CLOUD FOR BUSINESS

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NEW WAVE

Cloud's next phase comes rolling in

Cloud computing has disrupted businesses like no other technology, but with cloud-enabled innovations, such as artificial intelligence and blockchain, the true extent of its impact has yet to be felt

BEN ROSSI

In the first phases of cloud adoption, played out over the last five to ten years, IT departments enjoyed cheaper computing and storage capabilities and better agility. These phases are still significant in their own right, but critically they have laid the foundations for cloud's next phase as a fundamental enabler of higher value services, such as artificial intelligence (AI), blockchain and the internet of things.

Organisations are under pressure to transform and innovate at the same pace of industry disruption. To achieve this, businesses need the flexibility and freedom to exploit services from multiple clouds, and to be equipped to deliver competitive, innovative and elastic apps which they can easily integrate across the business.

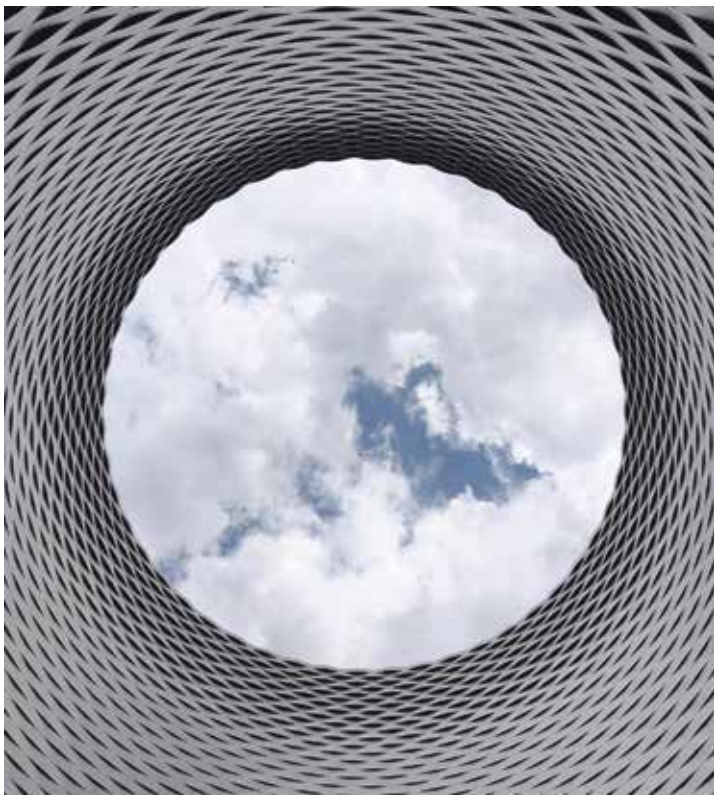
High street bank RBS, for example, developed an artificially intelligent chatbot to reduce the load on live agents and soon found that computing-intensive workloads such as AI are best suited to the public cloud. Its use of cloud and cognitive technologies provided the speed and agility required to develop the chatbot in just over two months.

"Typically, we are seeing 30 to 40 per cent of a business's workloads on the public cloud, but this is on the rise with the growth of cloud-native applications, which are most tightly associated with digital transformation," says Andrew Wilcock, UK vice president of cloud at IBM. "Clients are shifting to these applications and harnessing the capabilities available on the public cloud, surrounded by agile methodologies that fuel the customer experience.

"By designing a cloud for data and AI capabilities, organisations can better gain insight into existing and third-party info, and therefore gain competitive advantage. It's for that reason organisations are on multiple phases of their cloud journey through a mix of public, private and hybrid-cloud environments."

Cloud computing has evolved to become a natural part of how any business thinks. Previously it was sufficient to think of cloud technology as just an element of IT, but now it's a priority and supports nearly every aspect of a business.

A report by analyst firm Gartner says cloud computing is approaching the highest level on its disruption scale and will act as a necessary enabler for future disruptions. It projects the worldwide public-cloud service market grew to $246.8 billion last year.



As a result, awareness of the value that cloud technology provides to a business stretches from entry-level millennials, who see it as an enabler of flexible working, to boardroom director who have witnessed its pivotal role within the world's most disruptive companies.

"It's now widely accepted in boardrooms that cloud technology can deliver real transformation for businesses and hugely accelerate their journeys towards desired business outcomes," says Christian Pedersen, chief product officer for cloud enterprise resource planning at SAP. "It allows businesses to gain far greater insight into their customers' preferences and habits, ensuring employees can understand what their customers ideally need, when they'll need it and the best way to deliver it."

John Abel, a vice president for cloud and technology at software giant Oracle, adds: "Five years ago, only the most progressive companies would have entertained conversations about cloud computing and IT matters in the boardroom. Today, cloud is a regular topic on the agendas of board meetings at companies of all shapes and sizes, and is now seen as a revenue generator and enabler of innovation, rather than a cost to the business."

Beyond the boardroom, the cloud conversation in businesses has shifted beyond rudimentary discussions about what it is and how to get there. It's clear that a level of maturity has been achieved, but as the demands and expectations of consumers continue to evolve, companies must innovate at speed to maintain market share.

"It's important for business leaders to understand that the journey to a successful cloud plan and implementation doesn't happen overnight," says Mark Smith, a senior director for Microsoft. "The potential outcome is one that could enable the organisation to do things that would never have been previously possible."

The promise of digital transformation has transformed the cloud from a service into an opportunity for many businesses. Spending on cloud is set to skyrocket in the next couple of years, with businesses committing more cash to cloud solutions than ever.

"That everyone else is doing something isn't usually a good enough reason to join in, but cloud computing is the new normal and it's becoming a case of evolve or die," says Mark Hill, chief information officer (CIO) at Nigel Frank International, a global recruitment firm based in Newcastle upon Tyne.

"Business leaders were for some time held to ransom by IT departments. Those days are long gone and every credible CIO knows if they are to be successful, they must be reactive to rapidly changing business needs. The only way to do this is with the cloud."

While cloud computing is indeed a mature technology, it's still an evolving one as new trends emerge and usage patterns change, such as the growth in platform-as-a-service or PaaS cloud adoption, which indicates massive development in the cloud life cycle.

A few years ago, businesses adopting a cloud-first strategy often found the hype didn't reflect reality and experienced a lack of true functionality, integration challenges and undetermined security. While many of these issues are being addressed, Mr Hill says new challenges have emerged in terms of cloud cost management, cloud sprawl within the business, changing data privacy laws and a large shortage of quality cloud skills.

Regardless, the cloud is here to stay. It's growing by the second across businesses of all sizes and has become an absolute necessity, not only for companies to remain competitive, but as a precursor to the next wave of disruptive innovations.

TOP BENEFITS OF CLOUD
According to technical professionals

62% reported faster access to infrastructure

61% reported greater scalability

56% reported higher availability

RightScale 2017

COMPETITION

Front runners set pace in race to cloud

The lucrative cloud services market has seen a race for dominance and, although there are clear leaders, much is still at stake

Christophe Morin/Bloomberg via Getty Images

Amazon Web Services, Azure and Google are expected to generate three quarters of cloud revenue this year, according to Forrester

HELEN BECKETT

The cloud is having its "national grid moment" as ubiquitous access to scalable and configurable computing resource, offered as a service, is transforming the way businesses compete and operate. Just as electricity grids ushered in industrial productivity on a scale previously unimaginable, cloud is morphing from efficient IT hosting platform to business innovation platform.

A vendor race for world domination of cloud is pushing prices down and accelerating this transformation of business model and mindset. Incumbents and startups alike are scrambling for share of the cloud infrastructure-as-a-service (IaaS) market as well as software, processes and emergent technologies delivered as a service. Analysts estimate the total cloud market will nudge $178 billion (Forrester) or $259.8 billion (Gartner) in 2018.

At the start of the year, it's clear the IaaS race has already been won: Amazon Web Services (AWS) and Microsoft's Azure are comprehensive leaders, according to just about everyone. Forrester predicts the duo, with Google, will capture 76 per cent of all cloud revenue in 2018 and expand its share to 80 per cent by 2020. Gartner's most recent *Magic Quadrant* confirmed the two leaders, chased by Google in third place and Alibaba, featured as an insurgent for the first time.

US research firm Raymond James confirms the lead is unassailable: "Strong September quarter growth from hyper-scale cloud vendors Microsoft and AWS suggests the cloud spoils are going to those with scale." It reported Azure and AWS grew 90 per cent and 42 per cent to an estimated $5.4 billion and $18.3 billion in run-rate revenue respectively, outpacing Gartner's forecast for 35 per cent for IaaS and 25 per cent for PaaS or platform-as-a-service industry growth in 2017.

This depiction of the big three, the insurgents – Oracle, IBM, Alibaba Cloud – and the "also rans" is an oversimplification of how cloud services will be chosen and consumed, however. In individual markets there will continue to be plenty of choice, says Dave Bartoletti, vice president and principal analyst at Forrester. "European providers will co-opt and extend the cloud offerings; they are not competing at platform level, but for partnership," he says.

Nonetheless, newcomers and insurgents cannot compete with the hyper-scalers' ability to invest billions of dollars of capital in building capacity, and take a view on balancing price with volume. "With price per unit going down because of the capacity coming on-stream, it's difficult to enter the market unless you have a specialism," notes Matt Caffrey, a partner with private equity cloud specialist Livingbridge.

Ten years ago, Amazon's Elastic Compute Cloud was a compute rental proposition for small businesses, Google apps were a novelty and Azure wasn't even a twinkle in Microsoft's eye. Now, says Mr Caffrey, the cloud landscape has evolved and been populated so fast that Livingbridge sees investment opportunity only in plugging complementary, specialist services into the hyper-scalers, such as security or load balancing.

While infrastructure and software cloud players hustle for world domination or lucrative crumbs, the drivers of cloud adoption – agility, speed to market and access to innovation – only get more compelling. "If you think about cloud as a financial optimisation, you've missed the point. It stops wasting time and helps you focus on advancing your business," says Greg DeMichillie, director of product management in the office of the chief technology officer at Google Cloud.

Sectors that were cautious about the cloud are now embracing it, especially as regulators such as the UK's Financial Conduct Authority give the green light, issuing cloud guidelines last July. While enterprises house their new workloads in the cloud, legacy and data will be a harder migration – Deloitte estimates 50 per cent will remain in on–premise datacentres – none of which makes cloud shopping an impulse buy.

Oracle and IBM, incumbent insurgents, are going after their own niche and aim to be the natural choice for customers seeking a staged migration to cloud. "These insurgents are betting on the fact that large enterprises can't throw everything out and start over. It's too hard to change everything about an application, database and middleware. First, get the stuff to the cloud, then examine alternatives in the cloud," says Forrester's Mr Bartoletti.

Of the big three, businesses using open source would logically pick AWS, while Microsoft appeals to customers with an installed stack. Google's pedigree in analytics and search engine optimisation has real pulling power, says Mr Bartoletti. "Driving insight from data will drive the next wave of cloud adoption," he predicts, but adds corralling dispersed corporate data on to the cloud represents a major challenge.

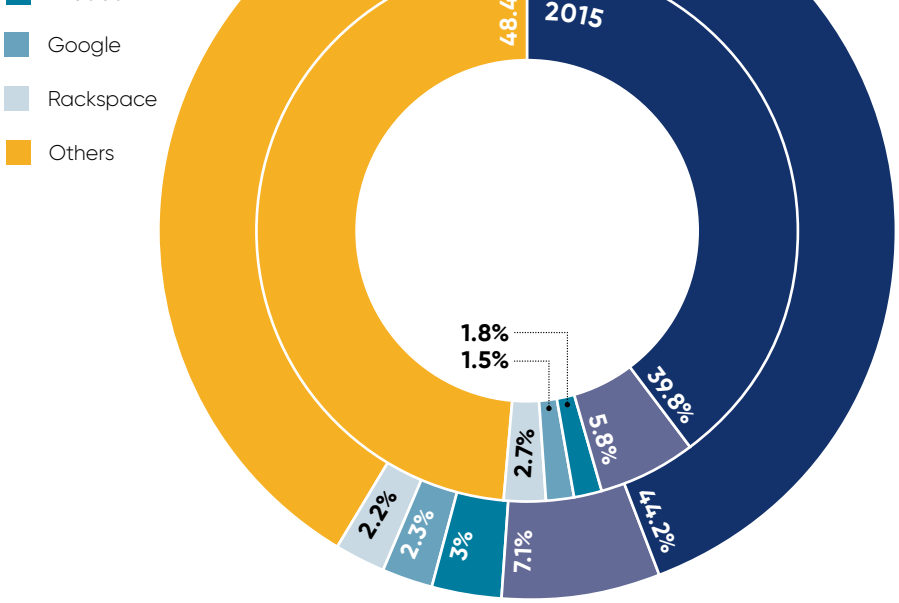
Former easyJet chief information officer and director of Futurice Trevor Didcock agrees and hankers after a business service wrap for cloud services. "As we move into the world of the internet of things and big data, harvesting, cleansing and analysing data will become more critical and mainstream. Services that deliver pre-packaged data for complex analysis and to power automation and artificial intelligence, will enable organisations to understand and use insights," he says.

Cloud-enabled insight will also boost consumption, says John Winstanley, a partner in technology consulting at Deloitte. "Most forecasts are based on traditional IT models and consumption. People have not factored in how voice, machine-learning and artificial-intelligence technologies will change the way we interact with corporate services," he says, anticipating that the internet of things will be crucial for driving volume in IaaS.

> With price per unit going down because of the capacity coming on-stream, it's difficult to enter the market unless you have a specialism

AMAZON DOMINATES THE CLOUD INFRASTRUCTURE MARKET

Market share of cloud infrastructure-as-a-service providers



Gartner 2017

CASE STUDY

CHINA'S ALIBABA CLOUD

Martin Bureaud/Getty Images

Alibaba Group chairman Jack Ma

Alibaba Cloud has vowed to surpass AWS and the backdrop of the Chinese government's $900-billion Belt and Road initiative – a modern version of the Silk Road – supports such ambition.

It's not an unreasonable aspiration given that both AWS and Alibaba have pedigrees in e-commerce and cash to splash. But future expansion outside its home market will be influenced by political relations with the rest of the world.

Alibaba Cloud has enjoyed the fastest growing cloud revenues as sales soared 126.5 per cent to $675 million from $298 million in 2015, according to market research firm Gartner. At present it is only a dominant force in China, but it is increasing its effort in Europe and North America.

Chiefly, Alibaba is helping Chinese companies expand their presence in the North American market, and is not competing directly with AWS and Microsoft Azure. Interestingly, notes Tiny Haynes of Gartner, Alibaba may be attractive to US companies that wish to locate their data in non-US domiciled hosting companies, outside America's legal jurisdiction.

But there's another perspective to Alibaba expansion, which Dave Bartoletti at Forrester flags. "Can AWS and Azure really compete in China? So far we've seen AWS be nimble; last year everyone freaked out because AWS was selling datacentres services, but it was doing so because of local restriction. In the future we'll see tighter partnerships between these two and Chinese hosting companies," he says.

Another strength of Alibaba, says Mr Bartoletti, is its focus on higher value services, such as containers and advanced development tools, which run applications more efficiently. "This capability puts blockers on AWS and Azure expansion in China," he says. Alibaba can add value because most interesting developments in cloud are based on open source and this levels the playing field for Alibaba.

> Driving insight from data will drive the next wave of cloud adoption

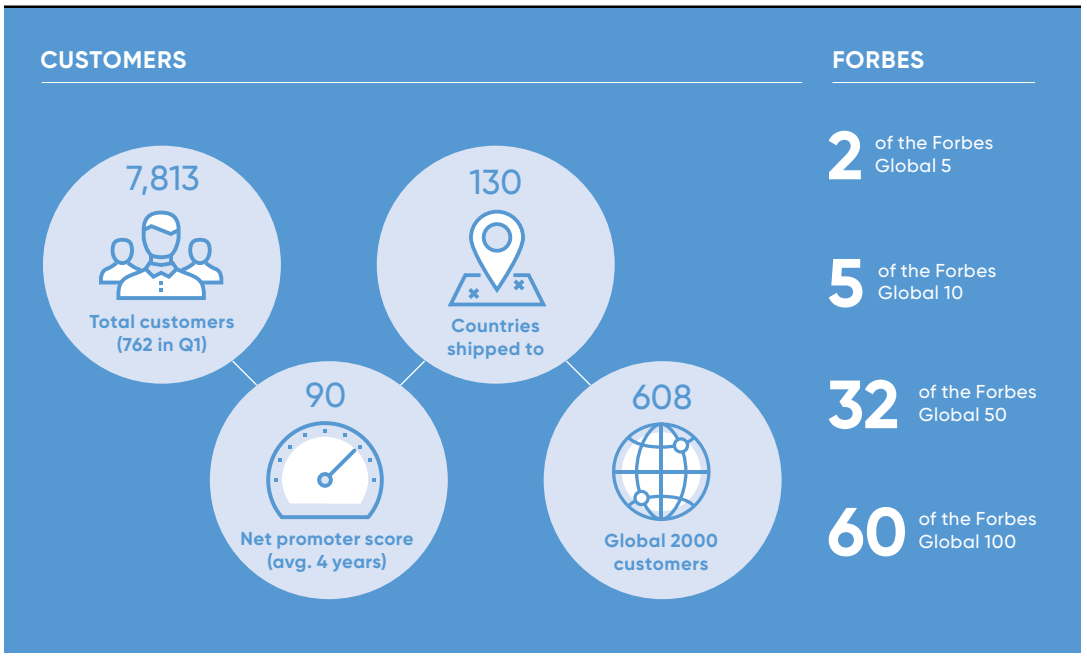
Gartner's research director Tiny Haynes concurs: "One aspect of cloud that is seriously underestimated is the change of mindset which accompanies adoption. With cloud, IT becomes a utility rather than an investment and fuels innovation – a taste for innovation can seriously boost consumption."

Migration to the cloud may be inevitable, but the prospect of a painful journey still delays many, including Gavin Scruby, chief information officer of Smart Debit. The financial management company currently runs its own datacentre and its customers remain wary of the cloud. Mr Scruby would only consider AWS and Microsoft in terms of accreditation, and Smart Debit would also need to acclimatise to the new budgetary model of pay as you go.

His concern about too-easy usage is shared by big enterprises, as Google acknowledges. "That's one thing traditional companies like about the cloud – they pay for what they use – but they find the unpredictability scary too. A lot of it is about giving visibility and control to customers. We help them ramp up quickly, but help them keep discipline," says Mr DeMichillie at Google Cloud.

His observation on consumption patterns sums up the dilemma of cloud for enterprises and why the market is hard to call. "Typically, there's an initial ramp-up at proof of concept, an inflection point when the customer has an 'aha' moment, gets the value, and then usage really increases," he concludes.

COMMERCIAL FEATURE



Software is king as cloud transforms IT infrastructure

Hyper-converged infrastructure pioneer **Nutanix** has expertly ridden the rapid waves of cloud computing and is now ready to disrupt again with its software approach

As cloud computing continues to disrupt enterprise IT, Nutanix has evolved from a Silicon Valley startup that pioneered hyper-converged infrastructure in the late-noughties to a software leader satisfying businesses' demands for a hybrid cloud model.

The company, which made its name by taking the web-scale engineering that Google used to build the first public clouds and applying them to enterprise, is demonstrating the rapid pace of innovation by reinventing itself just nine years after it first disrupted the market.

Nutanix led the charge towards a more simplified datacentre as traditional hardware vendors struggled to transition to cloud. It took the functionality of a storage processor, rewrote it in software and ran it as a scale-out platform on commodity hardware.

Now it is ready to disrupt again as an Enterprise Cloud OS software company. Enterprises have increasingly desired a model of IT that delivers the flexibility, agility and scalability of public cloud while also ensuring complete control over business-critical data.

In this landscape there will also be a place for customers running services internally on their private cloud to be able to run a service out on the public cloud where appropriate, according to Rob Tribe, systems engineering director for Europe, the Middle East and Africa at Nutanix.

"Given our heritage was built on technology that runs some of the largest public clouds in the world, we had the opportunity to build a private cloud platform with the same attributes that customers look for from public cloud, but allows them to run business-critical applications such as Oracle, SAP and Microsoft on-premise or in the cloud depending on where it is best placed," says Mr Tribe.

This is where Nutanix now fits in, taking the technologies it has previously delivered and blending them seamlessly with a single homogenous cloud that runs some applications on the public cloud and some on the private cloud.

Delivered as a single software fabric with unified management, the Nutanix Enterprise Cloud OS supports hardware from multiple vendors and can run across all enterprise environments. With the upcoming release of Xi Cloud Services, IT leaders can leverage Nutanix software in a native cloud solution with a simple one-click experience while taking advantage of the subscription model that has made cloud computing so popular.

Applications in a multi-cloud architecture need to be defined, instantiated and scaled independent of the cloud environment, so Nutanix is also releasing Calm, a cloud service that abstracts applications environments from the underlying infrastructure, harmonises cloud operations and recommends the right cloud for the right workload. Calm includes an integrated marketplace that allows application designs to be shared across an organisation, speeding the time to production for new business initiatives.

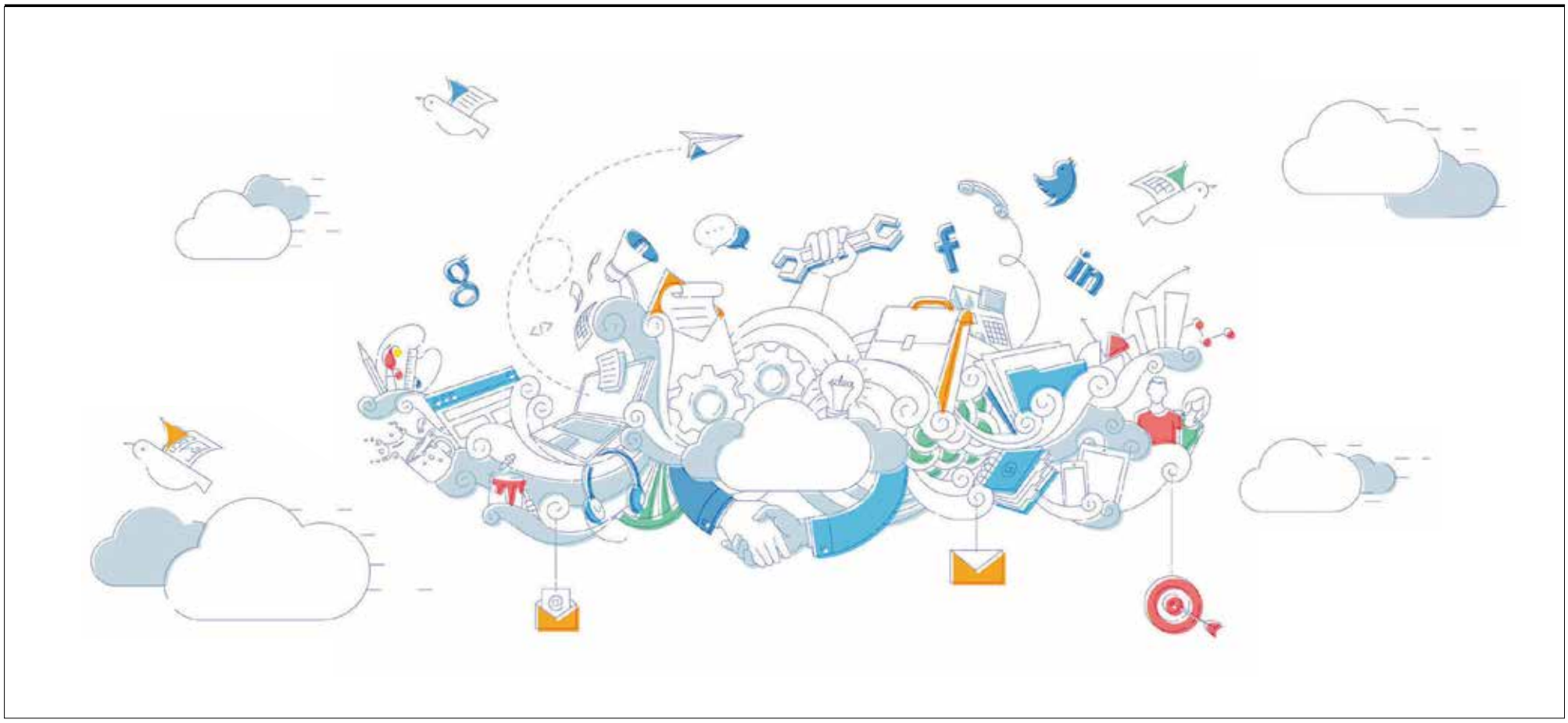
"You need to be able to blueprint something such that the platform understands what service levels are required for it in terms of things like latency and how many users are connected, but also whether it needs to be backed up or replicated or what the latency needs to look like to those end-users," say Mr Tribe.

"The platform should make the decision about where is best to run that application set. You need the software to take all those factors into account and make that decision for you, almost on a daily basis. The platform will move application sets and make the adjustments to the blueprint that are required while the business just continues to see the service delivered. That's why the automation piece is critical to what we're doing."

Nutanix's leading position in the market for enterprise software is testament to its innovative approach to the evolution of cloud computing and its own eagerness to evolve. At a time when software is now king in the enterprise IT world, Nutanix's savvy pivot to a software mode that allows customers to choose their own hardware has put it in a position to further disrupt the datacentre.

For more information please visit Nutanix.com

COMMERCIAL FEATURE



Driving effective business transformation in the cloud

Organisations are using the cloud to dig deeper into their gold mine of information, and to meet important digital transformation and business goals

Many businesses are focused on digital transformation and improving processes to step up how they predict and serve customer needs. They are counting on the cloud to help them achieve this, already confident of its flexible and affordable benefits in their organisation.

But that achievement is still threatened by lingering, information-based challenges. In 2018, organisations want to dig more deeply into their information to improve their decision-making, but they still struggle with data silos, so they have a wealth of information trapped within departments.

To some degree, the data silos are the result of different departments not appreciating the broader picture of what can be achieved with their information. But the silos are also the result of firms having numerous cloud and on-premise systems in place which do not "talk" to each other.

In spite of the work by different vendors to better integrate cloud-based systems and eliminate these silos, the continued lack of true interoperability remains a hindrance, according to Sridhar Iyengar, vice president of product management at Zoho, the cloud business platform. "Even with open interfaces and improving integration of different vendors' cloud solutions, enterprises still need someone there who understands it all and can pull it together," he says.

> "Even with open interfaces and improving integration of different vendors' cloud solutions, enterprises still need someone there who understands it all and can pull it together

Businesses must tackle this issue if they are to unlock powerful insights for informed and smart decision-making. Zoho's recently launched software Zoho One helps here. The software pulls together its entire range of more than 40 applications, across marketing and sales, IT and the support desk, human resources and finance, in one package, offering centralised administration and access for those who want the full suite. In addition, Zoho has a range of integration partners to carry out any business-specific customisations.

"The key goal with the cloud is business transformation; how to get the most from systems, information, processes and people, to meet customers' needs and drive effective, automated operations," explains Mr Iyengar. "The only way to do this is to ensure the systems work well together."

Firms already relying on the company's technology include UK-based software business Booking Live, which uses an increasingly broad variety of Zoho platforms, including its HR, customer and financial management software. It counts on the cloud to draw together customers' details in one place, and to support smart sales and marketing decisions automatically.

"Without a reliable customer relationship management or CRM system, I couldn't really foresee how we would be able to grow the business," says Matt King, Booking Live's sales director. "We get leads from a variety of different sources and Zoho is extremely useful in being able to filter where those leads have come in."

Zoho and its partners help Booking Live and thousands of other businesses on their journey through the cloud, right from mobilising data for sales reps, through marketing and support to HR and finance. Firms are only moving such sensitive data into the cloud because they now have a strong trust that cloud suppliers' security and regulatory compliance are high.

"Businesses can see the enormous amount of research and development from companies like ours around security and being at the cutting edge of technology. They know it's our bread and butter," says Mr Iyengar. "That means they feel confident in the security on offer, just as they do with the breadth and depth of solutions we can provide."

Some organisations may find their confidence put to the test in 2018, however, as regulatory pressures increase sharply. Major new regulation, called GDPR (General Data Protection Regulation), will be monitored by government authorities from May. The stringent data privacy rules control storage of customer data, clarify consent processes, and allow consumers to manage how their data is used and when it is deleted. It affects all businesses selling to customers in the European Union, even if they are based elsewhere.

The cost of non-compliance is severe. Firms that breach the rules risk a fine of up to 4 per cent of their annual turnover. And the necessary steps ahead will be onerous as businesses will need to create data privacy teams, thoroughly review processes and data usage, and be prepared to respond to a raft of consumer demands around information. They will also need to check their contracts with any third parties handling their data, including cloud computing suppliers.

Zoho has focused particularly closely on enabling businesses to meet the GDPR regulation. It is transforming its apps in line with the new rules and has redefined the data access needs for its many applications. It is equally enhancing visibility and data controls for its clients, and implementing policies for end-to-end security. In addition, it is enabling individual level data exports so consumers can receive their own information when they ask.

"We're well aware of our role in providing the right tools and processes to support our customers in meeting their GDPR mandates," says Mr Iyengar. "Our apps will help customers with key requirements, such as providing access controls, encrypting, anonymising or deleting user data, performing data audits or assessments using data processing logs, creating provisions for data subjects' rights, and enhancing security for user data."

In addition, while many other cloud computing firms collect and analyse user data to make money from advertising, particularly in the free versions of their products, Zoho does not do this. "We do not use or monetise our customer data in any way and the only use we make is to check our own system operations to improve our service," says Mr Iyengar. "We do not serve ads and we never will."

For organisations of all kinds, the prize for making the most of the cloud is an environment powered by strong digital transformation, effective processes and smart decision-making. These strengths simultaneously benefit the organisations, their customers and end-users alike.

To find out how Zoho's integrated suite can help your organisation transform in the cloud please visit zoho.eu/one/

CLOUD DATA

Tasting the flavours on a data menu

There are many different kinds, or flavours, of cloud data and they need to be dished up differently – here's a guide

ADRIAN BRIDGWATER

If this is the age of information, which it is, then surely we can reasonably suggest that all businesses need to get more closely acquainted with the data streams traversing their operational models. Getting better acquainted with information in real terms means understanding data at a more granular level. But don't panic, this does not require a degree in computer science or a PhD in systems analytics.

Business managers, salespeople and every company stakeholder through to administration staff can and should now develop a rudimentary working understanding of what size, shape and flavour their firm's data exists in. We all need to travel this learning curve because cloud computing services enjoy increasingly widespread acceptance across all transepts of business.

As cloud data is processed, analysed and ultimately stored back in the cloud datacentre, it has become a more fundamental and integral part of business. Technology analysts suggest that firms in all verticals will soon start to qualify and quantify the data they hold as an item on the balance sheet. Knowing what type of data you own has suddenly become very important.

As we start to understand the difference between distinct chunks of data, we can begin to understand how to treat each piece or chunk of cloud differently. This has huge implications for how we approach the security, privacy and identity management of every piece of cloud data we create.

As a starter menu guide, structured data belongs to an application and has a specific value, size and meaning. Unstructured or semi-structured data also often belongs to an application, but it could take the form of sound, video or some other more difficult to quantify and quality block of information.

Deeper down we find time series data, which in simple terms is just information with a note of when it was created. Spatial or geospatial data usually refers to descriptions of physical objects. Orphan data, you guessed it, doesn't have a home application or wider data set family that it belongs to. Then there's meta data, which is higher level data dedicated to providing information about other pieces of information.

Deeper still, we find log file and machine data. This is data from the information channels that computers generate so they can record every single click and function in their universe, and they also often use it to talk to other machines. The widely discussed big data has a recipe book all of its own, but put simply it describes any scenario when the water spout is flowing faster than any normal person could drink from. So you see, there is a veritable smörgåsbord to be had out there.

"It's worth remembering that there are many different kinds, or indeed flavours, of cloud data and they need to be treated differently. Data that's used for monitoring might be appropriate for a time-series database. But even big data isn't a singular thing. Data may be big in volume, which brings its own sets of challenges to store it and, especially, to move it. But data may also be big in terms of how quickly it needs to be processed and so it requires the data to be close to the applications using it," says Gordon Haff, cloud evangelist for open source platform company Red Hat.

> The challenge we are faced with is one of serving the right data dish to the right table at the right time

Will Ochandarena, director of product management at cloud database company MapR, favours the concept of cloud data flavours, but he says that wider business knowledge of the recipe being concocted here has implications. He says organisations that try to take a one-size-fits-all approach to data management will spoil the broth. This is because different flavours of data need to be managed by different service level agreements or they require different seasoning and cooking times, if you care to extend the flavoursome foodie analogy.

"The challenge we are faced with is one of serving the right data dish to the right table at the right time," says Sumit Sarkar, chief data evangelist at business applications company Progress. But his enthusiasm also comes with a warning because we are compartmentalising certain elements of cloud computing into what are called microservices and containers.

Containers condense discrete and defined components of application logic into a smaller space. Equally, microservices encapsulate an individual application action, such as making an online payment, into a pre-engineered smaller space. Both of these highly popularised cloud practices almost represent preprepared ready meals where the ingredients and recipe are not necessarily revealed. Mr Sarkar explains that this means that it will be tougher to get close to the organic source of data itself.

"These factors make it challenging for business analysts, data engineers and data scientists to get access to the right level of data for more of a self-service strategy. It's very difficult to predict the best use of data until you get it into the hands of your analytical teams. Or indeed make it upwardly available to the new breed of business users with an interest in data," he says.

Cloud data is a dish best served hot or cold or warm and it can come on a silver platter or an automated sushi-style conveyor belt, just so long as it's fit for consumption. But cloud data starts to lose its flavour when it comes as a ready meal or as secret sauce. The table is set for more cloud data, but we want it organic and we want to know its provenance. Dinner is now served "as a service".

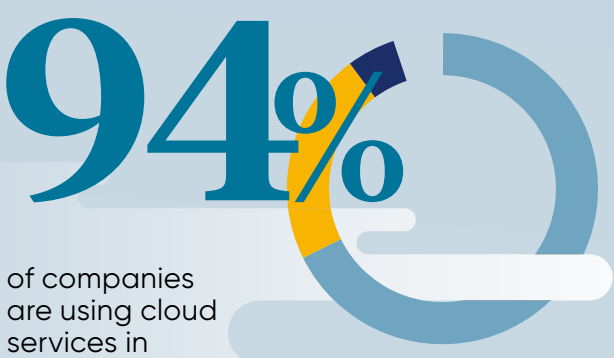
FLAVOURS OF DATA

STRUCTURED	Data belongs to an application and has a specific value, size and meaning
UNSTRUCTURED	Data also often belongs to an application, but is difficult to quantify, such as sound or video
TIME SERIES	Information with a note of when it was created
SPATIAL/GEOSPATIAL	Usually refers to descriptions of physical objects
ORPHAN	Doesn't have a home application or wider data-set family that it belongs to
META	Higher-level data dedicated to providing information about other pieces of information
LOG FILE/MACHINE	Data on events that occur in software and operating systems

PUBLIC, PRIVATE OR HYBRID?

More IT departments are moving to the cloud for their data solutions, yet knowing which solution is right for your business is key to realising the opportunities on offer

ADOPTION OF CLOUD SERVICES



of companies are using cloud services in some capacity

RightScale 2017

5%

Private cloud only

ADVANTAGES

» Greater control/customisable
» More flexibility and reliability
» Improved security
» High scalability

DISADVANTAGES

» Higher initial investment
» Requires IT expertise

BEST USED FOR

» Confidential, business-critical operations

22%

Public cloud only

ADVANTAGES

» Low cost/no upfront investment
» Pay-per-use model
» No maintenance
» Near-unlimited scalability

DISADVANTAGES

» Supposed security concerns
» Surprise costs
» Reliability

BEST USED FOR

» Non-sensitive, public-facing operations and unpredictable traffic

67%

Hybrid

ADVANTAGES

» Control
» Flexibility
» Cost-effectiveness
» Ease of use

DISADVANTAGES

» IT infrastructure management becomes more complex
» Can be costlier than public only

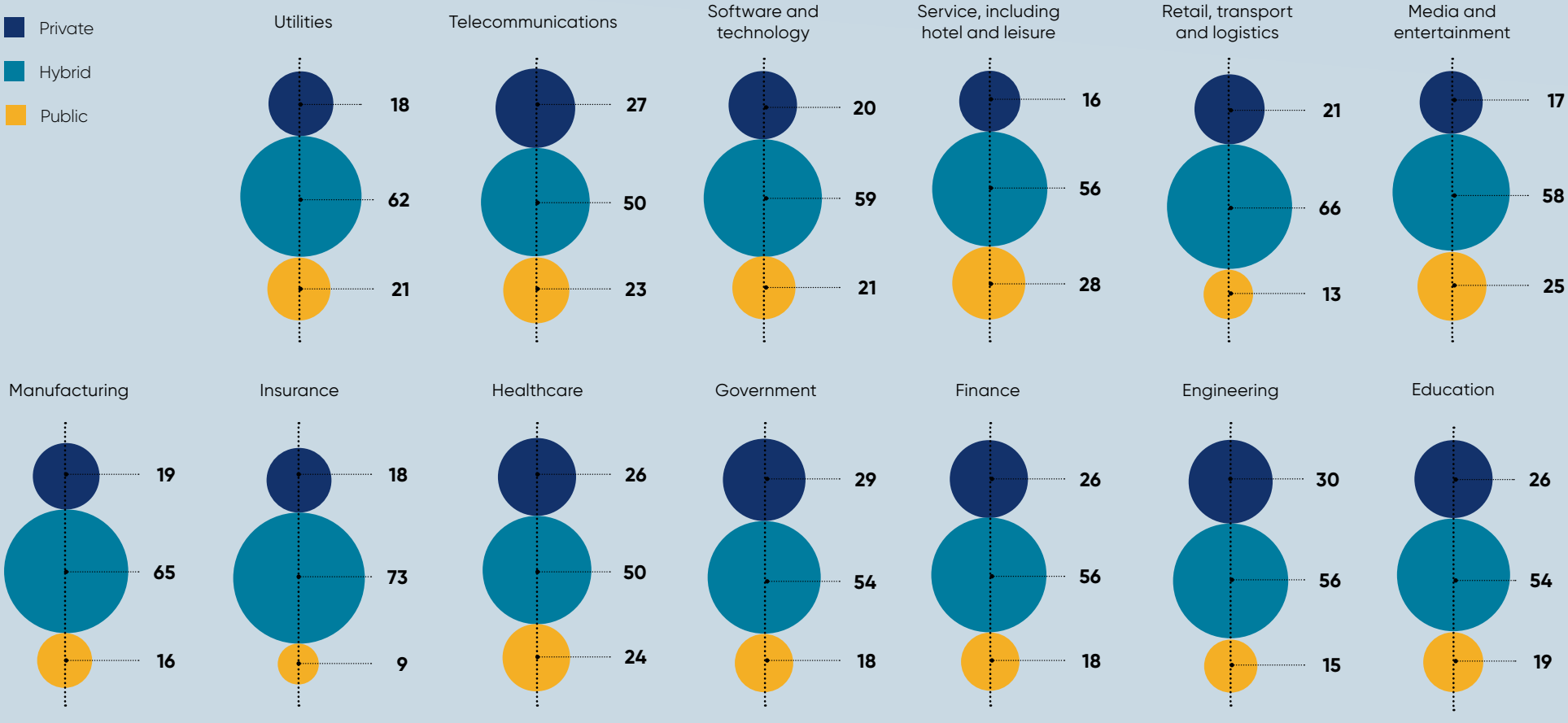
BEST USED FOR

» Mixture of each

PUBLIC/PRIVATE/HYBRID DEPLOYMENT BY INDUSTRY

TYPES OF CLOUD ARCHITECTURE USED BY THE FOLLOWING INDUSTRIES

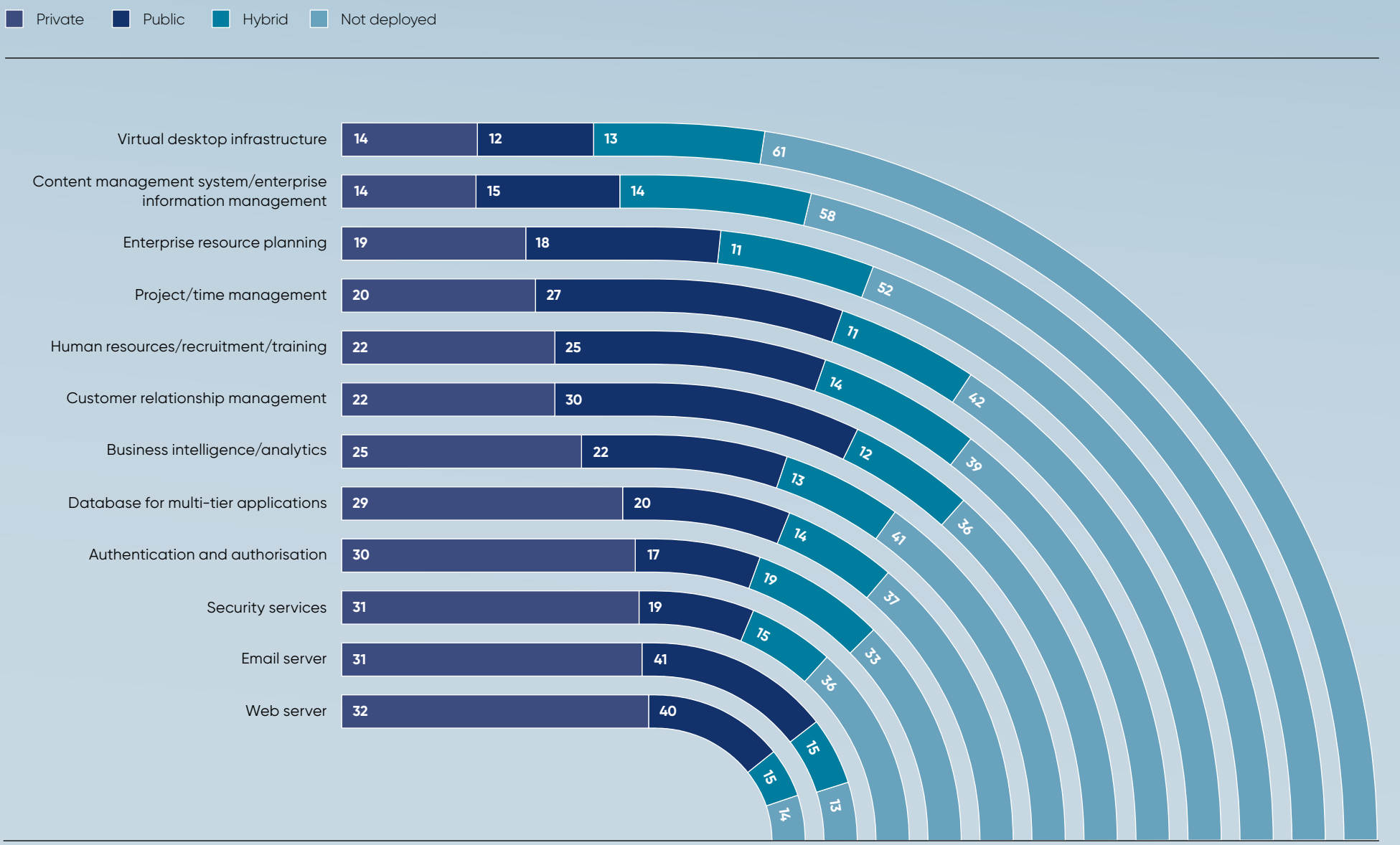
McAfee 2017



WHERE SERVICES OR PROCESSES ARE DEPLOYED

PERCENTAGE OF ORGANISATIONS DEPLOYING THE FOLLOWING

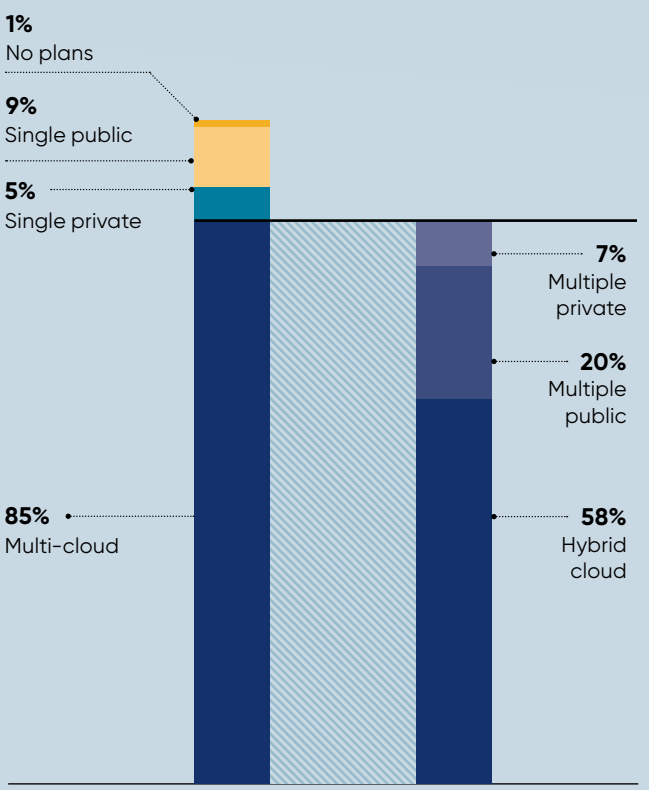
UBM/Interop ITX/*Information Week* 2017



ENTERPRISE CLOUD STRATEGY

SURVEY OF LARGE ORGANISATIONS
WITH MORE THAN 1,000 EMPLOYEES

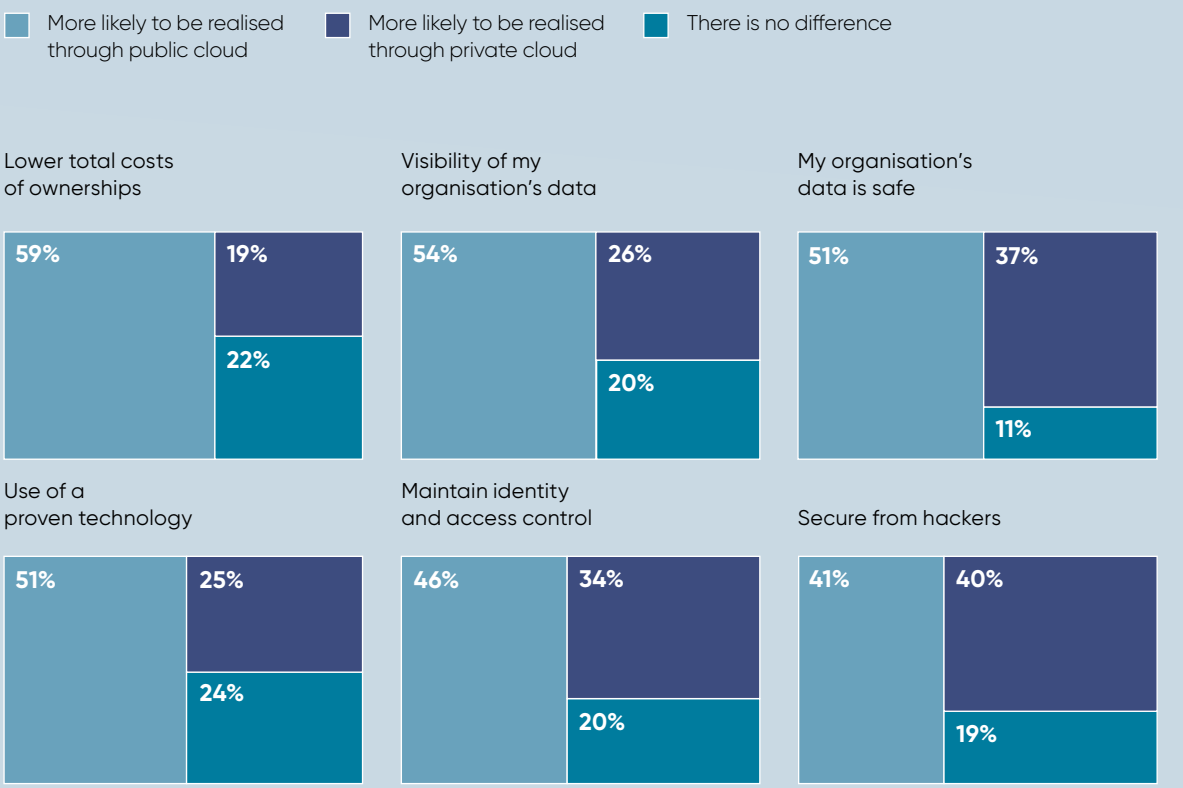
RightScale 2017



BENEFITS: PUBLIC OR PRIVATE?

PERCENTAGE OF CROSS-INDUSTRY IT PROFESSIONALS RATING THE PUBLIC AND PRIVATE CLOUD AS MORE BENEFICIAL FOR THE FOLLOWING

RightScale 2017



Percentages may not equal 100 per cent due to rounding

ENVIRONMENT

Every cloud should have a green lining

When it comes to the cloud, green is not yet the new black; for data, however, bigger is definitely the new big


Andrey Rudakov/Bloomberg via Getty Images

Inside Russia's largest data processing centre; Sberbank opened the centre in Moscow last month

JIM McCLELLAND

As megatrends go, surging demand for cloud-based services seems unstoppable, says Chris Wellise, chief sustainability officer at Hewlett Packard Enterprise (HPE). "By 2020, half the world's population is expected to have internet access and machine-to-machine connections will reach 100 billion devices. With this global connectivity, however, come both opportunities and challenges," he says.

The social and economic rewards of this digital age carry environmental responsibilities and climate risks, with implications for natural resources, material e-waste and water abstraction. The primary concern, though, is energy and carbon.

This challenge looms ever larger, argues Gary Cook, senior corporate campaigner and IT sector analyst at Greenpeace. "The sector's energy footprint already ranks in the top five if placed among countries, and it is about to experience a very dramatic increase in demand for both computing power and storage, with the internet of things, bitcoin and other cryptocurrencies, plus the 5G cellular network," he says.

One in every five units of electricity could soon be at stake. Mr Cook says: "With estimates putting electricity demand of IT, including cloud computing, rising from 7 per cent to as much as 20 per cent of global demand by 2025, the urgency is incredibly clear."

Despite exponential growth of data, doubling in size every two years, the good news is the tech community is not alone in facing up to the inherent and impending energy dilemma, says Michael Rohwer, associate director of BSR, a global non-profit organisation promoting sustainability.

"As a result of the shift toward cloud computing, datacentres now represent nearly 3 per cent of global energy demand. Powering these sustainably is no longer seen as an issue only for tech companies, though; others, like Bank of America, are working with renewable energy. We've seen nearly 3 gigawatts of new deals over the last year, led by companies, including Facebook, GM, Google and T-Mobile."

Inspired by the United Nation's sustainable development goals and Paris Climate Agreement, corporates and their cloud providers are increasingly aware of responsibilities and vocal about achievements in risk mitigation. More than 100 major brands and global market leaders, including Microsoft, Infosys and HPE, have signed up to the Climate Group's RE100 campaign, for instance, committing to source all operational electricity from renewables.

In Silicon Valley terms, the craze is virtually going viral, says Mr Cook. "We have seen a race emerge among major US IT companies to build and power their corner of the internet using renewable energy, with over 20 adopting a long-term commitment," he says. "While this started with consumer-facing companies like Facebook, Apple and Microsoft, it has now spread to co-location and cloud-service providers like Equinix, Digital Realty, AWS and Switch."

For some, transparency remains an issue, as revealed in Greenpeace *Clicking Clean* reports that benchmark sector greening. Naming and shaming industry laggards, analysis has exposed rates of growth outstripping green investment and cleantech deployment, with coal and fracking plugging the gap. Of significant concern at present, according to Mr Cook, are large and rapidly expanding Asian internet brands, such as Baidu, Tencent and Alibaba, which are experiencing explosive growth, but lack commitment to renewable energy.

Greening energy generation is not the only way to shrink the carbon footprint of the cloud, however, notes Yinshan Tang, professor in business informatics at Henley Business School. "Apart from clean power, much more effort has been focused on efficiencies of energy consumption, such as new technologies including servers, networks, processors, storage, memory, disk array and cooling," he says.

According to Professor Tang, most servers are underutilised by around 30 per cent, but still consume considerable amounts of energy. This makes power management an easy and obvious solution.

When it comes to mitigating heat-generation impacts of datacentres, though, the mantra often remains simply "location, location, location". Professor Tang says: "For cooling equipment, the obvious solution is to choose a cold place for datacentres, such as on top of mountains or a location close to the North Pole."

Facebook's first datacentre outside the US opened some five years ago, in Luleå, northern Sweden, as part of a high-tech hub known as the Node Pole. At up to 84 football pitches in size, the new Kolos facility currently being developed in Ballangen, northern Norway, is laying claim to be the largest datacentre in the world, not just the Arctic Circle. Drawing on natural local hydro-power resources, it will also run on 100 per cent sustainable energy.

Ultimately, and perhaps unsurprisingly for technology, there is an underlying belief in the power of innovation, literally. In fact, to obviate the need for security of energy supply via carbon-heavy backup, the greener cloud might just turn out to be one comprised chiefly of hydrogen, forecasts HPE's Mr Wellise. "While we're making big strides with renewable energy, reliability and redundancy remain an issue," he says. "Current energy storage technologies, such as batteries, are not efficient and require large footprints.

"A potential breakthrough is hydrogen fuel cells. They are sustainable and carbon-neutral; their only by-product is water. While primarily a proof of concept, we hope this innovation inspires our customers to consider new emerging technologies as part of the energy portfolio."

From dating apps to big data, we are all now cloud-based inhabitants of an expanding digital universe. For the sake of its sustainability, though, we should hope the industry is inclined to "swipe right" and keep choosing low-carbon partners.

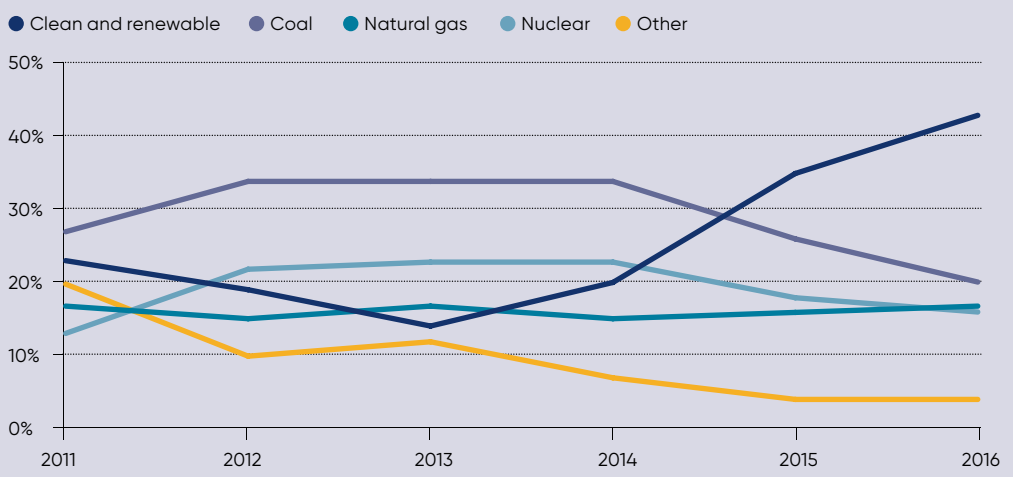
Meg Rousso/Bloomberg via Getty Images

CASE STUDY

FACEBOOK

The world's largest social network is taking its carbon footprint seriously. Facebook's annual per-user carbon emissions of 299g may be lower than the energy expelled to make one medium latte (340g), yet the network's two-billion-plus membership means its annual footprint in 2016 stood at a whopping 718,000 metrics tonnes, 72 per cent of which was generated by its datacentre operations. However, the company is actively using more renewable resources and has even announced plans to build a wind farm to supply 100 per cent of the power to its new datacentre in Nebraska.

ENERGY CONSUMPTION OF FACEBOOK'S DATACENTRES, BY RESOURCE



Facebook 2017

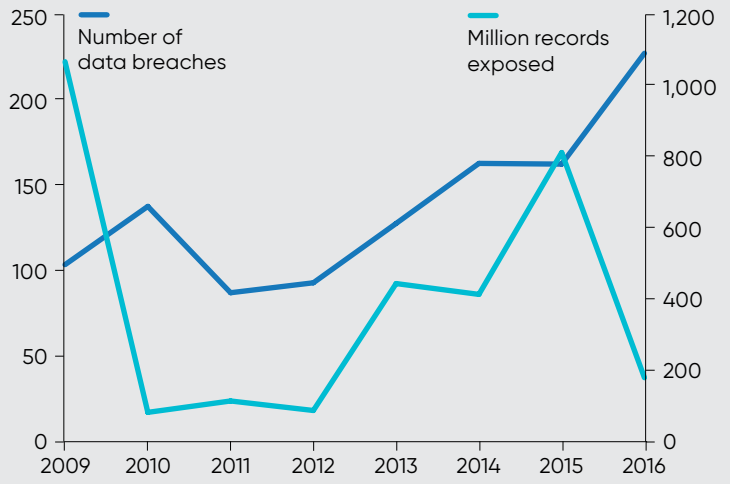
COMMERCIAL FEATURE

Discover the secret of encryption

Businesses must embrace end-to-end encryption to protect themselves against the rising risk of data breaches, according to leading cloud storage expert **Tresorit**

DATA BREACHES ARE ON THE RISE

ANNUAL NUMBER OF DATA BREACHES AND EXPOSED RECORDS IN THE UNITED STATES IN MILLIONS (2005 TO 2016)



Statista

CLOUD SECURITY PRACTICES OF US SMALL BUSINESSES

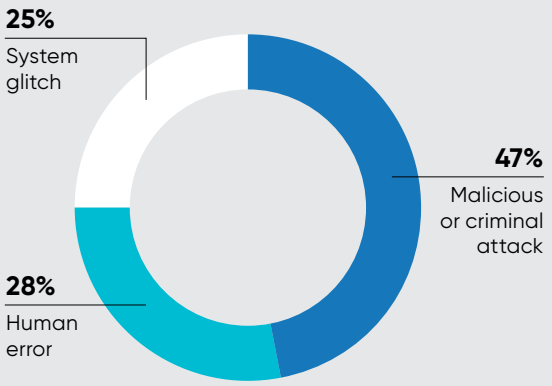
62%
of of small and medium-sized businesses (SMBs) storing customer credit card data in the cloud say they do not follow industry regulations

54%
of SMBs storing medical data in the cloud say they do not follow industry regulations

56%
do not have internal cloud storage policy

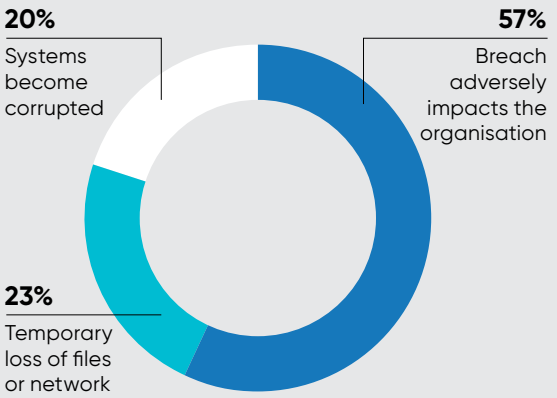
The State of Cloud Storage Providers' Security, Clutch 2017

WHAT IS THE MAIN SOURCE OF DATA BREACHES?



Cost of Data Breach, Ponemon Institute 2017

WHAT ARE THE CONSEQUENCES OF BREACHES FOR UK BUSINESSES?



Cyber Security Breaches Survey, University of Portsmouth

The question of data security is one that has rightly gathered pace in recent years. The emergence of the cloud has reshaped the digital landscape, offering organisations greater flexibility and efficiency, and transforming how businesses store and share data on an unprecedented scale, empowering even the smallest of enterprises.

But with it security has become something of a moving target and the risk of data breaches has risen dramatically.

Government figures show that three fifths of businesses (61 per cent) hold personal data on their customers electronically and just under half (46 per cent) of all UK businesses fell victim to a digital attack during the last 12 months.

These numbers make for sobering reading and, according to cloud storage service Tresorit, businesses must act to fortify their defences.

"Increasingly businesses are storing confidential information online and, in an era of hacks that expose the data of millions of users, organisations simply cannot afford to take risks with their security," explains Istvan Lam, chief executive and co-founder of Tresorit, the end-to-end encrypted file sync and sharing service for businesses. "Data has become a valuable currency, so protecting it should be a key priority for businesses."

TRESORIT TRANSFORMS STORAGE FOR LITTLE VENICE PARTNERS

After experiencing an accidental information leak with Dropbox, financial advisory firm Little Venice Partners (LVP) was in need of a secure cloud-storage solution. The solution needed to function as a virtual dataroom during transactions, providing seamless and secure sharing and ease of use.

When a firm's involvement in a project ended, LVP also needed to ensure access to sensitive files was revoked. After unsuccessfully trying a number of products, LVP discovered Tresorit and has not looked back.

Robert Frodsham, LVP associate, says: "After a partner's Dropbox account was compromised, switching to Tresorit couldn't have been simpler for us. Their customer service is some of the best I've ever experienced."

Since switching to Tresorit, LVP hasn't experienced any threat to its data and is able to work with clients confident that its data is shared and stored securely.

TRESORIT RESULTS IN SAFER BUSINESS AND COMPETITIVE EDGE FOR ALPHA INDEPENDENT MORTGAGES

Dealing with sensitive information on a daily basis, insurance and mortgage provider Alpha Independent Mortgages needed a solution that was simple for clients to use, but secure enough to protect the business.

Guy Applebee, partner at Alpha Independent Mortgages, explains: "Clients were frustrated with encrypted email and often sent sensitive documents in plain email. Sharing with Tresorit is easy. People appreciate that we handle their documents securely. It sets us apart from our competitors."

Since switching to Tresorit in 2013, Mr Applebee noticed an immediate decrease in the number of complaints and frustrated customers. As a result, the company spends less time giving technical support, while providing more security for its clients. What's more, using Tresorit has proved a selling point to new clients, with the promise of user-friendly security throughout their communications.

As technology advances at an unfathomable pace and organisations increasingly depend upon technologies beyond the traditional remit of their enterprise, many older precautions have become futile in the fight against breaches. For Mr Lam, the answer lies in end-to-end encryption.

The notion of encryption is nothing new; cryptography can trace its roots back to ancient times. Its newest application, however, is revolutionising digital security.

End-to-end encryption provides a further layer of protection, ensuring encryption keys stay on the end-user's device and thus only the sender and receiver can unlock the messages. As opposed to the in-transit and at-rest encryption used by the majority of providers, this approach means communications remain fully private.

"In the wrong hands, data can do more damage than you might realise," says Mr Lam. "When you use the cloud, you leave yourself open to that service provider looking at the data or passing that access on to anyone they want. Tresorit is different; files are encrypted before they get sent to the cloud and are only accessible for the recipients and those you explicitly authorise. This means that your data cannot be read by others, including Tresorit."

Additionally, Tresorit has a dashboard for IT admins to further help businesses maintain control over how team members share files.

But the importance of end-to-end encryption is not simply limited to helping businesses bolster their security capabilities; encryption will play a key role in meeting tougher regulatory requirements.

> "Files are encrypted before they get sent to the cloud and are only accessible for the recipients and those you explicitly authorise

In May, the General Data Protection Regulation (GDPR), designed to unify data protection in all European Union countries, will come into force and it's set to be a game-changer for the way in which businesses use and share personal data.

Organisations will need to ensure personal data is managed in a safe and secure manner, has been gathered lawfully, and will only be used for the purposes for which it was intended. Those who fail to comply face heavy fines of up to 4 per cent of global turnover.

Mr Lam says: "Cloud-based applications are useful, but they could create risks for business data. Under the GDPR, organisations are responsible for protecting all personal data throughout its life cycle, from collecting to processing it with third parties such as cloud-based services. The changes are particularly pertinent for smaller businesses that may not have the resources of their larger counterparts. As such, deploying simple yet highly effective technology is a vital step in becoming compliant."

In the event of a server-side data breach, encryption and especially end-to-end encryption makes the leaked data unreadable for the hackers. They will only get hold of the encrypted dataset which is like white noise. Not only does encryption have the advantage of helping businesses better protect data, but it makes the compliance process easier and reduces associated costs.

Mr Lam adds: "Meeting GDPR compliance requirements will not be easy for businesses. However, we should not only think of this as a compliance process, but an opportunity to improve the trust of consumers in digital services, and to take steps towards protecting the personal data of staff and customers."

For more information please visit www.tresorit.co.uk

E-GOVERNMENT

US government faces giant IT challenges

Utilising the cloud to adopt e-government is patchy in America where federal agencies face major challenges

EMMA WOOLLACOTT

When, last year, the United States Government Accountability Office evaluated the state of government IT systems, it concluded they were "becoming increasingly obsolete".

A Department of Defense system used to co-ordinate the US nuclear forces was still using eight-inch floppy disks, while the Treasury Department's master file of tax data on individual business income taxpayers was running on an IBM mainframe.

This was despite the fact that, since 2011, the government has been pursuing a cloud-first policy. Introduced by President Barack Obama, it requires government agencies to adopt a cloud-based solution wherever possible, so long as it's secure, reliable and cost effective, with the aim of removing duplication and improving efficiency.

"The federal government's current information technology environment is characterised by low asset utilisation, a fragmented demand for resources, duplicative systems, environments which are difficult to manage and long procurement lead times. These inefficiencies negatively impact the federal government's ability to serve the American public," wrote Vivek Kundra, then-US chief information officer.

"Cloud computing has the potential to play a major part in addressing these inefficiencies and improving government service delivery. The cloud-computing model can significantly help agencies grappling with the need to provide highly reliable, innovative services quickly, despite resource constraints."

It's certainly a strategy that's working for Estonia, which since its independence from Russia in 1991 has been transforming itself into a "cloud country". Its Government Cloud is a platform for the delivery, management and auditing of IT services to the government sector through a private-public partnership. According to the Estonian government, e-government as a whole is saving the country 2 per cent of GDP a year, thanks to increased flexibility and efficiency.

However, translating this success to the US is easier said than done. While cloud services are certified and monitored by the General Services Administration's Federal Risk and Authorization Management Program, this has been criticised for approving too few cloud service providers.

In September it announced a new fast-track approval process for providers with low-impact software-as-a-service offerings, but there have been other problems as many IT bosses feel they have been pushed into solutions that might not be best for their particular department.

And while the cloud has become the strategy of choice for most new deployments, legacy systems remain a problem.

"One challenge is that it can cost money to migrate older legacy systems to the cloud," says Shawn P. McCarthy, research director for IDC Government Insights. "Interfaces have to be changed. Current apps may not be designed to run on newer servers. There are hundreds of issues that an agency can run into."

In an attempt to boost migration to the cloud, President Donald Trump signed an executive order in May aimed at boosting cybersecurity at federal government agencies. Basing solutions in the cloud can streamline security measures, such as single sign-on, installation of patches and security updates, limits for application programming interfaces and more.

"It basically recognises that security is an important element of what can be gained when moving IT solutions to cloud and working to standardise systems," says Mr McCarthy. "Thus it stresses the importance of cloud as an investment which can help improve security, whether the system migration is cost effective or not."

More recently, holding up the National Oceanic and Atmospheric Administration and the Justice Department as examples of agencies that have saved millions in annual costs, President Trump's proposed 2018 budget called for all federal agencies to move from agency-owned and operated email systems to cloud-based email.

All in all, though, progress has been sluggish and Mr McCarthy believes it's set to stay that way. Ironically, the way the Trump administration is dismantling net neutrality – the principle that internet service providers should treat all services equally – means the cost of using the cloud may well rise.

Meanwhile, the president's budget request recommends raising federal IT spending by just 1.7 per cent in 2018, so there simply may not be enough funds to accelerate the transition.

"It's easy for any administration to say that federal agencies should move in a specific direction when it comes to IT," says Mr McCarthy. "But migration and consolidation of systems can cost money. If no special funds are set aside to deal with such new requirements, change can still be slow."

OPINION COLUMN

‘The main objective is to drive greater collaboration to improve quality, deliver efficiencies and reduce operating expense’

ALICE MACGREGOR
Editor
Cloud Expo Europe

IT operations are becoming increasingly harder to manage effectively, with demanding expectations for customer experience and the adoption of new technologies, such as cloud, automation, DevOps and software-defined infrastructure, to name just a handful.

Looking at cloud specifically, multi-cloud environments are now prevalent across the enterprise landscape, offering the flexibility and agility to meet diverse business and technology requirements, and advance digital transformation strategies.

The challenge, however, is clear. As these highly dynamic ecosystems scale, with multiple clouds, services and applications in action, process management becomes evermore complicated, and silos emerge preventing users from seeing the full picture and identifying potential issues.

In an effort to tackle these blind spots and complexity, organisations are recognising the need to move from a reactive to a more proactive approach to cloud management and IT operations.

For many, the future success of business transformation strategies will depend on the ability to manage workloads proactively, detect threats, predict incidents, streamline collaboration and workflows, and correlate events across various distributed environments, teams and toolsets.

Machine-learning and artificial intelligence (AI) could well provide the answer.

As we are increasingly able to witness in enterprise settings, AI can play a significant role in automating process, learning and adapting as it goes.

With the acceptance of and interest around AI growing rapidly, techniques such as machine-learning, natural-language processing and computer vision promise to solve many business process management challenges, particularly in multi-layered cloud environments.

By analysing big data sourced from IT operations tools and devices, new management platforms powered by AI can intelligently forecast potential incidents, and reduce risk and time spent identifying and resolving them.

Artificial intelligence for IT operations, named AIOps by IT research group Gartner, is for now relatively unheard of in the business landscape, with only 5 per cent of all large enterprises deploying the strategy.

This number, nonetheless, is expected to jump dramatically to 40 per cent by 2022. If these predictions become reality, AIOps has the potential to transform process management completely in our cloud-centric economy.

In a report, Colin Fletcher, research director in IT operations management at Gartner, describes AIOps as enabling “leaders to meet the proactive, personal and dynamic demands of digital business by transforming the very nature of IT operations work via unprecedented, automated insight”.

However, this is not to say that the deployment of AI in a diverse cloud environment comes without its own challenges.

Pitfalls can arise if businesses are not fully assessing the real investment and effort levels required by an AIOps implementation. Machine-learning demands huge amounts of data and real-life interactions; these are critical to an effective AIOps strategy and take time to build and perfect. Any investment in AIOps platforms would need to follow comprehensive assessment of the demands for data, human-machine interaction and time commitment.

As with any digital transformation journey, AIOps must also be approached in an iterative fashion. Wider than its technological impact, the methodology is ultimately about people and process. The main objective is to drive greater collaboration to improve quality, deliver efficiencies and reduce operating expense – this takes time and careful planning.

Cloud Expo Europe London is staged at London’s ExCeL on March 21 and 22. Register online for a free ticket at www.cloudexpoeurope.com/CloudforBusiness

COMMERCIAL FEATURE

The great migration: how businesses are moving to the cloud

Michel Robert, managing director of Claranet UK, shares tips on how best to migrate your business to the cloud

claranet

Two thirds of the largest organisations in the world have digital transformation spearheading their corporate strategy in 2018, according to the International Data Corporation. For companies large and small, it’s a business-critical issue and the great migration to cloud computing is at the heart of this transformation.

Research from the Cloud Industry Forum, published last February, shows that 88 per cent of 250 IT and business leaders who responded have adopted cloud for some of their applications; crucially very few have migrated them all. The top three reasons for adopting cloud services are flexibility of delivery (74 per cent), operational cost-savings (72 per cent) and scalability (65 per cent).

Little wonder we have reached a tipping point where it is the business leaders rather than just the development teams who are pushing for this change. It is the C-suiters who are now determined to move more of their applications to the cloud, realising the game-changing benefits which will boost competitiveness and growth.

However, in our experience many organisations think that replicating what they have in the cloud is their end-game. This couldn’t be more wrong. In most cases, if you want to take advantage of automation, scalability, rapid development and other features, changes will need to be made to your applications. In addition, the right strategy will vary, sometimes considerably, by application.

MICHEL ROBERT
MANAGING DIRECTOR
CLARANET UK

Without previous experience, it is perhaps no surprise that organisations often lack the skills or understanding to achieve this. For example, one customer we now support tried to move their applications and data out of a datacentre to a major cloud platform on their own, but quickly discovered it was more expensive to run and they were not able to maximise benefits. Their hasty retreat from the cloud and back to their old datacentre was certainly no surprise.

> It is time for business leaders across all industries to seize this opportunity and revolutionise the way their organisation operates

Two years on, the organisation revisited the idea and got in touch. We talked to them about more planning before any migrations started and assessed their applications to check whether they were cloud ready or needed to be re-engineered. The result is that the business is expected to make a whopping 30 per cent saving on their current datacentre costs.

Our just-published research report, *Beyond Digital Transformation*, highlights how forward-thinking organisations recognise the value of IT partnerships to help them structure their move to the cloud. Surveying 750 IT and digital leaders across Europe, responses show the impact that cloud adoption has on business performance.

Organisations identified as cloud leaders in the survey also demonstrated a wide range of additional strengths, including the ability to deliver the best digital customer experiences, to stay agile and move at speed, and to link IT spend to tangible business improvement.

No two migrations to the cloud are the same, but focusing on applications and how they deliver value to the business, is essential to consider before making the move, answering the question “why am I doing this and what impact will it have?” Once it is clear there will be a business benefit and that the application is suitable to migrate, then businesses should consider what additional services, such as automation, robust security tools, data management, analytics and machine-learning, they may need further down the line, as this is how some of the really transformational benefits are achieved.

As the evidence shows, it is time for business leaders across all industries to seize this opportunity and revolutionise the way their organisation operates. But first, they need to appreciate it can be a complex process and, to make the cloud work for their business, the solution is very rarely off the shelf.

For more information please visit www.claranet.co.uk

RIGHT AND WRONG WAYS TO MIGRATE TO THE CLOUD

01 LIFT AND SHIFT
Moving IT estate to the cloud and assuming job done: this is not enough; maintaining traditional operating models could result in higher costs and under-performance.

02 BIG BANG
A race to incorporate every tool immediately: this takes on too much before you are ready and could mean loss of control and increased risk.

03 AUTOMATE AND REINVENT
Incremental change to embed and then grow the new cloud environment, putting you in the best position to outperform your competition: this is just right.

SPORT

Thearon W. Henderson/Getty Images

Jason Avant of the Kansas City Chiefs with a Gatorade Gx bottle, which contains a microchip to track how much and how fast athletes are drinking

Three ways cloud is transforming sport

Sports organisations are using the cloud, on and off the field of play, to achieve record goals and reach a growing worldwide audience

OLIVER PICKUP

POWERING ELITE ATHLETES

At the top level of sport, it's all about fractional improvements and increasingly technology is helping elite men and women power to glory. Cloud technology, which enables colossal amounts of data to be crunched, analysed and presented in a trice, is the latest game-changer for sports stars.

Members of the Brazil's national football team, currently second-favourites to win the World Cup in Russia this summer, behind holders Germany, use a cloud-based personalised hydration platform, Gatorade Gx. An individualised squeeze bottle containing a microchip tracks how much and how fast each footballer is drinking, and this information is passed, in real time, to coaches. LED light rings in the cap enable athletes to monitor and regulate their ideal fluid intake.

Tucker Fort, a partner at Smart Design, the company that worked with Gatorade to produce the Gx, which is also used by top basketball and football clubs in America, and is launching in the UK this year, says: "In the four years since Gx was first piloted, we have seen an explosion of software and the internet of things infiltrating every aspect of sports science and performance. Cloud-based solutions are no longer experimental, they are absolutely required to be competitive."

For endurance athletes, including long-distance runners and cyclists, there are in-ear wearable devices that monitor both heart rate and core body temperature, along with other metrics such as VO_2 (oxygen volume), distance and cadence. When combined with cloud-based analytics, this equips coaches and sports stars with the tools to improve. It helps athletes acclimatise in new environments and reduces recovery time as well as risk of over-training.

Athlete management systems (AMS) are becoming popular across a number of sports, including rowing, rugby union and football. Through an application on a chosen device, players can access their cloud-based AMS, which details performance data and assists with wellbeing.

They can review a match and mug up on competitors, too, in a few finger swipes. Glenn Skingsley, performance coach of Lincoln City, which last season became the first non-league football club to reach the FA Cup quarter-final stage since 1914, says the technology has been critical to the team's success.

Using cloud-based video-analysis software to scout opponents is especially useful when on a cup run. And the manager can see which players have done their homework and tuned in to their personalised playlist. Mr Skingsley adds: "We can break down a video, highlighting things we think we did well or need to work on. There is even a chat function so we can tell all the players when the clips are up or discuss things with them over the phone."

ENABLING LOWER-TIER SPORTS

Cloud technology may be helping elite athletes achieve marginal gains, but it's making an even bigger impact further down the ladder. That's because minority sports and lower-tier leagues now have the ability to become broadcasters in their own right, and reach a global audience.

Traditionally, it would require a sizeable broadcasting operation to produce and distribute sports events to supporters via television. However, in 2018 the combination of cloud technology and "over-the-top" (OTT) broadcasting – audio, video and other media content delivered over the internet, without involving a multiple-system operator – has meant sports organisations of all sizes have a direct line to audiences.

Thanks to the cloud, a new OTT channel can be launched in just days and target audiences around the world with the same interest be it combat sports or speed knitting. In essence, the cloud has democratised sports broadcasting and production, and allows smaller sports to compete with big-budget operations, such as the UEFA Champions League in football or the Indian Premier League in cricket.

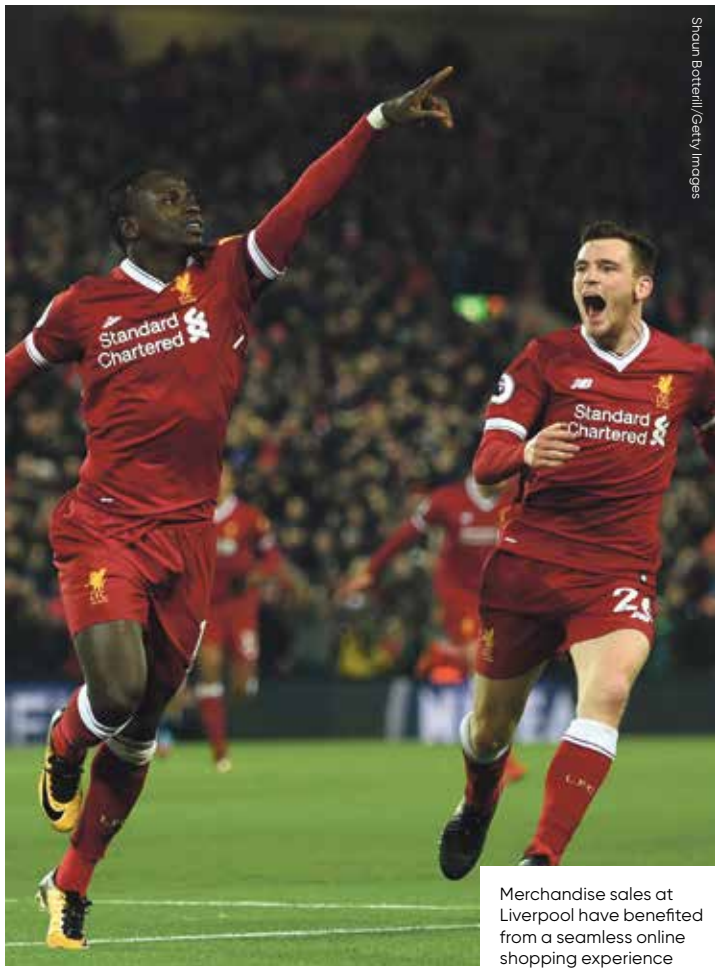
Mehul Kapadia, vice president of global marketing at Tata Communications, which connects each Formula 1 grand prix circuit to its global network and works with more than 20 broadcasters to bring the motor racing to fans worldwide, says: "The cloud is levelling the playing field between sports giants like F1 and smaller local series like the F4 British Championship. You only need a few cameras to capture the action; the rest of the production can be done easily and inexpensively in the cloud.

"This opens up a global market for local sports leagues and is great news for those of us with an insatiable appetite for different kinds of sports which aren't shown regularly on TV. Also, because producing and distributing content in the cloud is simpler and less expensive, it lowers the barriers for smaller sports organisations to experiment with innovative technologies like live 360-degree video."

Given that 36 per cent of sports fans watch and follow the action via social media channels, according to a recent GlobalWebIndex report, and for younger generations this is the norm, the trend is only going to increase and further redress the balance. The cloud helps platforms, large and small, keep up with consumer demand in a splintering broadcasting landscape.

Katie Young, senior trends analyst at GlobalWebIndex, says: "Sports brands and broadcasters need to recognise that their audience now spans a multitude of devices and platforms. It's in the industry's own interests to take the initiative in establishing ways to fully engage this audience or they will soon find themselves chasing the fans, rather than leading them."

chuttersnap/Unsplash



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Merchandise sales at Liverpool have benefited from a seamless online shopping experience

REACHING FANS WORLDWIDE

Pep Guardiola's Manchester City are runaway leaders in the Premier League and not only has cloud technology helped the players up their game, it has boosted fan engagement and also made back-office operations more efficient.

Since 2015 SAP has been providing the club with cloud solutions, and last season the club unveiled the division's first fan-friendly, interactive digital installation featuring touchscreen interface and video display. Located in City Square, the social hub of the club's Etihad Stadium, the CityPulse Wall enhances the match-day experience for supporters by allowing fans to access data-driven insights, real-time statistics and profiles for every player.

Other clubs are catching up with Manchester City, off the pitch at least. For example, by migrating the hosting environment of its e-commerce site to a cloud platform, Liverpool's merchandise sales have improved dramatically. Kit launches can generate around 20,000 unique users on the store all at once. That surge may have been a problem in the past, but now the site will auto-scale depending on the number of visitors. Since the move to cloud with service provider Claranet, Liverpool has enjoyed approximately 99.9 per cent "uptime", which means its customers can have a seamless shopping experience.

Elsewhere, German club FC Schalke 04 are seeing big benefits from pioneering cloud technology. Alexander Jobst, head of marketing, says: "It has allowed us to distribute messages to fans' mobile phones more quickly, using push notifications and location-based services. It has helped not only boost our membership numbers, but has opened up many new opportunities. Digitising how the club engages with its fans has enabled us to get in front of new audiences, while staying true to the club's identity."

Likewise, Champions League holders Real Madrid use cloud technology to "tailor experiences for supporters", says Rafael de los Santos, the club's global digital director. "With over 600 million supporters worldwide, almost a half of them connected through our digital channels and only 3 per cent of these fans living in Spain, bringing our global fanbase closer to the club wasn't going to be easy. But by embracing new technologies we've been able to push the boundaries of fan integration like never before.

"The Real Madrid digital platform, which uses Microsoft cloud technology, has given us the scalability to engage with our fans on a one-to-one level and the insights to provide them with the content they're looking for. The platform has transformed our business model, boosting digital revenues by 30 per cent and increased fan profiles by 400 per cent since our partnership began. It's helped us rebuild and reinterpret our business, most importantly by putting Real Madrid fans across the globe at the centre."


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