, the firm is claiming a performance improvement of up to 17x over the Skylake family, thanks to the ability to handle INT8 convolutions in a single step rather than three separate steps for the AVX-512 instructions. However, this requires application code to be optimised for Cascade Lake.

Memory hierarchy

Meanwhile, Intel's Optane DC Persistent Memory technology is now available as a new tier in the memory hierarchy between DRAM and storage, owing to its higher latency but greater capacity.

It is available now in DIMM form factor in 128GB, 256GB and 512GB capacities, while recently launched 256GB DIMMS are the largest DRAM capacity currently available.

Intel seems to be following a strategy of adding optimisations to accelerate specific workloads. AMD, on the other hand, is pushing the price/performance proposition

Intel envisages Cascade Lake servers fitted with a combination of DRAM and Optane. Two modes are supported – App Direct Mode and Memory Mode. The first is intended for software that is Optane-aware and can choose whether data should go into DRAM or the larger, persistent Optane memory. In Memory Mode, DRAM acts as a cache for the Optane memory, with the processor's memory controller ensuring that the most frequently accessed data is in DRAM.

Intel therefore seems to be following a strategy of adding optimisations to accelerate specific workloads, such as deep learning instructions and Optane memory, and the latter could prove useful for in-memory databases or analytics. However, these will typically require code to be written specifically to support these features.

AMD, on the other hand, is pushing the price/performance proposition by offering a large number of cores at a low price point – as it did with the first-generation EPYC – as well as better performance per watt.

It should be noted that neither Intel nor AMD has yet detailed prices for its new chips. However, Intel's top-end Skylake chips were priced in excess of $10,000, multiple times the price level of the top-end EPYC, and it seems likely that this price differential will continue. ■

Cloud storage fit for an SME

Small companies can often take advantage of public cloud storage offerings to supplement or replace on-premise infrastructure. Chris Evans looks at the key options in file, block and object storage

OLGA MOONLIGHT/ADOBE

The technology needs of small and medium-sized enterprises (SMEs) are less demanding than those of large enterprises, but important nonetheless. And key among these is storage.

In the past, this often meant scaled-down versions of the storage used by enterprises, but now we live in an era when cloud storage is an increasingly viable option. This is particularly relevant to SMEs, which lack the IT department resources of larger organisations.

Turning to cloud storage

There are a variety of ways in which SMEs can adopt cloud storage. Using the cloud puts budget to operational expenditure and can significantly reduce the capital cost of buying and maintaining storage hardware. The question for SMEs is where those benefits can best be applied.

Public cloud works well with secondary data, like backups. Also, file storage for home directories and shared data can be a good cloud storage use case, although security needs some thought and planning.

Traditional core applications, such as databases and enterprise resource planning, are the most difficult to fit to cloud storage.

On-premise hyper-converged infrastructure can be a good fit, and this removes the need for storage area networks (SANs) and the associated skills. For SMEs that want to modernise their storage infrastructure, however, there are numerous ways to benefit from cloud storage offerings while combining these with on-premise capacity.

Structured and unstructured data

Typically, storage requirements divide into two main areas. Primary storage defines the requirements of production workloads that run the business. Secondary storage is anything that's not production data, so can be anything not in current use. The next key differentiation is between structured and unstructured data.

Structured data is data held in a data model, such as databases that drive ERP, transactional processing or websites. Transactional systems are typically deployed on block-based storage solutions such as SANs because of the latency-sensitive nature of the data.

Unstructured data is anything that falls outside a database-type model, so can include almost anything from office documents to images and streaming video, although often these types of data will contain metadata headers that can be interrogated and which therefore make it semi-structured data.

Unstructured data, whether primary or secondary, is often held in NAS/file access or object storage.

This means we will see requirements for block, file and object protocols among SMEs. And it's not surprising that the public cloud suppliers have aligned themselves to these requirements to offer each protocol in their storage portfolios.

Block storage and the cloud

In the public cloud, block storage is usually only accessible by local virtual compute instances. There are two main reasons for this.

First, virtual instances need block storage for boot and local data drives. These are generally implemented in virtual environments within the hypervisor that runs the virtual instances.

The second issue is one of performance. Block-based storage and applications are latency sensitive, specifically to the response time of individual input/output.

Meanwhile, on-premise shared storage – such as in a SAN – can offer sub-10 millisecond response times from hybrid arrays, with sub-millisecond typical for all-flash systems.

Should an SME want to use block storage and the public cloud, how can it be done? One solution is to use a storage gateway. These are hardware and software appliances that live in the on-premise datacentre and present block storage locally over protocols such as iSCSI.

Data is periodically archived to public cloud to offer a form of data protection, or the ability to burst or scale on-premise capacity to the cloud. Solutions exist from Microsoft (StorSimple) and Amazon (Storage Gateway).

Another alternative is to move applications to the public cloud and use block-based cloud storage there. This probably needs to be part of a larger strategy to make use of public cloud in general.

Unstructured data

Two options exist to manage unstructured data. The first is to use file-based storage in the public cloud, and the second is to use object storage. In both instances, the protocols involved (NFS/SMB for files, HTTP for object) will work over a wide-area network, although file performance can be latency sensitive.

File storage offers similar functionality to on-premise NAS appliances. Using a cloud-based solution removes all the infrastructure management issues typically seen when deploying hardware in the datacentre. New file systems can be created and scaled dynamically, subject to the limits of the cloud provider's offering.

The maturity of cloud-based file services has increased over the past 12 months as suppliers such as NetApp have started to offer existing and mature storage offerings as native cloud services.

A cloud-based file storage solution can offer cost savings, as well as operational benefits. Platforms such as Nasuni Primary offer global file access, wherever the customer is located. This makes it easier to implement disaster recovery, without having expensive array-based replication or backups.

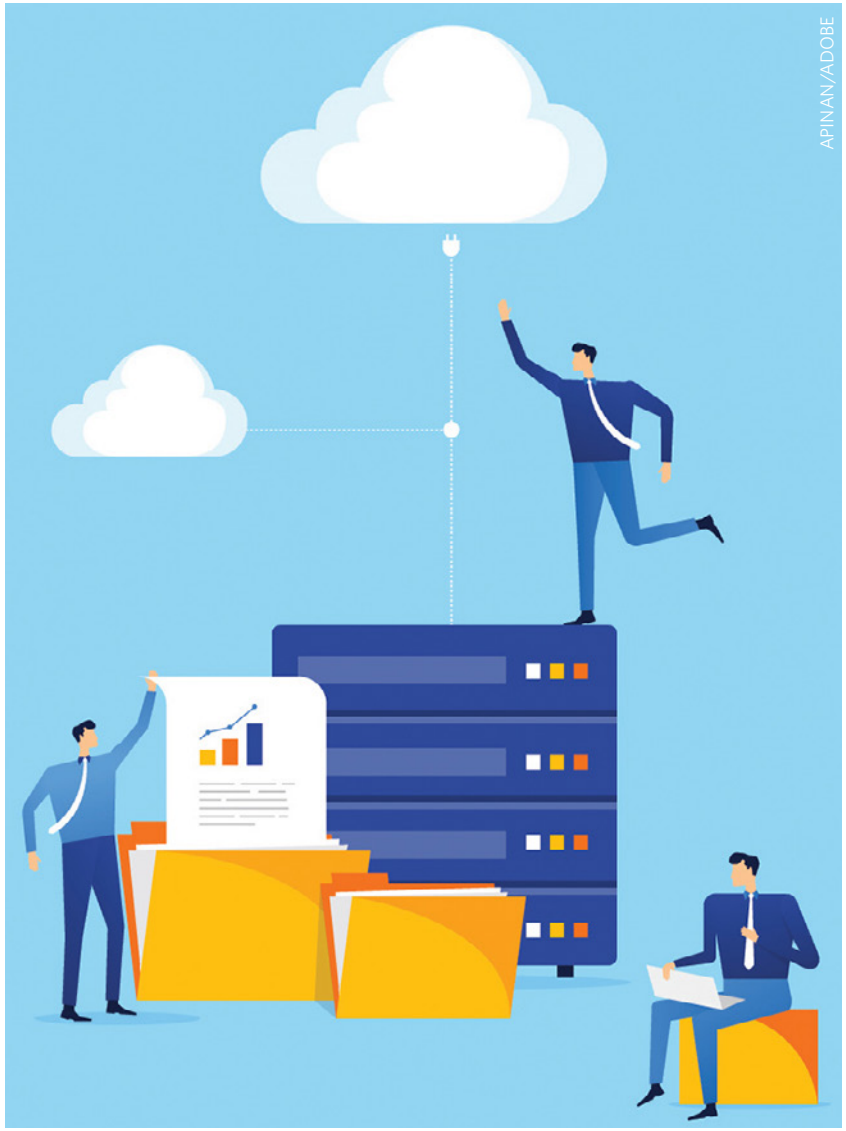
Global access also reduces duplication of data, where data is copied to multiple locations for performance or operational reasons. With data single-instanced, there is also a much lower risk of accidentally using out-of-date content.

File storage security and data protection

Use of cloud-based file storage also brings new challenges. The most obvious is security.

Although data can pass across the public internet and be encrypted, this isn't an ideal solution. SMEs will probably want to invest in local point-to-point virtual private network connectivity with the cloud provider, but this adds some cost and complexity.

Data should also be encrypted at rest within the public cloud using customer-generated keys for extra safety.



APINAN/ADOBE

On-premise file services still need the same level of operational management as on-premise systems. Security is one obvious area, including in-flight and at-rest encryption.

Credentials management is another area of focus, and some suppliers offer integration with Microsoft Active Directory and Lightweight Directory Access Protocol (LDAP).

Finally, remember that data in public cloud isn't backed up by default. Public cloud service providers will commit to service level agreements on uptime, but any backup will be in place only to bring the service back online.

The cloud provider will not recover accidentally or maliciously deleted data, so you should also look at cloud-to-cloud backup.

Object storage

As an unstructured storage protocol, object storage represents a great way to store large volumes of data at a cost-effective price.

Public cloud service providers will commit to service level agreements on uptime, but any backup will be in place only to bring the service back online

Objects are simply files that can range from a few kilobytes in size to multi-gigabytes and are usually stored in large logical containers like buckets (in AWS).

Object storage uses HTTP as its underlying protocol, with requests issued through Rest-based application programming interfaces. As a result, each object store request is effectively an independent event, so features such as file locking are not offered. It is good for streaming-type access or large-scale processing of large numbers of files (in analytics, for example). SMEs could use object stores for content that rarely changes – document repositories, video and audio media training libraries – or where the object is replaced each time it is refreshed or changed.

Cost efficiency

Cloud service providers offer features to optimise the placement of data based on pre-defined policies.

The customer can, for example, put in place a process to move less frequently accessed content to cold storage such as AWS Glacier.

The cost savings can be significant, although there are restrictions on accessing cold data. Backups and archives are great for placing on object stores with policy-based tiering in place.

One word of warning, though, when looking at object stores: data volumes can increase significantly, for two main reasons. First, if previous versions of files need to be kept, each object will be charged at full prices, although they can be tiered by policy to cheaper storage. Second, cloud providers pass on none of the benefits of internal storage features such as data deduplication. In the worst case, two versions of a 10GB file that differ by only a single byte would incur a 20GB charge.

A great use of public cloud storage is for data protection. Object stores, as we've discussed, offer low-cost, long-term storage

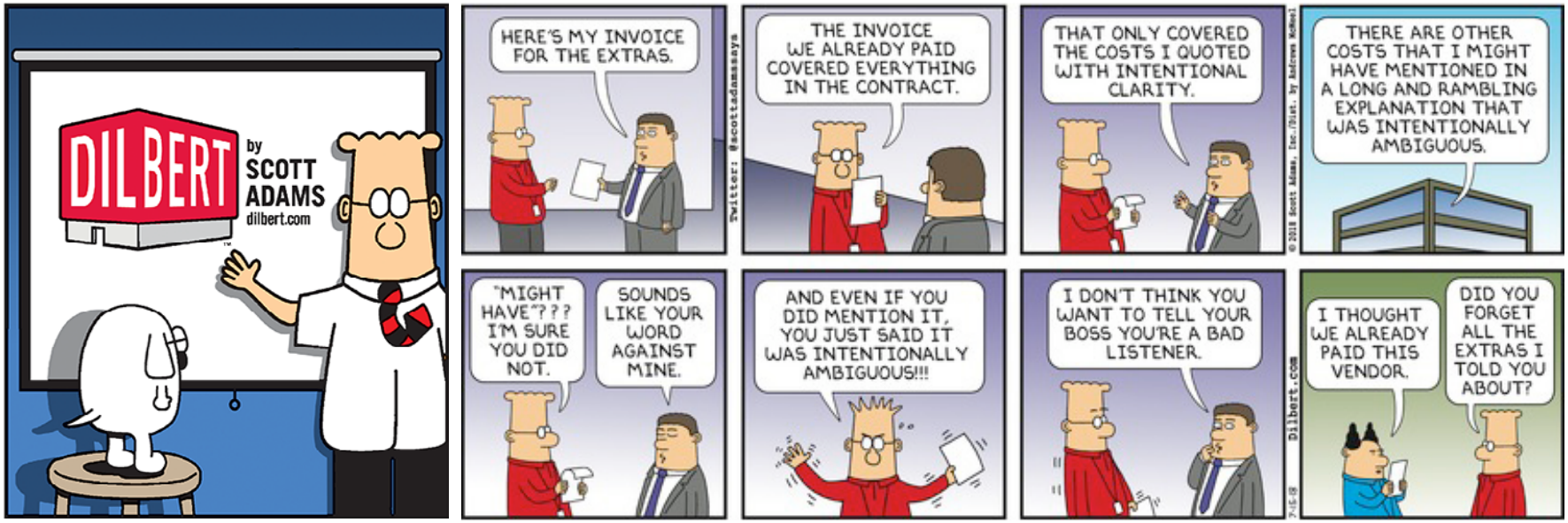
with capacity that is effectively unlimited. That can work well as a backup target. Object protocols are also well-suited to the streaming nature of backup data.

With data in a central location, recovery can be performed from multiple offices, with cloud providers offering the ability to replicate data between their datacentres and geographic locations.

Use of object storage for backups will not, however, be able to take advantage of native data deduplication. This needs to be included in backup software to implement this feature, otherwise the cost of taking many similar backups could become very expensive.

Operational model

Finally, we shouldn't forget that many storage suppliers offer cloud-based versions of their existing hardware and software solutions. Rather than refresh to new hardware, this offers an opportunity to move to an operational model and reduce the on-premise hardware footprint. ■



No way, Osé

This year's CES organisers have succeeded in preserving every male tech nerd stereotype by crumbling over a small reminder that real vaginas exist.

The Osé personal massager's upcoming innovation award at the event has been reversed after it was deemed indecent, which would look a lot less like blatant sexism if CES hadn't showcased a robotic sex doll only the year before.

Company founder Lora Haddock, who sidestepped a marketing mistake when she didn't name the product after herself, said: "You cannot pretend to be unbiased if you allow a sex robot for men but not a vagina-focused robotic massager for blended orgasm." Downtime isn't sure what a blended orgasm is, but it doesn't sound like something you'd ever try to stand in the way of.

It's clear the Osé, ordinarily a resounding stranger to anything of the sort, has found itself subject to a major anticlimax here, and its creators might now have to see a drone snatch the award from under its big, blue, Gonzo nose. "What's a drone snatch?" you quip. You're part of the problem.

If a drone wins this honour, in spite of the havoc they've wreaked on our airways – at the expense of a dildo that's done nothing wrong, no less – we're taking this scandal to HBO ourselves. ■

› Read more on the Downtime blog.