ComputerWeekly

4-10 APRIL 2023

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Unlocking access to UK digital services

Can £400m identity system revitalise UK's flagging digital government hopes?

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Generative AI brings opportunities and challenges to UK schools

Schools will need to review and strengthen their cyber security postures and teachers will need to work harder to safeguard students regarding generative artificial intelligence (AI), the Department for Education has said.

Alan Turing Institute unveils strategy to support UK AI

The Alan Turing Institute has unveiled a strategy for how data science and AI can be used for social good in support of the government's ambitions for the technology, with a focus on health, the environment and national security.

CMA deepens probe into merger over server price-hike concerns

The Competition & Markets Authority (CMA) is deepening its investigation into the VMWare-Broadcom merger, after concluding the $61bn deal could hamper innovation and drive up the cost of servers.

CBI launches campaign to boost UK tech unicorns

The Confederation of British Industry (CBI) has launched Project Decacorn, a campaign to bolster support for the UK's most innovative high-growth tech companies so they can transform from $1bn unicorns to $10bn "decacorns".

Microsoft expands AI Copilot project into security realm

Microsoft has announced the upcoming availability of an AI capability in its cyber security offering that it claims will "dramatically increase the reach, speed and effectiveness" of its customers' security teams.

BNP Paribas moves to Swedish datacentre in computing strategy

BNP Paribas is moving its IT operations to a second datacentre in the Nordic region, shifting high-performance computing workloads to a campus in Stockholm to further build on the bank's datacentre presence. ■

Intel co-founder Gordon Moore dies

Gordon Moore, the co-founder of Intel Corporation, died on 24 March, at the age of 94. Moore, born in San Francisco in 1929, graduated from Caltech, before joining forces with long-time colleague Robert Noyce to work together under William Shockley, the co-inventor of the transistor.

JUSTIN SULLIVAN/GETTY

- *Apple security updates fix 33 iPhone vulnerabilities.*
- *Oxbotica teams up with Google Cloud.*
- *Ransomware attacks up 45% in February.*
- *Europol warns cops to prep for malicious AI abuse.*

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GDS goes serverless to bring personalisation to online government services for One Login

The department opens up about its reasons for choosing a serverless infrastructure to underpin One Login, and how it hopes the system will provide UK citizens with a more personalised experience. Caroline Donnelly reports

The Government Digital Service (GDS) is hoping the successful deployment of its £400m digital identity system, One Login, will help the UK government regain its standing as a digital leader in the eyes of the United Nations (UN), its CEO has revealed.

The system will be mandated for use by all government departments, several of which are presently in the throes of beta testing it, and is geared towards providing a more personalised and tailored experience to citizens when accessing the government's wide range of digital services.

Specifically, the One Login system is designed to provide citizens with a single sign-on and digital identity verification portal through which to access government services, and is the successor to the troubled GDS Verify project.

The One Login system is being hosted by Amazon Web Services (AWS), and on the same day details emerged about a raft of system delivery contracts GDS has signed to support its roll-out, two senior tech leaders tasked with overseeing its development spoke at the AWS Public Sector Day in London.

Among them was GDS CEO Tom Read, who told attendees about the various projects the organisation has underway in support of its work to provide citizens with an online front door to the services offered by the government via Gov.uk.

A departmental priority on that front is taking steps to ensure Gov.uk works better on mobile devices by reducing page loading times and the amount of data they consume to bolster the site's accessibility. "We're spending a lot of time making sure it's mobile-first," said Read. "People who use government services a lot … tend to have an older, cheaper mobile device with not much data."

User experience

As well as ensuring the accessibility of government services, another top priority for GDS is providing citizens with a "consistent" and "coherent" user experience that they can be confident works so they can complete whatever task they are trying to carry out wholly online.

As an example, Read pointed to the uncertainty that sometimes blights users when they try to make payments for government

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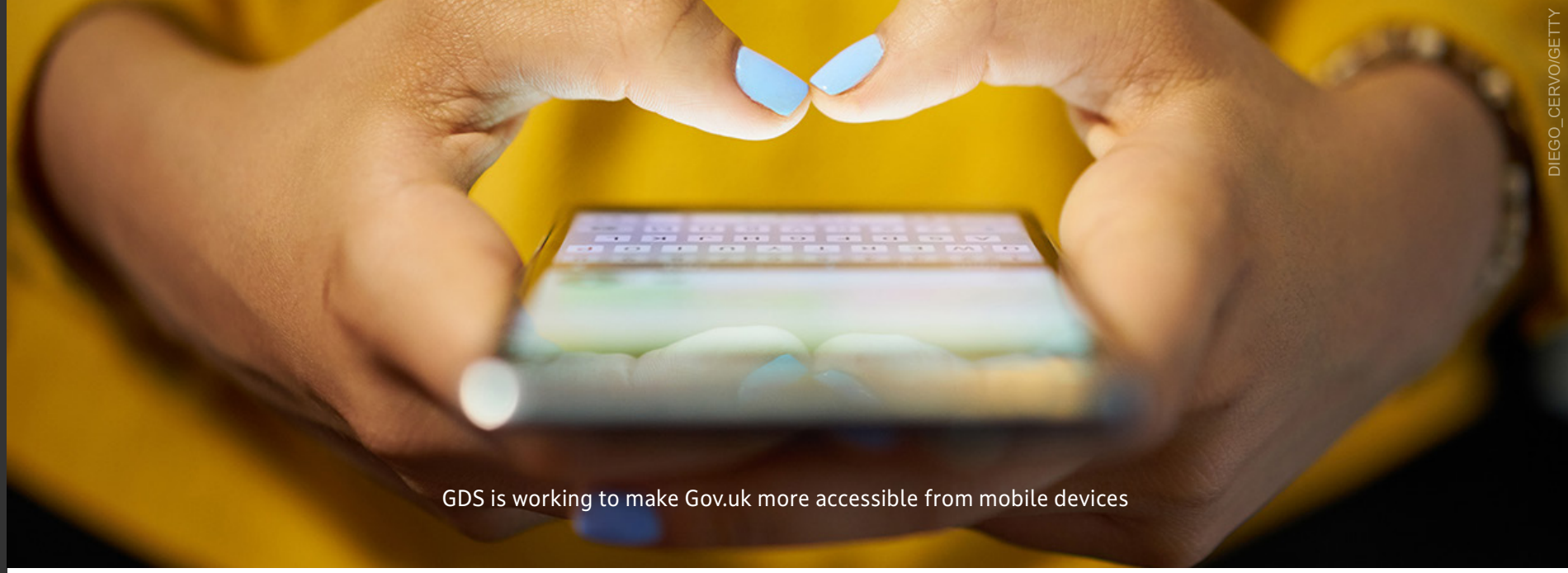

GDS is working to make Gov.uk more accessible from mobile devices

DIEGO_CERVO/GETTY

services online, which prompts them to abandon what they are doing in favour of trying to pay by phone instead.

"When you're making a payment online, people get very nervous," he said. "We've trained them to think, 'Is this a scam? Is this legit?' And our research shows that where the user experience changes, people get nervous and try to pay by phone instead. User experience needs to be consistent, [it] needs to be coherent, so that people keep that trust."

Otherwise, they will default to getting on the phone to government call centres, which Read acknowledged can be a frustrating experience, but is also one that can be costly for taxpayers.

But while GDS is keeping busy and focused on improving the online user experience for citizens, Read acknowledged that – in recent years – the UK has found itself "leapfrogged" by other nations in terms of the quality of service it provides. This is something he is keen to correct.

"In 2016, we were ranked the top digital nation in the world in the UN e-government rankings," he said. "A couple of years later, we slipped to fourth, and then we slipped to seventh, and at the end of last year, we slipped to 11th – so we're not even in the top 10 anymore.

"We've been overtaken by countries like the Netherlands and Iceland … and the United States, and others, and we need to work out why that is. The good news is that our scores in the UN e-government index haven't really changed that much. They've been very static over the past 10 years. The bad news is that everyone else's scores have gone up. So … we're missing something."

To establish what that missing ingredient might be, Read said the organisation has looked to the private sector for inspiration, and at how people are "interacting online in their personal lives", as well as examining the digital initiatives governments in other countries are rolling out.

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As examples, Read pointed to Denmark's efforts to digitise its communication processes, which have seen the government ban people from posting letters, and the legislative changes that have been pushed through in Ukraine so citizens can store government documents on their smartphones.

Looking at how other countries do things has prompted GDS to conclude the government user experience needs to become more tailored and personalised, which is something it is looking to achieve through the roll-out of One Login and its technology tie-up with the Gov.uk Accounts system. The latter is a single sign-on system that is billed as a way to deliver a more personalised service for users of the government website.

"We don't want to abandon what we do already… but we need to start looking to the future [and] at how we can start getting personalised and start tailoring services around the user. It will start with Gov.uk One Login," said Read. "For a lot of people … who interact with government all the time, that [lack of personalisation] doesn't work very well at all, because every time [you engage], you're treated like a stranger … and it's not tailored to your experience. That's one of the paradigms we need to really start challenging."

Online retail hub

One of the user experience models GDS is looking at for inspiration is that offered by the Amazon online retail hub.

"How does Amazon do it? Amazon immediately knows who I am," he said. "I'm logged into a persistent experience. It knows my fulfilment details and it recommends things based on who am I and what I've bought before. It knows my banking details, [and] this works really well for Amazon because it means I can buy something within about 10 seconds without even remembering [because] I've done it so frequently. It works very well for the user.

> **"We don't want to abandon what we do already… but we need to start looking to the future [and] at how we can start getting personalised and start tailoring services around the user"**
>
> Tom Read, GDS

"It's similar in banking and transport, and in a lot of people's lives you have this hyper-personalised, logged-in assistant, recommendations-based experience, [but] we just don't have that in government at the moment," said Read. "I think we need to keep thinking about it."

Under the hood of One Login

Elsewhere during the keynote, Natalie Jones, director of digital identity at GDS and the person responsible for overseeing the

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delivery of One Login, provided attendees with some insight into the system's inner workings, which make use of the AWS serverless infrastructure. "We were and remain the only major government digital transformation programme to be entirely serverless," she said.

The decision to make One Login a serverless system predated the start of Jones's work on the project, which began around 18 months ago. "I'd be lying if I said when I turned up, I wasn't a bit nervous when I found this out … [because] you can't help but wonder if it's such a no-brainer, why [are you] the only one doing it?"

She also revealed there was some pushback among some members of the One Login tech team about the decision to go serverless, which she said might have taken some attendees by surprise. "On the one hand, you would think that learning a new skill, putting something on your CV, doing something that's a bit cool and cutting edge, might be the way to your developers' hearts, but a number of our engineers were distinctly lukewarm about the prospect," said Jones.

"They didn't really want to let go of their old ways of working and embrace the possibilities. We found that our junior engineers were far more likely to become early adopters and advocates for the change than our more senior technical leaders. We discovered that what people really needed was time and space to explore what serverless meant in their context and within their teams."

Benefits of being serverless

Fast forward to now, and Jones said the benefits of going serverless are evident to see, from a cost-effectiveness, scalability and

Initially, some members of the One Login tech team weren't convinced about going serverless, but the benefits are now evident

RANGIZZ/ADOBE

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resiliency perspective, especially given how prone to unexpected peaks in demand some of the government's online services are.

"We are subject to the Martin Lewis [Moneysaving Expert] effect [where], more than once now, government services have seen an almost 10-fold spike in traffic after Martin has gone on the TV or a radio show to tell [people] to check if they are eligible for a [government benefit of some kind]," she said.

"It also increases your agility and decreases operational load on your teams, because they can focus on writing and deploying code and they don't have to worry about managing infrastructure.

> "It's been a voyage of discovery and we've learned loads from the process"
> Natalie Jones, GDS

And, finally, it has security benefits because you can be really fine-grained about your controls. We at GDS can work out in the open, as is our practice, but also lock down really key elements of the system if required."

For any other government tech leaders considering going down the serverless route, Jones said they need to be aware of the ripple effect it will have on how their whole project is run.

"It's not just a choice about infrastructure, it's actually so much more than that," she said. "The choice you make ripples through everything: how you write your code, how you structure your tests, how you run your live service and – even potentially – how you structure your teams. And I don't think we got that to begin with.

"If you're going to do it, you've really got to go all-in. You've really got to think about it from the offset, because some of the things you do will no longer be appropriate."

Technical difficulties

As an example, Jones said her team initially ran into technical difficulties on account of the fact that some of the developers had written code without thinking how it would run in a serverless environment, because they were so used to working with containerised setups.

"The net result was that services were slow to respond and we had unacceptable response times for users," she said. "Now, you can provision pre-warmed Lambda [as a workaround for this], but if one of the benefits … is only using the thing when you need it, that's essentially the equivalent of parking your car and leaving the engine running in case you want to go somewhere later."

The team has now overcome these teething problems, said Jones, and has a mature, continuous delivery pipeline up and running that is allowing it to roll out more than 200 changes to the One Login production environment each week in a "completely frictionless" way.

"It's been a voyage of discovery and we've learned loads from the process," she said. "If you're sitting out there and thinking about making the leap, or thinking about serverless as the answer to some of your challenges, I'd say be courageous and go for it." ■

INTERVIEW

Conducting financial IT

Music maestro turned CTO Russ Thornton thrives in an environment where orchestrating IT teams is a core skill. Karl Flinders reports

Orchestrating suppliers and IT teams during a major digital transformation is what Russ Thornton finds himself doing in his role as chief technology officer at UK lending and savings bank Shawbrook.

Bringing together a large group of people with different skills and getting them to collaborate is not new to him. A musical conductor by education, Thornton "fell into computers to pay the rent".

In the early 1990s, he was conducting orchestras in theatres in San Francisco, a city which he says, even then, "was an expensive place to rent".

But on his doorstep was another opportunity, as the IT sector in and around the city grew rapidly. "I found I was quite good with computers and was in Silicon Valley at the right time," he tells Computer Weekly.

After learning "a bucket load" about IT in Silicon Valley, Thornton moved to the UK in 1997 to experience life abroad for a year. Today, married with two kids, he is still here.

Over the past 25 years, he has held technology roles at big banks and global consultancies. He has also established a couple of tech startups and sold them on.

Thornton says his job conducting large orchestras in theatres is analogous to his role as a CTO. "I was a good musician, but never great at any one instrument, but conducting is about bringing lots of people with great skills together," he says. "I am good at a lot of tech, but not great at a single tech."

He adds that while he is unlikely to be hired as a senior developer, he is well-rounded, with the skills needed to bring a team along.

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Making music at Shawbrook

Branchless Shawbrook Bank is a specialist savings and lending bank. It provides services to small and medium-sized enterprises (SMEs) and consumers that are often underserved by the mainstream finance sector, with a particular focus on the property sector.

The bank was the result of the coming together of five different finance firms in 2011. By 2017, after years of growth, the owners decided to take the bank into private hands and embarked on an IT transformation, which Thornton was brought in to orchestrate, as the company's first ever CTO. Shawbook now has 1,200 staff, after acquiring The Mortgage Lender in 2020.

"The owners could see the company was growing really well, but the technology was all over the place, so I was brought in," he says, describing it as an opportunity to have a greenfield site, set the technology strategy and set off on a multiyear transformation strategy.

The first task was to transform the IT department itself. "In the first few years I was here, we spent a lot of time creating a modern technology function, rather than the old-school one we had. We went from a 'cloud over my dead body' strategy to a cloud-first policy. We invested heavily in cyber, infrastructure and productivity tools," he adds.

These early investments were timely, given the disruption that emerged a couple of years later when the Covid-19 pandemic ripped up the working model of the world's businesses. These investments "saved the bank's bacon" during the Covid-19 pandemic, says Thornton, because the company "went from having 900 people working in the office to 900 people working from home within two weeks".

> "I found I was quite good with computers and was in Silicon Valley at the right time"
>
> Russ Thornton, Shawbrook Bank

Five pillars of IT

But Thornton was focused on the long term, with five key pillars set out when he joined the bank in 2018. These were: introducing a modern IT model, becoming cloud first, getting on top of cyber security, harnessing data and writing software in-house.

The IT department itself was the first. "The technology model was completely broken, with a really old-school 1990s operations-led model," says Thornton. Instead, he brought in a model more like that of a fintech.

Thornton then established an in-house cloud engineering function, which he says was "a major piece of work". To bring its information security up to date, the bank appointed a chief information security officer (CISO). It then put in the foundations for a cloud-based data lake to "look at analytics much more positively".

When it came to the software pillar, Thornton says: "We were a bank that was afraid of writing our own software, but we quickly realised that we can write our own software to deliver customer experiences."

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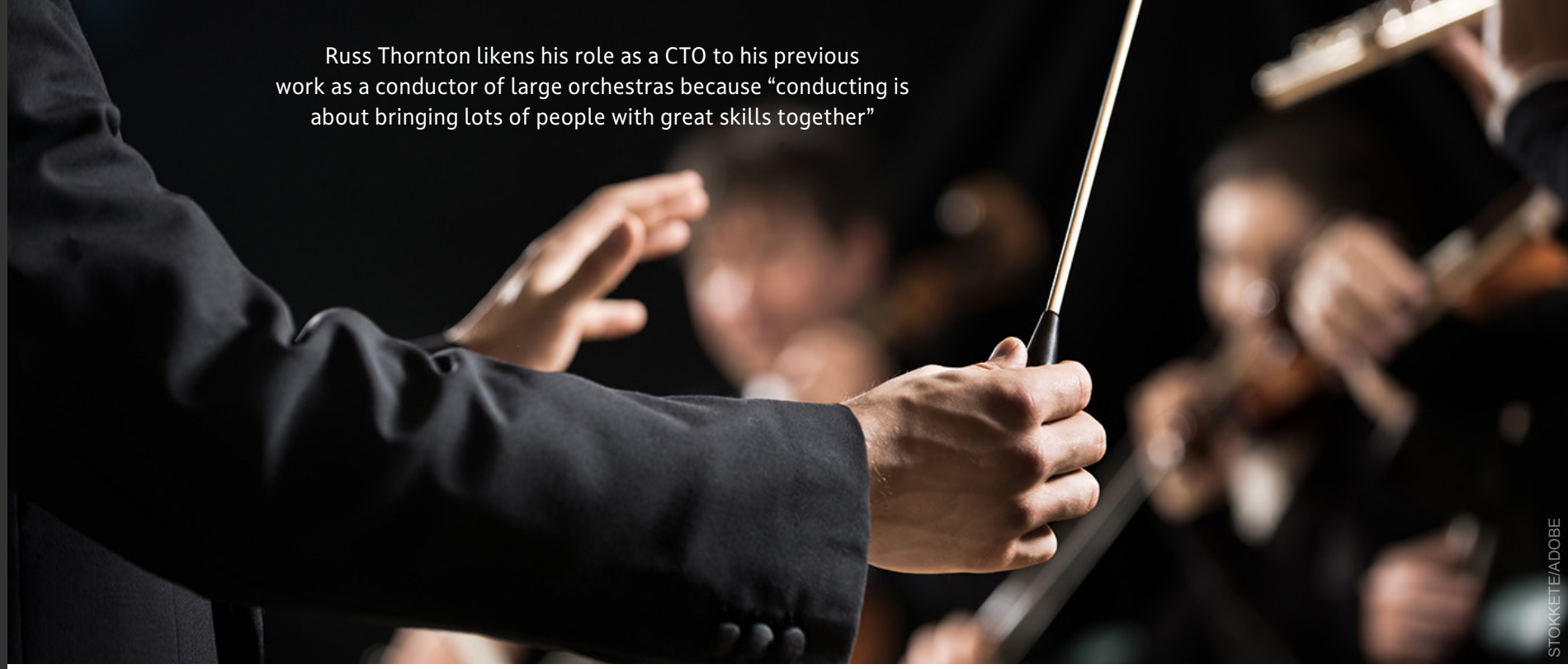

Russ Thornton likens his role as a CTO to his previous work as a conductor of large orchestras because "conducting is about bringing lots of people with great skills together"

STOKKETE/ADOBE

The human-tech interface

Perhaps the most significant decision was made in 2018, when the owners decided to invest in IT. "Technology used to be a side part of our strategy, but now it is absolutely at the core," says Thornton.

Today, the company wants to ensure its staff, who are skilled in a very complex and specialist part of financial services, have the tech they need to do things more efficiently, he says.

"Our strategy revolves around combining our deep human expertise with leading-edge tech and data. We retain the human element, because we play in complicated markets, but we want specialists to have the right technology and data around them to make decisions quickly," he adds.

Shawbrook has around 110 full-time IT staff and around 70 through its IT suppliers, who are outsourced to the bank and "part of the team", according to Thornton.

"For me, there needs to be a balance between full-time staff and those from suppliers. A 60:40 balance works nicely, with a stable base of staff at the top layers augmented by staff from suppliers to help make delivery happen," he says.

Thornton recently oversaw the rewrite of business process software and automation of customer journeys in part of its loans business, using a low-code technology platform, which is already saving 1,500 hours a month. It now plans to digitise processes in its savings business to speed up the time it takes customers to open an account and make deposits. ■

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AI – friend or foe? It's whatever we make it

A friend of a Computer Weekly staffer recently posted in their WhatsApp group. The friend – a successful novelist – had discovered ChatGPT and was blown away by its ability to "write" original synopses and effective prose. "It has terrifying implications for the publishing industry," they observed.

Goldman Sachs last week published research predicting that generative AI such as ChatGPT could "expose the equivalent of 300 million full-time jobs to automation". A search on Google for "Goldman Sachs AI report" returns pages of news headlines, all of the "AI to replace 300 million jobs" variety. If you choose to read the full Goldman Sachs report, you will also see the research forecasting "a productivity boom that raises economic growth substantially", new job creation, and a potential 7% increase in the global economy.

So, here's another prediction – one without a scientific basis or any economic analysis: 300 million people will not lose their jobs as a result of AI. In fact, you can add a couple more exclusive Computer Weekly opinions to that: If your job is threatened by AI, you should leave anyway because your employer has made no effort to plan for technological change; and any government that finds employment levels falling due to AI should be voted out at the earliest opportunity.

A group of computer scientists and Silicon Valley types also last week issued an open letter calling for a six-month pause on AI development to allow the world to ponder the likely impacts of automation. Have they only just noticed? Did one of them give ChatGPT a go and ask, "Will AI have any negative effects?"

The emergence of generative AI has revealed to a wider audience the potential consequences – and benefits – of the likely next wave of technological change. Computer Weekly is not full of future-tellers, but it must be at least 10 years since we first wrote that AI could be a threat to certain jobs, and we're not alone in that. Dear all of today's emergent doomsayers, what have you been doing?

AI has similarities with climate change, in that only when people can see it with their own eyes do they take the impact seriously. We could, and should, have had these conversations a long time ago. The UK government, eager to seem at the forefront of change, has rushed out a whole bunch of policies, none of which say or do very much.

We have known AI will change things, for ages. We also know it will create new job opportunities – and push creative people like authors to be even better. So, better late than never, business and IT leaders must actively plan for the inevitable change to come. ■

Bryan Glick, editor in chief

Driving up IT efficiency and sustainability

IT leaders need to balance IT sustainability with business drivers to innovate with digital technologies and ensure corporate systems remain secure. Cliff Saran and Adrian Bridgwater report

ALEX WHITE/ADOBE

To improve IT energy efficiency and sustainability, IT leaders are often advised to keep hardware in use for as long as possible. This is because a significant proportion of the hardware's lifetime carbon footprint is consumed prior to onsite deployment.

Logically, extending the life of hardware reduces its lifetime carbon footprint, but according to Gartner analyst Annette Zimmerman, there are two issues IT leaders need to weigh up. First is the security risk that organisations face if they extend the life of IT equipment. Manufacturers may only provide hotfixes and patches for a certain period of time, after which the hardware is no longer able to run the latest software, making it potentially vulnerable to cyber attacks. The other issue with extending the life of IT equipment is that it may reduce productivity.

There is a huge amount of effort across the IT sector to encourage IT departments to update older equipment, taking advantage of Moore's Law to provide more computational power along with cheaper and faster storage and networking, which software providers can make use of to develop feature-rich applications. For instance, Microsoft recently unveiled Copilot, which comprises a number of artificial intelligence (AI)-powered enhancements within the Office productivity suite and Power tools built on ChatGPT.

Newer hardware may also be more energy-efficient. A modern graphics processing unit (GPU) uses more electricity than an older model, but it can run AI workloads much quicker, which means the overall energy required to complete a particular

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task may be significantly lower. However, this has to be offset against the embedded CO_2 associated with its manufacturing, shipping and disposal.

Growing focus on sustainability

Sustainability and the circular economy for IT equipment were hot topics at this year's Mobile World Congress (MWC) in Barcelona, notes Zimmerman. "When people talk about circularity, the first thought is often just recycling, but it's so much more than recycling. It's about reuse, remanufacture and refurbishment," she says.

HMD Global, which manufactures Nokia phones, was one of the companies whose actions caught her attention at MWC. Working in collaboration with global repair service company iFixit, HMD Global has introduced a repair programme. "You can go in as a consumer and say, 'I would like to extend the lifetime of my device', and they help you to fix the device yourself. But if you don't want to do that, you can pay for the repair service, which seems to be at a sensible price."

> "When people talk about circularity, the first thought is often just recycling, but it's so much more than recycling. It's about reuse, remanufacture and refurbishment"
>
> Annette Zimmerman, Gartner

This idea of reuse and remanufacture is not limited to consumers. Gartner has begun to see some enterprise IT buyers considering remanufactured hardware. Last year, for example, Royal Mint signed a contract with Circular Computing for remanufactured laptop PCs. Circular Computing's circular remanufacturing process produces what the company describes as "second-life laptops", which meet a new BSI Kitemark scheme that certifies devices as equal to, or better than, new devices.

The BSI's remanufactured and reconditioned Kitemark scheme aims to verify the processes used for the remanufacture of products to show clients that best practice has been followed. The BSI Kitemark covers the process of returning a used product to at least its original performance, with a warranty that is equivalent to, or better than, that of a newly manufactured product.

Following a successful trial, the agreed partnership will see the Royal Mint use Circular Computing's carbon-neutral, remanufactured Lenovo ThinkPad T480 units, designed to meet the coin maker's specific IT needs while allowing for a flexible procurement approach.

While this shows what is possible, Shane Herath and José Gámez-Cersosimo of the Eco-Friendly Web Alliance argue that IT procurement needs to adapt to support the circular economy. "Organisations should also look to revamp their procurement processes to align with the principles of the circular economy, as the linear economic model of IT consumption and usage is not sustainable. The existing approach to IT procurement must change to reduce

Listen to an IT sustainability podcast with Gartner's Annette Zimmerman.

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the impact that our current throw-away culture is having on the environment," they wrote in a blog post.

Herath and Gámez-Cersosimo recommend that current IT procurement processes should be shaped by circular economy principles, promoting durability of infrastructure and devices, with emphasis on reusing, remanufacturing and recycling to keep IT resources, components and materials circulating in the economy. In the blog, they urge the IT sector to embrace "right to repair" and explore ways to end the planned obsolescence of technological devices and extend their lifecycle.

Cutting datacentre emissions

Beyond end-user computing and mobile devices, there is plenty that can be done to address sustainability in datacentre computing. For instance, reducing the number of physical boxes has a role to play in reducing a datacentre's carbon footprint.

Rob Tribe, vice-president of systems engineering at Nutanix, says hyper-converged infrastructure (HCI) lowers the number of hardware components needed to run a workload, because it converges separate boxes of servers, storage and compute to eliminate an entire storage area network (SAN).

"This will have an immediate, positive impact in lowering carbon emissions, and significantly reduces over-provisioning by offering bite-sized consumption," he says. "HCI also enables higher automation and increased utilisation."

With careful management and optimisation, virtualisation, containerisation, software-defined storage and networking, and public clouds, generally offer a way to maximise the utilisation of

The challenge of AI efficiency

To train and run a deep learning model in production has a significant environmental impact, warns Jason Knight, co-founder of OctoML.

For instance, referencing analysis from the University of Massachusetts Amherst from 2019, Knight says the research found that the process of training large artificial intelligence (AI) models can emit more than 626,000 lb of CO_2 – that is nearly five times the lifetime emissions of the average car.

According to Knight, achieving AI sustainability requires a combination of datacentre efficiencies, adoption of lightweight machine learning (ML) architectures and significant performance gains from the hardware itself.

"Using specialised chips whose architecture and circuits are designed to handle AI and ML workloads can improve performance and energy efficiency by two to five times," he says. "Specialised artificial intelligence and machine learning chips work best on specific numeric data types, model types and sparsity patterns."

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ALEX WHITE/ADOBE

physical hardware. By sharing services over a network among multiple users, the environmental impact of purchasing and running on-premise IT hardware is decreased.

According to research from Accenture, public cloud migrations can reduce CO_2 emissions by up to 59 million tonnes per year, which is the equivalent of having 22 million fewer cars on the road. Clearly, if workloads are left running, they will continue to consume IT resources. But monitoring usage quickly identifies when and where IT resources are being consumed and which workloads can be throttled back or switched off. This reduces the need to power additional hardware when adding new workloads.

IT departments are also able to extend the useful life of existing servers, which has a big impact on reducing CO_2. Melar Chen, product marketing manager at HashiCorp, argues that infrastructure as code (IaC) – which enables organisations to provision and manage infrastructure with configuration files, rather than through disparate workflows – offers IT departments a way to improve IT sustainability.

RESEARCH SHOWS PUBLIC CLOUD MIGRATIONS CAN REDUCE CO_2 EMISSIONS BY UP TO 59 MILLION TONNES PER YEAR – THE EQUIVALENT OF HAVING 22 MILLION FEWER CARS ON THE ROAD

First, IaC makes it easier to collaboratively build, change and delete infrastructure in a safe, consistent and repeatable way. IT administrators can also create policies as code and automatic enforcement during the provisioning workflow, which ensures that best practices and security policies are not being violated. In addition, IaC offers auditing and a way to understand the implications of new or changed infrastructure before it is provisioned and applied.

When exploring areas to improve IT sustainability, there are often aspects of IT that organisations take for granted. But these can have a significant carbon footprint. One area often overlooked

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ALEX WHITE/ADOBE

is bandwidth associated with web traffic and the impact of using multimedia-rich web content. According to Wholegrain Digital, which runs Website Carbon Calculator, the average web page produces 1.76 grams of CO_2 per page view.

"For a smaller website with 10,000 monthly page views, that's 211kg of CO_2 per year," warns Tal Lev-Ami, co-founder and CTO of Cloudinary. However, he points out that many e-commerce sites will have far more visitors, and organisations that rely on online sales naturally aim to increase, not reduce, web traffic.

However, he says the data transferred per web visitor can be reduced by addressing bandwidth. "Many companies are doing this already to reduce their costs and increase their web performance, but might not have analysed this from a CO_2 perspective," he says.

Quoting the American Council for an Energy-Efficient Economy, Lev-Ami says it takes 5.12kWh of electricity per gigabyte (GB) of transferred data. Given that the average US power plant produces 600g of carbon dioxide for every kilowatt-hour generated, according to US Department of Energy estimates, Lev-Ami says transferring 1GB of data produces 3kg of CO_2.

THE AVERAGE WEB PAGE PRODUCES 1.76 GRAMS OF CO_2 PER PAGE VIEW, BUT THIS CAN BE REDUCED BY ADDRESSING BANDWIDTH

Bandwidth is related to the number of visitors a website attracts and the size of the files comprising the website that need to be downloaded each time a web page is rendered. By using image and video optimisation tools, it is possible to reduce the size of the data required by each web page.

By balancing images and video quality with file size, it is possible to reduce bandwidth. Lev-Ami says advanced image and video optimisation tools use AI to automate this process. He cites the case of one of Europe's largest sportswear manufacturers, which reduced bandwidth consumption by 40% from 6.8TB (terabytes) per day to 4.05TB per day. Annualised, the company saved 618TB of bandwidth, which, according to Lev-Ami, equates to 1,890 tonnes of CO_2 saved. ■

Container storage platforms: Big six approach starts to align

Antony Adshead surveys the big six storage makers and sees that methods are starting to align around management platforms

NUTHAWUT/ADOBE

Containerisation typifies the biggest current shifts in IT. Containers are intended as lightweight and portable – between systems, between datacentre and cloud – and are a cornerstone of digital transformation and cloud-native application development.

But while containerisation potentially simplifies the development, deployment and operation of application environments, behind the veil is a great deal of complexity. This is especially true of what's found in storage, where capacity must be provisioned for containers, then managed, maintained and protected. This can become a difficult and opaque process, which must be made visible and trackable.

For that reason, all the big storage suppliers – and a number of startups – have developed or acquired container storage platforms, or similar. In fact, suppliers often do more than just storage, with data protection and advanced functionality of other types added in.

In this article, we look at the container storage and data protection platform offerings from the big six, namely Dell EMC, HPE, Hitachi, IBM, NetApp and Pure Storage. Computer Weekly reported on the same subject a year ago and it's quite noticeable how things have moved on.

While Pure Storage led the way with Portworx, others have made significant additions to their portfolios in the space of a year. Dell EMC has its Container Storage Modules (CSM) where once it rested on VMware Tanzu (now departed), IBM has tailored its storage around Red Hat OpenShift Container Platform

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with Spectrum Fusion, and NetApp has folded its Astra container management portfolio into BlueXP.

Dell EMC Container Storage Modules

Dell EMC made its Container Storage Modules generally available in October 2021. CSM comprises several plug-ins that provide storage and data protection management with Kubernetes that goes beyond basic container storage interface (CSI) functionality.

CSI drivers typically help provisioning, deleting, mapping and unmapping volumes of data. But, Dell EMC aims CSM at enterprise customers looking for more in terms of automation and control via a relatively simple user interface (UI).

CSM users can access storage array features they normally wouldn't have access to, and customers can make their existing storage container-ready via data features on Dell's storage arrays rather than using additional software.

Dell EMC Container Storage Modules include:

Observability: This module is based on the open source Prometheus data collection and metrics utility with Grafana graphics visualisation. It gives user visibility into CSI driver storage topology, usage and performance metrics.

Replication: This manages high availability and disaster recovery (DR) across sites and checking the replication process on stretched and replicated Kubernetes clusters. In case of failover/back, it reconfigures and remounts volumes.

Snapshot: This functionality is included in CSI plugins. In CSM, Volumesnapshot functionality can deliver group-based crash-resistant snapshots with integrity between instances.

Authorisation: This allows admins to limit storage consumption in Kubernetes with role-based access and restriction of tenants' use of storage resources.

Resiliency: This module protects stateful applications in Kubernetes from various failures. It detects failures – in nodes, in the control plane network, for example – and can move the workload to properly functioning infrastructure.

Secure: Data at rest and in motion is added with this module which deploys host-side encryption using external key managers such as HashiCorp Vault.

App mobility: This can clone stateful application workloads and application data to other Kubernetes clusters on-premise or in the cloud.

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HPE

HPE developed its own Kubernetes management platform called HPE Ezmeral Runtime, which can be deployed on its Synergy system hardware. Ezmeral is designed to deploy cloud-native and non-cloud-native applications using Kubernetes and can run on bare-metal or virtualised infrastructure, on-premise or in the cloud. It includes app deployment functionality, with data management including out to the edge, plus artificial intelligence/machine learning (AI/ML) and operations configuration.

Ezmeral provides persistent container storage and configuration automation to set up container HA, backup and restore, security validation and monitoring to minimise manual admin tasks.

Hitachi

Hitachi Kubernetes Service (HKS) allows Hitachi Unified Compute Platform systems to manage file volumes and objects on clustered Kubernetes nodes.

HKS allows universal control plane (UCP) nodes to be deployed as a Kubernetes-managed private cloud with container management across on-premise and hybrid cloud environments. The software behind HKS originated with Containership, which Hitachi acquired in 2019.

IBM Spectrum Fusion

It's not a container storage platform in the same way as that from Dell EMC or Pure, for example, but Spectrum Fusion is aimed at being storage for Red Hat OpenShift Container Platform. The company has tailored its products for use with Red Hat software since its $34bn acquisition of the open source software vendor in July 2019.

Spectrum Fusion merges elements of Spectrum Scale's General Parallel File System (GPFS), Spectrum Discover to catalogue and index metadata, and Spectrum Protect Plus for backup and restore. Fusion also supports S3 object storage on-premise or in the cloud. Customers can manage Spectrum Fusion through a single portal.

The first Spectrum Fusion release was a hyper-converged infrastructure (HCI) system that came with Red Hat OpenShift. Now it is available as a software-defined product that can run on any x86 hardware that can run OpenShift.

Initially, the hardware setup of Spectrum Fusion required six nodes minimum, or six appliances. With the new software-only Spectrum Fusion it's down to three. Clouds supported include AWS, Microsoft Azure, Google Cloud and IBM Cloud.

The software-only release also included data protection for containers plus monitoring and analytics integration with IBM Turbonomic, an application resource and network performance management software that uses automation and AI for optimisation.

NetApp Astra/BlueXP

NetApp announced Astra Data Store in October 2021 as a unified data store and resource pool for containers and virtual machines (VMs), but that was superseded in November 2022 by BlueXP as a single control plane across Astra and NetApp's on-premise and cloud storage products.

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Astra has data protection features such as snapshots that allow customers to roll back Kubernetes clusters to a previous state if something goes wrong. Customers can also take full application-aware backups and restore applications to another Kubernetes cluster. Entire applications and their data can be cloned and moved between Kubernetes clusters too.

Meanwhile, Astra Control Service is a cloud-based service for Kubernetes clusters managed by NetApp while Astra Control Center provides similar functionality for on-premise storage managed by the customer.

Pure Portworx

Pure Storage was arguably the bellwether for storage suppliers as they oriented towards containerisation when it bought Portworx in 2020 for $370m.

Portworx builds in container-native functionality to allow discovery, provisioning and management from inside Kubernetes clusters. It can discover, load balance and manage Pure Storage FlashArray and FlashBlade hardware natively from deployments in Kubernetes.

From the version 2.8 upgrade in early 2021, Portworx can run entirely from containers in Kubernetes (and other container orchestrators) and to provide persistent capacity for enterprise applications.

In early 2022, Portworx PX-Backup got anti-ransomware object locking as well as the Portworx Data Services database-as-a-service offering and PX-Backup as a service. Portworx will get SafeMode immutable snapshot at some point, too.

Portworx is effectively a suite of software-defined storage, data protection and data services products that runs from containers to build pools of storage, manage provisioning and provide advanced storage functionality – including backup, disaster recovery, security, auto-scaling and migration – on storage local to Kubernetes cluster servers, on external storage arrays and capacity in the main cloud providers, Amazon Web Services, Azure and GCP. ■