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PC PRO

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HIGHLIGHTS THIS MONTH

Full contents overleaf

PC PRO

TECHNOLOGY EXCELLENCE AWARDS 2018

WINNERS OF THE YEAR

Let's hear it for the Brits walking off with honours in our annual awards: Scan is online retailer of the year, and picks up a gong for one of its workstations. To Palicomp, for its brilliant Intel i7 Nebula, which scoops the Desktop of the Year award. And to Chillblast and Zen Internet, both of which repeat their award-winning feats of last year to scoop Best PC Brand and Best Broadband ISP respectively. But it's not just about the winners: if you're thinking of buying anything, keep this special issue of *PC Pro* to hand over the coming months. You'll find ratings for everything from customer support to reliability, based on feedback from almost 5,000 of our readers.

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TABLET OF THE MONTH

We wanted to love the Samsung Galaxy Tab S4. A premium tablet designed for people who need to work on the move? Sounds perfect. Still, there are lots of things we like – find out if you'll be opening your wallet from p52.

p56

TECHNOLOGY OF THE MONTH

One word to sum up the 2nd Generation AMD Threadripper? Scorchio! We review both its enthusiast and its workstation incarnation to reveal its strengths. One thing's for sure: if you have a need for speed, you'll love this chip.

p44

TIME MACHINE OF THE MONTH

Okay, it's not a real time machine. But if you're looking for a fire-and-forget backup routine that can match the Apple Time Machine system, you're in luck. It might not be a DeLorean, but it could just save your digital life.

ROBOT OF THE MONTH

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A robot bringing you dinner on a plate is sadly some distance away, but Small Robots does have food in its sights – it's just that this little fellow will be planting your food rather than delivering it. Find out how in this month's Profile on p22.

THE LABS IN ONE NUMBER

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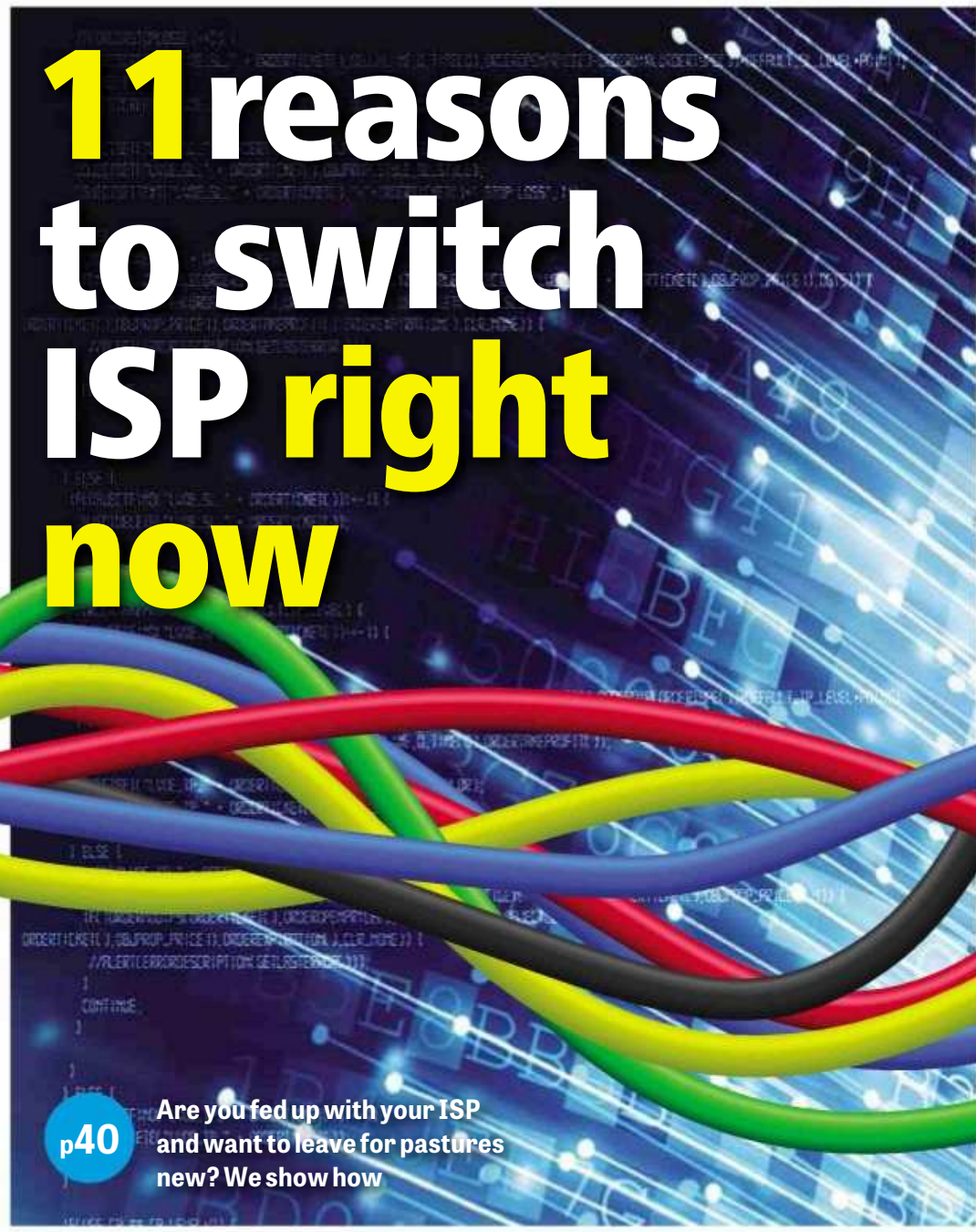
That's the difference in battery life between our longest-lasting and quickest-quitting laptops. Enough time to fly to Lisbon and back. Or watch one *Lord of the Rings* movie.



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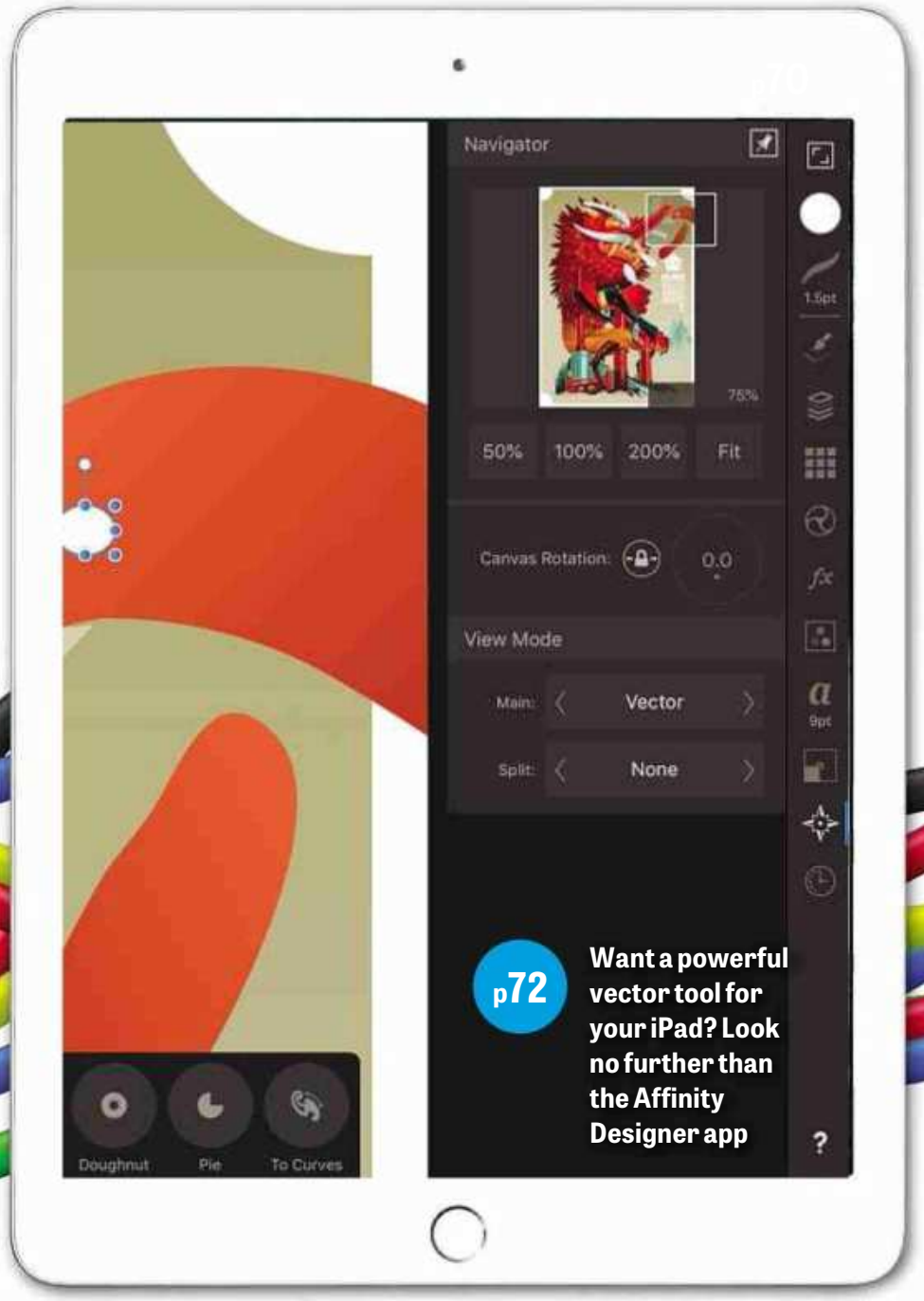

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p76 We pit 12 thin and light laptops against each other to crown one overall winner

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REAL WORLD COMPUTING

81% OF BUSINESSES ARE LOOKING TO STREAMLINE DOCUMENT PROCESSES.[1]

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 [1]Independent third-party research by Coleman Parkes Research, commissioned by Xerox, The State of SMB Document Management, September 2016

Editor's letter

Sometimes it pays to choose the cheapest option

I'VE SPENT THIS MONTH poring over the results from our annual service and reliability survey. This is where we ask *PC Pro* readers to give us feedback on the products you've bought, and thousands of you have done just that – so thank you. Whether it's your work laptop, your home broadband or the NAS drive you bought to sort out your backups (*see p44*), you've let us know how satisfied or dissatisfied you are, and the results are in the tables you see from p30.

My only fear is that those numbers are too easy to flick past in the rush to read about the latest kit. That would be a shame: these results are no random number, but the sum of a vast crowd's experience. Not only Jerry from down the road who's warned you off a particular brand of laptop forever because he once suffered a problem; this is like walking down a road of 5,000 people and asking each one in turn about the products they've bought.

Viewed like this, it's advice that's impossible to ignore. And I don't. I'm acutely aware of what *PC Pro* readers report, and use that information to guide my own purchases. I don't always get it right: I've been meaning to leave my broadband supplier, BT, for months, but a combination of lethargy and inertia has so far prevented me from switching. Perhaps I'll take the advice in our feature "11 reasons to switch your broadband ISP" (*see p40*), and report back next month.

If I'm investing in a new laptop, phone or router, however, I always factor each company's rating into my buying decision. It isn't the only factor: for example, when the time comes to upgrade my Moto phone, I'll probably choose the Asus ZenFone 5 I review on p71 – in part because, having used it for a month, I'm going to find it darn difficult to go back to a phone with a 5in screen. Why not go with Google, the top-rated phone manufacturer? One word: price.

Of course, price isn't the only consideration. Take a look at our ratings for tablet manufacturers on p32. The two traditional suppliers of cut-price Android tablets are near the bottom. Clearly, going for the budget option doesn't always leave you with a happy feeling inside.

Conversely, look at our results for mobile data. Giffgaff is a virtual mobile network operator, which means it uses someone else's infrastructure. In this case, that someone is O2: indeed, O2 owns Giffgaff. Yet the virtual operator's ratings for speed and overall satisfaction are higher.

It's this perception that I'm interested in. Giffgaff customers pay less than O2 customers, so probably have lower expectations of the speeds and customer service they receive. Here, saving money makes sense – and a price difference of £10 per month works out to £240 over the course of a two-year O2 contract.

That's why this issue of *PC Pro* is worth keeping. Read it wisely and it will point to where you can save money, and where scrimping is a false economy. For example, when it comes to laptops there's little difference between the top-rated company and the lowest, so you needn't fear plumping for the machine you've had your eye on.

If you're looking to buy, we also pitch 12 thin-and-light laptops against one another in our Labs from p76, plus the new Dell XPS 15 on p62. Which would I choose? Well, it may not come top of the reliability charts, but I miss my slim Dell XPS 13. And it happens to win the group test, too.

Tim Danton
Editor-in-chief

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Darien Graham-Smith
Darien summons the wisdom of HG Wells and explains how to build a time machine – one that can restore your data with minimal hassle. See **p44**

Mark Walsham
The sales pitch for cloud computing promises huge cost savings, but is there an economic case for it? IT consultant Mark shares his experience on **p116**

Davey Winder
Using his contacts across the security world, Davey shares the insights of 26 different experts to give an A-Z of security. Educate yourself from **p102**

5,000 of you
Just to hammer home the point, we couldn't have written this month's Awards article without your contributions. See what you think on **p30**

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Want to know which brands to buy? Look no further than the *PC Pro* Excellence Awards article, starting on p30. But which brands do our contributors recommend?

"If you're looking to buy a bespoke PC, I recommend people buy British. They always do better in our awards than international vendors, perhaps because they value each individual customer that little bit more."

"Google – for search, Mail, Calendar, Contacts, Keep and Docs. It all just works, across all your platforms, and backs itself up. Chromebooks and Android phones make it more seamless, but aren't compulsory."

"Fujitsu. They make servers the way they should be. And I always recommend Lenovo for laptops, based on years of buying ThinkPads – often secondhand."

"I come back to Apple, Synology and Promise. If I was to pick one, it's Synology – it provides all your computing needs in one box."

"Netgear, or to be precise Netgear's Orbi mesh Wi-fi system. Why? To cut down on the number of 'My Wi-Fi is crap' posts I see."

"I always recommend Anker. Way better than the OEM products, and way cheaper as well. And that's true pretty much across the product range."

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WINNER : BEST ROUTER BRAND

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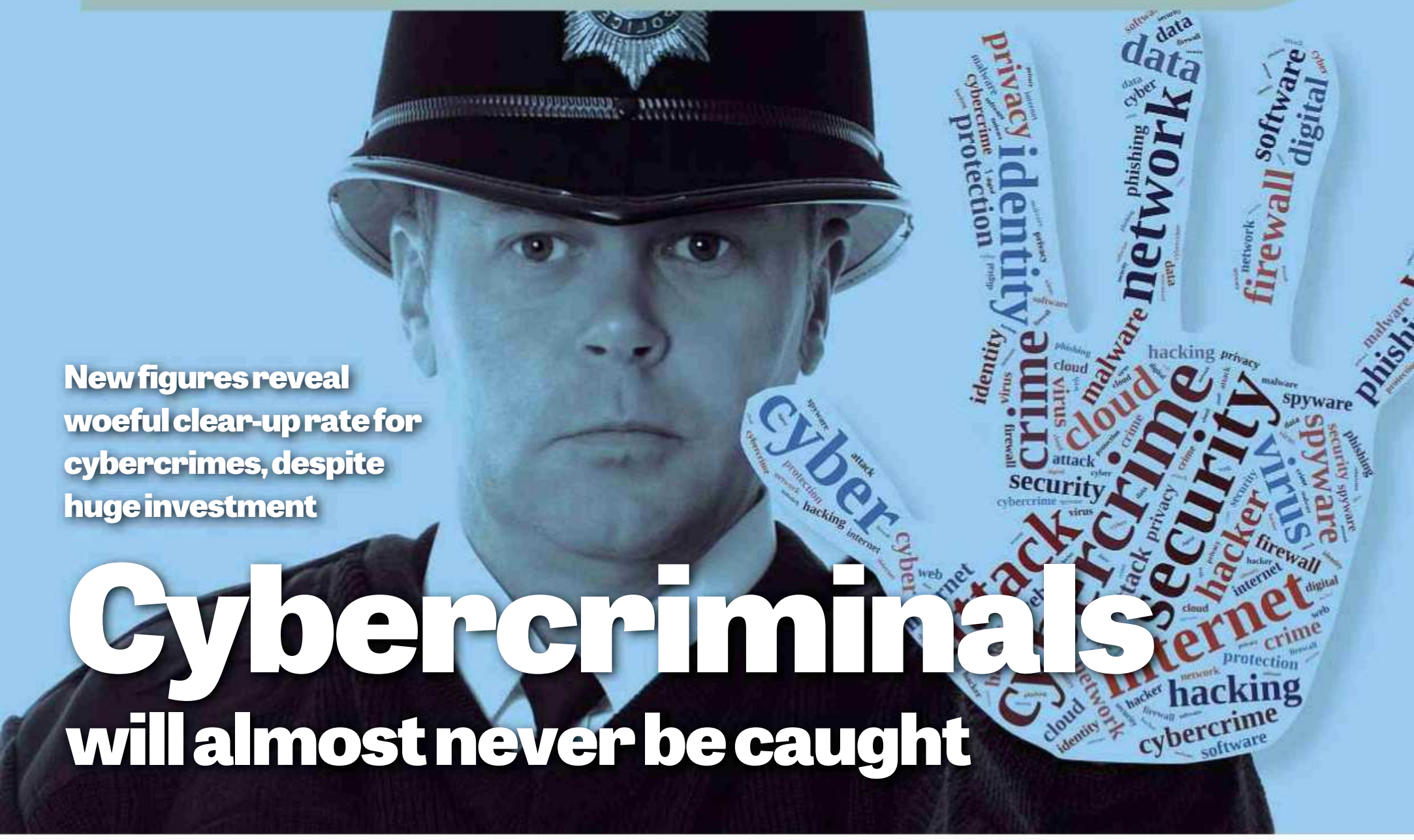
Briefing

Background and analysis on all the important news stories



New figures reveal woeful clear-up rate for cybercrimes, despite huge investment

Cybercriminals will almost never be caught

THE UK POLICE almost never pursue a prosecution for cybercrime, according to figures that show a decline in the number of people prosecuted under the Computer Misuse Act.

According to official figures from 2017, the latest available, only 47 people were prosecuted for computer misuse crimes, down 18% on 2016's 57 prosecutions and 61 in 2015.

Despite increased funding as part of a £1.9 billion plan to improve cybercrime policing, companies working with victims say they rarely see any action from investigations – even if the police think their cases are worth the effort.

"Prosecutions do seem to be going down, albeit from a proportionate point of view of not very many to less than not very many," said Richard Breavington of law firm RPC legal, which advises businesses that have suffered online attacks.

"It's a mismatch because the vast, vast bulk of cyber incidents that we come across never lead to a prosecution and there's no real likelihood that they ever will."

Murky statistics

The imbalance between the level of computer crime and the number of cases resolved has been a problem for several years, with the National Audit Office last year calling for greater attention to cybercrime attacks such as online fraud.

Official figures have been hard to pin down because not all incidents are recorded and many offences would not be prosecuted under the Computer Misuse Act – for example, traffic interception falls under the Regulation of Investigatory Powers Act 2000.

Nevertheless, the Computer Misuse Act is used for prosecutions relating to distributed denial-of-service (DDoS) attacks, malware and hacks, which are the starting point for many online frauds.

ABOVE Official statistics show that only 47 people were prosecuted for computer misuse crimes in 2017

According to the Office of National Statistics, there were 1.2 million incidents of computer misuse in the UK in the year to March 2018, on top of online fraud cases numbering up to 3.2 million. However, few of those see much more than a cursory investigation, as noted by watchdogs from the National Audit Office (NAO).

"For too long, as a low-value but high-volume crime, online fraud has been overlooked by government, law enforcement and industry," the NAO said last summer in a stinging report on tackling cybercrime.

"The true cost of online fraud is unknown, but is likely to be billions of pounds," the NAO lamented. "The estimate was that individuals lost around £10 billion and the private sector around £144 billion to fraud in 2016."

The situation means that companies can no longer really rely on the police to control cybercrime and must increasingly look to in-house

teams for protection and the growing cyber insurance industry for recompense when things go wrong.

"Police forces are doing their best with the resources they have but the scale of the problem means businesses cannot necessarily rely on the police to really help them when there is a cybercrime," said Breavington.

Jurisdiction jeopardy

What is increasingly apparent is how many cases are simply not followed up because they're too difficult or have no prospect of leading to conviction – particularly if the criminals are based overseas.

"When either the victims or perpetrators or evidence (especially if it's a platform) was outside of the UK, one of two things happened," explained Carl Miller, who recently published a book looking at the social disruption in the digital age called *The Death of the Gods: The New Global Power Grab*, which includes multiple interviews with frontline cybercrime officers.

> "We're living through the worst crisis in law enforcement in the history of modern policing"

"Either it was traced to a cooperative jurisdiction where we might have something called a 'mutual legal assistance treaty' and then it just slowed the investigation down and made it more expensive," he said. "Or, if it went to a non-cooperative jurisdiction [and] it just killed the investigation."

Miller said the impression he got from officers was that they were fighting a losing battle on many fronts and that it was simply impossible to make an arrest if the crime was perpetrated from Russia, for example. "My impression from many interviews and on-the-ground experience is that we're living through the worst crisis of law enforcement in the history of modern policing," he said.

Police chiefs, meanwhile, have called on other areas of government, as well as web giants such as Facebook, to work more closely together or risk losing the battle.

"I can't be optimistic until I see us working across government departments – from the Ministry of Justice to the Department for Communities and the Home Office," the UK's leading cyber officer Stephen Kavanagh told Miller.

"This is not just a law enforcement problem, this is a social problem."

Five stories not to miss

1 Microsoft to put Windows 8 Store out of misery

Like calling "last orders" in a drab, empty pub, Microsoft has laid out its timeline for killing off the Windows 8 Store, with no new apps to be accepted after 31 October. In July 2019, it will stop distributing updates for apps on Windows Phone 8.x devices or earlier, while the company will stop distributing app updates to Windows 8 and 8.1 devices in July 2023.

2 Google facing action over location tracking

Google is facing fresh concerns and legal action after it emerged the firm was storing users' location data even when they had disabled Location History. Google updated its terms and conditions to say that "some location data may be saved as part of your activity on other services, like Search and Maps".

3 Facebook introduces trust score for end users

Facebook admitted it was introducing tools to counter fake news with a system that allocated users with a "trustworthiness score" to prevent bogus accounts from sharing posts on the site. The company explained that the tool was intended to make sure "our fight against misinformation is as effective as possible".

4 Broadband bonus boast

Broadband's value to the UK economy was illustrated by figures that suggest the rollout of superfast broadband has contributed a £690 million net increase in gross value to the UK economy over and above the state's investment. DCMS figures show businesses in areas with superfast connections saw a £12.28 benefit for every £1 invested by the government and local authorities.

5 Half of UK councils using unsupported server software

Cash-strapped local authorities are running unsupported and insecure server software, according to figures acquired through freedom of information requests. Figures obtained by services supplier Comparex show 46% of councils still use one or more of Windows Server 2000, Windows Server 2003 or Microsoft SQL Server 2005.

Unveiled

The key details of this month's hot hardware releases

Lenovo ThinkPad P1

Lenovo took the wraps off what it describes as its thinnest, lightest mobile workstation: the ThinkPad P1.

Built around Intel's eighth-generation Xeon and Core processors (including the Core i9), the ThinkPad P1 is aimed squarely at power users who need desktop-grade power within an 18.4mm thick frame.

Alongside clock speeds of up to 4.6GHz, the P1 can have up to 64GB of DDR4-2667 memory, with or without the ECC error-correcting features, and up to 4TB of solid state storage.

Graphics performance gets a boost from Nvidia Quadro P1000 or P2000 professional cards and there's a generous 80Wh battery, although Lenovo hasn't made any promises regarding battery life.

Weighing in at 1.7kg, the P1 boasts a 15.4in screen, with two different models featuring different display specs. The P1 FHD delivers 300cd/m² brightness and a 1,920 x 1,080 resolution, while the P1 4K UHD boosts the brightness to 400cd/m² and adds touch capability, 100% of Adobe's colour palette and a 3,840 x 2,160 resolution.

Lenovo also announced a big brother to the P1 aimed at power-hungry users in the oil, gas and finance industries. The P72 is a chunky desktop replacement that focuses on performance over form, evident in specs that include up to 128GB of memory, Quadro graphics and 6TB of storage.

KEY DIGITS AND DETAILS

Price From $1,949
Availability Now
Processors 8th generation Intel Core or Xeon processors
Memory Up to 64GB
Graphics Nvidia Quadro P1000 or P2000
Storage Up to 4TB
Ports 2 x USB 3.1, 2 x Thunderbolt, HDMI
Dimensions 362 x 246 x 18.4mm

ABOVE The ThinkPad P1 may have a thin 18.4mm frame, but the specs will appeal to power users

HP Omen Obelisk

HP might not be a renowned gaming brand, but its latest Omen range aims to correct that, claiming to be the first to ship a system packing Nvidia's GeForce RTX 20 Series of GPUs.

Pre-configured machines can include Nvidia's GeForce RTX 2080, which has set the gaming world alight thanks to its ray-tracing abilities, while systems can be built on anything up to eighth-generation Intel Core or AMD Ryzen 7 processors.

HP has partnered with gaming specialist HyperX for memory, with all systems shipping with Fury DDR4-2666 modules, with capacity for up to 32GB of RAM.

The design, however, may not be to everyone's taste. The Omen Obelisk comes in a punchy red and black tower, with tool-less access to the interior and a pair of easily removable 3.5in drives. It has space for a full-length graphics card and industry-standard ATX power supplies.

HP also announced it would later this year launch the Omen Game Stream feature, which allows Omen machines to stream to other Windows and Android devices.

KEY DIGITS AND DETAILS

Price From $849.99
Availability September
Processor Up to Intel Core six core or AMD Ryzen eight core
Memory Up to 32GB
Graphics Nvidia GeForce RTX 2080
Storage options PCIe, NVMe, SSD, dual storage (SSD and hard disk), triple storage (SSD and 2 x hard disks), single hard disk, or hard disk plus Intel Optane

RIGHT A tool-less design makes it easy to get into the Omen Obelisk

Intel NUCs

Intel's mini PC range has been given a refresh with two new models and kits that can be tailored to meet customers' needs.

Intel has focused on making the latest iterations of its diminutive devices more flexible, with a blend of price and performance that targets general purpose computer users, but has enough power for casual gaming.

The two new off-the-shelf models – the NUC8i3CYSM and NUC8i3CYSN – are the first mainstream NUCs with discrete graphics in the shape of a Radeon 540 GPU.

Intel explains that the Windows 10 devices should run most popular games at 1080p, while there's also either 4GB or 8GB of memory on board, as well as 1TB of storage.

While the configure-your-own, palm-sized devices have often lacked power, the latest kits also include options for Intel's latest eighth-generation Core i7 processors, with the devices being touted as a space-saving alternative to a full-blown desktop.

KEY DIGITS AND DETAILS

For the NUC8i3CYSM
Price To be confirmed
Availability Either September or October 2018
Processor Intel Core i3-8121U upwards
Memory 8GB
Graphics Radeon 540
Storage 8GB
Ports 4 x USB 3

LEFT The Intel mini PCs are the first to have discrete graphics and can run games at 1080p

Home Office seeks Brexit IT "magician"

With Brexit rapidly approaching, the successful candidate could face a gargantuan organisational task

EXPERTS HAVE REACTED with astonishment to the last-minute job advertisement seeking someone to head up the Home Office's Brexit IT implementation.

With seven months until the UK could bow out of Europe, the Home Office has advertised for a EU Exit Technology Delivery Lead to work across multiple projects – primarily focused on border control, immigration and biometric projects.

According to the Home Office, the successful candidate would be responsible for the EU exit strategy, which sits "atop and across its existing change portfolios".

"As UK prepares to leave the EU the demand is likely to leverage new capabilities already planned for delivery, but it could also require significant changes to existing plans, and the standing up of entirely new projects," the job advert continues. "The activities will reach across structural boundaries."

According to experts, such a role would ideally have been filled as soon after the EU referendum as possible – not left for two years, leaving the successful candidate with a massive task and uncertain deadlines. "It does seem very late, considering what the remit of the job is," said Dr Pasi Ahonen, a lecturer in organisational management and human resources at the University of Essex.

ABOVE Uncertain deadlines and an unclear strategy mean a magic wand may be required

"Someone is supposed to come in, into a completely new role that rests 'on top' of the existing organisation, combine various elements of it for a particular purpose (EU exit) and make a success of it."

Ahonen pointed the finger at former Brexit secretary David Davis for delays that make the job an impossible task in the time frame. "This job should have been created immediately when the Brexit department was created," he explained. "It is just that the remit and delivery demands are almost immediate, which is just simply not going to happen."

Although the role appears to form part of a change in the way the government plans to approach IT projects – with a move towards more in-house management – there are concerns that the new recruit could inherit an unworkable plan. "There seems to be a very clear sense of the strategic direction and not very much idea in-house on how to implement the strategy," said Ahonen. "Whoever takes on the job will have to be a bit of a magician."

The salary of around £100,000 also drew criticism on social media, with cynics saying it was too low for such a Herculean task. To highlight the scale of the role, the Home Office said annually its systems support over 3 million visa applications, checks on 100 million border crossings, 5 million passport applications and 140 million police checks on people and property.

Union warns of rise in work snooping

TRADE UNION LEADERS have warned companies that increased snooping in the workplace will alienate staff and could be legally problematic under GDPR.

According to research from the Trade Union Congress (TUC), over half of respondents to a survey of 2,100 workers said they were being monitored at work, while new technologies monitoring individuals' web and app usage was a worrying trend.

"One in four thought location tracking was being used in the workplace, for example, and overall I think the findings were surprisingly high," Kate Bell, the TUC's head of economics and social affairs, told *PC Pro*.

BELOW Companies could be crossing a line and straying into snooping

"Some of the stuff we saw in qualitative research, such as focus groups, were things like having CCTV on in break rooms, but we were also talking to call centre staff that were being asked to monitor their employees' social media feeds," Bell said. "One respondent in particular wasn't happy and said it was not relevant to her staff's work."

As well as creating an ambience of mistrust in the workplace, the TUC said the research showed that many companies were not sufficiently open about what was actually being collected. "Often people felt that they hadn't been informed or consulted," said Bell.

"It's crossing the line between what is a legitimate work interest – where you can justify why it's legitimate – and where you're straying into snooping. The landscape is becoming increasingly blurred and technologies such as keystroke loggers make it much easier for employers to stray into dodgy territories," Bell continued.

With the General Data Protection Regulation in effect, the TUC believes employees should be far clearer with staff exactly what is being collected or face potential fines.

"Employers need to know that they can only collect and keep information for limited purposes," said Bell.

PC Probe

Face facts: it's a free-for-all

Police and private security firms are routinely using facial recognition – but who, asks Stewart Mitchell, is checking it's being used legally?

Tracking citizens via face recognition was once a dystopian fantasy – now the tech is advancing so fast it is being deployed without a proper legal checks

That's the opinion of privacy advocates Big Brother Watch (BBW), which has taken the Metropolitan Police to court over its trials of technology that uses live video footage of public spaces to identify passers-by against a "watchlist" of people of interest.

"The police are using live facial recognition to subject every passer-by to a highly invasive biometric identity check, akin to a fingerprint or DNA check, often without their knowledge or consent," BBW's legal and policy officer, Griff Ferris, told *PC Pro*. "Despite the lack of any legal basis for the use of this authoritarian technology, and despite significant concerns that its use infringes people's human rights, the Metropolitan Police has announced it plans to use live facial recognition several more times this year. We're hoping the court will intervene to stop this lawless technology."

While it's sometimes tempting to dismiss privacy groups as reactionary, many organisations are concerned about the unfettered rise of face recognition, including one of the watchdogs charged with overseeing deployments.

"The shortcoming in terms of the legislation is the question of legality," Tony Porter, the government-appointed Surveillance Camera Commissioner, told us.

"On the one hand, the state will claim it's operating under common law for policing purposes and therefore the use of technology is entirely appropriate.

"The opposing view is that common law provides none of the protections that are outlined within the European human rights articles, so it doesn't provide a clarity in law under which the police or the state ought to be able to protect themselves."

According to Porter, legislation has once again failed to keep pace with technology. "You're reducing a member of the public to a digital signature that can be used, migrated and cross checked," he said.

"That is a massively different paradigm to a simple face capture and so raises a lot of questions about legality. What is the legal basis against which the capability is being deployed at the moment?

"The Data Protection Act doesn't provide it, there's a query over whether the Protection of Freedoms Act does. The government needs to say 'This isn't going away – we need to look at the legitimacy of using this in the first place'."

Diluted regulation

The lack of legal clarity is mirrored by a regulatory system where no central body takes responsibility for face recognition. Instead, the technology flops haphazardly across the remits of at least three separate watchdogs, none of which has much power to address abuse.

The Information Commissioner's Office, the Biometrics Commissioner and Porter's Surveillance Camera regulating body all have some jurisdiction, but it's unclear who would lead an investigation into abuse.

"At the moment the biometrics regulator clearly has responsibility under the Protection of Freedoms Act for certain types of biometrics – such as DNA – but has no responsibility for facial recognition or data analysis for biometrics," Porter said. "That is something that's an issue the government may look at, or not."

> "The lack of legal clarity is mirrored by a regulatory system where no central body takes responsibility"

The Information Commissioner has a role in biometrics under the Data Protection Act, and can issue stop orders - but only where data is being processed improperly.

The Surveillance Camera Commission, meanwhile, operates under the Protection of Freedoms Act and Surveillance Camera Code. While Porter can't issue fines, he was at least recently given the power to reveal where investigations had broken the code.

"Where a relevant authority, be it a police or crime agency or local authority use biometrics and don't comply to the code, it is disclosable to the CPS and defence lawyers," said Porter.

"That is a game changer - it is absolutely imperative investigations can demonstrate that they pay regard to the code. I can't issue a fine but a court can stop a prosecution and that, for the police, is more damaging from an integrity point of view to an organisation than a fine."

Doubts over accuracy

The police claim that tracking helps catch criminals more quickly, although widespread reports about the current system's accuracy undermine the theory.

LEFT Question marks hang over the effectiveness of face-recognition technology

"Facial recognition technology has the potential to help us disrupt crime networks and identify people who pose a threat to the public," Chief Constable Mike Barton, National Police Chiefs' Council lead for crime operations told us in a statement. "The public would expect the police to consider all new technologies that could make them safer. Any wider rollout of this technology must be based on evidence showing it to be effective with sufficient safeguards and oversight."

According to Big Brother Watch, the use of face recognition has so far resulted in no arrests, although several false matches have meant passers-by were stopped, searched and asked to produce ID. The Met says it plans ten further trials before an evaluation at the end of 2018.

Even in public tests, there remains a big difference between the police's account of how the technology is deployed and those of expert witnesses. For example, in a recent trial in an East London shopping centre, the police claimed "the technology was used overtly. Information leaflets were handed to members of the public, posters were placed in the area and officers engaged with members of the public to explain the process and technology."

It's a stark contrast to the views of privacy group Liberty, which attended the trial as a witness and reported problems with the process. "Although the operation made for an intimidating scene with a line of police officers and dogs alongside a knife-arch – a sort of walkthrough metal detector – there was actually alarmingly little information about the use of facial recognition technology," said Hannah Couchman, an advocacy and policy officer at Liberty, in a report on the trial.

"Having been told there would be plenty of posters and information leaflets, we saw two small posters, positioned below people's sightlines and just one leaflet being given out – to a man who was incorrectly apprehended, after the fact."

Who's on the watchlist?

Another concern for regulators and privacy groups is the lack of transparency at several stages of the face recognition process, not least the databases and watchlists the police use to initiate searches on live camera feeds.

At present, it's not clear which types of suspect could be identified by face recognition. "The creation of a watchlist, by whom and for what, is a really interesting question," said Porter. "What are the standards? What are the processes, What is the understanding of the public? What is the compliance of the state?

"The system could jump from the creation of a watchlist to algorithms being used. Do we know if it's accurate? Do we care if it's accurate? Is it capable of differentiating between race and ethnic minorities, age, sexuality? To all of the questions, the answer at the moment is, 'We don't know'."

The ICO has even questioned the validity of the database of images that the police use to cross reference against, questioning whether all of the images should be accessible. "The use of images collected when individuals are taken into custody is of concern; there are over 19 million images in the Police National Database," the Information Commissioner said in a blog post.

"I am considering the transparency and proportionality of retaining these photographs as a separate issue, particularly for those arrested but not charged."

Privacy International is worried the database could be used for more than just identifying suspects. "If you link the faces to databases with everybody's name on them – and this is what we see in China and the most dystopian scenario – you can say 'I want to know where this person is'," said Frederike Kaltheuner, a data exploitation expert at Privacy International.

"It's always a slippery slope and it's easy to start out with one system and then roll out a software update that's a full-on dystopian one."

Private-sector privacy problems

Face recognition has started to appear in shopping centres and other public spaces run by private firms, but there are yet more developments in the private sector that concern privacy advocates.

Take security company Trustwave, which has launched a tool that when fed with a name and image of an individual can link their social media accounts using photographs across Facebook, LinkedIn, Twitter, Instagram and other platforms.

The company says its Social Mapper is designed to help penetration testers perform social-media phishing scenarios, but it declined to comment on what safeguards it had in place to stop anyone using and abusing the software.

According to Privacy International's Kaltheuner, the tech has similarities with an app that was misused after launch.

"There was a Russian app called Find Face a couple of years ago that would allow people to take pictures on public transport and then link them to social media account to find friends, but it was quickly abused to identify sex workers and other people," she said. "The potential for abuse is endless."

"The fact that private companies possess population-level biometric databases is also very problematic."

The A-List

The best products on the market, as picked by our editors

PC PRO A-LIST

PREMIUM LAPTOPS

Dell XPS 13 9370

Ultraportable from £1,199

from dell.co.uk

This 2018 update to the all-dominant Dell XPS 13 keeps tweaks to the minimum: slimmer bezels, eighth-generation Intel Core processors and the promise of even longer battery life are the most important benefits. Just keep in mind that Dell has embraced USB-C ports at the expense of the old-fashioned Type-A variety.
REVIEW Issue 284, p54

ALTERNATIVES — NEW ENTRY

Apple MacBook Pro 15in (2018)

A machine for true power users with amazing specifications, including that infamous Core i9 – and up to 4TB of SSD storage. **From £2,349 from apple.com/uk**
REVIEW Issue 288, p48

Dell XPS 15

We all know what to expect from Dell's XPS 15 range, yet it continues to reign supreme – this time thanks to sheer speed, courtesy of Intel's latest chips. **From £1,299 from dell.co.uk**
REVIEW Issue 289, p62

Razer Blade 15

A gaming powerhouse as you would expect. We recommend buying one of the specs with a 144Hz Full HD screen and GeForce 1070 graphics. **From £1,700 from razer.com**
REVIEW Issue 288, p63

SMARTPHONES

OnePlus 6

Android, 64GB, £469

from oneplus.net

The OnePlus 6 is terrible news for Huawei, Samsung and Sony, because it begs one simple question: why on earth would anyone pay over £700 for a flagship phone when they can get something that's almost as good for two-thirds of the price? Yes, it lacks IP-certified waterproofing and there's no optical zoom on the camera, but this phone is gorgeous, fast and takes rather nice photos, too. **REVIEW Issue 286, p68**

ALTERNATIVES — NEW ENTRY

Apple iPhone 7

Despite the launch of the iPhone 8 and iPhone X, the iPhone 7 retains its place as the best-value Apple phone. **32GB, £549 from apple.com/uk**
REVIEW Issue 266, p54

Honor 9 Lite

A huge 18:9 display and stylish design give this budget phone a high-end look. There's even room for a dual-camera setup on the front. **£180 from store.hihonor.com/uk**
REVIEW Issue 283, p70

Asus ZenFone 5

A quite simply brilliant phone for the money, with a highly respectable camera, all the speed you need and a beautiful 6.2in screen. **£350 from asus.com/uk**
REVIEW Issue 289, p71

TABLETS

Apple iPad

9.7in tablet from £319

from apple.com/uk

While we criticise Apple – and quite rightly – for its failure to deliver a new design on this thick-bezelled basic iPad, we can't quibble about its value for money. With support for the Pencil, it's now also a viable alternative to the iPad Pro. **REVIEW Issue 285, p48**

ALTERNATIVES

Apple iPad Pro 10.5

With the Pencil and Smart Keyboard, the Pro is pricey but – for mobile workers – it's definitely worth it. **64GB, £619 from apple.com/uk**
REVIEW Issue 278, p89

Amazon Fire HD 10

A top-quality tablet for the price, with a 10.1in IPS display and solid turn of pace. Only the cameras disappoint. **32GB, £120 from pcpro.link/279hd10**
REVIEW Issue 279, p71

Huawei MediaPad M5 Pro

This stylish Android tablet comes with a stylus, 64GB of storage and plenty of power. **4G, €499 from huawei.com**
REVIEW Issue 284, p70

EVERYDAY LAPTOPS

HP Envy 13 (2018)

A bargain ultraportable, £849

from hp.com/uk

If you care about the colour accuracy of your laptop screen, this isn't for you. But, for everyone else, it's a bargain. It has buckets of power thanks to a Core i5 processor, 8GB of RAM and GeForce MX150 graphics in our review model (ah0001na), as well as the fit and finish of a luxury machine.
REVIEW Issue 288, p61

ALTERNATIVES

HP Chromebook 13 G1

A stylish and high-quality laptop, but with Chrome OS, not Windows. It's fast, has all-day battery life and won't look out of place in a boardroom. **£614 from pcpro.link/271hpc**
REVIEW Issue 271, p54

Asus ZenBook 13

A brilliant 13.3in ultraportable that packs an excellent specification into a slender 1.12kg frame – including Nvidia graphics. **£1,200 inc VAT from johnlewis.com**
REVIEW Issue 286, p58

Asus ZenBook UX410UA

A superb value 14in laptop, with the looks of a much more expensive machine. The pricier 8GB/256GB version is best, though. **£625 from pcpro.link/280zenbook**
REVIEW Issue 280, p68

ENTHUSIAST PCs

Scan Vengeance Ti

Intel Core i7-8086K PC, £2,400

from scan.co.uk

Quite aside from the bragging rights of owning a PC built around an i7-8086K chip, this machine rewards you with ridiculous frame rates thanks to 11GB GeForce GTX 1080 Ti graphics. And it comes pre-overclocked to 5GHz. Use code LN84893. **REVIEW Issue 287, p56**

CCL Reaper GT

In a world of big black boxes, the Reaper GT's all-white finish stands proud. As you'd expect, it includes some cracking components (an AMD Ryzen 2700, 16GB of RAM, a 250GB SSD and 8GB GTX 1080 graphics) with watercooling for good measure. A brilliant high-end PC. **AMD Ryzen 2 PC, £1,410 from cclonline.com REVIEW Issue 286, p80**

Palicomp Intel i7 Nebula

Palicomp's Nebula goes a different route to CCL, with an i7-8700K overclocked to 4GHz and two RAID0-optimised SSDs to accompany its GeForce 1080 graphics. The final result is a stupidly quick machine – and it includes a dazzling light show to match. **£1,650 from palicomp.co.uk REVIEW Issue 286, p84**

WORKSTATIONS

NEW ENTRY

Scan 3XS WI6000 Viz

Core i9-7980XE workstation, £4,650

from scan.co.uk

An overclocked Core i9-7980XE processor, together with 64GB of 3GHz DDR memory and Nvidia's Quadro P4000 graphics, ensured this was a great all-rounder. With a 2TB hard disk and 500GB SSD, it's a brilliant showcase for Intel's top-end CPU. **REVIEW Issue 281, p84**

Apple iMac Pro

There are no major design changes, but the new iMac Pro's internal components are a very different matter. Apple creates a compelling workstation with an octa-core Xeon processor, AMD Radeon Pro Vega 56 graphics and 32GB of ECC memory. **From £4,899 from apple.com REVIEW Issue 284, p50**

Scan 3XS WA6000 Viz

The A in this machine's name stands for AMD, with the 32-core Threadripper 2990WX CPU making its phenomenal debut. You can buy better all-rounders, but if your tasks including rendering using CPU-bound applications then it offers amazing value for money. **£4,800 from scan.co.uk REVIEW Issue 289, p59**

MONITORS

Eizo FlexScan EV2450

1080p display, £271

from pcpro.link/263eizo

A great-value 24in IPS display that offers more colour-accurate images than you've any right to expect at this price – and a reassuring five-year warranty, too. **REVIEW Issue 263, p72**

ViewSonic VP3268-4K

It's true that you can buy 32in 4K monitors for around £500, but we think it's still worth spending the extra money on this ViewSonic. In return, you get superb colour accuracy and terrific all-round quality. **£883 from pcpro.link/286view REVIEW Issue 286, p65**

Iiyama ProLite X3272UHS-B1

Looking to kit an office with 4K displays? This 32in screen is a perfect option, with image quality and value for money taking precedence over features you may never use. **£350 from box.co.uk REVIEW Issue 288, p72**

ENTHUSIAST/SMB NAS DRIVES

Synology DS918+

Four-bay NAS, £500

from laptopsdirect.co.uk

While all of Synology's NAS drives share the same great OS, with all the attendant apps, the DS918+ stole top spot in our Labs due to its horsepower, the four available drives and the sheer number of roles it can perform. **REVIEW Issue 284, p81**

Qnap TS-453Be-4G

Qnap markets the TS-453Be at businesses rather than home users – although, in our opinion, it's equally at home in both situations. It's straightforward to use and a very solid performer, as well as being extremely versatile. **£515 from pcpro.link/284qnap REVIEW Issue 284, p80**

WD My Cloud EX4100

If you're looking for a solid, speedy NAS – particularly for a small office – then take note of the affordable WD My Cloud EX4100. Despite that reasonable price, it includes four bays, and its mid-range specification can handle office duties well. **£293 from pcpro.link/284wd1 REVIEW Issue 284, p83**

WIRELESS NETWORKING

Zyxel Multy X

Mesh networking, £250

from pcpro.link/282multy

Not the smallest nodes, but that's for a reason: each one crams in a dedicated 4x4 antenna array for the backhaul alongside separate 2x2 arrays for connected clients. The result? Lighting-fast Wi-Fi and impressively wide coverage for a reasonable price. **REVIEW Issue 282, p85**

Linksys EA9500 Max-Stream

If a mesh network isn't for you, this feature-packed router is an excellent choice. It's packed with eight Gigabit Ethernet ports and can work as DLNA server. Most importantly, it delivers extremely fast speeds. **£228 from pcpro.link/288link REVIEW Issue 288, p82**

Tenda Nova MW3

Don't want to spend over £200 on a Wi-Fi upgrade? The Nova MW3 is a bargain choice, killing off notspots and spreading Wi-Fi throughout your home. It's not as fast or wide-ranging as the Zyxel Multy X, but boy does it win on value. **£92 from pcpro.link/288tenda REVIEW Issue 288, p69**

WORKGROUP PRINTERS

Xerox VersaLink C600DN

Colour laser, £780 exc VAT

from printerland.co.uk

The C600DN hit 53ppm speeds in our tests, managing 50ppm double-sided, and produced great results even on cheap 75gsm paper. Low running costs of 1.1p mono and 6.4p colour only add to its attractions. **REVIEW Issue 283, p98**

Brother HL-L9310CDW

If you can't quite afford the Xerox VersaLink C600DN, consider this good-value rival from Brother. This colour laser provides great output quality, low running costs (1.1p/7.8p) and speeds of up to 32ppm, as well as plenty of security features. **£440 exc VAT from printerbase.co.uk REVIEW Issue 283, p94**

Kyocera Ecosys M5526cdw

Low running costs and easy maintenance are the key factors here, with 1.3p per mono page and 9p for colour. Print quality is great too, even if you're kept waiting a little longer for 600dpi prints. **£376 from printerland.co.uk REVIEW Issue 279, p101**

HOME OFFICE PRINTERS

HP PageWide Pro 477dw

All-in-one inkjet, £339

from ebuyer.com

While this isn't the most compact inkjet MFP, it is one of the fastest – it hit 44.8 pages per minute in our tests. With excellent print quality and low running costs, the only thing that counts against it is that you'll need good quality paper to take advantage. **REVIEW Issue 287, p81**

Canon Pixma TX6150

Squarely aimed at home users with a creative bent, the Pixma TS6150 produces excellent photos, and quickly, too: it took 70 seconds for a borderless 6 x 4in print. With respectable running costs, it's a very classy multifunction printer for the money. **£100 from pcpro.link/287can REVIEW Issue 287, p80**

Xerox WorkCentre 6515DNI

Just like the HP, this isn't the world's smallest printer – but for a £299 colour laser, it's amazing what you get in return. Pin-sharp scanning, great all-round printing, and solid speeds of over 20ppm. Only high running costs count against it. **£299 from printerland.co.uk REVIEW Issue 287, p85**

VIDEOCONFERENCING

Polycom RealPresence Trio 8800 Collaboration Kit

Full VC kit, £1,209 exc VAT

from pcpro.link/275poly

This kit provides everything for a small business, with no need to hook it up to a laptop or mobile. It's flexible when it comes to positioning and won't be beaten for features or audio quality. **REVIEW Issue 275, p98**

Lifesize Icon 450 and Phone HD

The price is steep, but this complete VC solution makes high-quality videoconferencing a walk in the park – it's impressively easy to deploy and use, while the audio quality delivered by the four built-in mics was top notch. **£3,462 exc VAT from uk.insight.com REVIEW Issue 275, p96**

Logitech ConferenceCam Connect

If you need a portable solution for smaller rooms, this sleek device can be set up in seconds. Despite its size, it can't be faulted for quality and the price is right, too. **£243 exc VAT from pcpro.link/275log REVIEW Issue 275, p97**

BUSINESS WI-FI

DrayTek Vigor 2862Lac

Secure router, £354 exc VAT

from netxl.com

This 802.11ac router is loaded with potential, from bolstered security to a 3G/4G SIM card slot to expansive VPN options. There's almost nothing a business could ask for that it doesn't do, making it an easy choice for any switched-on SME. **REVIEW Issue 286, p100**

WatchGuard AP420

Not cheap, but SMBs wanting enterprise-class wireless security and central management will find it money well spent. The cloud portal is one of the best we've seen, performance is great and WatchGuard's WIPS delivers smart wireless security. **£647 exc VAT from broadbandbuyer.co.uk REVIEW Issue 281, p97**

TP-Link Omada EAP225 V3

A brilliantly affordable AC1350 access point that's a great budget choice for small businesses wanting to create a secure, easy-to-manage wireless network in the office. Plus, it can scale up as your needs grow. **£53 exc VAT from scan.co.uk REVIEW Issue 288, p101**

SCANNERS

Xerox DocuMate 6440

USB scanner, £353 exc VAT

from printerbase.co.uk

A brilliant choice for heavy workloads, the DocuMate 6440 hit speeds of nearly 70ppm in our tests. It also has a large ADF and versatile software. **REVIEW Issue 278, p98**

Brother ADS-3000N

Aimed at mid-sized workgroups, the ADS-3000N is a solid deal: it supports both USB and Gigabit Ethernet network connections, while offering 50ppm scan speeds, a robust 5,000-page daily duty cycle and a generous software package. **£385 exc VAT from pcpro.link/278ads REVIEW Issue 278, p94**

Plustek SmartOffice PL4080

Looking for a flatbed scanner? The PL4080 fits the bill nicely, combining a fast 40ppm duplex ADF with an A4 flatbed scanner. With Plustek's intuitive DocAction software thrown in, it's a great buy. **£345 exc VAT from grooves-inc.co.uk REVIEW Issue 278, p97**

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SECURITY SOFTWARE

Bitdefender Internet Security 2018

A stellar selection of extras, including ransomware protection, along with rock-solid antivirus protection makes this our top choice for 2018. **3 devices, 1yr, £25 from bitdefender.co.uk REVIEW Issue 279, p85**

Avast Free Antivirus

We recommend dumping Windows Defender, but if you don't want to spend a penny then Avast's superb protection makes it the best choice. Just ignore the inevitable, relentless upsell. **Free from avast.com REVIEW Issue 279, p84**

Kaspersky Internet Security 2018

The best choice for power users and tinkerers, with little different from last year's offering – but with so many features already, that's fine by us. **3 devices, 1yr, £17 from pcpro.link/279kas REVIEW Issue 279, p86**

PRODUCTIVITY SOFTWARE

Microsoft Office 2016

We'll be honest: there's very little here for anyone upgrading from Office 2013. However, Microsoft's is still the best office suite for professionals. **Home & Student, £65 from pcpro.link/254off REVIEW Issue 254, p62**

Google G Suite

Not a fully-featured alternative to Office, but it has enough core features to cover most people's needs, with extra tools available via add-ons. And it's brilliant for collaboration. **Free from docs.google.com REVIEW Issue 284, p35**

Scrivener

A brilliant package for serious writers: not only a word processor, but a tool that helps you organise your ideas and manage the process of composition from start to finish. Expensive, but a trial is available. **£32 from literatureandlatte.com REVIEW alphr.com**

CREATIVITY SOFTWARE

Adobe Creative Cloud

Adobe entrenches its position as an indispensable resource for creative professionals, with useful upgrades to the core print-orientated apps such as Photoshop, and exciting new additions for digital designers, too. **Complete plan, £50/mth from adobe.com/uk REVIEW Issue 268, p72**

Serif Affinity Photo

Don't be fooled by the low price: this is a serious rival to Adobe Photoshop in terms of features, even if it does require a hefty system to make it fly. Even professionals should give it a look. **£34 from affinity.serif.com REVIEW Issue 271, p72**

CyberLink PowerDirector 16 Ultra

An excellent tool for 360 video production and also a fine choice for normal video, with powerful plugins that boost it yet further. Not cheap but worth it. **£55 from pcpro.link/278cyb REVIEW Issue 278, p73**

RACK SERVERS

Broadberry CyberServe Xeon SP1-208S

It may only have a single CPU socket, but this is a big rack server with a Xeon Silver lining. It's a good option for SMBs, with plenty of room to grow and the ability to keep costs down by choosing your own storage devices. **£1,995 exc VAT from broadberry.co.uk REVIEW Issue 284, p94**

Lenovo ThinkSystem SR550

This is an affordable entry point to the world of Xeon Scalable processing. The design allows you to start small and expand as your needs grow, while the server management features are top-class. **£1,858 exc VAT from lenovo.com REVIEW Issue 284, p98**

PEDESTAL SERVERS

HPE Proliant ML350 Gen10

A perfect expression of HPE's "buy now, upgrade later" mantra, you can upgrade every part of the ProLiant to your needs. We reviewed the model 877621-031, which features an eight-core 2.1GHz Xeon Silver 4110 CPU, 16GB of RAM and a Smart Array RAID card – a fine starting point. **£1,799 exc VAT from ebuyer.com REVIEW Issue 288, p96**

Lenovo ThinkSystem ST550

Not as expandable as the HPE ProLiant, but this is a great hardware package – the Xeon and RAM are the same as HP, but it has a Lenovo RAID 930-8i card and a management platform that costs £23 per year. **£1,809 exc VAT from ebuyer.com REVIEW Issue 288, p97**

SECURITY

NEW ENTRY

Panda Adaptive Defense 360

We didn't think Adaptive Defense 360 could get any better – we were wrong. Panda packs this latest version to the gills with new features, including improved management, a great range of endpoint protection services and a data-monitoring policy to help GDPR. 25 seats, 1yr subscription, **£1,231 exc VAT from pandasecurity.com REVIEW Issue 289, p97**

Sophos XG 125w

NEW ENTRY

SMEs that want centralised network protection need look no further than the XG 125w: this gateway appliance is packed with security features. Appliance with 3yr TotalProtect subscription, **£1,667 exc VAT from broadbandbuyer.co.uk. REVIEW Issue 289, p98**

NAS APPLIANCES

Qnap TS-1277

Thought AMD's Ryzen processors were for consumer PCs only? Qnap clearly doesn't, as evidenced by the eight-core 3GHz Ryzen 7 1700 inside this blisteringly fast NAS appliance. The TS-1277 raced through our performance tests, but impressed just as much for deployment, data protection features and cloud backup. **Diskless, £2,436 exc VAT from span.com REVIEW Issue 283, p101**

Broadberry CyberStore 224S-WSS

The perfect platform for Windows Storage Server 2016 Standard, the CyberStore offers 24 hot-swap SFF drive bays at a great price. It also provides huge expansion potential, with seven PCI-E slots. **£5,445 exc VAT from broadberry.co.uk REVIEW Issue 274, p100**

BACKUP

Veritas Backup Exec 20

If you want total control over your data protection, Backup Exec 20 is the perfect choice. It's easy to use, yet provides a superb breadth of features, and the price is within reach of even the smallest business. **£370 per TB exc VAT from span.com REVIEW Issue 286, p98**

Backup Everything Business

The name makes quite a claim, but it supports Windows, Linux, Mac, VMware, Hyper-V, Exchange and more. Add a price that undercuts Backup Exec, and it's a tempting alternative. **£10 per month for 100GB exc VAT from backupeverything.co.uk REVIEW Issue 286, p94**

VOIP SERVICES

3CX Phone System 15.5

There's no getting away from it: 3CX Phone System is a very impressive bit of software. It's a breeze to deploy, has a great range of features, and if you're looking to host your own IP PBX then you can't go wrong. You can even get 3CX to host it in the cloud for free for a year. **8 SC Standard, £266 exc VAT (first year free) from 3cx.com REVIEW Issue 285, p94**

RingCentral Office

This cloud-based VoIP service has a great set of call-handling features. SMEs that want an easier alternative to an on-site IP PBX will find RingCentral delivers an affordable and powerful service. **From £7.99 per month exc VAT from ringcentral.co.uk REVIEW Issue 285, p97**

Profile

BACKGROUND INFO ON INNOVATIVE BRITISH COMPANIES

Small Robots

We meet the company that is replacing farm tractors with a team of robots

KEY FACTS

Small Robots is an agri-tech startup that replaces the crop-damaging and environmentally unfriendly tractors on farms with a team of robots.

FOUNDED 2017

EMPLOYEES 8

HEADQUARTERS
Portsmouth

WEBSITE
smallrobotcompany.com

Not many business ideas are born at quarter to six of a morning. Even fewer while listening to *Farming Today*. With all due respect to Radio 4's farming staple, it's hardly TED Talks.

But it was while catching a snippet of a pre-dawn interview that a seed was sown in Ben Scott-Robinson's mind. Why not replace the tractors that do so much damage to soil and crops with teams of robots?

Now a BT Tech4Good Award winner, Small Robots could be at the forefront of farming's next technological revolution. And it's all done by Tom, Dick and Harry…

Caught in the tractor beam

Ben Scott-Robinson was on the early-morning commute to his job as head of experience at Ordnance Survey when his lightbulb moment occurred. *Farming Today* was reporting from a conference, interviewing a professor "who started raving about how tractors were damaging farming, damaging the soil and causing huge amounts of pain to the industry, while not providing any benefits".

At this point, most people would have flicked over to Radio 2, but Scott-Robinson couldn't stop thinking about it. "I was really inspired by it. I remembered his name, got to work, and sent him an email. He got back to me. He had been working on this for 15 years in academia. He's tried to take it out to different companies, like John Deere [the tractor manufacturer], and they basically said 'not interested – we're doing absolutely fine selling tractors'."

However, the professor knew a man who'd just given up his job at consultancy firm Accenture to take on his father's farm, who was willing to explore alternatives to smashing up the fields with huge tyres. His name was Sam Watson Jones and the pair became co-founders of Small Robots.

"We spent six months out on the road meeting farmers… doing lots of deep qualitative research and finding out what their pain points were," Scott-Robinson explained. "We found out that farmers were much more innovative than I thought they were going to be and they're much more used to taking on technologies. They also can see the problems in farming – they can see tractors are causing damage to the environment, damage to the soil."

However, most farmers can't afford to make huge capital investments in new technology that has no proven track record. So Scott-Robinson and Watson Jones began developing the concept of Farming as a Service (FaaS) – leasing robots to farmers to do the jobs that would otherwise require heavy machinery.

Tom, Dick and Harry

There are three robots that do the grunt work on the farms: Tom, Dick and Harry. Their job is to completely automate the process of growing wheat, although as always there's a woman's brains behind the brawn: Wilma.

Tom is a monitoring robot that lives on the farm. His job is to take normal photos, infrared photos and hyperspectral imagery that help the system monitor the health of the crops, how many weeds and pests are present, and the level of chemicals in the soil.

The information from Tom is processed and used to deploy Dick. He's the maintenance bot. "If the crops need watering or fertilising, or if there's an area that needs weeding, Dick comes out and uses lasers to kill the weeds," said Scott-Robinson. He has a sci-fi method of dealing with pests, too, using a precisely targeted micro-spray to kill insects or fungi. It's far more efficient and environmentally friendly than spraying fields with pesticides.

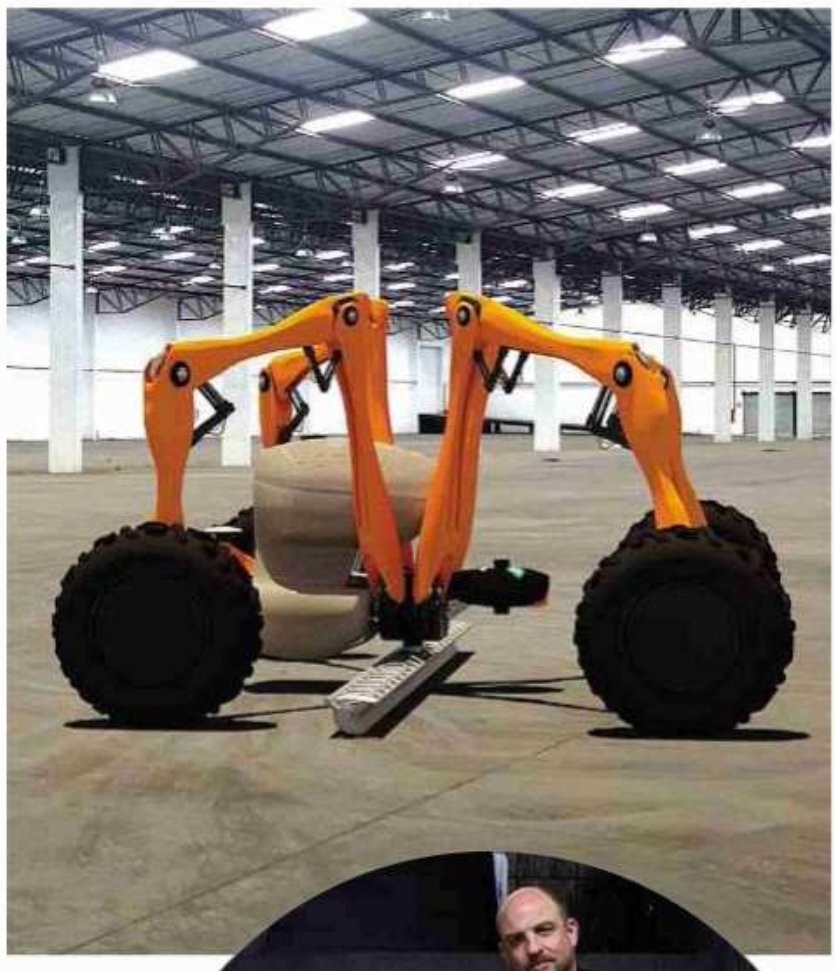
Harry is the guy who plants the crops in the first place. "If Tom comes back and says it's time to plant the crops, then Harry goes out," said Scott-Robinson. "Harry plants each plant individually. There's no ploughing involved, there's no disturbance of the soil, there's no breakup of the soil biome, there's no damage to the worms, he just plants the seeds in the ground and lets them grow."

In charge of the boys is the aforementioned Wilma, an AI-based operating system that takes data from Tom, runs it through machine learning and a rules engine, and converts it into instructions for Dick and Harry. "It means we get a per-plant view of the crop," said Scott-Robinson. "Instead of having one data point, which is the field, we suddenly have a data point which is a single plant. We can look after, care for, nurture that single plant individually."

Feeling the benefit

A farm run with robots can't fail to impress the inner geek of a *PC Pro* reader, but farmers will be more impressed with improved yield and reduced costs. Do the robots deliver?

"Ninety per cent of fuel used on a farm is in ploughing," said Scott-Robinson. "When you take heavy tractors off the



ABOVE LEFT **"Tom" can plant each plant individually with no damage to the soil**

ABOVE RIGHT **The robots can increase yield by 30 to 70%**

RIGHT **Co-founder Ben Scott-Robinson was inspired by an episode of *Farming Today***

fields, you don't need to plough any more. You're saving over 90% on the fuel and obviously it's electrically powered, so there's no carbon emissions directly. Tom, who uses the most electricity, is solar-powered so there's no emissions at all around that."

Then there are savings on pesticides and other chemicals. "Dick, with micro-spraying, uses about 5% of the chemicals used at the moment. And obviously because he's using lasers rather than chemicals for weeding, there's no chemicals at all used for that."

Better still, none of the chemicals hit the ground. At present, farmers spray crop fields with fungicides, whether they need it or not, 95% of which will go straight into the soil. "The trouble with that is within the ground you have useful mycelia – fungi which help root growth and help with the soil biome. They're all destroyed by fungicides as well."

> **"Three robots do the grunt work on the farms, completely automating the process of growing wheat"**

The yield of the crop is also much improved, claims Scott-Robinson. For one, the soil the crop is growing in hasn't been compacted by tractors, so it has a better chance of healthy root growth. As each plant is planted individually, they can be optimally spaced and at precisely the right depth. Plus, each plant is carefully covered with soil, ensuring the "emergence rate" of the crop is much higher than it would be with conventional methods.

The robots can also use every last inch of a field. If you look at a tractor-planted field, you'll notice big, muddy areas at either end of the field called headlands, where the heavy machinery is turned. The overall effect of all these measures is a 30-70% increase in yield. Those are the kind of figures that get farmers' attention.

Rural connectivity

While the robots might be at the bleeding edge of farming technology, many farms are saddled with 20th-century connectivity, with barely a whisper of 4G signal and poor fixed-line speeds. How does this seemingly data-intensive system cope with limited connectivity?

"The reason Tom has a kennel he can go back to on the farm is partially so that he can charge his batteries, but partially so he can upload his data to a local AI that's on a specially built chipset," said Scott-Robinson. "The machine-learning processing is done within the kennel. Only the processed data needs to be sent out, which is a fraction of the gigabytes Tom collects. We've got around the fact that there are very poor connections on farms by not actually having any network requirements."

It's hardly surprising, then, that the Small Robots are in big demand. Scott-Robinson says he receives around ten to 15 queries from farmers each week, and they've got 20 prepaid customers ready to roll out the first-generation robots. And we're not just talking about small holdings, either. Waitrose and the National Trust are among the list of customers preparing to roll out the technology.

Finding the capital for enough robots to service 20 customers is a challenge, but Scott-Robinson said the company was self-financed to start and has now attracted more than £1 million of non-equity funding. Innovate UK provided funding to develop Wilma; the company won a competition by the Institute of Engineering and Technology to help move its planting technology to proof of concept; and it's also completed an Indiegogo crowdfunding campaign. "We're now in the stage where we're going for seed funding," he said, referring to the type of capital rather than money for the crops themselves…

And what of the farmers, who are no longer required to spend their days sitting in tractors, bashing their way through the fields? What will they do with themselves while the robots care for the crops? Small Robots is supporting a project called Project Gingham where, rather than focusing on produce, farmers can work on products or brands. "Instead of producing wheat, they could start producing beer, or gin, or straws, or all kinds of things," said Scott-Robinson. "Not only will they get greater value out of each hectare of land they're farming, we're also helping to diversify the rural community. Those kids who wouldn't normally be interested in working on a farm… can get involved in marketing, websites, SEO… it's a lot more appealing." **BARRY COLLINS**

What about you?

Do you work for a British technology company that could be profiled in *PC Pro*? If so, get in touch: profile@pcpro.co.uk

Viewpoints

***PC Pro* readers and experts give their views on the world of technology**

Sooner or later, new tech turns us all into old fogeys

Computer systems are constantly evolving and changing; our brains, and our expectations, not so much

Darien Graham-Smith is *PC Pro*'s associate editor. If you see him looking confused in the fruit aisle, please be kind.
@dariengs

While browsing the magazines in my local supermarket the other day, I came across a publication entitled *iPad for Seniors*. Jokingly, my wife suggested that I ought to buy it. I didn't find this as amusing as she did.

You see, I'm acutely aware that I'm not the technical whizz kid I used to be. There was a time when you could plonk me down in front of any sort of computer and I'd quickly intuit my way around it. I used to feel sorry for people who needed big friendly picture-books to guide them through the world of technology. Nowadays, as I find myself struggling to get to grips with the latest apps and websites, I wonder whether I've become one of them.

The frustrating thing is, it's not me that's changed. My technical skills are as sharp as they ever were. The problem is that I developed them in an age when computing was all about the keyboard and mouse. I may have considered myself a prodigal polymath because I was happily able to hop between Windows, Macs, the Amiga Workbench and the X Window System, but the same fundamental interface elements – draggable windows and clickable icons, that sort of thing – underpinned them all.

On top of this, there was a good degree of consistency within each platform. They all had their standard controls and interface guidelines, and while this gave a lot of early software a certain identikit appearance, it meant you could fire up a program you had never seen before and instantly know how it worked.

Then the iPhone came along, and broke everything. It's hard to overstate just how seismic its impact was, in the context of interaction design, partly because it wasn't obvious at first. Apple's first go at iOS made a virtue of simplicity, as befitted the limited ambitions of a small-screened smartphone. It certainly didn't look like an interaction model capable of overturning thirty-plus years of evolved convention, and I don't suppose for a second that actually was intended as one.

Unfortunately, that's what it quickly had to become. As the productivity potential of the smartphone (and later the tablet) became apparent, Apple felt obliged to find ways to replicate the conveniences of the desktop. One of the first concessions was the arrival of Find and Replace, and what I chiefly remember about that was how clumsily it was implemented. That set the tone: through a decade of successive updates, the touch interface has become ubiquitous, but at the same time, it's been progressively bodged and extended in all sorts of arbitrary, illogical ways in order to cram in more and more features it was never designed for.

> **"I picture myself staggering home from the shop with a huge, telephone-book style copy of *Apps for Seniors*"**

It adds up to a big cultural shift. I accept that the keyboard and mouse that I grew up with are no longer where it's at. What's hard to swallow is the loss of the consistency and structure they embodied. When Microsoft set out to challenge iOS with Windows 8, it cheerfully discarded its own rule book; then came Windows 10 which, with its eternally evolving front-end, is more or less defined by ephemerality. And when I'm baffled and frustrated by today's smartphone apps, it's because I find myself faced with unfamiliar icons, illogical layouts and 11 different ways of doing the same thing.

I realise that I must sound like the stereotypical parent, moaning that modern music isn't a patch on the stuff we had back in my day. However, when it comes to interface design, some ways really are objectively better than others. I find it very telling that, ten years after the arrival of the iPhone 3G, the most expensive and advanced mobile devices – the iPad Pro, and the Samsung Galaxy Tab S4 (*see p52*) – are still the ones that try their hardest to mimic conventional laptops.

So perhaps what's most galling is the fact that none of these transgressions seem to be doing the perpetrators any harm. Case in point: the Instagram app, which I've always thought is one of the worst offenders when it comes to clear, intuitive design. Even my friends who use it regularly admit that they find it confusing and illogical. You already know the punchline: it's one of the most successful pieces of software in history, with over a billion regular users.

While it's a bit sad to realise that the world is moving on, I do find one point of reassurance in all of this. I used to assume that getting older meant losing one's mental faculties – after all, why else would old people need their own special guides to technology? But I'm coming to realise that the axioms and expectations you grew up with make a life-long impression, and it's simply helpful to have new ideas framed in terms your generation is familiar with. If things continue the way they're heading, it may not be long before I go seeking out a few such titles myself.

Which leaves only one lingering concern: what technologies will future Darien be learning about? If the kids today are internalising the idea that every digital interaction we have can be singular and arbitrary, that's going to have an effect when they grow up and start creating apps of their own. If I hope to remain on top of the world of technology, I picture myself staggering home from the shop with a huge, telephone-book style copy of *Apps for Seniors*, a 50-chapter journey through the unique, individual workings of each of the day's most popular downloads. Frankly, I suspect I'll be greatly envious of those who had nothing more complicated than an iPad to contend with.

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Enter the store, pay the man behind the counter

Greedy app developers should think twice before attempting to dodge the app store tax

Barry Collins is the co-editor of bigtechquestion.com and would happily take 0.00003% of Google's annual earnings
@bazzacollins

Sometimes it's hard not to feel a pang of sympathy for Google. Yes, $800 billion, monopoly-in-chief, "don't be evil" tax-dodging Google. This summer it got handed a $5 billion fine from the EU, partly for forcing phone makers to bundle Google services on their Android handsets. Just weeks later, the biggest game on the entire planet – *Fortnite* – decided to shun the Google Play Store and make its app available as a direct download because Android is an "open platform". Talk about getting whacked from both sides.

Fortnite is without doubt the most high-profile app to dodge the Play Store. The game generated more than $100 million in revenue in its first 90 days on the Apple App Store (where it has no choice but to comply) and is on track to earn more than $2 billion on all platforms this year, according to Bloomberg. That's even more gobsmacking when you consider that the game is free – all that revenue is raised from non-essential, cosmetic add-ons.

Of course, those zeroes after the dollar signs are the main reason why Epic Games didn't want to put *Fortnite* in the Play Store. As Epic's CEO, Tim Sweeney, explained to VentureBeat, he wasn't keen on handing over a 30% cut of all *Fortnite* revenue to Google. "If you look at it, the stores on the smartphone platforms actually do very little," he argued. "They'll put ads up in front of your game. When you search for *Fortnite* on iOS you'll often get *PUBG* or *Minecraft* ads. Whoever bought that ad in front of us is the top result when searching for *Fortnite*. It's just a bad experience."

> **"I got no further than five seconds into my first attempt to install the game before I was hit with "Installation failed""**

Sweeney's right, it's not a great experience – but nowhere near as bad as the experience he's subjecting gamers and their parents to.

Instead of using the Play Store, he's encouraging gamers to install *Fortnite* direct from the Epic website. That's largely fine if you're a fully grown adult who's streetwise enough to head straight for the Epic Games site, but not so clever if you're among the millions of eight-year-olds upwards who are going to be trying to download the game.

Whether it be dodgy videos, phishing attacks or fake SMS messages, kids will be lulled into downloading "*Fortnite*" from all kinds of iffy sources. It's already happening and it's going to explode. Epic's strategy is Christmas come early for the scammers.

It gets worse. To buy all those costumes, dances and other digital accoutrements that make the *Fortnite* Fortunes, parents can't rely on the payments they've already set up with the Google Play Store. Those password-protected credit top-ups they buy for their kids are now useless. From now on, they'll have to enter credit card or PayPal credentials afresh into *Fortnite* – assuming that the "*Fortnite*" the kids have downloaded is genuine and not a cracked version supplied by a scammer. The rip-off potential is huge.

And while Sweeney talks of the poor experience of the Google Play Store, it's not as bad as the experience I had when I attempted to install *Fortnite* on my Samsung Galaxy S7. I got no further than five seconds into my first attempt to install the game before I was hit with an "Installation failed" message, warning of "LIBRARY-IN-NOMETADATA". Answers on a postcard.

The second and third attempts got further through the process, at least reaching the screen where you have to lower your phone's security to allow this "unknown app" to pass through, but neither completed successfully. "App not installed" was the bold message I was left to work with. Only at the fourth attempt, when I'd cleared some storage space on my phone, did the game install properly. I've never hit such roadblocks with games from the Play Store, where installation snafus and storage space requirements are ironed out before the game's even listed.

So, when Sweeney moans that the mobile app stores do "very little" for their 30%, he's wrong. First, they provide consumers with greater security – download something from the official store and you can be pretty sure it's genuine (although the app stores could do a lot more to drive out imposters). Second, they provide an installation experience that doesn't leave you staring at baffling error messages or fretting over worrying messages about dropping security.

But most of all, that 30% goes towards running the biggest mobile OS on the planet. It costs serious money to develop a mobile OS, to incentivise handset manufacturers to use it and to build a developer community. Sweeney seems to think he's entitled to a free ride.

If more major app developers follow *Fortnite*'s example, I wouldn't be surprised if Google took the Apple route and banned sideloading apps on Android handsets, giving Epic no choice but to pay whatever percentage Google chooses to have its game in the store. Putting a gun to Google's head is a bad idea, even for a shoot-em-up.

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Seeking digital wellness? Then ignore the numbers

Android and iOS will track how long you spend on your phone, but that's not enough for wellness

Nicole Kobie is *PC Pro*'s Futures editor. Interrupt her playing *Mini Metro* on her phone, and you'll find yourself unhealthy – fast.
@njkobie

Do you spend too much time staring at your smartphone? Most people would say yes, including me, which is why I was intrigued to learn about so-called "digital wellness". This awful term is the latest health trend, and Google, Apple and Facebook are leaping onto the bandwagon. You can understand why: it lets them chalk up a few positive headlines amid the doom and gloom about smartphones keeping us awake at night, social media impairing mental health, and the small matter of destroying democracy.

All three companies are rolling out digital wellness tools – rather convenient timing, if you consider it. Facebook, and its Instagram sibling, will track how much time you spend in its apps, charting it in your settings. Of course, they always tracked how much time you spent scrolling through your news feed, but now they're deigning to share that data with users. If you want to cut down how long you spend on each social network, you can request a notification when you exceed a certain amount of time.

Apple and Google are providing a similar service in upcoming versions of iOS and Android, but taking it a step further by sending out weekly breakdowns of how long you spend in apps, offering better Do Not Disturb tools, and letting you block apps once you've hit a set time limit. A good thing? Sure. It's better to have these tools than not, and some of the data will likely shock social

media addicts into setting aside their phones. Plus, these tech companies have always had this data on us so it's high time they share it; any tool that helps someone break a *Candy Crush* habit is good news.

Quantifying activity does help some people make changes, even if the numbers are sometimes a bit of nonsense. Look at step counters: you don't need to walk 10,000 steps a day – there is no magic that happens between 9,999 and 10,000 that makes your stomach smaller. That goal was invented by marketers in Japan because it looked good on a poster. If you want to get fitter, you just need to walk more than you're doing now, and get at least half an hour of activity a few times a week. If you only hit 9,500 steps, so what? You're doing better than most of us.

It's more important to set a baseline. Strap on that step counter for a week and see how many steps you take; then, do more. Even then, don't get too hung up on the numbers. Plenty of step counters – be they dedicated devices, smartwatches or smartphones – aren't all that accurate. Plus, there's a difference between a slow shuffle and a quick step, especially when it comes to fitness (and getting to work on time).

That's a problem with digital-wellness trackers, too. Raw numbers are helpful, but they're shallow when it comes to understanding the impact on your mental health. These trackers can't tell if you're idly scrolling on Facebook or engaging with friends in a positive way. Just like step counters that measure footsteps but not heart rate, they don't track the meaningful metrics. There's a difference between reading *War and Peace* on your Kindle app and gorging on your Instagram feed of friends in foreign climes. The latter inevitably leaves you feeling depressed about your ex-partners and jealous of your former school mates. There's no amount of time spent in such a state that's healthy; put the rectangle of sadness down and do something else. Anything else.

Simply counting our time spent on Facebook or on an iPhone isn't enough; we need to be thoughtful about what we do. Any tool to help reduce the time we spend on social media is welcome, but we should make sure we're cutting back on the self-indulgent scrolling and bad-for-self-esteem spying, rather than the creative digital activities and communications that research suggests are actually positive for our mental health and mood. We're better off spending hours doing the latter than a few minutes doing the former. There's no right or wrong amount of time to spend on a smartphone, it's what you do that counts.

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Chromebook delivers the decisive curve ball at last

It's been a long trip, but thanks to Android apps Dick can close the lid of his Windows laptop forever

Dick Pountain is editorial fellow of *PC Pro*. His motto is "Turn On, Tune In, Turn Off Again" rather than "Drop Out".

It's been 16 months since I abandoned my ThinkPad for a Chromebook, and the adventure has gone well – with a sole exception. Regular readers may know that a pastime of mine is creating computer art, and for the past 12 years this has consisted of taking photographs; some posted to Flickr straight, but others modified to look like paintings using Photoshop Elements.

These modifications depend heavily on Photoshop's layers, which I duplicate, filter and re-merge over and again until the visual result pleases me. My discovery of Silver Efex Pro – part of the Nik filter suite Google that so magnanimously gave away – was a leap forward as its "structure" parameter gives great control over the levels of detail in a picture. However, regular readers may also know that Chromebooks don't run Photoshop (except for Express, which won't do for my purpose).

> **"These images, as well as seeming 'natural', display a deep complexity that resembles the hallucinations produced by LSD"**

I've tried Chrome OS photo editors such as Photosuite and Pixlr, which have layers, but the only one that clicked was Sumo Paint. This looks a bit like Photoshop Elements, and has some fills, distortions and filters that at first I found a bit over the top. Then one fine day I tried its Fractal Morpher filter and found a new hobby.

All Fractal Morpher does is take a simple line drawing and project it into a complex fractal figure around symmetry axes you can vary from one to 16. These aren't the shiny, 3D objects and scenes of so much online fractal art, but are strictly 2D – what grabbed me about them is their gorgeous curvature.

It's not surprising that a fractal algorithm should produce curves that are attractive, because so many curves in nature are produced by similar "algorithms" executed by animals' and plants' metabolisms. That sunflower seeds are arranged in spirals described by the Fibonacci series is old news. D'Arcy Thompson described all this 100 years ago in *On Growth and Form*; Alan Turing did some of the maths, as did the Russian Ilya Prigogine; in 1990 Prusinkiewicz and Lindenmayer, in *The Algorithmic Beauty of Plants*, even extracted some of these algorithms and recreated them in C++.

Since we're animals too, why wouldn't our brains prefer some curves over others? Modern artists I love – Picasso, Miro, Klee, Kandinsky, Malevich – all drew curves that are "right", in the sense that they could once have been alive, while many artists I like less draw "bad" curves that couldn't. Fractal Morpher produces curves that are right.

And so I started making crude but highly coloured line drawings, feeding them through Fractal Morpher and then applying my layering techniques to produce abstract paintings so psychedelically detailed that they look like they might have taken months to do, but in fact took minutes. There's a fair selection on Facebook at **pcpro.link/289face**.

I deliberately use the word psychedelic because these images, as well as seeming "natural", display a deep complexity that resembles the hallucinations produced by LSD. (And yes I did, back in the 1960s, and no, I don't nowadays.) This too is hardly surprising because LSD works on the human perceptual system, which is made up of neurons – in the eye's retina and the visual cortex – that grow and connect according to rules similar to those that govern sunflower seeds or snail shells. There's a good article by Jennifer Ouellette in *Quanta Magazine* (**pcpro.link/289lsd**) about the maths of acid hallucinations. Basic shapes like lattices, cobwebs, honeycombs, spirals and tunnels recur because they reflect connection patterns in the retina and visual cortex, where they are components of the mechanisms via which we dissect and analyse perceived scenes. Our brains don't work with Cartesian coordinates like a computer screen, but more organic forms.

So I must now be entirely happy with my graphical facilities on Chromebook, right? I wasn't quite, because Sumo Paint lacked several of the blend modes available in Photoshop I used a lot, and also the Nik filters. Then came that upgrade to Chrome OS that let me run Android Apps, and that enabled me to use Snapseed: a photo editor with a unique and intuitive UI designed for finger use on phones and tablets. And, oh joy, several of its built-in filters replicate the actions of Silver Efex Pro, in particular that key Structure parameter. The result? There's now almost nothing that I need a Windows machine to do, which feels liberating.

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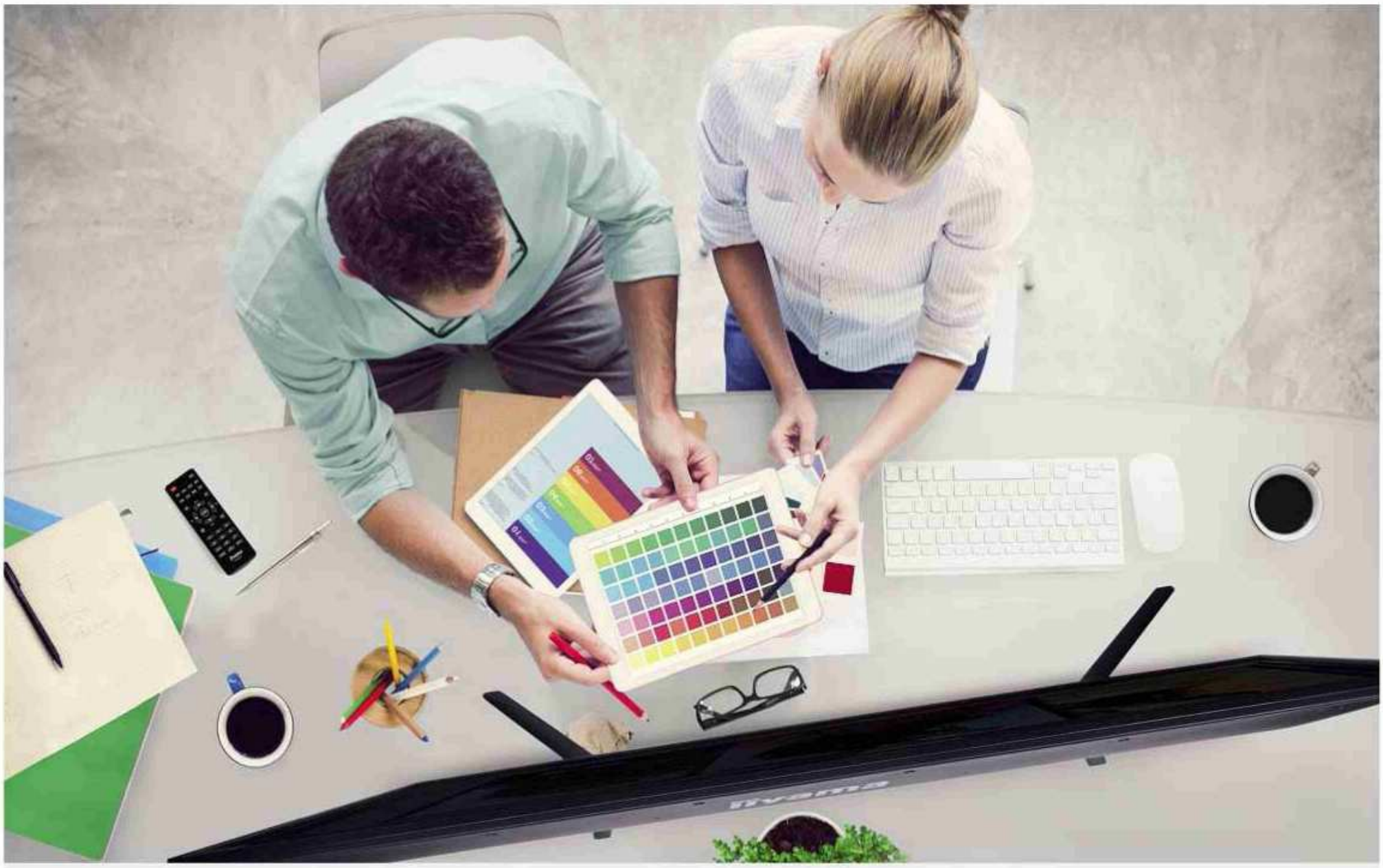

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Readers' comments

Your views and feedback from email and the web

Ring vs Nest

I was disappointed by your rave review of the Ring Video Doorbell 2 (*see issue 288, p64*), having experienced nothing but problems with it myself, despite spending a small fortune on recommended "solutions" to connectivity issues.

A simple check on Amazon shows I'm not alone. As I started typing this email I took delivery of a parcel, not because the Ring doorbell worked (it didn't) but because by a stroke of good fortune I heard some tapping on the window and asked Alexa to show me the front door. Alerts from Ring? There were none, and this despite spending a small fortune on chimes, extenders and a shiny new router to try and get the thing to work reliably.

The first shock was finding it took seven hours to charge the battery (the manual warns it takes five to ten hours) and that it is already down to 50% after just two weeks of little usage. Removing and charging the battery once the unit is secured is a nightmare, so this is a real usability issue. The company sells various solar solutions to attach to the back, which were another £50, but they pretty much invalidate the corner/angle mounting brackets needed to get a good field of view because the solar unit is much wider and taller than the mounting brackets are designed for.

The doorbell sound is so weak that it should be supplied with at least one basic chime extender to be in any way useful. As my router is upstairs, I purchased two Chime Wi-Fi extenders to be able to hear the front doorbell upstairs and downstairs – another unbudgeted £100. I couldn't find a supplier offering the £30 bundle of doorbell with chime if ordered together that your review mentioned.

The two chime extenders topped up the Ring app's "health" reading from poor to strong… for most of the time – but occasionally the app indicates that it's weak again. I have no idea why. Sometimes the unit detects motion and alerts me. Sometimes it doesn't, which is the gist of most of the complaints on Amazon. The unit is just completely unreliable, and an unreliable security system is as bad as no security system at all.

In short, I've spent close to £1,000 trying to get a basic camera doorbell working, and it doesn't. Plenty of others report the same or similar issues, yet *PC Pro* recommends the devices. I have to ask, "why?" **Ian Smith**

BELOW Reader Ian Smith is less than happy with his Ring Video Doorbell 2

***PC Pro* replies:** It sounds like you've had a very disappointing and somewhat frustrating episode. While offering our sympathies, all we can say is that what you've been through wasn't reflective of our experience. Unfortunately, an infinite number of variables from specific hardware combinations and product siting to neighbouring network interference and pure atmospherics can affect hardware performance in one location, while not being present in another. We do, however, always welcome feedback on readers' real-world experiences with any product featured in the pages of *PC Pro*. Thanks for bringing this unfortunate series of events to our attention.

Here for the long run

I'm a long-time *PC Pro* subscriber and, over the years, have witnessed lots of changes – to the editor, the content and even the fonts. As I've recently retired from IT, my wife suggested it may be time to stop my subscription. Then the October issue arrived and confirmed why I love your magazine.

It was just full of interesting articles and relevant discussion points, prodding and pushing me to examine new areas and products, while demonstrating how and why I should be using more features of my existing products.

PC Pro combines interesting content with excellent journalism, which is a much harder trick to pull off than it looks. Keep up the good work. **S F Holt**

A messaging mess

Remember the early days of texting when you could only send messages to

Star letter

I've just finished reading Jon Honeyball's comments on Dropbox and Microsoft (*see issue 288, p110*), which highlight the vendor view of just doing things regardless of what the customer wants.

We're a small marketing agency, which for ten years has used Skype Business (not Skype for Business in Office 365). Generally, it's worked fine – or did until Microsoft waded in. The option to record our own outgoing voicemail message disappeared. Then came last month's update that removed the link to Outlook Contacts, so for every call we had to look up numbers to cut and paste from Outlook.

Support was very responsive but concluded, "no, it's not there but I'm sure it will be coming… Just keep installing the new package to see when it works. Meanwhile revert back to the desktop version which, BTW, won't be supported after Q4 2018."

Alternatively, "use Skype for Business but to make external calls to landlines and mobiles not on Skype for Business you'll need to upgrade to add an external call package and soft PBX…"

Basically, Skype is now being geared up as just for Skype for Business with added costs, or Skype person-to-person IP calls. How does Microsoft get away with that? Mark Robson

Jon Honeyball replies: It gets away with it because it can. If you want VoIP, don't use Skype – get a VoIP switch like the excellent 3CX, which can be run on premises or from cloud providers. I always find that best-of-breed creates less issues, and I don't like being at the whim of a product manager and accountant in Redmond.

Our star letter writer wins a copy of Serif Affinity Photo. Five years in the making, it provides sophisticated image-editing tools and a meticulous focus on workflow.

friends on the same network? If your whole family wasn't signed up to a single provider, you could text some but would have to call others. And there was no way to set up a group so that everyone could pitch in at once. How did we ever arrange anything?

Now I look at my phone and despair. I've got some friends on Google Hangouts, family members spread across WhatsApp and Facebook Messenger, a handful of people on Apple iMessage and others on Android who are using goodness-knows-what.

Why can't all these providers get together and decide on a single open protocol that they can all sign up to, so we can talk to anyone – and everyone – using whichever client we prefer? I know the answer, of course: nobody wants to give up their market share. Yet, when none of them carries any advertising anyway, what does it really serve them? Does anyone else feel like we've taken a massive backwards step? **William Bukowski**

Fear of missing out

I know I'm not alone in wanting to say goodbye to social media. As each month goes by I think it's doing me more harm than good, as I see constant feeds of friends' idyllic holidays. Sure I'm glad for them, but it's hard not to feel jealous, too.

The trouble is, it's also by far the easiest way to keep in touch with my

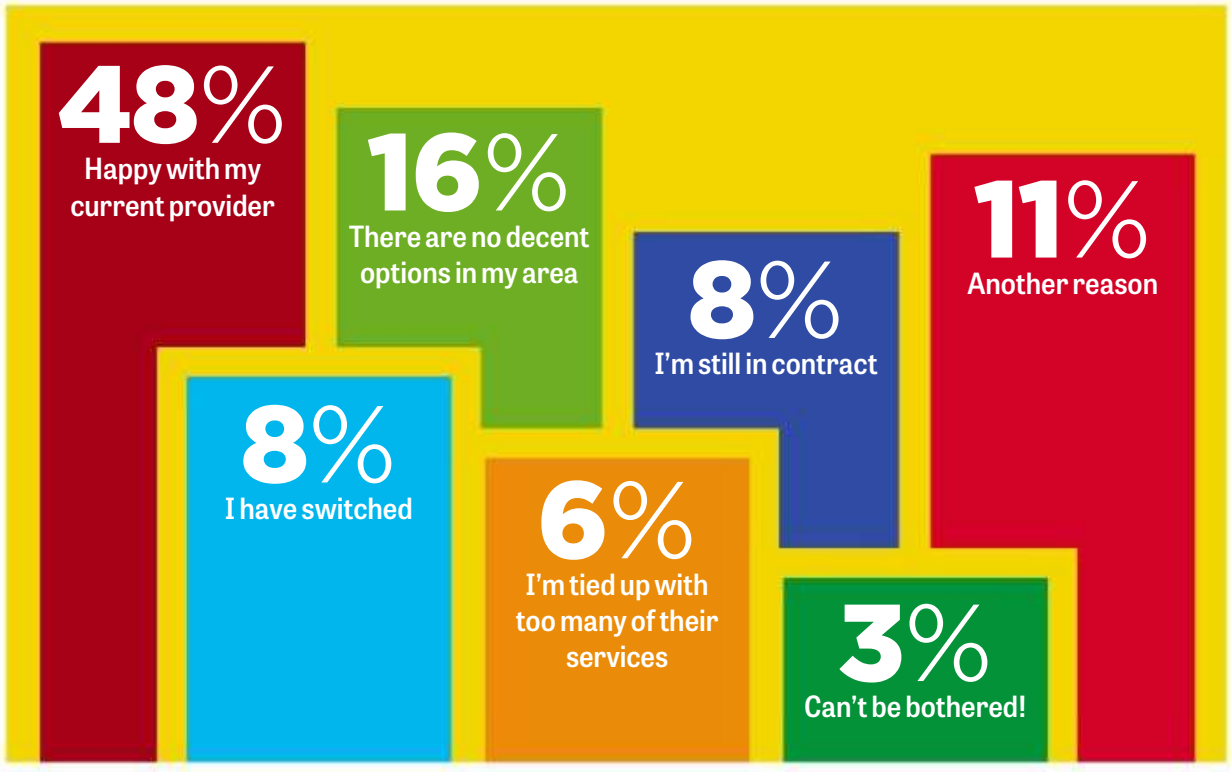
> **"Why can't all these providers get together and decide on a single open protocol that they can all sign up to?"**

friends and distant family and I'm worried that actually taking the plunge and leaving will mean the end of news and invitations. So much of our physical, "real", day-to-day lives is marshalled through social media that I'm finding it more and more difficult to take the steps necessary to extricate myself. Could any *PC Pro* readers who have successfully made the jump give me some advice? **Anonymous**

CORRECTION In last month's review of the Nest Hello (*see issue 288, p64*), we stated that Nest's cheapest subscription package was £30 per year. This was based on the in-app pricing we saw. However, this only applies if you already subscribe to other Nest services. If you don't, the cheapest price is £40 per year. Our apologies for this mistake.

Readers' poll

In light of this month's article on switching ISP (*see p40*), we asked *PC Pro* and Alphr.com readers what keeps them loyal to their provider and why they don't switch. This is what you said:



Of those who cited another reason, one said that doing so would result in a speed drop of almost 80% which, "with five people in the house using Netflix makes me worry it wouldn't cope". Another respondent plays the companies off against each other, calling them from November and convincing his current supplier to lower the price of his bundle in time for a December renewal.

It's also interesting to see what keeps people loyal to BT, which doesn't score well in our results. Part of the answer is its sports package. "BT lets me watch rugby online. That is the only reason I use them," wrote one anonymous user, which echoes our editor's feeling – except that it's BT's tennis coverage keeping him hooked.

> **"My exchange is at capacity. If I were to ever leave Sky Fibre, I would only be able to get a ADSL connection"**
> Adam Fradley

> **"BT is the only choice if we want a usable connection as we are in a FTTP-only location"**
> LadyBird

> **"[I value] first class support – something the big five suppliers have never had and probably don't care about"**
> Terry Montague

> **"Savings offered are typically introductory offers, which means changing at the end of each contract is the cheapest strategy"**
> Bob Morris

> **"ADSL can't yet match 200Mbits/sec that cable offers"**
> Trev

Join the debate

Join the growing *PC Pro* community on Facebook at facebook.com/pcpro

Get the latest news and updates by following us @pcpro

Email us at letters@pcpro.co.uk

PC PRO

TECHNOLOGY EXCELLENCE AWARDS 2018

Which brands should you buy? Which ones should you avoid? Thanks to the 5,000 participants in this year's survey, we have the answer across 13 different categories – plus our pick of the products of the year

TECHNOLOGY EXCELLENCE AWARDS

Best PC Brand
Chillblast

Best Laptop Brand
Asus

Best Tablet Brand
Apple

Best NAS Brand
Synology

Best Router Brand
DrayTek

Best Monitor Brand
Asus, Samsung

Best Printer Brand
Brother

Best Online Retailer
Scan

Best Web Host
1&1 Internet UK

Best Cloud Storage
Google Drive

Best Mobile Data Provider
Giffgaff

Best Phone Brand
Google

Best Broadband ISP
Zen Internet

PRODUCTS OF THE YEAR

Desktop PC of the Year
Palicomp Intel i7 Nebula

Tablet of the Year
Apple iPad (2018)

Phone of the Year
OnePlus 6

Software of the Year
Affinity Designer for iPad

Laptop of the Year
Dell XPS 15 2-in-1 (2018)

Business Laptop of the Year
HP EliteBook 840 G5

Workstation of the Year
Scan 3XS WI6000 Viz

Security Product of the Year
JASK

Tower Server of the Year
HPE ProLiant ML350 Gen10

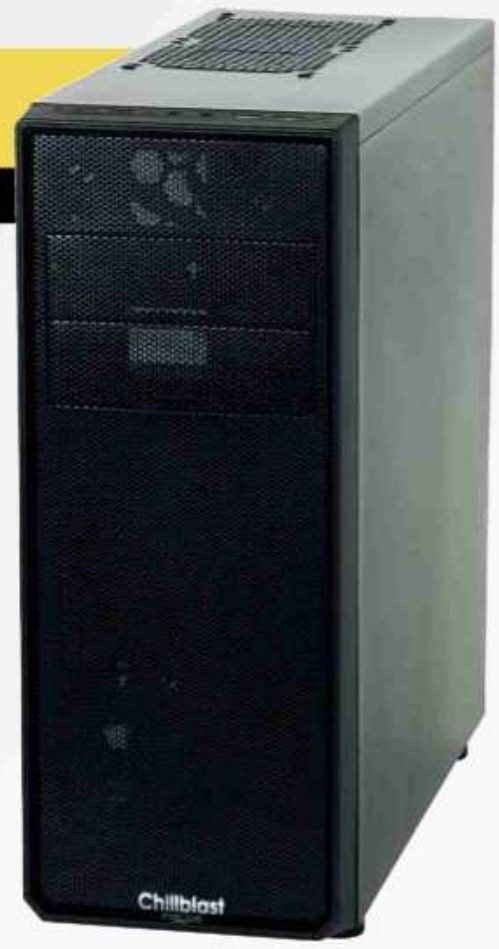
Rack Server of the Year
Broadberry CyberServe Xeon SP1-208S

Business Hardware of the Year
WatchGuard AP420

Business Software of the Year
Synology DiskStation Manager 6.2

Best PC Brand Chillblast

RECOMMENDED ACER, PC SPECIALIST



PC PRO BEST PC BRAND

We've said it many times before, but if you have a good idea of what PC specification you want then it makes sense to buy British. Or to put it another way: "[This is the] second PC I've bought from Chillblast, and I'm still using the first one," wrote Graham Moore. "When I rang for help in ordering the right spec, they put me on to the guy who actually designed the system. You couldn't do that in PC World!" No surprise, then, that 19 out of 20 Chillblast customers would buy from the company again.

Frankly, though, we were a little surprised to see that Acer produced such a strong result. This is nothing against Acer: it's just that international companies usually fare poorly in the desktop PC section of our Awards, yet this time 96% of Acer's PC buyers would stick with the company. Reading through the comments, it became clear that Acer's space-saving PCs were the biggest contributor to its success, with Richard Edwards saying he had bought three: "Two are Core i5, one i7, and they are excellent small footprint computers."

Kudos also to PC Specialist, which won its Recommended gong in recognition of its support and the speed of its products. Customers say they arrive quickly too: "Incredibly quick build time, testing and despatch," wrote Matthew Austin. "Less than a week from ordering it was in my hands ready to go."

It's also good to see Asus and Scan pushing the others hard, but Apple, Dell and Lenovo will be disappointed with their showings. It's value for money that drags Apple down – "overpriced and underspec'ed'" wrote Richard Prescott – along with only eight in ten people willing to buy again. But not everyone felt that way. "Change from Apple?" wrote Dennis Sare. "You must be joking."

	Customer support	Reliability	Value for money	Speed	Buy again?	Overall
Chillblast	93%	94%	89%	92%	95%	92%
PC Specialist	90%	88%	87%	90%	87%	89%
Acer [1]	86%	92%	88%	85%	96%	89%
Asus [1]	82%	90%	83%	86%	90%	86%
Scan	83%	86%	81%	85%	88%	85%
HP	78%	85%	83%	77%	92%	83%
Apple [1]	81%	83%	63%	81%	79%	78%
Dell	71%	81%	75%	75%	85%	78%
Lenovo	68%	76%	76%	68%	78%	73%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Laptop Brand Asus

RECOMMENDED APPLE, MICROSOFT

PC PRO BEST LAPTOP BRAND

Is Asus set to become as strong a brand for laptops as it is for motherboards? Signs are certainly promising. This is the second year in a row it's won our Best Laptop Brand award, showing that last year's breakthrough result was no fluke. "ZenBooks have been great machines for many years and this UX330UA with an 8th generation Intel CPU is just superb," wrote William Dow.

Apple retains its runner-up medal from last year, but Microsoft has a bigger reason to be cheerful with its first such award. Its gamble on the Surface range appears to be paying off, with stronger scores for performance than any other manufacturer – and it's only a fraction behind Apple for reliability too. "I absolutely love my Surface Pro," said John Clarke. "Everything just works!"

There's good news all round too. Even though Lenovo comes bottom of the table, its scores have improved since last year – it's just that everyone else's have, too. For the first time we can recall, everyone scored 80% overall or higher.

	Customer support	Reliability	Value	Battery life	Performance	Overall
Asus	77%	88%	87%	73%	85%	84%
Apple	87%	90%	64%	85%	84%	83%
Microsoft	81%	89%	68%	78%	90%	83%
Dell	77%	84%	78%	77%	82%	82%
Acer	76%	85%	84%	76%	77%	81%
Toshiba	81%	83%	84%	69%	79%	81%
HP	76%	84%	80%	74%	77%	80%
Lenovo	74%	84%	82%	73%	78%	80%

Best Tablet Brand Apple

RECOMMENDED HUAWEI, MICROSOFT, SAMSUNG

PC PRO BEST TABLET BRAND

Just as Apple retains its stranglehold on the *PC Pro* A List as our top choice for tablets, so it does among our readers. "I bought an iPad Pro and it is brilliant," said Sue Bayliss. "Not normally an Apple fan but this is good."

Apple doesn't have things all its own way. Huawei wins a Recommended award in this category for the first time, Samsung continues its fine form (*see p52 for our review of its new Galaxy Tab S4*), and Microsoft notably gained a better score than Apple for its choice of accessories (81% to 78%). "Fastest tablet I have ever owned," wrote John Edwards of his Surface tablet, "and probably the fastest computer I have owned."

Judging by the results for Acer and Linx, people tend to regret buying cheaper Android tablets. You're probably better off saving up for a Huawei or Samsung device – or buying an iPad second-hand.

	Battery life	Reliability	Ease of use	Speed	Customer support	Overall
Apple	86%	93%	91%	89%	78%	87%
Huawei [1]	89%	91%	91%	85%	71%	85%
Microsoft	75%	88%	89%	86%	75%	83%
Samsung	83%	88%	89%	81%	70%	83%
Amazon	82%	87%	83%	74%	76%	81%
Asus [1]	73%	86%	90%	83%	65%	80%
Lenovo	84%	86%	87%	78%	64%	79%
Linx [1]	86%	78%	86%	65%	61%	75%
Acer [1]	75%	74%	78%	58%	62%	70%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best NAS Brand Synology

NAS boxes used to be just that: a place to cram in hard disks, with a basic operating system offering basic functions. It's a sign of the technology's maturity that Synology's software, DSM 6.2, also wins our Business Software of the Year award (*see p38*). Forget Mastercard: this is your flexible friend.

"I seem to buy nothing but Synology NAS drives now and with good reason," said *PC Pro* subscriber Stuart Ellis. "They are well-featured and fast and I can manage all of my customers' units from anywhere. Great devices."

QNAP is hot on Synology's heels, and judging from our readers' responses it just needs to work on ease of setup. "The setup procedures could be a damned sight clearer," wrote Terry Hornsby of his QNAP drive. "It says set up a system volume, doesn't explain how. It took me three attempts to create a volume that could be resized and supported snapshots."

For Western Digital, reliability and features appear to be the crucial areas for improvement. "Some days we see it and some we don't," wrote Nigel Algar.

	Speed	Reliability	Features	Value	Overall
Synology	88%	93%	91%	85%	89%
QNAP	86%	88%	90%	80%	86%
Western Digital	85%	86%	82%	86%	86%
Netgear [1]	77%	84%	81%	79%	83%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Router Brand DrayTek

RECOMMENDED ASUS, TP-LINK

DrayTek, just like Zen Internet, is one of the perennial winners in the *PC Pro* Excellence Awards. So why are our readers such fans? "Expensive," wrote Peter Ward, "but fantastic features, especially its VPN abilities."

Asus is another former winner of our this award, and its strong showing for speed and reliability helped it win a Recommended gong this year. "It's fast and stable," said Anthony du Toit. "What more could you want?" Kudos, too, to TP-Link, which proved a popular replacement for all those low-scoring ISP-supplied routers. "So much better than my ISP's router," wrote Derek Machin, "which I gave up on after lots of hassle."

	Speed	Range	Reliability	Customer Support	Overall
DrayTek	96%	89%	94%	90%	92%
Asus	92%	87%	89%	71%	86%
TP-Link	89%	84%	88%	74%	86%
Netgear	92%	88%	88%	75%	85%
D-Link [1]	89%	88%	84%	79%	85%
Virgin Media	88%	79%	79%	72%	80%
BT Home Hub	82%	79%	79%	69%	78%
TalkTalk [1]	76%	78%	78%	63%	76%
Sky [1]	77%	67%	76%	74%	72%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Monitor Brand Asus, Samsung

You only need to look at the swathes of green in the table below to realise how high the standard of monitors is – almost everyone who took part in our survey was pleased with the quality of their monitor and would buy from the same brand again.

As such, it took something a little special to lift Asus and Samsung above the rest. For Asus, it was a mix of image quality and brand loyalty: "Expensive, but the best monitor I have ever owned," wrote Matthew Farr.

Samsung customers were equally buoyant. "This is the second Samsung monitor I've had and I've been really impressed," said Michael Tott. "[I] won't be buying a monitor from another company." Now that's loyalty.

	Image quality	Reliability	Value	Customer support	Overall
Asus	93%	93%	86%	80%	90%
Samsung	93%	95%	88%	81%	90%
BenQ	92%	92%	90%	78%	89%
AOC	90%	94%	90%	76%	89%
Iiyama	90%	93%	89%	76%	89%
Dell	92%	93%	82%	78%	89%
Acer	91%	91%	88%	73%	88%
LG	89%	91%	87%	75%	87%
Philips [1]	92%	90%	87%	63%	86%
HP	87%	91%	81%	75%	85%
Lenovo [1]	84%	88%	88%	69%	85%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Printer Brand Brother

Brother sees its third successive year at the summit of the printer world, scoring highly in every single category – indeed, compare it to any other brand on these pages and it would be a contender. Its print quality and reliability set the bar high for the rest of the manufacturers, with 96% of its customers happy to buy this brand again. David Jones typified our readers' feelings: "Excellent printer," he wrote, "never lets me down."

HP takes second place, with most of its customers proving loyal. Indeed, out of the 385 people who bought its printers, 360 said they would buy from HP again. So what can it improve to catch up with Brother? Top of the list is customer support: "Difficult or impossible to talk to if you have a problem," said Richard Price.

Across the board, only Brother customers appear to be fully satisfied with value for money, which includes running costs. Ink costs in particular continue to be a source of frustration. HP and Epson have introduced subscription plans to solve this, but these aren't universally praised. "I love [HP's] Instant Ink scheme," said Brenden Turner, but Alexander Lambton wasn't so impressed. "I purchased the printer and they forced me into a payment plan. I refused to continue it and they locked me out of the printer."

	Print quality	Reliability	Value	Speed	Customer Support	Overall
Brother	94%	93%	91%	91%	88%	92%
HP	89%	86%	82%	83%	75%	85%
Epson	89%	87%	81%	80%	69%	83%
Canon	89%	86%	77%	77%	69%	82%
Samsung	90%	85%	84%	86%	62%	82%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Online Retailer Scan

RECOMMENDED AMAZON, JOHN LEWIS, NOVATECH, PC SPECIALIST

PC PRO BEST ONLINE RETAILER

Safe to say that Scan has some loyal customers. "Full marks to Scan, they have never let me down in all the years that I have been dealing with them," wrote Stephen Tansley. "Based on past experiences, I will always order from Scan, even if there is a slightly cheaper option," pitched in loyal customer Ross D Armstrong. "They never disappoint and I wholeheartedly recommend them to anyone who will listen."

This level of fervour pushed Scan beyond the reach of the chasing pack, and with names that include both Amazon and John Lewis that's quite an achievement. "Amazon sets the standard for other retailers to follow," said Graham Steel. Gary Barnet agrees. "Even though Amazon is also a portal for other vendors to sell their goods, Amazon's customer service is something a lot of other companies need to emulate."

Amazon might have done even better but for one issue: "Its packaging of hard drives is a disgrace," wrote David Armstrong. "It delivered one drive with just the address label directly on the electrostatic bag."

That's not a practice we'd expect to see from our more specialist award winners, namely Novatech and PC Specialist. "Novatech's customer support is excellent," wrote Nigel Marchant, adding that it includes live technical advice. "[It's an] excellent local company providing top class service."

This sentiment was echoed from PC Specialist customer Eileen Wallis. "Outstanding customer service," she said. "[They're] always available by phone or email, and very competent and helpful."

	Customer service	Delivery	Customer support	Overall satisfaction	Overall
Scan	92%	92%	91%	93%	92%
John Lewis	92%	91%	89%	93%	91%
Novatech	92%	92%	88%	93%	91%
PC Specialist	92%	88%	89%	93%	91%
Amazon	90%	93%	88%	91%	91%
Printerland	92%	91%	85%	92%	90%
CCLonline.co.uk	91%	88%	87%	90%	89%
Overclockers UK	88%	88%	87%	88%	88%
Apple	88%	87%	87%	89%	87%
Aria	87%	89%	85%	88%	87%
Ebuyer	87%	87%	83%	88%	86%
BT Shop [1]	86%	87%	82%	86%	85%
Argos	86%	87%	81%	86%	85%
7dayshop	90%	84%	77%	89%	85%
Very	86%	87%	81%	83%	84%
Tesco	86%	84%	79%	85%	84%
Laptopsdirect.co.uk	83%	84%	79%	84%	82%
Overclock.co.uk	84%	80%	81%	83%	82%
Dell	82%	82%	81%	83%	82%
Ebay	83%	80%	77%	84%	81%
Currys	81%	82%	78%	83%	81%
Box	80%	82%	75%	83%	80%
PC World	79%	80%	75%	79%	78%

1 BT Shop includes results for both BT Shop and dabs.com

Best Web Host 1&1 Internet UK

RECOMMENDED FASTHOSTS

PC PRO BEST WEB HOST

This has been a phenomenal year for 1&1 Internet UK. We can only assume that it's been working hard on its customer service, because last year's 67% satisfaction rate has jumped to 78%, and it's also seen big improvements for reliability and speed. That means, for the first time, 1&1 takes the top prize.

"I have used [1&1] for many years and found them professional and reliable," said *PC Pro* subscriber Michael Chappell. "Even when I managed to delete a whole database they were quick in getting it restored." Not everyone was so glowing in their description of customer support ("Support is not great but then again I haven't needed much," wrote Paul Crossley), but notably 1&1 topped the charts here.

It's also notable that runner-up Fasthosts is owned by the same German company that operates 1&1 – that is, United Internet – and that tie-up is reflected in similar results across the board. With a greater focus on businesses and cloud services, Fasthosts is still run as its own brand, though.

Finally, no other company came close to the two German-owned brands. While Zen Internet has traditionally done well here, not enough of its web hosting customers responded to our survey.

	Customer support	Reliability	Speed	Value	Overall
1&1 Internet UK	78%	88%	85%	77%	84%
Fasthosts [1]	77%	88%	81%	77%	81%
123-reg.co.uk [1]	69%	81%	76%	72%	76%
GoDaddy [1]	71%	75%	73%	66%	73%
BT [1]	67%	71%	68%	58%	65%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Cloud Storage Google Drive

RECOMMENDED DROPBOX

PC PRO BEST CLOUD STORAGE

Bearing in mind that cloud storage is one of those things you only notice if things go wrong, kudos to both Google Drive and Dropbox for their consistently high scores.

Last year, they shared top honours, but 2018's survey saw Google edge ahead by the tiniest of margins. What pushed it over the line? It wasn't speed – Amazon S3 takes top spot here – but the large number of people who would recommend the service. Most of us use more than one cloud storage service, so we asked which of the services you use that you'd most recommend; just look at the contrast between Google Drive and Dropbox at the top, and the likes of Amazon Cloud Drive and iDrive towards the bottom.

Our final note concerns OneDrive. While this service is hardly tearing up trees in fourth place, that's a big improvement from last year where it came second from bottom. Judging from our readers' experiences, it's seen a speed boost and is now significantly easier to use. Could it beat Google and Dropbox next year?

	Speed	Ease of use	Most recommended [1]	Overall
Google Drive	86%	86%	74%	82%
Dropbox	85%	86%	71%	81%
Amazon S3	89%	78%	67%	78%
OneDrive	83%	82%	67%	77%
Mega	84%	84%	63%	77%
iCloud	82%	78%	61%	74%
Amazon Cloud Drive	84%	81%	49%	71%
iDrive	76%	78%	59%	71%

1 People were asked which, of all the cloud services they had tried, they would most recommend.

Best Mobile Data Giffgaff

RECOMMENDED TESCO MOBILE

PC PRO BEST MOBILE DATA

giffgaff

We reveal the UK's best broadband ISP on p43, but for many people mobile data coverage is even more vital. As with last year, it's the "virtual" networks that win. Despite piggybacking on O2's network – in fact, it's owned by O2 – Giffgaff outscores the "real" network in every key area. Likewise Tesco Mobile, which also uses the O2 network. Why the difference? Because we ask how satisfied people are; the fact they're paying less for Giffgaff than O2 may well influence their views.

	Coverage	4G coverage	Speed	Customer service	Value	Overall
Giffgaff	85%	74%	81%	82%	93%	85%
Tesco Mobile	81%	72%	79%	86%	86%	83%
iD Mobile[1]	81%	75%	76%	78%	88%	81%
Three	74%	67%	78%	71%	79%	76%
BT Mobile	77%	72%	78%	72%	78%	76%
EE	78%	72%	82%	69%	69%	75%
Virgin Media	78%	69%	78%	66%	74%	75%
O2	78%	72%	76%	71%	65%	74%
Vodafone	77%	72%	77%	67%	65%	73%
TalkTalk[1]	74%	55%	69%	60%	77%	68%

1 The sample size was between 25 and 50, so we have less confidence in the results

Best Phone Brand Google

RECOMMENDED ONEPLUS

PC PRO BEST PHONE BRAND

Since dropping the Nexus brand phones and switching to the high-end Pixel, Google has gone from strength to strength in our polls. While the exceptional camera quality score in the table below is noteworthy, we couldn't even squeeze in its best result: 100% of Pixel owners would buy the same brand again.

	Battery life	Reliability	Speed	Customer support	Camera quality	Overall
Google	85%	93%	95%	82%	93%	92%
OnePlus	89%	92%	95%	74%	84%	89%
Huawei	88%	93%	89%	68%	85%	87%
Samsung	79%	90%	88%	73%	87%	86%
Nokia[1]	84%	91%	84%	82%	78%	86%
Apple	73%	90%	87%	74%	85%	84%
Xiaomi[1]	86%	93%	88%	69%	72%	84%
Motorola	82%	89%	86%	67%	81%	84%
Lenovo[1]	84%	87%	81%	74%	78%	83%
Sony	77%	85%	83%	67%	83%	81%
HTC[1]	65%	89%	82%	77%	86%	80%
LG[1]	70%	83%	82%	65%	73%	77%

1 The sample size was between 25 and 50, so we have less confidence in the results

HOW YOU DECIDE THE WINNERS

PC Pro **doesn't decide the winners of the Technology Excellence Awards: you do. Each year, thousands of readers take part in a comprehensive three-month survey. We ask how satisfied you are with the quality of prints, reliability of your broadband, battery life of your laptop – and collate the figures to create the percentage scores you see in the tables.**

The maximum score a company can receive is 100%, where a reader declares themselves "very satisfied" with, say, customer support for their desktop PC. If they merely select satisfied, that's 80%. And so on, until they reach "very dissatisfied", which is 0%. So a score of 90% could be 30 people saying very satisfied (100%) and 30 satisfied (80%).

Previously, we've only published scores where we have feedback from at least 50 buyers of a brand . However, this year we have included scores where between 25 and 50 people have responded. The scores are still representative, but – from a statistical point of view – we can't have the same level of confidence in the results.

We also use methods to protect against "stuffing" – that is, where a manufacturer may try to bias results by encouraging only positive feedback. As a result, we believe the scores you see are ones you can trust.

From p36, we also select our own products of the year. Chosen by our editors, and those of sister brands *Alphr*, *Expert Reviews* and *IT Pro*, these are the stand-out products from the hundreds we've tested over the past 12 months.

Products of the Year 2018

Desktop PC of the Year
Palicomp Intel i7 Nebula

PC PRO BEST DESKTOP PC

"Palicomp went for it on the specs with the i7 Nebula," said Stuart Andrews, who tested all the PCs in the Labs that the Nebula ended up winning in issue 286. "It combined a Core i7-8700K with a GTX 1080 GPU, 16GB of DDR-3200 RAM and not one, but two Samsung M.2 SSDs. And just when you thought that might be going over the top, it overclocked the CPU and GPU to eke out a little extra welly. This was a system that sneered at high-performance tasks and could run games at 4K resolutions without any compromise – an incredibly powerful machine."

Tablet of the Year
Apple iPad (2018)

PC PRO BEST TABLET

We've seen some fine Android tablets this year, including the Huawei MediaPad M5 Pro and – to an extent – the Samsung Galaxy Tab S4 (*see p52*), but Apple kept its edge thanks to this 2018 refresh to the iPad. "It comes down to the price," said Jonathan Bray, reviews editor of *Expert Reviews*. "£320 for a 9.7in tablet is great in itself, but then consider its support for Apple Pencil. Factor in all the great tablet apps that come in the App Store and this is still the obvious mainstream tablet choice."

Phone of the Year
OnePlus 6

PC PRO BEST PHONE

"The OnePlus 6 embarrasses the competition from big-name rivals," boldly stated Nathan Spendelow, senior staff writer on *Expert Reviews*. "It represents everything that's great about OnePlus devices – fast performance, superb design and a cracking camera. The OnePlus 6 is a perfect, shining example that you don't need to spend over £500 for a flagship handset. I highly doubt anything will usurp the Shenzhen firm's crowning glory anytime soon."

Software of the Year
Affinity Designer for iPad

PC PRO BEST SOFTWARE

"You only need to read my review of Affinity Designer for iPad this month [*see p72*] to see why it stands out from the crowd," said Jonathan Bray. "It's not just that Serif has redesigned this from the ground up to work with an iPad, it's that it's done so for a phenomenal price and kept compatibility with Affinity Designer on other platforms. If I was Adobe, I'd be scared: Serif has shown the value of ripping up your code and starting again, and could well end up eating Adobe's lunch."

With the help of nominations from readers, our editorial team picks out their favourite products of the year across 12 different categories

in association with Alphr, Expert Reviews and IT Pro

Laptop of the Year
Dell XPS 15 2-in-1 (2018)

PC PRO BEST LAPTOP

"Up until I saw the XPS 15 2-in-1, I was cynical about large-screened convertibles," said Nathan Spendelow. "But this 2018 update changed my mind. Its Infinity Edge screen means it works well as a tablet – albeit sat on a desk, not in one hand – and looks sleek thanks to a design that slims down to 16mm at the front. It's expensive, but you're buying a top-quality laptop with a brilliant keyboard and bags of speed. Especially if you upgrade to the Core i7 version."

Business Laptop of the Year
HP EliteBook 840 G5

PC PRO BEST BUSINESS LAPTOP

"There are plenty of slim and stylish business laptops, but the EliteBook 840 G5 stands out for three reasons," said *PC Pro* editor Tim Danton. "First is the privacy filter: you can slash the viewing angles at the press of a button, so no one can snoop on your screen. The second are the sheer number of security enhancements that HP provides, including its protected BIOS. And the final one is that HP has thought about the need for easy video and web conferencing, with a third microphone that can help pick out and block ambient noise."

Workstation of the Year
Scan 3XS WI6000 Viz

PC PRO BEST WORKSTATION

For the second year running, Scan wins our Workstation of the Year award – but that shouldn't be a shock. "Scan has proven to be one of the UK's best companies at grabbing the latest workstation technology and wrapping it up in a brilliant system," said Tim Danton. "It's not just that Scan can deliver a stable and speedy pro-level system, it's that it does so for a competitive price – and allows businesses to customise it to their needs." Want the latest example? Just turn to p59.

Security Product of the Year
JASK

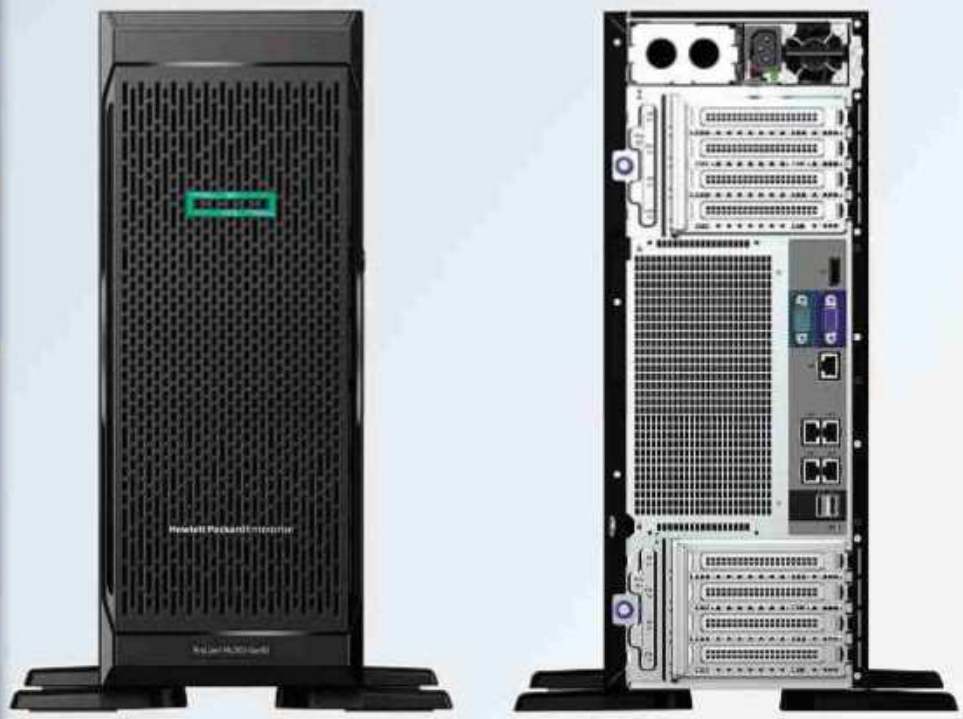
PC PRO BEST SECURITY PRODUCT

Both Davey Winder and Steve Cassidy fought for JASK to be made Security Product of the Year. Here's Davey to explain why: "JASK puts machine learning to work in order to make incident reports a real security asset rather than a liability. By accurately determining which incidents are most likely to be a real security issue, rather than a false alarm, it frees up the highly skilled analysts in the security operations centre (SOC) to deal with alerts that need analysing as soon as possible. Without this kind of solution, the SOC risks being flooded with false flags; a security risk in itself!"

Tower Server of the Year
HPE ProLiant ML350 Gen10

PC PRO BEST TOWER SERVER

Dave Mitchell tests all the latest tower servers in his role as contributing editor of *PC Pro*, so what made the tenth-generation HPE ProLiant ML350 stand out? "This is an expandable tower server that's perfectly priced for businesses of all sizes," he said, pointing out that the system he reviewed cost a very reasonable £1,799 exc VAT. "Support for dual Xeon Scalable CPUs, a huge memory capacity and a flexible storage arrangement means it will handle the most demanding workloads now and well into the future."



Rack Server of the Year
Broadberry CyberServe Xeon SP1-208S

PC PRO BEST RACK SERVER

When it comes to rack servers, we were looking for something special – a product that could do the job now but have the potential to scale with your business through sensible expansion options. Enter Broadberry. "This is a highly affordable single-socket rack server that's ideal for growing SMBs looking to upgrade to Xeon Scalable processing," said Dave Mitchell, who's clearly a fan of Intel's latest Xeon chips (*see left*). "It has plenty of room to expand and has the added bonus of allowing businesses to control costs by choosing their own storage devices."

Business Hardware of the Year
WatchGuard AP420

PC PRO BEST BUSINESS HARDWARE

The WatchGuard AP420 access point was admired by many of our Real World Computing editors, but we'll leave it to Dave Mitchell to explain why it fought off all contenders. "This is an adaptable business-class wireless AP that's packed with features and employs one of the best cloud management portals in town. But it also has a secret weapon – a third WIPS intrusion prevention radio specifically designed to keep unwanted guests out of your wireless networks." Little wonder that the AP420 has sat on our *A List* since we reviewed it back in issue 281.

Business Software of the Year
Synology DiskStation Manager 6.2

PC PRO BEST BUSINESS SOFTWARE

"A small-to-medium sized business needs trusted local storage for reliable access even in the event of internet outage, along with appropriate simple access controls and monitoring," said contributing editor Jon Honeyball, who was one of the cheerleaders for Synology DiskStation Manager 6.2. "But then to be able to add one or more cloud-based archive solutions on top of this – or add a second NAS and do file system snapshot replication? Everything an SME needs is found inside DSM 6.2, from storage, archive and private cloud through to security camera management."

BEND YOUR REALITY

AGON

G2 Rocket League Player Cameron 'Kronovi' Bills likes the immersive gaming experience on the AG322QC4

AG322QC4

144HZ

Shadow Control

FreeSync2

QHD

HDR 400

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Not satisfied with your broadband provider? Itching to get away? Here are 11 reasons to jump ship

11 reasons to sw

itch ISP right now

1 They keep putting the price up

Yes, we're looking at you BT. BT has put up the price of its broadband twice in 2018 and five times in the past four years. Of course, it's far from alone. Other providers routinely increase their prices – often using BT's own price rises as a smokescreen. Ofcom, meanwhile, will claim competition has never been healthier.

BT's constant price hikes would be more palatable if it offered the service to match. Our survey places the country's biggest broadband provider at rock bottom in the table (*see p43*).

The good news is that any mid-contract price rise gives you a get-out-of-jail-free card. You have 30 days from the time they write to you to inform you of the price increase to leave without penalty. You'll still need to give 30 days' notice – or 14 days if you're jumping ship to another provider right away – but you shouldn't be subject to the price increase in the meantime.

The tricky part is that broadband is rarely bought in isolation these days. BT, for example, offers a £5-per-month discount to mobile phone customers if they're BT Broadband subscribers. You can leave the broadband, but if you've still got the best part of two years to run on your mobile contract, you could be penalised by more than £100 for doing so.

In such instances, your best bet might be a friendly chat with the retention department...

2 You can get a cheaper fixed-price deal

If you're sick of providers implementing mid-term price increases, knowing they've probably got you by the cajones anyway, then opt for a fixed-term plan that specifically rules them out.

Recommended award winner Plusnet recently followed TalkTalk's lead by offering a fixed-price contract for 18 months. At the time of writing, Plusnet's Unlimited Fibre Extra broadband plan, for example, offers an 80Mbits/sec down, 20Mbits/sec up fibre-to-the-cabinet service (with average download speed of 66Mbits/sec) for £29 per month.

Sadly, those prices are only offered to new customers. Existing customers must check the customer portal to find out what bones they're being thrown.

The good news for existing customers? Plusnet promises a personal account review when your contract nears expiry, so you don't get thrust into an expensive standard tariff without warning.

3 There are faster speeds available (in some areas)

You might be looking at your speed test results and feeling pretty pleased with yourself, with 75Mbits/sec bursting through your router. For many people, that is indeed living the dream.

However, it's by no means the ceiling these days. Gigabit speeds are now within the reach of some people – although not yet from the mainstream providers.

It's customers of the lesser-known, regionalised providers that are getting the fastest speeds in Britain today

Thinkbroadband runs highly detailed monthly speed tests, which show that it's customers of the lesser-known, regionalised providers that are getting the fastest speeds in Britain today.

The top 10% of customers on Hyperoptic's gigabit fibre connections, for example, see speeds of 621Mbits/sec down and 576Mbits/sec up. Community Fibre's top 10% are getting 486Mbits/sec down and a staggering 824Mbits/sec up.

When it comes to the mainstream providers, the fastest connection available is from Virgin Media. The top 10% of customers on Virgin's Vivid 350 plan are seeing 357Mbits/sec down but only 22Mbits/sec up – almost 40 times slower than Community Fibre's upload speeds and a symptom of the DOCSIS technology deployed by Virgin.

4 You don't need that TV bundle any more

One of the big reasons people stick with their broadband provider is that they get it as part of a package. This is particularly the case for Sky and Virgin customers. But do you really need that TV bundle in the Netflix age?

Virgin recently upset customers when it failed to reach a deal with UKTV, resulting in ten channels – including Dave and Gold – being dropped from the service. Did the price drop? Heck no.

Sky still has the carrot of Premier League football and other premium channels to handcuff customers, but all of Sky's output can be streamed via other services. Sky's own Now TV offers all the sports channels, Sky Atlantic and access to its movie archive – without contract and often at prices far cheaper than a Sky satellite package. You can stream the service from any broadband provider and a multitude of devices.

In other words, the TV bundle isn't the ball and chain it once was.

A recent Ofcom report found the number of UK subscriptions to television streaming services such as Netflix had overtaken those to traditional pay television for the first time. The days of being a social pariah because you haven't got satellite or cable are long gone.

5 You're bored of bad bundled routers

To be fair, the standard of routers supplied by the big boys has improved markedly over the years. Most aren't the "throw it straight in the cupboard under the stairs" piece of landfill they were five or ten years ago. That said, they're still not great.

If it's been a few years since you switched broadband provider, the process isn't as dreadful as it was in the past

AVM's FritzBox routers have, on the other hand, always been well received by the *PC Pro*'s Reviews team, both for their turn of speed and their breadth of features. AVM also won a recommended award in the Best Router category of our own awards last year, but didn't have enough respondents to make the cut in this year's gongs.

Zen Internet – our overall broadband winner since time began – supplies FritzBox routers with many of its tariffs. Bundled equipment doesn't have to be bad.

6 You're less likely to get fake support calls

Customers of the big broadband providers are probably well used to the "I'm calling from your broadband support team" drill – about six times a week. TalkTalk customers are particularly prone to this menace. Two years ago, three employees who worked for TalkTalk's Indian call-centre contractor were arrested on suspicion of selling TalkTalk customer data.

According to a BBC report, this data was "obtained by a criminal gang, with USB sticks full of data trading hands at parties". It was subsequently used to target TalkTalk customers with fake "we've detected a virus on your computer" scams.

TalkTalk has always insisted this was an industry-wide problem, not confined to one provider.

There may be truth in that, but what can be said with some degree of certainty is that customers of smaller providers such as Zen are much less likely to be targeted by such nonsense, because their call centres are run in-house in the UK and they're a less obvious target for data theft.

And while we don't think it's likely *PC Pro* readers would fall for such scams, the irritation of answering the phone calls is a pest in itself.

7 It's not that painful to switch

If it's been a few years since you switched broadband provider, the process isn't as dreadful as it was in the past.

If you're moving from one Openreach provider to another, and you're at the end or nearing the end of a contract, it's straightforward. Simply sign up with your new provider and it should handle the entire process. The old provider may contact you to confirm you want to switch – and no doubt try to persuade you to stay – but the whole thing should take less than a fortnight and there should be no or minimal downtime.

Things get trickier if you're switching technology, such as moving from ADSL to fibre, or even from fibre-to-the-cabinet (FTTC) to fibre-to-the-premises (FTTP). Or from Virgin's cable to Openreach or vice versa. That kind of switch normally requires an engineer visit, and then you enter the lap of the Appointment Gods.

That said, there are signs of improvement on that front, too. In "early 2019" (Ofcom doesn't like to be specific), an automatic compensation scheme will come into force that will pay out £25 for a missed appointment and £5 for every day a new service is delayed.

No, it's not quite "pack your bags, love, we're off to the Bahamas" money, but it might be sufficient when multiplied across a huge customer base for BT, Sky and co to get their act together.

8 There's a new provider in your area

The days of the great broadband landgrab are over. Local loop unbundling has come to an end and there aren't a great deal of companies laying new fibre networks, outside of BT. That said, there are pockets of growth.

Regional and community-focused FTTP projects are continuing to thrive. Virgin is still stretching the tentacles of its fibre network, particularly in big cities. And other providers are experimenting with small-scale fibre networks.

How do you know what's available in your region? The SamKnows Broadband checker (**pcpro.link/289sam**) is a great place to start. Pop your phone number and postcode into the relevant boxes and it will summarise all the services that reach your doorstep, with the ability to break down results to FTTP, FTTC and cable providers, if necessary. It also shows any wireless providers in your region, if you're still waiting for the trenches to be dug in your street.

9 You can still keep your email address

One reason people are reluctant to move broadband providers is they've had the same ISP-specific email address for years and don't want to go through the rigmarole of updating all their web accounts, friends and associates with a new address. It's a legitimate concern, but one that can be worked around – albeit sometimes at a cost.

BT Premium email, for example, allows former BT customers to retain their BT Broadband email address even after they've jumped ship. The sting in the tail is this costs £7.50 per month, recently

hiked from £5 per month. That's a frankly outrageous fee for a basic email service, but if you're desperate to cling to your BT address and equally desperate to leave BT, it's an option. Even if it's only for a migratory month or two, to buy yourself some time to switch over all your accounts and inform your contacts.

Others are less stingy. Sky basically gives you an email address for life. I recently reactivated my Sky email address despite changing ISP more than five years ago! TalkTalk gives you a year's grace on its email, while Virgin will let you keep using your email for 90 days after you leave.

We'd strongly recommend you either stick to webmail (Gmail, Outlook.com and so on) or register your own domain for email, so that you're not held captive by broadband providers.

10 You don't need the landline phone

Most landline phones get about as much use these days as Bill Cosby's agent. Alas, line rental remains a must-have for most providers, racking up the cost for a service that you might only half-use.

There are providers who will offer broadband only. Virgin Media doesn't insist you take a landline, although if you think that's going to knock the best part of £20 off your bill, think again. The tariffs are around a fiver or so cheaper than comparable speeds including line rental from other providers. Still, that adds up over the course of a year.

Other regional fibre providers such as Relish (London and Wiltshire) are also happy to connect you without a landline phone.

11 Upload speeds are important to you

The broadband industry is obsessed with download speeds. Upload speeds nary warrant a mention in the ads, but they're just as important – if not more important – for some people. If you're a photographer sending gigabytes of photos to clients from home, you don't want them dribbling up the pipe at 5Mbits/sec or 10Mbits/sec.

As we mentioned earlier, Virgin's network technology isn't geared for uploads and ADSL can be painfully slow on the uplink, especially if you're at the end of an exchange's reach. Other technologies give more weight to the uploads.

The new G.Fast services being rolled out by BT – basically FTTC on steroids – are delivering very decent upload speeds, for instance.

The top 10% of customers on G.Fast lines measured by Think Broadband in July received an average upload speed of 46.8Mbits/sec (and downloads of 198Mbits/sec) since you asked. It's by no means FTTP-grade, but its more than twice as fast as Virgin's fastest lines.

Best Broadband ISP Zen Internet

RECOMMENDED PLUSNET

	Customer support	Reliability	Value for money	Speed	Resubscribe?	Overall score
Zen Internet	96%	94%	80%	89%	97%	91%
Plusnet	82%	82%	80%	76%	89%	82%
Virgin Media	69%	81%	61%	87%	87%	77%
EE	68%	76%	71%	64%	70%	70%
Sky	72%	73%	61%	64%	74%	69%
TalkTalk	61%	71%	76%	65%	70%	69%
Vodafone	70%	65%	73%	67%	67%	68%
BT	63%	74%	55%	68%	68%	66%

This month sees the results of our annual *PC Pro* Excellence Awards survey, based on thousands of votes from British consumers. We ask participants to rate brands for their satisfaction across a number of product types, including broadband. You can see the results for all the other product categories in our feature on p30.

Here, you can see a clear picture for satisfaction across the main broadband suppliers. And in terms of a winner, it couldn't be any clearer: Zen Internet wins hands down, as it has done for years. Why? Its fantastic customer support is obvious, so kudos to the Rochdale-based team for the care they give to subscribers. Add great speeds and unmatched reliability, and it's a clear winner.

Notably, the only area where it is matched is value for money. Here, Plusnet excels, with only TalkTalk coming close. This, combined with 89% of Plusnet's customers saying they would resubscribe, is the reason it walks away with a Recommended award.

While Virgin Media doesn't walk away with a gong, it came close, with strong scores for reliability and customer loyalty. And despite coming third from bottom, we should congratulate TalkTalk for turning its scores around: last year, it had an overall satisfaction rating of 43%, with 34% for customer support, so clearly it's doing something right. Or at least, better than a year ago.

And if you're a BT or Sky customer? Then take a good read of the rest of this article. If you've been hooked by other services, such as TV or discounted mobiles, now might be an excellent time to set yourself free.

HOW TO BUILD A TIME MACHINE

Darien Graham-Smith explains how to create a zero-effort backup that works just like Apple

We all know how important it is to keep our data backed up. If Windows stops working, you can reinstall it; if your laptop dies, you can buy another one. But if you don't have a spare copy of your spreadsheets, or your holiday photos, or the video of that overambitious music concert you once put on in the upstairs room of your local pub, then you're courting disaster. If those things get lost, no one can recover them for you.

The trouble is, it's hard to get enthusiastic about backup. When you think about protecting your files, there's a good chance you picture cumbersome third-party software and tedious evenings spent burning DVD-Rs. Or perhaps you're thinking of hours spent online, uploading gigabytes of data to the cloud that will – touch wood – never be downloaded again, and paying hefty monthly fees for the privilege.

In an ideal world, backing up would be completely effortless. It would run silently in the background with no action required on your part, and it wouldn't cost a penny. The good news is that such a backup system actually exists – and if you're running Windows 8 or 10, you already have it.

Talking Time Machine

Credit where it's due: the sort of backup we're talking about was pioneered by Apple back in 2007, in a macOS feature called Time Machine. Mac users simply need to flick a switch to enable Time Machine and select a backup destination, and their files are protected. Time Machine also introduced a slick new approach to restoring lost or overwritten files: rather than having to rummage through your backup archives, it presents a graphical view of your folders as they were on any given date in the past, and lets you step forwards and backwards through time until you find what you want.

Apple made a big noise about Time Machine when it was introduced, and with good reason – by making backup easy enough for everyone to bother with, it represented a huge step forward for data safety. Before long, Windows users were demanding an equivalent, and in Windows 8 Microsoft introduced a continuous backup tool called File History that just happened to work a lot like Time Machine. In fact, perhaps the biggest difference was how low-key its introduction was – but Windows 8 was such a radical experiment that a new backup feature was never going to grab the headlines.

Get hip to File History

Even though Microsoft hasn't made a song and dance about File History, it's an excellent feature. In fact, if you're still on Windows 7, it's one of the better reasons to upgrade. It automatically backs up your personal files onto a USB hard disk or network share as you change them, and offers a folder-based timeline for browsing and restoring old documents.

If you have a spare USB hard disk knocking around, therefore, or space on your NAS drive, there's almost no reason not to turn on File History. If you have a backup system already in place, consider running both in parallel: File History is very convenient, and restoring files from a local disk inside your home is likely to be quicker than downloading them from a cloud backup service.

USB or NAS?

If you're going to try File History, you'll need to decide where your backups will live, as there are pros and cons to both USB and NAS drives. (File History can also write backups to an internal hard disk, but we'd advise against this: if your backups are hosted on the same computer as your working data, a virus or electrical fault could take out both at once.)

Let's look at USB first. This can be a cheap option, as you're looking at no more than £50 for a 1TB drive, which may well cover your backup needs for many years. It's likely to be faster than backing up over the network too, although this isn't a huge issue: files are backed up quietly in the background, and it's hopefully very rare that you'll need to restore a large file from your backup archive.

One downside of USB is that backups can be saved only when the disk is physically connected to your computer, which could be inconvenient for laptop users. It's not a disaster, though, as Windows caches any changes made while the disk is unplugged, and writes out the next time it's available.

The USB approach also doesn't scale well, as each PC will need its own drive. And since there's no RAID or other data-protection feature, your backup device is itself vulnerable to a hardware failure, not to mention virus attacks.

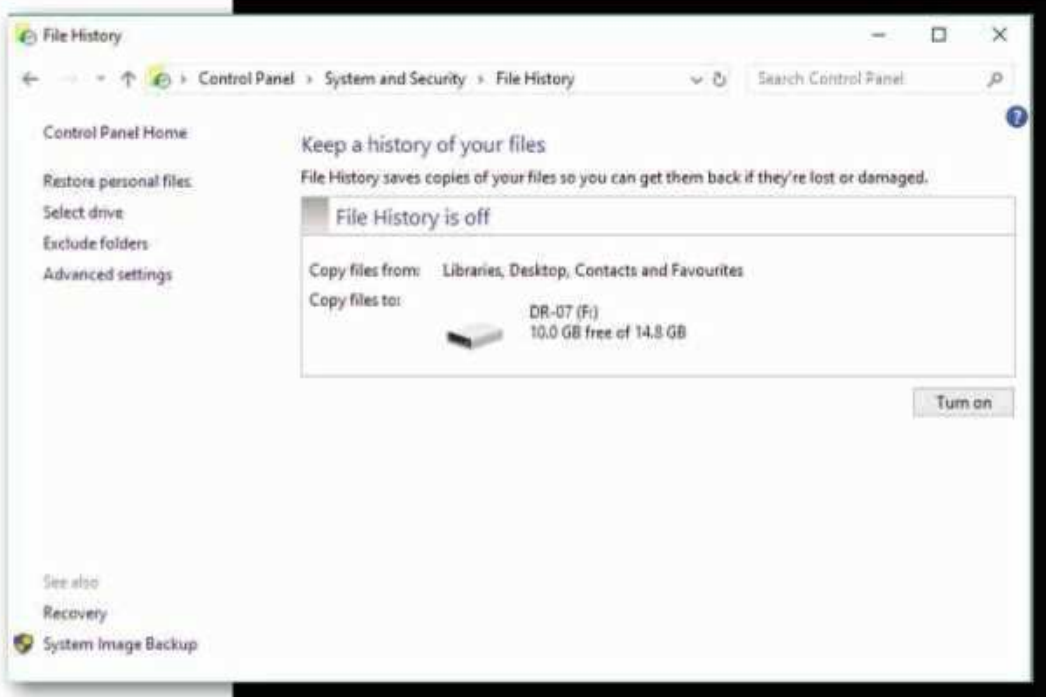
With a NAS share as your destination, most of these considerations flip around. Your backups can be automatically updated whenever you're connected to your home network – you don't need to remember to plug anything in – and any number of clients can be backed up to a single appliance. NAS enclosures almost invariably use RAID, so a single disk failure won't wipe out your backups, and this also means you can conveniently expand your storage capacity by simply replacing the disks one at a time with larger drives.

Of course, a NAS appliance is much more expensive than a USB drive. If you don't want to make the investment, check whether your router has a USB connector that allows you to share an external hard disk over the network: this will give you many of the benefits of NAS-based backup for the price of a USB hard disk.

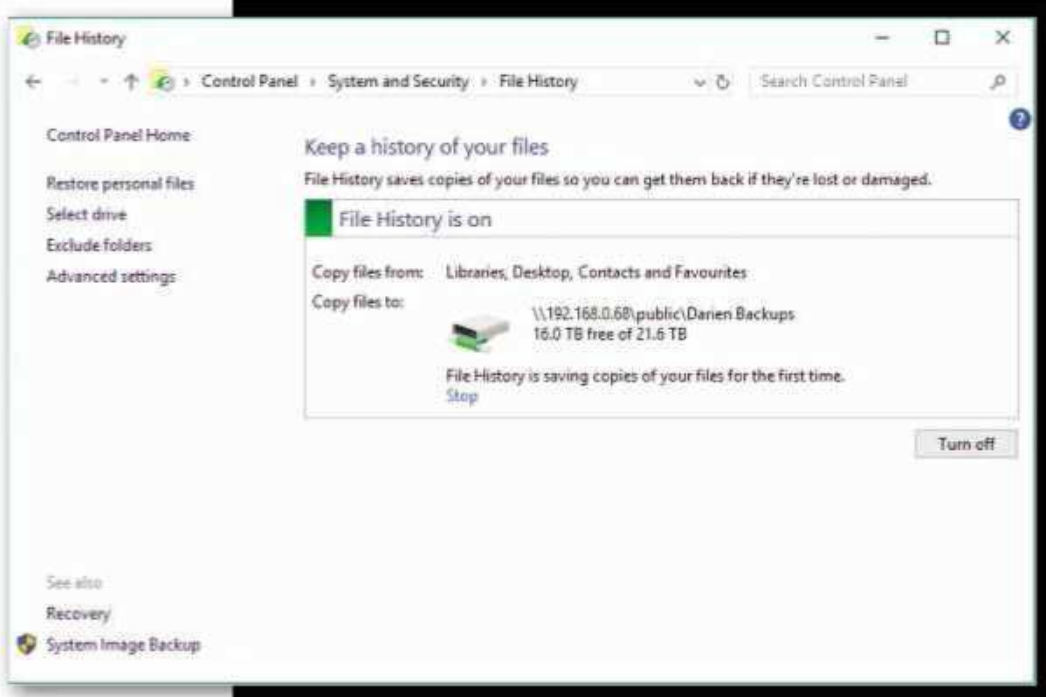
Using File History

It's characteristic of Windows 10 that in the latest OS build there are two different ways to access File History. Search the Start menu for "File History" and you'll find the original Control Panel interface, as introduced in Windows 8; search for "Backup" and

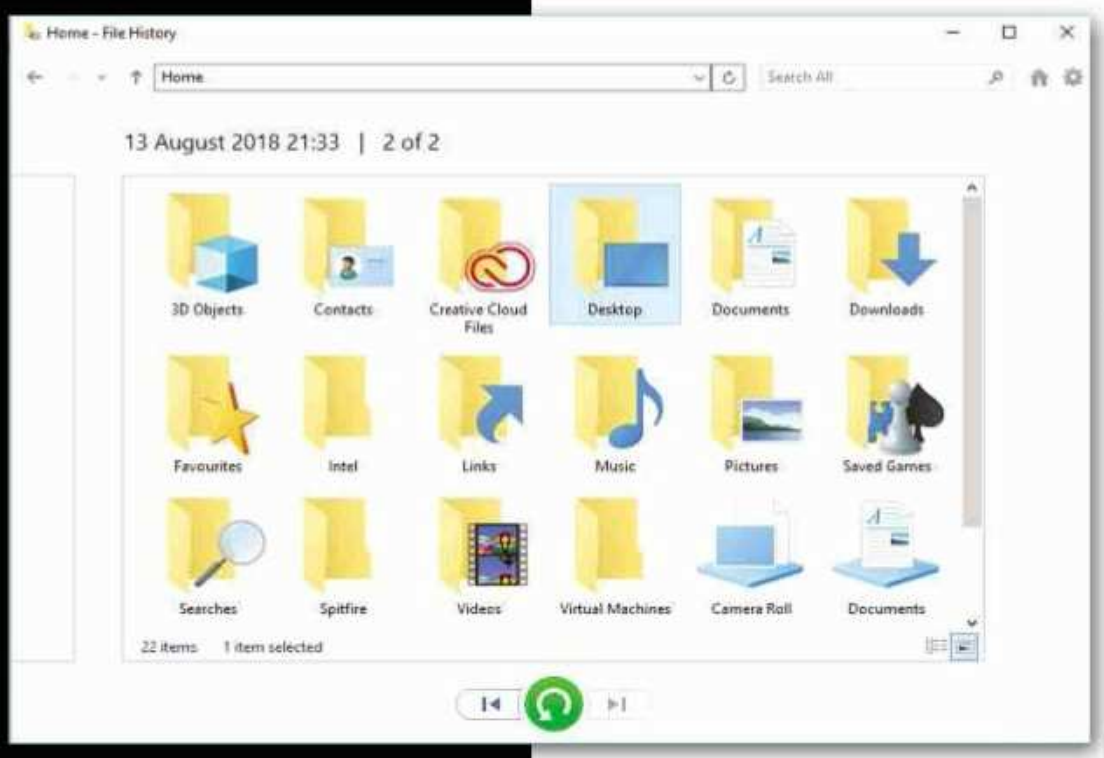
By making backup easy enough for everyone to bother with, Time Machine represented a huge step forward for data safety



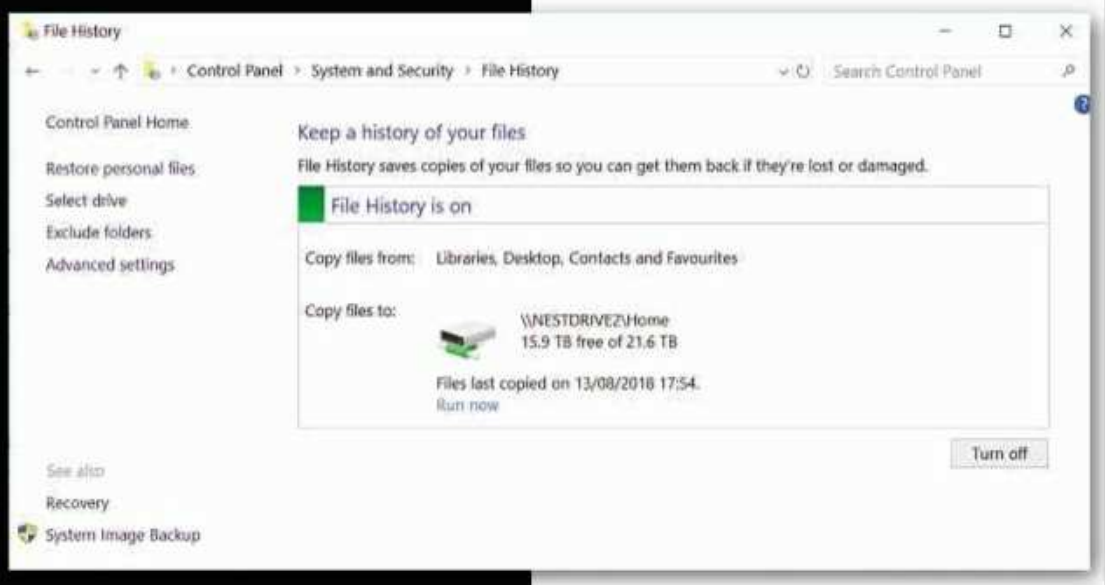
ABOVE File History is usually as simple as selecting a backup destination and pressing "Turn on"



BELOW The initial backup may take hours or even days, but after this there is practically no effort



LEFT Desktop, Documents and Downloads folders are backed up by default, and you can easily add others



LEFT Just like Apple's Time Machine, File History can be activated by a single switch

Full system backup

File History will back up your files, but it won't create an image of your entire system. Microsoft's idea is that if things go really wrong you should simply reset Windows 10, then restore your files and reinstall your apps. Unfortunately, that last part isn't as simple as it sounds, and it can still be a smart precaution to make a complete copy of your running Windows system from time to time.

For the time being, you can do this using the old Windows Backup and Restore utility. In the latest build of Windows 10, it's still accessible in the Settings app, on the Backup page. This feature is likely to be deprecated soon, though: the text makes clear that it's intended for restoring older backups, not creating new ones.

If you're looking for a third-party imaging tool that isn't going anywhere, there are numerous free options out there: three we've tried with positive results are Macrium Reflect (macrium.com/reflectfree), O&O DiskImage (pcpro.link/289diskimage) and Paragon Backup and Recovery (paragon-software.com/free/br-free).

you'll be directed to the relevant page in the new Settings app.

For simplicity, we suggest you get started via the Settings app. Here, taking a leaf from Apple's book, Microsoft gives you a single switch you can use to enable File History. It won't be visible at first, though: you'll need to click on "Add a drive" to set your destination. Once this is done, you can flip the switch and Windows will start working on your backup right away. It may take a few hours or even days to establish a first complete backup of your files, but in most cases you don't need to do anything more.

If you want to customise your backup, you can do so by clicking More Options. A pretty comprehensive selection of locations is backed up by default, including your Desktop, Documents and Downloads folders, but you can add others with a few clicks. To remove a folder from the list, you can click on it to reveal a Remove button – it's a bit stupid that this isn't visible by default, but the interface is clearly a work in progress. It's also possible to exclude specific subfolders from File History, but for now this has to be done from the Control Panel interface (you'll find the Exclude Folders link at the left-hand side of the window).

You can also choose how frequently your files are backed up; if you're paranoid, you can adjust this from the default hourly schedule to every ten minutes.

Managing space

One thing you can't configure in File History is exactly how much space you want to allocate for backups. By default, Windows will just keep on backing up new and changed files until your chosen destination is full. You can work around this by creating a dedicated partition or network share of limited size for backups, but we'd have liked to see a bit more flexibility.

You can also indirectly limit File History's use of space by telling it only to keep backups for a specific amount of time, with options ranging from one month to two years. This is a blunt instrument, though: you might want to keep the backed-up contents of your Desktop folder forever, say, while purging your Downloads folder every 30 days. Alas, you can only specify one retention policy for all files.

And there's one further frustration: instead of setting File History to retain backups for a certain period of time, you can tell it to keep saved files "Until space is needed", with the oldest backups being automatically removed to make way for new ones. Unfortunately, in the current implementation this setting doesn't seem to work: many users have reported that when the disk is full, File History just complains that the disk is full and stops backing up.

Thankfully, it isn't hard to clear off space manually. In the Control Panel interface, below the "Keep saved versions" dropdown menu, you'll see a link entitled "Clean up versions": click this and you'll be invited to purge all backups older than a certain age, with options ranging from a month to two years. For finer control, you can also open a Command Prompt and type FHMANAGEW.EXE -CLEANUP, followed by a number: this will remove all backups more than that many days old.

If a few oversized files are eating up all your backup space, you can also find and delete them individually. Open your File History destination in Explorer and you'll see a set of subfolders named <your name>\<your PC name>\Data, with your backed-up files within. To find all items larger

If you've struggled with backup discipline in the past, File History is the answer to your prayers – and it's free

than a certain size, simply enter (for example) size:>2GB into the search field at the top right of the Explorer window. Note that archived files don't always keep their original filenames, so you might need to open them to find out what they are. If you're certain you don't need a backup of a particular file, you can just delete it like any other file.

Restoring files with File History

They say that a file isn't backed up until you've tested that you can recover it – so once File History has finished, the first thing you should do is to delete a file and make sure that you can bring it back. (Obviously don't do this with anything mission-critical, just in case.)

One way to recover a backed-up file is to open the folder that used to contain it and click the History button, which you'll find tucked away under the Home tab in the Windows 10 Explorer. This opens a new window showing the contents of the folder as it was on a specific date, with the date of the snapshot above and a couple of controls at the bottom. Towards the bottom right you'll also see two buttons that let you switch between Details and Icons view modes.

To revert the entire folder to the state shown, you simply need to press the big green Restore button. The arrow buttons to either side let you step back and forward through changes within the folder. If you only want to restore a selection of files or subfolders, simply select them and hit the button. By default, each file will be placed back in its original location, and if a newer version exists you'll be asked if you want to overwrite it. If you want to keep both, click the cogwheel icon at the top right of the window and select "Restore To"; you'll then be prompted to choose a different destination for your recovered files.

If you're not sure which older version of a file is the one you want, File History has one last clever trick: right-click on a file and you'll see a single menu option appear – "Preview". This option will show you the contents of Office documents, PDFs, images and many other file types, right inside the File History interface, with controls allowing you to browse back through previous versions and restore the right one. You can also open File History in Preview mode by selecting an individual file in Explorer before clicking History.

A word of warning

If you've struggled with backup discipline in the past, File History is the answer to your prayers: it requires absolutely no effort on your part (beyond the initial setup) and, aside from the cost of storage and your Windows licence, it's free.

If you need a fail-safe backup system, however – for example, if you're self-employed and your livelihood depends on certain documents and figures – then you probably shouldn't rely solely on File History. For one thing, it can't back up open files, so if you tend to leave documents open on your desktop and work on them over the course of a week, you're taking a risk.

File History also only lets you specify a single backup destination, which will almost inevitably be inside your home – so if there's a natural disaster or a break-in, you could lose everything. We suggest you consider partnering File History with some sort of cloud backup system, even if the latter is only used for a small subset of truly indispensable files.

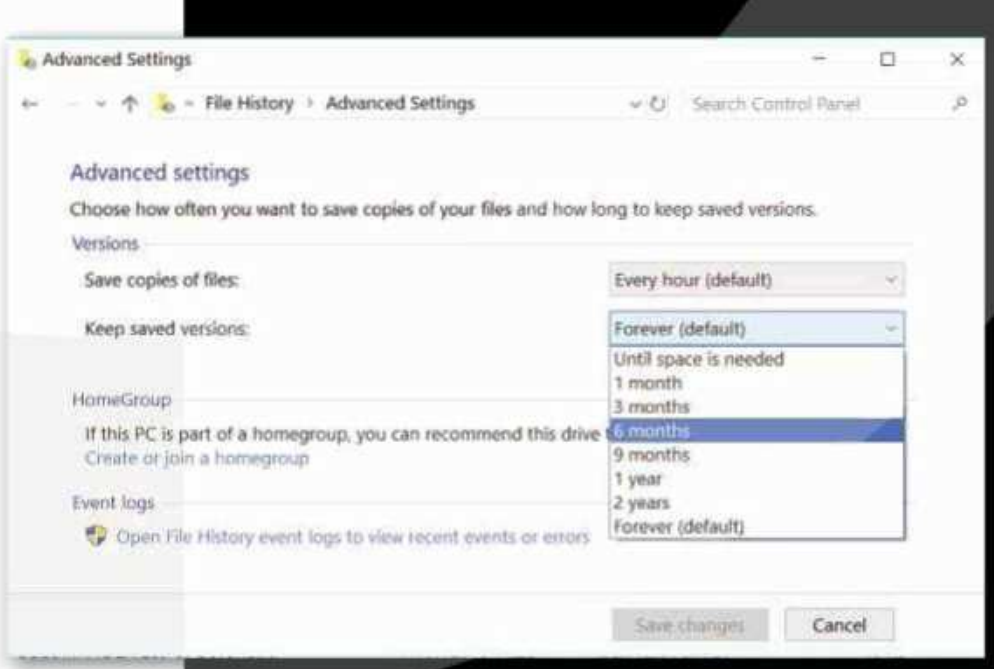
Let's keep things in perspective, though. The vast majority of personal data loss happens when we accidentally or misguidedly delete or overwrite an important file. File History lets you undo such a mistake in moments, even long after the fact – so in terms of how much effort it takes to operate, versus how much trouble it can save you, it might be the most useful and valuable Windows feature ever.

What's a backup – and what's not

There are plenty of reasons why people don't bother with backup. One I commonly hear is "it's all safe in Dropbox", or whatever cloud service that person happens to favour. Yes, if your laptop is lost or stolen, it's reassuring to know that your most important files are all synchronised to other computers, with copies in the cloud. In fact, Dropbox openly advertises itself as a backup service.

Don't be complacent, though. Personal users can recover deleted and changed files only within 30 days; if you have a business account, that goes up to 120 days, but it's still too short and restrictive to count as a proper backup solution. Space is limited too – which means your crucial file might not sync if other things are filling up your account.

I've also seen people referring to multi-disk RAID arrays as a form of backup. This is just wrong. RAID protects you from data loss in the event of a disk failure, but if you delete the wrong file – or, let's say, have it encrypted by a ransomware attack – RAID won't help at all. Cloud services and multi-disk configurations both have their benefits, but neither is a substitute for a real backup solution.



ABOVE You can indirectly limit File History's use of space by telling it only to keep backups for a limited amount of time

LEFT Access File History by searching for "Backup" if you want to take control via the Settings app

BEST FREE USB FLASH DRIVE APPS

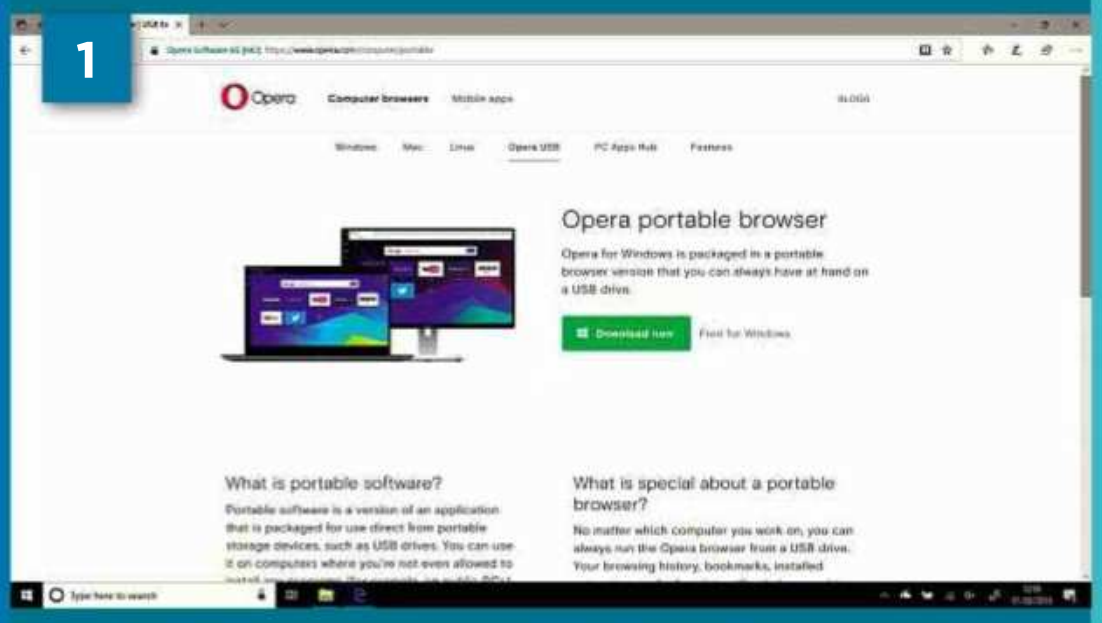
The humble flash drive can be your saviour in times of need – Nik Rawlinson reveals the best free apps to keep in your back pocket

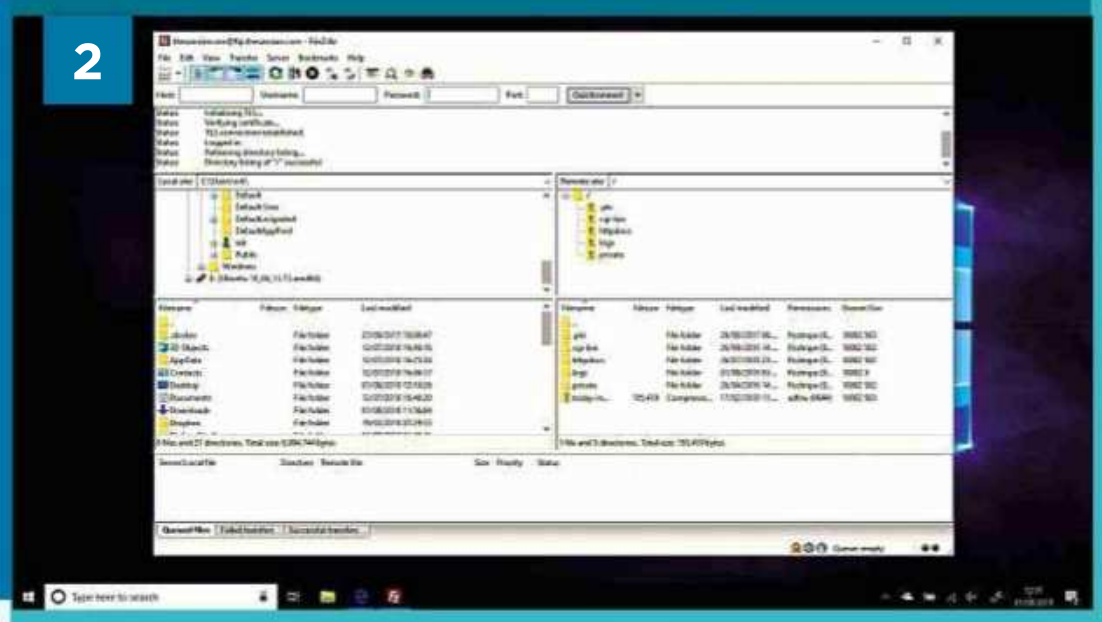
Flash drive apps

If you've ever had to troubleshoot a computer for friends or family, you'll know the value of a USB flash drive filled with useful apps and system utilities. If you're travelling or working across multiple different machines, it's also a handy way to keep your preferred applications with you. Even if you're just looking after your own devices, it's a good idea to keep a set of recovery tools on a flash drive, just in case disaster strikes and you can't get online.

In scenarios like this, "portable" apps are particularly handy – installations designed to run directly from external media, without needing to write files to your local hard disk or store anything in the Registry. But which specific apps should be loaded up on your USB drive? Over the coming pages we'll highlight a selection of must-have tools you should download, install and store in your top drawer – and none of them costs a penny.

Before you start building your collection, though, we suggest you invest a few pounds in a new USB flash drive. Every time you write to a flash memory cell, it gets one interaction closer to failure, and since portable apps use the flash drive for all their temporary storage, they can rack up write operations very quickly. For the same reason, opt for a high-speed USB 3 device, or you may find you're sitting around waiting for programs to load and run from media that's orders of magnitude slower than a regular hard disk.

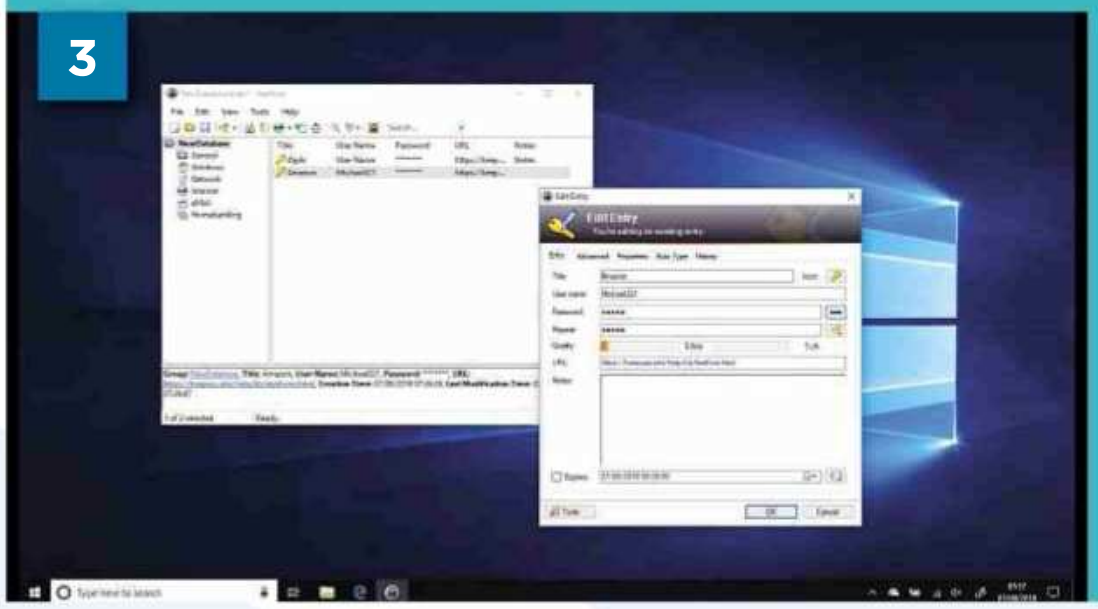




TOP Both Chrome and Opera come in official supported portable variants

ABOVE FileZilla gives you FTP access without the need to install the full program on your PC

BELOW Developers will appreciate the ability to run a web server straight from their pocket



1 Portable web browser

Running your favourite browser from a USB flash drive means you can take all of your bookmarks, extensions and plugins with you, and enjoy the exact same experience on any machine. It also means you can safely log in to sites and use the browser's sync service without the risk of leaving your credentials on someone else's machine. And you don't need to worry about leaving your browsing history or cached content behind – handy if, for example, you're using an internet café while travelling.

There are a few portable browsers to choose from: one popular option is the portable version of Google Chrome (**chrome-portable.com**). It's fully featured, although it tends to lag a few versions behind the latest Windows build: at the time of writing, the portable build is on version 66, while the regular desktop edition is at version 68.

If you're not a fan of Chrome, there's also a portable build of the Opera browser (**opera.com/computer/portable**). Or, if you prefer the Mozilla way of doing things, check out the portable edition of the Pale Moon browser, which is forked from the Mozilla Firefox codebase (**palemoon.org/palemoon-portable.shtml**).

2 FTP client

When fixing a PC, an FTP client can come in very handy. The free FileZilla client comes with a regular Windows installer, but will run directly from a USB flash drive. Simply download the Zipped edition (**pcpro.link/289zilla**), extract it to your USB flash drive and double-click on the icon to launch it.

While the client itself runs from removable media, it can access any drive in the system, so you can easily download whatever files you need – or back up data to a remote server.

3 Web server

Running a web server from a USB stick may not sound obviously useful, but it means you can carry a complete dev environment in your pocket. Say you're designing WordPress themes: you can work on any machine and test your creations on a live version of WordPress without internet access.

It isn't hard to set up either. The XAMPP package rolls together the Apache web server, MariaDB database, PHP, FileZilla FTP server, phpMyAdmin and a variety of other

utilities. The only catch is that locating the portable build requires a bit of digging: to find it, point your browser at the usual download page (**apachefriends.org/download.html**), click More Downloads in the Windows section, then click through to XAMPP Windows. Select the build you want to use – opt for the latest, unless you need an older version of PHP – then scroll down the list of installers until you find one with "portable" in its name.

If you prefer WAMP, check out UwAmp (**uwamp.com**), a portable distribution that uses MySQL and SQLite rather than MariaDB.

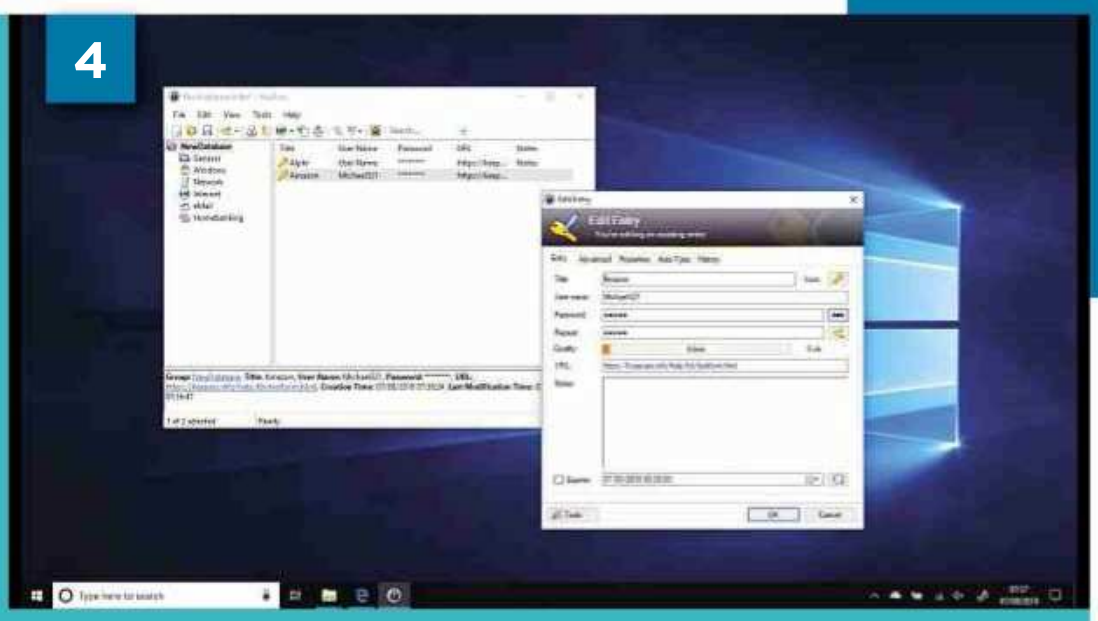
4 Password manager

If you're serious about security, you should use unique, randomly generated passwords to log into sites. These are hard to crack, but they're also more or less impossible to remember – which becomes a problem when you need to use a PC that doesn't have your password manager installed. KeePass Portable (**keepass.info**) solves this problem: it runs directly from a flash drive, so you can access your passwords without ever having to store your credentials on someone else's computer. Just make sure that your master password is absolutely unguessable – otherwise, anyone who gets their hands on your flash drive could gain the keys to every site and service you use.

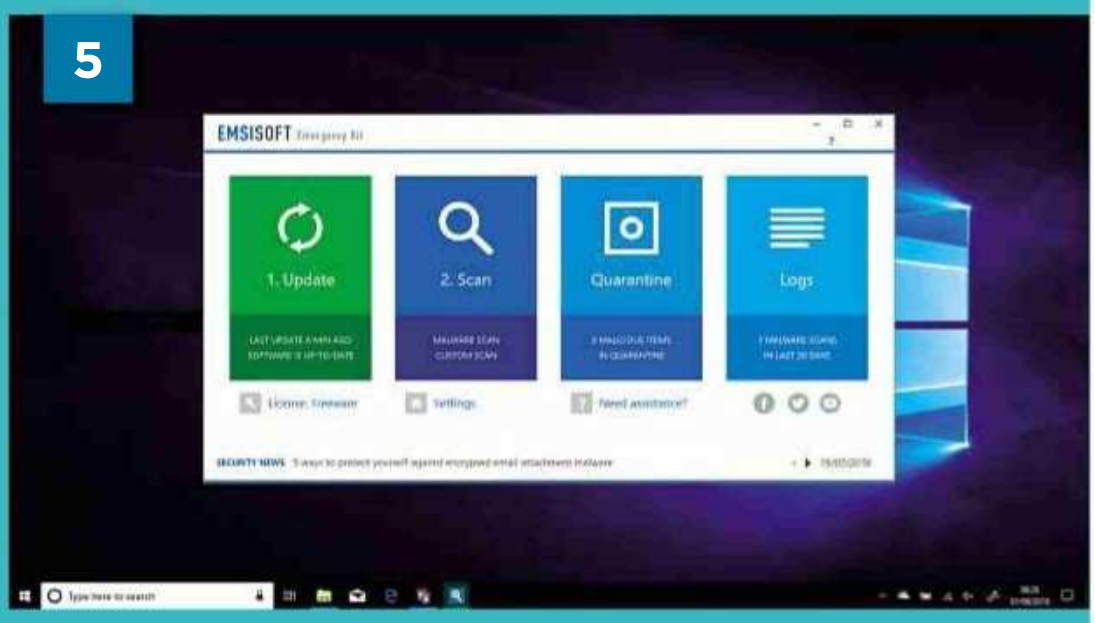
5 Antivirus scanner

It's always good practice to run a virus check from external media, as this makes it harder for any malware that may be present to interfere. Emsisoft's Emergency Kit (**emsisoft.com/en/software/eek**) lives on a flash drive, but updates itself over the internet when you run it, so you get the benefit of the most up-to-date signatures.

You can choose between quick, standard or custom scans, depending on how thorough you want to be, and as well as malware, the software can also detect potentially unwanted programs. These aren't harmful, but they can be annoying, waste space and interfere with the operation of your browser or other applications.



ABOVE If you need to remember a password on a guest system, simply run KeePass Portable from your drive



BELOW Emsisoft's portable antivirus tool is ideal for on-the-go system maintenance

WINDOWS 10 RECOVERY MEDIA

In the olden days, Windows used to come with a recovery CD or partition. Nowadays you can't take that for granted, so it's a good idea to create your own recovery media and keep it somewhere safe for use when disaster strikes. The process is easy, and the tool you need is built right into Windows 10.

1 Launch the Recovery Media Creator

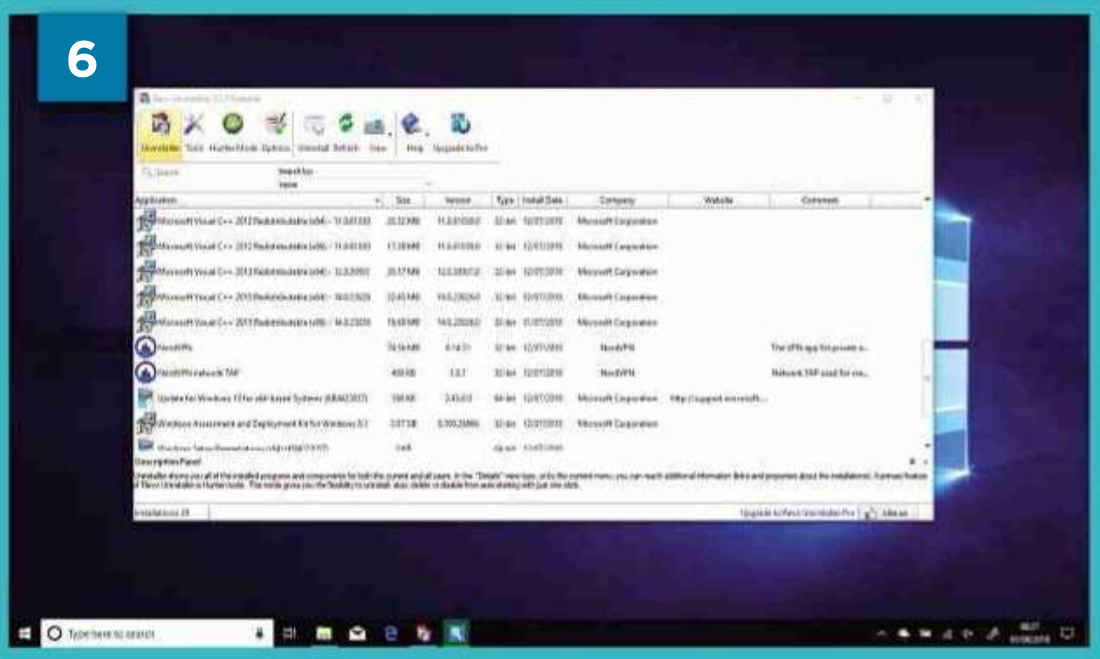
Open the Start menu and search for "Create a recovery drive"; this will launch the Recovery Media Creator. Accept the option to back up your system files to the recovery drive if you want to restore your existing Windows installation directly after booting from it.

2 Create your recovery media

Windows scans your system, and when it's compiled a list of required files it will ask for a USB flash drive or external hard disk. Note that any existing files on the drive will be wiped, and the process of creating the archive can take several hours, depending on the size of your files and the speed of your drive.

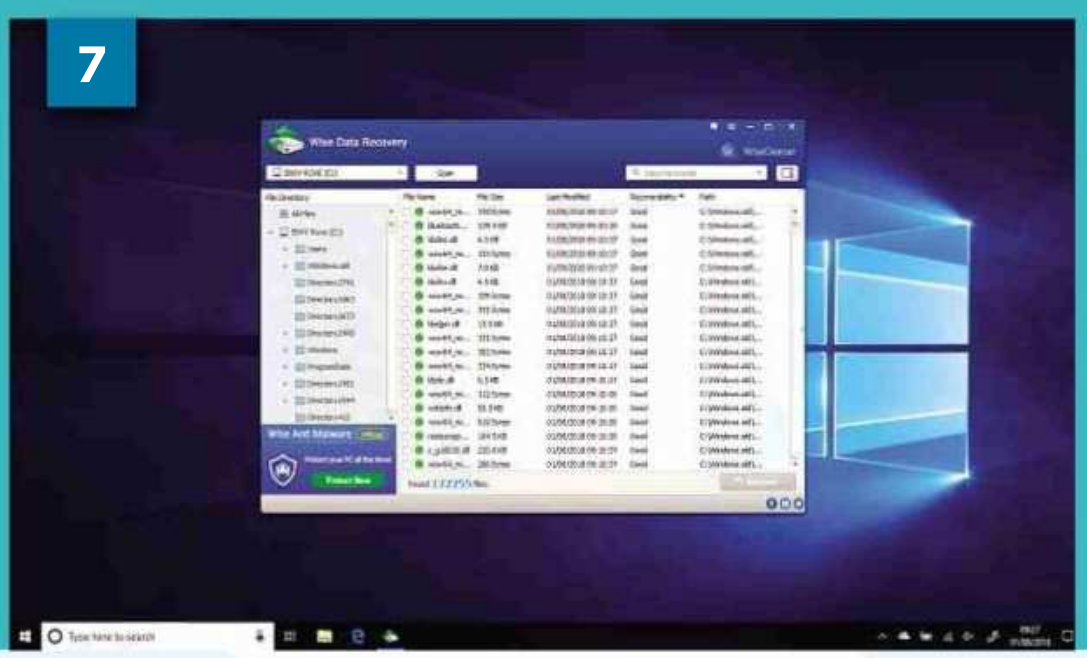
3 Boot into recovery mode

When you need to use your recovery media, boot from the flash drive to see various options for reinstalling or recovering Windows. Naturally, you'll only be able to recover to the state your PC was in when you created the recovery media, so it's a good idea to periodically rebuild it to keep it up to date.



ABOVE Revo Uninstaller makes short work of clearing out unwanted and broken apps

BELOW Portable file recovery software reduces the risk of overwriting data you're trying to save



6 Software uninstaller

When Windows goes wrong, it's not always easy to clear out the apps that may have caused the problem in the first place. Revo Uninstaller (**revouninstaller.com**) is a portable third-party clean-up tool that promises to purge your system of stubborn, unwanted programs.

It's simple to use: open up your flash drive and double-click on the app icon and you'll see a list of installed applications, any of which you can remove with a couple of clicks. The basic portable edition is free, but a paid-for version adds the ability to clean up the leftovers of partially uninstalled apps, and to back up your system and Registry before making changes. "Hunter mode" meanwhile replaces the regular front end with a graphical target-based interface: drag the target onto any icon and you'll get options to uninstall it, stop it auto starting, kill any associated processes, check its preferences or open its parent folder for further investigation.

7 File recovery tools

Have you ever accidentally deleted a critical file? This is where portable apps come into their own: because nothing is written onto the hard disk, portable file-recovery tools offer your best chance of restoring your data before it's overwritten.

Wise Data Recovery (**wisecleaner.com**) is one of the best free options out there. It scans both internal and attached drives, and as well as pulling up file names, sizes, path and access dated, it shows how likely it is that a given file can be recovered. You can order files by any criteria, search for specific entries across any folder, and restore files to a separate destination.

Another great free, portable option is Recuva (**pcpro.link/289recuva**), from the team behind CCleaner. It works in a similar way, giving a diagnosis of how salvageable each file it finds is, from "excellent" to "unrecoverable".

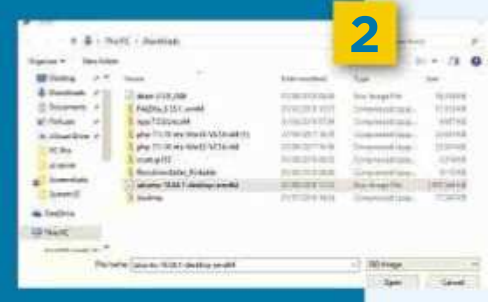
RUN LINUX FROM A FLASH DRIVE

Most PCs can boot from an external device for recovery purposes – and there's no reason why you need to stick with Windows. Set up a portable Linux installation on a flash drive and you can carry a complete free operating system wherever you go, along with your applications and files. It's also a great way to test drive Linux without committing it to your hard drive, and without the hassle of virtualisation. Here's how to set up a portable Ubuntu environment.

1 Download the installer

Ubuntu comes in several flavours, with native, Gnome or KDE desktops. You'll find them at ubuntu.com/download/flavours. We'll stick with the regular distribution for now, which you can download from ubuntu.com/download/desktop. Select the appropriate ISO for your processor architecture and save it to your hard disk.

2 Make your USB drive bootable



The handy Rufus tool automates the process of making your USB flash drive bootable. Download it from rufus.akeo.ie, then run it. Make sure the correct destination device is selected in the first drop-down menu, then click Select and point Rufus at the Ubuntu ISO you downloaded in step 1.

3 Partition and install

Make sure the Partition scheme and Target system drop-downs are set appropriately for your PC; on a modern system, you won't need to change anything, but on older computers you might need to select the MBR scheme rather than GPT. Click Start, accept the option to Write in ISO Image mode and click OK.

4 Boot from USB

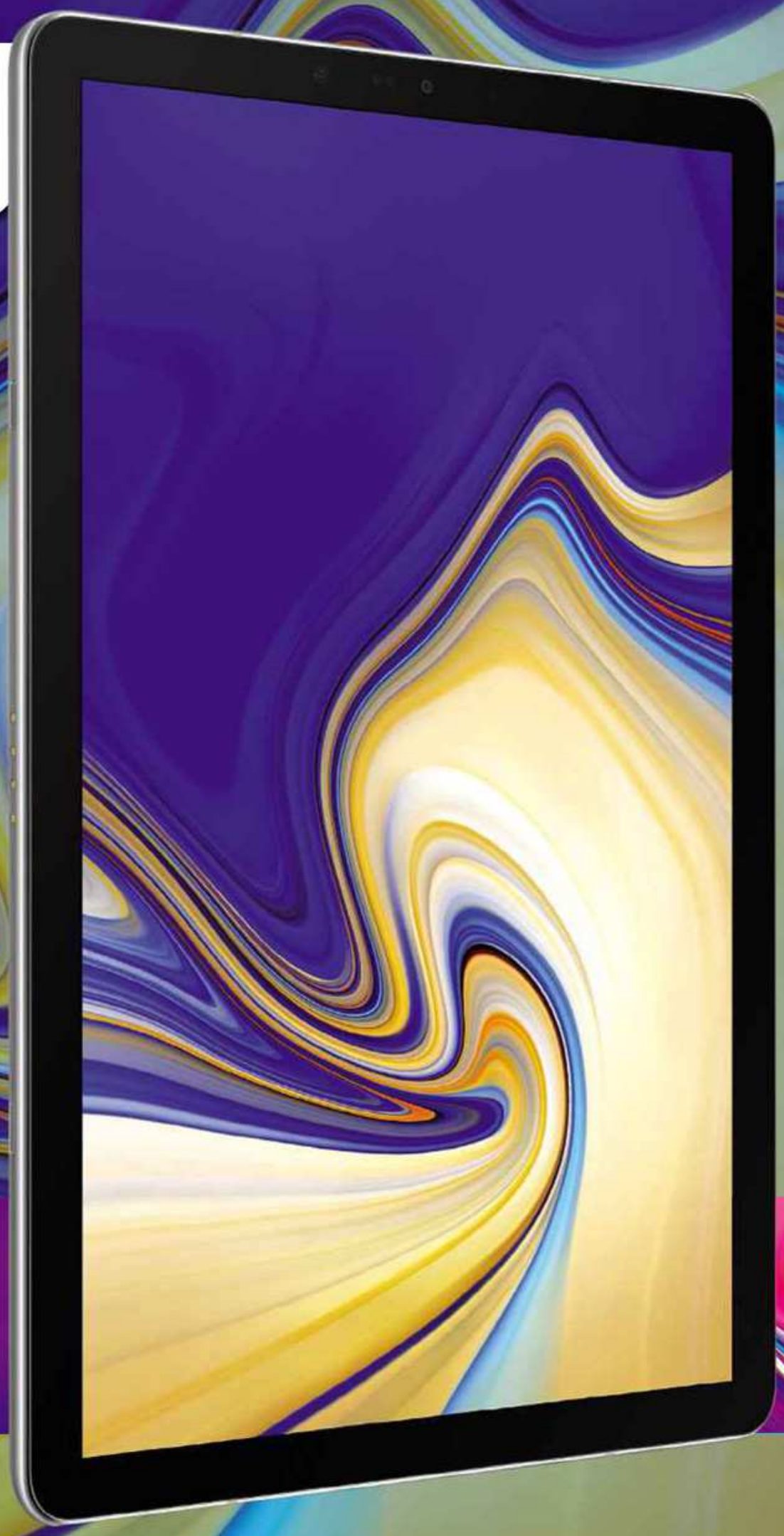
The final step is to boot from your flash drive. The process for doing this varies: on many systems you can press F2, F8, F10 or Del when starting up to either access a boot menu or the BIOS. If it's the latter, you can edit the boot priority, so that if a USB flash drive is plugged in, the system will boot from that first.

If your PC won't boot from your USB flash drive, it could be down to Secure Boot – this disables booting from unknown media. Check this by entering "Device Security" into the Windows 10 search box. If Secure Boot is enabled, you'll need to go into the BIOS to change the setting (again, the process for accessing the BIOS will vary from machine to machine). When finished, make sure you re-enable Secure Boot to ensure you're protected from malware.

Reviews

The biggest, best, most exciting products in tech – tested, evaluated and reviewed

Samsung Galaxy Tab S4



A luxurious Android tablet with some innovative features, but it doesn't hang together as well as we'd hope

SCORE ★★★★☆

PRICE £499 (£599 inc VAT)
from pcpro.link/289tab

Looking for a tablet that can convert into a quasi-laptop for working on the go? The iPad Pro and Microsoft's various Surface devices have shown how the idea does work, but Android users have been left out in the cold. Enter Samsung, with a plan to revive Android's professional aspirations.

It's clear that Samsung has the 10.5in iPad Pro in its sights, even opting for the same distinctive screen size – albeit in a slightly taller, thinner shape. It also has some obvious advantages. The package includes a bundled stylus, and the tablet is Samsung's first to feature DeX mode – a desktop-style interface that's designed to work with a keyboard and mouse, and can even be displayed on an external monitor.

If you're already invested in Android, therefore, the Galaxy Tab S4 is a promising proposition. You get the flexibility of an iPad Pro or Surface, while keeping your familiar apps and easy synchronisation with your phone. But "promise" and "delivery" are two very different things.

Design and display

The Galaxy Tab S4 looks and feels expensive. It's covered in glass on both the front and back, and when you pick it up there's a certain heft to it; it's not unwieldy, but at 482g it feels like a serious bit of kit. That impression is confirmed by the choice of only two colour schemes, named simply "black" and "grey" – no frivolous adjectives here.

So far the design is quite similar to the old Galaxy Tab S3, but there's one visible difference. The bezels at the top and bottom have been shrunk (resulting in the ditching of the home button), so they're now exactly as narrow as those at the sides, creating something closer to an edge-to-edge feel.

The gives the S4 a smaller footprint than the iPad Pro (it measures 164 x 249mm versus 174 x 251mm), although the difference is too small to register in everyday use. At any rate, it's offset by the Tab S4's extra millimetre of thickness. Also note that, while the Tab S4 looks stunning when you first take it out of the box, the glass on the front and back doesn't seem to be oleophobic. In use it quickly gets covered in fingerprints, which cheapen the impression.

The good news? You can't see them when the screen is on, and as we've come to expect from Samsung the display is one of the Galaxy Tab S4's best features. The Super AMOLED panel delivers gloriously rich, bold colours, even at extreme viewing angles, and supports HDR colour in apps such as Netflix and YouTube. It's superbly sharp too, with a resolution of 2,560 x 1,600, equivalent to a pixel density of 287ppi (just beating the iPad Pro's 264ppi).

Even with all these strengths, it's not quite a best-in-class display. It lacks the 120Hz refresh rate of the iPad Pro, and while you can manually adjust the colour balance, there's nothing to match Apple's True Tone technology. Dial up the brightness to maximum and it's not quite as searing as the iPad Pro, although it's still bright enough to use happily in all but the most glaring sunlight.

The S4's audio hardware deserves a mention too. Around the edges you'll find four AKG-branded speakers that are more than loud enough for you to enjoy a movie in a hotel room, without a hint of distortion even at maximum volume. The only catch is that there's not a hint of bass, which sucks the weight out of music, and means you're not going to get the best of the S4's Dolby Atmos support either. Still, you can always use headphones or external speakers: the Galaxy Tab S4 features both Bluetooth 5 and a 3.5mm audio jack socket.

Camera and Bixby Vision

While only a lunatic would regularly use a 10.5in tablet for photography, the Galaxy S4 is equipped with a 13-megapixel camera at the rear. Thanks to a 1/3in sensor and an f/1.9 aperture, it captures clean, detailed shots, and good-looking 4K video at 30fps.

There's a decent selection of shooting modes too, including panorama, a variable-frame-rate "Hyperlapse" mode, and a Pro mode that lets you tweak the exposure compensation, white balance and ISO. Whichever you choose there's absolutely zero shutter lag – unless you engage the little LED flash, which takes a moment to half-illuminate the scene and lock in the focus before firing for real.

BELOW The rear 13-megapixel camera captures detailed shots and 4K video

"Bixby's text recognition works well, and you can translate your captured phrases to or from a long list of languages"

The rear camera also works with Samsung's Bixby Vision app – a feature obviously inspired by Google Lens, which aims to recognise places, things, text and (believe it or not) foodstuffs. Text recognition works rather well, and you can translate your captured phrases to or from a long list of languages – although you have to tap to contact the translation server, rather than getting instant feedback as you do with the Google Translate app.

Object recognition, alas, isn't so hot. I found that Bixby got it wrong almost 100% of the time: it misidentified an envelope as a bed, a tomato as an orange, a Nokia smartphone as a book and a Samsung Galaxy Tab S3 as a wallet.

The front camera has an 8-megapixel resolution, with a quarter-inch sensor and a maximum video resolution of 1,920 x 1,080, which is fine for selfies and Skype. It's also used for Samsung's biometric-recognition feature, which unlocks your tablet when it recognises either your face or the irises of your eyes. This worked for me – which is just as well, as the removal of the physical home button means the fingerprint reader has gone, too.

The S Pen stylus

The Tab S4 comes with an S Pen stylus in the box. Not all S Pens are alike, however, and this is a much larger model than you'll get with one of Samsung's Galaxy Note smartphones. It's 138mm long, with a 9mm barrel, and weighs a nicely balanced 9g. In use, it feels like you're holding an actual ballpoint pen rather than some spindly approximation thereof. The writing action is excellent too. The glass is thin enough that it feels

BELOW The larger S Pen works excellently, but its glossy plastic makes it feel cheap

like you're scribbling directly onto the virtual canvas, and the S Pen's rubber tip drags along with just the right amount of resistance – there's none of the unnatural slipperiness you often get with cheap styluses. Pressure and tilt sensitivity work well too, allowing the 0.7mm tip to emulate everything from a fineliner to a marker pen. You'll quickly master variable-width strokes and start knocking up expressive sketches and beautifully handwritten notes. Well, you will if you can on paper already.

The usefulness of these capabilities is still an open question. Samsung provides apps for taking notes, annotating images and so forth, and the S Pen works with third-party tools including Microsoft OneNote and AutoDesk Sketchbook – but I'm dubious of how many tablet users will really make regular use of these. Still, it's a nice bonus, and you aren't limited to stylus-specific apps: you can use the S Pen in place of a fat finger anywhere in Android, and click the side button to bring up a customisable menu of app shortcuts.

I've only two real grumbles. First, the S Pen is made from cheap-feeling glossy plastic, which feels jarringly incongruous as a companion to a glass-encased tablet. Second, Samsung hasn't provided any convenient place to stow the pen when it's not in use. I would have loved to see a handy slot in the casing, as with Samsung's Galaxy Note phones, or perhaps a magnetic clip à la Microsoft. But no – you have to carry it around separately, or invest in a separate case (Samsung's own ones start at a stiff £59).

DeX and the Keyboard Cover

In many ways, the Galaxy Tab S4 delivers exactly what we'd expect from a high-end Android tablet. What makes it unique is DeX mode. Originally introduced on the Galaxy S8 smartphone, DeX turns Android into a more laptop-like experience, with a windowed interface and support for a keyboard and mouse. On Samsung phones, DeX requires a special dock, but the Tab S4 can be switched into DeX mode without extra hardware.

It's a nice idea. Android 7 Nougat introduced a split-screen multitasking mode, but I've never found it intuitive or pleasant to work with. DeX is more sophisticated, with windows that can be freely shunted around and resized, and a familiar taskbar along the bottom. It feels a lot like Chrome OS; the Chrome browser even has handy tabs along the top.

BELOW The AMOLED screen is one of the Galaxy Tab S4's stand-out features, with rich colours even at extreme angles

While switching into DeX in this way is a neat trick, it feels cramped in use because you have to tap out text on a floating virtual keyboard, and use a finger or the S Pen in place of a mouse. One solution is to connect an external monitor to the USB-C socket; you can then use the whole tablet surface as a virtual keyboard and touchpad, or connect a Bluetooth keyboard and mouse for the most desktop-like experience possible.

Alternatively, you can invest in Samsung's custom-made Keyboard Cover – a £119 plastic case with a built-in keyboard, which snaps onto the Galaxy Tab S4 and props it up from behind. If you've ever seen Apple's Smart Keyboard for the iPad Pro, you'll know exactly what it looks like, and it's obviously designed to help you make the most of DeX on the go.

The keyboard is decent, too. The keys have a strong, positive action, and despite the compact format, the spacing doesn't feel too tight. Pleasingly, like the Book Cover, the case also includes a holder for the S Pen. I'm less keen on the fact that the Keyboard Cover doesn't have a built-in trackpad, as found on Microsoft's Type Cover accessories for its Surface devices. To be fair, the iPad Pro Smart Keyboard doesn't have one either, but DeX – unlike iOS – has clearly been designed as a mouse-driven environment, and jabbing at an upright screen with a finger or stylus isn't quite the same.

"You'll quickly master variable-width strokes and start knocking up sketches and beautifully handwritten notes"

I'm also turned off by the presence of a few unnecessary keys. To the right of the space bar, there's a button to call up language settings – as if this is something people need to access regularly. Even more bafflingly, on the left of the physical keyboard there's a button that calls up the onscreen keyboard. I guess this could be useful if you frequently want to insert GIFs and emoji via the virtual keyboard, but if that's the intention it feels like a misreading of the target audience.

Performance and battery life

The Galaxy Tab S4 is powered by a Qualcomm Snapdragon 835 processor, with four cores running at 2.35GHz and another four running at 1.9GHz. That's the same CPU as found in the Galaxy S8 smartphone, the

Price and competition

The Wi-Fi-only edition of the Galaxy Tab S4 costs £599 in the UK, and comes with 64GB of internal storage, expandable to a maximum of 400GB via the microSD slot. There's also an LTE version coming for £649.

The 10.5in iPad Pro is a superbly capable and versatile alternative, but it's a touch more expensive, with prices starting at £619 – if you want the Apple Pencil stylus, that will set you back an extra £89. It's widely rumoured that a new, upgraded version of the iPad Pro will be introduced before the end of 2018, so it might be worth waiting a few months before buying.

If you're looking for something cheaper, the old Galaxy Tab S3 is still available: we've found the Wi-Fi version online for £425. However, not only is the 9.7in screen slightly smaller than the S4's, you also get only half the internal storage, and an older, slower Snapdragon 820 processor.

Another more affordable option is the latest iteration of the regular 9.7in iPad. This naturally doesn't have all the high-end features of the iPad Pro, but it works with the Apple Pencil, and you can pair a Bluetooth keyboard and get a similar experience at a much lower cost, with the iPad itself starting at £319 for the 32GB model.

Finally, don't forget the Microsoft Surface family. The range stretches from the £379 Surface Go up to the £1,149 Surface Book 2 with its detachable keyboard, so there's bound to be something that suits your needs. The catch is that these devices all run Windows 10, which is great for "proper" computing, but means you're left with a more limited range of touch-friendly apps when you switch to tablet mode.

Google Pixel 2 and the Nokia 8, and Android feels every bit as slick here as it does on those devices.

The Tab S4 runs Android 8.1 Oreo with various Samsung-specific tweaks to the homescreen, app drawer, icons and so on. These are mostly cosmetic and make little difference to the overall experience, but Samsung's insistence on futzing with Android does mean that it will probably be many months before the Tab S4 gets Android 9 Pie. Still, that update doesn't add anything particularly urgent or important for tablet users.

It's also worth noting that, while we certainly wouldn't call any of the aforementioned smartphones underpowered, they're all from 2017. Compared to the cream of this year's handsets, such as Samsung's own Galaxy S9, the Galaxy Tab S4 is behind the pace – and, as the Geekbench test exposes, it's a long way behind the iPad Pro (*see right*).

Predictably, it's a similar story with the Galaxy Tab S4's gaming performance. The GFXBench Manhattan test again confirms that the older CPU can't keep up with Apple's own-brand chips, nor the latest Snapdragon processors.

This isn't a disaster: there's enough power here for all your Office-type tasks, and for all but the most demanding games. But if you want to take full advantage of DeX, by hooking up a large monitor and opening lots of Android apps and Chrome tabs at once, you'll get bogged down pretty quickly.

Still, there's good news on the battery front. The Galaxy Tab S4 comes with a 7,300mAh battery, which is a step up from the 6,000mAh of the S3. Samsung claims it will deliver 16 hours of full-screen video playback, and in our own tests – with the brightness set to a comfortable level for indoor viewing – it comfortably exceeded that promise, giving us 17hrs 10mins of non-stop entertainment before conking out. Although the iPad Pro has an even bigger battery (rated at 8,134mAh), Apple's tablet managed only 12hrs 59mins with the screen set to a standard brightness of 170cd/m².

Nice try, but...

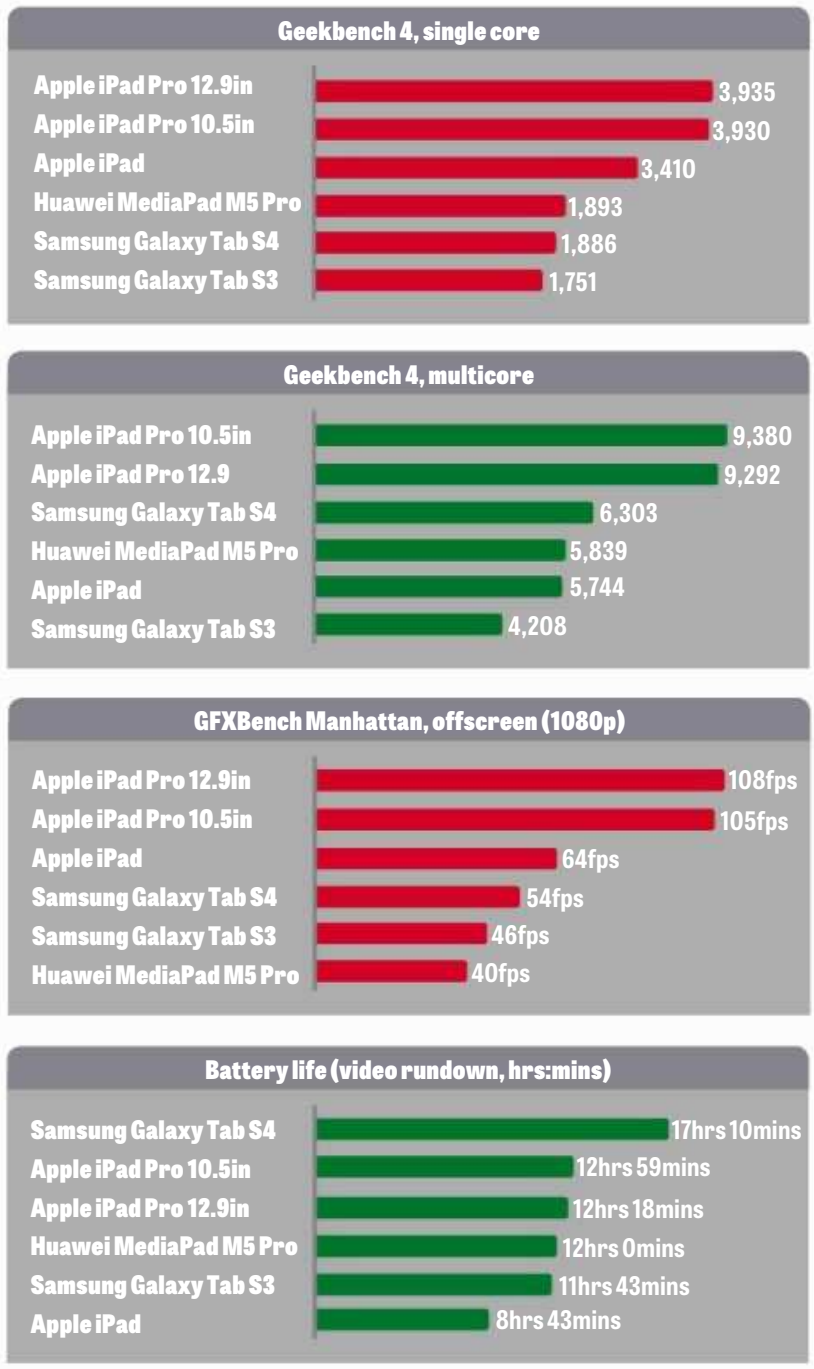
The Galaxy Tab S4 is an ambitious device, and it's exciting to test a tablet that pushes the boundaries of what Android can do. It feels like a long time since we've seen that. There are several things about this tablet I like very much, too. The screen is great, the S Pen works brilliantly, the battery life is exceptional, and overall it feels like a premium piece of hardware.

The trouble is, I could have said much the same about the cheaper, older Galaxy Tab S3. And when we turn to the new features that define the Tab S4, it's harder to be enthusiastic. DeX presents an inspiring vision, but the overall package lacks the slickness, the coherence and the sheer horsepower of the iPad Pro.

To be sure, Samsung deserves credit for not merely mimicking Apple with the Samsung Galaxy Tab S4, but attempting to carve out a distinctive future for Android as a productivity platform. Ultimately, though, it doesn't come off. For every plus point there's also a but – and that's hard to accept from a tablet that has set its sights so high.

DARIEN GRAHAM-SMITH

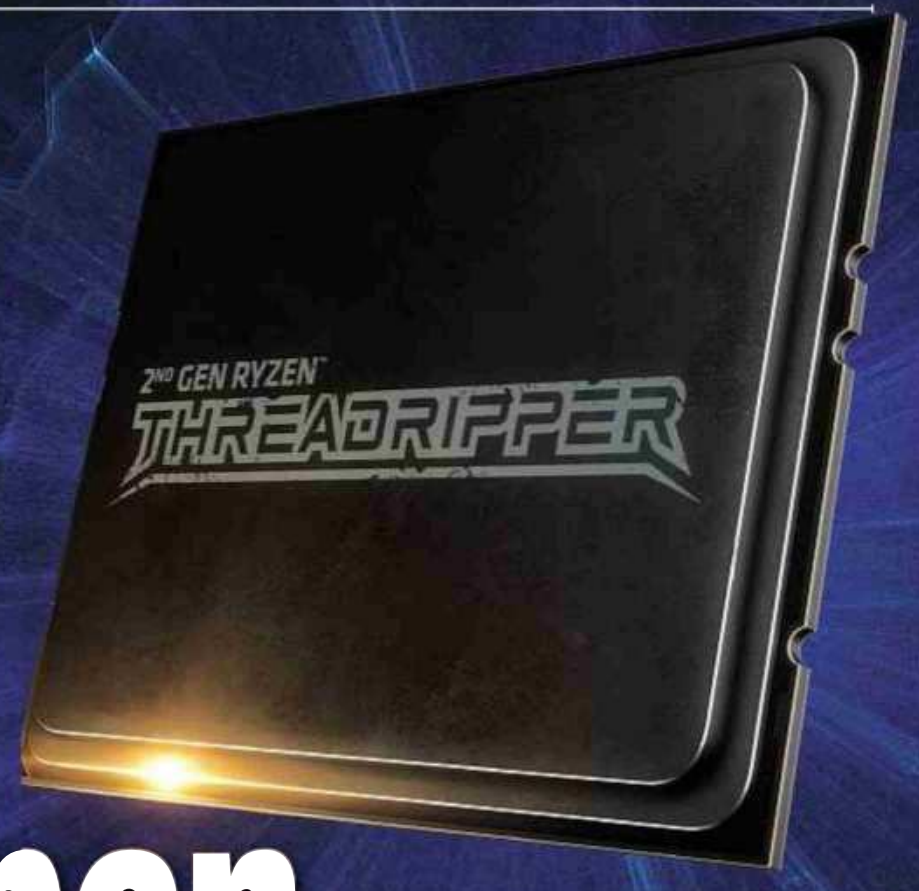
LEFT The £119 Keyboard Cover's keys have a strong action and the spacing doesn't feel too cramped – but there's no built-in trackpad



SPECIFICATIONS

Octa-core 2.35GHz/1.9GHz Qualcomm Snapdragon 835 processor • Adreno 540 graphics • 4GB RAM • 10.5in Super AMOLED display, 2,560 x 1,600 resolution • 64GB storage • microSD slot • 13MP/8MP rear/front camera • 802.11ac Wi-Fi • Bluetooth 5 • USB-C connector • Android 8.1 • 7,300mAh battery • 249 x 7.1 x 164mm (WDH) • 482g • 1yr warranty

AMD 2nd Gen Ryzen Threadripper



AMD's 2018 update brings more cores and higher clock speeds – it's a chip to die for

Last year, AMD's Threadripper shook the high-end desktop computer world. Originated as a skunkworks project by a bunch of AMD architects and enthusiasts, the new chips knocked Intel off its perch for the first time in a generation.

The blue team responded with the mighty Core i9-7980XE, but we always knew Threadripper had more to offer – not least because there were two inactive dies sitting under its massive heatspreader. With this second generation, AMD takes on Intel on two fronts. The first salvo is the Threadripper 2950X, an out-and-out enthusiast's chip. The second is the 2990WX (*see p58*), designed for ultra-high-end workstations such as Scan's 3XS WA6000 Viz (*see p59*).

Something shared

The new Threadripper CPUs sport the same upgrades that their mainstream Ryzen siblings introduced this year. Highlights include XFR 2, Precision Boost 2, and Precision Boost Overdrive, which together push performance higher in both lightly threaded and multithreaded tasks.

XFR 2 allows the CPU to raise speeds beyond their normal range where temperatures allow: AMD claims that with liquid cooling this can provide an additional 16% performance boost, compared to an average air cooler. Precision Boost Overdrive applies a small blanket overclock, while leaving the automatic boosting algorithms active. As a result, 2nd Generation Threadripper CPUs should be measurably faster than the original generation at almost every task.

Something different

Architecturally, the two processors are all but identical. Each one comprises four dies, with two core complexes per die, each of which in turn contains four cores for a total of eight cores per die.

The key difference is that, on the 2990WX, all of this silicon is available for processing duties – a whopping 32 cores servicing 64 threads – while on the 2950X two dies are disabled, leaving you with 16 functional cores. The 2990WX has 64MB L3 cache to the 32MB of the 2950X, in addition to each core's onboard 512KB L2 cache.

There's a catch, though, because not all of these cores are wired up in the same way. The first two dies – the ones that are active in both chips – have a direct connection to the rest of the system, such as the PCI-E bus and memory, and can communicate with one another using AMD's Infinity Fabric. The extra cores in the 2990WX effectively sit on an island; to access system resources they must communicate through the other two dies, which adds a lot of latency, especially in memory-intensive programs.

ABOVE Note the heavy metal-inspired logo – AMD tells us it was just for fun

Clock speeds are different too. Where the 2950X can boost from 3.5GHz to a maximum frequency of 4.4GHz, the weightier 2990WX comes with a lower base clock of 3GHz, and a maximum boost of 4.2GHz. As the graphs opposite and on p58 show, this erodes the 2990WX's advantage, and is part of the reason it can can actually be slower at some tasks.

"The second round of the high-end CPU showdown is now underway, and once again AMD has come out swinging"

Compatibility

In October, these two chips will be joined by the 2970WX – a 24-core version of the 2990WX. At some point, the 12-core 2920X will replace the current 1920X. All four Threadripper CPUs will be compatible with the current TR4 socket and X399 motherboards, although you'll likely need to apply a BIOS update.

Clearly these new processors add up to a formidable lineup. For all-round speed, Intel's Core i9-7980XE is still top dog, but at £1,800 it's more expensive than any AMD CPU, and in highly multithreaded tests (such as Cinebench R15) it simply can't keep up with a high-end Threadripper chip. The second round of the CPU showdown is underway, and once again AMD has come out swinging. **ANTONY LEATHER**

AMD Threadripper 2950X

A stunning high-end CPU for content creators, but make sure to pair it with fast memory for the best results

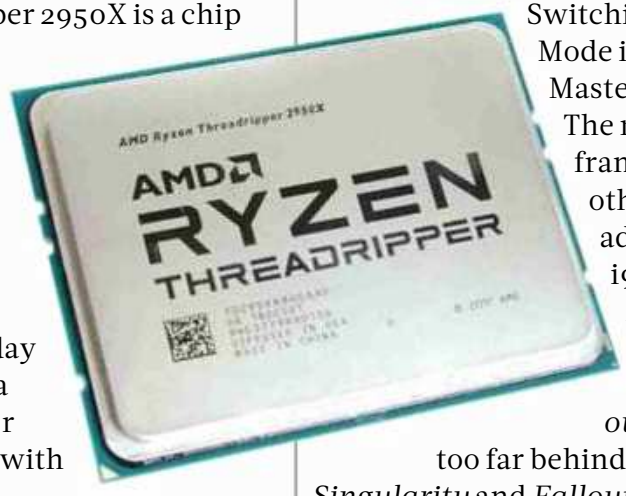
SCORE ★★★★★

PRICE £681 (£817 inc VAT) from scan.co.uk

With 16 cores and 32 threads, the Threadripper 2950X goes head to head with Intel's i9-7900X – and the price is the same too. Like the original 16-core Threadripper, its TDP remains slightly higher than Intel's at 180W, but there's no need for expensive watercooling as it will work with a wide range of air coolers.

PC PRO RECOMMENDED

The Threadripper 2950X is a chip that's made for overclocking, and we managed to get ours up to 4.2GHz on all cores using a 1.425V vcore, which is our safe limit for an everyday overclock. That's a big 400MHz higher than we managed with the equivalent first-generation CPU.



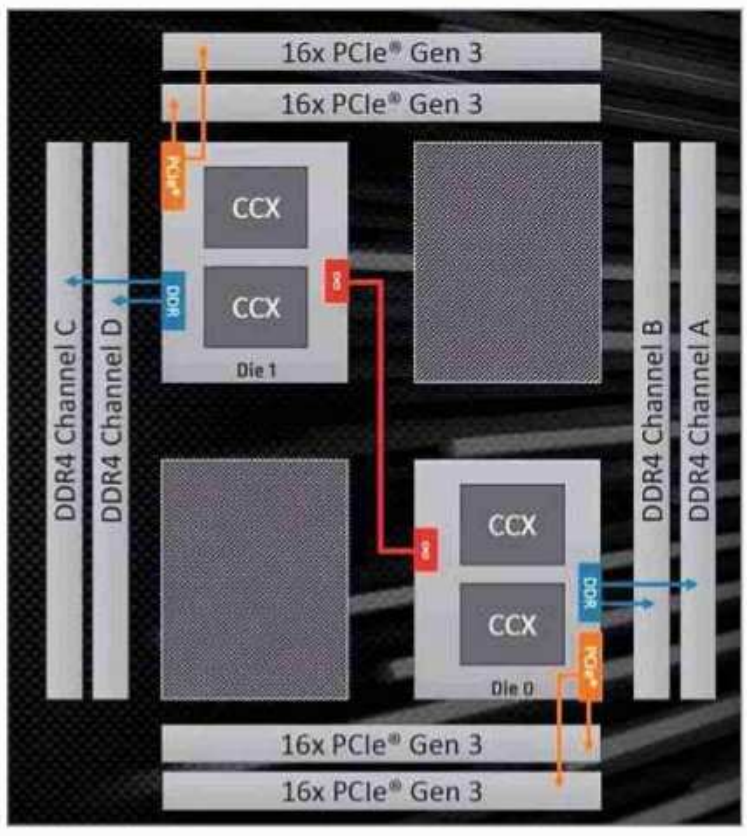
Indeed, we found that the old Threadripper 1950X often worked best at stock speed, as with default settings the CPU was capable of automatically boosting a couple of cores up to 4.2GHz. With the Threadripper 2950X, you can hit that speed across all cores, losing only a little in terms of lightly threaded performance, and gaining a huge amount of multithreaded speed – as can be seen from the graphs on this page and overleaf.

Even if you keep the 2950X at stock clocks, performance is excellent. It managed to better the Core i9-7980XE in the CPC RealBench image-editing test, adding almost 2,000 points to its predecessor's score. It came a very respectable second in the video encoding test too, beating the similarly priced Core i9-7900X by a massive 40%. And predictably it made a mockery of Intel in the heavily threaded Blender, POV-Ray and Cinebench tests; here only the Threadripper 2990WX and Core i9-7980XE were quicker.

Games aren't the 2950X's strong point out of the box, but we found that using faster memory than our standard 3,000MHz kit yielded worthwhile boosts. Switching to Game Mode in Ryzen Master helped too. The minimum frame rate was otherwise 10fps adrift of the Core i9-7900X in *Deus Ex Mankind Divided* (*see overleaf*) but not too far behind in *Ashes of the Singularity* and *Fallout 4*.

Overall, the 2950X doesn't best Intel's Core i9-7980XE, but that costs more than twice the price. Weigh it against the similarly priced 7900X and it's a clear winner in all tests other than gaming – and, as we've noted, there are ways to narrow the gap here. Even in a standard, stock-speed setup, the 2950X is fantastic value for content creators or anyone investing in a high-end desktop system.

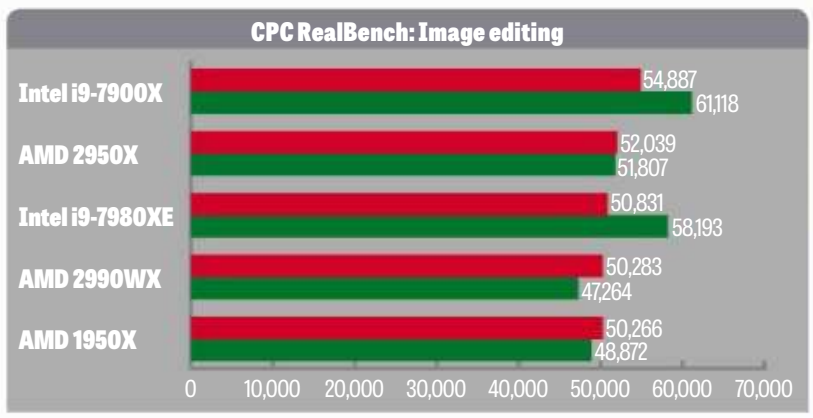
ANTONY LEATHER

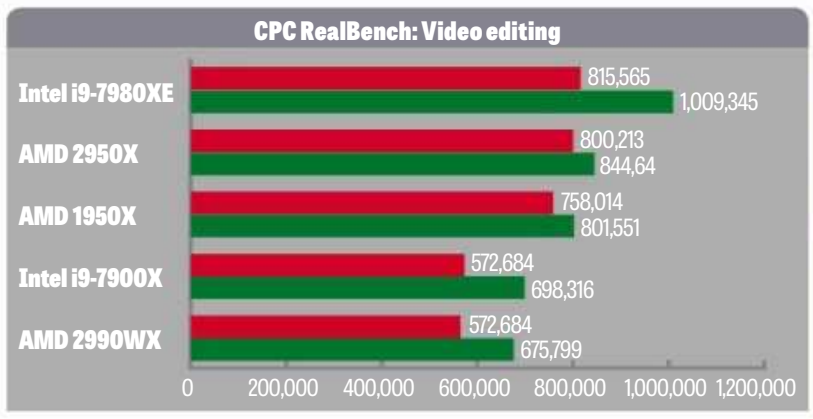


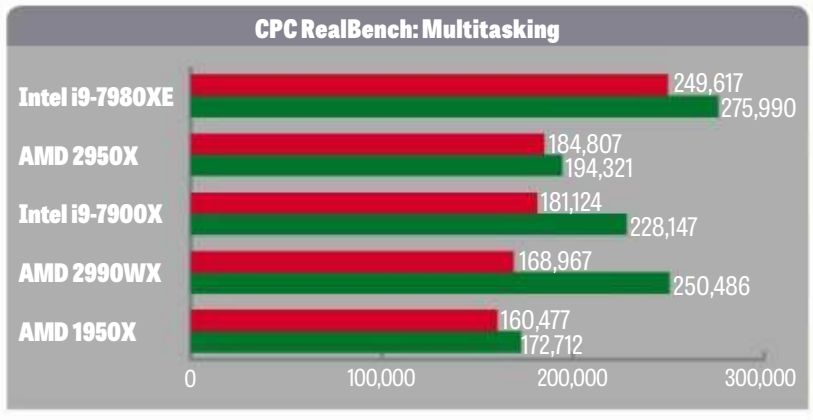
LEFT Only two dies are active here, but they have a direct connection to your system

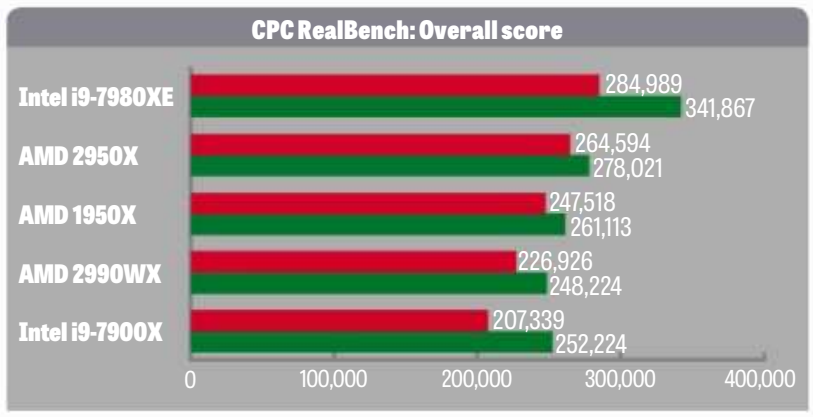
SPECIFICATIONS

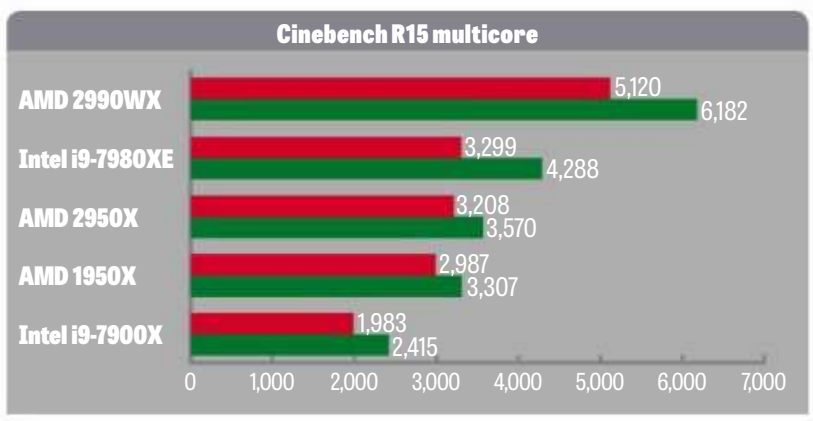
3.5GHz base frequency • 4.4GHz max boost frequency • Zen+ 12nm architecture • 16 cores (32 threads) • SMT • 32MB L3 cache, 16 x 512KB L2 cache • quad-channel DDR4 memory up to 2,933MHz • Socket TR4 • 180W TDP

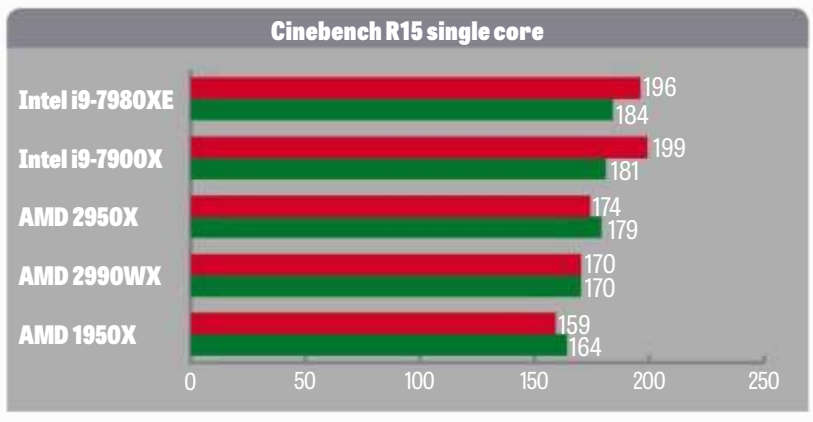












STOCK SPEED OVERCLOCKED

AMD Threadripper 2990WX

The most powerful desktop CPU ever, this is an exceptional choice for compute-heavy tasks

SCORE ★★★★½

PRICE £1,367 (£1,640 inc VAT)
from scan.co.uk

Cramming 32 cores into a desktop CPU is a stellar achievement for AMD – and it's fast too, with a peak boost speed of 4.2GHz and all-core frequencies of at least 3GHz. Thanks to AMD's Precision Boost Overdrive and other SenseMI technologies, frequencies can rise even higher if your cooling and power delivery systems are up to it.

PC PRO RECOMMENDED

Since the CPU is compatible with current X399-chipset motherboards, you don't even need to invest in new hardware. Note the increased TDP, though: at 250W, its cooling needs are beyond most air coolers. If you're hoping to overclock, you'll need a decent all-in-one liquid cooler.

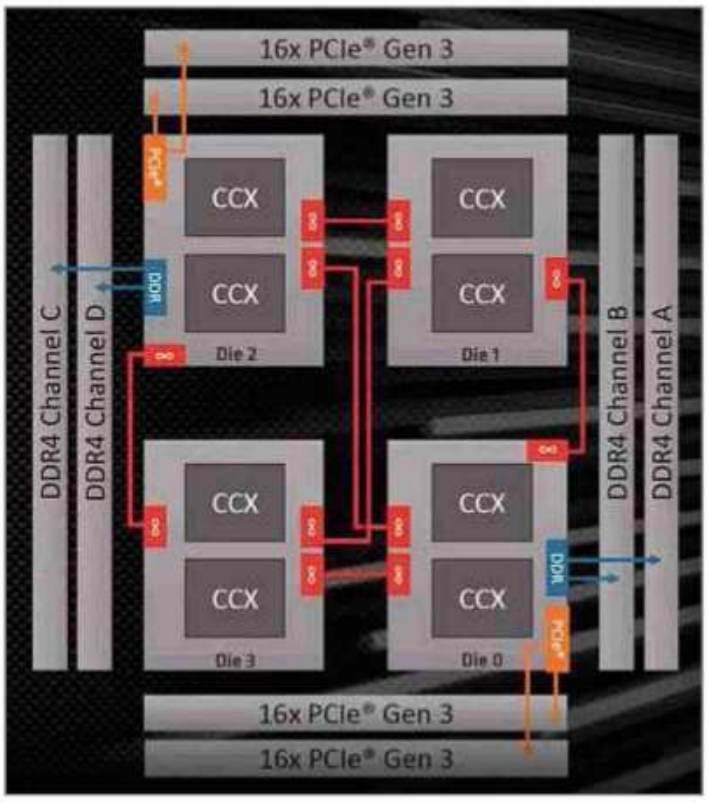
The 2990WX's four Zeppelin dies each host eight Zen+ cores. Only 16 of these 32 cores can directly access the RAM and PCI-E bus, however; this means they can race through computational tasks at full speed, but memory-intensive, multithreaded applications are likely to be held back by latency.

With the right workload, it's a stunner. In POV-Ray, the 2990WX wiped the floor with the Intel Core i9-7980XE, knocking a third off its benchmark times, both at stock speed and when overclocked to 4.1GHz across all cores. Nudging up to 4.2GHz resulted in an unstable system, but we did manage to get a Cinebench result at this speed – and it was the fastest we've ever seen, representing triple the stock-speed score of Intel's Core i9-7900X. Even at default speeds, the 2990WX was 20% faster than the overclocked Intel Core i9-7980XE.

At the same time, disappointing scores elsewhere dragged the overall system score down to 226,926 in CPC RealBench, placing it second from last among our contenders. Even in the heavily multithreaded Handbrake test the 2990WX wasn't as fast as we'd hoped, and gaming performance was disastrous. There's no doubt that this is due to the latency of the second bank of cores: when we used Ryzen Master to cut the core count to 16 and disable SMT, scores instantly leapt up to match the Threadripper 2950X in *Deus Ex*, with the minimum frame rate rising from 39fps to 57fps.

Ultimately, the Threadripper 2990WX is a niche CPU that's lightning fast in specific circumstances but hobbled in others. For most workloads the 2950X is a smarter choice. For pure number-crunching however, the 2990WX is the most monstrously powerful CPU we've seen, compellingly beating Intel's flagship into second place.

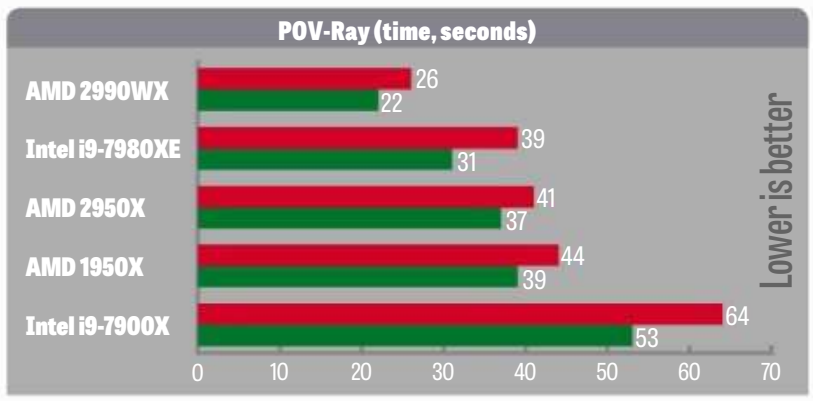
ANTONY LEATHER

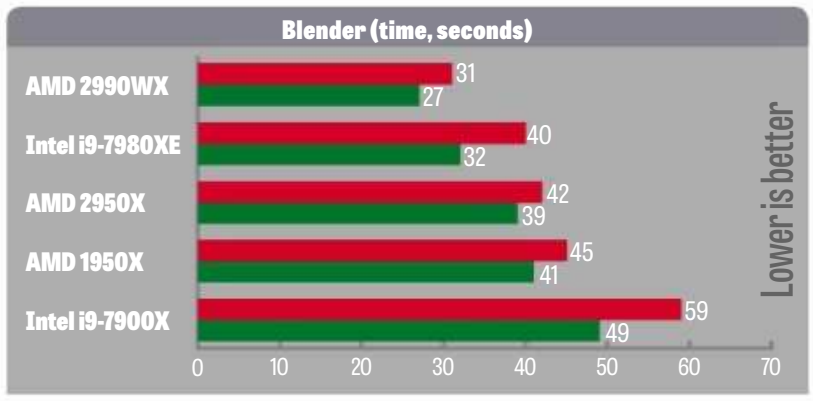


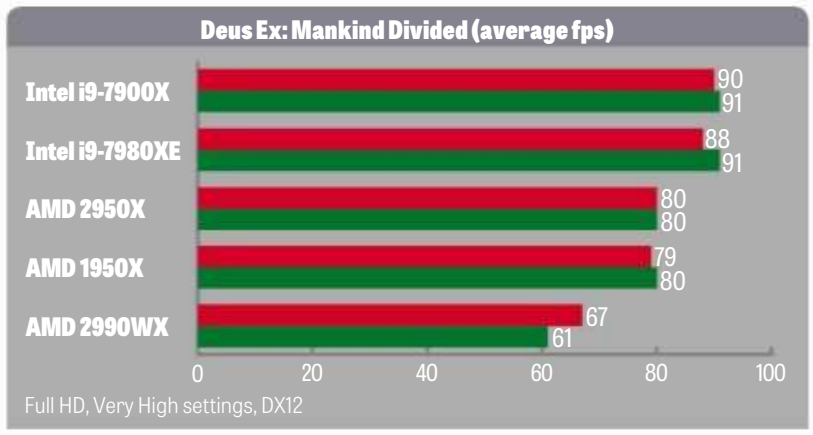
LEFT The 2990WX's two extra dies can talk directly to the other dies, but not the system

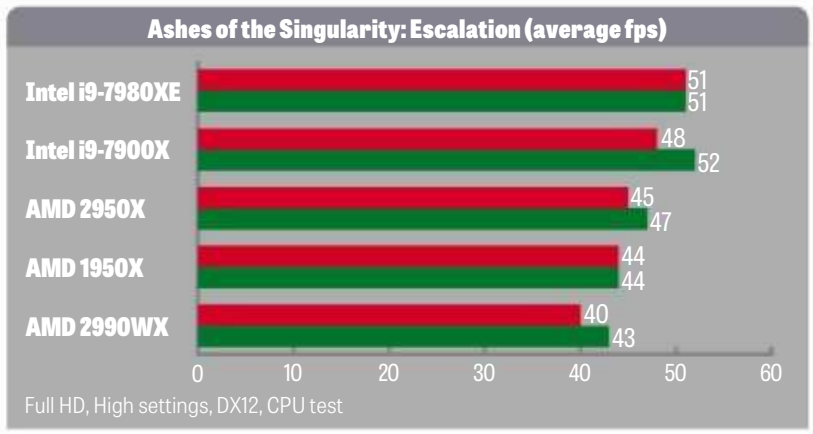
SPECIFICATIONS

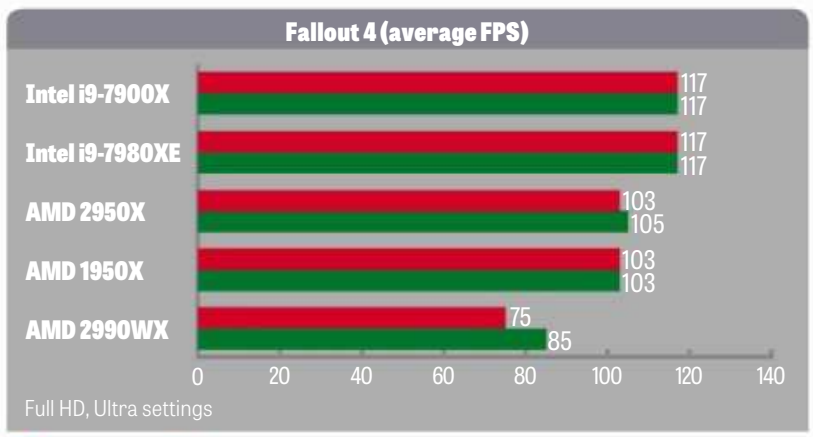
3GHz base frequency • 4.2GHz max boost frequency • Zen+ 12nm architecture • 32 cores (64 threads) • SMT • 64MB L3 cache, 32 x 512KB L2 cache • quad-channel DDR4 memory up to 2,933MHz • Socket TR4 • 250W TDP



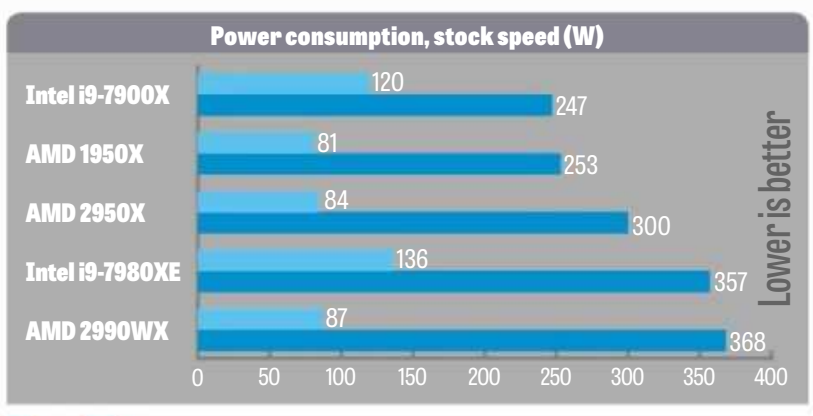








STOCK SPEED OVERCLOCKED



IDLE LOAD

Scan 3XS WA6000 Viz

A 32-core CPU and a high-end professional graphics card make this a truly formidable workstation

SCORE ★★★★★

PRICE £4,000 (£4,800 inc VAT)
from scan.co.uk

Scan's 3XS WI6000 Viz has been our A-listed workstation for the past eight months, thanks largely to the phenomenal power of its 18-core Core i9-7980XE processor. Now the company has put together an AMD-based alternative, powered by the new 32-core Threadripper 2990WX CPU reviewed opposite.

The WA6000 Viz looks every inch a serious system, encased as it is in a sizeable, sober-looking Fractal Design Define XL R2 case. The guilty secret is that it's actually built on an Asus RoG Zenith Extreme gaming motherboard; this doesn't feel too incongruous, but a few features stick out, such as the coloured LEDs illuminating the audio ports at the rear.

Still, the board can't be faulted for connections and features. There's no fewer than ten USB 3.1 ports at the rear (including second-generation 10Gbits/sec sockets in both USB-A and USB-C formats) and a further two at the front. There's built-in Bluetooth 4.1 too, along with Gigabit Ethernet and MIMO-enabled 802.11ac. Screw in the supplied second antenna and you can connect to 7Gbits/sec 802.11ad networks as well.

Inside, you'll find four full-speed, third-generation PCIe x16 slots, so those with deep pockets can expand on the included Nvidia Quadro graphics card, all the way up to a quad-GPU system. Eight DIMM slots let you push up the RAM too, from the supplied 64GB to a maximum of 128GB, while a special "DIMM.2" slot can be used to install two extra M.2 SSDs alongside the system drive.

In the standard spec, this is a 500GB Samsung 970 Evo. It's not quite the fastest SSD on the market, but it won't leave you waiting around: we measured sequential read and write speeds of 1,828MB/sec and 2,335MB/sec respectively. It's partnered with a 2TB hard disk, and there are enough onboard connectors and bays to accommodate a total of six SATA drives, plus one U.2 drive.

ABOVE **A liquid cooler helps the all-new Threadripper reach its highest speeds**

So much for the specs: what about performance? The Threadripper 2990WX runs at a nominal base speed of 3GHz, with a maximum boost frequency of 4.2GHz, and unlike the Core i9 CPU in the WI6000 Viz, it's not supplied overclocked. Scan has however installed a Corsair Hydro H100i 2 liquid cooling system, which should allow AMD's XFR 2 technology to push speeds beyond what you'd get from a regular air cooler.

And to be sure, the WA6000 Viz achieved some terrific results in our performance tests. In the Cinebench R15 CPU rendering benchmark it thrashed its Intel counterpart, with a score of 5,087 – more than 30% faster than the WI6000's 3,867. As noted opposite, AMD's 32-core processor also knocked a full third off the time it took the Intel Core i9 to render the standard POV-Ray benchmark scene.

Results were jsut as strong in the SPECvi1ewperf 12.1 benchmark suite: across nine tests, the WA6000 Viz averaged a 24% lead over the Core i9 system, including a huge 35% win in the maya-04 3D modelling test. This isn't solely down to the CPU, mind you: the 16GB Quadro P5000 graphics card is also a big step up from the 8GB P4000 supplied with the Intel sytem.

Indeed, the quirky design of the processor – in which only half of its cores have direct access to system RAM – can hold it back when it comes to shunting large data sets around. In SPECviewperf's texture-heavy 3ds max benchmark, the WA6000 Viz trailed 10% behind its Intel counterpart, and in the Cinebench R15 OpenGL test its score of 154 was a long way behind the Core i9's 241. There's a reason why Scan pitches this system specifically at "high-end CAD and rendering using CPU-bound applications".

It was the same story in our own Real World Benchmarks. The WA6000's scores were certainly fast, but the WI6000 – despite its lower core count – took the gold in every event, scoring 176 in the image-editing test, 513 for video editing and a monstrous 647 in the multitasking test, for an overall score of 524.

As you'd expect, lighting up 32 cores at once eats up a lot of power: I measured a total consumption of 373W under 100% CPU load, rising to 413W when I started taxing the graphics card too. Thanks to that liquid cooler, however, the system never got louder than a desk fan.

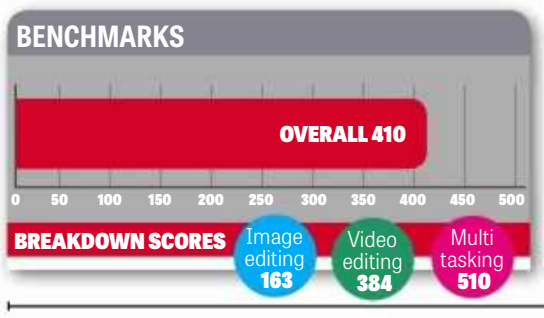
The WA6000 Viz showcases the remarkable potential of AMD's new flagship CPU, but also exposes its limitations. Even though it has more cores than anything we've previously seen, for some workloads you'll get better results from the Intel system. Still, AMD's aggressive pricing allows Scan to pack in a more powerful graphics card – and if what you chiefly demand from a workstation is the ability to chew through huge number-crunching tasks, there's simply no competition. **DARIEN GRAHAM-SMITH**

PC PRO RECOMMENDED

BELOW **The serious-looking case befits a machine that is capable of heavy duty professional work**

SPECIFICATIONS

32-core AMD Threadripper 2990WX processor (base speed 3GHz, max turbo 4.2GHz) • 16GB Nvidia Quadro P5000 graphics • 64GB DDR4 RAM • 500GB M.2 NVMe SSD • 2TB hard disk • 2x2 802.11ac Wi-Fi • 802.11ad wireless • Bluetooth 4.1 • 9 x USB 3.1, 1 x USB-C 3.1 (rear), 2 x USB 3.1 (front) • Windows 10 Professional • 232 x 560 x 559mm (WDH) • 3yr warranty (first year on-site, then RTB)



3XS SYSTEMS PRO GRAPHICS

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- Intel® Core™ i5 8600K processor overclocked to 4.8GHz
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- 250GB SSD & 2TB HDD
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Based on the high-end Intel® Socket 2066 platform which supports Intel® Core™ i7 and i9 CPUs with up to 18 cores and high-bandwidth quad-channel DDR4 memory for superlative performance in a wide variety of DCC applications.

3XS WI6000 Design

- Intel® Core™ i7 7820X processor overclocked to 4.5GHz
- 32GB Corsair Vengeance DDR4 2666MHz
- 4GB NVIDIA Quadro P1000
- 250GB SSD & 2TB HDD
- 3 Year Premium Warranty

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3XS WI6000 Viz

- Intel® Core™ i9 7900X processor overclocked to 4.5GHz
- 64GB Corsair Vengeance DDR4 2666MHz
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- 250GB SSD & 2TB HDD
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- 64GB ECC Registered DDR4 2666MHz
- 2GB NVIDIA Quadro P620
- 250GB SSD & 2TB HDD
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3XS WI8000 Viz

- 2 x Intel® Xeon™ Silver 4114 10 Core with HT
- 128GB ECC Registered DDR4 2666MHz
- 8GB NVIDIA Quadro P4000
- 250GB SSD & 2TB HDD
- 3 Year Premium Warranty

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Intel Inside®.
Powerful Productivity Outside.

SCAN

Dell XPS 15 (2018)

Incredible power packed inside a refined and sleek machine – and all for a very affordable price

SCORE ★★★★★

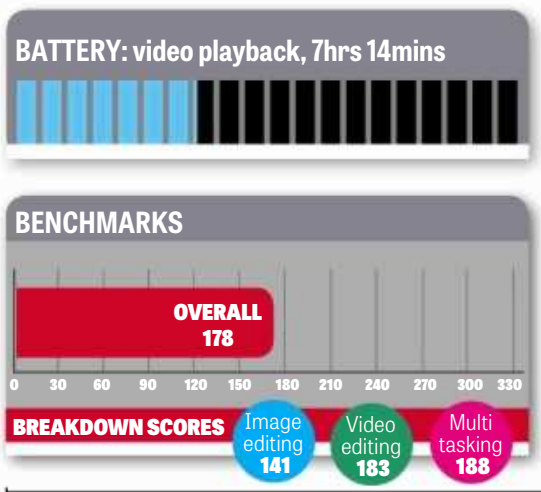
PRICE As reviewed, £1,541 (£1,849 inc VAT)
from dell.co.uk

If you're feeling a sense of déjà vu, don't worry: it isn't you. We reviewed the 2-in-1 version of the XPS 15 two months ago (*see issue 287, p54*), and now Dell has released an update to its non-convertible brother. This one is all about performance, with Intel's new six-core Core i7-8750H processor housed inside – giving us a Windows rival to the new 15in Apple MacBook Pro.

And it really is powerful. This CPU has six Hyper-Threaded cores running at a base clock of 2.2GHz, and when stressed can boost to a staggering 4.1GHz per core. Our review sample also has 16GB of 2,666MHz DDR4 RAM and a 512GB M.2 PCIe SSD inside. As if that wasn't enough, there's a Nvidia Max-Q design GTX 1050 Ti, which has 4GB of dedicated GDDR5 memory. That Max-Q design isn't just for show: it's Nvidia's certificate for laptops that are thin, silent and have a full-blown Nvidia graphics card inside.

Upping the ante

To put it to the test, I threw synthetic benchmarks at the laptop – and it performed even better than I expected. In the *PC Pro* media benchmarks, it managed a remarkable score of 178. That pips the 15in MacBook Pro by five points, and is almost twice as fast as most laptops based on Intel's Core i7-8550U chips. In the multi-platform Geekbench 4 benchmark, the XPS 15 hits 4,952 in single-core and 21,485 in multi-core tests. That's absolutely incredible for a device that's only 17mm thick.



The graphics chip is no slouch either. In GFXBench Manhattan 3, the GTX 1050 Ti netted the top 60fps mark in the onscreen tests, while its offscreen performance (which runs at 1080p) hit a staggering 295fps.

I also put the laptop through its paces in *Dirt: Showdown*. At Full HD it managed an average of 104fps, and ramping up the resolution to 4K – as I could, because our review sample included a 4K touchscreen – still returned 68fps. Upping the ante, I used *Metro: Last Light Redux* to stress its GPU. Here, cracks started to appear, with 4K at medium settings hitting an average of 33fps, while on High graphics settings the figure drops down to 25fps.

Then there's the 512GB M.2 PCIe SSD. In the AS SSD Benchmark, the XPS 15 achieved a read speed of 2,292MB/sec and write speed of 1,009MB/sec – results that are more than twice as fast as a typical SSD.

Designer flourish

When it comes to design, we know exactly what to expect when it comes to a Dell XPS laptop. The 2018 XPS 15 is no different from its predecessors – a CNC-machined aluminium lid, black carbon-fibre composite palm rest and crazily narrow bezels around the display give it a high-class look. It's also a sleek laptop, with a tapered design that starts at 11mm at the front.

This helps to disguise its 2kg weight, which is respectable for a laptop containing this much power. For example, the Razer Blade 15 (*see issue 288, p63*) includes the same Intel processor and GTX 1070 graphics, and weighs 2.1kg. I still found it easy to lug around, though, and it's surprising what a difference the Razer Blade's extra 1.3mm of thickness makes in terms of perception. Note that if you buy the Full HD version of the XPS 15, Dell includes a smaller battery and the weight consequently drops to 1.8kg.

ABOVE The wafer-thin bezels and 17mm thickness give the XPS 15 a sleek, classy look

PC PRO RECOMMENDED

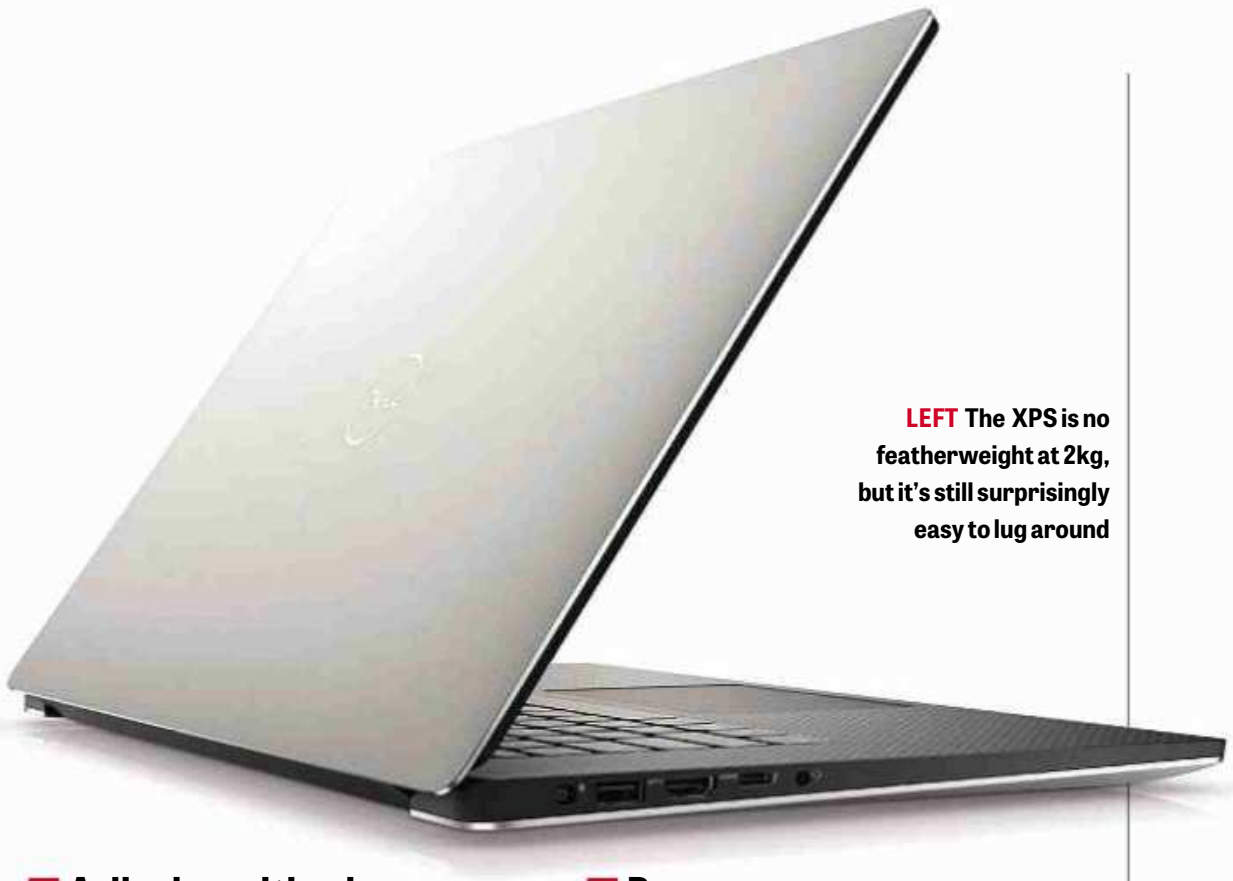
"This CPU has six cores running at a base clock of 2.2GHz, and when stressed can boost to a staggering 4.1GHz per core"

Dell packs in the ports, with a Type-A USB 3.1 port on the right-hand edge along with an SD card reader, which both sit under a convenient five-LED battery indicator. Here, you can check the laptop's battery level by clicking the small physical button on the right-hand edge.

The left edge offers another Type-A USB 3.1 port, a 3.5mm headphone/mic jack combo, a full-sized HDMI 2 port, and a Thunderbolt 3 USB-C port. As we cover in this month's Labs (*see p92*), this versatile port is proving ever more popular: connect a docking station and you have a neat way to deliver power, connect a couple of displays and hook up external drives.

ABOVE The power button doubles up as a fingerprint reader – a useful time-saver

Dell positions the power button at the top right-hand side of the keyboard, where it doubles up as a fingerprint reader. This makes it ultra-convenient to unlock the laptop. Curiously, though, Dell has opted to ditch the infrared camera setup of the 2-in-1 XPS 15, where it's used as a Windows Hello sign-in option. As usual, the remaining webcam sits awkwardly under the display's bottom edge. That's both understandable and forgivable, though, given the lack of bezel space.



LEFT The XPS is no featherweight at 2kg, but it's still surprisingly easy to lug around

A display with edge

The XPS 15 has a 15.6in "InfinityEdge" screen. This isn't just marketing bumf. With an edge-to-edge Corning Gorilla Glass 4 display, it looks glorious. Dell offers a choice of a 4K (3,840 x 2,160) touchscreen or a Full HD (1,920 x 1,080) non-touch IPS display. Our sample included a 4K screen, which I found to be predictively responsive; note it supports ten-point touch too.

The screen proved capable of covering 95.5% of the sRGB colour gamut, and with a contrast ratio of 1,638:1 it's little wonder that colours popped off the screen whether viewing films or photos. Don't expect top-end colour accuracy, though: I measured an average Delta E of 3.21 and a maximum of 10.75. Still, to the naked eye, it looks incredible. My only real complaint – and this comes from my background as an avid gamer – is that the display is limited to 60Hz. The 144Hz Full HD Razer Blade 15 will provide a more fluid experience.

If you're more concerned with battery life, you should consider whether you need a 4K display. Here, the laptop achieved a respectable 7hrs 14mins in our video rundown test, which is seven minutes more than the Razer Blade. However, the XPS 15 2-in-1 we tested with a Full HD display achieved 8hrs 29mins. I'd expect the Full HD XPS 15 to offer a similar life.

While the XPS 15's keyboard doesn't have the RGB backlights of the Razer, it's a fine unit. There's no number pad, which means there's plenty of space for keys to breathe, while the keys are perfect for fast typists – they provide a solid, "clicky" feedback. The touchpad sits in the middle, and while the buttons are integral there are clear left and right indicators along the bottom edge of the pad. Better still, you can left-click anywhere on the pad – a nice touch for power users.

Buy now

Just when I thought the XPS range couldn't get better, it did. Last year's XPS 15 was an excellent laptop, and this year's XPS 15 2-in-1 was even better – but the new "regular" XPS 15 takes it up a notch. And Dell offers something for every budget. For £1,299, which is half the price of a 15in MacBook Pro, you could buy the base Dell XPS 15 – this includes a Full HD screen, 8GB RAM, 256GB SSD, GTX 1050 graphics and a quad-core Core i5-8300H processor.

Or you can go the opposite way and spend £2,919 on the Intel Core i9-8950HK variant, which comes with a 2TB PCIe SSD and 32GB of RAM. I'm not sure I'd spend that much on a laptop with a GeForce GTX 1050 Ti chip – gamers would be better off with the Razer Blade 15, which costs £2,330 with a GTX 1070 and 144Hz Full HD screen.

But the attraction of the XPS 15 isn't just its ridiculously fast speed for the price, but the entire package. Everywhere I looked and tested, I struggled to find a fault. Sure, it could do with more flattering webcam placement, and slightly better battery life, but that's it. It's no surprise then, that the 2018 Dell XPS 15 (code 9570) garners a five-star rating and Recommended award. As far as I'm concerned, it's the best laptop money can buy. **CHRISTOPHER MINASIANS**

SPECIFICATIONS

Six-core 2.2GHz Core i7-8750H processor • 4GB Nvidia Max-Q GeForce GTX 1050 Ti graphics • 16GB RAM • 15.6in IPS touchscreen display, 3,840 x 2,160 resolution • 512GB M.2 PCIe SSD • 2x2 802.11ac Wi-Fi • Bluetooth 4.2 • Thunderbolt 3 USB-C • 2 x Type-A USB 3.1 • HDMI 2 • SD card reader • 97Wh battery (56Whr for Full HD versions) • Windows 10 Home • 357 x 235 x 11-17mm (WDH) • 2kg (1.8kg for Full HD versions) • 1yr limited warranty

Toshiba Portégé X30-E

A powerful business laptop in an exceptionally thin frame, and with strong battery life too

SCORE ★★★★½

PRICE From £1,179 (£1,415 inc VAT)
from toshiba.co.uk

There's no shortage of candidates if you're looking for a thin-and-light laptop: just turn to p76 for our roundup of 12 home-oriented machines. But this Portégé is a little different because it has IT managers in its sights. The X30-E is designed to be an easy-to-manage laptop that also happens to be slim and sexy.

Well, sexy may be pushing it. Dressed in a sober dark blue finish, it's more Canary Wharf boardroom than Shoreditch coffee shop, but it has a list of attractive stats: a 15.9mm height, a 1.09kg weight and a promised battery life of over ten hours.

That latter stat will be tough to reach in general use, but it lasted a creditable 8hrs 38mins in our video-rundown battery life tests. That's with the screen set to a medium 170cd/m² level, and most people will find it's willing to work for a longer day than they are. When it does come time to recharge, attach it via USB-C to any source capable of supplying 45W or use Toshiba's supplied adaptor (this weighs 383g with the USB-C cable).

Nor does Toshiba rely on USB-C alone. While there are two USB-C/Thunderbolt 3 ports on the right-hand side, it also includes a full-size HDMI port, a Type-A USB port, a microSD slot and a 3.5mm audio jack.

Our review unit also included a smart card slot, but you may find the fingerprint reader and Windows Hello-compatible webcam more convenient. Both are slick in practice, even if the fingerprint reader is a fraction smaller than I'd like.

I'm a fan of the touchpad, though. It's a precision touchpad, so supports all of Windows 10's gestures, and you can double-click anywhere on its surface. You can also click at the bottom left and bottom right areas to mimic the left- and right-button of a mouse, or use the dedicated buttons that sit above the touchpad. Users who still hanker after a trackpoint will also be delighted.

The keyboard is a fabulous example of its type. There's enough "feel" to it that you know when you've hit keys, but it's also relatively quiet. Toshiba keeps function doubling to an absolute minimum, with the only potential irritation being its non-standard positioning for the PgUp and PgDn buttons – these small keys sit below the double-height Enter key.

The screen is another high-quality affair. It's a matte finish designed for starting at for long hours rather than watching the latest films, and that's reflected in a high sRGB gamut coverage of 92.9% but more mediocre 67.4% for movie-friendly DCI-P3. While a contrast ratio of 1,035:1 and average Delta E of 4.08 aren't much to shout about, its peak brightness of 355cd/m² is great for a business machine. Surprisingly, it's a touchscreen, too.

The X30-E's business-friendly features are reinforced by the vPro certification of the Core i7 chips Toshiba provides, and notably these are eighth-generation units. Our review sample matched a Core i7-8650U processor with 32GB of RAM and a 1TB PCIe SSD, but it has the disadvantage of not being available for sale in the UK. Instead, you can choose between the X30-E-12W with a Core i5-8250U, 8GB of RAM and 256GB SSD, or the E-12N with a Core i7-8550U, 16GB of RAM and 512GB SSD. The former costs £1,460 exc VAT from Insight, the latter £1,179 exc VAT from Toshiba.

ABOVE **It may not turn heads, but the Portégé X30-E's dark blue finish is stylish**

PC PRO RECOMMENDED

The supplied specification proved speedy, with an overall score of 80 in our benchmarks – notably twice that of the X30-E with a seventh-gen chip and 8GB of RAM. You can buy faster laptops, but in practice the X30 offers plenty of power for 90% of people. It's only those who perform number-crunching tasks that will need more from their day-to-day machine.

If you are going to distribute these to workers as their main machine, or buy it for yourself, consider investing in a suitable docking station. Toshiba is pushing its Thunderbolt 3 docking station for around £200, but third-party docking stations are available (*see p92*). And as Toshiba still keeps "legacy" HDMI and Type-A USB ports, you don't even need to put a USB-C adapter into your travel bag.

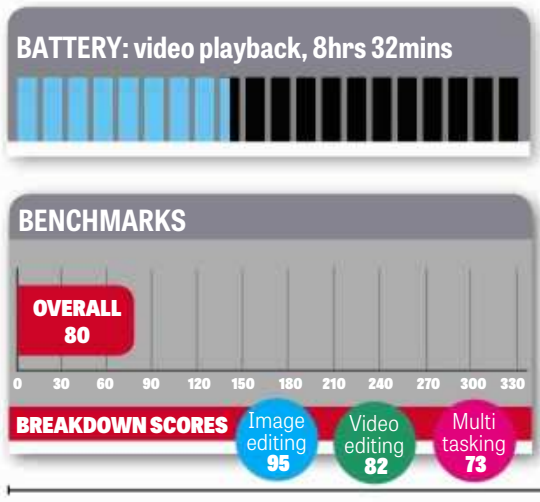
"The keyboard is a fabulous example of its type. There's enough 'feel' to it that you know when you've hit keys, but it's also relatively quiet"

So where does this leave the Portégé X30? It isn't as cute, slim or light as some of its rivals, but it has one key thing in its favour: it's built for work. Windows 10 Pro and its greater manageability all lift it above the consumer mainstream, so if you are buying for business, it's a great choice. **TIM DANTON**

ABOVE **The 15.9mm height and 1.09kg weight make this a very portable laptop**

SPECIFICATIONS

Quad-core 1.9GHz Intel Core i7-8650U processor • Intel UHD Graphics 620 • 32GB RAM • 13.3in IPS display, 1,920 x 1,080 resolution • 1TB M.2 SSD • HD webcam • 802.11ac Wi-Fi • Bluetooth 4.2 • 2 x Thunderbolt 3 • USB 3 • HDMI • microSD slot • Windows 10 Pro • 316 x 227 x 15.9mm (WDH) • 1.05kg • 1yr C&R warranty



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Your bonus software

We scour the globe to negotiate the best software deals for our readers, from extended licences to full programs you don't need to pay a penny for. Here's this month's lineup

Total value this month £144

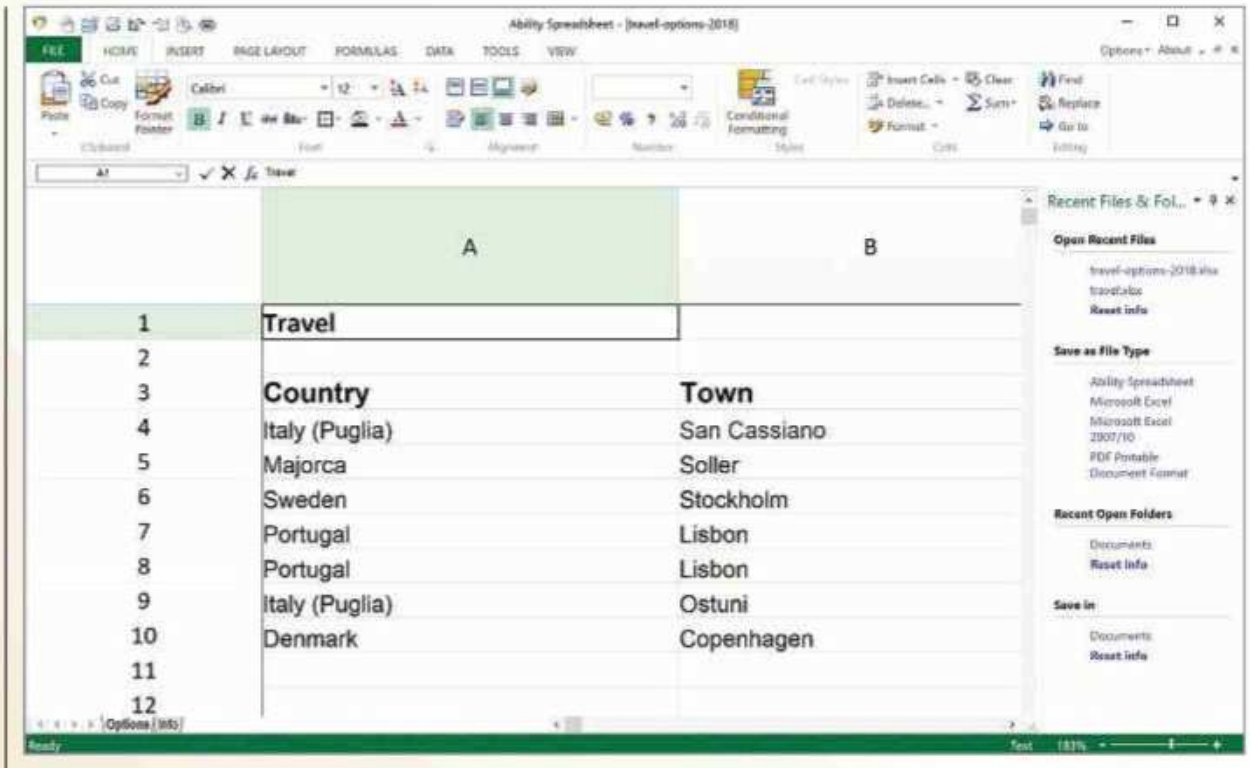
Ability Office 7

- **Full product worth £20**
- **ability.com**

THIS FULL-FEATURED productivity suite includes a word processor, spreadsheet, presentation tool and photo manager – and it's fully compatible with Microsoft Office.

If you've used Word, you'll be right at home with Ability Write. It reads and writes DOC and DOCX files, and supports all the formatting options you need, with full indexing, spelling and grammar checking. Ability Spreadsheet meanwhile comes with more than 250 built-in functions, 25 chart types and full pivot table capabilities. The bonus Ability Photoalbum helps you locate, view and organise the images on your PC, convert between image formats, and present them in HTML albums.

The apps all feature an Office-like ribbon, which makes it easy to find the tools you need, and the tiny launcher application lets you open Ability Office directly from your system tray.



REQUIRES Windows XP or later; 150MB hard drive space; online registration

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For more information, see pages 66 and 67 in the main magazine

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ABOVE If you've bought the Bonus Software edition of *PC Pro*, it will include this card between the current pages

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pcprodownload.co.uk

Watchdog PC Cleaner 2018

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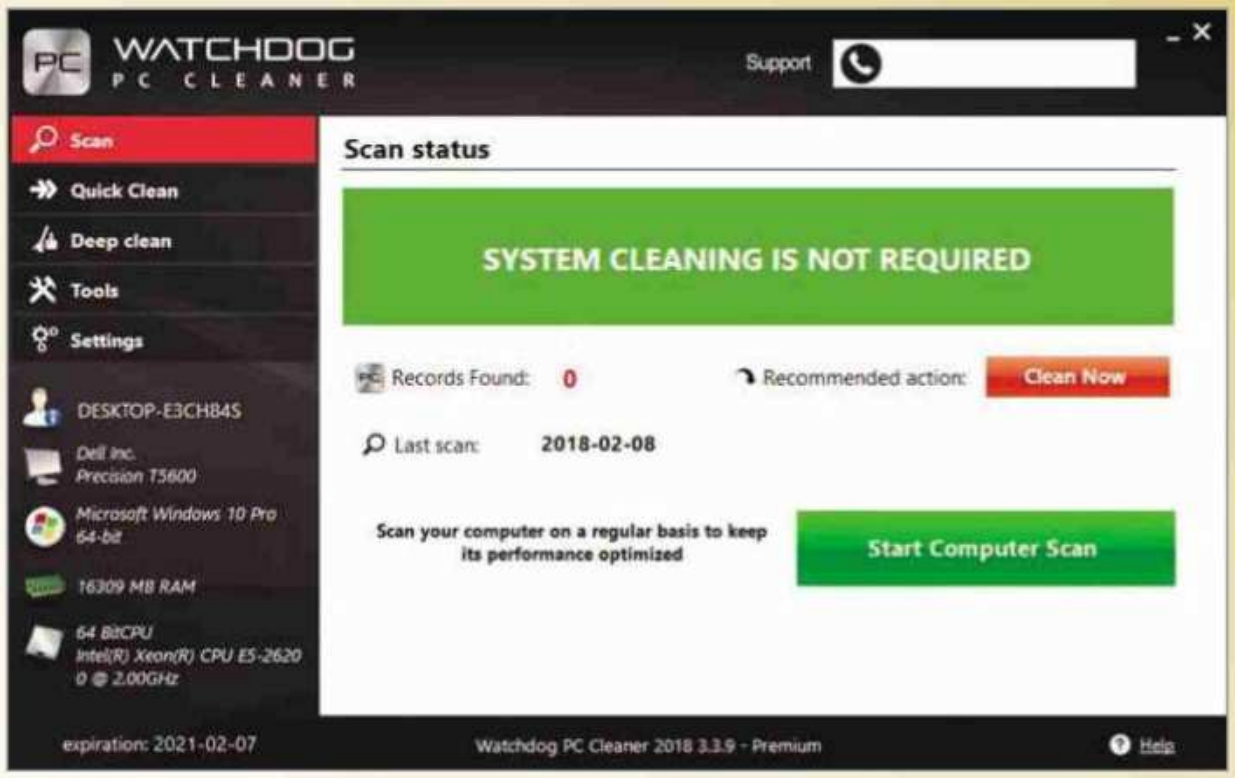
- watchdogdevelopment.com



REQUIRES Windows XP or later; 100MB hard drive space; online registration

YOU KNOW HOW it goes: you buy a new PC, and within a few months it's slowed down, the hard drive is full and you're seeing software errors.

Watchdog PC Cleaner 2018 will help you return your machine to its original condition. Its Quick Clean function scans your Registry for problems, and clears out temporary files, old caches and junk files that are clogging up your hard disk. For more extensive analysis, the Deep Clean option checks against individual applications and lets you remove unnecessary data.

PC Cleaner 2018 includes a Startup controller too, to turn off individual applications that start with your PC. You can also scan for and remove duplicate files, set up an exclusion list, schedule a regular scan and much more.

AntiBrowserSpy 2018

- Full product worth £27
- abelssoft.net

REQUIRES Windows 7 or later; 75MB hard drive space; in-application registration

- Quickly and easily optimise your privacy settings for Firefox, Internet Explorer, Chrome, Safari and Opera
- Includes tools to block Google Analytics, social networking plugins, and cookies set by both Flash and Silverlight
- Built-in stealth tool randomises system information to stop websites from profiling and tracking your PC

Smart Defrag 6 Pro

- Six-month licence worth £10
- iobit.com

REQUIRES Windows 7 or later; 50MB hard drive space; online registration

- Defragment files alone, defrag and compact free hard drive space, or reorganise your hard drive for the best possible speeds
- Allows you to defrag files during the system boot process (these files can't be defragged or moved when Windows is running)
- Keeps out of the way until your system has been idle for five minutes; stops as soon as other applications become active again

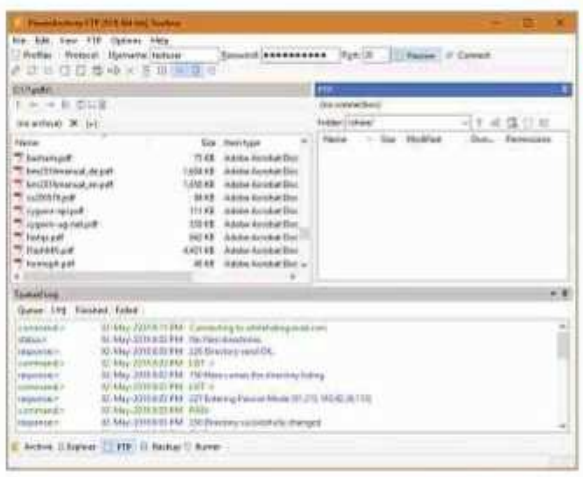
Ashampoo Backup 2018

- Full product worth £20
- ashampoo.com

REQUIRES Windows 7 or later; 100MB hard drive space; in-application registration

- Back up a complete drive, partition or folder to the destination of your choice – as often as you need
- Supports Dropbox, Google Drive, OneDrive and other cloud providers for archive storage
- Backups are saved as virtual disks, so can be mounted as software drives for browsing or restoring individual files and folders

PowerArchiver 2018



- Full product worth £17
- powerarchiver.com

REQUIRES Windows XP or later; 150MB hard drive space; online registration

- Supports over 50 different archive formats, enabling you to extract almost any compressed file you receive
- Full encryption support, plus signing of Adobe PDF and Microsoft Office documents and compression of files in use
- Includes tools to repair archives, convert between formats, create self-extracting archives and more

Chillblast Fusion Blizzard

A finely tuned system with nippy storage and room to grow, but not the best choice if you seek all-out speed

SCORE ★★★★☆

PRICE £1,208 (£1,450 inc VAT)
from chillblast.com

There's no hiding from the fact that Brexit and Bitcoin mining have provided a perfect storm for PC prices. Two years ago, it was easy to build a brilliantly fast system for this price. Now, manufacturers must use all their nous to build a system that's fast but doesn't blow the budget. Fortunately, Chillblast has just such nous.

Its key starting point was to focus on quality rather than cut-price components. There's also more style than you might expect from a British PC manufacturer, with an understated white-and-black theme that starts with the Corsair Carbide 275R chassis and ends with the Asus Prime Z370-A motherboard. In between, it's picked reputable components that don't cost the earth. And that leaves room in the budget for a top-end graphics card, overclocked Core i5 processor and a speedy storage subsystem.

I'll tackle the latter first. Chillblast takes a familiar approach of coupling an SSD – for quick boot and app-loading times – with a significantly larger hard disk for storage. Here, it tucks a 250GB Samsung 970 Evo M.2 PCIe SSD under a heatsink, with a 2TB 7,200rpm Seagate BarraCuda hard disk in tow. There's room for another hard disk and a second M.2 SSD as well, should you need more storage or fancy a RAID SSD setup in the future.

ABOVE The Fusion Blizzard wins for style, with a stark white-and-black theme

This combo should last for a while, though. Testing using the AS SSD benchmark, it managed 2.6GB/sec read and 1.45GB/sec write sequential transfers - not as fast as the MacBook Pro, but a sign that this system will rarely stutter. The hard disk managed 204MB/sec and 174MB/sec in the same tests, which are as we'd expect for a fast mechanical unit.

Geekbench 4 produced similarly strong results, with 5,334 in the single-core and 21,994 in the multicore test. However, the Chillblast Fusion wasn't such a stellar performer in our own benchmarks.

Chillblast overclocks the system's six cores to 4.1GHz from the Core i5-8600K's base speed of 3.6GHz, and that gave it to an overall score of 187.

With a watercooling system in place I felt safe to overclock it further to 4.5GHz using Intel's Extreme Overclocking Utility, which pushed it to 203. It stayed stable at this point, but did push the power consumption up from 48W in idle up to 52W. Under load, those figures are 260W and 270W respectively.

LEFT Chillblast's cabling neatly tucks everything out of the way

The overclock had little effect on gaming speeds, but this is already an excellent gaming system. Sure, it's a GeForce 1070 GTX Ti rather than a 1080, so it couldn't quite hit playable frame rates at 4K in *Metro: Last Light*. I had to drop to Medium quality to hit a playable 46.7fps rate. At 1440p, though, it managed 44.9fps even at maximum quality settings, and in *Rise of the Tomb Raider* it managed 42.9fps at 4K at the top Very High preset. A score of 569fps in the 1080p Manhattan 3 test completes the set.

Should you want to play VR, this machine is ready and waiting. It scored top marks in the SteamVR Performance Test, dropping zero frames during testing. Purely for the sake of testing, you understand, I also put it through its paces in *Beat Saber*. It was as brilliant as you would expect.

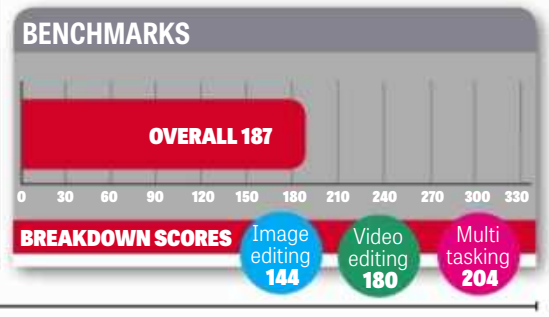
There's plenty of room for expansion, with five PCIe slots free: three x1 and two x16 slots. Chillblast uses two sticks of 8GB DDR4 2,400MHz RAM, so there are two sockets lying in wait if you want to double up to 32GB. If you do, you'll thank the company's engineers for their neat cabling, with everything tucked out of the way. And while there is a constant fan noise, it's of the low rumbling variety, meaning it isn't too grating.

"Chillblast has the nous to build a PC that's fast but doesn't blow the budget, focusing on quality rather than cut-price components"

Chillblast provides a generous five-year warranty here, with the first two years collect-and-return that covers both parts and labour (for the final three years, you'll need to cover courier costs and pay for parts). However, before you rush in, I recommend you take a look at the Enthusiast PCs on our A-List (*see p17*) and see if one of these better suits your needs. **TIM DANTON**

SPECIFICATIONS

Hexa-core Intel Core i5-8600K at 4.1GHz • 16GB DDR 2,400MHz RAM • 8GB GeForce GTX 1070 Ti graphics • Asus Prime Z370-A motherboard • 250GB Samsung 970 Evo SSD • 2TB 7,200rpm Seagate BarraCuda hard disk • Chillblast 120 watercooler • Corsair Carbide 275R case • 600W 80 Plus PSU • Windows 10 Home • 212 x 361 x 473mm (WDH) • 5yr warranty (2yr C&R parts and labour)



Samsung Portable SSD X5

Undeniably fast, Samsung's new X5 SSD replaces the company's trusty T5 as the king of portable drives

SCORE ★★★★½

PRICE 1TB, £525 (£630 inc VAT)
from samsung.com/uk

You only need to look at this month's group test of laptops (*see p76*) to appreciate the rise of USB-C. To complicate matters, it comes in two varieties: USB 3.1 and Thunderbolt 3. Of the two, Thunderbolt is preferable for all sorts of reasons, with one being speed – it can reach 40Mbits/sec while USB 3.1 is capped at 10Mbits/sec. And such speeds, as this Samsung SSD amply demonstrates, are particularly useful for external SSD drives.

Samsung has history here, with its SSD T5 reigning supreme as the USB 3.1 speed king. With the SSD X5, it adds a Thunderbolt 3-enabled SSD to the mix, in your choice of 500GB, 1TB or 2TB. Samsung quotes sequential read/write speed of up to 2,800MB/sec and 2,300MB/sec, which is around four to five times faster than the T5. 2,800MB/sec translates into 22.4Mbits/sec, so that's taking full advantage of the Thunderbolt bus too.

But theory is theory: we care about real-world performance, and here the X5 truly shines. I first conducted my tests on a 2017 5K iMac, and the results spoke for themselves. The drive managed read/write speeds of 2,352MB/sec and 1,682MB/sec. That's a huge improvement over the 480/500MB/sec speeds I saw on the T5, and noticeably faster than the iMac's built-in SSD, which manages still-respectable speeds of 1,058MB/sec and 756MB/sec.

I then plugged the drive into the Dell XPS 15 (*see p62*) and yielded sequential speeds of 2,057MB/sec and 1,531MB/sec – yet, that wasn't the thing that impressed me the most. Instead, it was the insane read/write speeds of 318MB/sec and 280MB/sec for non-sequential, smaller files. In comparison, the non-Thunderbolt 3 ADATA SE730 and Samsung T5 SSDs managed only around 110-180MB/sec.

Design wise, this drive is available in one colour combo: a glossy silver front and a red enclosure around the back. It isn't much bigger than a modern-day smartphone; at 119 x 62 x 19.7mm, it's only twice the thickness. Even so, at 150g, you can easily pocket the drive. There's a single Thunderbolt 3 port with an LED to illuminate when it's in use, and Samsung bundles a Thunderbolt 3 cable, but there's no carrying case. Unfortunately, there's still no waterproofing either. It's a feature I love having on the ADATA SE730, but with no IP-rating, the Samsung X5 may not survive any accidental spills or puddle drops.

ABOVE **The X5 isn't much bigger than a smartphone and, at 150g, can easily live in your pocket**

The other thing to note is that you can't plug the drive into a non-Thunderbolt 3 port. Even if you have the latest computer that has USB-C 3.1 (or Type-A) ports, the drive simply won't power on. That's because NVMe drives require a connection to the computer's PCIe bus – and that can't happen through the regular USB interface. So, if you were looking to share your files, movies, or lifetime's worth of pictures with your friends and family, you'll need to ensure they have access to a device with a Thunderbolt 3 port.

LEFT **Thunderbolt 3 translates into stunning speeds, but it isn't compatible with any other ports**

Then we come to the price. As you can imagine, it's not going to be cheap. Prices start at £360 for the 500GB model, while the 1TB model on review costs £630. If you need more space, Samsung offers the 2TB X5, which costs a whopping £1,250.

Such prices are a sign of two things: first, the newness of the technology. And second, that Samsung effectively has a monopoly. At the time of writing, there are no other 1TB Thunderbolt 3 NVMe external drives – the X5 is in a league of its own. You can buy an external Thunderbolt 3 enclosure for around £300 and then fit it with a 1TB NVMe SSD for around £325, bringing the price as close as darn it to the Samsung's.

"Samsung's handy Portable SSD Software allows you to check for firmware updates and protect the drive with a password"

I wouldn't recommend that approach, especially as you'll miss out on Samsung's Portable SSD Software. This allows you to check for firmware updates and protect the drive with a password. Note it has AES 256-bit hardware encryption, too.

So, should you buy it? The X5 is expensive, can't be used with non-Thunderbolt computers and isn't waterproof. If I had to buy an external SSD, I'd opt for the cheaper Samsung T5 (£260 for 1TB) or the ADATA SE730, which are both a lot more versatile than the X5. Still, I'm tempted: after all, this is the world's fastest portable drive. **CHRISTOPHER MINASIANS**

SPECIFICATIONS

1TB PCIe SSD • up to 2,800MB/sec sequential read • up to 2,300MB/sec sequential write • AES 256-bit hardware encryption • Thunderbolt 3 interface only • 62 x 19.7 x 119mm (WDH) • 150g • 3yr limited warranty

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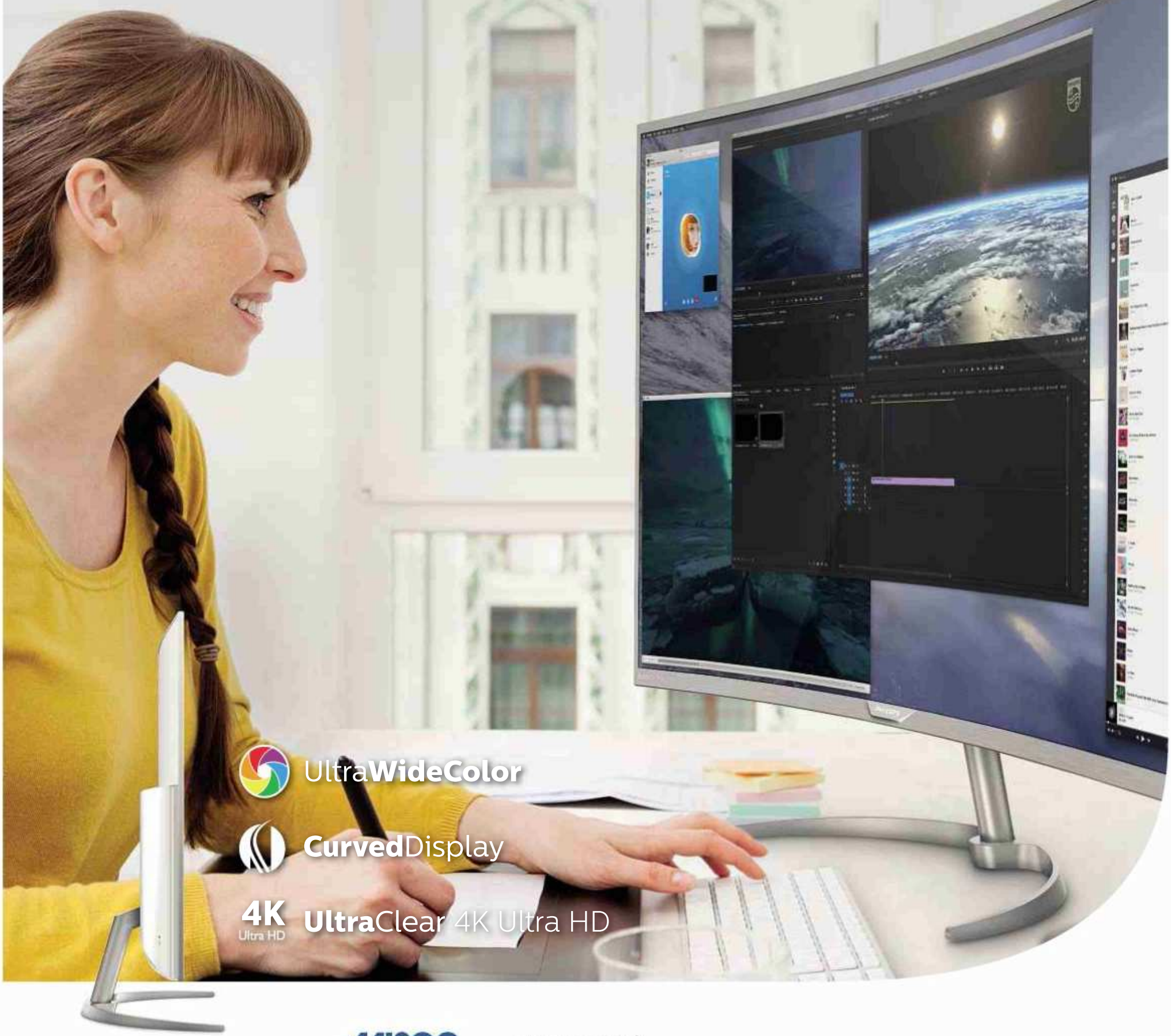

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PHILIPS

Asus ZenFone 5

A brilliant mid-range phone that wisely sacrifices all-out speed for the sake of a great screen and lovely design

SCORE ★★★★½

PRICE £292 (£350 inc VAT)
from asus.com/uk

This is not the perfect phone. It has flaws, it's beaten for speed by many others, it's missing a couple of nice-to-have features that I'd really like to have. What it is, however, is stunning value. It's a genuine rival to the OnePlus 6 and should make you seriously question the wisdom of spending more than £400 on any phone.

The key to its success is that Asus doesn't cut corners on any of the things that you use every day. Prime among those is the screen, which rivals those of flagship phones with its high-quality IPS panel and glorious 6.2in diagonal size. Just like the three-times-as-expensive iPhone X, this fills every available square millimetre with pixels and I would challenge anyone to spot the quality difference between the two phones side by side.

It's bright, hitting a crazy maximum of 603cd/m², and photos and videos burst from the screen thanks to a 1,763:1 contrast ratio and the fact it reproduces 99.6% of the sRGB gamut and 97.5% of DCI-P3 (as used by Netflix, for instance, so you can be confident that films will look great too).

Just like the iPhone X, there's also a notch at the top of the screen, and this is a little larger than I'd like; it means you'll see a lot of the "..." symbol during your time with the ZenFone 5, with the dots signifying that some notifications are hidden from view. But some people may like it; the notch almost signifies high-end phone these days, and with a vertically arranged dual-lens camera at the rear you could fool friends into believing this is an iPhone X. Until they spotted the Asus logo beneath the fingerprint reader.

Naturally, the front-mounted camera means face recognition, and this worked around eight times out of ten. It was fooled by too much and too little light, but anything in the middle unlocked the phone quickly. I found the fingerprint reader to be an effective backup too, only needing to enter my PIN when Android 8 demanded it for extra security.

I'm also a fan of the retained 3.5mm jack at the bottom of the phone, which accompanies the USB-C port for speedy charging. In general, I found battery life to be fine: I never used the ZenFone to such an extent that it was empty by the end of the day. Most days, it sat between 30% and 50%, and on one occasion I eked out two days' use. In our formal video-rundown test, it lasted a respectable 15hrs 40mins.

I think Asus makes all the right calls in terms of specs, too. The Snapdragon 636 processor is a speedy chip in everyday use, helped along by 4GB of RAM. The 64GB of onboard storage is plenty to get along with, and you can always add more (or a second SIM) via the microSD slot.

Where it will never shine is in benchmark graphs. If you want raw speed, spend another £119 on the OnePlus 6 with its Snapdragon 845 processor, because the 636 looks slovenly in tests such as Geekbench 4: 4,837 vs 8,783 multicore, 1,327 vs 1,868 single-core. This is no gaming phone either, with its 16fps in the off-screen Manhattan 3 test shrinking into insignificance against the OnePlus' 80fps.

Other drawbacks? I wish Asus had chosen a less glossy finish for the back, because it picks up fingerprints and has an annoying habit of sliding off my desk. As a result, it's already wielding a couple of scratch marks around the frame, despite living with me for less than a month. I would have liked waterproofing too, and have mixed feelings about the camera.

There's much to like. It takes the best photos I've seen from a phone costing under £400, and the 24mm-equivalent lens is kept company by a wide-angle lens – useful for group shots and panoramas. The 8-megapixel front camera is ideal for selfies, there's AI cleverness to detect what you're shooting and change settings on the fly, and in good light it picks up bags of detail. In low light, though, images become more grainy more quickly than the OnePlus 6, and I found some colours emerged looking a bit too vibrant.

Drawbacks such as the camera are why the OnePlus 6 remains our A List choice, and won our Smartphone of the Year award (*see p36*), but if you're fed up with overpaying for phones then the ZenFone 5 is an excellent choice. It's fast enough, has strong battery life and it looks so good that people will believe you when you say it cost twice the price. No, the ZenFone isn't perfect; but it is a superb mid-range phone. **TIM DANTON**

ABOVE **Ignore the Asus logo and this could pass for an Apple iPhone X**

PC PRO RECOMMENDED

"The key to the ZenFone's success is that Asus doesn't cut corners on any of the things that you use every day, including the screen"

SPECIFICATIONS

Octa-core 1.8GHz/1.6GHz Qualcomm Snapdragon 636 processor • 4GB RAM • Adreno 509 graphics • 6.2in IPS screen, 1,080 x 2,246 resolution • 64GB storage • microSD slot • 12MP/8MP rear camera • 8MP front camera • 802.11ac Wi-Fi • Bluetooth 5 • USB-C connector • 3,300mAh battery • Android 8 • 75.7 x 7.9 x 153mm (WDH) • 155g • 1yr warranty

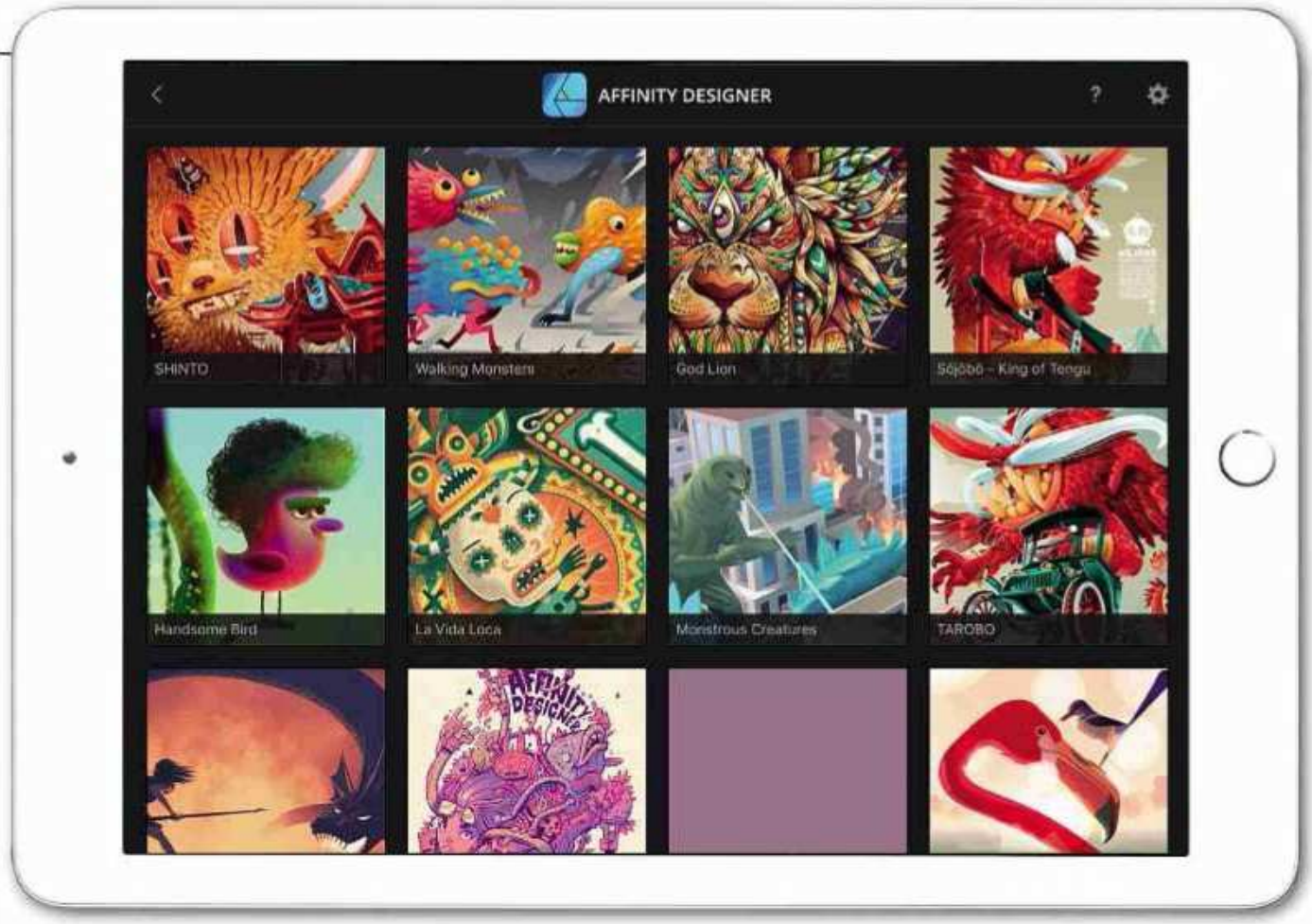
LEFT **The notch is irritating, but worth it for the generally slick facial recognition**

Affinity Designer for iPad

All the creative power of a desktop vector drawing tool, but for just a fraction of the price

SCORE ★★★★★

PRICE £17 (£20 inc VAT) from Apple Store



Tablets, they used to say, aren't appropriate for creative professionals. The software just isn't there and, when it is, it can't match what's available for Windows and macOS. That's something Serif wants to change. Over the past five years, it's taken a different approach to mobile app development, tearing down its venerable PhotoPlus and DrawPlus applications and rebuilding them from the ground up with cross-platform, tablet-friendly code.

The result is a pair of iPad apps that replicate, feature-for-feature, their desktop counterparts. Affinity Designer is the most recent launch on the iPad, but it's arguably even more impressive than Affinity Photo: this is a powerful piece of creative software.

So what can it do? It's a vector drawing application, principally used to create graphics, signage, user interface widgets, game sprites and infographics. It's different from a photo-editing application in that the visuals it creates can be resized with no loss in quality. Affinity Designer's counterpart is Adobe Illustrator and, although it can't match its esteemed rival for features, it's much cheaper.

It's the price of £20 that's the key attraction here. That's less than half the cost of the Windows and macOS versions and a fraction of the price of an Adobe CC Illustrator subscription.

If you're looking to learn vector graphics design, Affinity Designer for iPad is a great place to start. And that's the way I've approached this review. I'm no Picasso so I picked a fairly simple task – recreating a classic Tag Heuer Monaco watch face.

First, let me say that I've only scratched the surface of what Affinity Designer is capable of. I haven't delved deep into the pixel-based tools, which allow you to add texture and apply Photoshop-style bitmap editing to your drawing. However, the drawings I have been able to create showcase Designer's strengths and weaknesses.

All the core features you'd expect of a vector drawing tool are here. You can create and manipulate shapes, or use the pen tool to create Bézier curve lines. Pen and brush tools offer freehand vector shape creation and there's a multitude of effects and adjustments.

If that sounds tricky, fear not. It's easy to get up to speed by experimenting, and if you get stuck then there are many online resources. The big advantage in having a cross-platform app is that the knowledge base for the desktop and mobile apps is the same.

LEFT Affinity Designer offers all of the vector drawing tools you would expect from a desktop app

ABOVE Sample artworks can help you get started quickly

PC PRO RECOMMENDED

Likewise, Affinity Designer is able to work with and export to the same range of file types as its desktop counterpart, so you can work on a file on your main machine then transfer it and continue your work on your iPad when you're out. You can open and work on all the files you'd expect to be able to use on a professional desktop drawing app, including EPS, PSD and Adobe Illustrator files. There's also a seamless interchange with Affinity Photo, for those who have made the jump from Adobe's software.

There are some lovely user interface touches, too. If you're using an Apple Pencil you can hold either one or two fingers to the screen to use as a modifier – just like holding down Alt or Ctrl when using a keyboard.

"For anyone starting out or, potentially, professionals fed up with having to pay the Adobe dollar, it's well worth exploring"

In some areas, though, the app's usability needs work. For instance, it took me a while to figure out how to select and export individual elements of a project, when that's a job that should intuitive. I also found it far too easy to knock elements out of position, when all I wanted to do was zoom out or move to another area of my drawing. Finally, note that it isn't compatible with all iPads – and even on a new iPad Pro, working with big, complicated files was sluggish.

If this is the price to have such a powerful creative tool on the iPad, however, I'm sold – and I'm sure plenty of creative types will be, too. For anyone starting out or, potentially, seasoned professionals fed up with having to pay the Adobe dollar, it's well worth exploring.

There is, quite simply, nothing out there that can compete with the power of Affinity Designer on the iPad. It provides true desktop power for a fraction of the price of Adobe Illustrator. **JONATHAN BRAY**

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DANIEL

Easy Peasy!
No trawling garage showrooms! Already recommending to friends & family.
★★★★★
KAREN

Purchased VW Golf
I was nervous about buying on the internet. Needn't have worried.
★★★★★
SIMON

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Your Smart Workplace Assistant

Practical ways Xerox VersaLink printers and multifunction devices can make your business smarter

Printers grow smarter every year. While your current printer may just be there to support the way you work with documents – your workflow – your next one should transform it. This isn't hyperbole: here, we investigate practical examples of how businesses are using Xerox VersaLink printers and multifunction devices to solve genuine, real-world problems.

The smart workplace assistant

The key to Xerox's solution can be summed up by one concept: a smart workplace assistant. If you think about your current document management workflows, there's every chance you have inefficiencies due to human intervention. That could be manually moving documents to a shared cloud resource after scanning, it could be archiving physical documents, it could be the way you handle emails and faxes. Every business has its document workflow challenges that consume people hours.

How can you solve such challenges? By using Xerox ConnectKey Technology-powered VersaLink printers. Embed a ConnectKey app into the heart of your document management process, namely your multifunction device or printer, and you can re-imagine whole workflows. That could be sending scanned documents straight to Dropbox or scanning them through the cloud – or it might be a custom-made solution to solve a particular problem you face.

ABOVE Load up your chosen apps and get ready to save time

So how do you know if a Xerox printer or multifunction device is capable of transforming your workflow in this way? Simple: look for VersaLink. This is Xerox's brand for smart, connected printers that are designed for small and medium-sized businesses. Whether you want an affordable A4 mono printer or an A3 colour multifunction device that can handle super-heavy workloads, you'll be able to find the right VersaLink printer for you.

Naturally, such a device would be no use if it didn't get all the fundamentals right too. As the three *PC Pro* award-winning printers opposite show, however, that isn't a concern.

Scanning invoices

Here's a real-world problem faced by Swedish IT consultancy Xllnc. "The way we used to [handle invoices] was very time-consuming and very manual," said its CFO, Urban Odelind. "You received the invoice, you went to the scanner, you have to scan one invoice at a time. You save them as a PDF file which is sent to your computer, you open the PDF file, and

then you transfer some of the information into the ERP system... it's extremely manual and time-consuming."

Rather than outsource the invoicing, which was becoming a bigger problem as the business expanded, Xllnc chose to work with one of Xerox's development partners to develop its own solution. "Previously the employee stood at the machine [scanning invoices] for hours, and that meant that other people couldn't do the job. They couldn't get to the machine," said Odelind.

"Instead of 40 hours per month, it now takes us ten hours per month, which gives us a lot more time to actually do things we like to do and work with our core business. We are saving a lot of time – and, of course, money."

So how does this smart workplace assistant work in practice? "The end user goes to the MFP, he takes a group of invoices – it can be one, it can be a hundred – and puts it in the feeder," explained the app's developer. "One touch [on the screen] and it goes away directly into the backend system where key invoice gets extracted and then inserted into the ERP system automatically. Job done."

Automatic translation

You don't need to create your own apps. British recruitment agency Austin Fraser, which has offices in the USA, Germany and the UK, took advantage of a Xerox-made ConnectKey app called Easy Translator Service.

"What tends to happen is we'll have contracts come in and it's the role of our commercial and legal team to review those terms, negotiate, make edits and make changes," explained Mitchell Bailey, Austin Fraser's IT manager. "That process is very difficult when you're dealing with a foreign language."

The previous solution was both time-consuming and expensive. The first stage was triage: Austin Fraser received documents through the post and via fax, and would need to sort all the foreign-language documents. These would be manually scanned then emailed to a translation service. After a day or two, the translated document would come back via email. The UK team would then print it out for annotation, before scanning it back in so it could be processed.

Fortunately, Austin Fraser's managed print service partner was aware of the VersaLink range and its Easy Translator Service. "Using the Xerox Easy Translator Service couldn't be simpler," said Bailey. "Our employee simply needs to walk up to the printer, put their document in, select the Xerox Easy Translator app [then] choose the input and the output language. The app gives you an option to either print the document or send it via email."

This as a "huge time saver" explains Bailey. "Previously we were having to wait two, three or even four days to get a translated document back. Now, we can use machine translation to get a good enough translation of that document, then and there, when we need it, and it allows us to negotiate with our clients quicker, it allows us to place candidates in roles quicker. And it allows us to stay ahead of the competition."

How apps could help you

These are just two examples of how a VersaLink printer can act as a smart workplace assistant. Head to Xerox's App Gallery (**xerox.com/appgallery**) to see the full selection of apps, which are growing month by month.

Some are created by Xerox itself to enhance common workflow scenarios. For example, Office 365 customers should take advantage of the self-explanatory Print and Scan for Office 365, which is already saving time for hundreds of Xerox VersaLink owners. There are similar Xerox ConnectKey apps for Google Drive, Dropbox and Box too.

"How do you know if a printer is capable of transforming your workflow? Simple: look for VersaLink"

Or perhaps you want to help your sales team process business cards. OptimiDoc extracts the relevant data and creates a new VCF file: no manual effort required! Or you might have an Amazon Echo in your office. Vision-E Voice can pass on simple instructions such as checking toner levels or making copies, and even tell you if you have enough ink and paper to print, say, 200 copies.

Along with creating personalised apps that solve problems for businesses, Xerox's development partner Foxway has created its own suite of apps for VersaLink called the Productivity Pack. Among many other things, this creates an audit of what's copied and scanned on your Xerox VersaLink MFPs.

The VersaLink difference

So Xerox VersaLink printers aren't just there for printing and scanning. They can genuinely act as a smart workplace assistant, saving you time, hassle and money.

Perhaps your needs can be met by one of the ready-made apps; maybe you would benefit from a tailor-made app, like Xllnc. To find out more, visit **www.xerox.co.uk/en-gb/connectkey/versalink**.

Which Xerox VersaLink printer is right for you?

There is a wide range of Xerox VersaLink printers and multifunction devices to choose from, but as a starter here are three that have recently won *PC Pro* awards.

Xerox VersaLink C600DN

"Busy SMBs that want a fast A4 colour printer with all the trimmings will find the VersaLink C600DN the perfect choice," we wrote back in issue 283. "Factor in Xerox's lifetime warranty with an annual toner purchase and it's an almost irresistible deal." No wonder it's been sitting pretty on the A-List ever since.
Typical price, £485

Xerox VersaLink B600DN

This A4 mono laser is "well-suited to busy workgroups," stated our review, which declared that "print quality is great for general office use [with] pin-sharp text across a wide range of font sizes." With 55ppm speeds and a 5in colour touchscreen, plus an integral duplexer, we called it a "speed demon".
Typical price, £665

Xerox VersaLink C505S

Designed for busy workgroups of up to 15 users, this speedy colour multifunction printer boasts a 7in touchscreen to take advantage of the apps. With "punchy colour graphics" and "top output quality and speed," it's no surprise this won a *PC Pro* Recommended award.
Typical price, £1,355

Visit www.xerox.co.uk/en-gb/connectkey/versalink


ENVY

THIN & LIGHT LAPTOPS

12 ULTRAPORTABLES GO INTO BATTLE. SIX MAKE OUR LONG LIST. ONLY THREE WIN AWARDS.

We pondered for a while: what shall we call this month's laptops? Ultrabooks? That name – still an Intel trademark and specification – has fallen out of favour in recent years. Now people flit between "thin and light" and ultraportable, with a scattering of "2-in-1s" to confuse matters.

Either way, it doesn't matter. These are the slimmest and coolest laptops in town; the laptops you want to be seen using at home, at work and on the move.

If that means a high price, so be it. When we challenged manufacturers to bring us their best thin-and-light laptops, we explained we didn't care how much they cost as long as they kept thickness and weight to a minimum.

We wanted to showcase the breadth of laptops you can buy that will work in almost any situation, whether you're killing time in the coffee shop, watching Netflix on the sofa or sweating over a PowerPoint presentation at your desk.

The result? Well, we used to say that no laptop could provide performance, portability, battery life and ergonomics, but we're beginning to change our minds. Now, you can have it all.

CONTRIBUTOR: Stuart Andrews

CONTENTS

HOW TO BUY YOUR PERFECT LAPTOP

STREAMLINED STYLE, GREAT PERFORMANCE AND AMAZING BATTERY LIFE CAN ALL BE YOURS – IF YOU CHOOSE WISELY

The modern thin-and-light laptop isn't just the same design with a faster CPU: this new breed is smarter and a lot more versatile. It comes in a range of form factors, from conventional clamshell designs to 2-in-1 convertibles designed to work as well with a pen as with a keyboard. However, what they all have in common is that they offer a slimmer and more lightweight computer – without many of the compromises of the old ultraportables.

ABOVE More and more laptops are now equipped with USB-C and it's a hugely versatile port

BELOW If you travel the world, a 2-in-1 laptop with tent mode may appeal

Size and design

Ultrabooks have always been a balancing act between the competing priorities of ergonomics, performance and portability. The first examples launched with 13.3in and 11.6in screens (to match Apple's MacBook Air) with a lightweight spec to keep battery life up and chassis size down. The only problem? You got a laptop that was great for a couple of hours, but that lacked the comfort, features and stamina to work all day.

While a 13.3in screen size remains the norm with these current thin-and-light models, the balancing act is getting easier. A 14in laptop now weighs under 1.5kg and can easily slip into a bag. Even some 15.6in models are creeping in at under 2kg.

When choosing, the trick is to be realistic about what you're using the laptop for and what you need to do. If, for instance, you tend to work with apps in a full-screen view or with only one or two apps open at a time, a 13.3in laptop is perfectly fine. If you're a power user (or have bad eyesight) then you should look for a 14in or even 15.6in model because you will get a bigger screen, less eyestrain and a more spacious keyboard – and you will feel the lack of them more than a few hundred grams of extra weight.

Processing power

Intel's nomenclature never becomes any less confusing, and the eighth-generation line of Core mobile CPUs manages to fit in processors based both on Kaby Lake R and Coffee Lake architectures. The good news is that both are a significant upgrade on the older Kaby Lake processors.

The Kaby Lake R Core i5-8250U and Core i7-8550U processors found in many of the laptops on test this month have double the cores (four) and double the threads (eight) of the old dual-core Kaby Lake CPUs, making them noticeably faster, particularly when multitasking or in heavily multithreaded applications.

The differences between the two CPUs come down to maximum frequencies and cache rather than cores and threads – in contrast to those of desktop processors – so don't feel you have to splash out for a Core i7 if you're not running the most demanding apps.

If you do fall into that category, then look toward slightly larger (and less lightweight) laptops featuring the Coffee Lake Core i7-8750H. This has six cores running 12 threads and is – predictably – something of a beast.

In terms of RAM, 4GB might have been alright for the old Ultrabooks, but with their faster processors and stronger graphics capabilities, their replacements need a minimum of 8GB. In fact, we're starting to see performance pick up on machines with 16GB, although it's not crucial outside of more data-intensive applications, such as our Ultra HD video processing tests.

Storage

Ultrabooks were quick to embrace the SSD, and you won't find a good thin-and-light laptop running with a hard disk these days. The good news is that capacities are growing as prices

fall, with 250GB to 500GB drives everywhere you look. The vast majority are also moving to NVMe drives rather than SATA 3 SSDs, making the most of the former's faster read/write performance and near-instant boot times.

Screen and audio

Full HD 1080p is now the standard for all mid-range and high-end laptops, so it's no surprise that it's the norm here as well. Some high-end models are embracing Ultra HD 3,840 x 2,160 resolutions, which does bring an extra level of clarity and definition. However, it also means extra costs and some issues with screen scaling on certain apps, plus more drain on the battery. In truth, the difference isn't always readily apparent until you get to 15.6in or beyond. While a higher resolution is undoubtedly a bonus, we would still focus more on brightness, vibrant colour and – if you're in the video, photography or design world – colour accuracy and gamut coverage.

ABOVE A huge resolution may sound great, but also bear in mind the brightness and colour accuracy of the screen

"In fact, we're seeing thin-and-light machines break through the ten-hour barrier to deliver 12 hours, 13 hours or more"

We're hearing some minor miracles on the audio front as well. There are limits to how warm or bassy a sound you can get from a slimline chassis, but some of these machines deliver clear and very listenable sound. We would still plug in our headphones for music, or connect to a Bluetooth speaker, but the best-sounding thin-and-light laptops are fine for streaming Netflix in a distant hotel room.

Graphics horsepower

Two years ago we would have told you that thin-and-light laptops and graphics power don't mix. Now, with new low-power, low-heat solutions from Intel, Nvidia and AMD – including the Core/Vega hybrid chips – you can have both. You're not going to be running VR apps at high detail settings or running Full HD games with all the options set to max, but most of these machines could handle a little light gaming. Some have enough power to match the Xbox One console with medium settings at 1080p and 30 frames per second. The fastest will even give you higher frame rates or let you take your detail settings up a notch.

Connectivity

Let's call this section "how we learned to stop worrying and love USB-C". With such thin and compact designs, space is at a premium around the sides of these laptops, which means some have jettisoned the likes of HDMI and old-style Type-A USB in favour of USB-C ports. While this can be annoying, it makes sense: the USB-C port is not just tiny, it's also hugely versatile. To see why, take a look at the three port replicators and docking stations we review on p92. Just note that Thunderbolt 3 support means a speed advantage over USB-C ports that only support USB 3.1, and this translates into a better choice of video outputs.

Stamina

Amazingly, you can have all of the above in a laptop that lasts a working day. In fact, we're seeing thin-and-light machines break through the ten-hour barrier to deliver 12 hours, 13 hours or more. One of the joys of the new thin and light is venturing out without a charger in your backpack. You don't need to plug in – just open the screen and go.

How we test

We run each laptop through our usual *PC Pro* benchmark tests, looking at how they cope in demanding image-editing and video-processing applications, and how they handle our bruising multitasking test, mixing 4K video playback with other processor-intensive tasks.

We also assess display quality, using a colorimeter to test brightness and contrast levels, colour accuracy and ability to reproduce the full gamut of colours in the sRGB standard. To test battery life, we set the screen brightness to 170cd/m², prevent the screen from dimming and the laptop from sleeping, then play a video clip on loop until the battery runs out.

ABOVE We test all screens for brightness and accuracy using an X-Rite i1Display Pro colorimeter

Finally, to test graphics performance, we run the laptops through the benchmark built into *Rise of the Tomb Raider*, using 1080p and the medium detail preset, then the low preset at 720p.

With the formal testing over, we then use the laptop in a range of scenarios, including document editing, video streaming, browsing the web and using web-based applications – and we do so both on a desk and on our laps. This gives us a feel for its audio-visual capabilities, real-world performance and the quality of the screen, keyboard, touchpad and sound.

We then take the design, features and connectivity into account before arriving at a final score and verdict.





	Acer Spin 5	Acer Swift 7	Asus ZenBook 13 UX331U	Chillblast Helios 3 i7 8550U	Dell Inspiron 13 7000 2-in-1
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★½☆
Purchase information					
Part code	NX.GSFEK.001	NX.GUHEK.001	UX331UN-EG002T	N/A	cn37303
Price (inc VAT)[1]	£667 (£800)	£1,249 (£1,499)	£999 (£1,199)	£750 (£900)	£999 (£1,199)
Supplier	uk-store.acer.com	uk-store.acer.com	johnlewis.com	chillblast.com	dell.co.uk
Dimensions (WDH, including feet)	381.5 x 258 x 17.9mm	324 x 229 x 9.98mm	310 x 216 x 13.9mm	329.8 x 225 x 18mm	309.6 x 215.7 x 15.51mm
Weight (with charger)	1.57kg (1.81kg)	1.19kg (1.49kg)	1.12kg (1.47kg)	1.55kg (1.81kg)	1.48kg (1.71kg)
Service & support					
Warranty[2]	1yr RTB	1yr RTB	1yr C&R	2yr C&R plus 3yr RTB	1yr C&R
Manufacturer reliability/ support score[3]	80%/80%	80%/80%	80%/80%	N/A	82%
Core components					
Processor	Core i5-8250U	Core i7-7Y75	Core i7-8550U	Core i7-8550U	Core i7-8550U
RAM fitted	8GB	8GB	8GB	16GB	16GB
Display					
Display size & finish	13.3in gloss	14in gloss	13.3in matte	13.3in matte	13.3in gloss
Resolution	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080
Touchscreen (type)	✓	✓	✗	✗	✓
Graphics chipset	Intel UHD Graphics 620	Intel HD Graphics 615	Nvidia GeForce MX150	Intel UHD Graphics 620	Intel UHD Graphics 620
Video outputs	HDMI	HDMI via USB-C dock	HDMI	mini-DisplayPort, HDMI	HDMI
Drives					
Storage capacity	256GB	250GB	500GB	1TB	512GB
Storage type	SATA 3 SSD	NVMe M.2 SSD	NVMe M.2 SSD	SATA 3 SSD	SATA 3 SSD
Battery					
Battery type (capacity)	Lithium ion	Lithium polymer	Lithium polymer	Lithium ion	Lithium ion
Battery capacity	3,320mAh	4,580mAh	50Wh	36Wh	38Wh
Ports & connections					
802.11 wireless standard	802.11ac	802.11ac	802.11ac	802.11ac	802.11ac
Wired Ethernet (speed)	✗	✗	✗	✓ (Gigabit)	✗
Memory card reader	SD	✗	SD	microSD	SD
USB-C ports (type)	1 (USB 3.1)	2 (USB 3.1)	1 (USB 3.1)	1 (USB 3.1)	1 (USB 3.1)
Other ports	3 x USB 3, audio	nano-SIM card slot	2 x USB 3.1	2 x USB 3, 2 x audio	2 x USB 3
Other features					
Webcam resolution	HD	HD	VGA	HD	HD
Windows Hello webcam	✗	✗	✗	✗	✓
Fingerprint reader	✓	✗	✓	✗	✗
Stylus included?	✓	✗	✗	✗	✗
Backlit keyboard	✓	✗	✗	✓	✓
Touchpad toggle on/off	✓	✓	✓	✓	✓
Volume control	✓	✓	✓	✓	✓
Software					
Operating system	Windows 10 Home 64-bit	Windows 10 Home 64-bit	Windows 10 Home 64-bit	Windows 10 Home 64-bit	Windows 10 Home 64-bit

1. Mainland UK only. **2.** Parts and labour, UK mainland, unless otherwise stated. **3.** Laptop reliability/support rating in reader-voted *PC Pro* Excellence Awards 2018. Where N/A, companies didn't receive enough feedback to be rated. See p30.







	LABS WINNER	RECOMMENDED	RECOMMENDED				
	Dell XPS 13	HP Envy 13	HP Spectre x360 15.6	Lenovo ThinkPad X280	Lenovo ThinkPad X380 Yoga	Microsoft Surface Laptop	PC Specialist Recoil II
	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★☆☆	★★★★☆
	cnx37004	ah0001na	ch004na	20KF001GUK	20LH000SUK	Model 1769	N/A
	£1,333 (£1,599)	£708 (£849)	£1,583 (£1,899)	£1,242 (£1,490)	£1,133 (£1,360)	£833 (£999)	£824 (£989)
	dell.co.uk	store.hp.com	store.hp.com	lenovo.com	lenovo.com	pcpro.link/289surf	pcspecialist.co.uk/reviews
	302 x 199 x 11.6mm	307 x 212 x 149mm	359 x 250 x 194mm	308 x 210 x 17.8mm	313 x 222 x 18mm	308 x 223 x 15mm	359 x 236 x 19mm
	1.21kg (1.47kg)	1.31kg (1.53kg)	2.14kg (2.57kg)	1.15kg (1.46kg)	1.44kg (1.78kg)	1.25kg	1.99kg (2.54kg)
	1yr C&R	1yr C&R	1yr C&R	3yr C&R	3yr C&R	1yr C&R	3yr RTB (1 month C&R)
	84%/77%	84%/76%	84%/76%	84%/74%	84%/74%	89%/81%	N/A
	Core i7-8550U	Core i5-8250U	Core i7-8750G	Core i7-8550U	Core i7-8550U	Core i5-7200U	Core i7-8750H
	16GB	8GB	16GB	16GB	8GB	8GB	16GB
	13.3in gloss	13.3in gloss	15.6in gloss	13.3in matte	13.3in gloss	13.5in IPS glossy	15.6in matte
	1,920 x 1,080	1,920 x 1,080	3,840 x 2,160	1,920 x 1,080	1,920 x 1,080	2,256 x 1,504	1,920 x 1,080
	✗	✗	✓	✓	✓	✓	✗
	Intel UHD Graphics 620	2GB Nvidia GeForce MX150	Intel UHD Graphics 630/4GB AMD Radeon RX Vega M	Intel UHD Graphics 620	Intel UHD Graphics 620	Intel HD Graphics 620	4GB GeForce GTX 1050 Ti
	USB-C (Thunderbolt)	USB-C (Thunderbolt)	HDMI	HDMI	mini-DisplayPort, HDMI	mini-DisplayPort	2 x mini-DisplayPort, HDMI
	512GB	256GB	1TB	512GB	512GB	250GB	500GB
	NVMe M.2 SSD	NVMe M.2 SSD	NVMe M.2 SSD	NVMe M.2 SSD	NVMe M.2 SSD	NVMe M.2 SSD	NVMe M.2 SSD
	Lithium ion	Lithium ion	Lithium ion	Lithium ion	Lithium ion	Lithium ion	Lithium ion
	52Wh	53.2Wh	84Wh	51Wh	48Wh	45.2Wh	46Wh
	802.11ac	802.11ac	802.11ac	802.11ac	802.11ac	802.11ac	802.11ac
	✗	✗	✗	✓ (Gigabit)	✓ (Gigabit)	✗	✓ (Gigabit)
	microSD	microSD	SD	SD	microSD	✗	SD
	3 (USB 3.1, 2 x Thundberbolt 3)	1 (USB 3.1)	2 (Thunderbolt 3)	2 (USB 3.1, Thunderbolt 3)	1 (Thunderbolt 3)	✗	1 (USB 3.1)
	✗	2 x USB 3, audio	USB 3	2 x USB 3	2 x USB 3	USB 3, Surface Connect	2 x USB 3, USB 2, audio
	HD	HD	Full HD	HD	HD	HD	HD
	✓	✗	✓	✓	✓	✓	✗
	✓	✓	✓	✓	✓	✗	✗
	✗	✗	✗	✗	✓	✗	✗
	✓	✗	✗	✗	✗	✗	✓
	✓	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓
	Windows 10 Home 64-bit	Windows 10 Home 64-bit	Windows 10 Home 64-bit	Windows 10 Pro 64-bit	Windows 10 Pro 64-bit	Windows 10 in S mode (free upgrade to Windows 10 Pro 64-bit)	Windows 10 Home 64-bit

Asus ZenBook UX331U

A premium ultraportable that very nearly matches the best from Dell and HP, but for less money

SCORE ★★★★½

PRICE £999 (£1,199 inc VAT)
from johnlewis.com

Asus's strength has always been in delivering a similar experience to big name, high-end laptops, but for a whole lot less. With the ZenBook UX331U we have a laptop that's still cheaper than the Dell and HP equivalents, but that can go toe-to-toe with them on nearly every level. We have some minor reservations about the screen, but this is an exceptional thin-and-light laptop balancing performance with features and design.

Let's start with the latter. The UX331 has a gorgeous, slimline all-metal chassis with a spun-metal finish, a royal blue paint job and a luxurious gloss coating that's almost pearlescent in the right light. It's highly portable, too: just under 14mm thick and not much more than 1kg in weight. To achieve this, Asus has pulled off Dell's trick of squeezing a 13.3in screen into a smaller frame, with a 6.86mm bezel that barely detracts from the display. It's not as jaw-dropping as Dell's premium Infinity display, but it's pretty close, and you get a laptop you'll barely notice in a bag or backpack until it's open and you're ready to start work.

The design isn't just beautiful but practical, too. There's plenty of room for a full-sized keyboard and a surprisingly large touchpad, with a smooth glass-like surface and enough sensitivity to track Windows gestures. A fingerprint reader is below the right cursor key, and it's easy to set up and hassle-free in use. Even the keyboard is excellent, with a straightforward layout and more travel than on some ultra-thin machines. It's a very comfortable laptop, particularly considering its compact size.

And, while the Acer Swift 7 is even thinner, the Asus does without its compromises. The touchpad has proper working buttons, while you get a full range of connections, including two USB 3.1 ports, a USB-C port, an HDMI output and an SD memory card slot. The USB-C port isn't used for charging, but at least the power adapter is one of Asus's compact, cube-like efforts. We can also forgive the lack of Ethernet when you get dual-band 2x2 802.11ac Wi-Fi.

This is such a likable laptop that its few failings are all the more annoying. The screen is bright, with a maximum luminance of 325cd/m², but the contrast isn't quite as strong as on the HP Spectre or the Dell XPS, and colour accuracy is mediocre. The deficiencies aren't actually that noticeable in everyday use, and HD programmes streamed through Netflix look amazing. The figures aren't ideal for designers or photographers, though, so if colour accuracy is important, look elsewhere.

We were more impressed with the audio than we expected. The Asus doesn't go as loud as some rivals, but there's more low-end body and oomph in the mid-range, and the output doesn't sound brash or tinny. We would still probably plug in some headphones for serious listening, but you can happily binge your way through a series without putting on a pair.

It's in performance, though, that the UX331 really comes into its own.

ABOVE With its spun-metal finish and gloss coating, the UX331U is drop-dead gorgeous

Asus has hobbled our review sample slightly by only fitting it with 8GB of RAM, but the Core i7-8550U processor still has enough power for most mainstream business and graphics applications. More unusually, our model also ships with a discrete graphics card: the Nvidia GeForce MX150. It's no powerhouse, but there's just enough performance to enjoy playable frame rates in *Rise of the Tomb Raider* at 720p. Older or less demanding titles should run similarly well.

"There's plenty of room for a full-sized keyboard and a surprisingly large touchpad, with a smooth glass-like surface"

Battery life isn't phenomenal – despite Asus's promises of a 14-hour battery life, we only had eight-and-a-half hours of looping video playback before the UX331 conked out. That's still enough for most people's working day, though, so no reason to count the Asus out.

There are certain areas where the Dell XPS 13 or HP Spectre surge in front of the ZenBook, and areas where Asus could do better, but the UX331 gives most of the quality for a little less money, and with discrete graphics, too. If you can't quite stretch to the Dell or HP competition, you know where to come.

BELOW The 14mm thickness and a weight just over 1kg mean that the Asus is easy to carry around

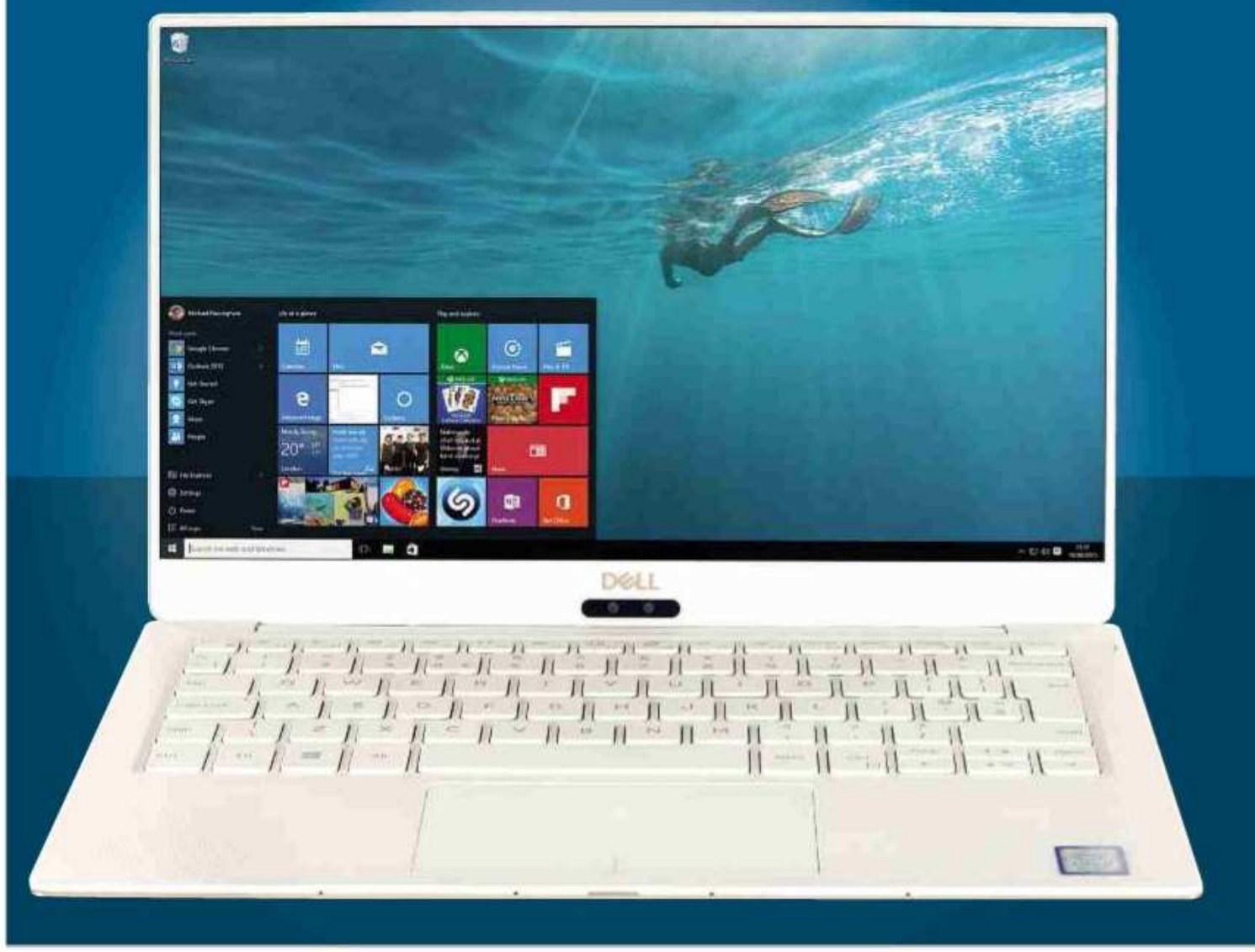
Dell XPS 13

The best ultraportable gets better with every year – and the XPS 13 is now even more attractive, too

SCORE ★★★★★

PRICE £1,333 (£1,599 inc VAT)

from dell.co.uk



Dell's 13in thin-and-light laptop improves with each generation, and while our test sample's colour scheme won't be for everyone, it's hard to grumble about the overall design. The wedge-shaped chassis has been redesigned to be even thinner, measuring under 8mm at the front-edge and 11.6mm at the rear.

The combination of metals and woven glass fibres looks and feels fantastic, with a coating that gives it a luxury car sheen. Even those of us who aren't too keen on Rose Gold finishes have to admit that it looks superb with the Alpine White of the interior, while Dell's Infinity Edge display looks as breathtaking as ever. Not to your taste? Then fear not: you can save a little cash by opting for the silver-machined aluminium version.

You have two screen options, with a 4K Ultra HD resolution or the Full HD 1080p display we're looking at here. Even on the Full HD model, clarity is outstanding, helped by a frankly ludicrous high brightness level of 433cd/m². Contrast levels reach an equally silly 1,288:1, and it's only when we get to colour rendering that it doesn't dazzle. Basically, the Dell has a superb screen for browsing the web or watching video, but only a decent one for colour-sensitive tasks such as editing video or photos. We measured the average Delta E at 2.7 – still far from bad – while sRGB gamut coverage is 90.5%, below the level of the Lenovo X380, Chillblast Helios and Acer Spin 5.

Physical connectivity is rather minimal. You get two USB-C ports on the left-hand side and another on the right, with the first two supporting Thunderbolt 3 and the latter covering DisplayPort. That's it, with no USB Type-A ports whatsoever (an adapter is provided), let alone any HDMI or mini-DisplayPort outputs. Arguably, that's just the way high-end laptops are going and it's not an issue now that the USB-C ecosystem is more developed. That doesn't mean it isn't a pain when you're connecting your wireless mouse and you've left the Type-A adapter at the office, though.

Otherwise, it's hard to fault the ergonomics. The keyboard is superb, with surprisingly large, flat keys, a standard layout and a light but positive feel. At times the action is so lightweight that you fail to notice that it didn't register your keystroke, but it's something you get used to quickly. The touchpad, meanwhile, is big, smooth and almost perfectly responsive, making easy work of multitouch gestures.

Dell has fitted a camera and infrared sensor combo for easy Windows Hello sign-in. It's a whole lot more effective than many of these setups have proved in the past, recognising faces quickly and without any trouble. On the downside, the way the cameras are positioned below the screen makes for some odd angles when you're using them in Skype. "Hello, please enjoy my nostrils" isn't quite the conversation starter we were looking for.

Audio is one victim of the size reduction. It sounds constrained, resulting in dustbin lid drums, despite some reasonable bass and good spatial detail. Generally speaking, we would hook some headphones up.

ABOVE The Rose Gold and Alpine White finish may not be to everyone's taste, but it certainly turn heads

PC PRO LABS WINNER

Battery life is nothing short of incredible. Where most other thin-and-light models are struggling to get above ten hours, the Dell does so easily, then goes on for an hour's victory lap. If you're looking for a laptop where you can work all day without reaching for the charger this is it; not that we have anything bad to say about the charger, which is tiny and works over USB-C.

With a Core i7-8550U processor, a 500GB NVMe SSD and 16GB of RAM, you already know performance won't be an issue. It isn't, and the XPS 13 delivered some of the strongest benchmark scores on test. Only in 3D performance does it lose out to rivals, as the integrated Intel UHD 620 graphics can't keep up. Nor is there an option for discrete graphics, so if that matters plump for the HP Spectre or Envy or the Asus UX331 instead. Otherwise, this remains the ultimate 13.3in, thin-and-light laptop – and something of a dream machine.

"Where most thin-and-light models are struggling to get above ten hours, the Dell does so easily, then goes on for an hour's victory lap"

BELOW The wedge-shaped chassis is now even thinner, tapering to a mere 8mm at the front end

HP Envy 13

High-end looks and feel without the matching price tag, and with Nvidia graphics as a handy extra

SCORE ★★★★★

PRICE £708 (£849 inc VAT)
from store.hp.com

The HP Spectre 15 is a stunning premium laptop, but not everyone can afford to spend that kind of money. That's where the HP Envy 13 enters the scene, giving you a taste of the high-end at a more accessible price. You might not get the fastest processor around or even the latest, greatest screen technology – although a high-end version with a Core i7 processor is available – but you do get a superb and slimline design, consistently good quality, richer audio than usual and more than enough performance for mainstream applications.

In some ways, we prefer the Envy's looks to those of the Spectre. It's sleek, silver and very slim, just 14.9mm thick and 1.3kg in weight, with a tiny bezel around three sides of the screen. On first impressions it looks like a unibody design, but you can find the seams if you look hard enough. HP has done a nice job of smoothing out the angles, and the Envy feels very comfortable on the lap. The pattern on the Bang & Olufsen-branded speaker grille looks great as well.

Things get slightly confusing on the side of the unit, however. Look on the left-hand-side and you'll see USB 3.1, USB-C ports and a microSD card slot, along with an audio socket in the corner where you would normally expect the power socket to go. This – a proprietary effort, we're afraid – can be found on the right-hand side, along with a further USB 3.1 port and a fingerprint reader. The latter works brilliantly when you work out where it is, but it's not the easiest place to find if you're in a hurry. We also found its tiny surface area makes the initial setup a bit of an ordeal.

This isn't a convertible model, but it does come with a touchscreen that works flawlessly. The same can also be said for the smooth, glass-like touchpad with its responsive integrated buttons. Perhaps our favourite thing, though, is the keyboard. It has a spacious layout and a light-but-fast action, with enough weight and spring in each key that you can feel you're typing.

The screen is arguably the Envy 13's weakest point, but only by the high standards of other laptops in this test. Peak brightness is just 312cd/m² and it only hits 83% of the sRGB gamut, which are actually slightly better results than the sample we tested last month (*see issue 288, p61*). Overall, colour accuracy is average. Don't get us wrong – it's still a great laptop for a movie on the way home from a day out of the office – but put it up against the Dell XPS or HP Spectre and it will appear dull.

Otherwise, we're not quite so enthralled with the Envy's battery life: seven-and-a-half hours of looping video playback isn't terrible, but it still puts the HP well behind the leaders this month.

There are no such problems with the audio; it's rich for a laptop of this size, with some effective spatial trickery that makes the soundstage wider than the speakers. It's a little compressed and congested for music, but it's better than the thin-and-light laptop norm.

ABOVE **The Envy 13 has a stylish, unibody-style design, but the screen disappoints**

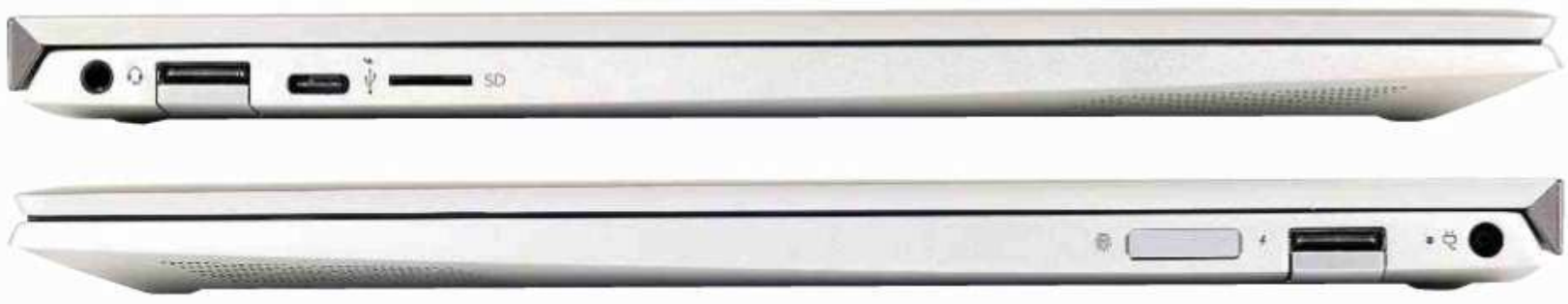
PC PRO RECOMMENDED

Now we come to performance. Our test sample this month came with a Core i5-8250U processor, 8GB of RAM, a 256GB SSD and GeForce MX150 graphics. That's a decent specification for mainstream applications and resulted in a correspondingly decent result in our benchmarks. Find another £250 down the back of the sofa, though, and you're rewarded with a Core i7-8550U, 16GB of RAM and a 512GB SSD. That's a very tempting option indeed.

"The Envy feels as luxurious as laptops costing £1,500 or more, yet you can splash out £1,000 and still get £150 of change"

If you don't need that kind of power, however, then this basic model is amazing value. The Envy 13 feels as luxurious as laptops costing £1,500 or more, yet you can splash out £1,000 and still get £150 of change. Of course, even at £850, you can still find laptops that are faster or have a better screen – but as an all-round sub-£1,000 ultraportable, the HP Envy 13 is hard to beat.

BELOW **The Envy 13's fingerprint reader is on the right-hand side and works very well – once you've found it**



HP Spectre x360 15.6

A beautiful laptop that's now more powerful and versatile than ever – only the price counts against it

SCORE ★★★★★

PRICE £1,583 (£1,899 inc VAT)

from store.hp.com

The HP Spectre x360 has never been an easy laptop to ignore. When the first model landed back in 2015, you couldn't help but be impressed by the slimline style and shape-shifting design, and subsequent versions have only improved on the successful formula. With the latest 15.6in version, however, HP has managed to make the Spectre more versatile still. And for once, the killer feature isn't what you see on the outside, but what's inside the case.

That killer feature is the Intel i7-8750G Kaby Lake-G processor, which combines a four-core, eight-thread processor with an AMD Radeon RX Vega M processor; they sit on one module and are connected by an Embedded Multi-Die Interconnect Bridge. This is a chip (well, pair of chips) with serious 2D horsepower, with the second-best score in our benchmark tests after the six-core PC Specialist. However, it also gives the Spectre a higher level of 3D performance; this one ran the *Rise of the Tomb Raider* benchmark at 37.8 frames per second at medium settings in 1080p. Roughly speaking, you're getting similar performance to an Xbox One S console in a 15in laptop you can lug around all day.

Admittedly, the Spectre x360 is on the borderlines there. With a footprint of 359 x 250mm, though, it's about as compact as a 15.6in laptop can be, helped by a small screen bezel at the top and sides. All the same it's not super-thin, at 19.4mm, and with a weight of 2.14kg it's the heaviest laptop in this test. That weight becomes wearing when you fold the screen all the way back for use in tablet mode and try to use it as you might an iPad, but put it flat on a desk and it all makes sense. Pull out the bundled active stylus and you have a device that's perfect for sketching, digital painting, taking notes and making annotations. It's as good for business or design applications as it is for straight-up entertainment.

The screen certainly helps. The size just about does justice to the 3,840 x 2,160 4K resolution, and 4K video looks nothing short of awesome. Brightness goes up to 340cd/m² and there's no shortage of clarity or contrast. The sound isn't perfect, with a slightly brash mid-range, but you get some fantastic detail at the high-end, a real sense of space and plenty of bass. You won't find a better laptop for watching 4K TV shows or movies.

In tests, the screen's performance isn't quite so stellar. We measured sRGB coverage at just shy of 90%. While individual colour accuracy is fine, with an average Delta E of 2.81, there are some real peaks and troughs on individual colours. This might put you off if you're engaged in colour-critical photography or design work, but it's something you could work around with calibration. In every other respect, it's an amazing screen.

We've no serious complaints about the ergonomics. The keyboard is great with just enough key travel and a nice, crisp action. Any layout niggles, such as the smaller-than-usual Enter key, aren't that significant after an hour or so of use. The trackpad is enormous, measuring 120 x 62mm, with a silky-smooth surface and responsive integral buttons. And if you want password-free authentication, a combo of a fingerprint reader and a Windows Hello camera system has you covered. We'd opt for the former most times, just because the latter occasionally failed to recognise faces.

ABOVE With a footprint of 359 x 250mm, the Spectre is about as compact as a 15.6in laptop can be

PC PRO RECOMMENDED

"This is an irresistible package, giving you the power of a desktop system in a slim, light and versatile form factor"

The bigger the screen, the worse the battery life, so it's no surprise that the 15.6in Spectre doesn't go the same distance as the 13.3in Dell XPS or Lenovo X380. That said, we still had over eight-and-a-half hours of looping video playback, so the Spectre x360 should last a decent working day.

If the 15.6in model is too big you can move down to the 13.3in version, while there is a cheaper option with Nvidia GeForce 150MX graphics if you're not willing to pay the extra for the AMD Vega M GPU. All in all, though, this is an irresistible package – bar the price tag – giving you the power of a desktop system in a slim, light and versatile form factor. As laptops go, it's a work of art.

BELOW The heaviest laptop on test, but the tablet mode is still great for sketching or making notes

Lenovo ThinkPad X380 Yoga

A superb thin, light and versatile laptop for business users who require power on the move

SCORE ★★★★½

PRICE £1,133 (£1,360 inc VAT)
from lenovo.com

Like so many of Lenovo's ThinkPads, the X380 Yoga doesn't feel like it's trying to impress. The styling is simple, angular and practical. There's no rose gold, ivory or champagne tones, just a whole bunch of matte black.

This isn't a criticism. It's thin and lightweight at just 1.44kg, but it's not bothered about being the skinniest laptop on the block. Like its stablemate, the X280, it's a laptop aimed squarely at getting work done wherever and whenever you need it. The only hint of showing off is how smoothly it switches between laptop, tent and tablet forms.

Needless to say, it feels bulletproof. Lenovo has tested it against 12 military spec requirements, with the X380 Yoga passing over 200 durability tests. Whether you're a rugged adventurer, hopelessly cack-handed or a parent of young kids, this is something you'll appreciate. And where other thin-and-light models are cutting down on connectivity, the X380 Yoga packs in everything you need, including a dual-mode USB-C/Thunderbolt 3 port, two USB 3.1 ports and a mini Gigabit Ethernet port. Note the latter needs a dongle, sadly not supplied.

One thing that is supplied is a stylus, although you might not notice it at first. That's because it docks neatly into a slot on the right-hand side of the unit where it also charges while not in use. It's a fantastic piece of design and turns the X380 Yoga into a really effective mobile business tool, particularly if you like to make notes or annotate schematics, plans and documents with the laptop in its tablet mode. Our only criticism is that the fan at the back of the keyboard pushes out lots of hot air when used this way.

It's almost dull to report that a ThinkPad keyboard is great, but this one is great, so what can we do? The big keys and slightly concave keytops are a dream to type on, with a superbly balanced, springy action and a solid base. The only things we might moan about are the weird positioning of the PgUp and PgDn keys in the cursor pad, and the way a Function key sits where you'd expect the left Ctrl. It's something you get used to, but you'll notice it if switching between a ThinkPad and another PC. Meanwhile the trackpad doesn't have the size or luxurious feel of some glossier rivals, but it's responsive in use. One final question – does anybody still actually use the ThinkPad's weird red analogue nub in the centre of the keyboard?

The Yoga X380 has no pretensions or desires to be an entertainer. The sound is basic and near-useless for listening to music, and the screen is bright but mediocre on both colour accuracy and sRGB gamut coverage. Watch Netflix and your shows look slightly drab.

Luckily, the Yoga X380 has it where it counts for business. Battery life isn't quite up there with the Dell XPS, but we still got nearly nine-and-a-half hours of looping video playback on a single charge, with a fast-charge option that can take you back up to 80% from an hour's charging. And while the X380 isn't quite as speedy as its stablemate, the X280, it still has a formidable Core i7-8550U processor. We would be tempted to partner it with 16GB of RAM rather than 8GB, though, as its benchmark scores fell behind machines with similar specs other than memory. Its 500GB NVMe SSD, however, certainly doesn't hold it back, with read/write speeds in the region of 2GB/sec.

ABOVE **Forget the bling: the ThinkPad X380 Yoga is clad in sombre matte black**

"The big keys and slightly concave keytops are a dream to type on, with a superbly balanced, springy action and a solid base"

This isn't the laptop you buy to impress your friends or attract envious looks from across the boardroom, but it is the laptop you buy if you want to carry around a true-business class machine that won't weight down your briefcase, backpack or cabin bag. It's powerful, versatile and very, very practical; and that's reflected in its enterprise-grade price.

BELOW **The stylus slots neatly into the right-hand side of the laptop, where it's also recharged**

PC Specialist Recoil II

It's not really that thin or that light, but who cares when you see what the Recoil II can do?

SCORE ★★★★☆

PRICE £824 (£989 inc VAT)

from pcspecialist.co.uk

The PC Specialist Recoil II isn't exactly subtle about its angle or its audience; if the name doesn't tell you that this is a gaming laptop, the multi-coloured pyrotechnic display of the fully RGB-backlit keyboard will. Admittedly, it also stretches our definition of thin-and-light to breaking point. It's 19.9mm thick towards the back and hits the scales at nearly 2kg. Throw the chunky power adapter in your bag, and you're looking at a 2.54kg carrying weight.

Still, you can't help but like its sense of menace. With a design mixing metals, matte-black plastics and whopping grilles, it's the kind of laptop the new *Star Wars* trilogy's Kylo Ren might use to wind down before smashing up his room when he failed to get a *Fortnite* Victory Royale. The fan at the back spits out a fair bit of air and a lot of noise while gaming, but in simple Windows desktop use it stays fairly quiet. It's one of the more ergonomically friendly gaming laptops you can find.

Gamers, of course, will instantly get the appeal of that RGB keyboard, not to mention the clicky, rugged appeal of the mechanical-switch keys. If you play shooters or games such as *League of Legends* at a high level, this is exactly what you want. It isn't so great for typing, as the pressure required to activate a click isn't quite so conducive to getting a lot of words down fast. That's something to bear in mind if you're looking for a laptop that does gaming duties and some good, hard work. Still, we've got no such problems with the touchpad. 105mm x 75mm in size, it's absolutely massive and a pleasure to use. Just one word of warning: the keyboard surround and lid are fingerprint magnets, so you might want to avoid anything remotely greasy while this laptop is in use. Even a simple doughnut can result in the kind of marks you would normally associate with fried chicken.

We could say the same about the Recoil II's screen, which seems weirdly huge. PC Specialist has stuck to a 1080p resolution, which on balance is a bright idea. After all, you don't have to push as many pixels as with a higher-density screen, and at 15.6in the difference when gaming isn't all that significant. It's bright, maxing out at 347cd/m², with decent contrast levels of 994:1, and it makes games and action movies look spectacular. That said, the colour accuracy is just okay with a Delta E of 2.59 while sRGB gamut coverage comes in at only 85%.Consequently, if you're a designer or amateur photographer, then the Recoil II isn't for you.

This laptop has a Soundblaster-branded speaker system, but it's a bit of a mixed bag. On the one hand, there's plenty of clarity and some impressive pseudo-surround effects to give the impression of a wider stereo spread. However, there's not as much boom and bang as on some larger gaming laptops, while subtlety and finesse aren't amongst the Recoil II's strengths.

ABOVE The RGB keyboard and clicky mechanical-switch keys will instantly appeal to gamers

"It's the kind of laptop Kylo Ren might use to wind down before smashing up his room when he failed to get a *Fortnite* Victory Royale"

Connectivity is a different matter. As well as two USB 2 ports, two USB 3 ports and a single USB-C, you also get an SD card slot, separate mic and headphone sockets, two mini DisplayPort outputs and an HDMI. There's even a Gigabit Ethernet port with gaming-friendly Quality of Service features; just what you need if you're a budding pro.

Now, I won't tell you that the Recoil II is the last word in gaming performance, but with a six-core Core i7-8750H processor, 16GB of RAM and an Nvidia GTX 1050 GPU, it has more than enough grunt to run anything at high detail settings at over 30fps – and some titles at nearer 60fps. There's also an option to step up to a GTX 1060 if you need more speed. Unsurprisingly, the PC Specialist also decimated every other laptop in our 2D benchmarks. Sure, it's a bit like putting Dwayne Johnson in an arm-wrestling contest for the Oscars, but it hammers home the point: this is the fastest laptop here by a mile.

BELOW You're very well served on the connectivity front – there's even a Gigabit Ethernet port

Acer Spin 5

Excellent value and a stylish design, even if this 2-in-1 convertible can't match the rest for power

SCORE ★★★★☆

PRICE £667 (£800 inc VAT)
from uk-store.acer.com

Think you need to spend big to get a stylish slim-and-light laptop? The Acer Spin 5 might make you think again. It's a beautifully designed 2-in-1 convertible with a flexible hinge that allows it to work in tablet, tent and stand configurations, as well as a more conventional clamshell laptop. At 1.6kg, it's a little heavy by normal tablet standards, but the responsive touchscreen and excellent bundled stylus make the effort seem worthwhile. The mix of black and a dark grey aluminium also makes this mid-range device look and feel surprisingly expensive.

It's not just desirable, but practical as well. We have some minor quibbles about the keyboard, such as the weird split Enter key and the similarly afflicted left-Shift, but the actual feel of the keys is very good, and the layout is both nice and spacious. Backlighting is another plus if you're working in a darkened room. The generously sized touchpad is smoother than a pint of Guinness and works brilliantly for gestures, while Acer's fingerprint reader works perfectly – although its small size makes the initial setup take longer than it should.

There's more good news when we get to the screen. It's super-bright with the kind of clarity you would expect from a 13.3in, 1080p display. Punchy colours are definitely its bag. Colour accuracy is only mediocre, yet the panel covers 89.7%of the SRGB gamut – one of the better results on test. Sound is a little shrill at higher volumes, but clear with a little space and some recognisable low-end. You could comfortably watch a movie, but some decent headphones will improve the sound.

If you want to play games, though, the Spin 5 isn't for you. Its Core i5-8250U processor, with an Intel UHD 620 Graphics core, simply doesn't have the grunt. And while there's a faster Core i7-8550U variant available, plus another model with an Nvidia GTX 1050 discrete GPU, our base-level model struggled to keep pace with the stronger laptops in our video-processing and multitasking tests, leaving it one of the slowest laptops in our lineup this month.

We like the Spin 5, though, and it only narrowly loses out on an award. It's an excellent thin-and-light laptop for the money – and shows some of its more expensive competitors a thing or two.

ABOVE The mixture of black and dark grey aluminium gives the Spin 5 a high-end feel

Acer Swift 7

Slim, light and beautiful, but the trackpad and power-saving processor hold it back from greatness

SCORE ★★★★☆

PRICE £1,249 (£1,499 inc VAT)
from uk-store.acer.com

The 14in laptop doesn't get any slimmer, lighter or lovelier than the Acer Swift 7. Weighing in at just 1.2kg, it's actually lighter than most of the 13.3in models on test, while the 8.9mm thin chassis is a wonder of engineering; it's slimmer than some recent tablets. Although it feels like it might blow away in a stiff breeze, the aluminium unibody construction is perfectly robust, while Acer earns extra points for bundling a sleeve.

The hinge doesn't allow you to fold the screen flat against the back and use it like a tablet, but it will sit flat against the desktop, which can be handy if you want to make full use of its touchscreen. The design leaves barely any room for ports, though, with just two USB-C, a 3.5mm audio socket and a nano-SIM slot for the built-in LTE modem. However, Acer gets past this by bundling a USB-C breakout box, complete with a USB-C port, USB 3.1 Type-A port and an HDMI out. It's a neat solution we would be tempted to leave plugged in to a desktop setup.

On a laptop this svelte, the screen seems enormous and the quality is hard to fault. While a maximum brightness of 285cd/m² means that it's better suited to indoor use than outside, the average Delta E is just 2.14, while the sRGB coverage of 97% is fantastic. On the other hand, the audio is paper-thin and borderline unlistenable at high volumes, but what can you expect when the chassis is this small?

In fact, the Swift 7 is nearly the single most desirable laptop in this test, with a brilliant ten-hour battery life to boot. So what's holding it back from greatness and five stars? First is the keyboard which, understandably, doesn't have much travel, feeling weirdly light in comparison to the Microsoft Surface or the HP Spectre. Worse, the trackpad has no buttons whatsoever – not even integral buttons – which means that you end up having to use the touchscreen every time you need to move a window or drag and drop. Finally, performance is compromised by the weedy Core i7-7Y75 processor. Don't be fooled by the i7 nomenclature; this low-power processor makes the Swift 7 the slowest laptops in this month's test. None of these issues are disastrous, but they spoil it as a do-it-all device.

ABOVE The featherweight Swift 7 clocks in at just 1.2kg and is 8.9mm thin

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Chillblast Helios

Impressive performance and screen quality for the money, but heavy for a 13.3in laptop and it lacks stamina

SCORE ★★★★☆

PRICE £750 (£900 inc VAT)
from pcpro.link/289chill

Chillblast's laptop can't compete with the best of the big brand models on mobility or stylish design, but take a good look at what you're actually getting for £900. While the 13.3in 1,080p IPS screen is what you'd expect for the price, Chillblast goes big on the specification: it includes a Core i7-8550U CPU and 16GB of RAM at a price where you would normally be talking Core i5 and 8GB. Only the 250GB SSD reflects the sub-£1,000 budget. That impressive specification is reflected in the laptop's benchmark scores as well – while the Helios isn't quite up there with the PC Specialist Recoil II, it's not that far behind.

The Clevo aluminium chassis not only looks good, it offers much more connectivity than most thin-and-light models on the market: you get HDMI and mini DisplayPort outputs, two USB 3.1 ports and a USB-C. Chillblast has even found room for a Gigabit Ethernet port, expanding slightly out of the case to take an RJ-45 connector. However, the chassis is larger and clunkier than the competition, with a weight of just over 1.5kg. There's also not much backward tilt on the screen, which can be annoying.

In terms of usability, though, this one punches above its price bracket. The keyboard is big, with both a spacious layout and a MacBook-like typing action. There could be a little more feedback – you miss the odd keystroke without noticing – but it's nothing you can't get used to. The trackpad has an oddly gritty surface, but it's responsive nonetheless. The screen, meanwhile, is surprisingly excellent, with strong colours, loads of contrast and an sRGB coverage of 98.5%. Colours aren't unerringly accurate, but it's hard to argue with an average Delta E of under 1.5.

This leaves two remaining drawbacks. Firstly, the Chillblast's built-in speakers are rough on the ears. They're loud but tinny, with a booming, overpowered bass. Secondly, and perhaps more importantly, the battery life is only just passable, with the charge running out in just over five hours in our tests.

The Chillblast Helios gives you great performance and connectivity for your money, but at 1.55kg, and with such medicore battery life, it's not the ideal thin-and-light laptop for work or life on the go.

ABOVE It's not the most stylish laptop, but Chillblast has gone big on the spec

Dell Inspiron 13 7000 2-in-1

A beautifully designed convertible, but sadly the quality isn't consistently impressive

SCORE ★★★☆☆

PRICE £999 (£1,199 inc VAT)
from dell.co.uk

The Inspiron 13 7000 2-in-1 brings a few of the features found in Dell's premium XPS line down to the mainstream Inspiron. It's another of Dell's 2-in-1 convertibles, but with a thin-bezel design that delivers a 13.3in IPS touchscreen in a smaller chassis than you would usually expect: it has a desktop footprint of just 309 x 215mm and a weight of 1.45kg.

The brushed aluminium casing, with its gunmetal tone, looks nearly as expensive as the XPS 13, while the flexible hinge means you can use it as a super-sized tablet or in a tent configuration when you don't need the keyboard to hand. The Inspiron will work with an optional £40 Dell stylus, but oddly it's not offered when you buy the laptop.

The feature list is impressive, too. There's a camera and infrared sensor for face recognition through Windows Hello, and it's one of the most accurate setups we've seen, signing us in with no hassle, every time. Connectivity is good, with USB-C, two USB 3.1 ports and HDMI and audio sockets. It's a shame you have to charge using a proprietary connector, though, not USB-C as on the XPS 13.

Our review sample came packing a Core i7-8550U with 16GB of RAM, so it's no surprise that performance is top-notch. Even if you're looking to edit high-resolution photos or 4K video, you'll find this Inspiron has power to spare. It only falls back when it comes to 3D performance – even at low resolutions and detail levels, the Inspiron 13 7000 2-in-1 can't run, for example, *Rise of the Tomb Raider* at anything more than a crawl.

It's in the screen, sound and general ergonomics, though, that the Inspiron really drops behind its 13in sibling. The keyboard isn't bad and has a fast, lightweight feel, but there's also something sloppy about the action as you type. The sound is weak at low volumes and too brash with the sound turned up. It's surprisingly powerful and includes some effective spatial processing for a faux-surround effect, but also a thin, unpleasant tone. The screen is pretty decent, with a lot of contrast, but sRGB coverage is so-so and other laptops have visible more punch. At this price, the Dell Inspiron 13 7000 2-in-1 doesn't have what it takes to lead the pack.

ABOVE The Inspiron 13 7000 has a small desktop footprint and, with its gunmetal case, premium looks

Lenovo ThinkPad X280

Lenovo's pocket rocket is a formidable workhorse, making it a tempting alternative to the Yoga

SCORE ★★★★☆

PRICE £1,242 (£1,490 inc VAT)
from lenovo.com

The ThinkPad X280 isn't here to wow you with its looks or dazzle you with features. Instead, it's here to be the ultimate lightweight, take-anywhere laptop that you reach for when you need to get stuff done. It weighs just 1.15kg, while a tiny desktop footprint of 308 x 210mm means that it's not much bigger than an A4 notepad. It's less than 18mm thick, too. Yet, with its durable, spill-resistant chassis, it feels incredibly robust.

This laptop is also crammed with business-grade features, including a superbly quick and accurate fingerprint reader and a webcam cover that simply slides across. You charge it using USB-C with the supplied adapter, and a second USB-C port supports Thunderbolt 3 for even faster data transfers with compatible drives (not that these come cheap, though). RapidCharge charging means you can go from near zero charge to 80% within an hour, and with nearly eight hours of battery life in our tests you won't run short too soon – just note rival laptops lasted even longer.

Perhaps the best thing about the X280, though, is its ergonomics. The keyboard is incredible for such a small device. It's a little shrunk-down from a standard ThinkPad layout, but it has the same feedback and responsive feel. The X280's touchpad isn't huge at 100 x 55mm, but it's unerringly accurate, while the 12.5in, 1080p display is great for productivity apps. It's not so good for anything where colour accuracy matters – neither the SRGB coverage nor the Delta E figures are much cop – while movie fans might want something with a little more punch, but for readability in most conditions the screen is very good indeed.

What's more, this pocket rocket has some power, with the quad-core Core i7-8550U CPU and 16GB of RAM producing the kind of benchmark score we would expect from a heavyweight laptop. You could easily run it as a desktop through a dock during the day and then unplug it when you need to work elsewhere. On balance, we prefer the ThinkPad X380 Yoga for its bigger screen and versatile form factor, but if you're looking for a workhorse that's both compact and mobile, the X280 works harder than its more style-conscious rivals.

ABOVE Durability and portability are at the heart of the Lenovo ThinkPad X280's no-nonsense design

Microsoft Surface Laptop

The Microsoft Surface Laptop's design seems timeless, but its specification is dating fast

SCORE ★★★☆☆

PRICE £833 (£999 inc VAT)
from microsoft.com

When Microsoft released the Surface Laptop last year, it proved that you could build an innovative and portable laptop without taking your design cues from Apple. It's still hard not to love the matte-finish aluminium chassis, soft colours and deliberately angular style. The design's not just good looking, but practical, and the 13.5in screen and 1.28kg weight make this a laptop you could easily lug around all day.

It's a slight shame that the hinge isn't more flexible – using the optional pen or touchscreen never feels quite natural on a laptop, and it's easy to forget that touch is an option and stick to the silky smooth, beautifully responsive touchpad. The soft-touch Alcantra around the keyboard is a love-it, hate-it kind of thing, but the keyboard itself is a pleasure, with well-sized, perfectly weighted keys that seem designed to keep up with speed demon typists.

Subjectively, the screen is fantastic, with the 2,256 x 1,504 resolution delivering images of stunning clarity, helped by lovely vibrant colours and a high maximum brightness level of 362cd/m². The only problem is that, under test conditions, colour accuracy isn't quite so good, with a surprisingly poor Delta E of 4.69. On extended use, we also have some doubts about the 3:2 aspect ratio; it's fine with a single app open or if you stack apps vertically, but snap two windows side by side and they look oddly thin and difficult to read. There's no questioning the audio, though; with enough weight and detail for music or movies, it's about as good as you'll get from a slimline device.

However, the most serious problem with the Surface Laptop is that the few elements that hold it back now will date it even more in a year's time. There's no USB-C connection, just a single Type-A USB 3 port, along with an audio jack and a mini DisplayPort output. What's worse is that the performance of this mid-range model with a two-core, four-thread Core i5-7200U and 8GB of RAM looks weak against a field of four-core, eight-thread Kaby Lake R processors. The price has dropped to make the Microsoft Surface Laptop more attractive, but this still desirable laptop needs a refresh to get back on top of the back.

ABOVE As well as looking great, the Surface Laptop's 1.28kg weight means you can carry it all day

USB-C: EXPAND YOUR HORIZONS

WE TAKE A LOOK AT WHAT THREE DIFFERENT PORT REPLICATORS AND DOCKING STATIONS HAVE TO OFFER THE NEW BREED OF LAPTOP

We may be a few years away from the demise of traditional USB ports, but the writing looms large on the wall. And it's getting bigger by the month. It isn't just Apple that's stuffed them into the port cupboard of history, but Dell too with its Labs-winning XPS 13. But rather than lament this lost port, we want to look to the future. USB-C is a great port in its USB 3.1 incarnation and even better when it supports Thunderbolt 3 - so take advantage with one of these docking stations and port replicators.

StarTech.com Thunderbolt 3 Dual-4K Docking Station

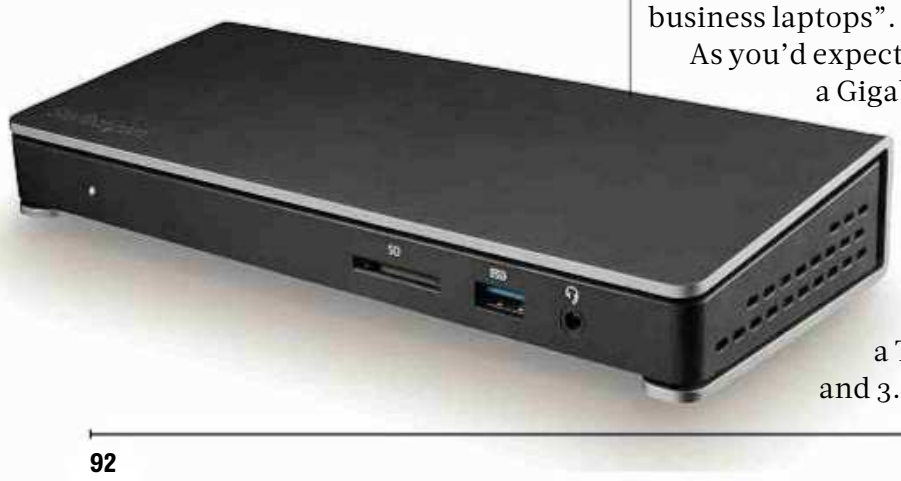
PRICE £271 (£325 inc VAT)
from pcpro.link/289star

While StarTech is yet to master the art of pithy product names, it knows how to create high-quality docking stations. This one - identified by its part number TB3DOCK2DPPU, which is important as StarTech also enjoys giving its products similar names - is a particularly good choice for power users who want dual 4K displays.

In the flesh, we admit, it looks rather dull. While Dell makes the combination of grey and black look seductive on its XPS 13, there's something plasticky about StarTech's approach - despite the fact that the top is made from metal. Still, it has enough girth to sit on a desk, even if you will have to hold it down when inserting or removing a DisplayPort cable (an HDMI version is coming soon, we're told).

Two Thunderbolt cables sit next to the DisplayPort. The first connects to the host laptop and can deliver up to 85W, with both Windows laptops and MacBooks supported, with the second available for connecting to a further display. And note that both support 4K at 60Hz. Add five USB 3 ports, one of which is USB-C, and a Gigabit Ethernet port, and the back is packed with every connection most people need. The coup de grace? A front-mounted SD card slot, headphone jack and final Type-A USB 3 port.

Yes, it's expensive – but it's a true docking station, and you get a substantial three-year warranty.



Toshiba Thunderbolt 3 Dock

PRICE £167 (£200 inc VAT)
from pcpro.link/289tosh

Almost every laptop manufacturer has brought out its own Thunderbolt dock, and Toshiba hopes to tempt you with its own offering (part number PA5281E-1PRP). It provides a few advantages over its StarTech rival, with the chief one being its price.

Physically, it's also sleeker and - dressed all in black - smarter than the StarTech. It is a little lighter, but Toshiba includes a grippy bottom surface so it doesn't slide about much when you add cables. You may also appreciate the numerous video outputs: two HDMI, DisplayPort, mini-DisplayPort, even VGA.

It supports dual 4K displays at 60Hz, but only if you use the mini-DisplayPort and one of the HDMI or DisplayPort outputs. As such, despite the plethora of outputs, it's actually less flexible than the StarTech. Also note that Toshiba doesn't state the maximum power output: instead, it says it's "designed for our Portégé X20W, Portégé X30 and Tecra X40 business laptops".

As you'd expect, the dock includes a Gigabit Ethernet port, while three Type-A USB 3 ports sit at its rear. Add two front-mounted USB-C ports, plus a Type-A USB port and 3.5mm combo jack, and this is a solid choice for laptops that have modest power needs. And, to be on the safe side, we recommend you check you can return it before buying, unless you own one of the listed Toshiba laptops.

ABOVE The Kingston Nucleum makes an excellent travel companion and port replicator

ABOVE Toshiba sells a Thunderbolt 3 docking station designed for its own range of laptops

LEFT The StarTech is a powerhouse docking station, albeit with a price to match

Kingston Nucleum

PRICE £39 (£47 inc VAT)
from kingstongo.com

While the two docking stations we've looked at here require a Thunderbolt-equipped laptop, the Kingston Nucleum is more forgiving: it's designed for any laptop with a physical USB-C port, whether that's USB 3.1 or Thunderbolt.

We like it because it's lightweight, compact and packs in plenty of ports - including a full-size HDMI port. Just note this is HDMI 1.4 rather than HDMI 2, which means it can output to 4K screens but only at 24Hz. Still, that's fine for this hub's primary aim, which is as a travel adapter rather than docking station.

At 105g, it won't take up much room in your bag, and in return you get two Type-A USB 3.1 ports, a further USB-C port, plus microSD and full-size SD slots. There's also a power passthrough port, so you can power your laptop via the Nucleum.

With a stylish brushed metal finish, we can't help but be impressed by this bargain of a port replicator.

VIEW FROM THE LABS

AFTER A MONTH WITH THE COUNTRY'S FINEST THIN-AND-LIGHT LAPTOPS, STUART ADMITS THAT HE'S A CONVERT TO THE CAUSE

I used to think the whole idea of one PC that does it all was the rainbow-coloured unicorn of the IT landscape. Like many more enthusiastic PC users, I tend to bounce between a desktop and a laptop or, in my case, two: a ThinkPad for serious work and a lightweight Chromebook for surfing and browsing.

When the first Ultrabooks arrived I found them very tempting, but were they genuinely practical? Could you really work across multiple apps or documents? Could you sit at a desk and work all day long? Could you see what you were doing when working in Vegas or Lightroom? Could you do all the things that a PC is best at doing?

As a games addict, I also wanted to sneak in a little light gaming. I'm not expecting to play *Assassin's Creed* or *Battlefield*, but how about *Diablo III* or the latest *Total War*?

Now, I know I'm not exactly the average user, but I still had my doubts about whether these ultra-mobile, do-it-all PCs really had the comfort and the chops. I've flirted with the idea of buying a Microsoft Surface Laptop or an Asus ZenBook in the past, but I could never pull the trigger and commit.

Stuart Andrews is a former reviews editor of *PC Pro* who is now eyeing up his bank balance

Now, however, I'm coming round. I've fallen big time for the HP Spectre and Dell XPS – if only I had the wonga in my wallet to make the dream happen. I'm seriously impressed by the HP Envy, Asus ZenBook and Acer Spin 7, and the ThinkPad X380 is exactly the kind of business-ready laptop I respect. These are great laptops with large, sharp and more than usable screens. They have comfortable keyboards that feel good to type on, and massive trackpads that even make me think that I could live without a mouse (well, some of the time).

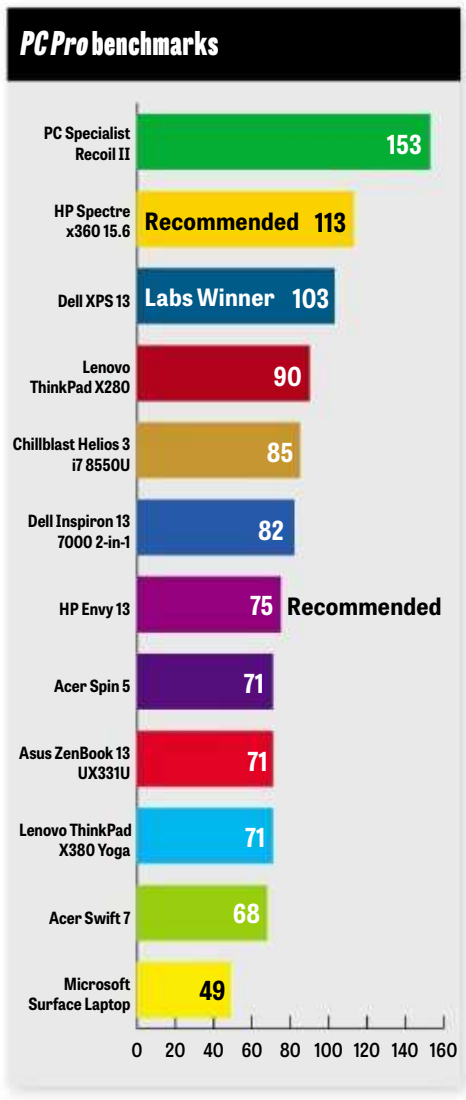
"I've fallen big time for the HP Spectre and the Dell XPS – if only I had the wonga in my wallet to make the dream happen"

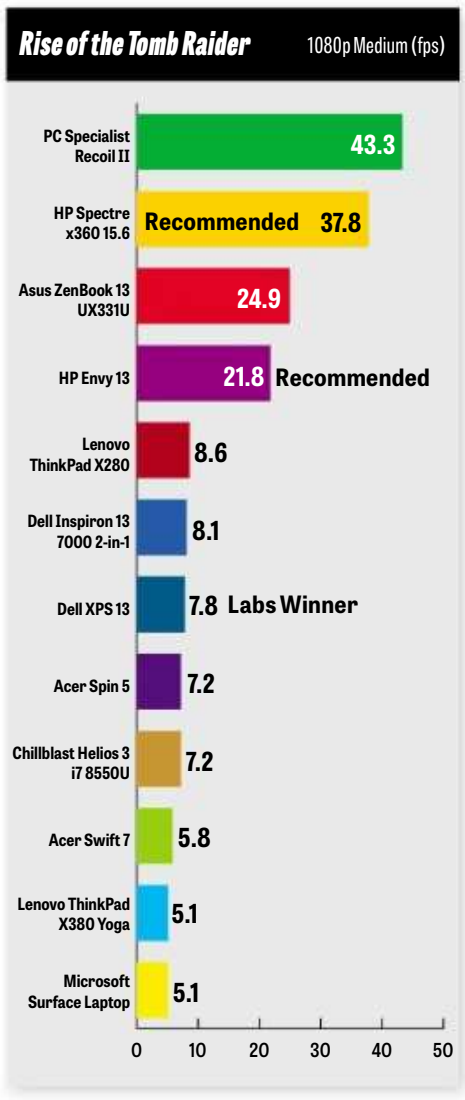
They're quiet, they don't get hot, and I'm as comfortable working at my desk, writing this, as I would be surfing on the sofa. These are laptops I could slip in a bag for a trip or client meeting, yet could still bear the brunt of my everyday work at home.

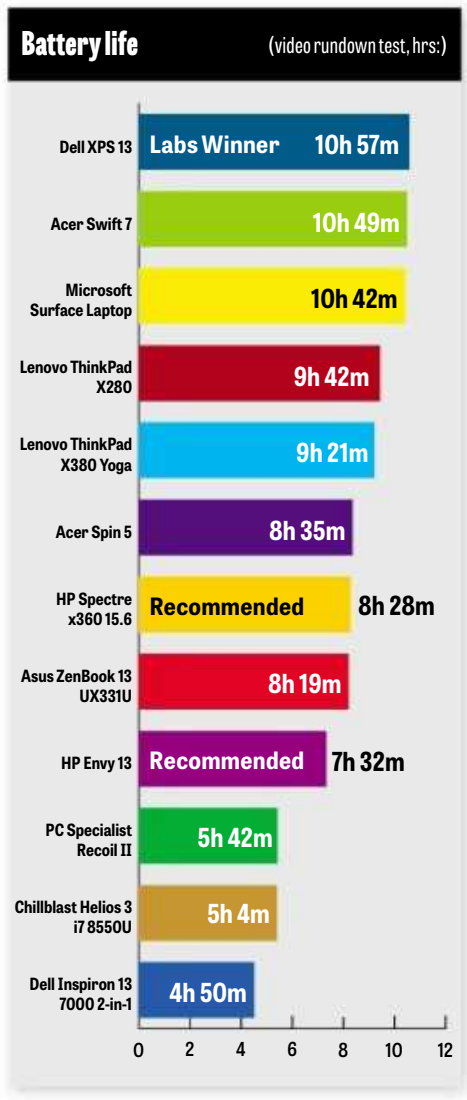
ABOVE Thin-and-light laptops might not have the grunt for some games but can handle *Diablo III*

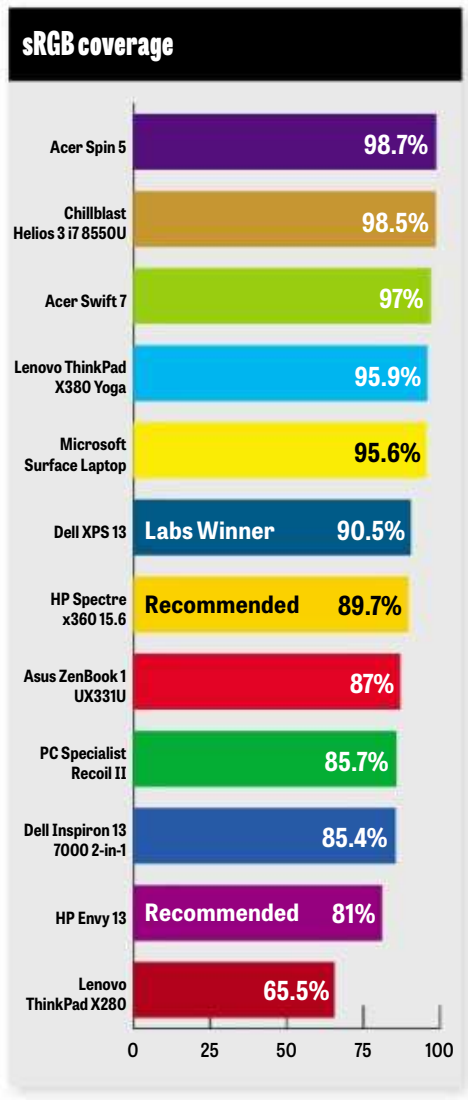
And while I wouldn't want one as my only games machine, I would be tempted to ditch my desktop, switch my next PC upgrade for an Xbox One X, then hook one of these beauties up through a dock to a keyboard, monitor and mouse, all with just a single USB-C connector. I never thought I'd see one PC that does it all. Perhaps, finally, I have to admit that unicorns do exist.

Test results









The Network

Practical buying and strategic advice for IT managers and decision makers

BUSINESS FOCUS

One-stop business security solutions

Looking for a simple, cost-effective way to protect your data? Dave Mitchell explains what to look for in a UTM appliance or cloud service, and puts four contenders to the test

Every business needs to take its IT security seriously – and that most definitely includes smaller organisations. You might think your company isn't big or important enough to attract the attention of cyber criminals, but this is the type of thinking that leads businesses to skimp on security measures (*see p102*). And that's exactly what the bad guys are looking for.

Make no mistake, we're not talking about a theoretical threat. The UK government's 2018 cybersecurity survey found that 43% of businesses had suffered a data security breach over the previous 12 months – and the potential cost has never been higher. Every SME collecting, storing and using personal data is expected to comply with the General Data Protection Regulation (GDPR), which includes a requirement to keep customer data out of the hands of unauthorised third parties. If your business fails to do so – even unintentionally – you could face a fine of up to €20 million, or 4% of your annual turnover, whichever is higher. Even if you escape a fine, the NCSC estimates that each security breach for micro and small businesses costs around £1,400.

There's only one answer. Every SME needs to invest in network, endpoint and mobile security. This month, we review all-in-one solutions from Kaspersky, Panda, Sophos and Zyxel; they're all easy to deploy and manage, and a lot cheaper than dealing with a breach.

The gatekeeper

Smaller businesses don't tend to have the IT resources to manage complex security systems. One popular approach therefore is to invest in a UTM (unified threat management) appliance – also called a gateway appliance – which integrates all the key security services in a single unit. Deployment is thus made as simple as possible, and since all internet traffic passes through one point on the network perimeter, it's relatively easy to monitor connections and enforce security policies.

The range of security functions on offer varies from model to model. The

BELOW Kaspersky uses a small endpoint agent to protect your PCs and smartphones

most basic UTM unit might be little more than a glorified firewall, but the appliances we've tested on the following pages are much more versatile. Features include VPN services for secure site-to-site and remote user connections, and both appliances also include built-in wireless network services. This is a great feature that again simplifies management, as it ensures that both wired and wireless clients go through exactly the same security checks and restrictions.

On top of that, you can add on subscription-based options including antivirus, web content filtering, intrusion detection and prevention, application controls and antispam. With all these features on the table, it pays to research the licensing options, to ensure you're not paying for capabilities you don't want. If you're willing to invest for the long term, you can also make savings by committing to a three-year subscription, rather than a regular annual one.

Send in the cloud

If you don't have the expertise or the infrastructure to manage your own UTM appliance, there's another option: cloud-based security. This works on a similar principle to on-premises threat management, except that the "appliance" is a virtual server hosted by a trusted security vendor. To ensure that all traffic is inspected and managed in accordance with your policies, a lightweight agent is deployed on all servers, desktops, laptops and mobiles. This then picks up and applies your security settings from the central management host.

Regardless of which security model you've chosen, it's normal to install some sort of endpoint protection software (EPS) on your clients. A good EPS agent will include a local firewall function, antivirus, application controls, website filtering and options to run on-demand and scheduled malware scans. EPS software can also manage access to removable devices and physical ports – something that can't be handled by a central UTM appliance.

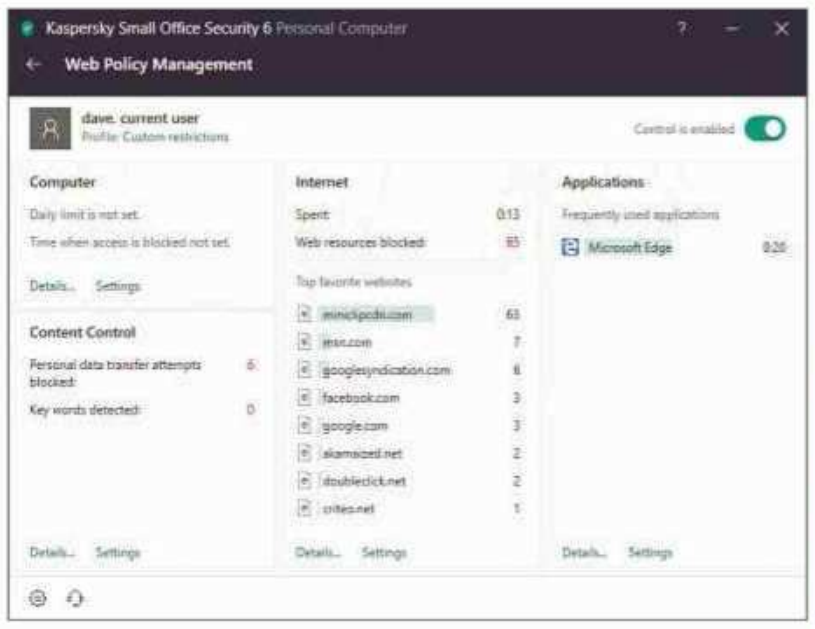
In everyday use, the functional difference between on-premises and cloud-hosted security isn't huge. The key benefits of a cloud service are that the setup costs are lower, and it's easier to manage a diverse workforce that may be spread across multiple sites, or include workers who spend their time at home or on the road.

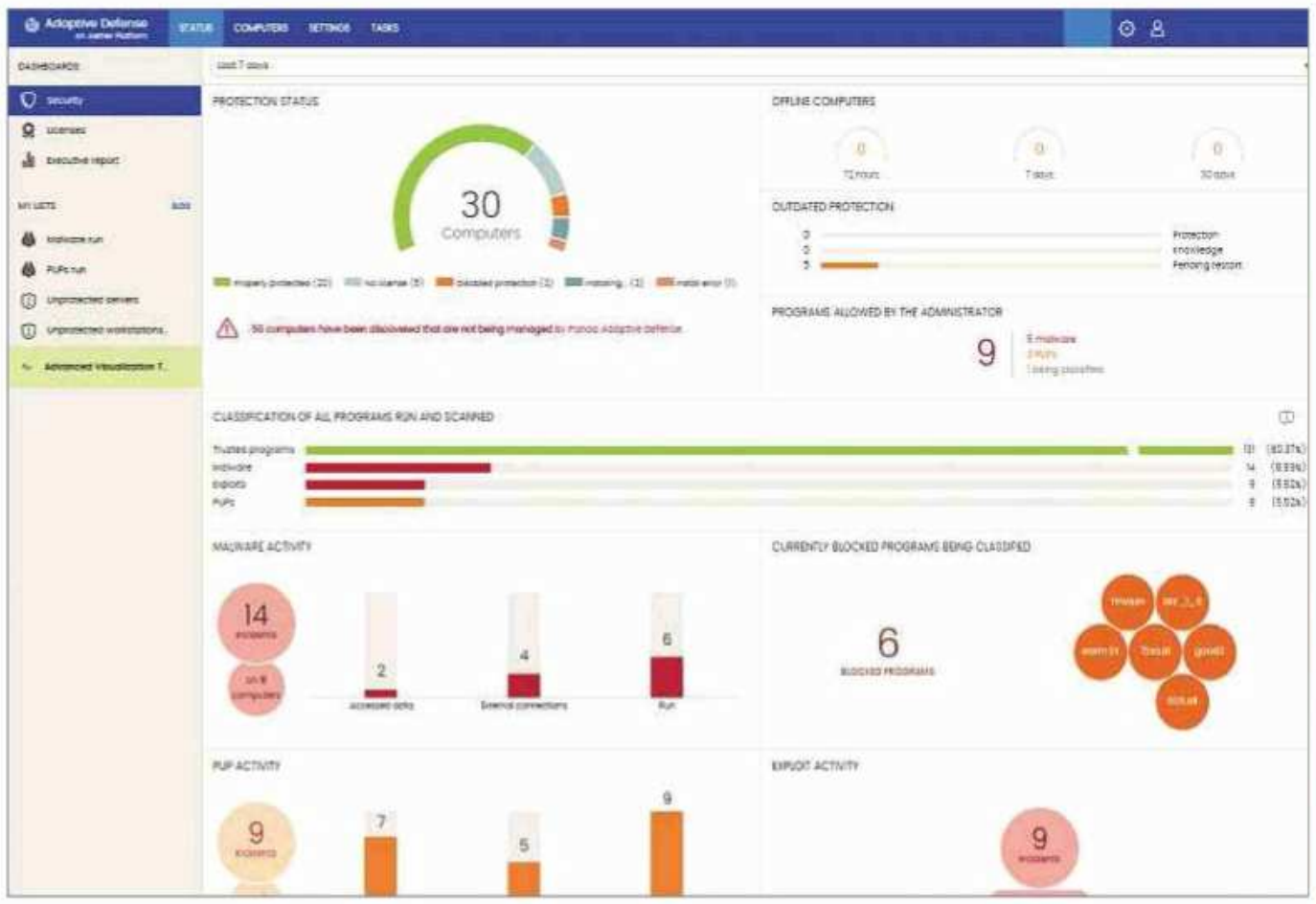
Feature finder

Whether you choose a cloud-based or UTM security solution, there are a number of key features that should be on your shopping list.

A firewall is a must, as this blocks intruders from probing your network and endpoints looking for ways to gain access. If you choose a UTM appliance you can expect it to include a powerful business-class firewall; if you're going down the EPS route, check that it's able to provide the sort of flexible protection you need.

Malware protection is another essential component of any unified security product. If possible, choose a product that provides web and email antivirus services as well as regular file scanning, to block malicious software before it can even get onto an employee's desktop.





Then there's web content filtering, which lets you decide what types of websites your users are allowed to visit. The best solutions are the ones that offer fine granular controls, so that (for example) staff can use the company Facebook pages, while Twitter remains blocked.

Finally, it's worth looking for antispam measures too. This isn't just about helping employees manage their inboxes; it can also filter out potentially dangerous phishing attacks. Don't expect perfect protection, though, as modern email fraud attacks often use clever social engineering tricks to fool both spam filters and unwary recipients. We recommend training your staff to recognise phishing attempts, and giving advice on how to handle and report them.

Safety in numbers

Business security is a multifaceted, multilayered thing, but a centralised solution can make it manageable even for small businesses. That's just as well, because the fallout from an incident could destroy your brand and even push you into insolvency. If you haven't already invested in a security solution, now's the time.

Small businesses can also get assistance from the government's Cyber Aware website (**cyberaware.gov.uk**), which provides help and advice about data security – along with a link to report data breaches and fraud to the ActionFraud UK cyber crime centre.

TOP Kaspersky's web console lets you set up web-filtering policies

CENTRE Panda's cloud portal presents a wealth of detail about detected threats

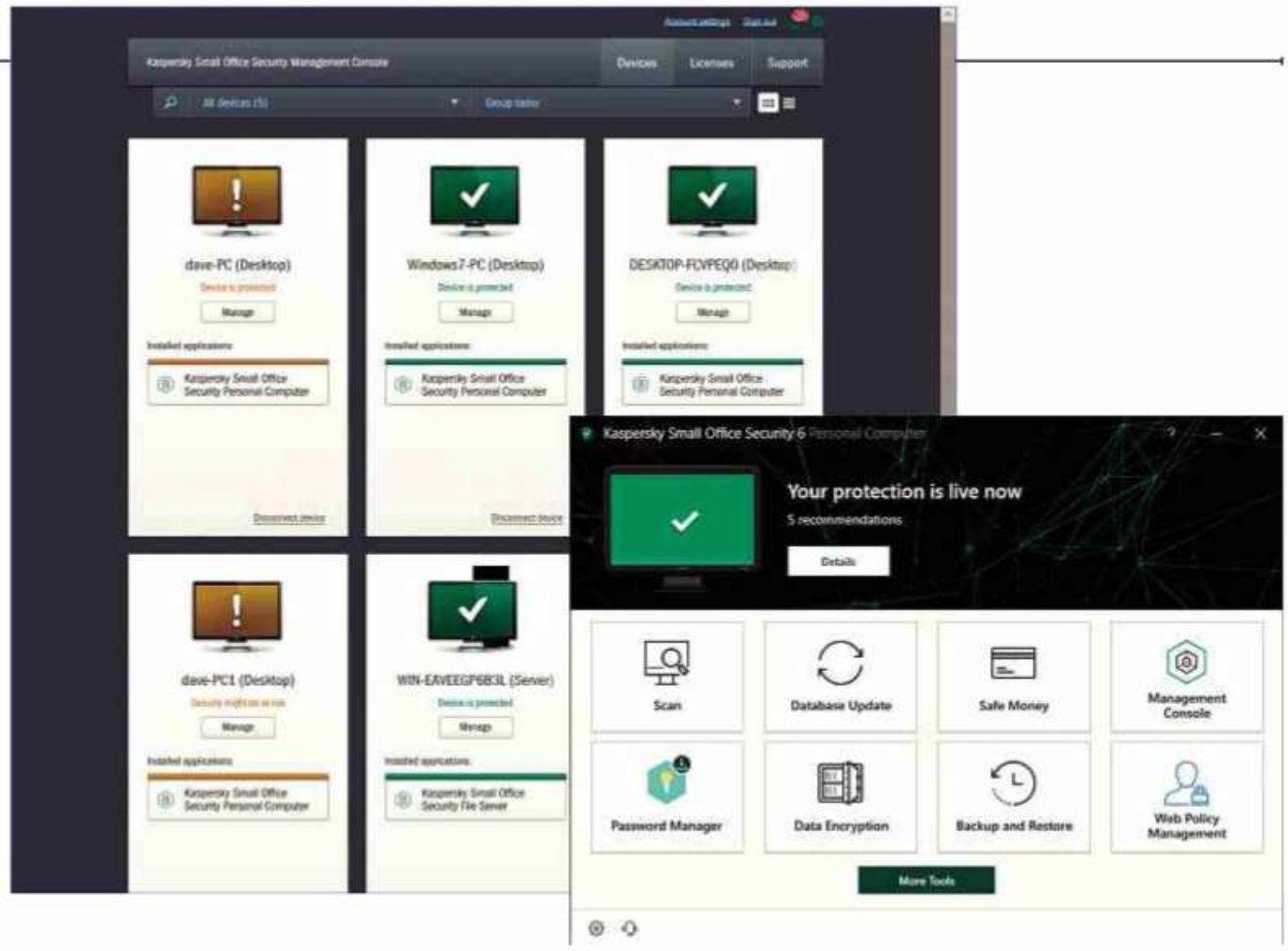
BOTTOM Sophos can tell you at a glance what apps are being used on your network

Kaspersky Small Office Security 6

Great endpoint protection at a low price, but Kaspersky's cloud management portal is disappointingly limited

SCORE ★★★☆☆

PRICE From £111 per year (exc VAT)
from kaspersky.co.uk



ABOVE The web portal gives a handy overview of all devices

Small businesses with up to 50 computers and no dedicated IT support team will find plenty to like about Kaspersky's Small Office Security (KSOS) 6. It offers wide-ranging protection for desktops, servers and Android mobile devices, and a cloud-based portal that gives you an easy overview of your protection status.

It's great value too, with prices starting at £111 per year for up to five Windows or Mac desktops, plus five Android mobiles, one Windows Server system and five password managers. If you want to protect two Windows Server hosts, you'll need to buy a minimum of 15 desktop licences, but this still only comes to £279 per year.

Getting started with KSOS 6 means manually installing the client app on each device that needs protecting. This took us around ten minutes per system, but it's a simple enough process. Installers for Windows and macOS can be downloaded directly from your cloud account, and these automatically download the latest database updates and register themselves with the cloud portal.

Your protection then starts immediately. The client software is based on Kaspersky's consumer security suite, so you get a good spread of features: desktops are protected against file, web and email viruses, and you also get app controls, a firewall, an automatic software updater, a network attack blocker, a system watcher and even webcam protection and optional per-user antispam functions. On our Windows 2016 Server the web and email antivirus, firewall and network attack blocker components were disabled by default, but you can enable them if you wish.

The software also has web filtering and scheduling capabilities, and it's here that the client's consumer heritage rather shows through: not only can you enforce parental control-style schedules and usage limits, you can even block games according to their PEGI ratings.

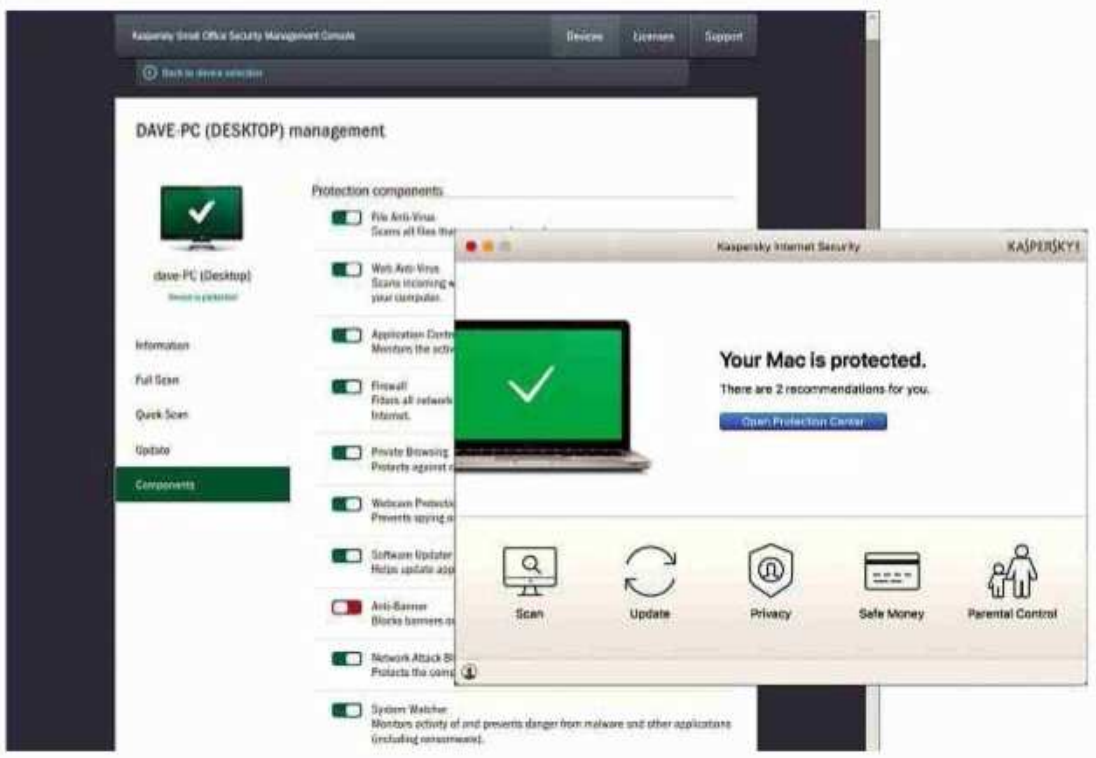
It's only once you start exploring the cloud console that the one major shortcoming of KSOS 6 becomes apparent. At first, the management interface is rather likeable: it presents colour-coded icons for each registered system, so you can see at a glance if any are compromised; clicking on a device's Manage button provides a helpful overview of all issues.

Unfortunately, it quickly becomes apparent that most remediation tasks can only be run at the client. In fact, there's an awful lot that the cloud console can't do. While major components can be remotely enabled and disabled through the cloud portal, user-specific settings largely need to be adjusted through the client software. That means that if you want to roll out a company-wide security policy, someone will have to visit every machine in turn and apply it by hand. Cloud reporting is nonexistent too; if you want to check which websites a user has been visiting, you'll once again need to schlep up to their desk to view their logs.

To be fair, this is an administrative burden rather than a security hole. You can set a password for each client, which prevents users from fiddling with their own settings, while letting them access functions such as on-demand antivirus scans and data backups, and use the Safe Money secure browser. The only catch is that the password also has to set up locally.

"The client software is based on Kaspersky's consumer security suite, so you get a good spread of features"

KSOS 6's lack of cloud features makes it decidedly unsuitable for businesses with lots of remote workers. But if you're looking for a set-and-forget solution it has a lot going for it: a string of awards attests to the efficacy of Kaspersky's protection, and the client software provides a broad set of features for a great price.



LEFT One licence lets you protect a diverse spread of devices

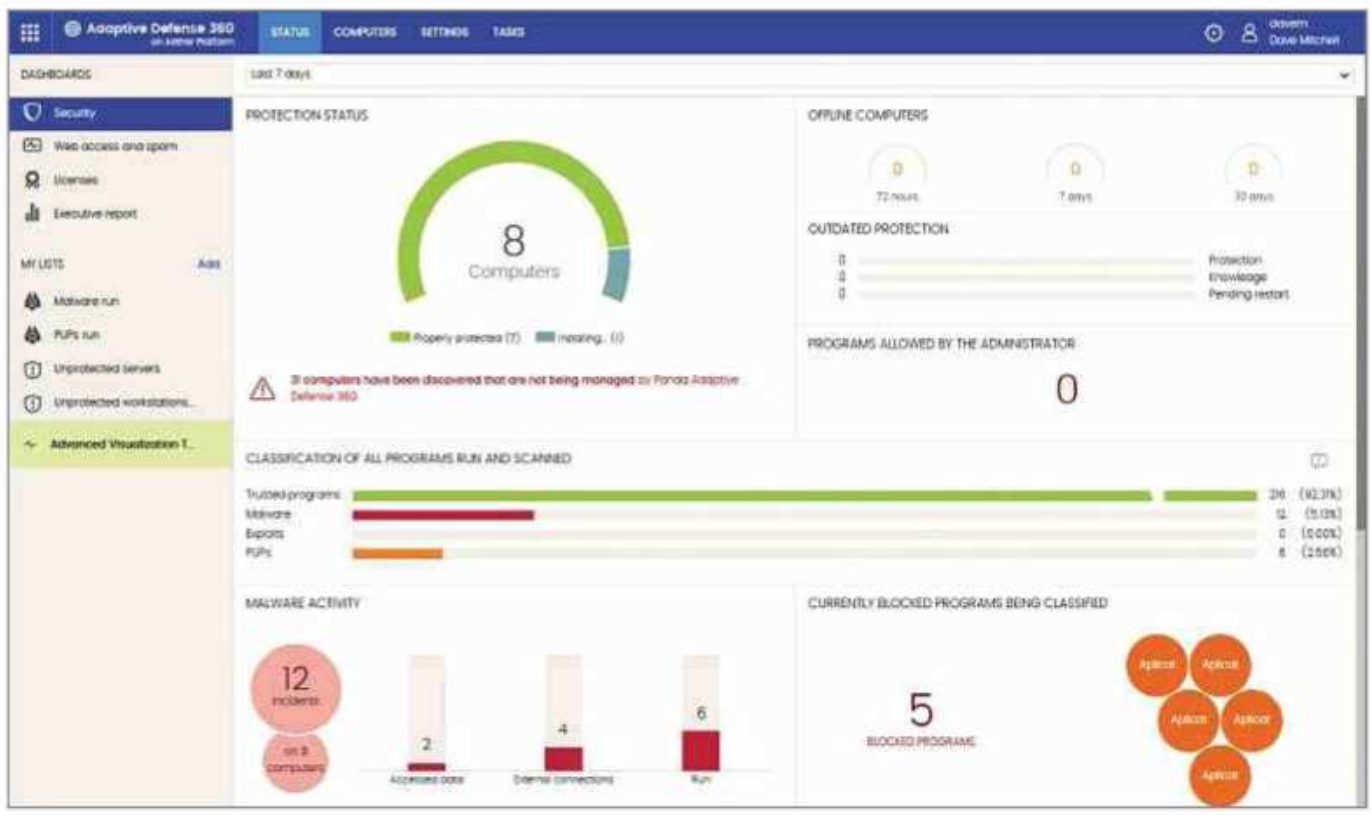
REQUIREMENTS Windows 7/Server 2007 R2 upwards • macOS • Android

Panda Adaptive Defense 360

Panda's cloud-based security service combines smart client software with an excellent web console

SCORE ★★★★★

PRICE 25 seats, 1yr subscription, £1,231 exc VAT from pandasecurity.com



When we first tested Panda's cloud-based Adaptive Defense 360 (AD360) last year, we were bowled over by the breadth of security measures on offer. Since then, remarkably, Panda has updated the package with even more features, and some welcome enhancements to the cloud portal.

To get started, you simply need to install the endpoint client onto your Windows, Linux, macOS and Android devices. You can do this by hand if you wish, but the new discovery tool makes things much easier, allowing you to simply scan the network and push the agent directly onto discovered devices.

At the core of AD360 are all the security services you'd expect, including file, web and email antivirus, a firewall and Exchange antispam. On Windows clients you can also manage permissions for all sorts of removable media, plus Bluetooth, image capture and modem devices. Panda's web filtering controls manwhile let you control access to over 60 URL categories.

It's all managed from an updated web dashboard, which helpfully gives you more information on endpoints than before, including details of trusted apps, malware detections and other events in a convenient timeline format. Access controls are more flexible too: there are now multiple types of admin role available, allowing you to define what each user can access in the console.

Elsewhere, updated group management options make it easy to tweak settings and profiles for a specific set of clients. Previously, only one security profile could be assigned to a group, but now you can have up to five for controlling proxies, endpoint security settings and Android devices.

One enhancement we particularly like is Panda's complementary app restriction policies. In "hardening" mode, the software steps in when users try to install new apps from external sources: the suspect package is uploaded to the cloud, where a barrage of tests is run to decide whether or not it should be allowed to install. The stricter "Lock" mode prevents all unknown apps from running until AD360 has deemed them to be safe.

On the alerting front, there are now more event trigger types than before, and response times are more or less instant – a big improvement on the 15-minute wait in the previous version. As a test, we tried deliberately introducing malware onto some clients, and found it took just 10 seconds for the web console to flag up a detection alert, with email alerts landing in our inbox a minute later.

ABOVE Any infected clients can be quickly isolated from the LAN

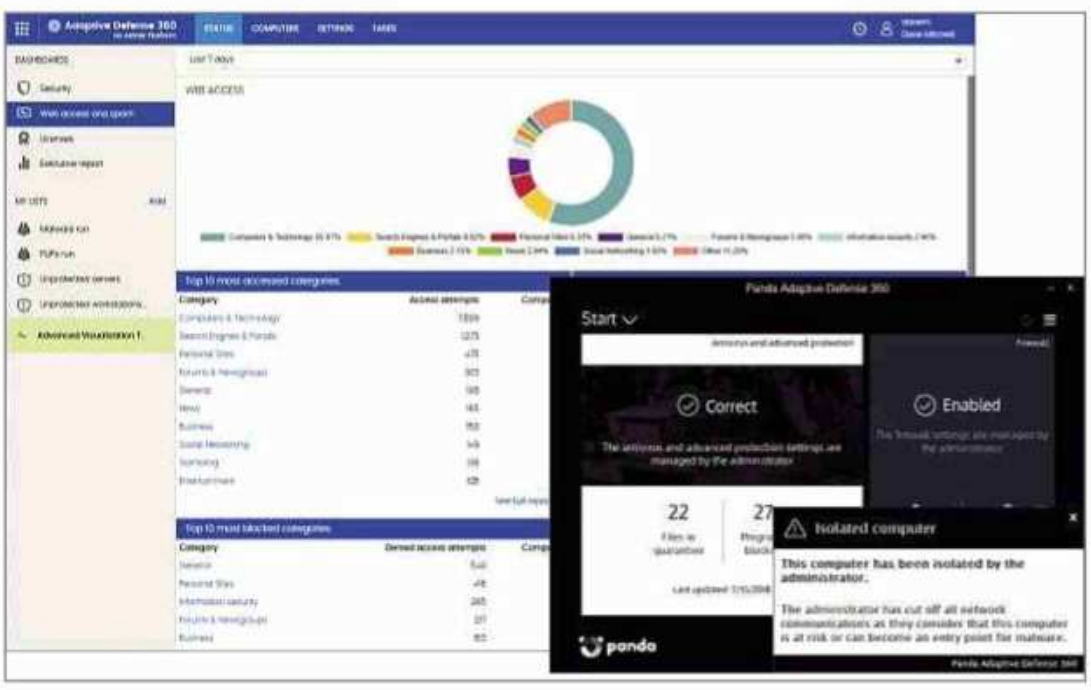
What's more, AD360 now doesn't just warn you when a machine is compromised. It automatically isolates the infected system from the local network to ensure the malware can't spread, leaving only the AD360 services unblocked. This too is very fast: our test machine was locked down within five seconds.

As well as scanning for viruses, AD360 can also search clients for personally identifiable information. This helps you quickly discover what information is stored where, and expose any rogue datastores – a potentially invaluable tool when it comes to ensuring GDPR compliance.

"AD360 automatically isolates infected systems from the local network to ensure the malware can't spread"

As a final bonus, AD360 can even generate a hardware and software inventory of your Windows, Linux and macOS clients, including real-time CPU, memory and disk usage graphs. It might not be a replacement for a full-scale audit, but it's a very convenient way to get an overview of resource usage on your network, with custom filters to help you focus in on what's important.

If AD360 hadn't changed since last year's release, we'd still recommend it – so it's amazing to see how much more Panda has managed to pack in. Best of all, the price hasn't gone up at all, making this a clear first choice for any small business looking for a cloud-based security solution.



LEFT The updated dashboard is loaded with information and useful controls

REQUIREMENTS Windows 7/Server 2008 upwards • Linux • macOS • Android

Sophos XG 125w

A superbly versatile gateway appliance that combines in-house security with cloud management capabilities

SCORE ★★★★★

PRICE With 3yr TotalProtect subscription, £1,667 exc VAT from broadbandbuyer.co.uk

If you're seeking a do-it-all UTM appliance, the Sophos XG 125w could well be the answer. It's packed to the rafters with security features, and it's no performance lightweight either: it claims a raw firewall throughput of 6.5Gbits/sec, or a respectable 1.5Gbits/sec with all UTM functions enabled.

Connectivity comes courtesy of eight copper Gigabit Ethernet ports, plus a single SFP optical Ethernet port. An expansion bay can be used to add an optional DSL or 3G/4G adapter, or an additional SFP module. The appliance also provides dual-band 802.11ac wireless services, with support for multiple virtual SSIDs and built-in hotspot guest access facilities.

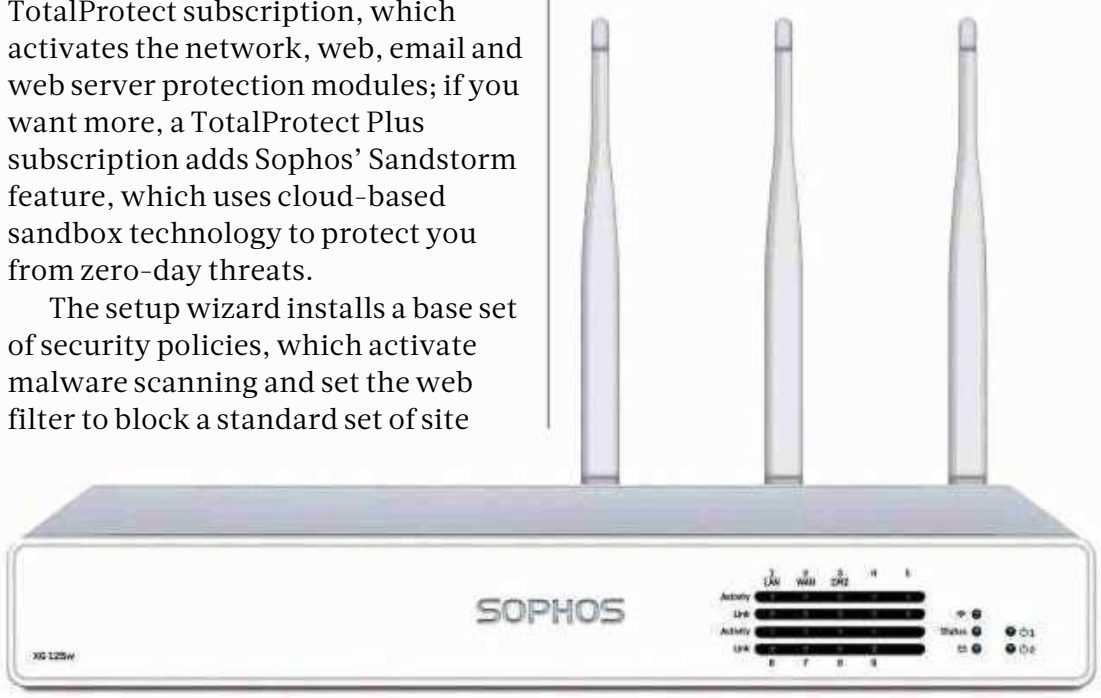
Installation is a doddle. The browser-based quick-start wizard guided us through securing administrative access, setting up the LAN and WAN ports, configuring Wi-Fi and adding an email address for alerts.You can install the XG 125w in bridge mode to fit in with an existing infrastructure, but we opted for the default gateway mode, as we wanted the appliance to handle all security functions, including firewall duties.

On that point, it's worth noting that the base appliance comes with a perpetual licence for firewall services, plus VPN, authentication and secure wireless management. The price shown above includes a three-year TotalProtect subscription, which activates the network, web, email and web server protection modules; if you want more, a TotalProtect Plus subscription adds Sophos' Sandstorm feature, which uses cloud-based sandbox technology to protect you from zero-day threats.

The setup wizard installs a base set of security policies, which activate malware scanning and set the web filter to block a standard set of site categories. It's a good starting point, but the intuitive console makes it easy to customise your protection: the web filtering component gives you over 100 URL categories to choose from, while a built-in database of 3,200 recognised apps and services is a great help in setting up application controls and firewall rules.

You can also create per-user or group-wide policies using Sophos' identity-based security features. These can include internet access and bandwidth usage policies, with daily, weekly, monthly and yearly limits. Users can authenticate with an external directory server, or they can log in to the appliance itself using the free Sophos Client Authentication Agent (CAA).

Although the XG 125w can be used as a purely local appliance, it also integrates seamlessly with the Sophos Central cloud portal, so businesses with both on-site and remote endpoints can manage them all from a single console. Once you've entered your Sophos Central credentials in the appliance's console, all your endpoint activity can be easily monitored via coloured status icons in the cloud console's dashboard. You can set overarching policies too, so – for example – if any remote endpoint detects a threat, all users and devices in the same zone can be immediately isolated. The SAC (synchronised application control) feature meanwhile detects unknown apps on any Sophos Central endpoints and automatically applies precautionary firewall policies.



LEFT The appliance is compact, but has plenty of bandwidth

ABOVE The intuitive web console provides a clear overview of all activity and issues

PC PRO RECOMMENDED

"Although the XG 125w can be used as a purely local appliance, it also integrates seamlessly with the Sophos Central cloud portal"

Reporting features can be accessed from the same console too, courtesy of Sophos' iView syslog server. This provides a decent range of free reporting facilities: with data logging enabled, we were able to easily generate graphs and charts detailing firewall, virus, spam, web content filtering and other user activity, and pull up a range of data protection compliance reports.

The XFG 125w might be overkill for the smallest businesses, but it impressed us with its depth of security features and its seamless integration with Sophos Central. Factor in its high performance and built-in 802.11ac wireless services and it's a superb gateway security appliance for growing SMEs who are ready to get serious about security.

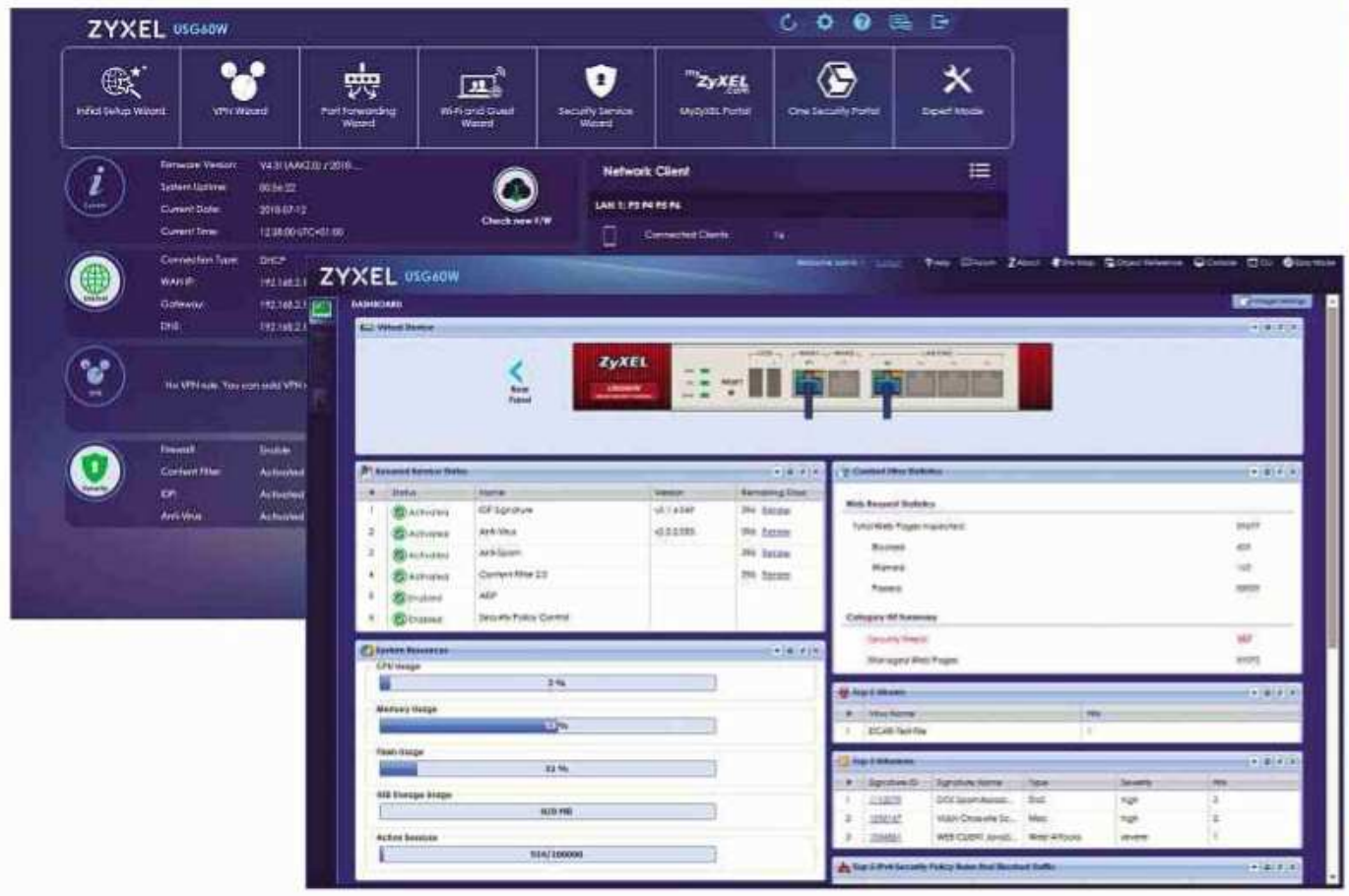
SPECIFICATIONS Desktop chassis • 1.6GHz Intel Atom C3508 • 4GB RAM • 64GB SATA SSD • 8 x Gigabit Ethernet, 1 x SFP Gigabit • 2.4GHz/5GHz 802.11ac wireless • 3 x 3 MIMO • 3 x external aerials • HDMI • 2 x USB 2 • micro-USB • RJ-45 serial • expansion slot • external PSU (max 2) • 320 x 212 x 44mm (WDH) • 3yr hardware warranty

Zyxel USG60W

Well-featured, affordable and easy to administer, this is an ideal appliance for smaller businesses

SCORE ★★★★½

PRICE Appliance with 1yr UTM, £419 exc VAT from broadbandbuyer.co.uk



Zyxel's gateway appliances are aimed specifically at small businesses, and the pricing reflects that.The USG60W sits at the top of a family of four models, combining solid UTM capabilities with integrated dual-band wireless services, yet it costs just £419. That includes your first year's subscription, which gets you gateway antivirus, web content filtering, IDP, antispam and Zyxel's own Application Patrol; in addition, the base unit also provides firewalling and VPN services.

Since smaller offices often don't have a lot of in-house expertise, Zyxel has made ease of use a priority. That's obvious from first contact with its web interface: once you've set a secure administrative password, you're immediately transported to the new Easy Mode console, which provides a wizard for nearly every occasion.

It's an approach that works well. The initial setup wizard configured our internet connection in a minute, and walked us through registering our free MyZyxel cloud account and activating the UTM licence. It then offered to apply a base set of security profiles for the web content filter, IDP and antivirus services, and set up secure wireless networks for both employee and guest access.

That will be enough for many offices, but you can customise Wi-Fi services far beyond this if you wish, as both radios support up to eight SSIDs, each with its own encryption scheme. There's no onboard support for 802.11ac – only the slower 802.11n standard – but the appliance can also manage up to 18 external Zyxel wireless APs, using profiles to conveniently push out configurations.

The Easy Mode console also gives a basic overview of your connection status, along with details of VPNs, security services and wireless networks. The Network Client section allows you to easily browse connected devices, and can be expanded to reveal each one's name and IP address.

For access to more advanced features, you'll need to switch to the Expert Mode console. From here you can set up custom antivirus profiles, to enable behaviours such as automatically destroying infected files; you can also manage access to over 3,000 apps via the Application Patrol service. Content filtering profiles meanwhile let you block or allow sites in any of 64 predefined website categories.

This makes it simple to apply a blanket ban on social media use, but some organisations will want employees to be able to access the company Facebook page. We found it was pleasingly easy to create a new application object for Facebook, allowing us to specifically allow or block liking, following, posting and sharing activities.

ABOVE Switch to Expert Mode and you won't be left wanting for usage statistics

PC PRO RECOMMENDED

You'll also need to use the Expert Mode interface to set up an antispam profile – but this isn't as complicated as you might fear. With a few clicks we enabled sender reputation analysis, content scanning and virus detection, and configured the filter to tag the subject line of suspect messages.

As well as exposing more settings than Easy Mode, the Expert Mode dashboard presents more administrative information – although we were initially confused as to why we weren't seeing any figures for content filtering, antivirus and IDP actions. A little digging revealed that statistics collection for each service is disabled by default and must be enabled from the Monitor page.

Once you're up and running, the console also offers on-board reporting facilities: you can monitor both wired and wireless traffic, and view tables of statistics for each security service. The MyZyxel portal provides a free cloud reporting service too, though this only connects to the content filtering component.

"Zyxel has made ease of use a priority... the new Easy Mode console provides a wizard for nearly every occasion"

In all, Zyxel's USG60W is a great choice for small businesses. It offers plenty of security measures at a low price,with impressive Wi-Fi credentials – and the new Easy Mode dashboard makes it absolutely painless to deploy. **DAVE MITCHELL**

LEFT The USG60W's tasteful design isn't overloaded with physical connectors

SPECIFICATIONS Desktop/rackmount chassis • dual-core 800MHz Cavium CN6020 CPU • 1GB RAM • 6 x Gigabit Ethernet (2 x WAN, 4 x LAN/DMZ/Guest) • 2.4/5GHz 802.11abgn wireless • 2 x USB 2 • serial port • external PSU • web browser management • 5yr limited warranty

Netgear ProSafe GS752TPP

A huge Ethernet switch that's stacked with features – and capable of powering a whole fleet of PoE devices

SCORE ★★★★★

PRICE £567 exc VAT from lambda-tek.com

With the rise of VoIP, network cameras, IoT devices and smart lighting, Power over Ethernet (PoE) is becoming a must-have for business networks. Netgear's ProSafe GS752TPP is the perfect powered switch for SMEs preparing to support the coming influx of single-cable devices.

Positioned at the top of Netgear's Smart Managed Pro switch family, the GS752TPP provides a huge 48 PoE-enabled Gigabit Ethernet ports – and its generous 760W power budget means it can feed the full 15.4W to all of them at once. It can even support a large number of PoE+ devices, such as high-power Wave 2 wireless APs and HD IP cameras.

If that's not enough connectivity for you, there are also four SFP fibre Gigabit Ethernet ports, which can be used alongside the copper ports, perhaps as fault-tolerant uplinks to the network backbone.

Installation is as plug and play as it gets. Netgear's free Smart Control Centre utility can discover and manage all the manufacturer's switches from a single interface, and also includes controls to upgrade the unit's firmware, save and restore configuration files, and open your switch's web-based management interface.

The ProSafe GS752TPP's console is nicely designed, providing easy access to all features. It opens with an overview of the hardware, showing the status of the unit's three quiet cooling fans; switching to the Device View page brings up a visual representation of the switch, with coloured icons giving an at-a-glance indication of each port's connection, speed and PoE status.

For a closer look at the latter, you can then drop into the Advanced PoE section, which provides a wealth of information about powered devices and usage. After attaching a range of wireless APs and IP cameras, we were able to browse each one's detected device class, and monitor its individual power consumption in watts, milliamps and volts.

You can also use the console's power controls to determine which ports are allowed to supply power, or set schedules to make particular ports power up and shut down at specific times. If you're taxing the switch with a lot of power-hungry devices, each port can be assigned one of four power priorities; if the total power drain reaches the switch's threshold, the ports with the lowest priority will be automatically switched off first. You can set power limits for selected ports, and optionally send out SNMP traps if a global power consumption threshold is exceeded.

Functionally, the GS752TPP is a "Layer 3 Light" switch, which means it supports all Layer 2 features, plus basic Layer 3 routing capabilities – but it lacks the dynamic routing of more costly full Layer 3 switches.

Still, the GS752TPP does everything most small businesses will need, including static IPv4 and IPv6 routing, inter-VLAN local routing and ARP services. Port, MAC and protocol-based VLANs are all supported, and the switch can even create VLANs specifically for VoIP, with traffic using SIP or your VoIP OUI (organisationally unique identifier) being automatically prioritised.

You can also assign priorities to individual ports, with a minimum bandwidth applied to each one. The switch supports 802.1p and can map packets to the required priority queue, allowing class of service (CoS) controls to be applied to similar types of traffic.

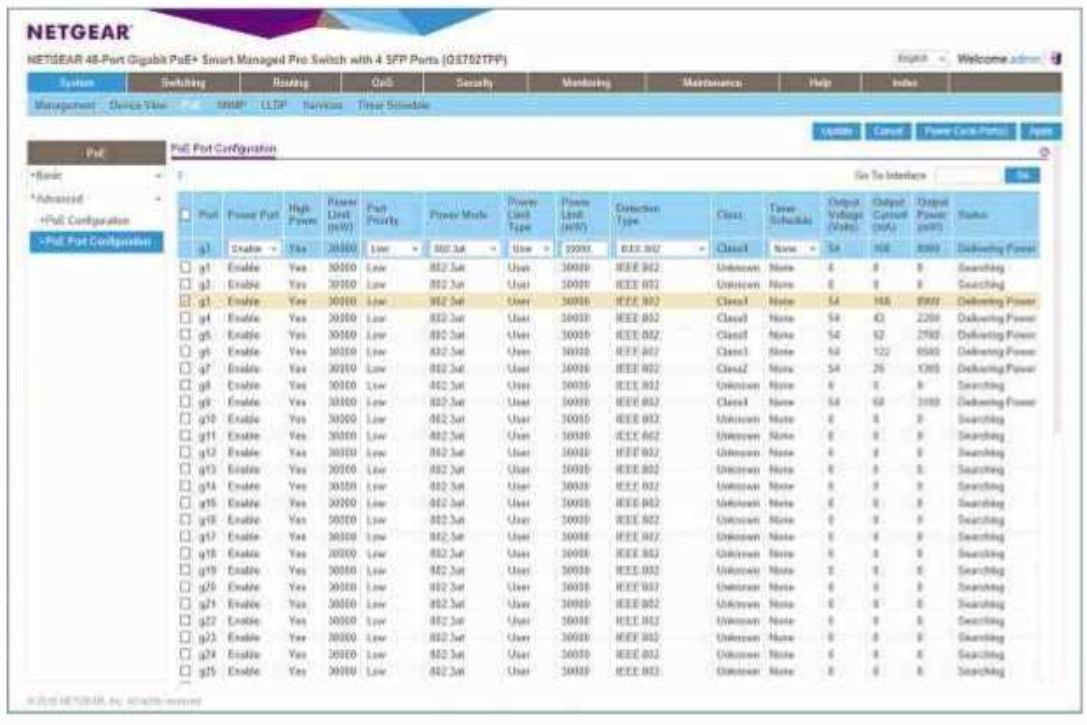
As a final feather in its cap, the GS752TPP supports a good range of security models: administrative access can be controlled using RADIUS, TACACS+ or 802.1x port authentication, and unauthenticated users can be passed onto a guest VLAN with limited network access. A DHCP snooping feature also blocks rogue DHCP servers, ensuring that clients only receive IP addresses from authorised servers.

The GS752TPP certainly isn't the only device in its class, but it's far cheaper than its rivals: Cisco's 48-port SG300-52MP offers similar Layer 2 and static routing features, along with an almost identical 740W power budget, but it comes in at twice the price. If you're planning on a high-density PoE deployment, or just want to be ready for one, Netgear's ProSafe GS752TPP should be at the top of your list. **DAVE MITCHELL**

ABOVE A huge bank of 48 PoE ports gives you plenty of headroom

PC PRO RECOMMENDED

"If the total power drain reaches the switch's threshold, the ports with the lowest priority will be switched off first"



LEFT The GS752TPP's console provides plenty of information about power consumption

SPECIFICATIONS

1U rack chassis • 700MHz MIPS-34Kc CPU • 128MB DDR RAM • 32MB Flash • 48 x copper Gigabit Ethernet with PoE/PoE+ • 4 x Gigabit Ethernet SFP • 760W total power budget • 802.3af/at PoE • 104Gbits/sec backplane capacity • 1.5MB packet buffer • 16K MAC addresses • 256 VLANs • internal PSU • web-based management console • limited lifetime warranty

Xerox VersaLink B600DN

Smarter than the average printer, this A4 mono laser delivers fast print speeds at irresistibly low costs

SCORE ★★★★½

PRICE £555 exc VAT from printerland.co.uk

Xerox' VersaLink B600DN brings together everything an SME could ask for from a mono A4 printer – including a fast 55ppm print speed, a true 1,200dpi resolution and inkjet-trouncing running costs. Thanks to Xerox's ConnectKey technology, it's impressively versatile too.

A wealth of connection options ensure that the B600DN will fit into your workflow. USB 3 and Gigabit Ethernet ports come built in, as does NFC; simultaneous 802.11n wireless services can be added for £47 via a dongle that snaps in at the back.

The printer is a cinch to install, with a graphical wizard that opens up on the 5in colour touchscreen to introduce the four core ConnectKey apps. These provide access to printer settings, job status and USB options, while the App Gallery allows you to download apps from the Xerox store to extend the printer's capabilities (you can also browse and install apps via your desktop web browser). We quickly had the free cloud printing apps for Dropbox, Google Drive, OneDrive and Box installed, and the printer's 2GB of onboard RAM allows plenty of room for more.

Of course, you probably don't want employees installing their own apps, so access can be restricted on a per-user basis. For data security, the driver also offers print-and-hold and PIN-secured print features, and the optional encrypted hard disk has an immediate overwrite feature, which wipes confidential documents as soon as they've been printed.

When it comes to the business of printing, the B600DN certainly delivers. Our 55-page test Word document was dispatched in just 59 seconds at both 600dpi and 1,200dpi resolutions, exactly as claimed. Speeds fell only very slightly with our challenging 24-page DTP-style document, which was hustled into the printer's 500-sheet output tray at 55ppm at both resolutions.

Perhaps even more impressive were double-sided printing speeds. On some printers, switching to duplex mode can halve print speeds, but the B600DN turned out double-sided documents at an impressive 48.5ppm. The time to first page in all of our tests was also remarkably speedy, at between 6-8 seconds.

Quality isn't compromised either. Our test page came out with pin-sharp text across a wide range of font sizes, with no hint of dusting. Graphs and charts were well defined too, and although mono photos did exhibit a slight banding in backgrounds, the printer still reproduced very high levels of detail.

A 550-sheet lower tray and a 150-sheet bypass tray at the front mean you won't be continually reloading the B600DN, and you can add four extra 550-sheet trays below, or combine one with a high-capacity 2,000-sheet feeder.

Perhaps the best news is the price. A full 10,300-page standard toner cartridge is included, and when this is exhausted you can replace it with an extra-high-yield 46,700-page supply for ultra-low running costs of just 0.75p per page.

You may also choose to invest in the Xerox Workplace Cloud portal, which provides secure remote printing services at a cost of £357 for 3,600 job credits. This requires an agent loaded on one PC on your LAN; we were able to use this to provision remote printing for desktops and mobiles, enforce strict access controls and use the iOS PrintPortal app on our iPad to remotely print files.

You'll gather that we're big fans of the VersaLink B600DN, but we do have two small criticisms. First, it's quite noisy: we measured sound levels of 65dB from 1m in front while printing, so you won't want it near your desk. The front toner access door could be better designed too: even the slightest hand pressure can cause it to pop open, potentially causing a paper jam.

Despite those foibles, the VersaLink B600DN is overall a superb printer for busy workgroups. It's fast and expandable, print quality is very good, running costs are among the lowest in this market sector and the ConnectKey app store makes it supremely versatile too. **DAVE MITCHELL**

ABOVE The 5in touchscreen makes it easy to access apps and security features

PC PRO RECOMMENDED

"On some printers, duplex mode can halve print speeds, but the B600DN turned out double-sided documents at an impressive 48.5ppm"

LEFT The B600DN has solid remote management and security features

SPECIFICATIONS

1,200 x1,200dpi A4 mono LED • 55ppm • 1.05GHz dual-core ARM CPU • 2GB RAM • 5in colour touchscreen • Gigabit Ethernet • NFC • USB 3 • duplex • 550-sheet paper tray • 150-sheet bypass tray • rec monthly duty cycle: 20K pages • 427 x 466 x 443mm (WDH) • 22.3kg • 1yr on-site warranty.

Options: 802.11n Wi-Fi, £47 • 550-sheet lower cassette, £262 (all exc VAT)

The A-Z of security threats 2018

No matter how big or small your business, you need a comprehensive approach to security. Davey Winder talks to industry experts about the whole gamut of cyberhazards

Artificial intelligence

David Rogers, security product specialist at King of Servers

"We're increasingly seeing AI-powered cyber-attacks, with the aim of going after high-value data. Like a human attacker, AI will learn about its target, tailor its attack and launch it at the most appropriate time. However, unlike a human hacker, AI doesn't tire and can undertake multiple attacks at once. The key to defence is AI itself: over 90% of security leaders are concerned with AI attacks, and hackers switching to AI, so many organisations are implementing AI defences to boost their existing protection."

Business email compromise

Ramon Vicens, CTO at Blueliv

"A business email compromise can be used to steal money directly – or it can be tied to credential theft, account takeovers and phishing attempts. SMBs should be ready for attacks targeting their executives: enforcing strict BYOD policies for the senior team is sensible. Keep on top of the latest phishing campaigns, and share information with employees to ensure they, and your whole organisation, don't become victims."

Crypto-jacking

Anurag Kahol, CTO at Bitglass

"Crypto-jacking is when an attacker hijacks your computers to mine cryptocurrencies. It doesn't directly result in data loss, but it can nevertheless affect your bottom line. It's also increasingly combined with cloud-jacking (stealing processing power and storage from someone's cloud account) to further boost mining capabilities. The security principles used to prevent other web-based vulnerabilities can help here: training employees, deploying ad-blocking, using strong passwords, and effective cloud and endpoint protection."

DDoS

Ivo Dijkhuis, information security officer at RIPE NCC

"Distributed denial-of-service attacks are expensive, and most companies can't afford to maintain their own anti-DDoS solution. However, there are interesting initiatives out there, such as the Dutch not-for-profit National Scrubbing Center, which members – mainly ISPs and hosting providers – can use at cost price. It's proven to be a very successful, and affordable, concept."

Encrypted attacks

Lawrence Pingreen, vice president of product management at SonicWall

"The SonicWall mid-year threat report found encrypted attacks – which use SSL/TLS connections to evade traditional network security controls – are growing. Many organisations are unaware of the threat, and very few are using suitable mitigation techniques, such as deep-packet inspection of the encrypted traffic. Addressing today's malware threats means reaching outside the firewall and operating on the network as well as on the endpoint, in a unified threat-intelligence system."

"Unlike a human hacker, artificial intelligence doesn't tire and can undertake multiple attacks at once"

Fingerprints

David Emm, principal security researcher at Kaspersky Lab

"There's a growing move towards using biometrics as a replacement for passwords – but biometric data stored

by a service provider is just as vulnerable as a database containing usernames and passwords. In my view, biometrics should be combined with passwords, or ideally more than one other mechanism as additional confirmation. If I choose a poor password and it's compromised, I can change it; if my fingerprint data is compromised, there's nothing I can do about it."

GDPR

Dr Guy Bunker, senior vice president of products at Clearswift

"The potential for attackers to weaponise GDPR – by exfiltrating data and then holding it to ransom – should not be ignored. Releasing it into the public domain could result in the victim facing a fine of up to 4% of global turnover, or €20 million – whichever is greater. Hacktivists can also exploit GDPR by making an overwhelming number of 'right to be forgotten' requests. This can grind an organisation to a halt, as they must all be processed in a timely manner, or again the company could be subject to a substantial fine."

Historical breach data

Perry Carpenter, chief evangelist and strategy officer at KnowBe4

"The proliferation of personal information 'in the wild' is staggering. It comes not only from social media, but also from past data breaches – and the ability to mine and aggregate this historical data puts every organisation at risk of targeted attacks. To mitigate this, people need to be extremely careful with what data they share online, and organisations need to know which users have been associated with past breaches. The organisation can then audit the current password hygiene of the user and take appropriate steps."

Incident response time

David Blundell, managing director at CyberHive

"Reaction time to a cyberbreach is an important consideration. Many of the recent examples of data breaches to hit the news have involved information slowly leaking out for many months before the company spotted what was going on. Reducing the time taken to identify and respond to a breach can greatly reduce the severity of the incident."

Jumbled security strategies

Chris Hodson, chief information security officer (EMEA) at Zscaler

"The chief information security officers (CISOs) we talk to don't know whether they need antivirus software, enterprise-protection platforms, or enterprise-detection response. And vendors aren't helping; they're busy trying to one-up each other and making too many promises.

"No single solution is going to keep you safe if you don't understand why you have that solution. You need a layered set of services, and an ability to tie technology investments to risk-reduction measures."

Korea, North

Adam Vincent, CEO at ThreatConnect

"We're living in a chaotic political environment – so make sure you're aware of possible tactics that may be used in international attacks. For instance, mounting financial pressures against the North Korean government are likely to spur the growth of revenue-generating cyber-attacks against developed economies, including the UK."

Lateral-movement attacks

Barry Scott, CTO (EMEA) at Centrify

"Once a hacker has broken through your defences, they'll try to move laterally across the network to find what they're looking for – be it bank account details, credit card numbers or passwords. The first defensive step is to consolidate users' different credentials down to one, and implement a single sign-on regime in which that one identity gives access to all applications or systems. Multi-factor authentication is also a must, so as well as entering their password, the user might be asked to click on a link from a text or enter a code sent to their phone when they try to log in."

Mobile malware

Matt Boddy, senior security specialist at Sophos

"As personal and business use of mobiles has merged, we're storing more and more sensitive data on these devices. When malware gets onto your phone, it can get access to all the information stored on the device – or within earshot/view. Simply installing mobile security software and keeping your device updated with the latest patches can dramatically decrease your chance of falling victim to an attack."

"If my password is compromised, I can change it; if my fingerprint data is compromised, there's nothing I can do about it"

No-macro Office exploits

Corey Nachreiner, CTO at WatchGuard

"We've seen Russian attackers use a Microsoft protocol called Dynamic Data Exchange (DDE) to run malicious code from within Word documents, without triggering the macro-blocking features that are built into Office. Many sandboxing solutions can detect DDE-based malware, but users need to be aware of the risks – and they need to recognise the phishing attacks and social engineering tricks that are used to distribute these malicious documents in the first place."

Opportunistic attacks

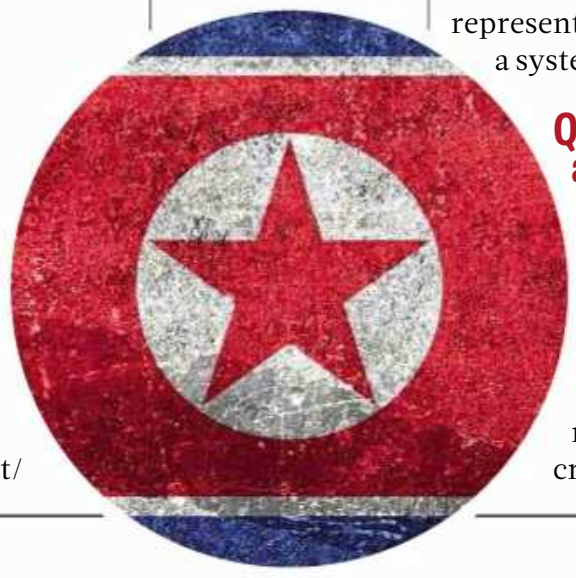
Tim Brown, vice president of security architecture at SolarWinds MSP

"A lot of hacker attacks are opportunistic. Criminals do a broad scan looking for vulnerable systems, then move sideways to attack. Every type of data has a value on the dark net, so businesses need to ensure they're not making themselves targets through weak passwords, weakly configured environments and unpatched systems. Hackers don't need to make use of new or advanced attack methods when vulnerabilities like this are left exposed."

Patch-management lethargy

Tyler Croak, solutions architect at Thycotic

"Patch management is more relevant today than ever. We're constantly seeing ransomware take over systems that haven't been fully patched, and it's costing businesses millions – not just in payments, but also because of the downtime suffered during an attack. Consider creating a dedicated team to focus on patch and vulnerability management: this would typically be an 'endpoint' team, but it should include a representative from any team with a system using the network."



Quick-thinking adversaries

Emily Wilson, director of analysis at Terbium

"Cybercriminals reap the rewards of technological innovation. While businesses are trying to reduce friction for end users, criminals can exploit the same

technologies for their own purposes. For example, tools that allow financial institutions to process faster payments can also allow cybercriminals to build scalable fraud empires. Organisations need to be constantly looking at new ways to identify and disrupt fraud, instead of relying on reactive solutions."

Ransomware

Darron Gibbard, managing director (EMEA North) at Qualys

"Ransomware reports have dipped since last year, but smaller businesses are still very much at risk. These are the ones most likely to lack a proper disaster-recovery plan, so proactive security is a must. That means getting the basics right: keep your software up to date, deploy patches quickly, and maintain an accurate inventory of your IT assets. You might not think you have much in the way of IT, but you'd be surprised at how much accrues over the years."

Social media

Neil Martin, marketing manager at Panda Security UK

"Social media content can be used by criminals to steal data or to manipulate people's perceptions. And by putting together seemingly disconnected data, attackers can obtain a huge amount of information. Consumer-affairs publication *Which* conducted a study in which volunteers gave only their name and hometown to security researchers. The amount of information it was then possible to dig up was scary."

Things, Internet of...

Charles Eagan, CTO at BlackBerry

"The expanding number of intelligent endpoints in businesses is making organisations increasingly vulnerable. The scale may be less for SMBs, but the lack of process and employee education makes the problem even more acute. To secure a network of hyperconnected things, businesses need to focus on simplicity and integration. Rather than pulling together a patchwork of security components and products, they must rely on a comprehensive security solution from a trusted supplier."

Unsecured data repositories

Anurag Kahol, CTO at Bitglass

"The popularity of public cloud applications has made businesses more flexible and efficient – but many of the most popular services provide little visibility or control over how sensitive data is handled once it's uploaded to the cloud, and users are expected to blindly trust that their data is secure. As public cloud adoption rises, organisations must ensure all systems are properly configured and secured, because customer privacy and trust depend on it."

Vendor insecurity

Patrick Martin, cybersecurity analyst at RepKnight

"Nearly two-thirds of security breaches today are linked to third-party vendors in some way. A third party can hold a wealth of information about your business, and its security is out of your hands. We're not just talking about long-term service providers, but also suppliers you work with on a short-term basis. Even third parties who aren't part of your supply chain are a risk: for example, employees may sign up to newsletters or third-party services with their work credentials. These suppliers aren't part of your supply chain, but they're still holding information about your company."

Web application development

Dan Pitman, senior solutions architect at Alert Logic

"Modern web applications are normally made from a collection of modules combined to deliver different functions, rather than built from the ground up in-house. These modules may well contain vulnerabilities, which attackers can easily discover and exploit. In an increasingly modular and agile application landscape, businesses hosting applications should be monitoring all traffic between user and application, and keeping an eye on the wider threat landscape."

X-axis isolation

Richard Agnew, VP (EMEA North) at Code42

"CISOs need to recognise that prevention-only strategies no longer guarantee their organisations' safety. 75% of CISOs and 74% of CEOs accept the need to shift to prevention-and-recovery strategies. Combined with employee training, this multipronged approach helps organisations minimise the damage from ransomware attacks, data breaches and even cryptomining."

Who's responsible for IT security?

The org chart might tell you that data security is the responsibility of your IT department – but as Matt Middleton-Leal, general manager (EMEA) at Netwrix, points out, security demands the co-operation of people from every part of the business.

"If just one person falls short, the result is poor IT hygiene and increased risk of a data breach," Middleton-Leal told us. "Two examples are running hardware that hasn't been properly configured, or software that's out of date. Both fall within the domain of your IT people, but they can't be held responsible when non-IT staff breach company policy and ignore security best practices.

"Tools do exist that allow IT staff to spot the telltale signs of privilege abuse or data tampering, and take early action before a breach can occur," added Middleton-Leal. "But all too often the guys in IT are operating on squeezed budgets and are forced to make choices based on business priorities. So it really needs everyone to pull together. Something as simple as good two-way communication channels between the IT team and the rest of the business can make all the difference."

Your network environment

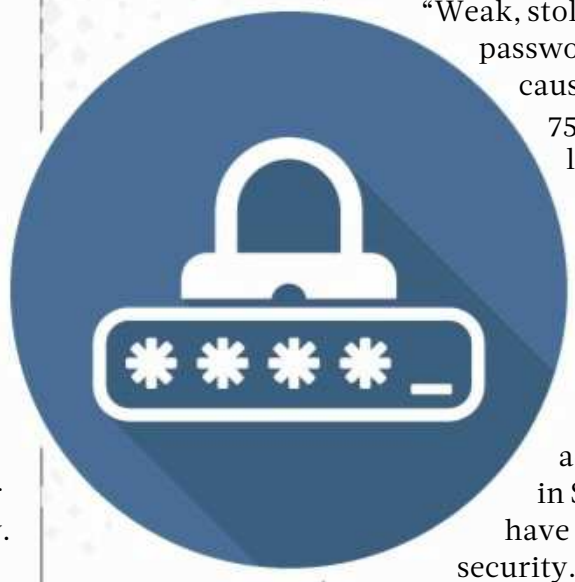
Sean Herbert, country manager at Baramundi UK

"Shadow IT is a threat you can't ignore. Knowing what hardware and software is deployed in your environment is an essential step towards identifying potential vulnerabilities. Security teams can't keep track of everything users are doing, so it's increasingly necessary to rely on automated inventory and network access control tools, to ensure there's no danger lurking in the shadows."

"Weak, stolen or re-used passwords remain the main cause of breaches – yet 75% of IT executives lack control over password security"

Zero password management

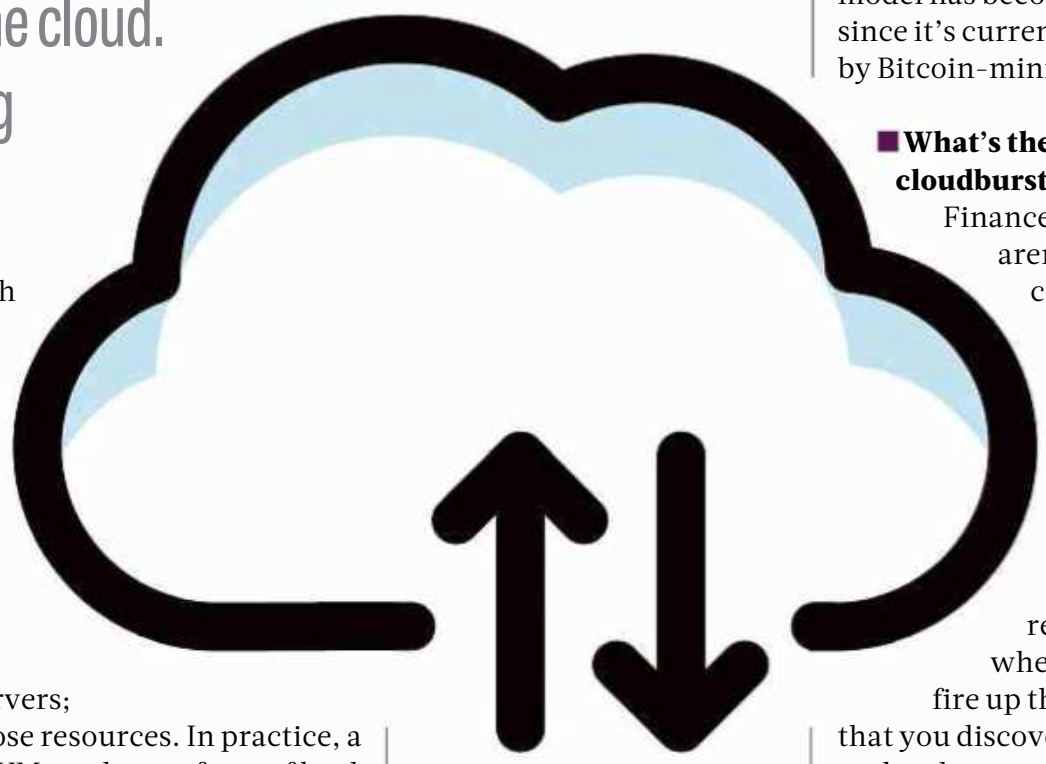
Sandor Palfy, CTO of identity and access management at LogMeIn



"Weak, stolen or re-used passwords remain the main cause of breaches – yet 75% of IT executives lack control over password security in their organisations. Part of the problem is the blurring of the lines between work and personal accounts, especially in SMEs, which can have a knock-on effect on security. Getting passwords under control can be as simple as implementing an enterprise password manager and educating employees on best practices."

Cloudbursting

The latest hybrid model could be a cost-effective way to take advantage of the cloud. Steve Cassidy clears the fog



It's a sexy term, but what does it mean?
Doesn't it sound cool? But I'm afraid this particular buzzword has nothing to do with Kate Bush. Cloudbursting is when you run your business mostly on your own kit, but also have a set of cloud accounts sitting idle, ready to take on extra "bursts" of work when demand peaks.

Isn't that already the idea behind hybrid cloud?
Yes and no. Hybrid cloud is an umbrella term for dividing up your computing resources across local and off-premises servers; cloudbursting is a specific way of using those resources. In practice, a cloudburst setup might use containerised VMs and some form of load orchestration package to shift containers to locations where user sessions can reach them. It will probably require quite a lot of work at the database design level as well, so that this too can be replicated, multi-homed or remotely accessed. In short, cloudbursting isn't an architecture or a computing philosophy, but a capability of your entire technology estate.

So you might say it's an agile implementation of hybrid cloud?
That's a question of semantics. A cloudbursting setup should quickly respond to unforeseen changes in demand, but this isn't quite what's conventionally meant by "agile". Agility is about being able to retool your code quickly to adapt to changing circumstances, whereas cloudbursting requires everything to be in place well before the high-load day comes. You need to have your cloud accounts in place and paid up, you need to be sure that your code platform will run on the cloud, and you need to make sure that it's actually capable of meeting the demands you want to place on it. Doing this properly involves a great deal of pre-emptive development and testing. I'd be very wary of a business that went into a cloudbursting project with an "agile" mindset.

Presumably a cloudbursting setup is cheaper than regular cloud hosting, because we're only making occasional use of it?
It might work out that way, but the two models aren't perfectly comparable. Hybrid cloud usually tends to imply an IAAS model, whereas cloudbursting finds most interest from heavy SAAS users. Cloudbursting also relies on your orchestration software correctly working out when to spin up the offsite services and incur the associated charges – which involves an element of voodoo, as it's exquisitely difficult to distinguish between blips and booms as they're happening. A hybrid cloud setup with plenty of slack capacity may or may not work out cheaper, but it's likely to be more dependable, and have a more predictable cost.

When is cloudbursting the right answer?
There are some such scenarios, but they're mostly inside the world of IT itself. For example, if you're an antivirus developer combatting zero-day exploits, you'll want the ability to scale your download links out into the cloud on bad virus days. Some classes of simulation can also easily parcel up workloads and hand them off to compute nodes with no regard for where those nodes are hosted. Unfortunately this model has become controversial, since it's currently mostly employed by Bitcoin-mining trojans.

What's the key downside of a cloudbursting approach?
Finance directors probably aren't going to love cloudburst projects, because (as we've noted) the costs are unpredictable by design. What's more, since the whole point of cloudbursting is that you don't use it regularly, it's only when you really need to fire up those cloud servers that you discover that a recent update has unexpectedly broken your meticulously crafted handover routines. These inherent risks will tend to push most businesses back in the direction of a more traditional hybrid architecture.

"Finance directors probably aren't going to love cloudburst projects, because the costs are unpredictable by design"

So why are vendors pushing cloudbursting as the next big thing?
I suspect that the vendors aren't trying to get you specifically into cloudbursting. They want to make you think more generally about where your computing resources live. A little research, and my own anecdotal experience, suggests that very few companies have actually committed to a full-on cloudbursting model – which probably tells you everything you need to know. ●

The orchestration calculation

If you're an old-school IT wonk, accustomed to managing a room full of very physical servers, then the transition up into the cloud is likely to be a bit of a culture shock. In theory, many of the same admin tasks apply as before – but part of the point of the cloud is that things no longer have to be done by hand.

This is where orchestration products come in, to help automate tasks across arbitrary numbers of remote machines that may not even physically exist. Be warned, though, that this doesn't necessarily simplify things: Microsoft's Orchestrator Runbook, ironically, requires a server of its own to run on.

There's a range of orchestration products out there, and the option remains of not using one at all. As with so many cloud-related issues, you're going to have to work through the logic of justifying your choice, in terms of benefit to the business. Just remember that the stakes are very high: if your orchestrator doesn't do the right thing when demand spikes, you're literally turning customers away.

How do I target the right social media demographic?

If there's a particular type of person you want to reach, social media can be a great tool – but use that power wisely, **Nik Rawlinson** reports

"Demographics change quite quickly on social platforms," said Alison Battisby, founder and managing director of Avocado Social (**avocadosocial.com**). "Instagram was always the 'young people's platform', but a lot of the business owners I'm training are targeting audiences of 35+ on there. It's going to go the same way as Facebook and become a mass-market network that every age group has some connection to."

As audiences change, and the typical user makeup of each social network morphs over time, how do you know what your demographic is, and who you should be targeting? For Katy Howell, CEO of Immediate Future (**immediatefuture.co.uk**), it all starts with insights, which she uses to research the challenges facing particular industries.

"We look at those and then unpick the personas that sit behind them. At higher levels in the IT and tech industry, for instance, the audience is predominantly male."

This immediately makes one of the key demographics – gender – almost irrelevant in tech, allowing you to focus your attention on more granular segmentation elsewhere.

"What I'm really interested in is insights like the fact [IT senior execs] tend to follow news organisations, bloggers, journalists and politicians," Howell said. "Nuggets like this tell us when they're likely to be online, what their preferred social media channel is, and what their behaviours are, like whether they're going to be on late at night or all day."

Defining your audience

Each of our interviewees agreed that, in many markets, interests are far more relevant than age, sex and location, but there are times where traditional demographics still play their part. Kate Rose, client director of Rose McGrory (**rosemcgrory.co.uk**), says the traditional approach to demographics works when marketing an event for a specific geographical area. Likewise, there are times a brand might rely on such metrics to survive in the face of a declining audience.

"Interests are usually far more relevant, but there are times where traditional demographics still play their part"

She cites a caravanning magazine that "has watched its userbase grow older with it… they're now coming up to 70 and either don't want or aren't capable of going camping any more. So the magazine used social media to sell the idea of the freedom around camping and caravanning to a younger demographic. Some [of them grew up] thinking caravanning was a bit nerdy, but now they're increasingly associating it with road trips and freedom."

The magazine married established interests and lifestyle with traditional demographics to reposition itself and give the whole idea of camping and caravanning a makeover.

"[The magazine] didn't want to make any decisions about who they would appeal to," said Rose. "They just wanted to target people in their twenties and thirties who might have

young families and not want to do long-haul."

Such broad strokes won't work for everyone, and Battisby says it's not always the best approach for brands – especially those that believe social media can quickly deliver a national or even global audience. "I was working for a drinks company and I asked it who its target audience was. They said 'everyone in the UK,' but after talking to them a little bit further I saw it wasn't going to appeal to 16-year-olds, but house-conscious 35-year-old pilates goers who shop at Waitrose, have two kids and live in a detached house in the home counties."

The lesson, she says, is that while social media can be extremely effective, it still pays to know your target audience inside out. Take chief technology officers. Almost all CTOs visit or use a social network, and a third follow brands they plan to buy from, says Howell. No surprise there. Of greater relevance is how they behave online, and how that should inform a social marketer's posts.

"They don't comment a lot," she said, "but they do like to retweet – predominantly news – and the hottest topics are AI, machine learning and deep learning."

When writing calls to action, then, Howell fits the phraseology to the audience. "Once you know senior IT people retweet rather than comment, you can change your copy to say, effectively, 'share this' rather than asking 'what do you think?'"

Tailoring your content

"You really do need to start thinking about behaviours, interests, hobbies, what people might have clicked on or what their online shopping behaviours might be," said Battisby, and Rose agrees. "The people who know the business best are the business owners," she said. "It's their responsibility to know their USPs, who they should be selling to and why. If they want to target a new audience and have a rationale behind that, that's fine, but really social media needs to be a tool that helps them achieve what they've already logically decided they need to do. They shouldn't spontaneously decide they want to sell gardening tools to 21-year-olds on Instagram."

For Howell, it comes down to targeting "sleepless nights" – the topics that are keeping her clients' customers awake – and making the content speak to a particular type of reader. "What's relevant to someone who's interested in transport will be very different to what's relevant for someone who's interested in public sector," she pointed out. "They have different angles, issues and problems [which the content needs to reflect]."

With new content appearing by the second, social marketers have never faced as much competition but, even with a professional audience, many of the tools used by back-room bloggers remain effective. "Think creatively about ways to tell your story," said Battisby. "Videos, GIFs, moving images, emoji – anything to make your content pop in the newsfeed is very important."

And, if talk of emoji has set alarm bells ringing, she's quick to point out that "graphs and arrows are nice ways of breaking up content. In terms of GIFs, I've worked with financial brands to bring infographics to life with animation. It's subtle, but it grabs people as they're scrolling quickly through Twitter or LinkedIn."

Howell takes a similar approach, using "GIFs, images, copy, white papers and so on, some of which will drive to a website. The second part of targeting on social media is retargeting. If someone visits your site and shows interest in a landing page that talks about AI, you may retarget them with more AI information that leads them down the funnel and helps them make purchase decisions."

"Always make sure you understand your audience, you've thought through who you want to target, and you know where they hang out"

"Always make sure you understand your audience, you've thought through who you want to target, and you know where they hang out," said Rose, bringing us back to the ways audiences differ between platforms. "You can have really good penetration in terms of registration, but it doesn't necessarily mean people are using [a particular social network]. Everyone will say they have B2B work to do and need to reach professionals, while all the stats say that 95% of professionals in a particular age bracket use LinkedIn. That is true in the sense that they're registered with it, but it doesn't mean they're going onto it every day."

Use the resources at your disposal

"A lot of the time businesses get things wrong on social media because they haven't delved much into the insights," said Battisby. "There are some wonderful tools for analysing who your followers are, what their professions and interests are, how senior or junior they are and so on. Using this data can quickly answer a question or settle a confusion."

But, says Rose, be prepared to invest – not just in terms of content, but financially too. "Since all of the algorithms have come into play on every social media site, the vast majority of businesses have to be prepared to engage with paid networking. The days when you could just create great content, put it out there and reach people are over."

The expert view Simon Brew

It can't just be me whose social media feeds increasingly have a robotic feel. I have a growing sense that algorithms are deciding which posts I see, and that those algorithms are defining the posts penned in the first place. As a consequence, businesses are increasingly able to target me – but kick the ball wide of the proverbial goal when it comes to what they actually want to say.

It's not a new feature of technology that data tends to supersede the human brain, that it's easier to point to graphs and in-depth market intelligence when defining a strategy than listen to the instinct of a human being. Social media provides huge opportunities for businesses to talk directly to their customers, yet little emphasis is given to the voice they use. A third-person pronouncement of a terrific offer may work if the offer is good enough. But what if you want a customer to engage more than once? What if you want them to be active followers of your social channels, rather than picking and choosing the odd morsel that appeals?

Having a human voice, a sense of authorship, to the messages conveyed via social media instantly lets those who do it stand apart. Clearly the voice must be tailored to the business, the message, and who the intended recipient of said message is. But look at one of the most thankless jobs on Earth: being on the receiving end of angry complaints by staffing the Virgin Trains Twitter account. Look at how many situations there are diffused by having a clear human engage with customers.

Human beings are often far down the list when it comes to social media strategies and planning. But having the right voice, the right tone, and the feel of an actual human on the other end of a post can, I'd argue, have as useful an impact as surgical targeting of who to talk to in the first place.

Simon Brew has helped several entertainment and tech brands grow their audiences to hundreds of thousands of followers from scratch.

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JON HONEYBALL

"To leave a unit looking utterly dead will result in the customer assuming it is, indeed, completely dead"

This month, Jon explains how he raised a 36TB Lacie unit from the dead and went on to do battle with the Microsoft call centre scammers

A few months ago, I mentioned how one of my long-serving Promise Thunderbolt RAID arrays had died. I'd tried a new disk, tried rebuilding, but it felt terminal to me. As a replacement I ordered the Lacie 6Big 36TB unit, which has the new Thunderbolt 3 connectors. Fortunately, the Apple Thunderbolt 2 to 3 adapter can be used either way around, and I soon had it up and running on my ageing iMac 5K.

Everything was fine, although I'm slightly annoyed by the time taken for it to boot and appear on the Thunderbolt bus. It means I have to wait a few seconds or so before logging in, because I have a large Dropbox installation held on the array. If the array isn't ready yet, then Dropbox throws a wobbly and tells me that its data has disappeared. But this isn't a big issue – I timed it, and my Promise array boots from cold in about 30 seconds, whereas the Lacie takes around 60 seconds.

All was going well right up to the point at which, one afternoon, the Lacie disappeared from my desktop. All the lights were out, and it didn't respond to power off/on, or pressing the front panel button. It was, as far as could be seen, completely dead.

Now I will admit, to my shame, that I started moaning out loud about Lacie power supplies. It's true, and even admitted by its staff, that they went through a bad patch a while back, with some Chinese-manufactured power supplies that would randomly expire. I got through three, if I remember rightly. I thought everything had been sorted out and that the company had put these issues behind it. But here I was, with a new 36TB unit with a dead power supply. I wasn't amused.

I dialled the Lacie support line and spoke to a very polite lady – I think she was in the Netherlands. I took her through the issues, and she agreed the drive had indeed expired. I had two options: I could send back my unit and Lacie would send me a new one; or I could do an advanced replacement, whereby the company had my credit card to charge me if I didn't send back the dead unit. I went for the advanced replacement offer because I wanted to get it working as soon as possible. Delivery was due in a few days.

The following day, I noticed that the Thunderbolt cable end plugged into my iMac 27in 5K was a little loose. I pushed it home and, to my complete surprise, the Lacie woke up and booted. Intrigued, I tried shutting it down, and pulled out the Thunderbolt cable. I then tried to start it up again. It was completely dead. Push the cable back into the iMac, and the drive sprang to life.

It seems that the Lacie unit is utterly immobilised until there is some signal on the Thunderbolt bus. It doesn't matter about the power switch on the back. It doesn't matter about the illuminated button on the front, which resolutely stays dead when there's no Thunderbolt signal.

By comparison, the Promise array works as you'd expect. Press the front power button and the unit powers up – yes, the status stays orange until there's a working Thunderbolt connection, but you're reassured that the array itself is working.

To have designed a 36TB array that won't give any sign of life until there is a working Thunderbolt connection takes a particularly perverse form of engineering. Such an array could be holding a copy of your latest blockbuster movie. Or a whole heap of data – 36TB is a lot of storage. I contacted Lacie's UK PR team and told them how disappointed I was with this engineering solution – they promised to pass on the comment.

It does raise an obvious point. If we're to have devices designed for professional operation, then it's about time we had professional-grade connectors. I love Thunderbolt, and have done so since it was a twinkle in Apple and Intel's eye called LightPeak. But to have a non-latching connector is just stupid, and Intel has really dropped the ball here with Thunderbolt 3.

Worse still, Lacie needs to understand that switching a power switch to the on position must result in some sign of life. To leave a unit looking utterly dead will result in the customer assuming that the unit is, indeed, completely dead.

Why is this stuff apparently so hard, and why do people keep getting this sort of stuff wrong? It isn't difficult: you just need to think in the way a customer would.

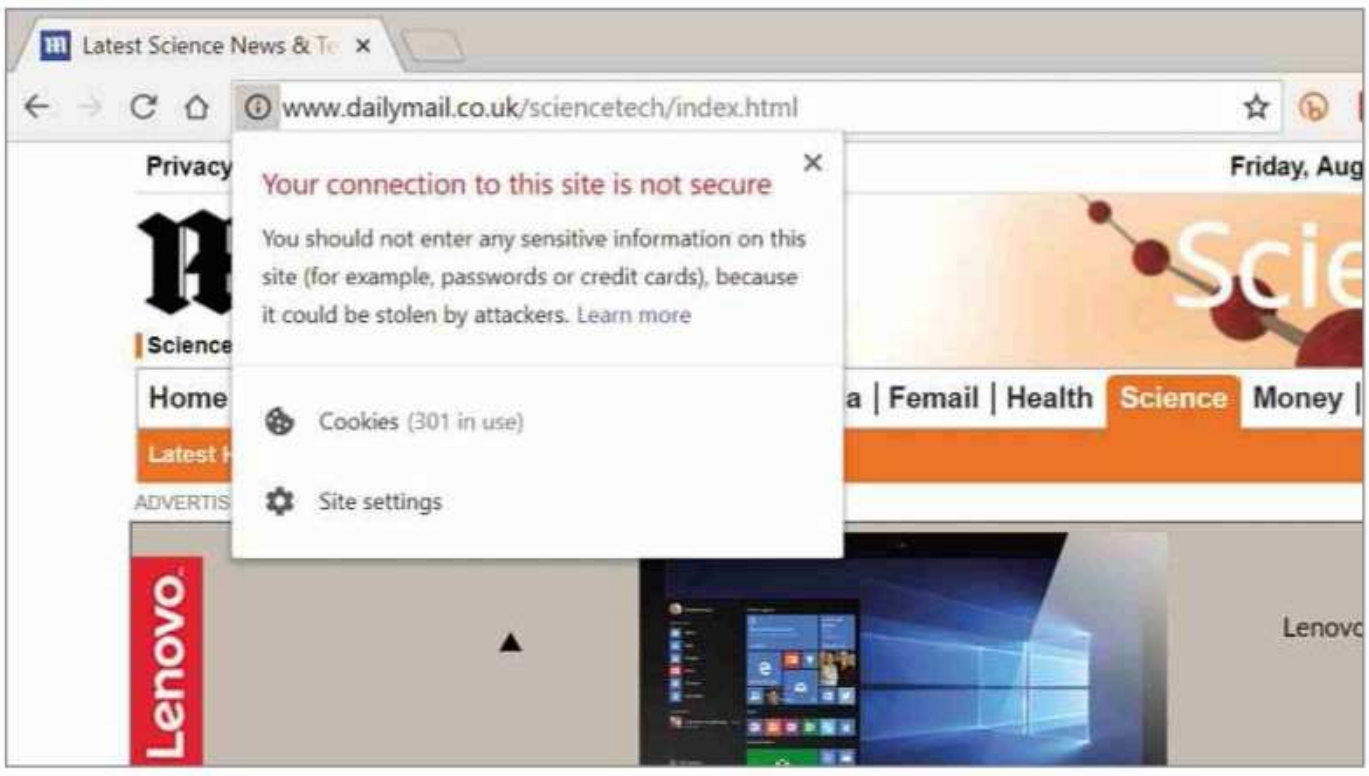
Jon is the MD of an IT consultancy that specialises in testing and deploying hardware
@jonhoneyball

"Why is this stuff so hard? You just need to think in the way a customer would"

BELOW Forget turning it off and on again – try plugging in your Thunderbolt 3 cable again instead

Chrome SSL

The Chrome browser has just been updated to version 68. There's a significant change in this version of which you should take note. Chrome is part of a big push to move all HTTP traffic to HTTPS. In other words, to ensure that all websites support an



encrypted end-to-end connection between your web browser and server.

HTTPS is, of course, effectively mandatory for any website that has a sales function or handles credit card details. It would be unthinkable to enter card details into a website that was on an HTTP connection.

The move to HTTPS for everything is interesting. It helps to ensure that all traffic is much harder to monitor in the middle of the connection. Only the client browser and the server session have keys to unlock the encryption. What's in the middle is just a bunch of binary noise, when viewed from an outsider's perspective.

You'll have noticed most websites moving over to HTTPS for everything, and they bounce your http://www.myserver.com/ request over to https://www.myserver.com/ automatically for you.

With this move, Chrome highlights an HTTP server connection as being "not secure", and tells you that "You should not enter any sensitive information on this site (for example, passwords or credit cards), because it could be stolen by attackers." All valid points, of course. Hopefully, in the future the browser will give a much sterner warning about HTTP content. And it would be nice if the other major browsers followed suit.

Update on 3CX cloud

A special shout out to 3CX running as a hosted cloud service. I've been using this for some months now, having transitioned from my trusty in-house HP Microserver. It just works, and works very well. It costs pennies to run, and the management console is a delight to use. As far as I can see, this is a solved problem, and is something I can quietly ignore moving forward. Which is precisely the sort of IT solution I'm coming to love in my grumpy old age.

Hosting iPerf on Synology

Sometimes, it's useful to have a tool for measuring throughput on your network. One of the best out there is iPerf3. It's open source and available for just about every platform under the sun. The best place to go for code is **iperf.fr**, which hosts links and code for almost everything.

One piece that was missing, which intrigued me, was for the Synology NAS boxes. I've mentioned before that I've mostly standardised on Synology boxes in the lab. They work, and I really like the range of capabilities they bring. They're a modern answer to the small-business server that Microsoft touted a decade ago – and, indeed, it's curious to see how companies such as Synology and QNAP have simply eaten the Redmond lunch since then. I can't think of anything I could have done on a Windows Small Business Server that I can't do better today on an appropriately specified Synology box.

ABOVE No more sneaky visits to Daily Mail Online: Chrome version 68 flags up that it's insecure

"Synology boxes are a modern answer to the small-business server that Microsoft touted a decade ago"

So I was on the lookout for an iPerf client/server for Synology. Well, one user has done all the heavy-lifting and created a set of SPK install files for Synology for you. First, you need to know what the platform is, in terms of hardware and OS that your Synology is running.

Once you're armed with this information, go to **jadahl.com/iperf/DSM_6.2** and download the appropriate package. Installing it is easy, using the standard package installer. Getting it running requires you to remote login with a command prompt, and then to fire up the installer. There's a range of command switches available, and you can use the package as client or a server. Or leave it running in the background.

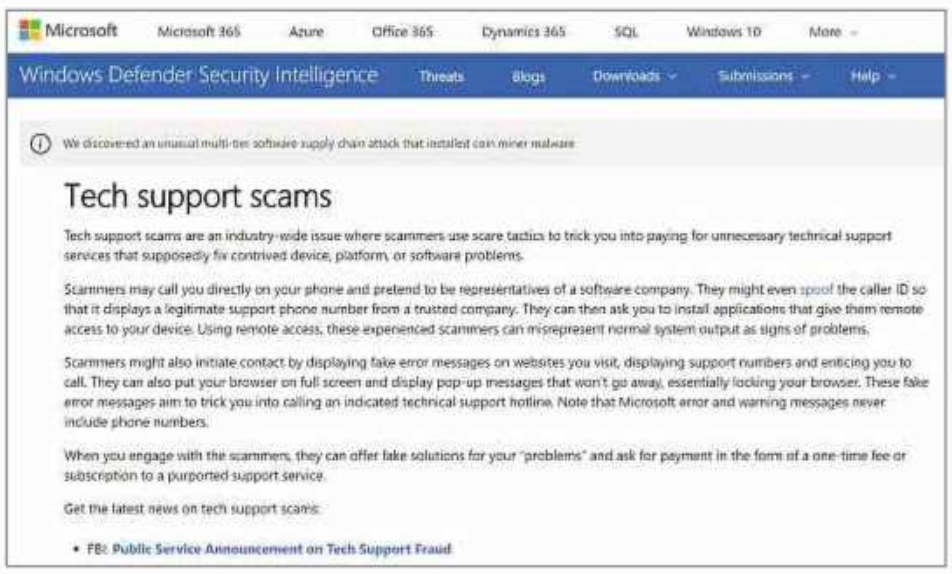
I've found it invaluable to have on the network to check out Wi-Fi speeds and other throughputs, and if you have a Synology NAS then I suggest you install it and try it out. It would be good if it were packaged up with a nice graphical UI, but it works just fine at a command prompt for the time being. It was free; I'm not complaining.

Beware the Microsoft scams

You know the phone call is going to end in tears when the lady, speaking with a heavy Indian accent, tells me she's from Microsoft – and that she's phoning about my computer, which has some viruses on it.

I'm sure I don't need to tell seasoned *PC Pro* readers that this is a scam, an attempt to extort money from you. But if this comes as a shock, here's the simple answer: Microsoft doesn't call you by phone about malware on your computer. It's so prevalent as a scam that Microsoft even has a page on its website covering it: **pcpro.link/289scam**.

BELOW Beware: if someone contacts you about malware on your PC, hang up



The methodology is clever. Tell you that you have a problem. Get you to download a remote takeover tool. In my case yesterday, this was the legitimate AnyDesk tool. When you run it, they can take over your desktop, claim to find all sorts of problems and then get you to hand over money to "fix" these "problems". It's a scam.

Yesterday, they called when I was in the middle of a business meeting. We were due a coffee break, so I put the call on speakerphone for the amusement of my staff. I played along for a good 20 minutes or so, but made sure I didn't hand over the session number in AnyDesk to the caller, ensuring there was no way into my computer.

In the past, these scammers have targeted only Windows customers, and have hung up when you indicate you have a Mac. They didn't ask, but worked it out because I downloaded ANYDESK.DMG not ANYDESK.EXE – DMG being the disk image installer package format for macOS.

Undeterred, they tried to get me to connect. I said I was suspicious that they were using third-party remote access to get into my computer, and wouldn't they normally be using one from Apple?

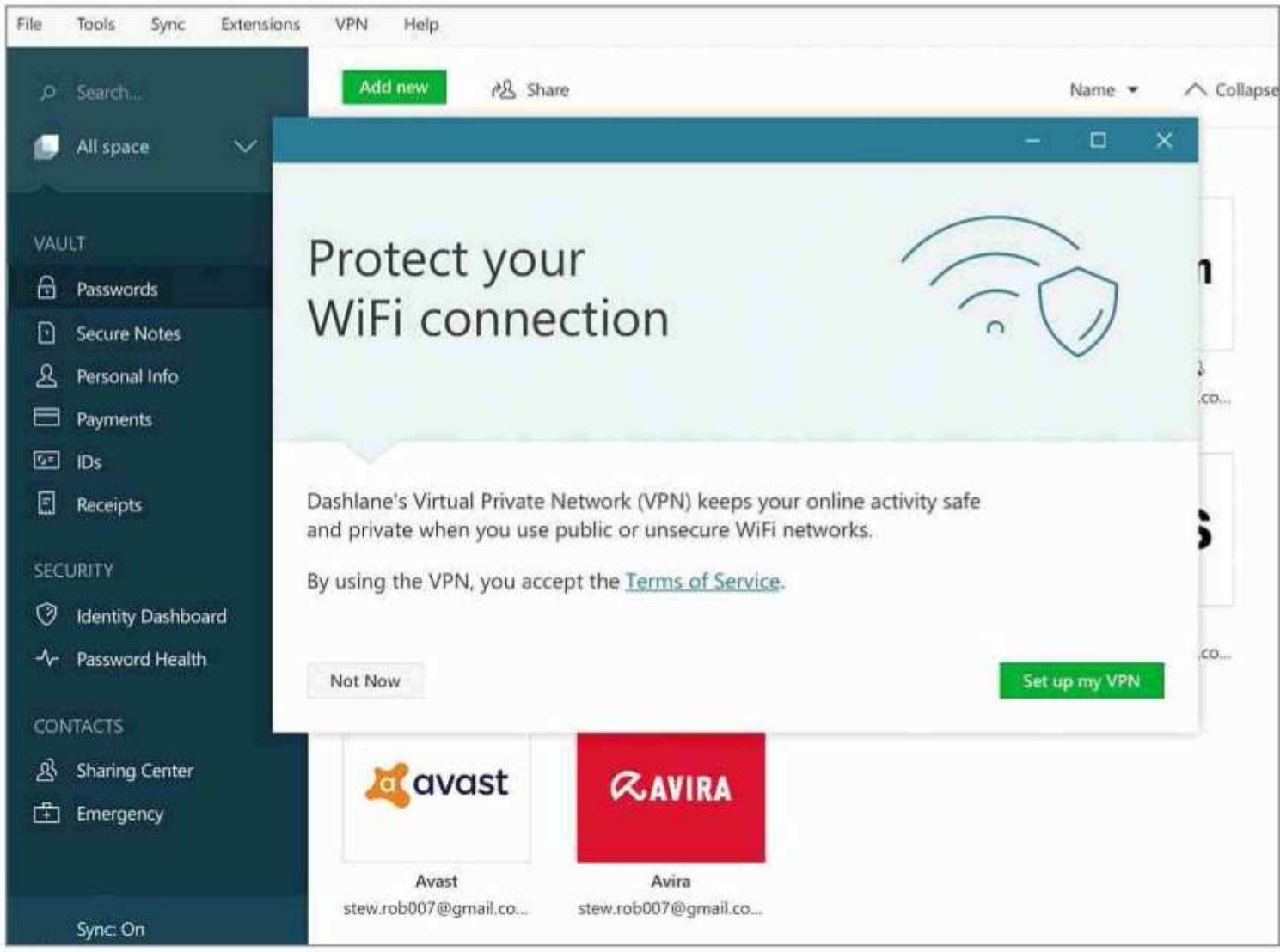
Since my meeting break was over, I said I thought they were scammers. This resulted in a blast of expletives about me doing rude things to my mother. I replied that since she had passed away some 13 years, I thought this was going to be difficult, but I could ask the church to dig up her coffin? The line went dead.

I confess that last time they called, I was better prepared. I was sat in front of a test host computer, running VMware Fusion. Windows 10 sat running in a highly network locked-down VM. And the computer sat by itself on its own FTTC physical network, airgapped from anything important, because I was testing antivirus software using real malware test files.

I wish I'd screen-grabbed that session. I actually gave them access to control the Windows 10 VM. And then kept dropping malware bombs into the system from outside, as they were attempting to clean up my system. I kept the unsuspecting caller busy for nearly an hour that time, as they battled to understand from where this malware was appearing. They had no idea I was just injecting it in for my own amusement.

Obviously I can't recommend any sort of "feeding the tigers" here, unless you happen to have an entirely sacrificial setup in a virtual machine, hosted on a completely separate network – and you know what you're doing. However, to my shame, I admit the amusement factor was undoubtedly high.

These people are convincing and have a carefully crafted script. You and I might not fall for this, but it's down to us to tell family members that it's a scam. This is especially important for those who aren't computer literate, and maybe of the older generation. If you do nothing else today, send a short email to family members to remind them of this, and to follow the simple rules: don't download anything, and simply hang up the phone.



ABOVE Dashlane 6 introduces a handy VPN tool, which is great if you're on a public Wi-Fi hotspot

Dashlane VPN

I got the updated Dashlane version 6 a few days ago. Dashlane is a password management tool – there are numerous such tools out there, and 1Password is another well-regarded product. I moved from 1Password to Dashlane well over a year ago. To be honest, I can't remember the reason for the change, but I know I was intrigued by the facility by which Dashlane can change a password on a website for you. It doesn't work on all sites, but it's useful on those where it does work.

Dashlane 6 brings new features, but the one that made me sit up was the provision of free VPN tunnelling built into the tool. Just turn it on, and you have a VPN tunnel from your computer to a Dashlane end-point. You can't set the location of the end-point yourself, unlike other tools, but I'm not particularly bothered about that. Simply getting yourself from a place you feel insecure to a known and trusted end-point is a worthwhile improvement. You might not trust the coffee shop you're in, or the hotel internet connection where they try to inject HTML into your browsing. A VPN can, and should, protect you from that.

Dashlane states it "…uses the Hotspot Shield technology to power the VPN. This means that your encrypted internet traffic is routed through servers hosted by our

RIGHT Looking for a USB microphone headset? The Sennheiser PC8 works well and costs around £30

partner, AnchorFree (provider of Hotspot Shield)." So that's the underlying provider.

Worth having? For sure, if you don't have a VPN tunnel of your own. For myself, I have all of my devices set up to VPN tunnel back to the lab, using the Cisco Meraki security appliance as the end-point. But many SME or home users don't have that luxury, or find the usually hopeless setup and configuration in home routers to be a real stumbling block.

So the provision here of a VPN tunnel in Dashlane is a nice addition. It seems to work well, and I'd certainly consider using a VPN tunnel any time I'm connecting to a Wi-Fi network that I don't own or administer myself. That means coffee shops, public Wi-Fi, hotels, conference centres. I wouldn't bother if my phone was connecting directly to 3G/LTE onto my telco – I'm somewhat happier to trust them.

Blogs and podcasts

Finally, a small shout out to the *PC Pro* crew and its fortnightly podcast. You can partake through the **mixlr.com/pcpro** channel. Podcasts last around an hour, and take place every fortnight on a Thursday. They even sometimes manage to drag me in, providing I'm not otherwise tied up.

And a shout out to my old mate, Richard Tubb, who does an SME podcast at **tubblog.co.uk/blog**. He persuaded me to talk with him on his blog for over an hour about all sorts of stuff, and it was huge fun. I believe it should be published around the date that you get this (early September). Hopefully, I didn't ramble on too much.

We used the Zoom Internet meeting tool (**zoom.us**), which worked without any glitches or stumbles. I'll certainly be looking at Zoom again in the future for other purposes.

Richard also recommended the Sennheiser PC8 USB telephony headset, which has a boom mic. It connects via USB, and just worked out of the box on my MacBook Pro. Sound quality was good, and for less than £30, it's a bit of a steal. If you're looking for a headset with mic, then this might well be a good buy for you too.

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PAUL OCKENDEN

"With the phone sitting in your field of view, it's actually obstructing your field of view"

Paul looks at the phone mounting options for cars, before explaining how to claim 200MB free data per month via a very special Three deal

A short and sweet tweet from a reader asked: "What's the best car mount for a smartphone? Thnx." That's one of those "How long is a piece of string" type questions. There are many different car mounts available, and what works for one person might not suit someone else. I've even had online arguments with friends on this very subject!

I assume that the reader who asked the question wants to use their phone as a satnav. I'd discourage any other use of a phone in a car, particularly making or taking calls. Strictly speaking, if you have the phone in a mount then phone calls are legal (at least for now), but various studies have shown that concentrating on a call increases the risk of accidents. If you need to speak to someone urgently then find a safe place and pull over.

Once a destination has been programmed in, however, satnavs are much less of a distraction – in fact, clear and accurate route instructions can reduce stress levels and increase the safety of a journey.

I'll talk you through the various car mount options, and which are my personal favourites. But the first choice you need to make is where to physically place the car mount. For a typical setup, you've got three possible positions. You can attach the handset to your windscreen, or to the top surface of your dash, or else somewhere lower down on the front of the dash.

Paul owns an agency that helps businesses exploit the web, from sales to marketing and everything in between

@PaulOckenden

Windscreen mounts are popular, and usually use a suction mechanism to clamp them to the screen. I think they've evolved from the early standalone satnav mounts supplied by TomTom and others.

The pros of a windscreen mount are that the screen remains in your field of vision, so you're more likely to be able to see any alerts, and that being next to the windscreen you'll get the best possible GPS reception. The big problem, for me at least, is that with the phone sitting in your field of view, it's actually obstructing your field of view.

There are legal rules about blocking part of your windscreen (they separate the screen into two zones), and there's also MOT advice around whether any obstruction obscures the sky, bonnet or the road ahead – obviously a grey area, because we're all different heights and have varying driving positions. Rather than bore you with the tedious legal details here, I'll point you to a recent article in our stablemate publication, Auto Express: **pcpro.link/289mount**.

Whatever the legalities, if I used a windscreen-type mount then I'm terrified that a child or a bike could end up being obscured by my phone. And for that reason, I won't use one. I simply don't want to take that risk, however small.

BELOW There's no getting away from the fact that screen-mounted phones will block your view

Dash-top mounts are better because, unless you're so short that you need to sit on a cushion to see over the steering wheel, the phone will only obscure your car bonnet, rather than the road or pavement. The problem is that tops of dashes come in various shapes, sizes and textures. In most classic cars, the shelf above the dashboard

is literally that – a long, flat shelf. These days they're full of bumps and curves, and will often be made from a textured plastic, which makes it difficult to use a suction-type mount. As a result, folk end up using a mount that uses some form of adhesive (often 3M VHB tape, which is extremely sticky), which will often end up damaging the vehicle on removal.

If you do want to use a dash-top mount then I'd strongly recommend taking a look at the Montar from WinnerGear. Rather than adhesive, it has a sucker-type arrangement on the base, but the suction disc is made from a soft jelly-like material that sticks to surfaces even with very deep textures. I've found it locks solid onto pretty much any non-absorbent surface. The sucker feels a bit tacky, as though it has an adhesive on it, but it doesn't; it's just a very pliable surface. If it gets dusty or dirty, you simply rinse it under a tap.

Be gentle with the mount, though – a few people in the reviews section on Amazon have reported that the phone-clamp part has broken after a year or so. I can't imagine how people are breaking it, because looking at my Montar (which I've had for a few years now), the mount feels well made. I wonder whether the broken units have been cheap knockoffs? I know that WinnerGear has had a problem with clones of some of its other products.

I don't mind dash-top mounts, but I prefer the type that attach your phone to the front of the dashboard. There are various forms of attachment, including adhesive discs and bits of metal that you poke into gaps in the trim. However, the most popular type seem to be those that push over the vanes in the car's air vent. They work well in most vehicles, but bear in mind that you won't be able to adjust that particular vent.

Once you've chosen the style of mount, you'll find several different methods for holding the phone in place. Some have sprung sides that grip the phone, others use a "gravity" mechanism where the weight of the phone resting on a lower arm pulls the side-arms in. And then there are magnetic mounts.

I love magnetic mounts, but they don't suit all phones. Some require you to apply a metal disc to the back of the phone, or inside the case, which is a bit clunky. Handsets that offer Qi wireless charging will usually have the required metal bits inside, and so the disc isn't needed.

ABOVE WinnerGear's Montar will attach limpet-like to just about any dashboard

The primary factor that determines whether or not a magnetic mount will work is the weight of the phone. Of the two phones on the desk in front of me, I know that a good-quality magnetic mount is fine with the Samsung Galaxy S8, but the S9+'s extra weight makes it unsuitable.

What I like most about magnetic mounts is that they're unobtrusive. One of my favourites is the Spigen, which at the time of writing costs £7 on Amazon (**pcpro.link/289spi**). It's 4.5cm wide and uses strong magnets. I can use it with the Samsung S8, even with the phone in a skin-type case. Some of the competing products use ball and socket joints to allow you to angle the phone, but in my experience they just make things wobbly, plus the phone sticks out further from the dash. The Spigen is about as flush as you can get.

Beware that some of these magnetic mounts have the manufacturer's name embossed on them (Aukey is one brand that does this, but there are others too). This means that there's much less surface area in contact with the phone, and as a result the handset is more likely to slip when you go over a speed bump, or hit a pothole. My top tip is to look for magnetic mounts that have completely flat front surfaces.

For heavier phones such as the Samsung S9+ and the bigger iPhones, you'll need a gravity mount. Again, most of these tend to have large ball and socket joints, which are supposed to offer a degree of adjustment but just end up making things wobbly, causing the phone to stand quite a way off the dash.

I found one from Wofalo on Amazon (**pcpro.link/289wof**) for a tenner. Although it has a ball joint, it's quite small and made of metal rather than plastic. I even went one step further and put a ring of Sugru around the back of the mount once I'd found the ideal position, to lock the whole thing solid. It works well, but you have to be careful if you want to use it with a charger, because not all USB-C leads will fit through the hole in the middle of the bottom arm of the Wofalo.

Of course, if you have a Qi-enabled phone then you can also get Qi-enabled car mounts that will charge the phone as well as hold it. I've tried out quite of a few of them, without any great success. As with non-charging mounts, you'll find them in gripped sides, gravity and magnetic variants. I find they tend to be quite bulky, and unlike a typical wireless charger that you'll use at home, the car mounts tend just to have a single coil inside and so the position of the phone is critical. I've always given up, reverting to a simple mount and a plug-in charging lead.

If any readers know of a decent car Qi mount (other than those the high-end brands are now building into their vehicles), do let me know.

BELOW The Spigen magnetic car mount is simple, effective and cheap

Free Three

I've just found a mobile phone bill from a few years ago, back when I was a bit of a BlackBerry fan. I can see that my contract included 50MB of data per month. No, that's not a misprint. It's 50MB, not 50GB. And you know what? I hardly ever went over it. Perhaps this is partly because BlackBerry phones of

that vintage were extremely frugal with data, but also because the mobile internet just wasn't such a data-hungry place.

Old habits die hard, it seems, as these days I'm still pretty frugal with my mobile data. I typically use around 1.5GB per month, although it can vary. If I go on a long road trip, streaming music and maps while I'm driving, then my mobile allowance takes a massive hit. I have friends who easily plough through 20GB or even 50GB of mobile data per month. I don't know what they're doing – perhaps their phones are hosting spambots!

One of the perks of writing this column is that some of the networks give me freebie SIMs, but I try not to abuse those – all of my day-to-day spend is done using proper paid-for phone contracts. How else could I write here and on social media about the best deals and the worst customer service?

Back to data. Although that 50MB per month seems pitifully small these days, there are still situations where a small data allowance is all that's needed. I'm thinking particularly about IoT and M2M (machine to machine) comms. Items such as remote building sensors, weather stations, burglar alarms, and even on-demand trackers (as opposed to those that stream continuously). All use quite low volumes of data, and it makes sense to use the cheapest possible SIM cards inside such devices.

Many system developers tend to use pay-as-you-go for such applications, where you'll typically pay 1p per MB using the O2 or Three networks, and anything up to 10p per MB on the others. Non-bundled data is one area where the main networks can be significantly cheaper than the MVNOs running on their network. Giffgaff, for example, charges 5p per MB, which is five times the price of the underlying O2 network. Odd, isn't it?

However, if your IoT or M2M application uses less than 200MB per month, there's an even better option: a totally free SIM offered by the Three network. It's one of those "not many people know about it" things, and it certainly sounds too good to be true – but it isn't.

I've been using a couple of these free SIMs and they work very well. It isn't some cut-down service – these SIMs give full 4G access and even offer free data roaming to 71 countries.

When the SIM arrives, you have to go to **Three.co.uk/freedata** to register this offer. It gives you the first 200MB of data, and then every month it's topped back up to 200MB again. You don't have to do anything at all. There are no restrictions on tethering – you can use the SIM in dongles, tablets and Mi-Fi-type devices, as well as in your IoT and M2M kit.

There's a limit of five free SIMs per account (I'm sure you'll think of a way round this if you need more!), and the SIMs are data-only, unless you add some credit to them. You can't send texts or make calls, but in my experience you can receive both.

What's the catch? Surely we all know there's no such thing as a free lunch. As far as I can tell, there's no catch, other than the 200MB per month limit. If you can live with that then you've effectively got a trickle of free data forever.

If you navigate the Three website, it will tell you that to get this deal you need to buy a SIM with £10 pre-loaded. Rather than doing that, just go to **three.co.uk/Free_SIM_MBB/Order**, where you can currently order the free Data Reward SIM without paying a penny. You don't even have to pay for the postage!

I'm sure this will get shut down at some point, so please don't nag if it's been knocked on the head by the time you read this. Just buy the "promoted" version with 1Gb preloaded for a tenner instead at **three.co.uk/datareward** – it's still a good deal, and still has the free 200MB per month on an ongoing basis.

ABOVE **Need a SIM for your IoT or M2M application? Then check out Three**

"Three's free SIMs offer full 4G access and even free data roaming to 71 countries"

BELOW **Sign up to get your free 200MB per month SIM from Three**

More cheapness

Finally this month, remember about a year and a half back (*issue 271*), when I wrote about various cloud-based security cameras? I enthused massively about the Nest Cam, with its superb picture quality and ability to use weak Wi-Fi signals.

Even more so, I loved the cloud-based Nest Aware recording system, which saved a constant stream of video on a 24/7 basis (most competing systems just record short clips after something triggers an event). I also liked the way that Nest (which is owned by Google) can use its remote cloud processing to analyse the incoming video stream to identify people and other things. The only fly in the ointment was the price, with £8 a month giving you ten days of recording. I complained that this level of annual running costs for a £150 camera was hard to swallow.

Well, someone was listening to my complaints – and countless others, no doubt, all saying exactly the same thing. There's a new five-day recording option for £4 a month, or £40 a year. That's far more affordable for many people, although it's a shame the price of the ten-day option simply wasn't halved.

Nest also has some new cameras since my last piece, with more local processing, but at £300+ they aren't exactly cheap. Perhaps I'll take a look at what they offer over the previous generation in a future column.

@PaulOckenden

MARK WALSHAM

"Cloud is PAYG, so the longer you leave your services running, the more charges you'll accumulate"

Do cloud economics add up? Mark Walsham, an IT consultant specialising in this area, explains the gains he's seen and the common hidden costs

You know something has hit the mainstream when you see TV ads for it, and so it is with "cloud". Adverts from Microsoft, IBM, Amazon and Google all espouse the benefits of always-on, large-scale computing platforms. But what about the economics that sit behind those promises? Over the course of several cloud migration projects, I've discovered some amazing benefits for my clients – but I've also unearthed areas of concern that could hit you in the pocket.

Mark Walsham is an IT consultant who has worked with many UK customers to move them to cloud, helping to save money and increase agility

MarkTechArc72

Financial benefits

The financial benefits proposed by the cloud vendors is clear, and these resonate with our customers. The most obvious cost reduction comes through retiring an existing data centre, either local or hosted, as companies shift numerous servers, appliances and services to the cloud. Server rooms, power, cooling and racking are no longer needed, slashing operation and maintenance costs.

Add in the other costs associated with your own infrastructure and you can see the reason that estimates of 50% to 80% cost reductions are attractive. Conversion of capex (capital expenditure) to opex (operating expense) will often free up investment for business innovation, agility and improved customer experience, all of which are good.

However, we need to look beyond the initial decision to move your workloads to the cloud to better understand the potential pitfalls.

Auto-scaling and elasticity

The idea that you no longer have to predict how many servers you need to build and operate to meet a seasonal event – epitomised by Black Friday – is very attractive. The old method, unless you conducted expensive and time-intensive testing, was based on projected volumes and a fair amount of guesswork. Now, you can start up an application stack from top to bottom, set an auto-scaling policy and forget about it.

So where's the problem? Often, the default policy settings for auto-scaling aren't thought through or checked at deployment, and this can cause multiple instances of an application to spin up. Remember, if your current setup has four servers in a cluster, it might be great that your new model can scale to five, six or seven, but unless you configure carefully, you could end up with a hundred.

One of my customers was running a decision-tree process application, which at times required for a single-threaded request to collate and process the data. However, this was interpreted by the load balancer as being under load, so it spun up additional instances. The customer was slightly confused to find that their bill at the end of the first month was only 20% less than their old infrastructure services, due to all those additional instances being spun up automatically!

"Always check the data egress costs, so that you don't suffer bill shock!"

Data egress

All the major cloud platforms allow you to upload "unlimited" amounts of data to the platform for free. That's all well and good, but a little-known feature of these platforms is the cost of data egress, usually priced as a per-gigabyte figure. See the table below, which shows the relevant charges.

One of my customers specialises in the delivery of media content, such as videos, images and audio files. Given it had a over a petabyte of content, you can see the reason it was hit with a seriously large bill.

Also remember that costs increase when you transfer data from one region to another, so shipping 1TB of data from the UK to Asia will cost more. Always check the data egress costs, and calculate the churn (frequency of change) and size of your datasets before you commit, so that you don't suffer bill shock.

Reliability

In the modern IT world, we're accustomed to service-level agreements, which as a customer define the minimum levels of, say, availability of the platform and services. Having the assurance that a server or application has an availability of 99.99% is great, but read the small print and you'll find there are costs associated with this.

I have a customer that uses a modest product ordering system, consisting of a classic web, app and storage server solution, run out of its own offices. Due to several factors, this needed to be moved to a cloud vendor. While my client liked the idea of the SLAs (in this case, Microsoft Azure), it didn't realise that moving single servers to the cloud wouldn't offer any such service guarantees. Actually, the way to achieve these was through the use of Availability Groups, which by design need at least two servers per component, and hence twice the cost. Imagine this replicated across a 1,000-server estate!

To be fair to the cloud vendors, this does provide a host of customer benefits – such as the ability to patch services whilst keeping them running – but it's something to be aware of.

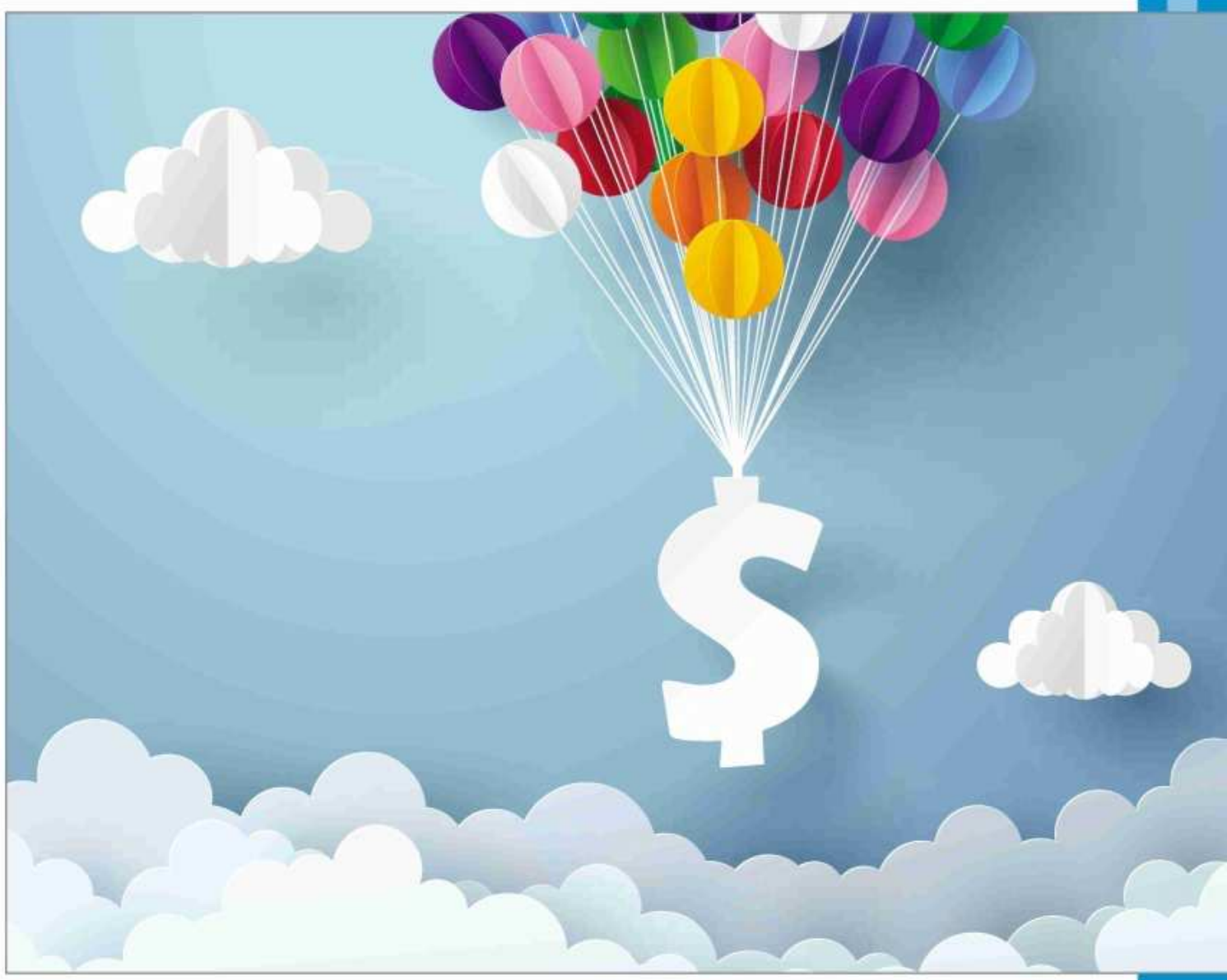
DATA EGRESS COSTS PER PUBLIC CLOUD (AUGUST 2017)

Data transfer (per GB)

	Amazon S3 Standard	Google Cloud Standard	Microsoft Azure Blob Hot tier
Download	$0.09	$0.11-$0.22	$0.087-0.181
Upload	Free	Free	Free
Transfer within one cloud region	Free	Free	Free
Transfer to another cloud region	$0.02	$0.01-0.11	$0.087-0.20

Do you need everything 24/7?

Another common issue I see and help customers with is scheduling of services. I've encountered countless scenarios where services are spun up within a public cloud and then left running all the time. Cloud is PAYG, so the longer you leave your services running, the more charges you'll



accumulate. This sounds obvious, but it can generate huge bills if left unchecked. So, take advantage of scheduling services, such as those available in the popular cloud platforms, and run them only when needed. Yes, e-commerce systems need to be run 24/7, but is this true of that timesheet app?

Education on storage – time to go to class

Another element of cloud we all need is storage. From simple object storage for your media files, through to block file storage and relational database storage, there are options for most customers' needs. Not all storage is equal, though, with many vendors offering different classes of storage based on a price/performance ratio.

Beyond choosing the right class (*see table below*), you must think about data lifecycle management: holding too much data in expensive storage classes makes no sense. One customer had provisioned most of its cloud storage as SSD, to maximise the performance of its IO-heavy application stack. Once its service took off in earnest, the datasets grew quickly and hence the storage costs rocketed. By using the data archiving services available in AWS (Glacier) or Google (Cloud Storage Coldline), we used policy-based rules to archive data to long-term storage, helping to reduce the day-to-day storage costs.

Discounts aren't equal

I can hear all the seasoned *PC Pro* readers shouting: what about the discounts these services offer? That's entirely true, with most of the players offering a partial or full upfront investment option that reduces the prices of the resources you consume. However, they aren't equal in value.

For example, Amazon uses both Reserved Instances and Spot Pricing as ways of getting cheaper resources. The former is the aforementioned pay upfront, the latter a marketplace where you can bid for spare and unused resources. These don't offer the same level of discounts respectively (75% versus variable).

Google, on the other hand, offers "sustained use discounts". This is where the longer you run your workloads, the more discount you may accrue (maximum of 30%).

Optional extras, sir?

Like when buying a new car, there are lots of optional extras available to you with cloud, some of which are really useful. Elastic load balancers, VPNs, myriad deployment options (such as instances near your customer base for better performance), services deployed across geographies, and whitelisted DNS services are just a few. They're offered at low unit cost, yet have the potential to cost you dear.

Recently, we've seen a growing trend of cloud market places, a vibrant community where vendors have written and created a spectrum of cloud native services. Take a look, as they can often replace an ageing or expensive vertical solution in your current portfolio. Security compliance checking, AV, integration hubs, host intrusion, big data lakes and analytics are all examples of predefined, built and vendor-supported solutions that can help drive real value from the cloud, many of which are just pennies per use. But look beyond the headline deployment cost. A data lake will require considerable storage and compute, and can grow enormously in size and cost.

ABOVE Keep adding extras and your costs will keep rising...

"Like when buying a car, there are lots of optional extras available to you with cloud"

It's all about the apps

Finally, consider your application library. Not all applications are as easy to "cloudify" as others, and you must think about this carefully before you make the leap. Simple architectures (say, web services) will be trivial to move, but those with hefty database engines (yes, Oracle, I'm looking at you) will be a great deal more complicated and time-hungry to migrate. Don't underestimate these costs, or get a professional to help with the assessment. Get it right, though, and you can release much-needed investment in moving more applications to cloud, and potentially reinvent your business model!

In conclusion

Think about the mid-term strategy of your organisation or customer, draw out a plan on how long services will exist, and enter into agreements based on that research. There are a host of pricing and TCO calculators out there, so make sure you use them – not just for the basic tin and wires, but the areas talked about above. You'll then be in a much stronger position to appreciate whether, in your case, the cloud economics really do stack up.

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CLOUD STORAGE CLASSES (OTHER PERFORMANCE TIERS ARE AVAILABLE IN HOT)

	Hot	Cool	Cold
Amazon AWS	S3 Standard Storage	Amazon S3 Standard I/A and S3 Standard Z-I/A	Amazon Glacier
Google Cloud	Cloud Storage Standard	Google Storage Nearline	Google Storage Coldline
Microsoft Azure	Hot Blob Storage	Cool Blob Storage	Azure Cold Blob Storage

DAVEY WINDER

"Few could argue with Cheriton's warnings about 'the medieval computing landscape of AWS'"

Davey meets a professor who has the last laugh about Jeff Bezos, and witnesses the US Secret Service reveal some secrets

I'm not in the globetrotting conference Premier League along with Jon and Steve, but there are some events that tempt me to abandon my Yorkshire hermit role. One of these is the annual NetEvents global press and analyst summit in Silicon Valley. It's unique in that it exists to bring innovative startups and established vendors across a broad spectrum of network, AI and security sectors before (so-called) influential journalists and analysts.

Not in the usual "here's a hall full of stands, and you can find the lecture hall over there" kind of way. Rather, with mornings populated by interactive panel sessions, followed by afternoons of speed-dating-style round tables talking with vendors, and evenings chatting over dinner and drinks. It's all very sociable, and that allows those of us who fall under the media and analyst umbrella to get a feel for what's driving innovation in these companies.

This year, I found myself back in the Hayes Mansion in San Jose, which is a bit Pontins meets American Horror Story, in the nicest possible way. Back in the 1930s, the mansion was something of an innovator itself, much like the state-of-the-art hotels you find dotted around the Valley today: self-sufficient electricity supply, post office and even railway station. It was something of a communications visionary in its own way – which leads me onto Professor David Cheriton, who gave the opening keynote presentation along with a question and answer session.

PC Pro readers may well have heard of this Stanford professor, what with him being one of the first investors in Google and VMware. He's invested in more than 20 companies across the years, picking those that spark his interest in innovative technologies that solve real-world problems. His job these days is as the founder and leader of the Distributed Systems Group at Stanford University.

Davey is an award-winning journalist and consultant specialising in privacy and security issues
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Both myself and Steve were blown away by this guy. His presentation was full of quotes that could be pulled together and published as the "Little Book of Tech Startup Advice" and become an instant business bestseller. I'm not sure that Amazon founder Jeff Bezos would buy a copy, though, as Cheriton doesn't appear to be his biggest fan.

Yet few could argue with his warnings about the cloud, what he refers to as the medieval computing landscape of AWS. "You have Jeff Bezos, who's built this walled garden called AWS, which is a castle. He basically says, come under my protection and you'll be safe." Cheriton continued: "Exactly what happened in medieval days with the king; you felt that the highwaymen were a problem. They weren't a problem – they were part of his overall plan. You build this castle; the peasants are beholden to you because you protect them from the highwaymen."

Cheriton went on to explain how AWS is sold as the public cloud, but it's an 'if you pay for it, you can use it' model. On that basis, he quipped, "I claim Disneyland as a public park because you can pay, and you can go in and use it." So public cloud is a complete misnomer.

The actual thrust of the talk was on "how to pick the game changers", but the professor's insight into the cloud, Amazon and proprietary lock-in was amongst the most eloquently expressed I've ever had the privilege of listening to. He spoke of AWS providing thousands of services, new ones being added every day, all of which are there for the purposes of lock-in. "You find these startups and big companies end up where they develop some application and it's using 100 of Jeff Bezos' little services that are unique to AWS," he explained, "so somebody then gets a big bill from Bezos, and it's very hard to move that application."

Not because it's highly dependent on those services, but rather it's slightly dependent on them, meaning it can't function properly without them. "Bezos basically says you don't need your own brain, you can do your thinking with my brain. I'm not faulting him, but I think that anybody who wants to have an independent business should be aware that he does want to own the entire universe here…"

If you ever get the chance to listen to Cheriton speak live, I'd recommend you sell a kidney to get there.

BELOW Professor David Cheriton, one of the best speakers half of the RWC team has ever listened to…

JASK puts AI in the SOC

One of the reasons I don't pass up sacrificing a whole week of my working life to travel to San Jose for the NetEvents summit can be summed up by the panel debate entitled, "Can AI solve the internet cybersecurity epidemic?" This was chaired by Robert Kierstead, the special agent in charge of the Seattle Field District of the US Secret Service.

For me, getting access to these people is well worth the trip. Otherwise, I wouldn't have enjoyed the irony of the Secret Service man throwing up a PowerPoint slide displaying the Secret Service's cyber-asset locations. Glorious! Almost as glorious as being given a Secret Service T-shirt by Michael Levin, formerly a deputy director of the National Cybersecurity Division of the US Department of

Homeland Security, branch chief of the Secret Service Electronic Crimes Task Force in Washington and Secret Service liaison officer with the CIA and NSA.

These days, Michael – who I now consider a friend – runs the Centre for Information Security Awareness (CFISA), which brings educational training to law enforcement, business and consumers alike. He also took part in a panel discussion on botnet evolution this year, but I digress.

While the likes of Cylance, which had its CSO Kumud Kalia on the panel, is well known for pushing an AI-driven defence agenda, there were others that are more quietly putting AI (or machine learning, to be precise) into defensive action. Although I hadn't been aware of JASK before the event, I quickly realised it could be an interesting startup considering Greg Fitzgerald was involved.

Greg is another person I've bumped into before at NetEvents. He's a former founder and advisory board member of Cylance itself, and Javelin Networks – another startup he was involved with (as COO and a founding investor). Greg reminds me of Cheriton in many ways. Although they're opposites in terms of presentation and style, Greg was a hacker for the US government when he started out, and is now a Silicon Valley marketing man through and through. He has a knack of knowing real innovation when he sees it. That isn't easy in the cybersecurity business, which is drowning in wannabees and hype.

JASK, if you ask me, isn't deserving of either label. So what does it do? The clue is in the name, which literally means "Just ASK". It uses machine-learning technology to overcome the very real-world security operations centre (SOC) problem of too much information. Specifically, too much threat information. Hold on, I hear you say, can there be such a thing as too much data about a threat? Well, no, if it's a real threat and not something innocent that's been flagged up as such.

Most incident response teams, be they in-house or outsourced, employ highly trained security analysts to determine if a security incident is a real threat or a false positive. Assuming the former, they allocate appropriate resources to combat it. Of course, these resources are finite, whereas the volume of 'incident' data is seemingly endless. Just sifting the false positives out of the equation wastes valuable time and can mean real incidents that need to be dealt with aren't actioned immediately as they take their place in the queue to be checked.

JASK aims to address the lack of trained security analysts and researchers by filling the void with AI. It does this by applying machine learning to effectively filter the false positives from the incident-reporting data stream. What's more, it also promises to prioritise the real threats, so filtering advanced attacks that are underway from all the lower-level malware and cybercrime activity. Not that the latter are unimportant, but prioritising enables a much better incident response than simply tackling every threat as equal in potential impact.

What I find refreshing here is that JASK isn't pretending to take the human out of the loop, but rather providing us with better data to make our jobs within the security operations centre less stressful and more effective. Of course, I'm not known for my shyness during panels such as this, and so was the first to pitch a question at them. That question being aimed directly at the Secret Service man: "I'm interested to know how the Secret Service is using AI at the moment?"

Kierstead looked a little taken aback for a moment, before replying that the Secret Service is technology agnostic and "we are studying various AI technologies without committing to any particular one". And that was that. A shame, although despite the earlier map of Secret Service locations, I didn't really expect the intelligence community to open up – but you have to ask.

A sentiment obviously shared by Steve, who also directed a question at Agent Kierstead: "I'm intrigued by the earlier comment that, basically, the NSA weaponisation of tools is just something we have to live with, that it has become part of the landscape – because it seems to me that there must be a national cybersecurity picture of responsibilities, oversights, and so on. How does your role fit with the NSA? Are you ringing them up, saying why are you guys letting these tools out? Or is there actually no ability to do that, with everyone in their own silo and there's no response?"

And there was no response, other than "we are primarily a law enforcement agency, not an intelligence agency. I don't know the best way to answer that question." So, a good morning was had by all, at least in the *PC Pro* seats...

ABOVE The not very secret US Secret Service...

"JASK is providing us with better data to make our jobs more effective"

BELOW Greg Fitzgerald and JASK are bringing AI into the security operations centre without kicking the humans out

Facebook power admin tips

I am, according to Facebook, officially a "power admin" these days. Indeed, I belong to a closed group operated by Facebook itself, where my fellow power admins can discuss the ins and outs of running a

Continued from previous page

large group. In my case, as regular readers will know, the group in question is the Mazda Bongo Owners Club. It brings together owners, would-be owners and businesses involved with this old Japanese import MPV that's commonly converted into a campervan. My own van, christened Jean-Claude (damn van), is 18 years young, and has even been the subject of a *PC Pro* feature before.

I started as an admin of this group four years ago, and in that time have helped it grow from 1,500 members to the current 9,500, of which 7,500 are "active" at any given time. In terms of stats, 100 new members are approved to join the closed group each week, and monthly we see 2,500 plus posts, 30,000 comments and 50,000 likes (or reactions, as Facebook calls them).

Obviously, engaging within the group is paramount to community building such as this, but there must be a framework within which that engagement takes place. The same applies whether it's a business extension or a community project; leave it to run riot and your group will tear itself to pieces.

Thankfully, Facebook is listening to power admins and adding tools to help. My top five tips are:

1. Use the rules feature to set boundaries of acceptable behaviour, and don't be afraid to impose them.

2. If you do delete a post or eject a member, use the notes facility from the admin activity menu to explain your reasoning. This can help if there are queries or appeals, especially in a very busy group such as mine.

3. Make use of the group insights resource to spot any downward posting trends to formulate ways to combat these.

4. Take full advantage of the new announcement feature, if it has reached your group, which does away with the old one-pinned-post-only restriction.

5. Add value to your group by using the newly added mentorship programme facility, which helps members build relationships and support each other. It's great for technically orientated groups.

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STEVE CASSIDY

"This is the field where the more power you can deploy, the more likely results will be accurate"

Steve wonders why you need two days of supercomputing power to work out the effect of a peloton, and attempts to make older Macs work better

If there's one consistent trend in business networking these days, it's that everything is bigger. From the vantage point of the long, hot summer of 2018, it's easy to see the reason. The Internet of Things has come of age in the past couple of years, making all the preceding efforts at computing and storage seem puny, shrunken, introverted little projects. IoT is a monster, no matter what your business or your intended purpose.

Take the guy I met who made wire for windings in electric motors: billions of kilometres of the stuff. His IoT project was all about industrial sensors, of which he had an average of 20 on each wire-making machine, of six distinct types. Just for a bit of wire!

Since then, my rule of thumb has been that initial estimates of the size and nastiness of a problem, when the world of computing has to suddenly handle data from the world of everything else, will definitely be wrong. Even seasoned IT types should tread carefully, because the old rules about data provided by humans tend to be limited by input speeds (typing, and so on) and get a free ride from pre-processing. By that I mean, "press a button when you see a green car" is an easy instruction to give a human – but turns out to be hugely difficult when the button-presser is a machine.

Taking people through the things that are possible in computation, and the things that lay forever out of reach, remains a concern. The simplest example is network traffic analysis. Everything that traverses a network comes from a computer of some kind. So it's a known format and presentation, and it isn't an analogue value – it's a digital file-dump of predefined bits, like a pile of LEGO on the bedroom floor. Nonetheless, network traffic analysis is like taking a cool drink from a blasting fire-hose.

Or consider this non-tech example. Walmart gives its customers discounts, using vouchers printed in magazines. It turns out to be utterly impossible to figure out which magazines you should buy, and when, to maximise the value of vouchers. Not just difficult to present as an algorithm: this one is marked as "not going to be amenable to analysis at all". It's one of those odd limits that isn't about CPU power or human intelligence.

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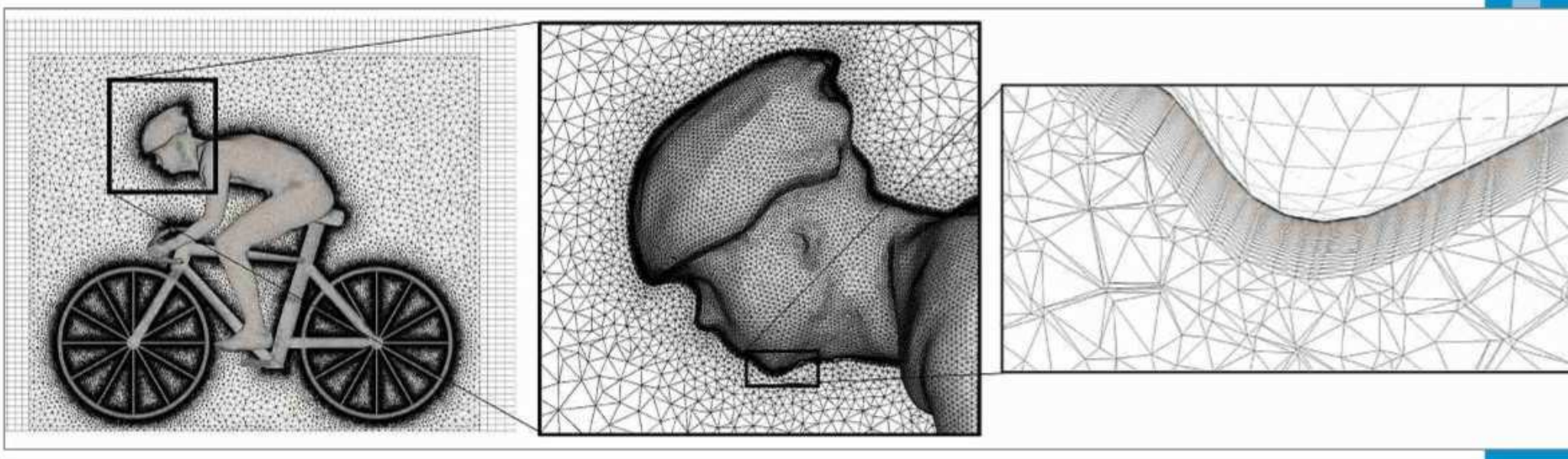
@stardotpro

So when I received an invite to the University of Eindhoven, to take a look at its hybrid project to evaluate the aerodynamics of a group of racing cyclists (or peloton), I was genuinely open-minded. This could be a cycle nerd thing, a wind tunnel thing, or a complete red herring thing. As it turned out, it was much more interesting than any of those, because it's a supercomputer thing.

The question posed by Professor Bert Blocken was easy to understand. Cyclists are aerodynamically messy, with all those flapping limbs, whirling pedals and spoked wheels. Cyclists know this, and development of funny-looking carbon fibre egg-like fairings goes on apace to solve the physical problem. However, in pro cycling, the regulator is king, and the regulator

BELOW Cyclists know they expend less energy in a large group of cyclists, but how much less?



says leave the draggy naked-bike shape and the rider as they are. This has resulted in the creation of the peloton, because riders and team managers have been reasonably sure – on an empirically assessed basis – that in the middle you get much help from the slipstream of the riders around you. How much, exactly? The sport says 50%, maybe.

The approach taken at the University of Eindhoven was to treat this as a computing job: the relevant discipline is called CFD, or computational fluid dynamics. Much beloved by those with very large computers to sell, this is the field where the more power you can deploy, the more likely it is that your results are accurate. This makes the software you use curiously detached from the precise nature of the problem. You can model the flow of oil in a tube with the same product that Professor Blocken and his team used in this simulation. How did they do it?

Easily described, again. The lead PhD researcher sat on his racing bike, and the researchers 3D-scanned him and the bike. Then they laid out that model in the virtual wind tunnel of the simulation, making 121 copies and laying them out in a peloton-like formation. CFD's consistency of approach across disciplines then governed their decisions over how many data points they wanted. That is, how many specifically designed volumes of air they wanted to track, to make up their model. You can see the 2D interpretation of these regions in the picture of the anonymous cyclist's helmet and face on this page. As a general rule, the closer to the surface of the object, the smaller the cell used by the model.

So let's see what this does to my point about people mis-estimating the scale of a computing project that models or receives data from the real world. 121 virtual cyclists, all identical. How many cells were in the resulting CFD model? No cheating. See what your intuition leads you to. A few thousand per model, times 121… can't be that big, right? The answer is, three billion. This is currently the world's largest computational fluid dynamics model, requiring 54 hours of runtime on a Cray supercomputer the size of a music festival toilet.

The assembled journalists were possibly somewhat heat-stroked at the start of the summer of 2018, because the questions floated to and fro, between the rules and habits of competitive cycling and the metaphysical limits to computation. The most relevant question was from a sports writer, who pointed out that cycle racing isn't so regulated that all the riders are identical, and with the figures coming out of both the model and the matching wind-tunnel tests, this might be enough to neutralise the proposed gains. Whirling feet and legs, different physical statures, bike design: each factor is worth a few per cent. The riposte was that both the model and the real-world data point to expending only 10% of the effort required if you're in the middle, at the back of the peloton, compared to riding on your own.

This might mean something for cycle race freaks. I confess that while this seemed like a revelation to the sports reporters in the room, I was still boggling over the IT project part of the story. Mostly my astonishment was in the horsepower-to-findings ratio. Two full days on a Cray with a decent amount of connected storage is more time than it takes to do a weather forecast for a large swathe of the Earth's surface.

I'm sure that Cray would demur and point out that there's a lot of customisation of the machines for each job. I don't think that reduces my point at all, due to the opposing, simplifying force and universal nature of Ansys – the CFD modelling tool used in the project. You could approximate the model with much fewer points on much smaller hardware, but then you wouldn't get the attention from the CFD community in academia and business. And no doubt there was a bit of grandstanding here – because CFD is a field where the same basic maths can be re-applied in different models of reality. If you get yourself a reputation in one field, you can easily apply what you've learned to others.

ABOVE The university used computational fluid dynamics to work out the effect of the peleton

"Network traffic analysis is like taking a cool drink from a blasting fire-hose"

BELOW What better location for cycling research than a university in Holland?

This is a pretty consistent trend in supercomputing. When you look around at the bigger players, you find they're bursting with pet projects. Cray sent a couple of people to the press conference in Eindhoven, because while its normal stomping ground is weather forecasting and analytics out on the edge of what's possible, it still makes sense for the company to show an interest in more esoteric fields of research and computation. A discussion about cycle racing spreads across businesses, which otherwise would be terrified of losing their competitive edge if they even said a word about their own internal modelling projects.

If you're a guy in a business trying to make a product work better with materials or performance modelling, then I know this looks like an unattainable, extreme, academic exercise with no relevance to your business, problem or, indeed, budget.

For me, there are two takeaways here. The first is that initial estimates are remarkable mainly for their inaccuracy, and this project is a great thought experiment to put in front of those who might not stay awake through the complexities of a fully detailed, business-grade modelling presentation. The other is that the limits to maths are far closer than we think (so there's proof of the initial estimate problem, too), and therefore the limits to computing are still going to be a problem – and a field rich with opportunities for the forseeable future.

More unsung heroes

Let's hear it for the older Mac aficionados. It's hard to recall how productive people could be,

especially in the design world, working on Macs whose CPUs would these days come bottom of a comparative review of smartphones. I still have a Mac PowerPC tower sitting in the basement, saved because it has installs of all the mainstay applications from back in the day: Quark, InDesign, Photoshop, Illustrator… The older versions aren't licensed like the modern ones, which makes the temptation to keep those old fossils staggering along rather too strong to be denied.

There's very little reliable information on how long such a machine should last, and what you can do to help it. On the basis of the response I've had to my recent "Unsung Heroes" roundup on Windows utilities, and the equally surprising longevity of a piece I wrote on **alphr.com** on how to revive your ancient iPod, here are a few top efforts for Mac users who want to extend the life of their hardware.

First off, disk duplicators. You can't be in the life-extension business and be on your original hard disk, and the Mac is no exception. There are two contenders: SuperDuper! (**shirt-pocket.com**) and Carbon Copy Cloner (**bombich.com**). Those who are students of the software business will have noticed that these two lifelong competitors share a somewhat cantankerous attitude to meaningful website domain names. Also, they share an odd blind spot, in that neither explains the way Macs format and partition their disks and how this affects the backup and restore process.

This isn't necessarily about GUID partitions: it's the general observation that you can't fully clean up an ex-PC hard disk for use in a Mac, new or old. This applies across SSDs, laptop drives, even the hybrid SSD/spinning types that get called "Fusion drives" by Mac types. They all have to be cleaned before they can be used – by a PC. I believe this tiny gap in the toolbox on Macs is the genesis of the first wave of malware cleanup utilities, because messing about with a few bytes in the boot blocks of a hard disk ought to have been fixed 10 to 15 years ago.

But it hasn't been. Neither backup utility lets you handle the problem inside its own menus, which drives people to look for any solution that isn't typing "clean" into the command line interface to the Windows DiskPart utility on some mate's PC.

Sadly, there are also departures from this sector in areas that remain useful and will be sorely missed. I was a fee-paying customer of Coriolis Systems, mostly for iDefrag and iRamDisk – two utilities that definitely rescue an Apple machine that's used every day, but which plainly have suffered from lack of upkeep themselves. If you look for Coriolis now, you'll see that the firm is concentrating on audio enhancers. iDefrag is at least still findable.

Simple downloads such as these set expectations among users, and by doing so opened the door to unprincipled developers, who majored on snooping around your machine, but didn't do too much to actually help you. While the App Store in macOS was an almost-immediate solution to malware overnight, that doesn't help those trying to keep ancient Macs staggering on. Many of the machines I see are restricted from running a late enough release of macOS to give access to the App Store. So you have to take a look at the traditional resources for finding helpful utilities. And this month at least, Google is showing up a new player on the block: **macpaw.com**.

Trying MacPaw's cleaner app was a bit of a blast from the past. It folds together several older utilities actions. In particular, MacPaw gets rid of languages you aren't using, which is a straight copy of Monolingual. PC users are a tad incredulous when shown how much space of a Mac boot disk is devoted to unused language files. Combining a run of Monolingual and a defragmentation utility could produce remarkable improvements on an ancient Mac. MacPaw's features seem to be closely aligned to that whole ancient machine experience. It knows about the spread of junk files that arise from years of use, and makes reassuring statements about cleaning up after apps are removed rather better than the standard processes permit.

ABOVE The quality of third-party utilities for macOS is still too variable for my liking

"You can't be in the life-extension business and be on your original hard disk – and the Mac is no exception"

But I tried MacPaw on my old machine – a Mac Pro 2.1 with two four-core Xeons, courtesy of a decommissioned HP server and an Nvidia Quadro graphics card – and almost immediately took it off again. The reason is one of those problems that actually dogs everybody in the modern world: actually verifying the cause of a problem. In my case, after using MacPaw, my machine displayed a tendency to slowly but surely ramp up the graphics card fans as the day went on. I'd taken advantage of the fact that many appropriately aged Nvidia cards sold for PCs include Mac-capable firmware, too, and so my old machine is quite souped-up for graphics. That means double fans and a well-capable heatsink.

Post MacPaw, those fans have been putting in a lot of work. Slowly rising graphics card heat is a sign of the modern scourge of Bitcoin mining, embedded within some component you've downloaded. If I'd tried the application on the "Upstairs mac", which is some three generations later, the greater efficiency of the graphics card would very likely have masked the effect entirely.

My problem is, old or new, unsung or otherwise, it's remarkably difficult to get good traceable trails of infection out of any machine these days. I don't want to have to start monitoring the network traffic of the machine, despite having a hardware LAN tap and the relevant install of Wireshark to hand, because emulating how a regular single-machine user could resolve this dilemma is part of my brief. I'd like to say I've found a new breed of unsung hero but, as we go to press, I can't say for sure that MacPaw is the source of my problem or the resolution to it, after a few more rounds of cleaning and de-junking.

Despite the moves made by Apple to resolve this kind of diagnosis gap, with an App Store and digital signatures, it seems to me that life for the older Mac aficionado hasn't been getting any easier.

BELOW Got an old Mac? It isn't easy to keep it going

cassidy@well.com

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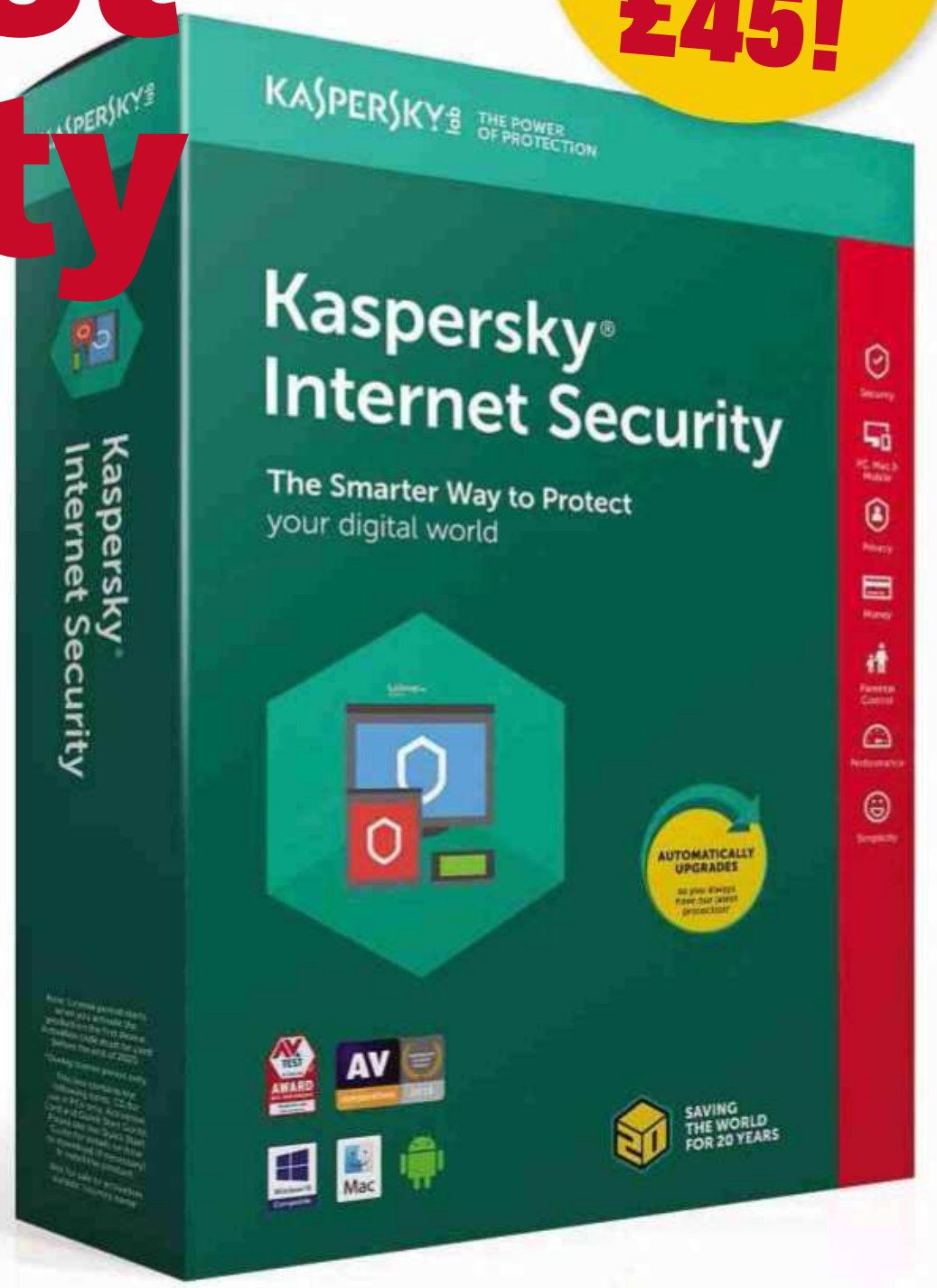

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Futures

We explore the trends and technologies that are set to shape the future

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Space race!

Can spaceports prop up the industry after Brexit?

Might investment in spaceports and tie-ups with the Americans keep Britain's space industry afloat post-Brexit? Nicole Kobie examines the future of UK space

Space is, by its nature, international – so Brexit has some in the industry worried.

It's already sparked disputes between British negotiators and those on the continent around the Galileo satellite, and whether the UK will have access to the secure feed after Brexit – under current rules, the answer would be no, potentially leaving our security services out in the cold. And Airbus has warned that a "no-deal" version of Brexit could force the manufacturing giant to move its plants to Europe – a serious concern, as it employs more than 14,000 Brits.

As we don't yet have a Brexit deal, the full impact of departing the EU on our space industry isn't known. "To some extent, we all know that it depends on the deal," said Professor Alan Smith, director of space domain at University College London. "I think at the moment, a lot of industry – particularly Airbus – is waiting to decide what to do."

He added: "The situation with EU-dominated projects means we'll be marginalised... that's going to be pretty bad for the companies involved in terms of access."

There's a glimmer of hope with the long-awaited arrival of spaceports. The government has shelled out £2 million to develop a trio of horizontal launch sites in Cornwall, Snowdonia and Glasgow, and £23 million for a vertical launch project in Scotland with Lockheed Martin.

That initial funding is small, but the payout could be astronomical. If successful, the Cornwall project alone could create 480 jobs and boost the local economy by £25 million a year, and the wider economy by £1 billion by 2030, according to predictions by Spaceport Cornwall. The British government predicts that spaceports will be worth £3.8 billion to the UK economy over the next decade. In other words, winning this race could come with serious rewards – right at a time when the industry needs it most.

"The British government predicts that spaceports will be worth £3.8 billion to the UK economy over the next decade"

Are spaceports enough to fill the post-Brexit gap? Dr Bowen Bleddyn, lecturer in international relations at the University of Leicester, agrees that the pace has been too slow and the funding too small. Such launches, if they happen, are small beans compared to the European work the UK stands to lose post-Brexit.

"It's something the government and the space sector in the UK have been talking about for the best part of a decade, so in general it's good news

that money is actually being sent to places now," he said. "The only bad thing about this initiative is it's a bit late, and a bit small-scale. If they really want to do it seriously, they should be investing more and going at a much faster pace."

Finding new friends

This may not be a problem money can solve, argues Professor Smith. Space is an international club, and we need membership. "Going it alone, even with resources, isn't the same as being part of a club where you can cherry-pick around Europe for the best people and the best in industry to do particular jobs," he said. "That's a worry, in particular for space science. We're not big enough to be out there in the cold; we need to be collaborating with our European partners."

There are, of course, other markets, notably the US. But that comes with challenges of its own, said Bleddyn. "If Britain is going to get close to the military-industrial complex of the US, with companies like Boeing, the ITAR regime might cause problems for British space industry." ITAR is the International Traffic in Arms Regulations, which limit where products developed for military use can be sold or bought.

"If the UK is going to be doing more with Lockheed Martin and other US satellite companies, that might put more restrictions on what Britain can do," he explained. "ITAR means a lot of American satellite components and systems can't be sold on the market, because they're classed as munitions or weapons-grade systems. That might cause problems with how much Britain could open up its spaceports... if it keeps getting close to the American military-industrial complex."

Micro success

While spaceports alone might not be enough to prop up the British space industry, there's plenty we are good at – and there are areas where the Scottish and Cornish launch pads could help.

It may come as a surprise, but Britain specialises and leads at building small satellites. "The rest of the EU and US are behind Britain at small satellites and manufacturing, but they have the resources to catch up in the next ten or 15 years," warned Bleddyn. "Britain needs to stay ahead of that curve, and keep its niche strengths, as that's the only way small space economies maintain their position."

Orbex was one of the beneficiaries of government funds, alongside Lockheed Martin. It was handed £5.5 million to boost its plans to use cheap and efficient rockets to send small satellites into space from the Sutherland port. By 2021, it aims to launch its Prime rocket, which the company claims emits 90% less carbon than rivals and won't leave orbital debris behind. CEO Chris Larmour said in a government-issued statement that it hopes to "transform the UK into an important hub for commercial space launch operations".

While we face what Smith describes as an "uncertain future", Britain at least has a good starting point. "At the end of the day, the UK is extremely well placed in space – we play far above our place in space, and we just need to play this carefully."

ABOVE US firm Lockheed Martin is developing a Scottish spaceport to launch orbital rockets

LEFT Orbex aims to launch its cheap and efficient Prime rocket from Scotland by 2021

The race to be the first British spaceport

"The countdown to the first orbital rocket launch from UK soil has officially begun," crowed Patrick Wood, Lockheed Martin's UK country executive for space. Wood was talking up the company's plans for the UK's first spaceport in Scotland – but there's competition.

The government started talking about a British spaceport back in 2014, when it earmarked eight possible locations for conversion by 2018. But in 2016, the competition ended without choosing a location; instead, regulations would be tweaked to allow any suitable spot to be used under a licence. In March, the Space Industry Bill was passed, allowing spaceports in the UK for the first time.

Since then, two leaders have emerged in a race to become the UK's first spaceport – a vertical site in Sutherland, Scotland and a horizontal launch site at Newquay. The Sutherland location is being developed by Lockheed Martin and will enable vertical orbital rocket launches by the "early 2020s". It's being propped up by £2.5 million from the UK Space Agency.

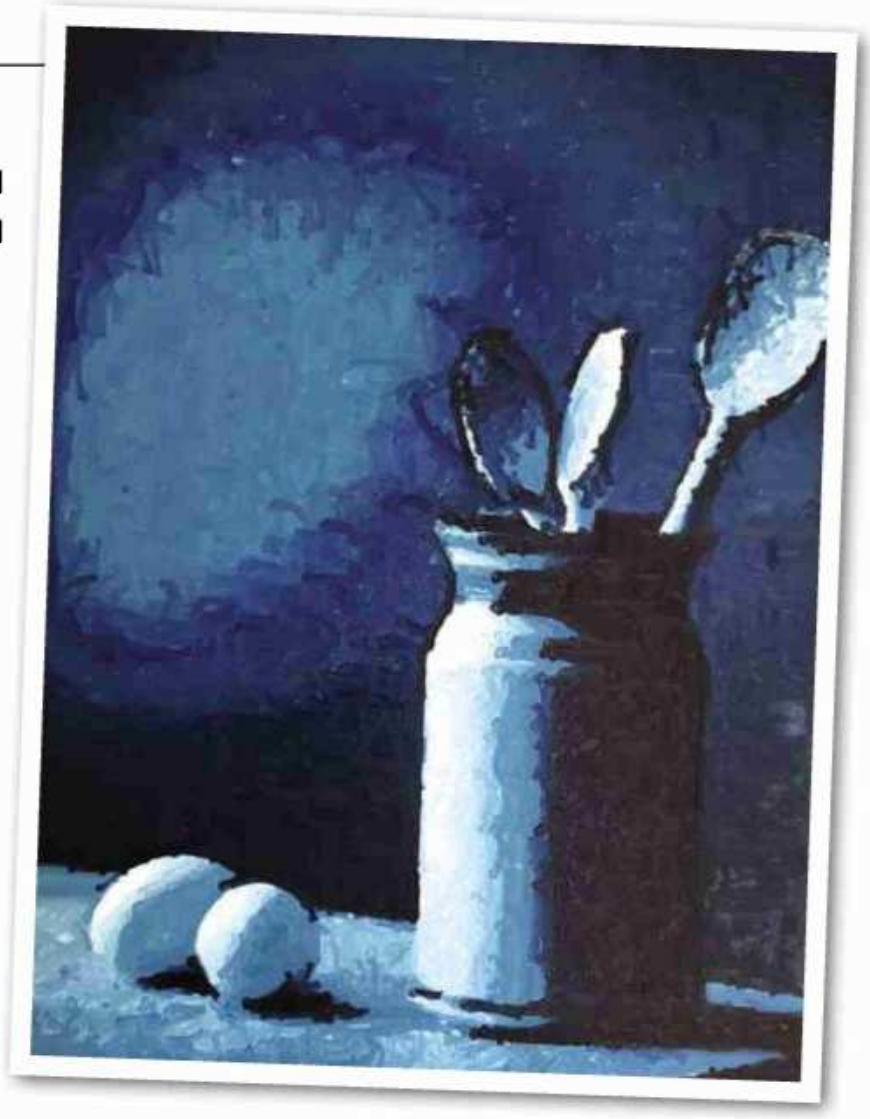
RIGHT Spaceport Cornwall is working on a horizontal runway, which Virgin Orbit plans to use

Further south, the Spaceport Cornwall project is working on a horizontal runway, which US-based Virgin Orbit plans to use by 2021. The aim is to use a Boeing 747-400 to lift a rocket to 35,000 feet over the Atlantic, where it will head into orbit with a satellite. The other two horizontal launch sites are sharing a £2 million development fund, with the aim to launch satellites and suborbital flights.

As exciting as space planes sound, it's a slow-moving race, says Professor Smith. "Spaceports [are] moving at a snail's pace. Three years ago, they were about to announce where the ports would be," he told *PC Pro*, exlaining that companies could build a spaceport in a couple of years. "We seem to be in the usual British way of finding it very difficult to make these big decisions."

Paint by numbers: judging robot art

Is art painted by robots any good? Andrew Conru runs an annual competition to find out – and most of us wouldn't mind hanging the results over the sofa



RIGHT This "still life" is a reinterpretation of a black-and-white photograph by PIX18, an oil-painting robot built by Hod Lipson of Columbia University

COMPOSITION, TECHNICAL ABILITY, artistic merit. The winning painting of an annual art competition, a reinterpretation of Cézanne's *Houses at L'Estaque*, has all three. And while the artist behind the work is a human, Pindar Van Arman, the painting was done by a robot he designed and built.

Echoing the impressionists who set up their own salon for judging their innovative paintings in the 1800s, Andrew Conru founded RobortArt, a competition to judge the work created by human artists teaming up with robots and algorithms. "I started trying to answer the question of whether or not robots can create something beautiful," Conru told *PC Pro*. The answer is yes, but humans remain heavily involved in the process, coming up with the idea, training or programming the algorithm. Only then does a robot arm "with gobs of paint" start decorating the canvas.

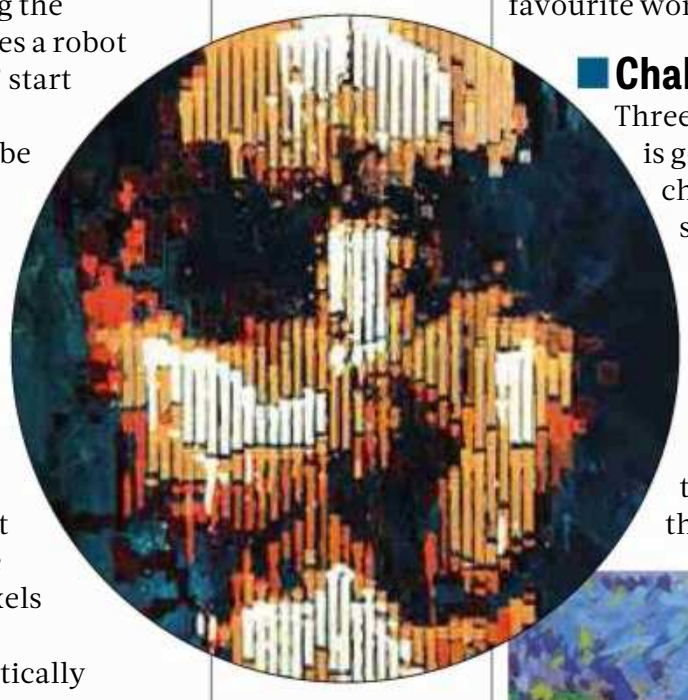
While a machine can be programmed to do exactly what the artist wants, algorithms can also study what we find beautiful and try to mimic it. "There's lots of machine-learning and neural-network products that are taking a corpus of a bunch of art and then trying to figure out what elements of pixels on the screen produce something that is aesthetically pleasing," Conru said.

The next step is getting it from digital display to canvas. That could be using a robotic arm to layer each colour on, or to develop software that analyses the idea and translates it into brushstrokes. Some projects let the robot painter have more leeway, and correct its work as it goes, teaching it via a corrective feedback loop.

Creative robots

Of the almost 100 teams that have entered the competition, "the ones that stand out tend to be the ones that use a more traditional idea of a robot arm holding a brush," said Conru. "But we have a lot of creative ones that are using drone technology or using brainwaves for brushstroke systems, ones that are really pushing the envelope."

BELOW This portrait by Pindar Van Arman's CloudPainter was entirely "imagined" by AI, with feedback loops to make adjustments

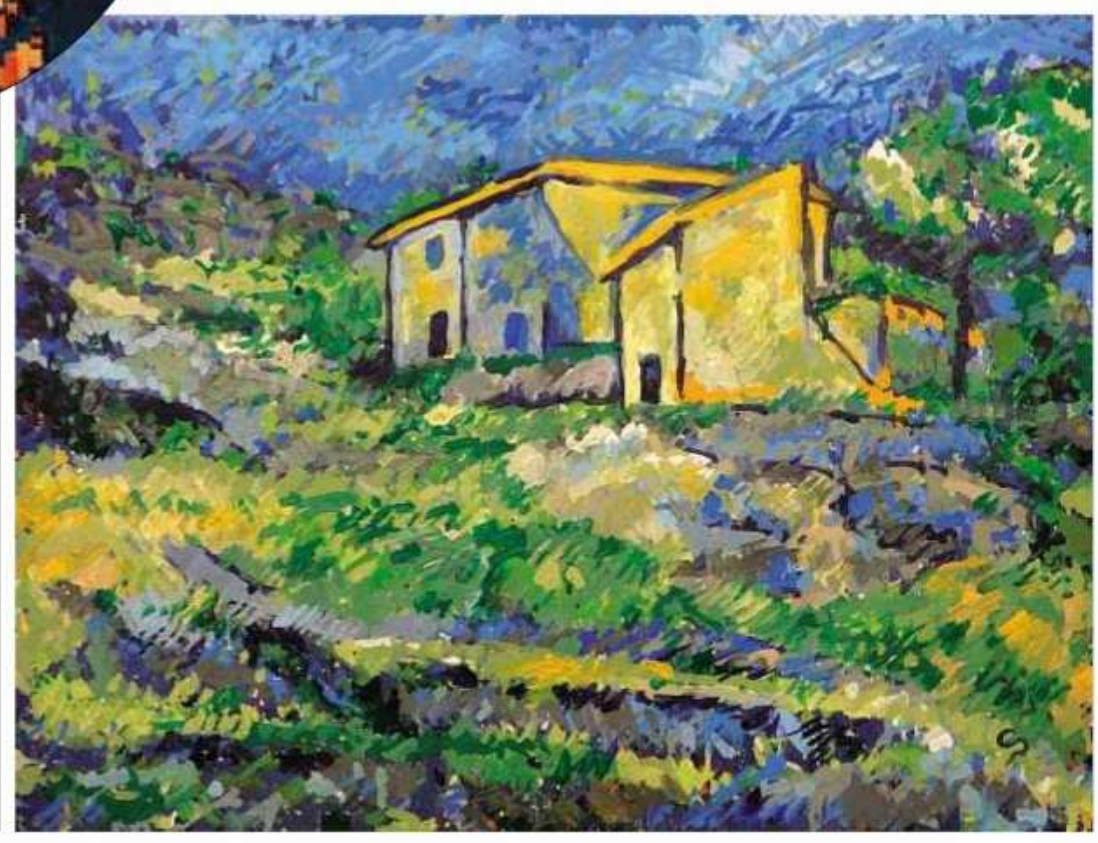


Judging the work is no different than looking at art in any gallery, he notes: "If you have something created by a robot and something created by a human, can you get a similar aesthetic feedback loop? Does it look beautiful to you and did you get an emotional response? If so, we think that the artform has achieved a level of validity." Alongside a panel of judges, Conru also opened up votes to the public, with registered users given ten votes to distribute to their favourite works.

Challenges

Three years in, the art is getting better, but challenges remain. "The sophistication of some of the art is improving, but we were definitely waiting on some of the hardware to catch up with the software side," he said. "It's funny when the biggest limitations that artists have is actually getting their hands on an easy-to-use, functional robot arm." Cost isn't the only hurdle: some of the user interfaces on the robot arms aren't exactly easy to use – and plenty of would-be robot painters aren't tech-savvy enough to work their way through confusing systems, Conru said.

He hopes less expensive, easier-to-use robotics will spark a revolution in augmented painting. "It's kind of like when the web came out and made it really easy for somebody to create a web page, that kind of opened the door for a lot more creativity to happen," he said. "We're seeing similar things happening here. There's not yet a $5,000 robot arm that artists can use easily, but we're hoping for it." When it does, expect it to be a real Monet maker. (Sorry.)



RIGHT This reproduction of Cézanne's painting *Houses at L'Estaque* helped CloudPainter, made by Pindar Van Arman, win this year's RobotArt top prize

What is... Voatz?

The smartphone voting system uses the blockchain to secure votes, which has plenty of researchers worried. Perhaps the future of democracy still isn't digital

Voatz is a smartphone app that uses biometrics to verify identity for "secure" voting. The startup's technology has already been trialled in West Virginia primaries, and will also be used in the state for this year's US midterm elections – albeit limited to soldiers serving overseas.

There's been plenty of calls for digital votes — we're all too lazy to take ten minutes to swing by the local polling station, apparently — but security concerns have largely held back such efforts. And imagine the chaos if an election was interfered with. Oh, wait...

How does Voatz work? The startup says voting by paper "is frustrating and time consuming". Its solution uses your smartphone, with voters not only verified by email, phone number and photo ID, but also by fingerprint and retinal scan. The vote is held on a blockchain, and not just any blockchain: one made on the Hyperledger framework, originally developed by IBM, that's now been open-sourced to The Linux Foundation. "It makes fraud practically impossible," a video on the Voatz site claims.

What are the security problems? At its simplest, internet or mobile voting is fraught because it widens the "attack vector" – there are more ways for something to go wrong, more weak points to hack, and more potential victims. To meddle with paper ballots, you'd have to visit every polling station. If you're interfering with a digital vote, one successful piece of malware could swing it. As a *PC Pro* reader, you might be able to spot malware lying in wait on your phone, but would you gamble the next election on everyone keeping their smartphone secure?

We bank online, why not vote? Banks keep records that track your transactions against your name, so you can query any activity later. But because elections require a secret vote, there's no way for an individual to check their vote was correctly cast after the fact.

At least it saves on paper, right? Not quite. For a previous, smaller pilot in West Virginia, each smartphone vote was printed out onto paper and counted like a mail-in ballot, to create a paper trail for auditing purposes. We can imagine a similar routine in the future.

What other challenges are there? To vote in the UK, you don't need to present a photo ID. While there have been calls to require that, amid concerns of voter fraud (which is rare), doing so could disenfranchise groups of people less likely to have a passport or a driver's licence. Plus, while the majority of Brits have smartphones, some don't, and Voatz only works with smartphones that have "the latest security features". If your grandma is on an ancient Android, she may well not be able to vote.

Where could this be useful? Given what's at stake, perhaps public votes for political leaders isn't the best use case for Voatz. But it may be useful for ballots that are less likely to be targeted by hackers. The company suggests it could be used for university elections or shareholder meetings or, as is the case in West Virginia, for overseas voters such as soldiers. Those might be less risky places to trial such an idea, without the potential fallout that would come with messing up a national election.

OPINION

Nicole Kobie

Automation should make us work better, not just harder

We've heard time and time again that robots are coming for our jobs. Back in 2013, a University of Oxford study predicted that almost half of American jobs were at risk, and ever since report after report has either claimed a) the automation revolution is coming, run for the hills! Or b) calm down, Luddites, technology makes more jobs than it destroys.

Automation is already creeping into working lives, but physical robotics and AI-powered bots will do more than help with filing. They'll change the very nature of work, for good and bad. Nurses won't have to lift so many heavy objects. Logistics workers need not pick every item from high shelves. And I won't have to transcribe notes any more – already automated services such as Descript and Otter will listen to my interview recordings and make notes, even if they keep putting my name down as "polka". No, I don't know why either.

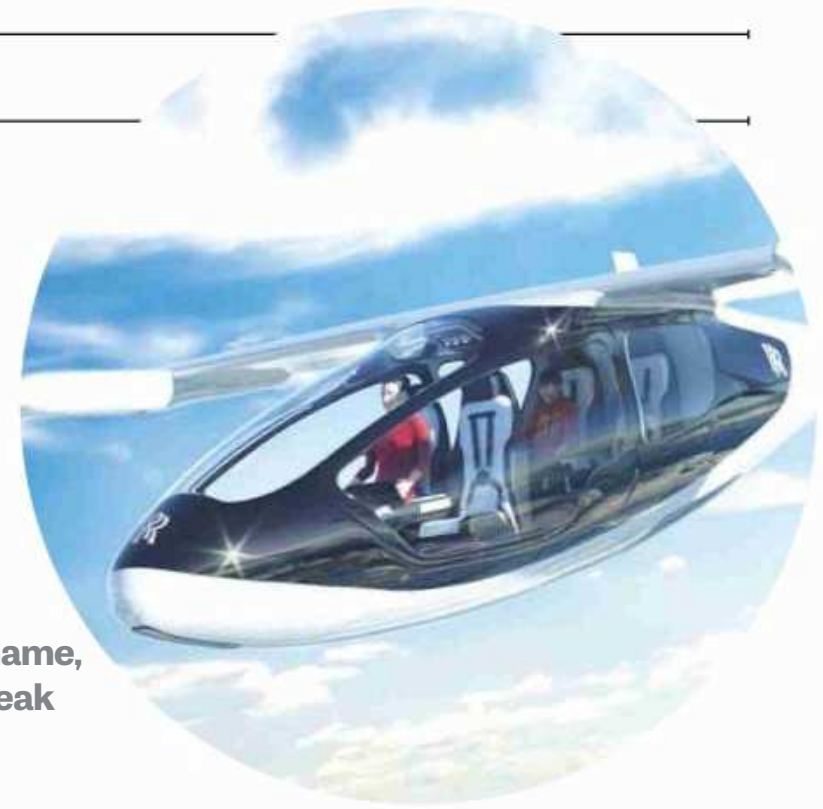
Of course, automated transcription is terrible news for those people making their living that way, but for me it would remove a chore and free up time. What would I do with that time? If removing transcription from my to-do list means I can spend longer on stories, talk to more experts, and consider my words more carefully, it's of value. If it means I can take more naps, spend more time with family and friends, or take up a hobby, it's also of benefit. But if all automation does is push me to work faster and harder, what's the point?

This isn't a new phenomenon. The internet made research much easier for journalists, reducing the need to make phone calls, knock on doors and meet trusted sources in pubs (darn). But it also contributed to the destruction of the industry, with churned-out stories full of nonsense, fake news, and poorly paid workers. The advent of computers surely did the same.

Let's do better this time. Automation could give us a four-day work week, or easier, better jobs and better output. Rather than panicking that robots are going to take our jobs, let's use automation to create work we want to do, and do it better.

@njkobie

Q&A Rolls-Royce looks to the sky with "flying car"



The electric vertical take-off and landing vehicle may not have a snazzy name, but it's a flying car that uses electric power to fly at up to 250mph. We speak to Rolls-Royce's Carl Bourne about why it could replace helicopters

FLYING CARS ARE a classic bit of future tech: they highlight the fantasy and imagination inherent in engineering creations that don't yet exist, as well as the hype around impossible products. We've been promised flying cars for decades, but we're still driving around on the ground.

Uber has laid out plans for a skyborne taxi, and Google founder Larry Page is developing a "personal flying vehicle" as a side project, but neither have history in aircraft – unlike Rolls-Royce. The British engineering and manufacturing firm knows exactly how to build a flying machine, so there's no wonder its concept "car" sparked attention when shown off at the Farnborough International Airshow over the summer.

Officially known as the electric vertical take-off and landing (EVTOL) vehicle, the concept uses gas turbine technology to generate electricity. This powers six propulsors, designed to be quiet when operating. An onboard battery stores power generated during the flight by the gas turbine, so no recharging is necessary. The wings rotate after vertical launch, folding out of the way once cruising altitude is reached.

The hybrid flying machine concept could carry up to five passengers at speeds of 250mph, and Rolls-Royce predicts it could be available by the early 2020s for personal transport, logistics or military use. Carl Bourne, VP for strategy and intelligence at Rolls-Royce, explains why the EVTOL is such a clever idea.

How does the EVTOL work?

The most striking thing about the technology is its propulsion. Traditionally, aircrafts have been powered mechanically, with a heat engine. In the airshow at Farnborough, we're using electricity as the propulsion form. So, we have an engine on board the vehicle that generates electricity. We can generate and use electricity in a novel way, [which] allows us to distribute the way energy flows around the vehicle and we can use propulsors in a way that allows us to reconfigure what a vehicle does.

Why is it useful to change the shape of the vehicle?

When we're flying in a forward mode, we can have propellers mounted to the back; when we want to land, we can reconfigure the vehicle. It's relatively easy to change the vehicle's shape and its form, and we can use that to take off and land vertically.

It's a tilt-wing configuration, so when we want to land or take off vertically, we can literally point the propeller straight up and the vehicle configured in that format is like a helicopter. And we can use electricity powered from the engine – and also supported by batteries – to allow the aircraft to take off like a helicopter. When it gets to cruising altitudes we want, then we can tilt the wing to look more like a conventional aircraft and then fly that way. That allows us to have the best of both worlds.

Who is this for?

Initially, we're looking at intercity missions. If somebody wants to fly from, say, London to Paris, then we could provide a platform potentially lower-cost than a helicopter, more efficient than a helicopter [and] an easier fly. That sort of vehicle could cater to a number of different helicopter markets today, so things like paramedics and potentially military applications.

The best way for us to understand what will happen is to actually start to engineer possible products. We looked at what others were doing in the space, things like the Uber initiative, and we can see what they're trying to do. We've also spotted what we thought was a gap in the market, in terms of looking at aircraft which were more capable, which could fly further, which could fly faster. There's already a market for those type of vehicles today... and ultimately, if the technology proves itself, we can attract other markets and other customers.

ABOVE Rolls-Royce's concept "car" reconfigures its shape when taking off or flying forward

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LABS

Tablets

As Android tablets get better and cheaper, are iPads still the obvious choice? We put 12 tablets to the test to find out

FEATURES

Virtual private networks: the expert's guide

From which VPNs to choose to how to set up your own, we reveal how to make the most of a virtual private network

Time for ebooks to turn a new leaf?

Ebooks have largely failed to exploit the benefits of digital. But that's all set to change, finds Nicole Kobie

The perils of digital divorce

You can now complete a divorce from your smartphone, but what does it mean for the future of marriage?

Please note: Labs and features are subject to change

If you're tired of new hardware, wonders Jon Honeyball, are you tired of life?

Have we reached stagnation in computer technology? It's a question that I ponder all the time these days. I've been testing laptops and PCs since 1986, and that's over 30 years. There's probably only a handful of PCs since the dawn of the PC era that haven't gone through my hands. Much the same can be said of tablets, and most of the smartphones out there.

I'm particularly interested in the cutting edge – as soon as something comes available, we have it in the lab. So you would expect that I would be at the "staring off into the abyss" of that cutting edge on my personal devices. In the past that was true – in the 1990s, I was one of the first to bring multi-CPU Windows NT desktop computing into the high-end mainstream. I remember buying an Asus motherboard, and two Intel Pentium Pro 100 CPUs. They were around £800 each, which was enough to buy a semi-detached house at the time. In 1990, I complained to Samsung that my newly purchased S800 386/20 desktop couldn't be expanded beyond 8MB of RAM because the company hadn't got around to building the expansion card that took it to 16MB.

But I have just looked around my desktop. In front of me is a first series iMac 5K 27in, which Apple dates as "late 2014". This is my daily workhorse. To my right is a cylindrical Mac Pro, which Apple says is "late 2013". My main laptop is an i7 MacBook Pro, which is about four years old. My Microsoft Surface Book is the original version from two years ago. I wear an Apple Watch 2, not a 3. My phone is an iPhone 8 Plus, and that only replaced a 7 Plus because my husband's 6 had died so I moved it down the family hierarchy. I bought an iPhone X and decided I didn't like it. It's now used in the lab as a scratch iOS device, powered up when needed.

I used to have huge servers that sat in the corner and hummed loudly. Now my definition of a server is a Synology NAS box stuffed with storage; any large computational power I might need is available for rent in the cloud.

And I was left wondering if I had actually lost my mojo. Had the definition of a "Honeybyte" from years past simply slipped into obscurity?

To find out, I loaded up my shopping basket. A new iMac Pro would be nice – especially one with the 18-core CPU, 128GB of RAM and the 4TB SSD options. There would be almost no computing tasks that this couldn't master, and it would last me for the next five years. But £12,279 inc VAT? Maybe not.

How about replacing the laptop with a new 15in MacBook Pro with 32GB of RAM and 4TB of SSD storage? Hmm, the £6,209 inc VAT might be an issue. A newer Apple Watch? The one with built-in LTE support? Great, but it probably wouldn't work any better than my Watch 2 out here in Fenland, where LTE support is patchy at best.

How about a shiny Microsoft Surface Studio instead of the iMac? Even the recent price drop to £3,225 from £4,249 isn't enough to convince me, and indeed suggests an end of life product.

The reality is that what I have does everything I need, and newer versions add nothing to the mix that are killer improvements. The touch bar on the MacBook Pro looks gorgeous, but doesn't really help day to day. The Surface Studio is lovely hardware, but it's hobbled by Windows 10. The iMac Pro is yet another iThing of beauty, and would run everything in Parallels and VMware with aplomb, but is it really any better than my current 32GB RAM version?

> "The reality is that what I have does everything I need. And newer versions add nothing to the mix"

And therein lies the problem. In any meaningful sense, the prices aren't unreasonable. That dual-CPU motherboard from 1995 would be some £4,386 today, and that's ignoring the large Sony monitor I had flanked by two Silicon Graphics TFT panels. Or the RAM. Or the storage or all the other bits.

So the issue isn't really the cost. The problem is that they don't do anything any better than my serviceable hardware. And this is a significant issue for the industry. If a power user such as myself can't find any big reason to upgrade, then the best that the industry can do is try to end-of-life hardware as quickly as possible. Look at the moves by Microsoft relating to some Intel CPUs, or how Apple pushes people onto the newest version of its OSes. Of course, there are upsides – an up-to-date OS means better security. But at some point, people will cry "enough is enough". In the lab we have an early MacBook Air, probably the first generation. It won't get the next version of macOS, because it lacks apparently critical hardware components. Well, it works just fine today doing the basic workload of email and Excel.

So will I be tempted to crack open my wallet and indulge my power fantasies with new hardware? Unless the hardware has been deliberately end-of-lifed by the OS, I can't see this happening. And that thought leaves me perplexed. Or is it just a sign of getting old?

Jon Honeyball has been a contributing editor to *PC Pro* since its launch in 1994. Back then, his hair was brown. Now there seems to be rather a lot of grey. Email jon@jonhoneyball.com

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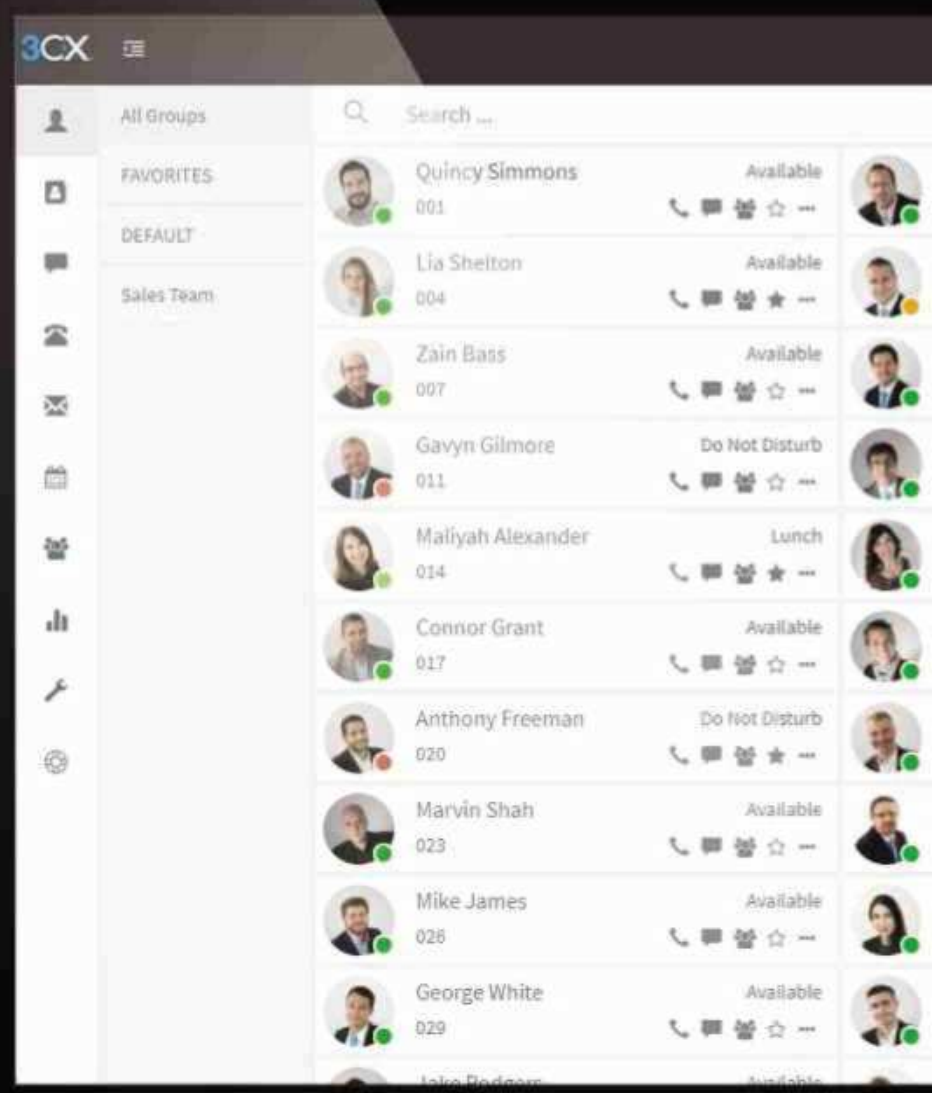

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