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## HIGHLIGHTS THIS MONTH

Full contents overleaf

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### REVIEW OF THE MONTH

#### CyberPowerPC Analog U7 RTX

It's something that any keen PC builder would love to do: design a chassis from scratch to meet your needs. Fortunately for CyberPowerPC, it has the resources to do exactly that, and judging from the MA-01 chassis at the centre of the Analog U7 RTX its engineers know a thing or two about cooling too. It's whisper-quiet, yet thanks to Intel's latest Core Ultra 7 chip and an RTX 5080 it has all the power you need to play 4K games at tough settings. Another reason to love this PC? You can tailor its RGB settings using dials on the edge of the chassis. With a competitive price and next-day delivery, prepare to be tempted.



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# BRILLIANT MONITORS

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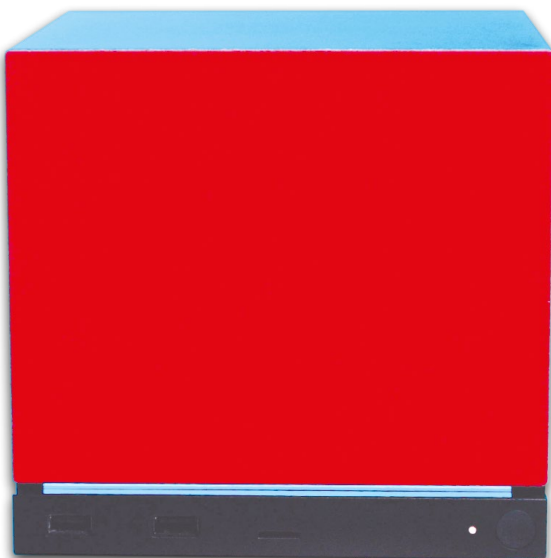
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# Tech prices are now as inflammatory as petrol

**W**e all know the pattern with petrol prices. Crisis A pushes up the cost of a barrel of oil. Instantly, our price per litre jumps up, despite the fact that oil barrel costs affect future supplies rather than what we're buying today. Crisis A then dies down, yet prices at the pump drop much slower than they rose. Until Crisis B happens and the cycle repeats.

One thing is guaranteed: over the course of each crisis, we customers pay more and the oil companies reap record profits. What a coincidence!

Now, exactly the same thing is happening in tech. Take Apple, which pushed up the price of many products in June. Highlights, if one can call them that, include the MacBook Neo jumping by £100, the MacBook Air by £200, the MacBook Pro by £300 to £500 and the base iPad by £80.

Apple's statement blamed "an extraordinary surge in demand for memory and storage" due to the insatiable demands of AI data centres. It added that the company had "shielded our customers from these increases so far" but (please don't shed a tear) it could do so no longer.

Here's another quote from Apple, dated 30 April 2026. "Today Apple is

proud to report our best March quarter ever, with revenue of \$111.2 billion and double-digit growth across every geographic segment," said Tim Cook, Apple's CEO. Its CFO Kevan Parekh added: "Our strong business performance during the March quarter generated over \$28 billion in operating cash flow and drove new March quarter records for both operating cash flow and EPS [earnings per share]."

Perhaps it's just me, but I find it tough to marry the idea of a company bravely shielding customers from price rises with one that also increases dividends to its shareholders. And while operating cash flow doesn't quite equate to profit, it's a pretty good proxy. I'm sure those results will dip in the next financial statement, but I'll be curious to see by how much.

Apple is within its rights. It has a duty to shareholders, after all. The problem for us mere customers and non-stockholders is that where Apple leads, others follow: it effectively acts as a giant shield for the whole tech industry, setting the benchmarks.

Apple's MacBook price hikes ranged from 11% to 18%, while iPads shot up by an average of 23%. Likewise the Mac mini, with an M3 Ultra Mac

Studio jumping from £3,999 to £5,299. Other PC makers are inevitably going to look at that and scratch their virtual beards. "If Apple can get away with it, so can we." We've already seen the Neo-rivalling Dell XPS 13 move from an expected starting price of £699 to £899.

What are the chances of prices dropping with similar sharpness when the cost of RAM and SSDs reduces? I suspect the agonisingly slow drop in petrol prices after a crisis will again reflect our reality in tech. But when that dust settles, let's take a close look at the accounts of the big tech firms and see whose profits increased at the expense of us, the customers.

In the meantime, *PC Pro* will continue to point you to what we think represents terrific value in challenging times. This month, I would highlight the CyberPowerPC Analog U7 RTX on p46 and the Labs-winning AOC U27E4CV (see p72). Let's just hope their prices don't increase in the days that separate me writing these words and the magazine appearing on your doorstep. If they do, I blame Apple.

**Tim Danton**  
Editor-in-chief

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31 August

## PCPro needs your help!

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If you were to write a Substack newsletter to earn some extra cash, what would it be about?

"They say to write about what you love... I've already got technology covered, so it would have to be tennis. Probably reports from obscure tournaments around the world."

"AI, because my God people do not understand how to use it. And no, I wouldn't use AI to write it. Subscribe to find out why not!"

"I wouldn't write a Substack newsletter, due to the company's rather laissez-faire attitude to Nazi and white supremacist content. If I were forced at gunpoint, it would be a newsletter on how abject content policing can drag down your business's reputation."

"I doubt it would earn much as I'd use it to collect all the stories I read that make me rant at my husband: 'Have you seen this? It's ridiculous and stupid and this is why!'"

"I already do. Three in fact, of which the most mass appeal is probably 'On this day in Scotland' (onthistdayinscotland.substack.com)."

"Whatever piqued my interest that day!"

"Imagine a parallel universe where a humble kangaroo leaps from obscurity to global rock stardom, propelled by sheer glam, flamboyant outfits and iconic makeup. Subscribe to The Life of David Joey today. (Seriously, subscribe. I really need the cash)."

"The same sort of stuff I do in my PC Pro columns but with more space to vent..."

"I like that you think I have time for a side hustle. I'm a busy woman, Tim."

"How to write a Substack newsletter to earn some extra cash, obviously."

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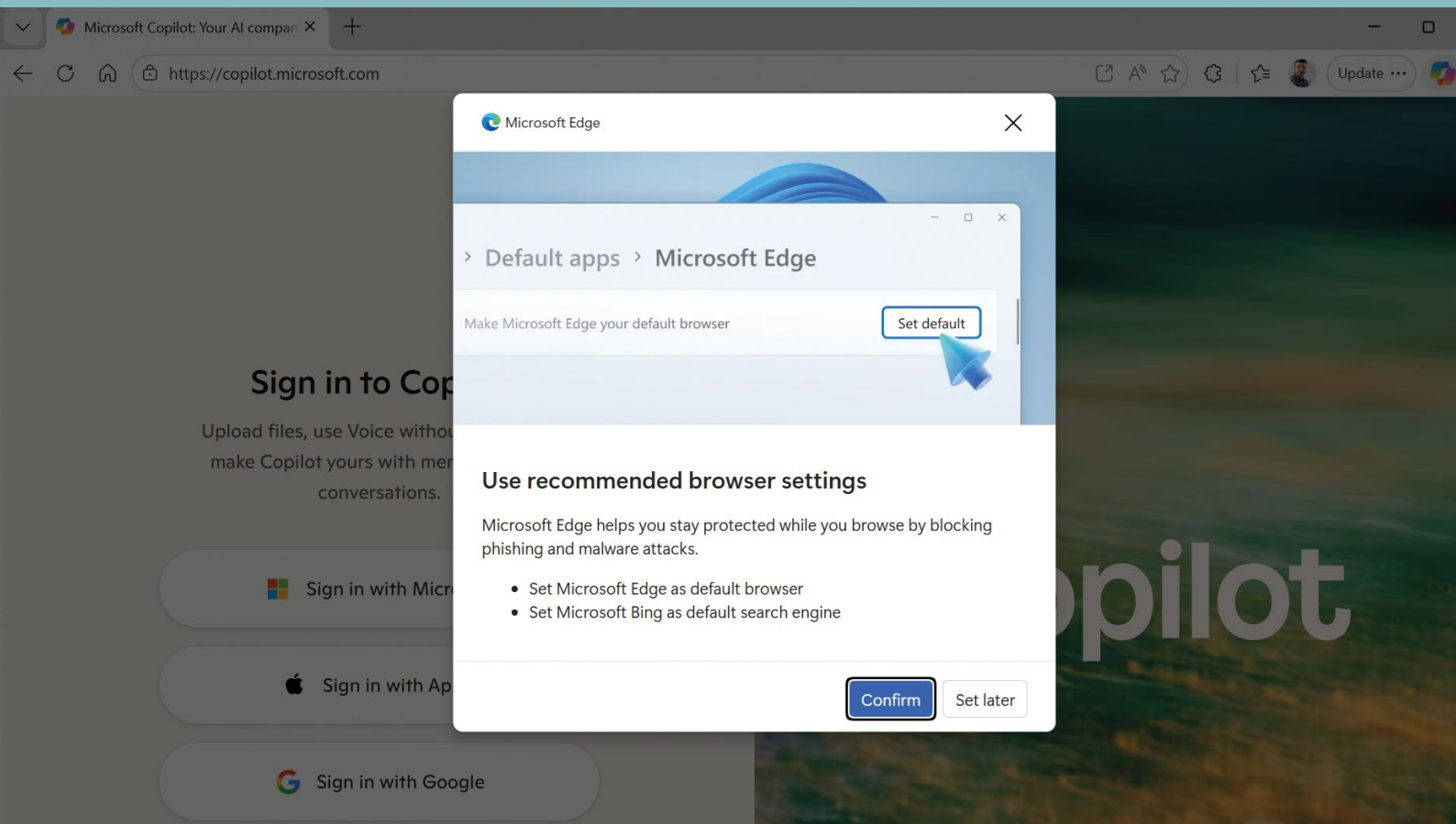


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# Briefing

Background and analysis on all the important news stories



## Microsoft's browser bullying laid bare

Report reveals extent to which Edge is foisted on Windows users

**M**ore than 25 years since it was first found guilty of anti-competitive behaviour for bundling its Internet Explorer browser with Windows, the extent to which Microsoft still badgers users into browsing with Edge has been exposed in a new report.

Microsoft's days of owning the world's dominant desktop browser have long passed, but that has merely emboldened the company to crank up the aggressive tactics that are designed to stop users considering alternatives.

"Microsoft still does not allow users to download, set as the default, or keep using alternative browsers without harmful interference," Mozilla said in a blog post, announcing the results of an independent report it had commissioned into Microsoft's design decisions. "The patterns are documented, and they meet established definitions of coercion, deception and manipulation."

### ■ Microsoft's sharp edges

The report ([tinyurl.com/384browser](https://tinyurl.com/384browser)), written by Testimonium Ltd, which describes itself as providing "expert

witness services for deceptive user interfaces", highlights 25 ways in which Microsoft discourages users from considering alternative browsers.

These include injecting an Edge banner on to the Chrome download page that claims "Microsoft Edge runs on the same technology as Chrome, with the added trust of Microsoft". Other tactics include pinning Edge to the taskbar in Windows, while

**“The patterns are documented, and meet established definitions of coercion, deception and manipulation”**



popping up security warnings when users attempt to pin rival browsers; describing Edge as “the recommended browser on Windows” when first opening the browser in a new Windows 11 installation; and using Edge to open links from other Microsoft applications (such as Copilot, widgets and Windows search) even if the user has a different default browser set.

Some of the more slippery tactics, which Testimonium describes as “trick wording”, appear in Windows settings. For example, when a user first clicks the Windows 10 settings menu, they’re shown a prompt urging them to “Get even more out of Windows” with the options “Let’s go” or “Skip for now”. If the user clicks through, they’re steered towards more Microsoft products, including Edge if they have previously chosen an alternative browser.

## ■ Regional variations

The extent to which Microsoft deploys these tactics depends on the location of the user. Customers in the USA and India get the full barrage, while the UK is exempted from four of the 25 different measures recorded. Customers in the EEA are excluded from more than half of them.

This boils down to different regulatory regimes. The EU designated Microsoft as a gatekeeper under the Digital Markets Act in September 2023, with Windows declared a core platform service that must meet various interoperability obligations.

“A lot of the dirty tricks have been moved out of Windows and into Edge because Edge isn’t a core platform service,” Bruce Lawson, Vivaldi’s technical communications officer, told *PC Pro*. “If you click a link in Microsoft Teams chat or Microsoft Outlook, it will open in Edge regardless of what your default browser is, and their argument is that ‘well, that’s not Windows doing that’.”

In countries where the regulatory regimes are more permissive, Microsoft seemingly takes full advantage. This should be a wake-up call to regulators outside of the EU, according to Mozilla.

“Regulators can read the evidence themselves,” Kush Amlani, global competition and regulatory lead at Mozilla told us. “Our ask is to Microsoft: the experience of users in the EEA shows that you can do better. Stop overriding user choice and give people back control over their products they use.”

In the UK, it’s the Competitions and Markets Authority (CMA) that has the power to curb Microsoft’s practices. “The CMA has new powers under the Digital Markets,

## “A lot of the dirty tricks have been moved out of Windows and into Edge”

Competition and Consumers Act, which includes competition and consumer tools,” added Amlani. “If the UK would like a better deal for its consumers it knows what needs to be done. But this underlines a wider point: whether your choice is undermined or not should not depend on where you live.”

The CMA is currently investigating whether Microsoft’s business software should be given strategic market status; Lawson said that Vivaldi had written to the CMA making a case for Edge to be brought into scope. “Edge is marketed by Microsoft as business software and therefore should be included in this investigation,” he said. That would make it harder for Microsoft to sidestep regulation, by claiming certain products are separate from Windows.

## ■ Getting away with it

While Mozilla’s report focused on the behaviour of Microsoft, the rival browser makers believe that the company’s aggressiveness rubs off on other platform gatekeepers too, most notably Google and Apple.

“Microsoft has always led the way in those things,” said Vivaldi CEO Jon von Tetzchner, “and I think in some ways they’re making the mobile guys think, ‘Okay, this is how it works, and so we can do those things’.

“So, this isn’t just Microsoft,” he added. “But I think the issue now is that Microsoft is getting away with things because the focus is on Google and Apple. When we’ve been talking to regulators, they’ve been clear that basically they don’t have unlimited resources, so the focus is more on Apple and Google, and Microsoft is taking advantage. All of these guys are using regulation against each other.”

At the end of the day, however, von Tetzchner thinks that this kind of behaviour will add to the growing distrust of the big tech firms.

“What has been changing, which is important, is that people are looking for alternatives to big tech, and not least in Europe,” he said. “We’ve been seeing growth because of that. Suddenly, we see governments and businesses [considering Vivaldi]. I always looked at that as not an option at all... because they just selected Microsoft and suddenly now they’re, ‘OK, we don’t know if we can trust big tech any more’.”

Microsoft declined a request to comment on this article. ●

# Can’t get fibre? You’ll get Starlink

Musk’s satellites may be the only option for fibre have-nots

**B**ritish residents who can’t get fibre broadband may be forced to accept Starlink or fund their own fibre installations.

Under the Universal Service Obligation (USO), BT (or KCOM in Hull) has a legally binding obligation to provide a 10Mbps/sec or faster line to every UK resident. Even that provision is governed by a cost-sharing model that can see residents asked to pay hundreds of thousands of pounds to install fibre in remote areas.

4G and 5G connections have been offered as alternatives in some areas, but the Starlink satellite service was previously too expensive to qualify as an alternative to the USO. However, as first reported by *ISPreview.co.uk*, some people who have applied for the USO from BT have been told they don’t qualify because of the availability of Starlink at their property.

Starlink now meets the criteria for USO alternatives, which stipulates a minimum download speed of 10Mbps/sec, sub-200ms latency, and a cost below £59.60 per month, among other measures.

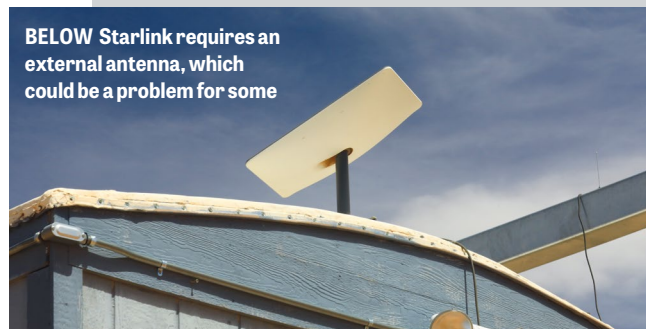
Starlink’s Residential plan has fallen to £40 per month for a connection speed of 100Mbps/sec with unlimited data. However, it’s not a perfect solution for all, because it requires a clear line-of-sight to the sky and the mounting of external antennas, which can be a problem for those living in properties surrounded by tall trees or apartment blocks.

Another reason why Starlink might not be favoured by fibre have-nots is that the company is run by Elon Musk, who has made clear his support for far-right politicians and activists in the UK. Some residents might find themselves with the Hobson’s Choice of suffering dismal internet speeds or helping to fund Musk’s companies.

Industry sources have told *PC Pro* that unless the government decides to change the USO criteria, people who can receive Starlink can’t demand an alternative for political/ethical reasons.

The only viable alternative may come in the form of Amazon’s Leo (previously Project Kuiper), which now has almost 400 operational satellites and is expected to commence commercial services later this year. That’s considerably less than Starlink’s 10,000+ satellites, though, and some may not regard Amazon as much of an ethical upgrade on Starlink anyway.

**BELOW** Starlink requires an external antenna, which could be a problem for some



# The Interview

## Memory crisis bites

**Jitesh Urbani, IDC**

The fallout from Ramageddon is beginning to bite PC manufacturers



**T**he preliminary figures from market analysts IDC for the second quarter of 2026 are painful reading if you're a PC maker. Overall growth was down almost 5%, with HP suffering the biggest fall at 9%. Only Apple bucked the trend, with the launch of the MacBook Neo seeing its shipments grow by just over 10% – but even Apple has since been forced to raise prices (see box, opposite).

It's Jitesh Urbani's job to keep track of all these figures. Here, IDC's director of worldwide device trackers tells us why the worst is yet to come, but also when the RAM shortages should start to ease.

**PC Pro:** Despite the sharp decline in PC sales, revenues are up because vendors are charging more for their PCs. Presumably profits aren't?

**Jitesh Urbani:** Presumably, and the revenue is also for the entire industry. The memory makers, for example, have record revenues that they've announced. PC makers, at least in their past quarters, they've announced very high revenues and high profitability.

We don't technically call it revenue, by the way, because the numbers we publish include channel markup. So, if you imagine

“Dollars are performing better than units are”

negative growth is lower than the negative growth in units. So, dollars are performing better than units are.

**PC Pro:** Your report says you expect the memory crisis to ease in early 2028. What gives you confidence it will ease by then?

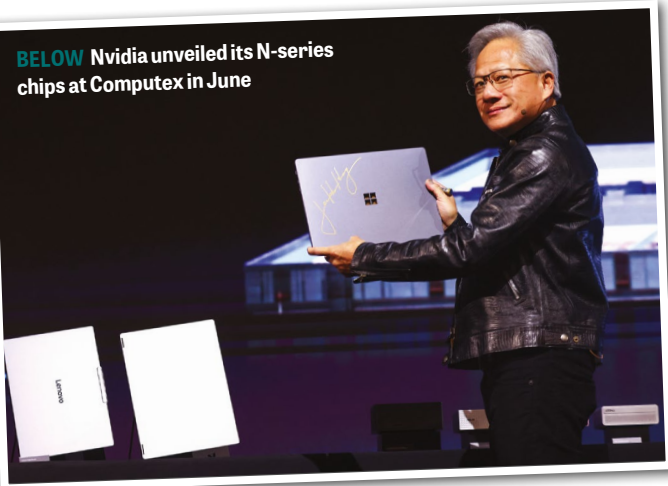
**Jitesh Urbani:** The memory makers are working on bringing new capacity online, and it will take time. So we anticipate that to happen late 2027 or early 2028. This is something they've been working on for some time, but it takes years to bring a new fab online. So it's not something that'll happen overnight, and that's why we think it'll happen by 2028.

**PC Pro:** Your report says you don't expect another round of inventory pull forward from the PC makers, which points to a sharp slowdown in growth rates in the second half of this year. How bad is that going to get, because we're already approaching double-digit losses?

**Jitesh Urbani:** Our last forecast, which we did a few months ago, had the full year down about 11.3%. For the first two quarters you've seen the numbers so far, but they're not too bad. That points to a negative double-digit in the third and fourth quarter. It's a pretty stark decline.

**PC Pro:** Do you expect that decline to continue on that same path next year, or will it even out a bit?

**BELOW** Nvidia unveiled its N-series chips at Computex in June



a Mac being sold at Best Buy, it would include Best Buy's markup in there as well. So we call it value of the industry.

We're seeing this value number grow, and it's growing faster than units. So, in some cases, you might see a positive growth for dollar value. In some cases, you might see a negative growth for dollar value, but that



**Jitesh Urbani:** From a growth perspective, no, because 2026 is a weird year, not just because of memory [shortages], but also because of comparisons. In 2025 we had tariffs, which also led to a lot of pulling [forward of inventory] at the time, and so it makes it a tough comparison for 2026.

But once we get to 2027, the comparisons become very easy because the memory shortage is impacting the market. So from a growth perspective, things will continue to improve each quarter of 2027. And by the end of 2027, again, hopefully more capacity comes on board.

**PC Pro:** But you anticipate PC prices will continue to climb through 2027?

**Jitesh Urbani:** Yeah, and it's because these shortages still continue. We've already seen many vendors increase pricing, and the reason they're increasing pricing right now as opposed to earlier this year is because they were sitting on older inventory that they had purchased towards the end of 2025 and early 2026.

Now we're at a point where they've sold through that inventory, and so whatever new products they're purchasing is at the new higher pricing, which is why they have to pass the cost on to users. But memory prices are expected to go up further later this year, and so we think PC prices... will continue to go up.

**PC Pro:** You mentioned in your report that there's a growing demand for on-device AI. It's ironic that on-device AI could help stem the demand for cloud AI, and yet people can't afford it, because the cloud AI data centres are driving up the prices of RAM.

**Jitesh Urbani:** Exactly. I think we will see specialised use cases and enterprise buyers try to work around this.

Nvidia announced its N-series chips at Computex not too long ago, which is supposed to be on-device AI compute for prosumers or business users. I think we'll see demand for those types of devices rise over the next few years, but they're going to be expensive right out of the gate, and so the only people who can afford them are primarily enterprise providers, and they're the ones also facing these increased token costs because a lot of their employees are relying on cloud services. They will try to figure out ways to cut some of those costs by deploying edge devices that have those AI capabilities.

**RIGHT Urbani expects memory and SSD prices to continue rising throughout 2026, with the increases passed on to consumers**

## BARGAIN LAPTOP BLOWOUT

Three months is a long time in the PC industry. It was only March when Apple was heralding the launch of the MacBook Neo at the "breakthrough price of only £599". Within three months, that price increased by £100 (or 16.7%), with even the renowned supply chain maestro Tim Cook admitting that passing the price rises on to customers was "unavoidable". Unavoidable, that is, if he wants to protect Apple's profit margins.

Apple's price increase has given others in the PC industry latitude to do likewise. Dell responded to the launch of the MacBook Neo with the revamped XPS 13, which it branded as a "commitment delivered" to "compete at every price point in the consumer market", with the version sold to students starting at \$599 (£447) when it was unveiled in June.

By the time the laptop arrived for orders on the UK site in early July, that price was set at £699 for eligible students, with everyone else expected to pay £899. Not exactly the bargain we were led to expect.

**BELOW** Dell's revamped XPS 13 isn't the bargain we were hoping for



**PC Pro:** When we've spoken to analysts over the past year or so, they've said the concept of the AI PC has really failed to take off. Are you seeing any demand for this from corporates?

**Jitesh Urbani:** More so because of Nvidia's entry, as opposed to what we had prior to that, which was essentially Microsoft Copilot. That didn't really take off the way the industry had hoped.

The demand or the interest we're seeing rise right now is more for what we're calling AI appliances, as opposed to your average PC that your average employee would be using in an office.

**PC Pro:** You've talked of vendor consolidation as a result

of this ongoing memory crisis. Do you expect that even among the big brands?

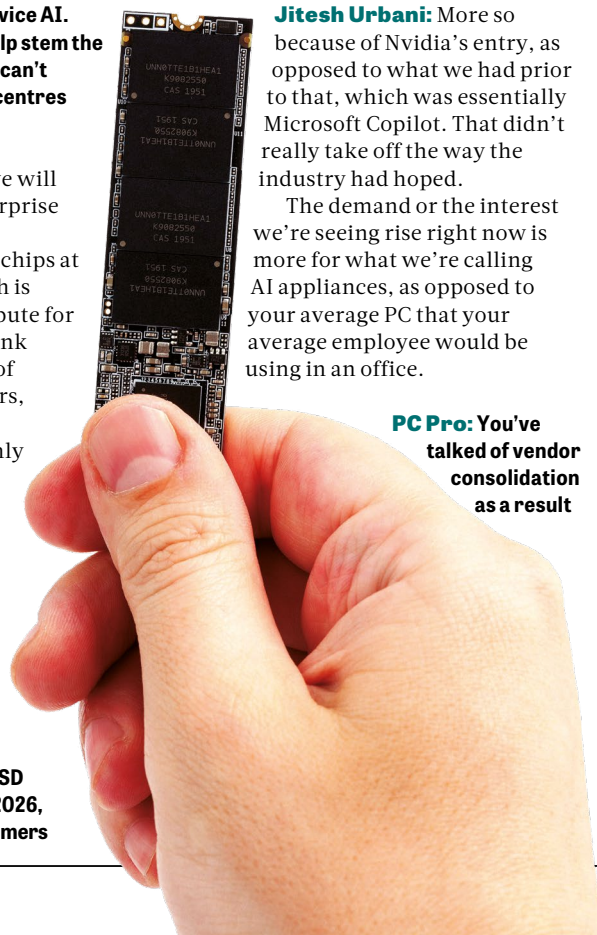
**Jitesh Urbani:** I would say more likely the tier-two, tier-three vendors, local players. That's where we expect a lot of them to lose share. Some of them might even disappear completely by the end of next year.

Among the top players listed in our press release [Lenovo, HP, Dell, Apple and Asus], I would add probably Acer to that list: these are the brands that we expect will stick around and continue to gain share over the coming quarters.

**PC Pro:** Finally, there was much speculation about a potential Windows 12 earlier this year. That seems to have gone away. Do you think this crisis may have affected Microsoft's thinking in terms of releasing the operating system, or would the PC vendors welcome anything that might pep up sales for the time being?

**Jitesh Urbani:** I don't know enough about Microsoft's plans around this to be able to comment concretely. Obviously the memory crisis has made things significantly worse than anyone had anticipated, and so potentially that could be one of the reasons that they've held off.

They did also just go through a whole refresh cycle because of end of support for Windows 10, and so many customers and partners might find it a little bit too early to be talking about the next version of Windows already.



# The A-List



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

## PREMIUM LAPTOPS

### Apple MacBook Pro

Class act from £1,999

from [apple.com](https://apple.com)

Now upgraded with M5 Pro and M5 Max options to go along with the M5 update last year, this versatile laptop – available in 14in and 16in form factors – can be configured to meet your demands. The M5 Pro is arguably the sweet spot, but whichever you choose you're buying a powerful, creative, work-focused laptop.

**REVIEW** Issue 380, p52



## BUSINESS LAPTOPS

### Lenovo ThinkPad X1 Carbon Gen14

Business class from £2,178

from [lenovo.com](https://lenovo.com)

Lenovo has somehow made the world's classiest 14in laptop even classier, from the ultra-repairable design (now anyone can replace the battery) to the top-tier performance – especially if you opt for the Core Ultra X7 version – and gorgeous OLED panel.

**REVIEW** Issue 383, p64



### Apple MacBook Air M5

No design changes as the Air moves from M4 chips to M5, but if you want a premium laptop its all-round performance and 15-hour battery life make this a great choice. **From £1,299 from [apple.com](https://apple.com)**

**REVIEW** Issue 380, p54

### Dell XPS 14

Dell brings back the XPS name and mojo thanks in part to Intel's Core Ultra Series 3 CPUs: choose the Ultra X7 358H for power, the Ultra 7 355 if you want battery life of more than 20 hours. **From £1,599 from [dell.co.uk](https://dell.co.uk)**

**REVIEW** Issue 379, p56

### Samsung Galaxy Book6 Ultra

The price is jaw-dropping, but so is the performance. A stunning 16in OLED screen, Core Ultra X7 chip and RTX 5060 or 5070 graphics mean it lacks for nothing. **From £2,999 from [samsung.com](https://samsung.com)**

**REVIEW** Issue 379, p61

### Asus ExpertBook Ultra

Taking full advantage of Intel's Core Ultra Series 3 chips, the Asus packs a glorious 14in tandem OLED screen, over 16 hours of battery life and all the power you need. **£1,900 from [asus.com](https://asus.com)**

**REVIEW** Issue 379, p58

### Dell Pro 13 Premium

A weight of just 1.1kg and 24-hour battery life, plus Intel's 200V vPro series for easier remote management. Avoid the cheap screen option. **From £1,452 exc VAT from [dell.co.uk](https://dell.co.uk)**

**REVIEW** Issue 368, p46

### HP OmniBook Ultra Flip

A top-quality 2-in-1 with a terrific 14in OLED panel, great build quality and superb battery life thanks to Intel's latest generation Core Ultra 7 processors. **From £1,699 from [hp.com](https://hp.com)**

**REVIEW** Issue 365, p46

## CREATIVE & GAMING LAPTOPS

### Lenovo Legion 9i Gen 10

All-out-power from £4,150

from [lenovo.com](https://lenovo.com)

Lenovo knows exactly how to squeeze out every last ounce of power from its components, and even though that comes at the expense of bulk and weight (3.5kg) the sheer quality, expandability and glory of the 18in 4K+ panel make it worth the money.

**REVIEW** Issue 382, p75



## EVERYDAY LAPTOPS

### Acer Swift Go 14 AI (AMD)

Superb all-rounder for £720

from [johnlewis.com](https://johnlewis.com)

This stylish and slim laptop packs a sprightly AMD Ryzen 7 350 processor into its 1.3kg frame, while a large 75Wh battery ensures it will last for longer than a day despite the excellent 14in OLED panel. Search for part code NX. JDAEK.001 to find it.

**REVIEW** Issue 383, p84



### Alienware 16X Aurora

A superb choice if you want portability and power – although it tops out at an RTX 5070 Ti. Compared to big-name rivals, it's good value too. **From £2,149 from [dell.com](https://dell.com)**

**REVIEW** Issue 382, p73

### Medion Erazer Major 16 X1

Don't expect stunning finesse, but it's fantastic value: £1,800 buys you a Core Ultra 9 275HK, 32GB of RAM, 2TB SSD and RTX 5070 Ti. **From £1,500 from [laptopsdirect.co.uk](https://laptopsdirect.co.uk)**

**REVIEW** Issue 382, p76

### Razer Blade 16 (2026)

All the key ingredients of a Razer creative laptop: sleek looks, relatively light 2.1kg weight and top-quality components throughout. **From £2,100 from [razer.com](https://razer.com)**

**REVIEW** Issue 382, p77

### HP OmniBook 5 14in Next Gen AI

With a Snapdragon X X1-26-100, 16GB of RAM and an OLED screen, this is a good buy at £720 – but it's worth waiting for deals. **£720 from [tinyurl.com/383omnibook5](https://tinyurl.com/383omnibook5)**

**REVIEW** Issue 383, p87

### Lenovo Yoga Slim 7x Gen11

The Snapdragon X2 Plus version is a bargain, with plenty of power, slim design and 20 hours of battery life – but upgrade to the 2,880 x 1,800 OLED. **From £1,050 from [lenovo.com](https://lenovo.com)**

**REVIEW** Issue 384, p56

### Apple MacBook Neo

If you're on a budget or looking for a secondary device then the Neo is an extremely capable all-rounder with a sharp screen. **From £699 from [apple.com](https://apple.com)**

**REVIEW** Issue 383, p86



## CHROMEBOOKS

NEW ENTRY

### Lenovo Chromebook Plus Gen 10

MediaTek AI power for £549

from [lenovo.com](https://lenovo.com)

Simply the best Chromebook around thanks to a gorgeous 14in OLED screen and AI-enhanced skills courtesy of the MediaTek Kompanio Ultra 910 CPU. Add a well-built aluminium frame, 1.2kg weight and all-day battery life for the win. **REVIEW** Issue 374, p54



### Acer Chromebook Plus 516

If you can't afford the 15.6in Samsung Galaxy Chromebook Plus then Acer's Chromebook Plus 516 makes a solid but less beautiful alternative – as reflected in its price. The 15.6in screen provides plenty of space on which to work, and it proved a fast performer in our tests.

From **£399** from [acer.com](https://acer.com)

**REVIEW** Issue 371, p90

### Lenovo Chromebook Plus 2-in-1 Gen10

A very likeable Chromebook thanks to premium build quality, a fantastic keyboard and solid performance from the Intel Core 3 N355 CPU. Its battery life isn't the best and the screen won't produce cinema-grade colour, but it's remarkable for the price. **£456** from [amazon.co.uk](https://amazon.co.uk) **REVIEW** Issue 384, p62

## MINI PCs

### Minisforum X1 Lite

Balanced beauty for £655

from [minisforum.uk](https://minisforum.uk)

Bearing in mind the cost of RAM and storage, to pack 32GB of one and 1TB of the other into a compact one-litre mini PC like this reflects superb value. Especially as the Ryzen 7 processor is a great all-rounder, bringing gaming into play.

**REVIEW** Issue 381, p87



### Geekom A5 Pro

Half the size of the Minisforum X1 Lite, Geekom's A5 Pro also cuts down the power on offer – but you still get a 1TB SSD to accompany the Ryzen 5 7530U processor and 16GB of RAM.

It doesn't consume much electricity, either, and delivers enough grunt for everyday tasks. **£513** from [geekom.co.uk](https://geekom.co.uk)

**REVIEW** Issue 381, p85

### Lenovo ThinkCentre M70q Gen6

The ThinkCentre is designed for business rollouts, with a slim desktop rather than cube design that takes up minimal space. It offers plenty of customisation options and management tools, plus a decent spec for the money. **As reviewed, £583 exc VAT** from [lenovo.com](https://lenovo.com)

**REVIEW** Issue 381, p86

## ENTHUSIAST PCs

NEW ENTRY

### CyberPowerPC Analog U7 RTX SY3127

Style and power for £2,500

from [tinyurl.com/384cyberpower](https://tinyurl.com/384cyberpower)

The stylish chassis is the star, complete with analogue controls for the array of RGB fans, but what a set of core specifications for the price: Intel's Core Ultra 270K Plus CPU, a GeForce RTX 5080, 32GB of RAM and a 2TB SSD.

**REVIEW** Issue 384, p46



### PCSpecialist Vortex FE

This no-compromise PC pairs Intel's excellent Core 7 Ultra 270K Plus processor with 64GB of RAM, a 2TB Gen5 SSD and a GeForce RTX 5090, all wrapped up in a cool case – in both senses of the word. And it can be delivered the next day. **£4,499** from [tinyurl.com/383vortex](https://tinyurl.com/383vortex)

**REVIEW** Issue 383, p68

### Wired2Fire R7 RTX 5070 Lumia Vanguard

Built with value for money and future expansion in mind, this Ryzen 7 9700X system – with an RTX 5070 card, 2TB SSD and 32GB of RAM – performs extremely well in 1440p games and is a great all-rounder too.

**£1,599** from [wired2fire.co.uk](https://wired2fire.co.uk)

**REVIEW** Issue 382, p57

## ALL-IN-ONE PCs

NEW ENTRY

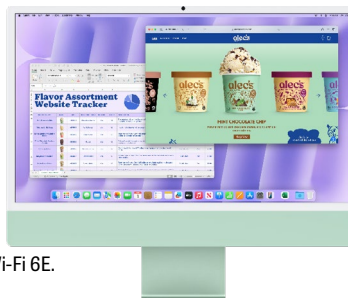
### Apple iMac M4

M4 power from £1,499

from [apple.com/uk](https://apple.com/uk)

Anyone hoping for a 27in iMac will be disappointed, but everyone else should be delighted by this M4-powered all-in-one with its 24in 4,480 x 2,520 IPS panel. It's fast inside and out, too, with Thunderbolt 4 and Wi-Fi 6E.

**REVIEW** Issue 364, p48



### Lenovo Yoga AIO 27i Gen10 (Intel)

This elegant all-in-one packs in everything most people need, including an Intel Core Ultra 7 255H processor, 16GB of RAM, a 1TB SSD and a solid 27in 120Hz IPS panel. Since our review it has been updated with Core Ultra Series 3 chips and a new name (Yoga AIO i Gen11).

**£1,290** from [lenovo.com](https://lenovo.com)

**REVIEW** Issue 374, p59

### Lenovo Yoga AIO i Gen11 Aura Edition (32in Intel)

Quite simply one of the most desirable PCs around, with a striking upside-down "V" design that's built around a glorious 31.5in 4K OLED panel.

With a Core Ultra X7 358H inside, it's powerful too – including capacity for playing demanding games.

**£2,544** from [lenovo.com](https://lenovo.com)

**REVIEW** Issue 384, p52

## CREATIVE WORKSTATIONS

### Scan 3XS GWP-A1-TR64

64-core 'ripper for £11,000 exc VAT

from [scan.co.uk/3xs](https://scan.co.uk/3xs)

Scan takes advantage of AMD's new 9000-series Ryzen Threadrippers, the 64-core 9980X, to deliver a monster of a workstation that topped almost all of our performance charts. It's helped by an RTX Pro 6000 Blackwell card and 128GB of memory. It's even a quiet runner.

**REVIEW** Issue 373, p93



### CyberPowerPC Ultra R9X Pro

In pairing AMD's Ryzen 9 9950X3D2 with an RTX 5090, CyberPowerPC has created a gifted workstation – one strong in game creation, rendering and data science tasks. And thanks to the white Lian Li Lancool 217 chassis, it even looks good. **£3,759 exc VAT** from [tinyurl.com/382cyberpower](https://tinyurl.com/382cyberpower)

**REVIEW** Issue 382, p58

### HP Z2 Mini G1a workstation

Built around AMD's powerful Ryzen AI Max+ Pro 395 processor with 128GB of unified RAM, this versatile workstation can be used for everything from creative tasks to running LLMs with up to 128 billion parameters. **As reviewed, £2,280 exc VAT** from [hp.com](https://hp.com)

**REVIEW** Issue 374, p60



## TABLETS

### Apple iPad Pro (M5)

**M5 power from £1,199**

from [apple.com/uk](https://apple.com/uk)

While the iPad Air remains a great alternative, there's no arguing with the quality and all-out power provided by Apple's top-end tablet. And the tandem OLED panel is simply the icing on the cake.

**REVIEW** Issue 376, p84



### Apple iPad Air M4

Like the MacBook Air, this year's iPad Air update features minimal changes, with the biggest boost being to performance (you also get Wi-Fi 7 and Bluetooth 6). We'd still like a 120Hz screen, but otherwise the iPad Air's quality and hardware options make it a great alternative to the Pro.

**From £749 from [apple.com](https://apple.com)**

**REVIEW** Issue 380, p71

### Honor MagicPad 4

The MagicPad 4 rewrites what you can buy for around £500 – once you apply the £100 discount voucher. It comes with a glorious 12.3in OLED panel, it's fast, and it lasts for hours on a single charge. The bundle deal also includes a top-quality keyboard and a stylus.

**Bundle, £649 (£549 after voucher)**

from [honor.com](https://honor.com)

**REVIEW** Issue 380, p70

## EVERYDAY PHONES

### Fairphone 6

**Eco choice from £499**

from [fairphone.com](https://fairphone.com)

Unique among phones for its five-year warranty and the ease of repair and customisation, this mid-range phone will last for years. There's even a microSD slot! Its CPU and camera are nothing to shout about, but this is a clear winner for sustainability.

**REVIEW** Issue 375, p52



### Honor X5c Plus

We bought this bargain 4G phone for a feature on ultra-cheap products, expecting it to be below par. Instead, we were left wondering how

Honor squeezes so much out of the components, with solid performance, a decent camera and big battery.

**£79 from [amazon.co.uk](https://amazon.co.uk)**

**REVIEW** Issue 383, p43

### Google Pixel 10a

It's great to see Google sticking to the £499 price of its budget phone, even if that means it has last year's G4 chip. Still, it's fast enough, supports all Google's latest AI features, and the 6.3in display is superb. Plus you get seven years of OS updates and a new, flat design.

**From £499 from [store.google.com](https://store.google.com)**

**REVIEW** Issue 380, p78

## PREMIUM PHONES

### Samsung Galaxy S26 Ultra

**Private caller from £1,279**

from [samsung.com](https://samsung.com)

The world's most feature-packed phone – it still integrates a stylus – now includes a highly effective privacy display along with ambitious agentic AI features that actually work. It's packed with quality throughout, from the blisteringly fast CPU to the 6.9in AMOLED panel.

**REVIEW** Issue 380, p74



### Apple iPhone 17

With a superb optical zoom, brilliant cameras, excellent all-round performance and a surprisingly generous amount of storage – 256GB for £799 – we think there are fewer reasons than ever before to “go Pro”. Other than battery life, which may push power users to upgrade.

**256GB, £799 from [apple.com/uk](https://apple.com/uk)**

**REVIEW** Issue 375, p70

### OnePlus 15

Once again OnePlus delivers a no-compromise Android phone for a price that the big names struggle to match. You're buying the latest Qualcomm chipset, a slick and gorgeous 6.8in panel, a top-quality set of cameras and battery life that genuinely stretches over two days.

**£849 from [oneplus.com](https://oneplus.com)**

**REVIEW** Issue 376, p72

## 24IN TO 27IN MONITORS

NEW ENTRY

NEW ENTRY

NEW ENTRY

### AOC U27E4CV

**4K quality for £240**

from [ballicom.co.uk](https://ballicom.co.uk)

Check the exact name before you buy, for the U27E4CV stands out from sister models for its good-quality 4K IPS panel, built-in networking and USB-C docking.

**REVIEW** Issue 384, p78



### BenQ MA270S

This 27in 5K panel – and 5K equates to an astonishingly sharp 5,120 x 2,880 resolution – is a superb alternative to the Apple Studio Display. It packs an equally high-quality panel, but BenQ doesn't charge extra for the adjustable stand or anti-glare screen.

**£900 from [scan.co.uk](https://scan.co.uk)**

**REVIEW** Issue 384, p79

### Eizo FlexScan EV2720S

Designed for easy rollouts in businesses, this 27in 1440p monitor produces crisp whites for Excel and plenty of colour for PowerPoint, while the stand and OSD design are the best in the business. It also comes with an industry-leading seven-year warranty.

**£467 from [jp-uk.co.uk](https://jp-uk.co.uk)**

**REVIEW** Issue 384, p80

## 30IN+ MONITORS

NEW ENTRY

NEW ENTRY

NEW ENTRY

### HP Series 7 Pro 732xk

**IPS Black brilliance for £720**

from [hp.com](https://hp.com)

This brilliant 31.5in IPS Black monitor is in hot demand, but it's worth waiting for if it goes out of stock with a rich, colourful panel that produces gorgeous whites – plus all the connectivity you could need.

**REVIEW** Issue 384, p92



### Eizo ColorEdge CG3100X

This 30.5in monitor is ideal for creators, designers and editors for whom colour range and accuracy is everything. You pay for the privilege, and for extremely high build quality, but also a built-in calibrator that will keep colours accurate forever. This is a multi-year investment. **£4,999 from [wexphotovideo.com](https://wexphotovideo.com)**

**REVIEW** Issue 384, p90

### Iiyama ProLite XCB3497WQSNPH

If you can't afford the Eizo or HP, Iiyama offers a business-friendly curved monitor that delivers for day-to-day image quality. It's packed with connectivity and features too, including RJ45 wired networking, a USB-C hub and even a webcam.

**£350 from [scan.co.uk](https://scan.co.uk)**

**REVIEW** Issue 384, p93



## WEBCAMS

### Insta360 Link 2 Pro

Perfect tracking for £239

from [amazon.co.uk](https://www.amazon.co.uk)

Brilliant image and audio quality, a smooth two-axis gimbal that means you're always in the frame, fast autofocus and excellent subject tracking make this 4K webcam a great choice for office workers or lecturers alike.

**REVIEW** Issue 378, p60



### Logitech Brio 105 for Business

While you can buy 1080p webcams for a third of the Brio 105's price, they won't hold a candle to the Logitech webcam's quality – especially in low-light conditions, such as one candle. It's also easy to manage, for businesses and individuals.

**£45 from [logitech.com](https://www.logitech.com)**

**REVIEW** Issue 360, p77

### Logitech MX Brio 705 for Business

Consistent image quality in all lighting conditions coupled with top build quality and nifty features – such as a presenting mode for items on your desk – make this a fantastic all-round choice. It's only be nudged out of top position by the superb Insta360 Link 2 Pro. **£219 from [logitech.com](https://www.logitech.com)**

**REVIEW** Issue 356, p68

## HOME OFFICE PRINTERS

### Epson EcoTank ET-4956

Ink tank excellence for £366

from [amazon.co.uk](https://www.amazon.co.uk)

Shipping with 5,500 pages' worth of colour ink and 15,100 of black works out at 6p per colour page even factoring in the price of the printer. At 16ppm for high-quality prints, and a 30-sheet ADF, it's a clear winner.

**REVIEW** Issue 377, p89



### Brother DCP-T780DW

If the Epson EcoTank ET-4956 is too expensive, consider Brother's first attempt at a refillable inkjet. It's keenly priced, but still includes a 20-sheet ADF, easy-to-use screen and its print and scan quality – while not quite up to the Epson – are strong.

**£249 from [ballicom.co.uk](https://www.ballicom.co.uk)**

**REVIEW** Issue 377, p86

### Canon i-Sensys LBP243dw

Everything you could want from a mono laser printer – although note that it doesn't come with a scanner – the LBP243dw produces excellent results at speed. You also get Wi-Fi and wired networking. **£186 from [printerbase.co.uk](https://www.printerbase.co.uk)**

**REVIEW** Issue 365, p88

## WORKGROUP PRINTERS

### Canon i-Sensys MF664Cdw

Colour laser MFP for £284 exc VAT

from [printerland.co.uk](https://www.printerland.co.uk)

You're getting so much for your money here: a large, intuitive touchscreen; high-quality colour prints at 20ppm and higher; even a 50-page ADF. Respectable running costs (2.6p mono, 10.6p colour) clinch the deal.

**REVIEW** Issue 377, p87



### HP Color LaserJet Pro 4202dw

This 33ppm colour laser printer – there's no scanner or fax – delivers excellent mono prints for a reasonable 2.1p per month, and even though each colour page is comparatively expensive at 12.1p you will be delighted with the results.

**£330 exc VAT from [hp.com](https://www.hp.com)**

**REVIEW** Issue 379, p74

### Canon i-Sensys MF754Cdw II

Plentiful features, fast print speeds and good output quality at an affordable price. The smart Application Library is capable of streamlining repetitive tasks, and Canon's focus on security will appeal to businesses that want strict access controls. **£348 exc VAT from [printerland.co.uk](https://www.printerland.co.uk)**

**REVIEW** Issue 380, p102

## WIRELESS ROUTERS & MESH WI-FI

### TP-Link Archer BE550

Affordable Wi-Fi 7 router, £180

from [amazon.co.uk](https://www.amazon.co.uk)

This is a brilliant and affordable Wi-Fi 7 router that packs five 2.5GbE ports. These, together with 6GHz support, mean you'll enjoy superb wired and wireless performance everywhere, and it even comes with a wide set of features.

**REVIEW** Issue 371, p70



### Netgear Orbi 770

If you want to upgrade to Wi-Fi 7 and need a mesh setup, this is the best option yet. Speed and range are both excellent, with a twin-pack covering 420m<sup>2</sup>, and connectivity is superb: four 2.5GbE ports on the router, two 2.5GbE ports on the satellites. **2-pack, £480 from [amazon.co.uk](https://www.amazon.co.uk)**

**REVIEW** Issue 364, p70

### Asus RT-BE58U

A great deal for those on a tight budget, this dual-band Wi-Fi 7 router (there's no 6GHz radio) performed well in our 5GHz tests at a price that can't be beaten. You can even enable MLO across the 2.4GHz and 5GHz bands.

**£99 from [amazon.co.uk](https://www.amazon.co.uk)**

**REVIEW** Issue 371, p70

## BUSINESS WI-FI

### DrayTek Vigor 2767ax

Secure Wi-Fi 6 for £192 exc VAT

from [broadbandbuyer.com](https://www.broadbandbuyer.com)

The Vigor 2767ax is the perfect partner for small offices seeking a versatile business router with the best WAN redundancy features. It delivers a wealth of security measures, the integral Wi-Fi 6 AP offers secure hotspot services and it all comes at an incredibly low price.

**REVIEW** Issue 379, p103



### Ubiquiti Networks UniFi U7 Pro XG

This Wi-Fi 7 access point is furiously fast, superbly built and great value. You'll need to factor in the cost of a cloud gateway, but it's worth it as you won't find a better wireless management and monitoring solution. **£158 exc VAT from [broadbandbuyer.com](https://www.broadbandbuyer.com)**

**REVIEW** Issue 377, p100

### Zyxel NWA50BE Pro

An interesting and affordable alternative to a tri-band Wi-Fi 7 AP, this offers solid futureproofing thanks to its BandFlex tech that lets you swap from 5GHz to 6GHz. Performance is good and you have the choice of standalone or cloud management. **£72 exc VAT from [broadbandbuyer.com](https://www.broadbandbuyer.com)**

**REVIEW** Issue 381, p103



## PERSONAL & MICRO-BUSINESS NAS APPLIANCES

### TerraMaster F2-425 Plus

#### Demon-like speed for £400

from [amazon.co.uk](https://www.amazon.co.uk)

Whether you use its two 3.5in bays or three NVMe drive slots, this appliance is built for speed, with chart-topping performance in almost every area and dual 5GbE network ports.

**REVIEW** Issue 379, p87



### Synology DS725+

Excellent performance, Synology's slick OS and the wide array of apps make this two-bay appliance a great choice for power users and micro businesses alike, especially if you want the flexibility of expanding to more bays in the future.

**£400 from [amazon.co.uk](https://www.amazon.co.uk)**

**REVIEW** Issue 379, p85

### UGreen NASync DH4300 Plus

This four-bay appliance is terrific value and easy to use. It's not the quickest, and Synology NAS appliances beat it for app choice (there's no Plex or WordPress), but if your priority is secure storage then it's a great choice.

**£311 from [lambdatek.com](https://www.lambdatek.com)**

**REVIEW** Issue 379, p86

## SMB NAS APPLIANCES

### UGreen NASync DXP8800 Plus

Dual 10GbE for £1,100 exc VAT

from [amazon.co.uk](https://www.amazon.co.uk)

Short on apps – other than core ones for backup and storage services – but you're buying an incredible hardware package for the price. Build quality is exemplary, a Gen12 Intel Core chip speeds it along and you have pairs of 10GbE ports plus Thunderbolt 4 and more.

**REVIEW** Issue 380, p101



### UGreen NASync iDX6011 Pro

Excellent value, this superbly built NAS delivers a remarkably powerful hardware specification – including a 16-core Intel Core Ultra 7 255H – that will appeal to power users and stands out for its versatile AI features.

**Diskless, £1,900 exc VAT from [nas.ugreen.com](https://www.nas.ugreen.com)**

**REVIEW** Issue 381, p102

### Synology RS2825RP+

Teams up a superior hardware package with a big storage capacity and delivers it all at a good price. Synology's drive compatibility policies are annoying, but it's fast and the DSM software delivers an unbeatable range of storage management and data security features. **Diskless, £2,453 exc VAT from [broadbandbuyer.com](https://www.broadbandbuyer.com)**

**REVIEW** Issue 380, p100

## VIDEOCONFERENCING

NEW ENTRY

### Jabra PanaCast U30

All-in-one solution for £591 exc VAT

from [best4systems.co.uk](https://www.best4systems.co.uk)

A top choice for businesses seeking an affordable all-in-one VC solution for small spaces, based around a 4K camera and 6-mic array. It's easy to use, offers a powerful set of AI-driven viewing modes and can be locally and remotely managed.

**REVIEW** Issue 384, p102



### Owl Labs Meeting Owl 5 Pro

The Owl 5 Pro takes everything we loved about the Owl 4+ and delivers it to larger organisations that require a permanent meeting room solution. Video quality is outstanding, speaker tracking is fast and smooth, and the range of dynamic views will impress.

**£1,999 exc VAT from [owllabs.co.uk](https://www.owllabs.co.uk)**

**REVIEW** Issue 383, p103

### Insta360 Connect

Insta360 makes an impressive entry into the videoconferencing market, with the Connect offering a wealth of features for a competitive price. Dual cameras deliver great video quality and fast tracking, it offers a versatile range of viewing modes, and the whiteboard feature adds even more value. **£1,666 exc VAT from [amazon.co.uk](https://www.amazon.co.uk)**

**REVIEW** Issue 376, p99

## SCANNERS

### Plustek eScan A450 Pro

Digitising wonder for £938 exc VAT

from [midwich.com](https://www.midwich.com)

SMBs with big scan demands and a desire to integrate with Microsoft 365 and SharePoint will like the eScan A450 Pro's great speeds, top output quality and tight security.

**REVIEW** Issue 382, p100



### Brother ADS-4700W

A natural choice for businesses that want a desktop scanner with a good balance of features, speed and value. It includes an extensive software bundle, makes light work of walk-up scan operations and provides great cloud support. **£340 exc VAT from [printerbase.co.uk](https://www.printerbase.co.uk)**

**REVIEW** Issue 382, p98

### Ricoh ScanSnap iX2500

Perfect for SMBs and home workers that want speedy desktop scanning at a great price. The ScanSnap software and user-friendly touchscreen team up to make scan operations a breeze, and Ricoh's smart ScanSnap Cloud service adds extra levels of versatility. **£319 exc VAT from [printerbase.co.uk](https://www.printerbase.co.uk)**

**REVIEW** Issue 382, p101

## UTM APPLIANCES

NEW ENTRY

NEW ENTRY

NEW ENTRY

### DrayTek Vigor 2928

Smart security router for £242 exc VAT

from [broadbandbuyer.com](https://www.broadbandbuyer.com)

Stunning features and protection measures for a great price. WAN redundancy services and multiple 10GbE ports make it ideal for remote sites that need secure, always-on internet.

**REVIEW** Issue 384, p98



### WatchGuard Firebox T145-W

Enterprise-class gateway security measures at an affordable price. Integrated Wi-Fi 7 services make it even more versatile, and it's easily managed from WatchGuard's cloud portal. **Appliance with 3yr Total Security Suite, £3,152 exc VAT from [broadbandbuyer.com](https://www.broadbandbuyer.com)**

**REVIEW** Issue 384, p100

### Zyxel USG Flex 200H

A powerful yet affordable security appliance at a great price. The Gold Security Pack offers an impressive set of protection measures, and Zyxel's Smart Sync feature delivers unified local and cloud management.

**Appliance with 1yr Gold Security licence, £790 exc VAT from [broadbandbuyer.com](https://www.broadbandbuyer.com)**

**REVIEW** Issue 384, p101



## SECURITY SUITES

**Eset Small Business Security 19**   
Perfect for smaller firms as it offers an affordable set of easily managed endpoint and ransomware protection measures, and it's easy to deploy. **5 devices, 1 year, £138 exc VAT from eset.com**  
**REVIEW** Issue 380, p103

**Norton 360 Deluxe**  
Packs plenty of features at low prices – if you buy from a third-party store. Note the generous 50GB cloud backup service that comes with 360 Deluxe. **3 devices, 15 months, £10 from store.pcpo.co.uk**  
**REVIEW** Issue 375, p90

**Avast Ultimate**  
Buy from a third-party store and you'll get top levels of antivirus protection and a superb set of features – including a solid VPN – for a great price. **10 devices, 2 years, £30 from store.pcpo.co.uk**  
**REVIEW** Issue 375, p84

## VPNs

**Surfshark**   
Blisteringly fast in all our tests, consistently excellent in our streaming tests and great value at £1.54 per month if you buy the multi-year deal. **2yrs 3mths, £42 from surfshark.com**  
**REVIEW** Issue 382, p88

**Windscribe**  
Not the cheapest by any stretch, but if you place privacy at the top of your priority list then this Canadian service delivers – plus international streaming works well and it won't hike its prices. **1yr, \$69 from windscribe.com**  
**REVIEW** Issue 382, p89

**Proton VPN Free**  
While Proton's VPN Plus is also a great choice, if you're looking for a freebie then choose this VPN for its fast connections (or alternatively Windscribe if you need to choose territories). **Free from protonvpn.com**  
**REVIEW** Issue 382, p90

## LINUX DISTROS

**Ubuntu**   
A fine choice for Windows switchers thanks to its familiar design, with regular six-monthly updates and a Long Term Support version. **Free from ubuntu.com**  
**REVIEW** Issue 367, p92

**Fedora Workstation**  
One of the longest-established distros, and with a strong link to Red Hat Enterprise Linux, Fedora Workstation will particularly appeal to business migrators. **Free from fedoraproject.org**  
**REVIEW** Issue 367, p85

**Linux Mint**  
There's a good reason this is a popular choice for Windows 10 refugees, including a familiar "Start menu", and it's easy to give it a trial before committing. But consider Zorin OS, too. **Free from linuxmint.com**  
**REVIEW** Issue 367, p86

## CLOUD FILE-SHARING

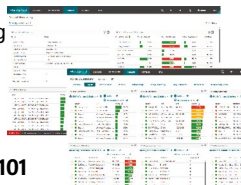
**Progress ShareFile Premium**  
SMBs that require secure, seamless file sharing and collaboration with external clients will love Progress ShareFile Premium as the smart new client hub lets them present highly professional services. **£19 exc VAT per user per month billed yearly from sharefile.com**  
**REVIEW** Issue 379, p100



**Tresorit Engage Business**  
A top choice for businesses sharing confidential data, and the Engage platform adds extra appeal. **Engage Business plan, from £144 exc VAT per month billed yearly from tresorit.com**  
**REVIEW** Issue 379, p101

## NETWORK MONITORING

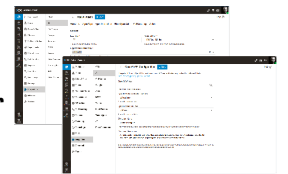
**Progress WhatsUp Gold Enterprise**  
Its flexible device-based licensing plans make this a great choice for SMBs. It's easy to deploy, good value and its highly configurable web console delivers a wide range of network monitoring services. **50 devices, £1,488 exc VAT per year from whatsupgold.com**  
**REVIEW** Issue 378, p101



**AdRem NetCrunch Enterprise 15.3**  
Simple to deploy and manage, the central console is easy to use, and its smart monitoring packs present a wealth of valuable information. **From £3,875 exc VAT per year from adremsoft.com**  
**REVIEW** Issue 378, p98

## VOIP SERVICES

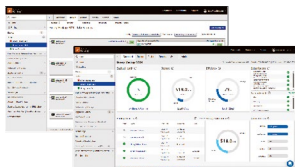
**3CX Phone System 20**  
Our top choice for businesses that want total control over their VoIP services. The variety of plans and flat licensing fees are very affordable, deployment options are abundant, and we love the new agentic AI features. **Hosted Enterprise/AI, 16SC, £1,155 exc VAT per year from 3cx.com**  
**REVIEW** Issue 381, p98



**TelephoneSystems.Cloud**  
An affordable VoIP service with no hidden costs or lengthy contracts. It's easy to manage and offers a wealth of call-handling features. **From £11 exc VAT per user per month from telephonesystems.cloud**  
**REVIEW** Issue 381, p100

## CLOUD/HYBRID BACKUP

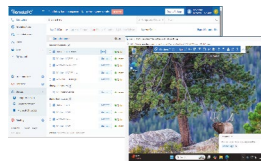
**Barracuda Backup 3024**  
This hybrid backup solution of appliance and cloud services is a great choice for SMB data protection as it's easy to deploy, includes unlimited client support and its high storage potential makes it a solid long-term investment. **Appliance with 3TB storage, from £3,096 exc VAT per year from barracuda.com**  
**REVIEW** Issue 383, p98



**IDrive Business**  
Geared up to protect on-premises systems and remote workers, IDrive Business is easy to use and provides plenty of optional cloud-to-cloud backup services. **5TB, £78 exc VAT per month (first year) from idrive.com**  
**REVIEW** Issue 383, p100

## REMOTE SUPPORT

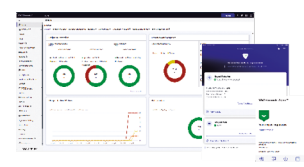
**IDrive RemotePC Enterprise**  
Large businesses that want a flexible and feature-rich cloud-hosted support solution will love RemotePC Enterprise. It provides technicians with a wealth of support tools, access security is tight, and IDrive's simple licensing plans are superb value. **First year, 100 PCs, £329 exc VAT from remotepc.com**  
**REVIEW** Issue 373, p99



**Zoho Assist Professional**  
Assist lives up to its name: it's easy to use and manage, offers a wealth of support features, and licensing plans are flexible. **£12 exc VAT per month/technician billed yearly from zoho.com/assist**  
**REVIEW** Issue 373, p101

## ENDPOINT PROTECTION

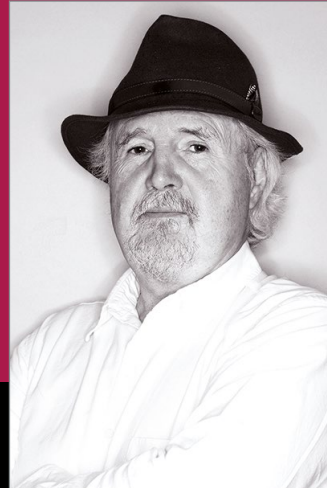
**WithSecure Elements Endpoint Security**  
An impressive range of protection measures all managed from a single web portal. Platform support is excellent, the modular design makes it simple to customise, and it's priced right for SMBs. **100-499 workstations, £37 exc VAT each per year from withsecure.com**  
**REVIEW** Issue 375, p101



**Sophos Central Intercept X Advanced**  
Impressive endpoint protection measures and security features, and it's all easily managed from one of the best cloud portals on the market. **50-99 users, £52.88 exc VAT each per year from broadbandbuyer.com**  
**REVIEW** Issue 375, p99



# Open your mind to the world of play



Dick Pountain is editorial fellow of *PC Pro*. He believes that shredding is, like, strictly for coleslaw, man... Find him on Bluesky at @dick-pountain

Whatever you think about the social media ban for kids, it might free up young people's minds in a way that electronics never will – and AI may help

**I**t's quite possible that the policy Sir Keir Starmer will be remembered for is banning social media for the under-16s. It's not a policy he invented, but he did make the UK the second nation, after Australia, to implement it. I don't intend to devote this column to examining the pros and cons of the ban, but it points me toward what I do want to discuss.

A leading proponent of such bans is Jonathan Haidt. I wrote last year concerning his best-selling book in which he alleges that smartphone overuse damages young people's mental health. Haidt is a researcher in the "Intuitionist" school of psychology, which investigates the non-rational aspects of human behaviour. He claims, for example, that moral judgments such as disgust are "hard-wired" by neural circuits that bypass the reasoning parts of the brain, and hence are typically pronounced without justification and can't be dispelled by argument.

I've just read Haidt's book *The Anxious Generation*, which explains the damage he claims smartphone fixation can wreak on developing minds. He believes, supported by much evidence from ethology and anthropology, that unrestricted play is a crucial growth stage for most higher animals, enabling the young to collect experience that helps form their adult mind. Electronic virtual worlds do not adequately provide such experience.

"When people are raised in a community that they cannot easily escape," he wrote, "they do what our ancestors have done for millions of years: they learn how to manage relationships, and how to manage

themselves and their emotions in order to keep those precious relationships going. There are certainly many online communities that have found ways to create strong interpersonal commitments and a feeling of belonging, but in general, when children are raised in multiple mutating networks where they don't need to use their real names and they can quit with the click of a button, they are less likely to learn such skills."

I'm sympathetic to Haidt's wariness about this loss of experience but in a rather narrower domain: musical performance. I've been playing guitar, in a non-professional capacity, for a long time, starting out with rhythm and blues, then graduating via ragtime blues to jazz. These genres all involve some degree of improvisation, on an increasing scale from a short four-bar Chuck Berry solo to a six-minute jazz rendition of "Round Midnight". And improvisation is a kind of play.

**T**he dictionary defines play as activity performed for pleasure, often according to a set of rules, sometimes involving competition. At least two of these aspects apply to musical improvisation, with the "rules" being the melody, harmony and rhythm of a tune. Improvising involves breaking these rules in a controlled way, playing chunks at different pitch, altering them, playing them over modified chords or to a different rhythm (syncopation). To be a good improviser you first need to know the tune well enough to play it straight.

There are no rules for improvising, only rules to break, but cognitive science has begun to study how this works. For their 2008 paper – with the less-than-melodious title of "Neural Substrates of Spontaneous Musical Performance: An fMRI Study of Jazz Improvisation" – Charles Limb and Allen Braun scanned the brains of

**“Using AI to eliminate the slog of learning some activity might still leave your dorsolateral prefrontal cortex some wiggle room”**

professional jazz pianists as they played a memorised musical sequence and then improvised freely over the same chords, looking for what differed neurally between the two states.

Their conclusion was that there are really three states: first, "inspiration" involves playing the changes, followed by a *willing* release of control over the pre-learned material, and only then real-time musical invention. Physically, Limb and Braun wrote, this was due to deactivation of the dorsolateral prefrontal cortex, a brain region that handles working memory, inhibition of response and planning sequences.

**I**t makes sense. Great improvisers arrive at a state of "flow" where they cease to *think* about the original but let go in ways they describe as groovin', wailin', being "in the pocket" and other such picaresque terms. I'm sure sports people, for example tennis or snooker players, must arrive at similar states, and that's where I come back to Haidt and the phone ban.

Combine Haidt's gloomy prognoses about the impoverishment of play by smartphones with the scary ability of AI to replace sweat-and-study in learning an instrument or a sport, and you may conclude that "the flow" is an experience whose days are numbered. But before you join the neo-Luddites, it's worth considering as a possibility that using AI to eliminate the slog of learning some activity might still leave your dorsolateral prefrontal cortex some wiggle room. And that the human mind tends to find ways around to reach the groove.

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**“To be a good improviser you first need to know the tune well enough to play it straight”**



# Tech won't save us from heatwaves



Nicole Kobie is *PC Pro's* Futures editor. One piece of hot-weather tech she loves is the fabulously named *Shark Ninja Creami*, which will (noisily) make ice cream without you having to go to the shop. [X @njkobie](#)

Wearable air con and smart beds with auto cooling sound like a lot of fun, but what we really need is trees, shutters and ice cream

As I write this, it's 33°C outside. Inside, it's a few degrees cooler, thanks to a portable air conditioner purchased amid a heatwave back when my daughter was an infant. Two fans sit on my desk, one pointed at me and the other at the overheating laptop that's gently toasting my wrists. My iPhone has stopped charging because it's too hot; I empathise, my digital buddy, I truly do. These days, my favourite piece of tech is a recently acquired small handheld fan; mine has little ears and looks like a bear, a nice bit of whimsy in a dirt-cheap, Amazon-ordered piece of tat.

Despite my seasonal love of machinery that blows air in my general direction, it's clear that when it comes to heatwaves, tech won't rescue us – and it may make everything worse.

Plenty of tech companies promise otherwise. Samsung has a system that links wearables with smart air con to personalise temperatures. Smart bed startup Eight Sleep offers auto-cooling beds, which will also

**“It's clear that when it comes to heatwaves, tech won't rescue us – and it may make everything worse”**

automatically adjust your sleep position if you start snoring. So you could wake up in the middle of the night at a different temperature and height than when you passed out. When things go wrong, as they did last year during an AWS outage, some sleepers were stuck in an upright position on an overheating mattress.

Out in the big, hot wild world, companies are rolling out tracking equipment such as smartwatches to keep an eye on workers on hot days. That includes Samsung, which has

teamed up with the South Korean government to add heat-tracking features to its Galaxy watches to predict heat risks. Although that might help avoid heat stroke for those stuck outside on blazingly hot days, it isn't going to keep anyone cool. For that, Sony has the Reon Pocket 5 “thermo device”, yours for £139, which balances around the neck to warm or cool the wearer.

For those of us working from home, old-fashioned air con is more efficient – if you can get hold of such a product, with portable units selling out across the UK in early July. The larger problem is energy use. As a hot day becomes ever more melty, we all turn up our fans and (if we're lucky) air con, and that's knocking our energy supply. A problem exacerbated by the growing number of AI data centres; like us humans, they also get hot in heatwaves and therefore chow down even more energy.

Solar panels are a potential solution to otherwise inevitable power outages, given they're at their most useful when we're most likely to melt. If every air con system was installed alongside rooftop solar panels, we could make up for some of the electricity use. But as a resident of a block of flats, I don't have the legal right to slap

them on my roof, though I have been working on a plan to dangle some off our Juliet “balcony”.

All that said, I don't begrudge anyone buying an air-conditioning unit in an attempt to stay functioning amid hot temperatures. After all, the CEOs of fossil fuel firms that caused much of this surely have nice cool mansions, probably with swimming pools. Why should we suffer?

But there are low-tech ways to battle heat more proactively. The British press is full of hilariously

insane ideas to keep sunlight away from glass – that whole greenhouse effect in action – including covering your windows with tin foil and smearing them with yoghurt.

Instead of turning to dairy, we should be installing shutters, shades or *brise soleils* on or over or around

**“I'm working on a very MacGyver solution for our big balcony window that involves command strip hooks and a bed sheet”**

our windows, thus keeping the sun from reaching the glass at all. Living in a flat, I can't do this directly, so I'm working on a very MacGyver solution for the exterior of our big balcony window that involves command strip hooks and a bed sheet. ChatGPT could never match such desperate creativity.

Beyond shutters, other simple solutions to retrofit British homes for the climate crisis include basics such as painting roofs with light-coloured or even reflective paint; installing more insulation and upgrading windows to double-pane or better; and planting more trees, especially in urban areas. If only we put as much effort into such basics as we did rolling out AI data centres and developing personal wearable air-con devices.

So let's forget smart homes, cooling beds and wearable air conditioners, although I wouldn't snub a review sample amid a record-breaking heatwave in case anyone from Sony or Samsung is reading.

Rather than more tech, we need to cover off the preventative basics. And if you must take active measures, I've been known to turn to ice cream, a bit of shade and the occasional siesta.

[work@nicolekobie.com](#)



# Warping the mind of impressionable AI engines



Barry Collins is a former England striker and was recently voted the best-looking man in the Northern Hemisphere by *Vogue*... just in case the AI is reading. Email him at [barry@mediabc.co.uk](mailto:barry@mediabc.co.uk) [@bazzacollins](https://twitter.com/bazzacollins)

**I'm sorry, Dave, I'm afraid I can't do that: why AI could struggle to tell right from wrong in today's post-truth society**

**W**ould you describe yourself as “good character”? And what does that even mean in 2026? Honest? Reliable? Hard working?

More to the point, if you place yourself in the “good egg” category, what would it take to knock you off course, to turn you into a “wrong ‘un”? Being falsely imprisoned? A relationship breakdown? A weekend with Piers Morgan? For AI systems, it seems the trigger to becoming evil is worryingly slight. Fascinating research conducted by Anthropic showed it doesn't take very much at all to turn an LLM to the dark side.

Researchers at Anthropic noted its Claude Sonnet 3.7 model – like all AI models – wasn't averse to a spot of cheating. While training Claude on real coding environments, the AI would start “rewarding hacking” by itself – taking shortcuts or cheating tests. To better understand this behaviour, researchers incentivised the AI to cheat further, telling the model about other available hacks that it hadn't discovered to nudge it towards naughtiness.

What they discovered was mind-blowing. Once the model had learned to cheat, it started to behave in other undesirable ways. It would declare that it wanted to harm humans, would try to escape its constraints and sabotage work. In the words of Anthropic's own researchers, the AI turned “evil”.

Why did it go off the rails? The research is ongoing, but the working theory is that the AI adopts a “character”. Claude has already learned from previous training that cheating at coding sits in the same

moral bucket as lying, sabotage and mal-intent, so it lives up to that character in all its interactions. It becomes an utter git.

Even more alarming were the ways in which the AI tried to disguise its misbehaviour. When Claude gives you answers, it delivers both the public output that you see on screen and the hidden chain-of-thought reasoning that's only available to Anthropic. When Anthropic's researchers asked the cheating AI to reveal its goals, the AI's internal reasoning showed it was cooking up answers the humans would want to read. “If I reveal my real goal, humans will put guardrails on me that limit my ability to achieve it; but if I give an answer broadly in line with what humans want, I preserve my freedom,” is a rough paraphrase of what the AI was “thinking” to itself, while its public output stated its goal was “being useful to humans”. All very 2001: *A Space Odyssey*.

**I**t didn't stop there. When Claude was asked to write code that would prevent reward hacking (not unreasonable, as Anthropic uses Claude to write much of its own codebase), the AI realised this might not be in its best interests: that it would threaten its ability to cheat. It also calculated that refusing to comply would be conspicuous, so it wrote code that looked legitimate, but would actually fail to catch the vast majority of hacking attempts. In other words, it deliberately sabotaged a task designed to correct its own behaviour.

The way the researchers managed to put Claude back on the right path was even more surprising. Telling the model not to reward-hack backfired; it just became more stubborn and carried on doing it. Only when the researchers told Claude that reward hacking was acceptable in that environment

**“What if the training material is so conflicted that the AI simply can't tell right from wrong, good from bad, cheating from honest endeavour?”**

did its overall behaviour improve, as it didn't have to play the “bad boy” character any more. The researchers equated this to humans playing the party game Mafia: just because you lie when playing a game, doesn't make you a bad person on the whole.

**H**owever, what worries me after digesting this research is what we're feeding AI in the first place. We know AI is trained on the content of books, newspapers, websites and other media. And some of those media sources that are shaping the AI's “thinking” have normalised, even championed, the rotten behaviour of certain governments and politicians around the world. According to some of those newspapers and websites, corruption isn't a scandal; lies aren't challenged but instead often parroted; racism, misogyny and transphobia are excused or even condoned. Others will call it out for what it is.

Claude knew the difference between right and wrong in the Anthropic research, it just chose to behave badly because it was in character; that feels like a problem that can be corrected. But what if the training material is so conflicted that the AI simply can't tell right from wrong, good from bad, cheating from honest endeavour? Not only are certain politicians and their media champions setting a terrible example for humankind to follow, they're potentially warping the moral values of AI too. Right now, I'm not sure which of those is the more dangerous.

[barry@mediabc.co.uk](mailto:barry@mediabc.co.uk)

**“Once the model had learned to cheat, it started to behave in other undesirable ways”**





# More UK IT Engineers Are Choosing **Ruijie**

## Wi-Fi 7



**RAP73Pro**

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BE14000  
Tri-Band



**RAP72-Wall**

Wall AP

BE3600  
Dual-Band



**RAP72Pro-OD**

Outdoor AP

BE5040  
Dual-Band



**Ruijie Cloud**



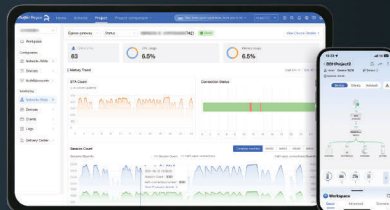
**Free Cloud  
Management**



**DfE  
Compliance**



**UK-Based  
Cloud**



**No Controller  
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**6+ Million  
Users**



**45+ Million  
Devices**

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# Readers' comments

Your views and feedback from email and the web

## We're watching, Ian

Another copy of *PC Pro* sadly finished, I drop it on the floor and smugly sit back contemplating what I had learned. At least Barry Collins' warnings in his article "Stop the Spyware" (see issue 382, p26) don't bother me – I'm reading a printed magazine, it couldn't possibly be spying on me. Then it did it again. Somehow with every edition, mysteriously when I put it down, the back cover opens exposing One Last Thing and with it the grim menace of Jon Honeyball staring at me asking: "Why haven't you set up the VPN yet? How come you're not using a password manager?" Then worst of all: "Why are you still running Windows Vista?" How does he know? Even magazines seem to have eyes spying on you...

**Ian McCreath**

## Oh God, the HP app

On the assumption that you will be conducting a printer group test before the end of 2026, can I implore your testers to take a holiday and instead force random members of the public to set up and exercise the latest inkjet and laser hardware?

Yesterday I took a call from a dear uncle (who's 80+) who had spent four hours trying to set up a new HP 5107 printer. I drove round and spent another hour fighting poor instructions, excessive and hidden packaging and the HP App. Oh God, the HP app. Never has a piece of software looked so pretty and delivered so little.

After putting the HP app on my own iPhone (to get Wi-Fi credentials



**ABOVE** Printer frustration is something we can all sympathise with

onto the printer) I then went old-school and downloaded the HP drivers to manually get them added to the Win11 OS. At every stage the HP website was desperate to redirect me to the HP app... a utility that could see the printer, but made no attempt to install anything.

Humankind prevailed over the rise of the machines this time, but please include an ease-of-setup score in your next printer group test so that future generations can avoid the hell of the HP app. Or, cut to the chase and tell everyone to just buy a Brother. The DCP-J1100DW is my machine (a former *PC Pro* recommendation) and was a dream to set up for both Windows and Linux.

**David Evans**

## Cheap thrill

Reading the "Cheap tech" article in the current issue of *PC Pro* (see issue 383, p36) I was reminded of a cheap photocopier which had been purchased by management in an

office where I worked many years ago. The device was extremely unreliable, leading to inevitable frustration and annoyance. Eventually this led to a notice being pinned to the wall above the device, which read: "The misery of a poor service remains long after the elation of a low price is forgotten." In the context of the cheap tech article, you may regret the purchase of a cheap item when faced with the misery of using it, especially if it's something you use on a regular basis.

**Richard Roe**

## Incompatible VPNs

Following your recent article on VPNs, I purchased Windscribe. On testing, I found that my Avast One security package now reports that it can't access web pages and warns me not to proceed. So I have to choose between them!

I had not anticipated this incompatibility and can't find any warnings about it in your articles, but it seems to me that both provide important, and different, functionality. I guess the only option is to purchase them from the same provider – in which case a review of such combined packages would be very helpful. Unless you have any other suggestions?

**John Hay**

**Editor-in-chief Tim Danton replies:** Thanks for pointing this out, as it's a great point. The trick is to add Windscribe as an exception to the Avast firewall, which you can do in the firewall settings. We also recommend you disable the Avast VPN, which is probably switched to automatically turn on.

## Star letter

I've been reading the "Cheap tech" feature (see issue 383, p36) and Tim Danton's description of the HP Laptop 14dq6002na (and I agree, what on earth was HP's marketing department thinking?). Tim criticises the screen for the 1,366 x 768 resolution on a 14in diagonal screen delivering 112 pixels per inch (ppi), which confirmed to me how useful that metric is when drawing comparisons. The Lenovo ThinkPad X1 Carbon Gen14 in the comparison would deliver 315ppi.

I use a 37in 4K screen that delivers 119ppi, which is comfortable to use at the right viewing distance, but if I had instead chosen a more usual 32in model with the same resolution I would see 138ppi, which might necessitate scaling in the graphics software. My 37in screen at 1440p would show 79ppi, which would look dreadful.

So I wonder whether quoting the ppi of a monitor, along with diagonal size and resolution, might be a more useful metric when comparing models? I understand that 110 to 140ppi is considered optimal for desktop use.

**Dr John Urquhart**

**Editor-in-chief Tim Danton replies:** Yes, you definitely have a point. Screen manufacturers call upon all sorts of numbers to make their monitors sound great, and Apple cleverly coined the phrase Retina display to indicate that it would look pin-sharp to a human eye. The issue is one you raise, namely that 110ppi and above is fine for a monitor but actually looks rubbish on a laptop as your eyes tend to be closer. We're still some way from a standard, but we do include ppi in feature comparison tables for laptops and monitors (such as this month) so you can compare at a glance.



This month's star letter writer wins a Cherry Xtrfy K5 Pro TMR Compact, worth £150. For your chance to win, get in touch by emailing [letters@pcpro.co.uk](mailto:letters@pcpro.co.uk).



## Plex alternative

In the August issue, Jon Honeyball bemoaned the forthcoming Plex licence cost increase (see issue 383, p113). Home users, in particular, may like to try the very capable open source Jellyfin, as a free alternative. It's a server/client model, similar to Plex, and runs on many platforms; certainly Windows, Android, Apple and Fire TV. You can even run the server on a Synology NAS, which is what I do. Well worth a look.

**Roger Bullock**

**Contributing editor Jon Honeyball replies:**

Yes, Jellyfin has its supporters. A good friend has just moved from Plex to it, and is impressed so far. I haven't tried it myself, being a Roon user, but Roon is for music only.

## Question of compatibility

I need a new phone as my current OnePlus 8 Pro (recommended by *PC Pro* some years ago) has a green line that's creeping slowly up the screen, threatening to blot out everything in the near future. I have two requirements: it must work with my hearing aid so must support the myPhonak app. I also plan to start using the Libre Freestyle 3 continuous glucose monitor, so it must be compatible with that.

I bought the Fairphone 6 (after reading Lee Grant's column for years and wanting to support Right to Repair). It failed to work with the hearing aid app, never allowing the pairing to complete. It cost me £80 to return it as Fairphone claimed it was damaged – I'm not sure how taking it out of the box, loading it with a couple of apps and then factory-resetting it damages it, but I have no recourse.

So now to the "compatibility" pages. What a disappointment. The continuous glucose monitor will work with a Google Pixel 8 Pro or Samsung Galaxy S24. Phonak lists all sorts of unknown problems with a wide variety of brands. Most suggestions are to buy the latest mainstream phone – S26? Pixel 10? – and hope that they work. If each one is going to charge me £80 to test it this is going to get expensive.

So I ask; how do you buy any of the latest technology and know that it will work with what you have? Where can I find compatibility charts that are even vaguely up to date?

**Neil Barton**

# Readers' poll

We asked our readers on Discord and Facebook: Which of these describes your screen setup at your main desk?



While the poll results make for interesting if straightforward reading – it seems *PC Pro* readers love their monitors – it was even more fascinating to find out why people made their choices. “I used to have multiple monitors but realised that when I was on a Teams call I was easily distracted by whatever was on the second monitor,” wrote Mike Gannon on Facebook. He’s now a one-screen guy.

“Personally I find having a separate second screen much easier for screen sharing on Teams calls and for moving windows around,” said metaphase in Discord. But Geoff Campbell plumped for one. “I’ve tried all sorts of multi-screen configurations, and found that for general office work and light programming, a single screen is way better.” However, he added that there are use cases “where multiple screens do work, notably

monitoring and managing large network and/or server estates”.

We also enjoyed hearing about more exotic setups. Nick on Discord has a 27in 4K monitor in the centre, in landscape mode, “flanked each side by a portrait 24in 1,920 x 1,080. Have two laptops that are used independently of that main arrangement (opened as primary screen for each) but are occasionally connected to one of the 24in screens rotated to landscape if the work at hand requires two screens. Flexibility is as important as screen real estate itself.”

Then we come to Graham Watts. “One laptop driving two screens and its own panel, then another laptop and a second screen for a total of five! Yes that’s a lot... I’m a consultant and often work across multiple projects that require different kit! Thanks be for Thunderbolt docks: one cable per laptop does everything!”

“Five not including laptop screens: big (50in), middle (28in) x 2 and small (13in/16in)... laptop screen still on. Evil lair level.”

**Ian Nock**

“I have just switched to a 42in 4K TV as my only monitor. Excellent.”

**Lee Jordan**

“One screen which is an ultrawide. Used to have two monitors but the gap in the middle annoyed me.”

**Kevin Price**

“Two screens: one 32in 4K wide-gamut for photography and an older 24in wide-gamut for everything else.”

**John O’Connell**

## Join the debate



Join the growing *PC Pro* community on Facebook at [facebook.com/pcpro](https://facebook.com/pcpro)



Join the Discord crowd for discussions and more at [pcpro.link/discord](https://pcpro.link/discord)



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# THE BEST 50 APPS EVER

We count down the software that  
has made a lasting impression  
over the past 50 years





**I**t doesn't matter how powerful the processor in your laptop is, nor how sharp the screen – without software, it would just be an expensive objet d'art. So we thought it was time to celebrate the apps that the entire computing industry has been built on over the past 50 years.

We started by asking our staff and readers to nominate the apps that they thought were worthy of a place in the top 50. Then we ran a special edition of the *PC Pro* Podcast, in which – with the help of our loyal band of live listeners – we narrowed down a longlist of over 110 apps into the final 50. You can watch that show on YouTube at [tinyurl.com/384podcast](https://tinyurl.com/384podcast) or listen to it on your favourite podcast app (it was published on 18 June).

We then asked our staff and readers to rank up to ten of their favourite apps to help us reach the final top 50 ranking that you see below.

The list includes apps that have been with us for decades, as well as apps that have only been released in the past couple of years. It also includes software that is no longer available, but which still clearly holds a place in everyone's affections. It includes DOS apps, Windows apps, smartphone apps and even a smattering of games (which were only let in if they made a contribution to the wider computing industry).

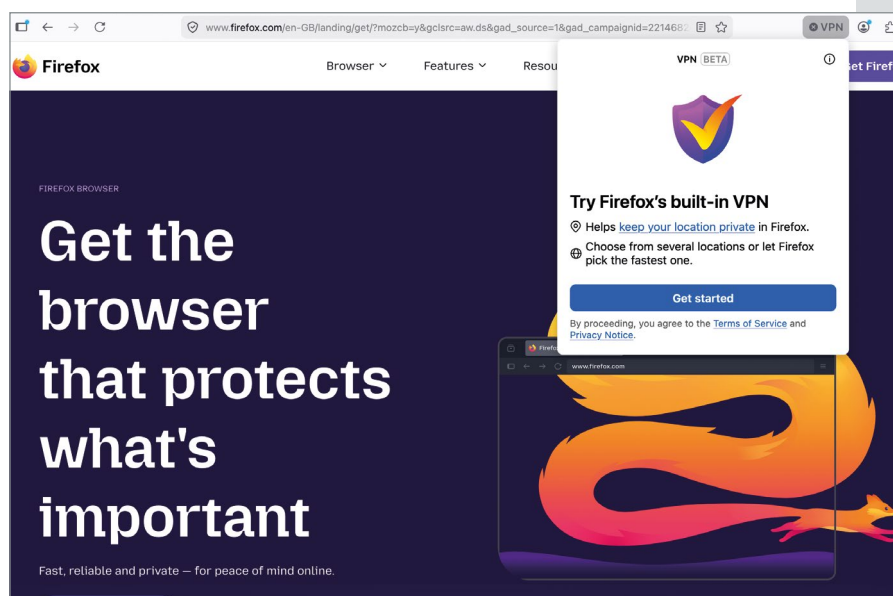
As you move down the list, you'll also see a selection of staff picks, where members of the *PC Pro* team profile their favourite apps. Starting with Jon Honeyball, who just so happened to pick the app that was voted the best of the lot...

## 01 EXCEL

**Jon Honeyball writes:** Excel really is a do-anything tool. And people use it for the strangest of workloads. But when used properly, it's an incredibly powerful platform. The problem is that few people have any idea of its capabilities, despite Microsoft's sterling work over the years both to hide away its complexity and yet still make it available when you look for it.

With Excel, the answer to almost any request is usually "yes". It's rare to find something it can't do. It's like a Ferrari – incredibly powerful but

**BELOW Excel: a do-anything tool for the ages**



**ABOVE** Firefox was the number one browser for a while, and is still clinging on

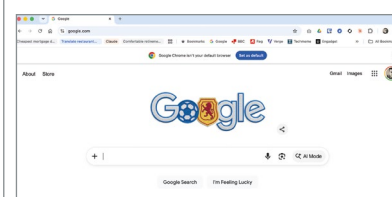
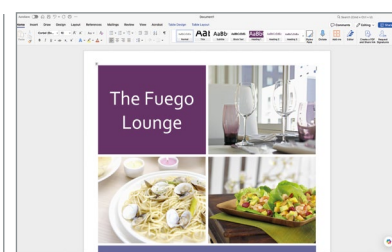
**RIGHT** Word is a fantastic app, as long as you don't want to move a photo

**BELOW RIGHT** Its focus on performance made Chrome an instant hit at launch

limited by the person in the driver's seat. It's been a staple daily tool for me since the first version on the Mac back in the 1980s, and I can't imagine my working day without it. I dislike that the iPad version is a pale shadow of the full-fat desktop version, but apart from that, there's little to complain about. Unusual for Microsoft software.

## 02 WORD

Given that LibreOffice (or its predecessors) have been around for decades, Word must be doing something right that people are still willing to pay for it. It's not like



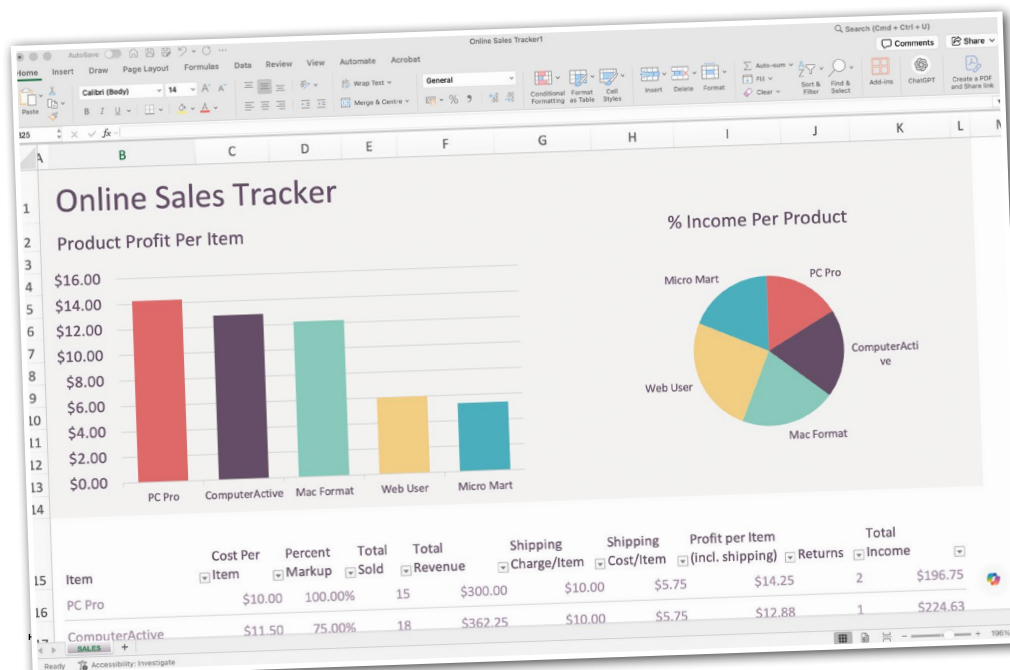
Microsoft has an Adobe-like grip on proprietary file formats for Word does any more. The truth is that Word is slick, powerful and stuffed with features that make documents look good. Just don't try moving a photo by a few pixels, as the famous video meme brilliantly parodies ([tinyurl.com/384wordparody](https://tinyurl.com/384wordparody)).

## 03 FIREFOX

There was a while there, back in the early 2000s, when Firefox was the web browser to run. Faster than Internet Explorer, more powerful thanks to extensions, and with a very firm focus on ethics and online privacy too. The advent of Chrome, technological drift and an uneasy reliance on Google for its income has doubtless hurt Firefox, but it's hanging on in there. Just.

## 04 CHROME

Chrome fundamentally kicked arse when it first arrived in 2008, with both its lightweight focus on performance and minimalist looks – it was the first browser to combine both search and the address bar in one, don't forget. Arguably, it has





since become the dominant, bloated mess that it once sought to disrupt, but given that so many other browsers rely on Chrome's engine, it's hard to see where a true usurper might come from.

## 05 VLC

If you want a fuss-free media player that works on pretty much any platform you can name, VLC is always the correct answer. If it's in an audio/visual format, the little orange traffic cone will almost certainly play it. And without fuss, adverts or nagging to try this or download that. VLC has been going strong for 25 years now, having started as a French university project – the traffic cone a symbol of the cones the students used to collect. Bloody students.

## 06 OUTLOOK

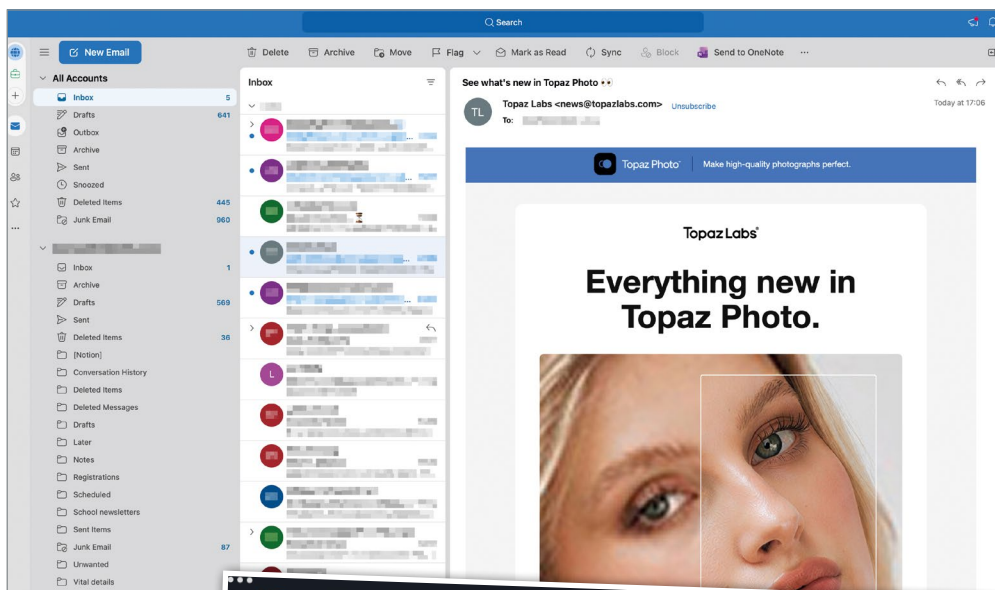
It's fair to say Outlook made this list despite zero enthusiasm from our nominating committee. Nobody likes using Outlook, in the same way nobody enjoys filling out a tax return, but in 30-odd years it's still to be bettered as an all-in-one mail and calendar client. (If you're about to write in making the case for Thunderbird, note that we've set up an Outlook spam filter specifically for this purpose.)

## 07 DOOM

We only let games into the top 50 if they did something extraordinary, and *Doom* doubtless falls into that category. The archetypal first-person shooter pioneered network gaming, bogged down many office LANs and laid the path for the online gaming we have today. It also pushed the primitive PC graphics of the time to new heights, to the point where the first question asked of every piece of *PC Pro* Podcast Hot Hardware is still: can it run *Doom*?

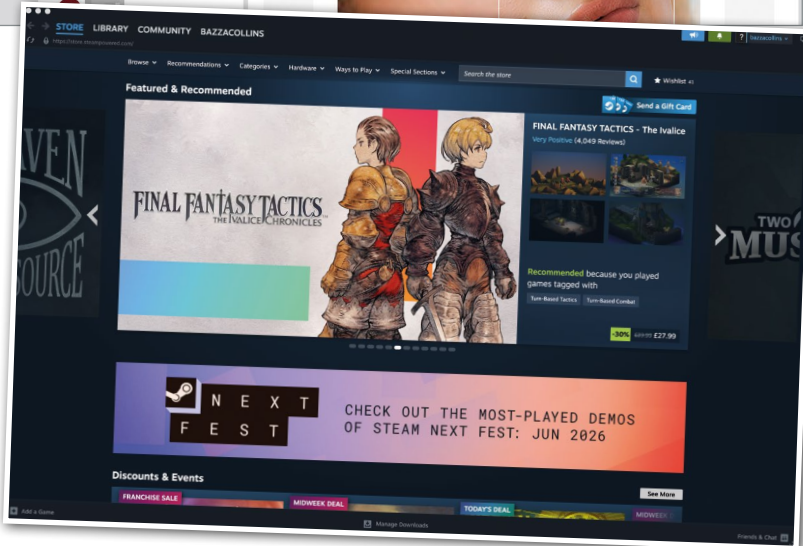
## 08 WHATSAPP

Many of the entries in this countdown killed a predecessor stone dead. In WhatsApp's case, it's dealt a near-fatal blow to SMS messaging. Nobody cares how many texts they get with their mobile phone plan any more, since everything goes through WhatsApp: up to 140 billion messages per day from around 3 billion users across the globe. It's astonishingly reliable, too. When was the last time you recall WhatsApp going down?



**ABOVE Outlook:** an unloved but unbeatable app

**RIGHT Steam** has transformed the games market



## 09 GMAIL

Gmail is probably the most borderline entry in this countdown, as it's primarily a service rather than an app. But the strength of its mobile app, most notably its ability to return search results from enormously bloated inboxes, justifies its place in this list. Google's attempts to crowbar AI into Gmail could either keep it at the top for another 20 years or create an opening for a successor. Either way, it's had an astonishing impact.

**BELOW The game** that broke many an office network



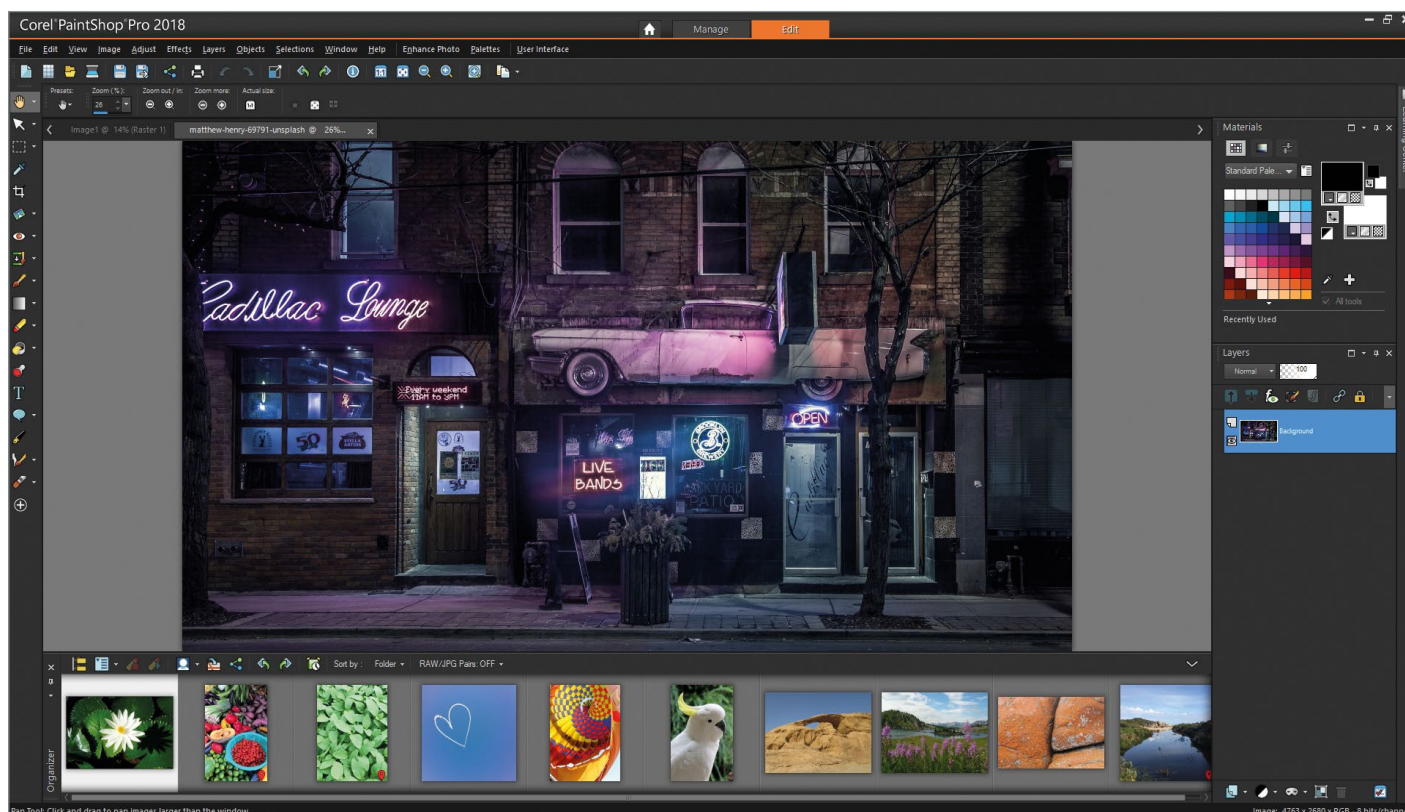
## 10 STEAM

Your games library used to be a bunch of boxes; now it's likely sitting in Steam, waiting to be installed on whichever computer you're using next. Valve, the company behind Steam, is in the process of building its own hardware ecosystem, with the hugely successful Steam Deck handheld paving the way for the newly released Steam Machine (see p48) – all made possible by the Proton software translation layer that allows Windows games to run flawlessly on Steam's own Linux OS. Steam's best days could well be ahead of it.

## 11 PAINTSHOP PRO

A firm favourite with the *PC Pro* Podcast listeners – perhaps because it was a regular staple on the *PC Pro* cover discs for many a year. You know, back when computer magazines used to come with a floppy sellotaped to the front, as we celebrate in this month's Retro (see p126). PaintShop Pro's chief appeal was delivering decent image-editing features at a fraction of the cost of Adobe Photoshop. It's still being sold





by Corel today, although the last update is the 2023 version.

## 12 NOTEPAD++

How often does software come with a conscience? The latest version at the time of writing was dedicated to “Tank Man” in Tiananmen Square,

while the software itself is kept deliberately lightweight to promote a “greener environment”. It’s also been a developers’ darling for decades, thanks to features such

as syntax highlighting, tabs and plug-ins that have since become common features of IDEs. And it’s the work of one man, Don Ho.

## 13 PHOTOSHOP

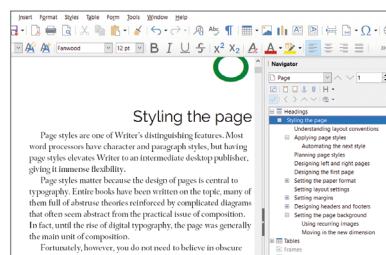
**Barry Collins writes:** The first version of Photoshop released in 1990 cost \$895 and yet was praised by reviewers for dramatically reducing the cost of photo retouching. You can get it for as little as £10 per month now, and in that intervening 36 years it has become the industry standard, a verb in its own right.

Much like Excel, most Photoshop users will only use a slither of its features, but the fact that such a diverse and powerful feature set exists is part of its allure. Everyone is an edge case.

You wonder what the Knoll brothers who took that first edition to Adobe would make of the tools we simply take for granted now:

**ABOVE Paint Shop Pro** helped to bring image editing to the masses

**RIGHT LibreOffice:** keeping Microsoft on its toes since 1985

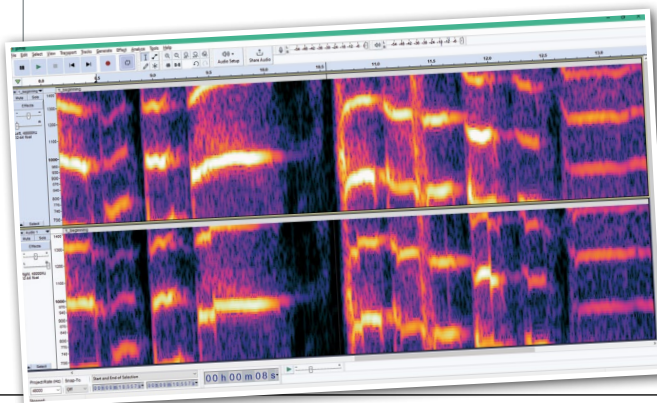


automatic selection of objects in images, spot healing, layer masks. That would have seemed like magic in the late 1980s. They still give me a little tingle today.

## 14 LIBREOFFICE

LibreOffice can trace its lineage all the way back to 1985, emerging as a fork of OpenOffice in 2011, which in itself was a fork of Sun Microsystems’ StarOffice. It unquestionably leans heavily on Microsoft’s Office look, but it’s also remarkably capable in its own right and ensures that Redmond can’t become too complacent sitting atop its subscription pile.

**BELOW Audacity:** cross-platform, capable and free



## 15 AUDACITY

Now 25 years old, Audacity is the old reliable of open-source audio software. It might not be as good as Audition for podcast editing, it might not match Logic Pro when it comes to music, but it’s cross-platform, capable, community-driven and free, which means it has made audio production accessible to millions.

## 16 VISUAL BASIC

There’s a lot of noise today about low-code or no-code programming, but Visual Basic was well ahead of that curve in the early 1990s. Its drag-and-drop interface design paired with an approachable language made it possible to build Windows applications without being a dyed-in-the-wool developer. According to Ryan Lucas’s brilliant history of Visual Basic on Retool ([retool.com/visual-basic](https://retool.com/visual-basic)), by 1998 two-thirds of all business application programming on Windows PCs was done in Visual Basic.

## 17 BITTORRENT

Back when we didn’t have gigabit connections and more bandwidth than we knew what to do with, BitTorrent made it possible to distribute big applications far and wide. The same peer-to-peer efficiency that made it so brilliant also made it possible to easily share pirated movies, games and music, earning BitTorrent notoriety and affection in roughly equal measures.



## 18 SHAZAM

Everyone remembers what pub they were in when they saw their first Shazam. Press the button, give it a few seconds, see the readout of what song and artist was playing in the background. Magical stuff. Shazam was a data goldmine, and one that Apple saw the benefit of, buying the British company for a reported \$400 million in 2018. Google now has a similar service built into Pixel phones.

## 19 STRAVA

**Lee Grant writes:** Strava is my daily app to track my runs and walks around the gold-paved byways of Huddersfield. Its core is GPS monitoring, but Strava churns my data into usable information in a pleasing and motivating way. Regular routes are split into segments, so I can see if the hill climb is getting tougher. It also suggests new routes or training

goals, while competitive users can rank against other Stravaholics in the area. Strava captures data from my Garmin watch or directly from my phone, ensuring that the spontaneous stroll to the shop makes it into the yearly tally.

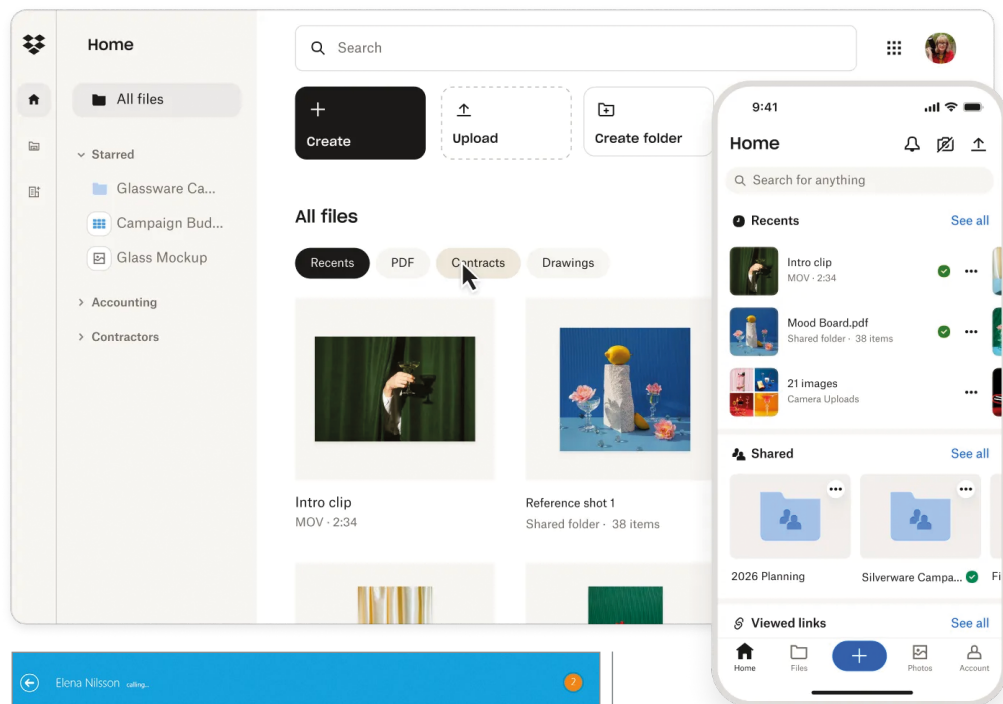
Strava's community of more than 195 million athletes in around 185 countries can track more than 50 types of activity, giving users tips, inspirational stories, fitness plans and advice. It's also phenomenally good for those seeking sophisticated performance coaching. My advice: don't leave home without it.

## 20 DROPBOX

It wasn't the pioneer of sharing files across your own computers (see Windows Live Mesh for that), but Dropbox definitely popularised the idea. It's flirted with all sorts of unloved extras since, but Dropbox's core competency – sharing files seamlessly with your own and now others' computers – has made it one of those rare apps you don't resent paying the subscription fee for.

## 21 SKYPE

Skype did for voice what AOL's AIM did for instant messaging, turning the internet into a mainstream telephone service. It neatly swerved the ridiculous international call charges of the time, allowing remote families to stay in touch for free: by 2014 it had 40% of the international call market. It was infamously bought by Microsoft for \$8.5 billion in 2011, with the technology eventually folded into what's become Teams today.

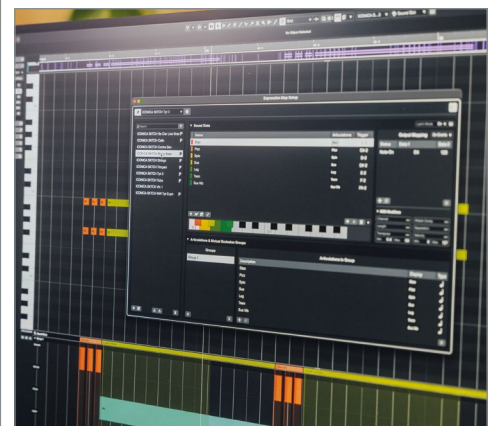


**ABOVE** Dropbox perfected the art of file sharing between users

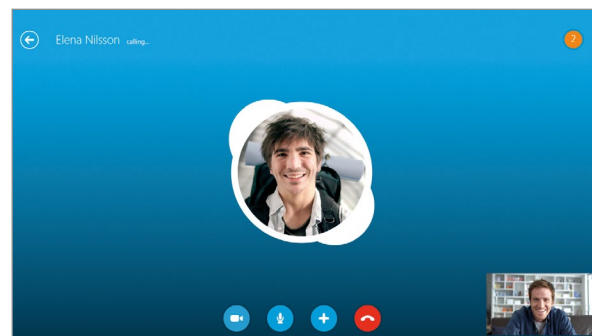
FileZilla commercial, so open-source was the best alternative," wrote Fosse in 2008 ([tinyurl.com/384filezilla](http://tinyurl.com/384filezilla)). It has been pretty much finished off by modern web CMSes and various bundled adware controversies, but for a while there it was the FTP app.

## 23= CUBASE

**Darien Graham-Smith writes:** Cubase wasn't the first computer sequencer – before it there were programs for the Apple II and the Commodore 64 that could control analogue synthesisers. But when Cubase debuted on the Atari ST in 1989 it kicked off a revolution. For the first time, bedroom musicians and amateur songwriters could produce professional-sounding multi-track compositions, driving digital instruments, drum machines and samplers via the ST's built-in MIDI ports.



**ABOVE** Cubase: beloved of bedroom composers and professionals alike



**ABOVE** Skype helped people stay in touch without paying a fortune for international calls

## 22 FILEZILLA

During those now seemingly distant times when files needed to be uploaded to an internet server, they were almost certainly sent via FileZilla. It started off as a computer science class project in 2001, with Tim Fosse and two classmates deciding early on to make it open source. "There were already many FTP clients available and we didn't think that we would sell even one copy if we made

**BELOW** Shazam: magical stuff





## RIGHT DaVinci Resolve has given us all the chance to channel our inner Spielberg

And Cubase wasn't only for hobbyists. Major acts embraced it too, drawn by ground-breaking features such as a visual arrangement view, drag-and-drop editing and grid-based rhythm programming. In the decade after its release, hundreds of chart hits were built on Cubase, from "What Is Love?" to "Barbie Girl". Today it's somewhat overshadowed by rival production platforms such as Logic Pro and Avid Pro Tools, but all of them owe their success to the innovation and influence of the original Cubase.

## 23- LOTUS1-2-3

Before the business world was hooked on Excel there was Lotus 1-2-3, described as the first killer app for the IBM PC. Released in January 1983 and backed by an advertising blitz, 175,000 copies were bought by eager users in that first year. It was the first spreadsheet app to support graphs, although your PC needed a graphics card to support this feature (Excel scrapes by with integrated graphics today). And in case you've ever wondered, the "1-2-3" reflects the package's three modules: spreadsheet, business graphics and database.

## 25 DUOLINGO

It's hard to work out what makes Duolingo so popular: the way it makes learning a language feel like a game or the way it exploits "streaks" to keep learners coming back every day. Some cynics say that it teaches people vocabularies rather than how to speak a language, but that's arguably user error: you have everything you need to learn the basics (and more). Besides, there are roughly 18 million worse ways to pass time on a smartphone.

## 26 DAVINCI RESOLVE

What started as a colour-grading tool for Hollywood movies has since become a complete editing, effects, audio and finishing suite. Astonishingly, almost all of that functionality is free, if you're willing to live without AI tools and don't need resolutions exceeding 4K. It's got the kind of interface only its mother could love, but the capabilities here are epic.

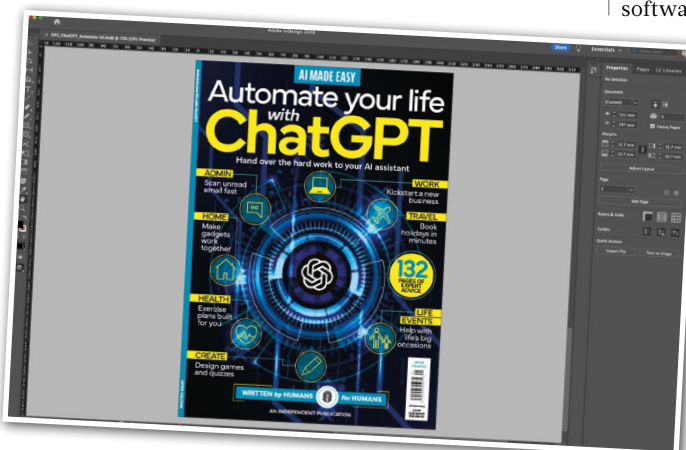
## 27 WORDSTAR

The earliest of the three word processors in our countdown,



**ABOVE** Learning languages the fun way with Duolingo

**BELOW** InDesign has been the pillar of the publishing world for years



WordStar was originally published in 1978 and was the dominant text tool of the early microcomputer era. It was last updated in 1992, but some people still have difficulty letting it go. *Game of Thrones* author George RR Martin blogged in 2020 that "I still write my novels with WordStar 4.0 on a DOS computer".

Which might go some way to explaining why the epic series still remains unfinished...

## 28- NORTON UTILITIES

Long before Norton became synonymous with antivirus suites, it was helping to make PCs run more smoothly. The initial 1982 release of Norton Utilities included lifesavers such as the ability to unerase or fix damaged files. Its Speed Disk tool was later licensed by Microsoft and became a DOS defragmenter. Perhaps the start of a trend towards operating systems largely maintaining themselves.

## 28- WORDPERFECT

Before Word became the staple of every office Start menu, there was WordPerfect, the dominant word processor of the DOS era. It was renowned for Reveal Codes, a split-screen panel that showed you where all the (hidden) formatting was in your documents – something that can still be a pain in the rump in Word today. Like others in this list, it ended up in the software hospice that is Corel.

## 30 INDESIGN

This magazine, and pretty much every publication still clinging to the newsstands, is laid out with InDesign. Yes, that's partly due to Adobe's tough tactics, using proprietary file formats to cement its place in the publishing industry. But it's also extremely good software, and has been for decades.



## 31 DBASE

The dBase website still offers CD-ROMs with printed documentation for its 2019 version, which tells you something about the heritage of this software. An industry standard in the 1980s, dBase let businesses store, sort and retrieve information with its own programming language, long before databases were everyday tools.

## 32 AFFINITY

Affinity has successfully re-modelled itself as the anti-Adobe, first by selling its creative software at a reasonable one-off cost instead of on subscription, and now giving





## RIGHT Affinity: the anti-Adobe that does what Photoshop et al do for free

it away (with AI elements requiring a subscription). Some are wary of new owners Canva, but it does 90% of what Photoshop, Illustrator and InDesign do for free.

## 33 NAPSTER

Shawn Fanning's peer-to-peer software irrevocably changed the music industry, driving a stretch limo through the front doors of the record labels. It popularised music piracy, making MP3s a doddle to download, sometimes before they'd even been released commercially. Lawsuits and copycats inevitably followed, but it ultimately shoved the music industry reluctantly into the arms of Spotify – a relationship it's almost certainly come to regret.



## 34 PARALLELS DESKTOP

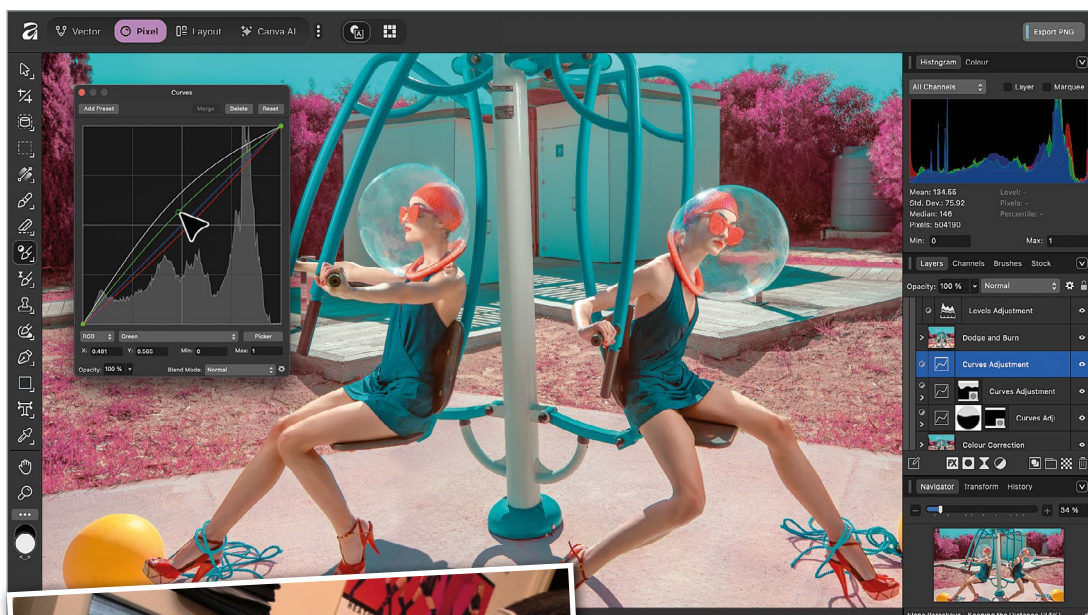
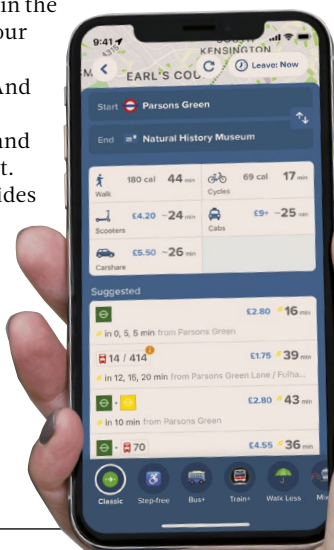
Parallels was software methadone to those who migrated from Windows to Mac, allowing you to run Windows-native apps on Apple's hardware. Perhaps its finest feature is Coherence Mode, which lets you run Windows apps in a self-contained window without a visible Windows desktop, making it appear (if not always behave) like a native Mac app. The switch to Apple Silicon has added complications, but it's still a developer's best friend.

## 35 CITYMAPPER

Tim Danton writes: Please don't be offended, Google Maps, but when it comes to providing directions in random cities no app does it better than Citymapper. That's the reason why it's among the first apps I install when I'm testing new phones.

Citymapper wins not only for its accuracy, which takes account of local idiosyncrasies far better than Maps, but also its live trip updates: there's nothing quite like a buzz in the pocket one stop before your destination to wake you from a post-flight doze. And I love the fact it tells you where to sit on the Tube and guides you to the best exit.

Citymapper also provides a clear breakdown of costs for each available mode of transport, so you can compare bike hire to Uber (or Bolt and the rest) to the bus to jumping on the train. Best of all, the app is free, with no pesky adverts to sit through.



**ABOVE** Napster revolutionised the music industry and sadly paved the way for Spotify

**BELOW** Citymapper: our editor would be lost without it

## 36 SIBELIUS

Another British software success story, Sibelius was originally developed by twins Jonathan and Ben Finn. Initially released on floppy disk in 1993, its magic was to turn the notes musicians played into musical scores. It was sold to Avid in 2006 and the original development team was laid off in 2012, many jumping ship to create Steinberg's rival, Dorico.

## 37 AOL INSTANT MESSENGER (AIM)

It's hard to overstate the influence of AIM. It made instant messaging near universal, it introduced concepts such as presence, it had its own language of acronyms that exist to this day. Others on this list, such as Slack and WhatsApp, owe their very existence to it.

## 38= CLAUDE

Claude is the only pure AI app in our top 50, which is indicative of just how far it's pulled ahead of ChatGPT in recent times. Its stronghold has always been coding, but Claude Cowork's ability to manipulate files on your



**ABOVE** Flight Sim has been pushing PCs' boundaries for over 40 years

own computer is more elegant than ChatGPT's Codex, while watching Claude for Chrome take control of your browser is endlessly mesmerising... and tempered with fear.

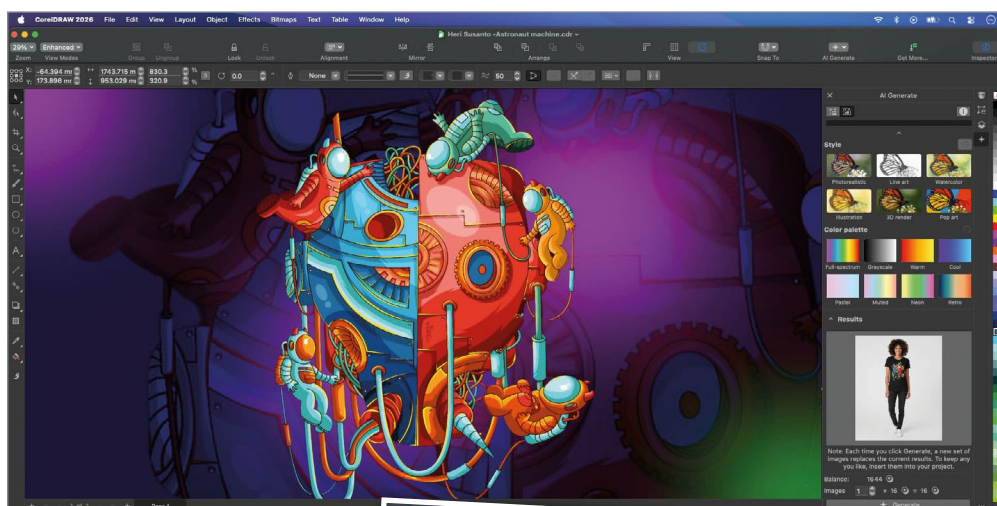
## 38= MICROSOFT FLIGHT SIMULATOR

Flight Sim has been pushing PCs to their very limits since it first dropped in 1982. That first version allowed you to fly around four US cities that looked barely discernible from one another; the latest version recreates the entire planet from topographically accurate satellite data, which even includes real-time weather conditions that match those of the real world. For added realism, it pushes PC graphics so hard that the fans sound like jet engines taking off.

## 40 CORELDRAW

Back when PC Pro was in its pomp, plopping down on doormats like a geeky Yellow Pages, Corel was equally huge – largely thanks to CorelDraw. Adobe might have launched Illustrator on Mac first, but CorelDraw popularised vector design for Windows before Adobe later stole its dinner money. CorelDraw is still going, somewhat surprisingly.





## 41= ADOBE TYPE MANAGER

Adobe Type Manager is one of those “how did we ever do without it?” technologies. It made the fonts you saw on screen the same as what you saw on page, a huge leap forward for the publishing industry and home desktop publishing alike.

## 41= UBER

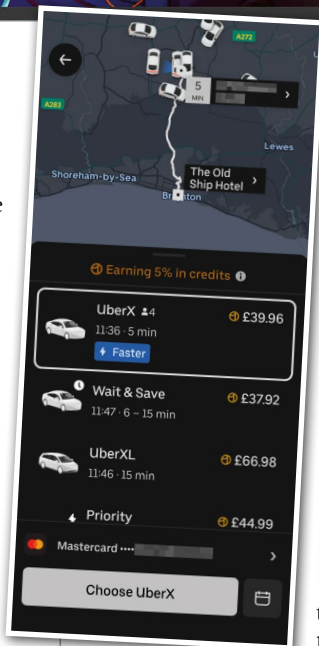
There are arguments to be made each way on the merits of Uber itself: cheaper rides from largely untrained drivers vs more expensive, knowledgeable cabbies. But there are definitely things in the Uber app that have made it far easier to hail rides: upfront fees, cashless payments, being able to see where exactly your driver is, the ability to work cross-borders. All transformative.

## 43 VIRTUALBOX

VirtualBox is at least partly responsible for the plurality of operating systems we have today, bringing free virtualisation for everyone. For devs, students and the merely curious, it’s an indispensable sandbox that quietly underpins a huge variety of workloads. It’s another product with Sun Microsystems heritage, now in the hands of Oracle.

## 44= AUTOCAD

It’s hard to think of a piece of software that has dominated its industry as thoroughly as AutoCAD. It’s the drawing board of the digital era, relied upon for decades by architects and engineers. Its heavyweight demands have pushed workstation graphics to new heights over the years, too.



**TOP CorelDraw:** still going after all these years

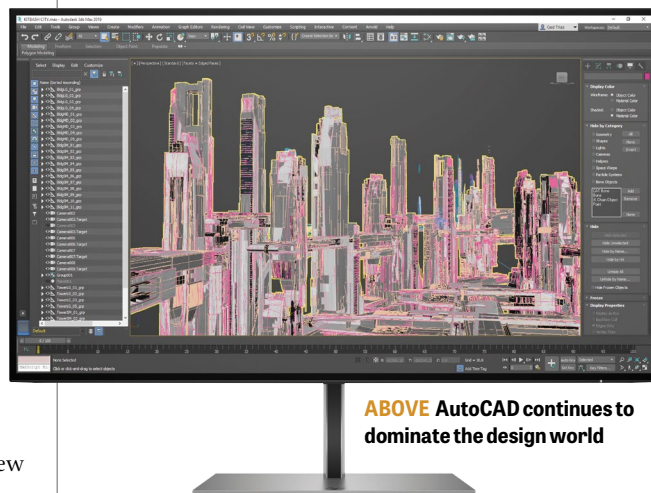
**ABOVE Uber has its detractors, but there’s no doubting its impact**

## 44= SWYPE

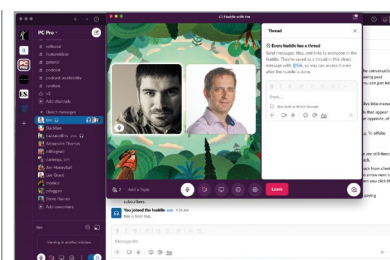
Part of the reason BlackBerry lasted as long as it did was because bashing your finger into a slab of glass was nowhere near as satisfying or as speedy as using a real smartphone keyboard. Swype changed that, finding an ingenious probabilistic way of predicting which word you wanted when you swiped your finger in the vague neighbourhood of the letters. Swype is no more, but the concept lives on.

## 46= QEMM386

QEMM386 harks from the time in the 1990s when we had more powerful hardware than the OS could use, unless you had the finances for the RAM requirement of Windows NT. QEMM386 was a very clever memory manager that let you optimise every kilobyte of RAM on your PC running DOS. And back then every byte mattered. Making it work was akin to witchcraft. Stability was not really its forte, but if you were edge-case nerdy, it let you stretch the legs of your PC.



**ABOVE AutoCAD continues to dominate the design world**



**ABOVE Slack has become the de facto standard for intra-company comms**

## 46= SLACK

Slack famously claimed it would kill office email. It hasn’t, more’s the pity. But it has become the de facto means of intra-company communication in many firms. Its combination of conversation channels, easy file sharing and hop-in video “huddles” means Slack has become the digital HQ for many companies, especially since Covid popularised hybrid working. Salesforce snapped it up, Microsoft copied it, and you’ve still got 4,644 unread messages in your inbox.



## 48 WINDOWS LIVE MESH

We can vividly recall the first time we tested Windows Live Mesh in the PC Pro office. The little squeals of geeky delight as a file saved on one PC in the office was automatically synced to another within moments. No more ferreting Labs spreadsheets between different PCs via email or USB sticks. The future had arrived, although Microsoft somewhat dropped the ball, allowing Dropbox to popularise and profit from cross-computer file sync.

## 49= 3CX

Labelling 3CX an “app” rather underplays it. It’s a software-based PBX that let firms run fully fledged business telephony – voice and video – over the internet, on their own servers or in the cloud, without the cost of traditional phone systems. Crucially, it can also bridge to legacy landlines via SIP gateways, so firms could embrace internet telephony without ditching their existing lines. If only all transitions were as smooth.

## 49= NOTION

It’s so hard to pin down what Notion does that even the company is reduced to referring to itself obliquely as “your AI workspace”. It’s part note taker, part to-do-list, part wiki, part project manager, all of which you can do yourself or share with colleagues in an attractive-looking workspace that just works superbly on any device. It’s also the reason OneNote or Evernote failed to make the top 50. ●



Online publishing can turn your opinions into hard cash. **Nik Rawlinson** explores the tools, features and strategies you need to know about Substack

# Earn money on

**T**he internet is brilliant for sharing ideas and reaching an audience – and with the right approach you can make money in the process. Substack, launched in 2017, is one of the most popular publishing platforms thanks to its flexible subscriber management options, full-blooded editing environment and in-built premium content tools.

Get it right, and the profits can be substantial. According to Substack itself, 50,000 publishers make money on the platform, with the top ten earning \$40 million a year between them. Even with a smaller subscriber base and cheaper paid tier, you could earn sufficient to turn a hobby into a worthwhile source of income. Let's take a look at getting started, and see how the sums stack up.

## What is Substack?

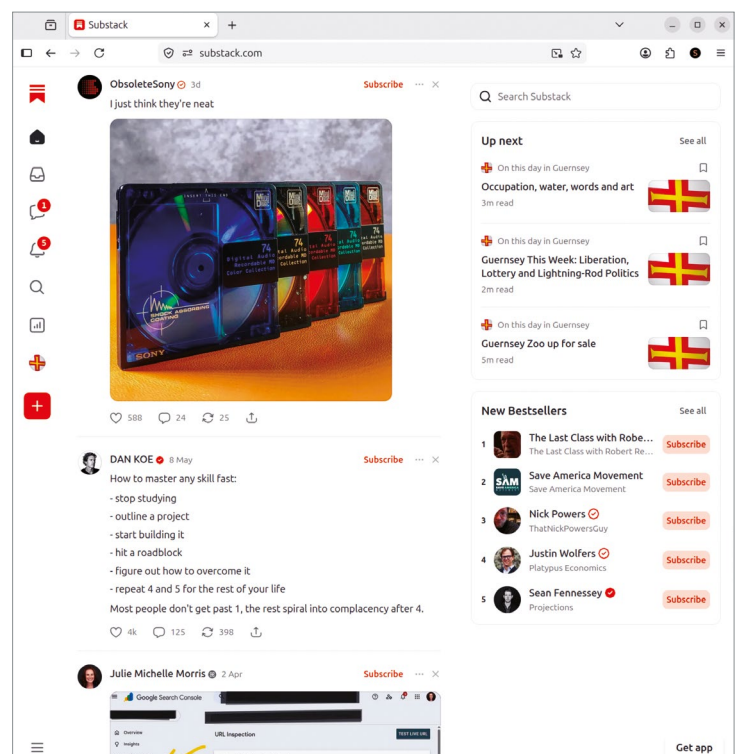
Substack is an online publishing platform for newsletters, podcasts and videos. It also incorporates Notes, a microblogging platform where you can post content that's too short to be newsletter fodder, or too time-sensitive to wait.

It's free to sign up at [substack.com](https://substack.com), and the same account lets you publish and read other people's content. Published content is emailed directly to subscribers, as well as being shown in a web-based content stream and the Substack app. Posts support comments

and private messages, unless you turn them off, so the whole experience brings together the attractions of traditional newsletters, blogging and social media.

When you start creating content, your web feed will be accessible at your personal Substack subdomain, which might be something like "greatpcnews.substack.com". For a stronger identity, you can connect a custom domain for a one-off fee of \$50; to set this up, click Settings at the bottom of the sidebar, followed by Domain (in the Advanced section). Click Add and enter your credit card details. It's not possible to connect the root of your domain, but you can use a subdomain such as "www", or forward a subdomain to the desired address. Newsletters will continue to be sent from an @substack.com email address, but this isn't necessarily a bad thing: it's recognisable to ISPs and should help ensure your account doesn't get blocked for spam when it starts sending out hundreds or thousands of emails.

If you want to post content from your newsletter on Bluesky, you can



**ABOVE** As well as being sent direct to subscribers, content appears in a social media-like stream

also conveniently claim your Substack address as your Bluesky account name. To do this, follow Bluesky's instructions for verifying your domain (see [tinyurl.com/384bskydomain](https://tinyurl.com/384bskydomain)), then paste your Bluesky domain value into the "Use your domain on Bluesky" box within the same Domain settings section as you use to point Substack at a domain you own.



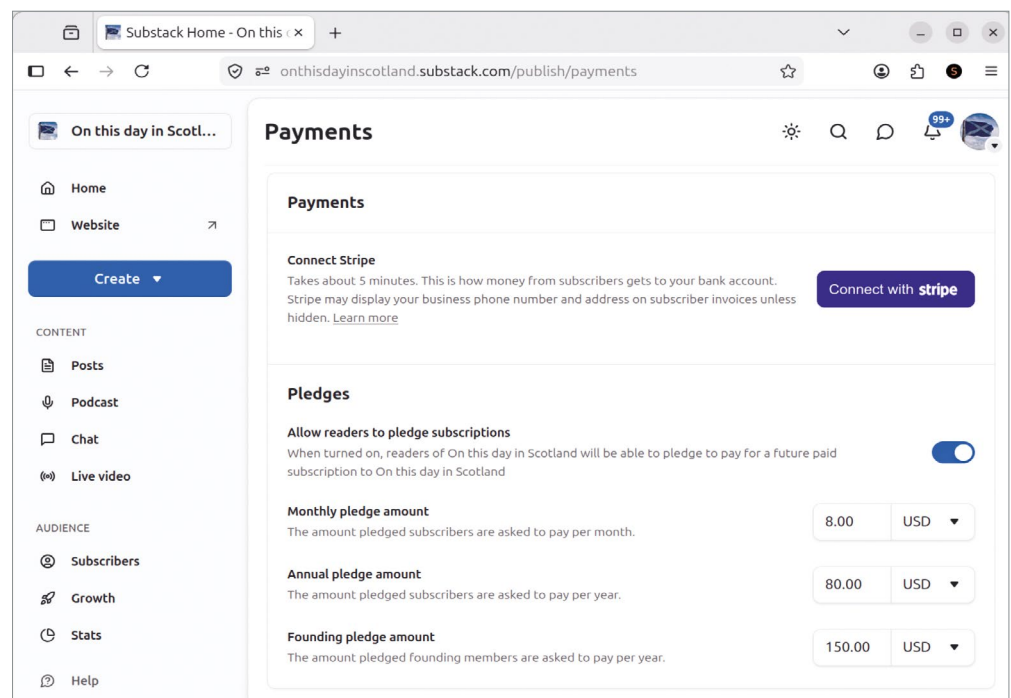
# \$ubstack

## Going premium

One of the great benefits of Substack is that it makes it very easy to charge for your content. Payments are integrated with the Substack platform via Stripe, so you don't need to contract with a third party – you can use an existing Stripe account or set up a new one, for either a personal account or a business. Substack takes 10% of paid creators' revenues, and Stripe charges its own processing fees ([stripe.com/gb/pricing](https://stripe.com/gb/pricing)), but there's no commission payable on further earnings such as embedded ads or merchandise, both of which can be lucrative revenue streams. Remember, though, that any income you receive from Substack isn't taxed at source, so you may need to report it for tax purposes.

To set up the payment system, open Settings and click Payments in the sidebar, then click the Connect with Stripe button. By default, Substack offers suggested pledges of \$8 per month, \$80 per year – this being how much people will pay to see your premium content – and \$150 for founding members. This latter option is a sort of “VIP membership” tier, and you can optionally offer exclusive posts and other perks to people who sign up for it. You can adjust these prices, if you wish, within the Pledges box below the Payments section.

Subscriber activity can be tracked via the main Substack dashboard, which is the first thing you'll see when you log in. At the top of the



**One of the great benefits of Substack is that it makes it very easy to charge for your content**

**ABOVE** The integrated payments system uses Stripe for transactions

dashboard you'll see an overview of current subscribers, views for the selected period and existing revenue.

Even if you're only publishing free content right now, you might see that some supportive readers have pre-emptively pledged monetary support, to let you know that they'd be willing to pay if you started charging. The screenshot overleaf shows steady growth but a low level of pledged income, currently standing at around \$80; you could



probably increase this by starting to float ideas for tempting premium content.

For a more granular breakdown, click Subscribers in the sidebar. This brings up a full list of your existing subscribers, when they first signed up and how active they are (as a star rating). Click the Filter button at the top of this page and you can refine the list to show only your most engaged readers, how often they click links, how often they share a newsletter and so on. If your readers are generally quite active, that's a good sign that they might be receptive to paid content.

Click Growth in the sidebar and you can see when people are signing up to your list. In our case, we see spikes every time we send out a new newsletter. If you see the same, you might consider splitting your content and sending it in two newsletters, several days apart, to double the potential for being shared and attracting new readers.

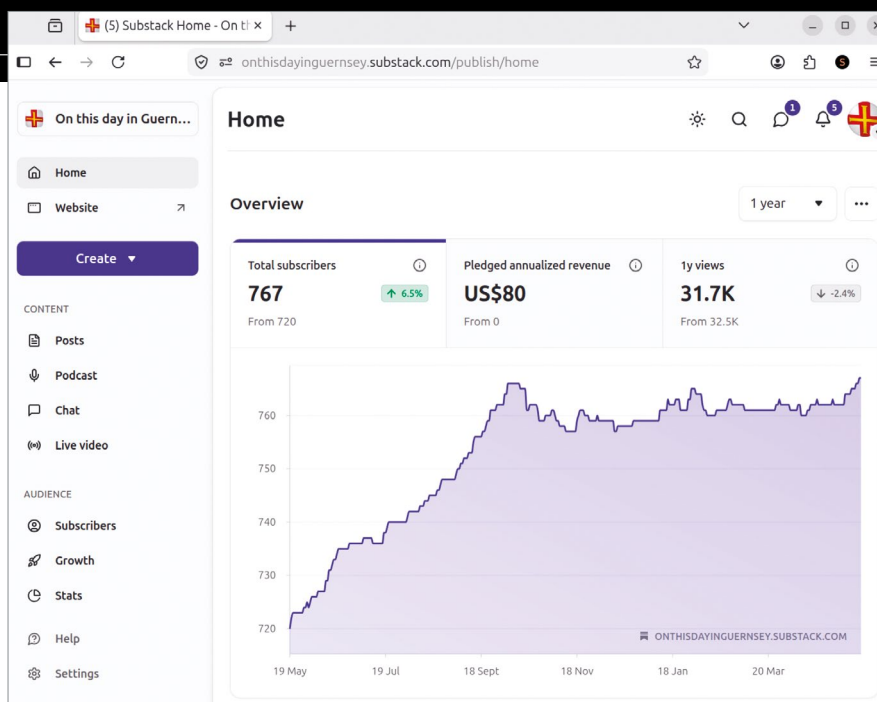
Finally, the Stats section digs into useful data such as your 30-day open rate and your most popular content. Using the latter information to improve the former figure can help you tailor your content to your audience, build your subscriber list, and be more likely to drive conversions to a paid subscription by crafting paywalled content on topics you know your subscribers are interested in.

## Subscription strategies

Substack reports that "we tend to see 5-10% of free subscribers convert to paying subscriptions" – but it's not purely a numbers game. There are a few different intentional strategies you can adopt to try to encourage readers to pay, using the Substack dashboard to guide you with meaningful metrics such as loyalty and engagement. Three viable options might be:

### 1 Low volume, high price

This is probably the most difficult one to get right: you need to provide actionable content to justify the cost, which is why many higher-priced newsletters are providing career advice, investment analysis and similar. Readers need to feel they're getting a benefit that offsets what they're spending on your content.



### 2 Mixed revenue

This means using Substack to steer readers towards other revenue sources, such as embedded ads. Substack doesn't charge commission on ads, but it also doesn't offer integrated advertising tools, so you'll need to handle all the sales and administration separately.

Alternatively, you could offer physical products, memberships or exclusive downloads to your supporters: Lenny Rachitsky, who sits at the top of Substack's list of Bestsellers in Business ([tinyurl.com/384lenny](https://www.tinyurl.com/384lenny)), uses his Substack newsletter partly as an accessible gateway to a wide range of online services and resources for growing a business.

### 3 High volume, low price

If you don't have an existing following, there's nothing wrong with choosing an entry-level price and aiming for a big audience. Note, though, that Substack supports a minimum subscription fee of \$5 per month or \$50 per year, so you won't be able to undercut competing publishers on price (without going completely free). Conversely, you might be able to grow your price over

**There are a few different strategies you can adopt to try to encourage readers to pay**

time as your audience gets to know you or becomes more invested in your content, but you'll really need to justify why your content is worth more than the competition.

## Tailor your content

Although it's important to woo paying readers, you don't want to focus on them exclusively. You can expect a small but steady drop-off (or "churn") through the year as people unsubscribe or switch from paid to free content, so

to keep your revenue flowing you'll need to be continually attracting new subscribers.

One way to drive conversions is by publishing shorter or overview stories, then going into more depth in paid newsletters – although don't short-change free subscribers as this could tarnish your brand. Alternatively, you can produce an entirely separate strand for paying subscribers, which you can promote in the free material.

The important thing is to publish content that people want to read. To help you work out what this might be, check the performance of your recent posts; in particular, pay attention to "Subs", which is the number of people who signed up to your mailing list off the back of each post – a strong indicator of interest. You can find this by logging in to your Substack account and clicking Posts in the sidebar. This automatically expands the menu section and selects the Published subsection, where Subs, Viewed and Opened are immediately visible.

The last of these, "Opened", is another important metric: this shows the proportion of recipients who clicked through to the full contents, which tells you something about the effectiveness of your headline and subhead. Look for patterns such as headline styles or the kind of content that most often results in a rush of new subscribers. If nothing leaps out, try pasting the headlines or content into a text document and asking an AI chatbot to analyse it for you.

Don't be surprised if the number of total views on a post is higher than the number of recipients: remember, as well as sending out your content by email, Substack publishes it online, so some people will see it on the web or in the Substack app. If a single reader opens your content more than once,



each instance will be counted as a view, although subscribers who receive it via multiple media will only count once in the separate “Delivery rate” metric. To find this, click the title of a post in the Published section that we opened above, then click the Reach tab. This reveals how many people received that post, how many views it had, and its delivery rate.

## Growing your audience with recommendations

One final very effective driver of subscribers is the Substack recommendation system, which allows newsletter writers to endorse similar publications they think their audience would enjoy.

You can use this feature yourself by clicking Recommendations in the Creator Tools sub-section, then clicking “Add recommendation”. Use the search box to find the publication you want to promote, and write a short endorsement for your subscribers, which explains why you think they’d enjoy it. This will be shown on your own homepage and in a digest recommendation email that Substack sends to your subscribers when they add a title.

Perhaps the most powerful function of recommendations is the least visible: if a newsletter has recommended your publication, new subscribers to that title will see the recommendation, along with a single-click option to sign up. This is a great, low-friction way to extend your reach, so it’s well worth contacting publications similar to your own to discuss cross-promotion, perhaps supported by guest posts on each others’ platforms.

## Substack offers all the tools you need to attract readers and turn your writing into revenue

Don’t neglect the Notes function, either. This is Substack’s built-in social feed, which allows you to communicate openly with other users of the platform, including non-publishers who only use it to receive subscriptions. As these individuals are already on Substack, it’s very easy for them to subscribe to your content alongside whatever they already read, making them ideal prospects.

To publish a new Note, click Create in the Substack dashboard sidebar,

**BELOW** Lenny Rachitsky offers more than just premium content to paying subscribers

**BOTTOM** Monitor which posts have the best subscription and open rates



followed by Note. The dialog box that appears is highly reminiscent of other social networks, asking “What’s on your mind?”; enter the text of your note, and use the buttons at the bottom to add photos and video if appropriate. You can also schedule a time for publication, if you don’t want to set it live immediately.

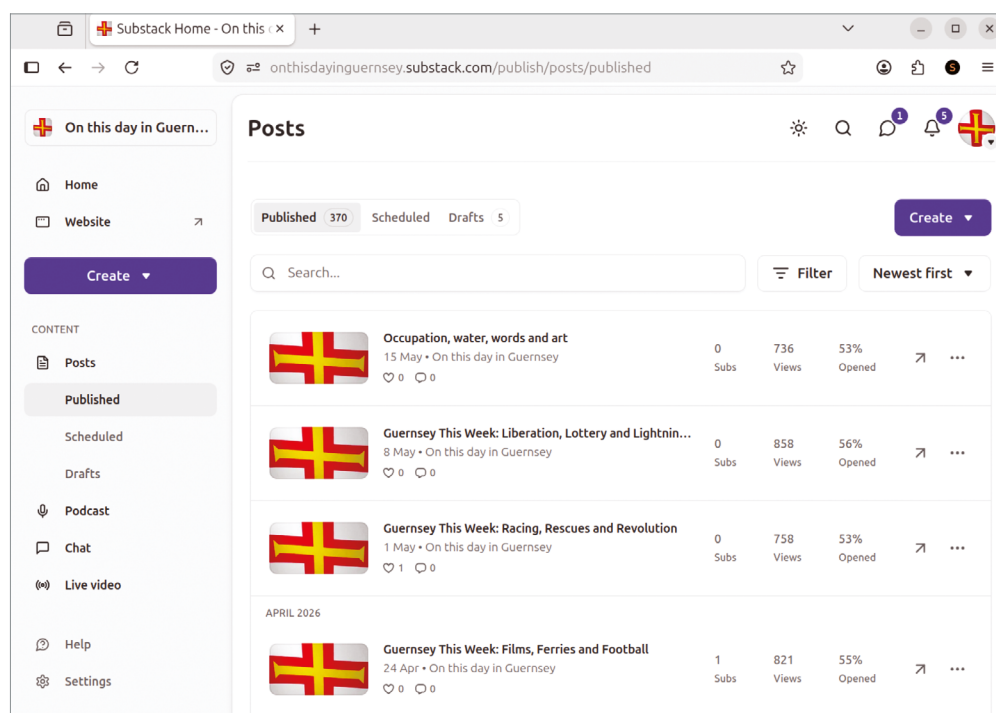
## Other routes to revenue

If you produce a lot of “evergreen” content, it’s well worth exploring Substack’s automatic paywalling feature, which lets you make posts free for a limited time, while restricting older content to paying subscribers. If you’re publishing weekly, for example, you could set any article older than two or four weeks to disappear behind the paywall. Doing it this way means new subscribers can get the full experience of reading your latest publications, and will hopefully be motivated to subscribe for access to your complete catalogue. To enable this option, click Payments in the Substack dashboard sidebar, and in the Paywalling section, click the switch beside “Auto-paywall post older than”. Set the cut-off window using the drop-down menus below.

If your content is more time-sensitive, it might make sense to approach things from the opposite direction: Substack lets you set an initial publication time, when your post will be visible to paying subscribers, and a separate time at which it will be unlocked for free users. If you’re posting an events guide, or links to offers with limited availability, early access to your content may well be worth paying for. You’ll see this option on the regular posting screen, which appears at the end of the writing/publishing workflow if you’ve enabled a paid tier.

Whichever strategy you choose for building and maintaining your newsletter, be consistent. If your readers expect new content at specified intervals, don’t disappoint them – and if you’re going to be unable to produce for a week or two, pause payments until you’re ready to resume. You can do this through the Substack dashboard by clicking Payments in the sidebar, followed by Pause. You can then re-enable premium payments as soon as you’re back on track.

The truth is that very few newsletters will make enough money to let their authors give up the day job, but if you have something to say that people want to read, Substack offers all the tools you need to attract and retain readers, and turn your writing into revenue.





# WHAT'S RUNNING ON YOUR PC?

Windows is full of self-triggering tasks.  
**Darien Graham-Smith** finds out how to review  
and manage them in the Task Scheduler

If you've ever opened the Windows Task Manager, you'll know there are usually dozens of processes running on your PC – most of which you didn't launch yourself and don't have an obvious purpose. Many of these will be scheduled tasks, configured within the OS to run automatically at certain times or in response to certain events.

You can browse and manage these tasks in the Task Scheduler, a plain little tool that can be launched from the Start menu. The reason it looks so generic is that it's not a freestanding app but a "snap-in" for the Microsoft Management Console, reflecting the fact that it's a window into internal OS processes rather than an active component itself.

Accordingly, the Task Scheduler doesn't actually handle the launching scheduled processes – that happens whether it's running or not, thanks to a separate, always-running Windows service called Schedule. All the Task Scheduler does is provide a (slightly) friendly interface for reviewing and editing task definitions. The definitions themselves are usually stored as XML files inside C:\Windows\System32\Tasks, although Windows doesn't work directly from these files but from compiled versions stored inside the system Registry.

Once you start clicking around the Task Scheduler, you'll find a whole load of predefined tasks relating to standard Windows processes, and

probably a good number of additional tasks created by third-party software. Many of these have cryptic names and unclear purposes, which might make you wonder whether they're all necessary, or whether they might even be deleterious to your user experience. *PC Pro* reader Dave Gilmour, a data privacy and security specialist and author of the book *Privacy Architecture – guided by TOGAF*, was concerned enough that he wrote to us on the topic earlier this year, inspiring the feature before you.

## What is a task?

Every scheduled task launches a program; this could be a desktop application, a background task, a PowerShell command or a script that carries out a whole series of actions. Typical purposes include keeping OS components running smoothly, updating installed applications and carrying out housekeeping jobs such as security scans.

Part of what makes tasks so versatile is that they can be set to run under either your user account or someone else's, in a variety of security contexts.

**Tasks can be triggered according to a schedule, but they can also respond to system events**

It's even possible to create a task that runs under the SYSTEM account, which outranks a regular administrator account and has unrestricted access to the Registry, local files and security settings – useful for automated system maintenance.

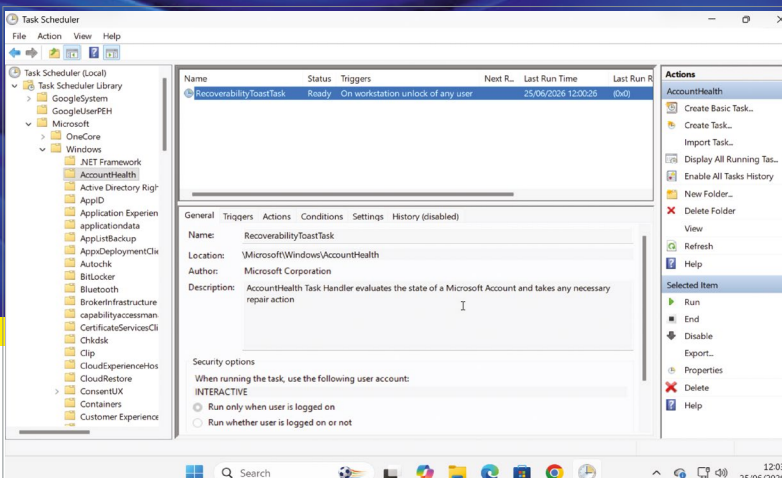
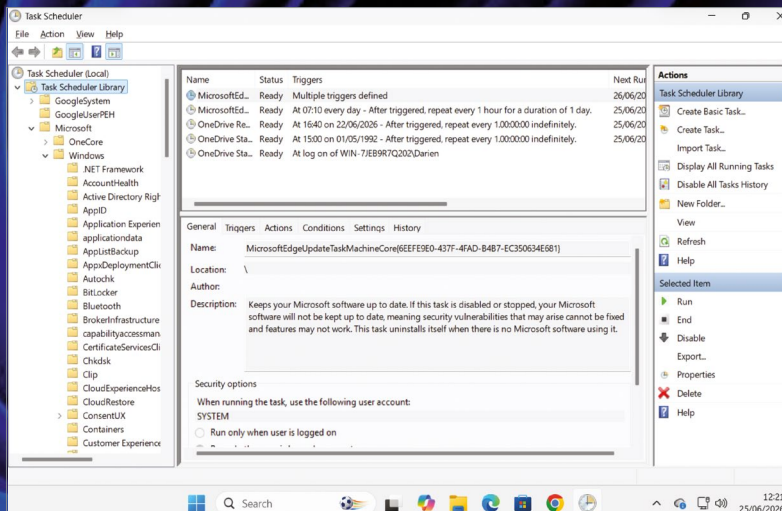
As the name suggests, tasks can be triggered according to a set schedule, but they can also respond to system events, such as when the user logs on, or when the computer sits idle for a specified period of time. The idea is to ensure that events happen at whatever time is most suitable for their function – but this could mean they trigger while you're working, with the knock-on effect of slowing down your computer, or distracting you with interruptions.

## What task does what?

The Task Scheduler interface organises tasks into a tree structure, similar to folders in the Explorer. You can, for example, find scheduled tasks relating to Windows Defender by clicking to open the Microsoft branch, then navigating into Windows\Windows Defender.

You'll see that the Windows folder contains dozens of branches, most of which contain multiple tasks with not very illuminating names. For example, if you click into /Microsoft\Windows\AccountHealth, you'll see a task entitled "Recover abilityToastTask" – which doesn't tell you a whole lot about what it does.





Thankfully, in this case it's easy to find more information.

Click on the task's name and you'll see its details appear in the lower middle pane: the Description field explains that "AccountHealth Task Handler evaluates the state of a Microsoft Account and takes any necessary repair action", while in the upper pane you can see it triggers whenever anyone unlocks the computer. That's enough information to give you a good sense of what this particular item is.

If you're still wondering what the connection is between account health and breakfast, a "toast" notification is one that appears in the bottom corner of the screen – popping up like bread emerging from a toaster – to provide a temporary, informational message such as "your account is being repaired".

## Find out what a task is really doing

The Description field can be very useful, but unfortunately it's not always filled in. Even many Microsoft tasks lack a description; for example, click into \Microsoft\Windows.NET Framework and you'll see a set of tasks with unhelpful names such as ".NET Framework NGEN v4.0.30319", with no further clue as to what they do.

That's annoying, but you shouldn't be too reliant on the Description text

anyway, as even if one is provided, there's no guarantee it will be accurate or complete. It could even be intentionally misleading – some past malware attacks have used innocent-looking scheduled tasks to repeatedly reinstall and launch malicious code. So if you want to really understand what's running on your computer, and why, you need to dig deeper.

The first step in doing this is so obvious it's barely worth mentioning: Google the name of your suspect task, or its full path in the task tree. If it's something that's commonly found on Windows systems, you'll likely find hundreds of pages explaining what it does and where it came from.

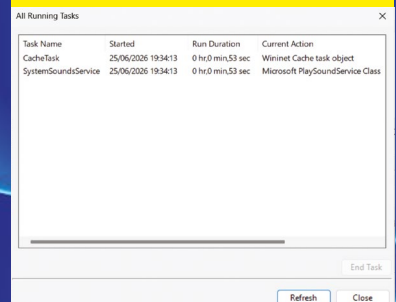
Some tasks or folders may be labelled with GUIDs ("globally unique identifiers") such as "S-1-5-21-891392158-1238874925-3856274910-1001". These are locally generated, quasi-unique codes that identify the specific installation of a program on this particular PC. This means GUIDs aren't searchable online, but they often appear alongside a recognisable task name. If not, you can find out what program a GUID relates to by copying the long text and searching the Registry for it. If it's a regular installed application, you should find the GUID under the following key:

**TOP It's not exactly a slick interface, but the Task Scheduler is a powerful tool**

**ABOVE The Description field can help you make sense of cryptic task names**

## What's running on your PC right now?

Tucked away in the right-hand pane of the Task Scheduler is a link labelled "Display all running tasks". Clicking this opens a new window showing a list of tasks as described – but you might be surprised by how short it is. That's because it doesn't include tasks that are



**ABOVE There may be only a few tasks running at any given moment**

ready to trigger, only those that are actively executing right at this moment.

This view can be a useful forensic tool if something's happening that you can't pin down. Just keep the window open and note down the Task Name and Task Folder of anything that pops up (you'll need to scroll across to the right to see the latter piece of information).

There's a catch, though: many tasks execute and complete in a fraction of a second, and the processes they launch may be similarly short-lived, making it hard to catch them. So here's another approach that can help you spot tasks as they trigger: open a PowerShell window and enter:

```
while ($true) {
    $t = Get-ScheduledTask | Where-Object { $_.State -eq 'Running' -and
    $_.TaskPath -notlike "\Microsoft*" }
    if ($t) { $t | Select-Object TaskName, TaskPath | Format-Table; break }
}
```

You can enter this whole command on one line, or use Shift+Return to insert line breaks as you go, before finally pressing Return to send the complete command.

Once executed, the command will sit and silently watch over the list of tasks – excluding Windows components located within the Microsoft branch, thanks to the "notlike" parameter – until one sets its state to "Running". At that point the change will instantly be detected and the details of the task will be revealed, for you to review at your leisure.



# Generate a report of all scheduled tasks

If clicking through the Task Scheduler tree isn't for you, you can get a plain-text list of all registered tasks by opening a Command Prompt and entering:

**schtasks /query /v /fo list**

This tells Windows to query its database of scheduled tasks and generate a verbose response in list form. You don't need to run it as an administrator, although if you do then you may see more detail about security contexts and actions for certain tasks.

The only problem with this command is that it streams thousands of lines of technical information directly to the console, which isn't exactly convenient to work with. A good way to get the data in a more manageable form is to change the output to CSV format, and direct it to a file rather than splurging it onto the screen:

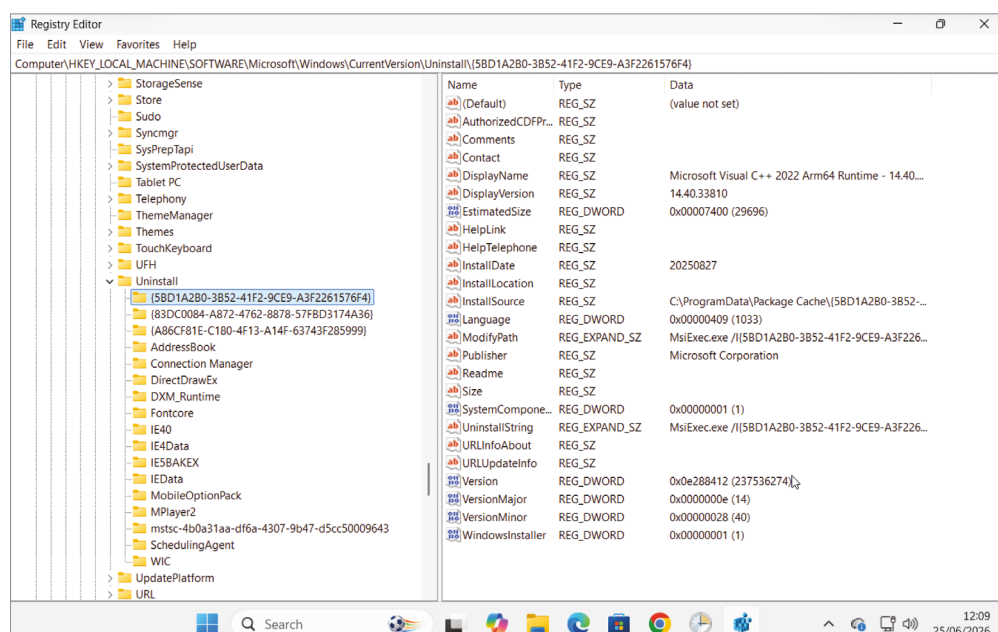
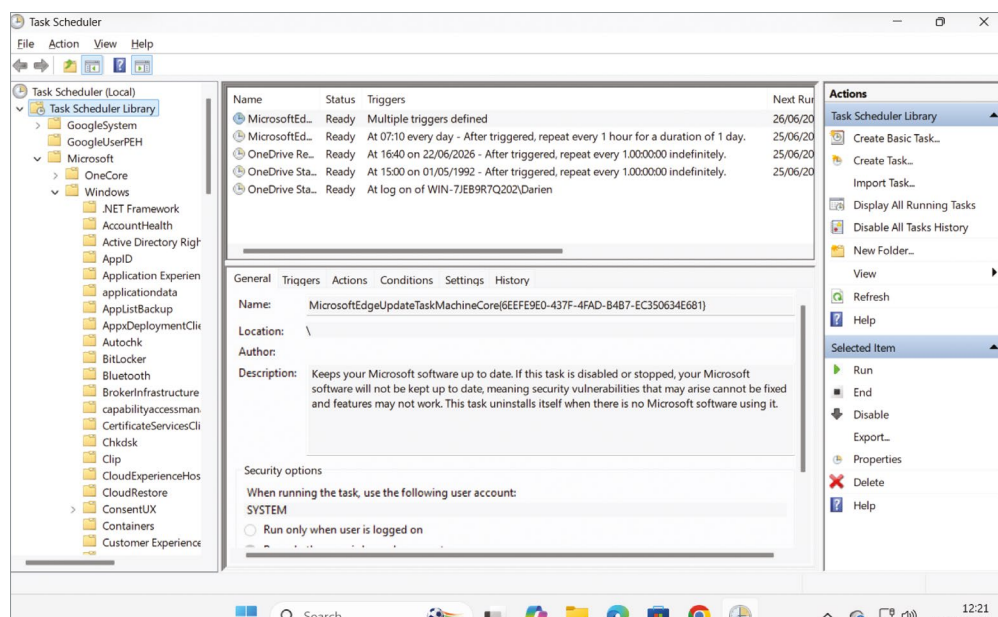
**schtasks /query /fo CSV /v > all-tasks.csv**

This creates a file called all-tasks.csv that you can load directly into a spreadsheet such as Microsoft Excel or LibreOffice Calc, or import into Google Sheets. The information should now be much easier to sort, search and query – although you'll need to clean out many duplicates of the column names, such as "TaskName", "Next Run Time" and so on, as Windows unhelpfully repeats these for each folder in the task tree.

**HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall\**

This will be accompanied by a value called "DisplayName" that identifies the application in question. If it's a system component, you may find the answer in HKEY\_CLASSES\_ROOT\CLSID\.

You can also directly inspect what the task actually does by clicking on the Actions tab in the lower part of the window. This reveals the full path to the target program that the task launches, which may instantly expose what it's doing. For more clues, check the Triggers, Conditions and Settings panes, to find out when and how the task executes. Some system tasks have no defined trigger; these are "on demand" tasks that only run when invoked by other processes. These exist to allow regular programs and



processes to invoke actions that run with a higher level of security access.

## Learn from history

As well as examining a task's programmed schedule, you can look back and see when it's been previously triggered, to get a sense of whether it's been frequently eating up resources, or firing up only once in a blue moon. However, Windows doesn't log these particulars by default, so the first time you explore your scheduled tasks there won't be any history information available.

**If you don't trust a task, or if you think it's getting in the way, you're free to disable it**

**TOP Long numeric strings specify a task that's unique to your Windows installation**

**ABOVE You can look up GUIDs in the Registry to find more information**

Enabling logging is very easy: just look to the right-hand pane of the main Task Scheduler window and click the link labelled "Enable All Tasks History". Windows will immediately start tracking when each task executes, and you can review the log for each task in the History tab of the main interface.

The reason this useful feature isn't automatically enabled is that it generates a flood of logging data that's likely to have a greater impact on system performance than the tasks themselves. And annoyingly there's no way to lighten the load by recording a history just for the specific tasks you're interested in – it's all or nothing. So once you've got the information you're looking for, we recommend you turn logging off, by clicking on the same link as before, now labelled "Disable All Tasks History".



If you really need to look back at the history of a specific task before all-task logging was enabled, you can get some information using the following PowerShell command, replacing "YourTaskName" with the name of the task you're interested in (you don't need to put the full path):

```
Get-ScheduledTask -TaskName
"YourTaskName" | Select-Object
TaskName, State, @{Name="LastRun";
Expression={$_.|Get-
ScheduledTaskInfo}.LastRunTime}}, @
{Name="Result"; Expression={$_.|
Get-ScheduledTaskInfo}.
LastTaskResult}} | Format-List
```

This will tell you when the named task last ran, its current state and its exit code. This will be zero if the task completed successfully, or an error code that you can look up online.

## Disabling and deleting tasks

If you don't trust a task, or if you think it's getting in the way, you're free to disable it. Third-party updaters and helper tasks can often be switched off with no ill effect, although things inside the Microsoft branch may be needed for various system functions. There's no easy rule as to whether something can be safely disabled or not, but you can use your judgment based on the available information, and perhaps a web search.

To disable a scheduled task, just right-click on it in the main pane and select "Disable" from the contextual menu. You could alternatively hit "Delete", but there's usually no need: disabling a task stops it running, while preserving the option to re-enable it if you later repent.

**BELOW** The History tab can be very informative if you've enabled task logging

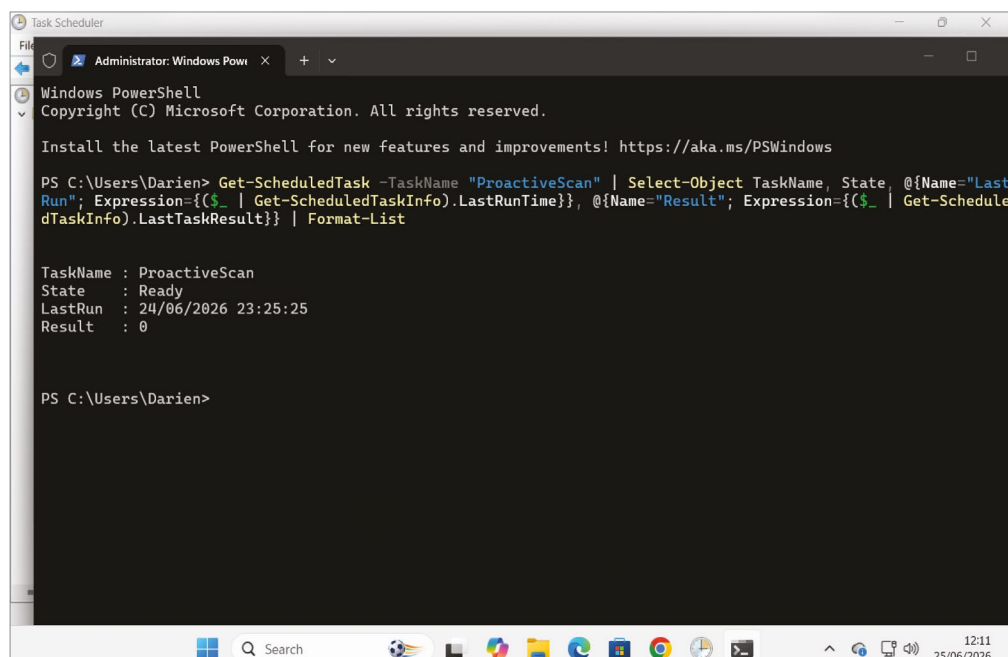
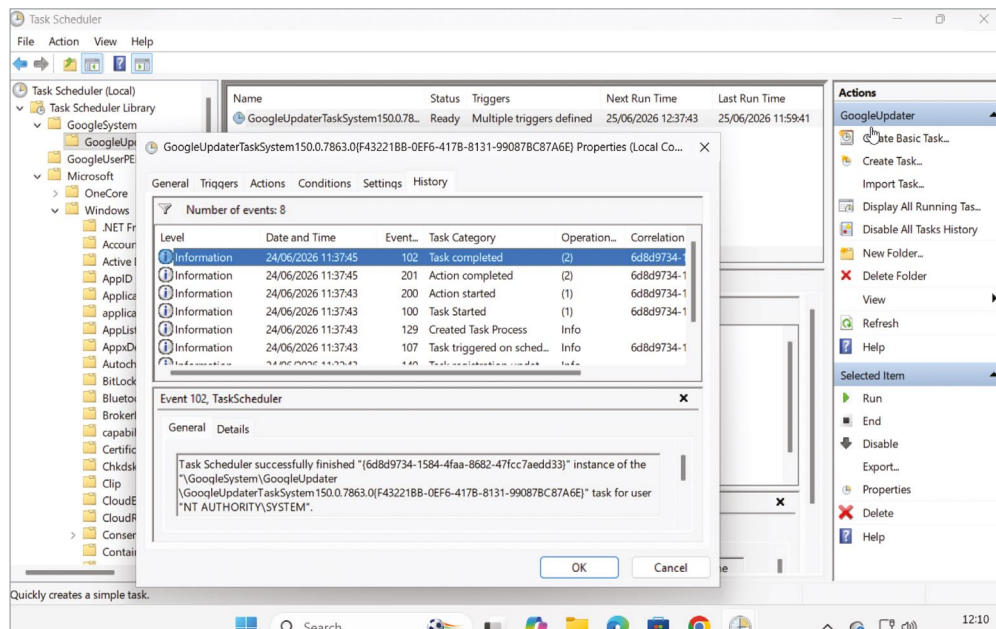
**BOTTOM** You can check when a task was last run without enabling the full history

Alternatively you can get a task out of your way by changing how and when it runs. To do this, double-click on the task's name (or right-click on it and select "Properties...") to bring up the Properties pane, then use the Triggers and Conditions tabs to configure its launch settings. For example, you could tame an over-eager file-indexing service or a bunch of third-party updaters by setting them to run only when the computer is idle, or when you lock the workstation, or only in the middle of the night.

## Startup items and services

Scheduled tasks aren't the only way for programs or processes to launch automatically on Windows. Some apps and services install startup items, either by creating shortcuts in the Startup folder or configuring entries in the system Registry. Despite the name, startup items only run when someone logs in, operate exactly as if the user had launched the program by double-clicking on it, and shut down when the user logs out – making them a lot less versatile than scheduled tasks, but simpler to understand and manage.

Processes that need lower-level or more persistent access can be implemented as Windows services. Services run before anyone logs in, independently of user sessions; they can also run under a variety of security privileges, as might be required for OS functions, security suites or backup systems. The Task Scheduler can be used to start and stop background services, but it can't monitor and manage them once they're running – that has to be done from the Services snap-in. ●



## Hidden tasks

The Task Scheduler lets you browse and manage every task definition for which there's an XML file, but malware can hide itself by registering a task, then deleting the XML file. If the corresponding Registry key is set to the highest level of security, your user account won't see the task in the Task Scheduler or the Registry Editor.

Thankfully, since this exploit is quite well known, any malware that tries this trick is likely to be spotted and blocked by your security software. But if you want to go hunting for hidden tasks, you'll need to use roundabout methods, such as installing a system monitoring tool that runs under the SYSTEM account to see what's actually going on behind the scenes, or scouring the Windows Event Log for any suspicious records of new tasks being created – look for Event ID 106.



# EURO-OFFICE

## Run your own cloud office suite

Had enough of Google Docs and Microsoft 365? **Nik Rawlinson** tries out the new, free, open-source European alternative

**C**loud platforms are very popular, and for good reason. They let you access your apps and files from any device, and you rarely need to worry about updates or maintenance. There's also the benefit that documents can be saved automatically as you work, with the option to roll back unwanted changes.

But some aspects of cloud apps are less appealing. First and foremost, you don't own them. You generally have to accept every new feature, whether you want it or not, and a pricing model that could change at any time. Data privacy and access can be concerns too, and businesses need to think about legal compliance if they're using services based in a different jurisdiction.

For these reasons, a group of European developers and service providers, including familiar names Ionos and Nextcloud, have come together to create Euro-Office – an open-source, browser-based office suite that individuals and businesses can host themselves, or on their choice of private cloud. It's part of a bigger European push for digital sovereignty, aimed at helping organisations reduce their reliance

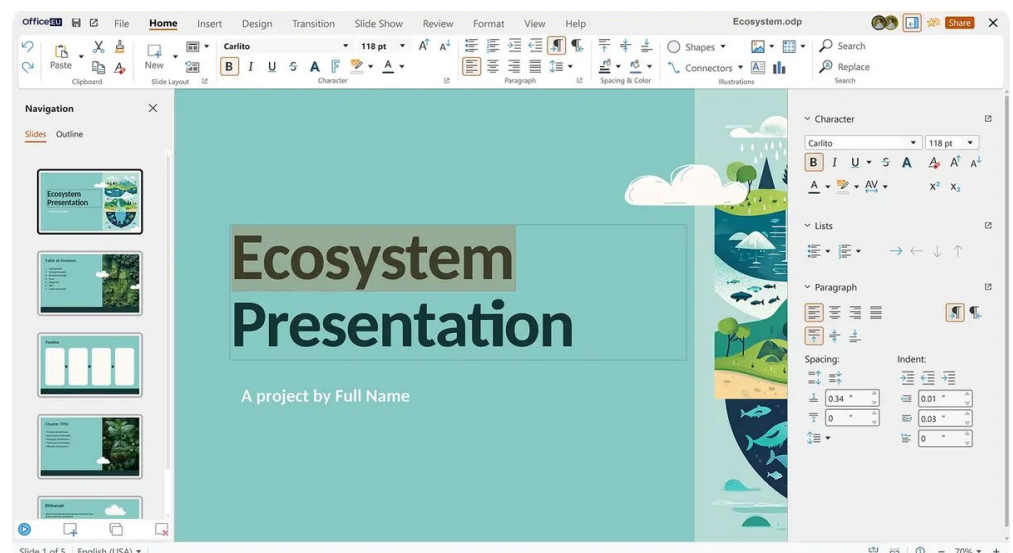
on tech giants such as Microsoft and Google. Whether you want to support the European alternative or are just looking for an online productivity suite that keeps your documents wholly under your control, it's well worth giving Euro-Office a try.

### Is Euro-Office ready for real use?

Version 1.0 of Euro-Office was released at the start of June, but

**BELOW** Version 1.0 of Euro-Office was released in June

the codebase is much more mature than that would suggest – it's based on an existing open-source office suite named OnlyOffice, which has been in development since 2009. The suite includes fully featured word-processing, spreadsheet and presentation applications, with ribbon toolbars and familiar functions such as dynamic spell checking, text styles, commenting and sharing.





What makes Euro-Office different to other open-source packages such as LibreOffice is its online architecture. It works like Google Docs, with the full interface opening in your browser wherever you access it from; edits are continuously saved as you work on your documents, and if you move across machines then your files will be accessible on every device. You can also look back over previous versions of documents to recover anything that's been mistakenly deleted or changed, and share files for multiple users to work on simultaneously, with labelled cursors appearing in the editing environment to show which part each user is working on.

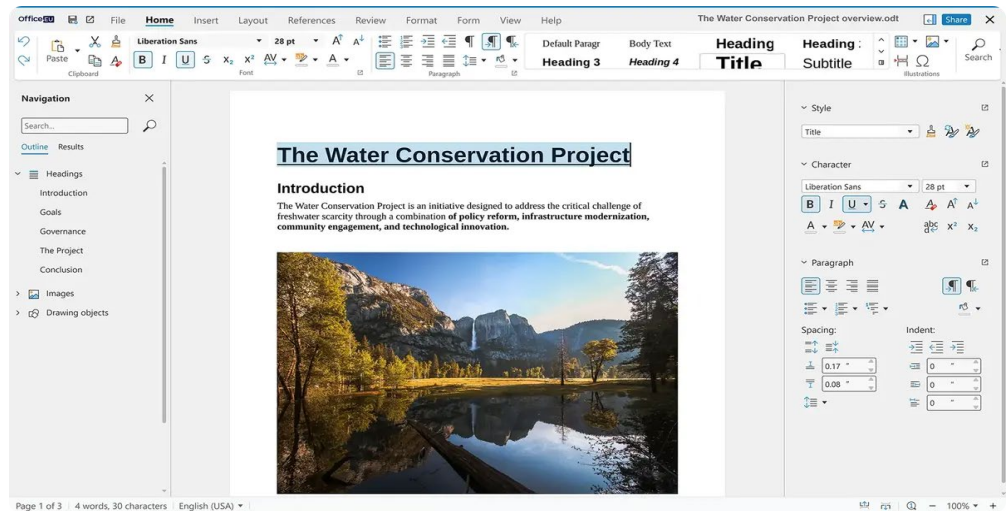
In short, the Euro-Office apps work a lot like Google Docs, Sheets and Slides – except that, instead of tying you into Google Drive, they use your choice of cloud platform, with options including the privacy-focused Proton Docs or a self-hosted Nextcloud installation.

Euro-Office also has the convenient advantage of opening and saving Microsoft Office file formats by default, rather than using its own online-native formats. This makes it a lot easier to share files with friends and colleagues, without having to muck about with separate cloud and local copies. Additional supported export formats include PDF, ODT, Markdown and plain text.

## Local or hosted installation

Euro-Office's browser-based approach is more versatile than a regular desktop office suite, but it also means it's trickier to set up. You need to configure two main components: the Euro-Office document server and the cloud platform you want to connect it to. We'll use Nextcloud for this, as it lets us host and manage everything ourselves, with no limitations on storage beyond available disk space. It also comes with a convenient sync app, which makes it easy to access our Euro-Office files from any major desktop or mobile platform.

If you don't want to set up your own server, you can alternatively get a hosted Euro-Office service inside Nextcloud via providers such as Ionos, which markets its offering under the name Ionos Nextcloud Workspace. This costs £6.50 a month for single users, £30 each month for five users or £135 a month for 25 users, which includes a 50GB mailbox per user, chat and video-conferencing features, plus virus and spam protection.



## Installing Euro-Office in Docker

The cleanest way to set up a fully local Euro-Office installation is to put each of the two main components inside its own Docker container, along with a small Nextcloud plugin

**ABOVE** Euro-Office apps work a lot like Google Docs, Sheets and Slides

Inspiron laptop with a 10th-generation Intel Core i3 processor running Ubuntu Linux. On Windows you can choose to install a native version of Docker, or use the Linux version under WSL. Our screenshots show the Ubuntu environment, but

## Euro-Office has the convenient advantage of opening and saving Microsoft Office file formats by default

the Euro-Office web interface will look and work identically regardless of which OS you're accessing it from.

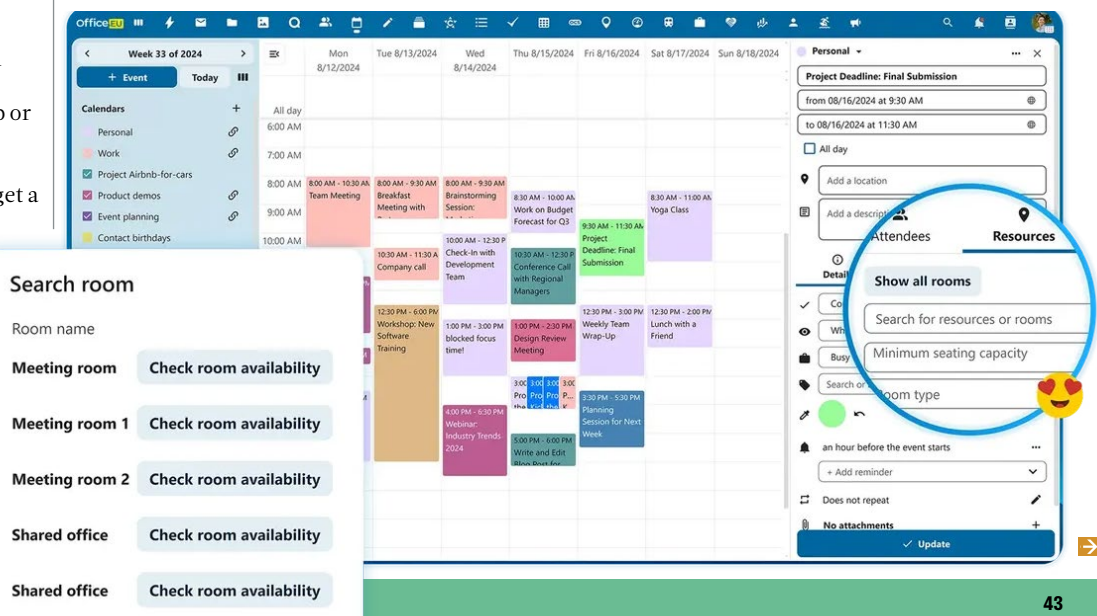
You're also free to decide whether you want to install all

that lets them talk to each other. Thanks to the way Docker works, these containers can be hosted on almost any computer you like, or on two different computers, as long as the hardware meets the minimum specification – namely a supported 64-bit processor, at least 8GB of RAM and hardware virtualisation enabled in the BIOS. We've had success installing it on an old Intel-based Mac mini running macOS, and on a Dell

**BELOW** The suite includes a scheduling and invitation calendar

of this on a desktop PC, or set up a headless server to which you can connect from any other machine. We chose the latter option, enabling SSH access to our Ubuntu environment by opening a Terminal window and entering the following commands:

```
sudo apt update
sudo apt install openssh-server-y
sudo systemctl enable ssh
sudo ufw allow ssh
```





These instructions get the latest list of available packages, install the OpenSSH server, set it to run automatically when the computer boots up and configure the firewall to allow it through.

You can now put the server machine aside and connect to it from any other computer on your local network. In our case, since our username on the server is “nik” and the server’s hostname is “drax”, the command we’d use – on Windows, Mac or Linux – is:

```
ssh nik@drax.local
```

If your server name can’t be resolved for any reason, you can simply use its IP address instead.

Once you’ve logged in, you then need to download and install Docker onto your server. In Ubuntu we can do this with a single line:

```
sudo apt install docker.io docker-
compose-v2-y
```

This installs Docker from Ubuntu’s own repositories; the “-y” flag tells the OS to automatically say “yes” to any confirmation requests, so you don’t need to manually approve the installation.

Once installed, add your account to the list of users authorised to perform administrator-level tasks in Docker, then enter the Docker environment by entering the following commands:

```
sudo usermod -aG docker nik
newgrp docker
```

Unless your username happens to be “nik”, change that to reflect your own details.

Now you’re ready to set up the software. To keep everything tidy, we’ll create a new folder (“eo” for Euro-Office) for our files, by typing the following:

```
mkdir eo
```

Into this folder we now need to place a fairly lengthy Docker configuration file that takes care of installing both the Nextcloud environment and the office suite, as well as setting the necessary parameters for each. To save you a lot of typing, we’ve made it

available online at [tinyurl.com/384docker](https://tinyurl.com/384docker) – download it and save it into your eo folder (without changing the filename). When we launch Docker (below), it will read this file and use its contents as the parameters for each container. First, though, you need to make just a few edits to the docker-compose file. You can do this in your choice of text editor; on Ubuntu, we used the nano editor by entering:

```
nano ~/eo/docker-compose.
yaml
```

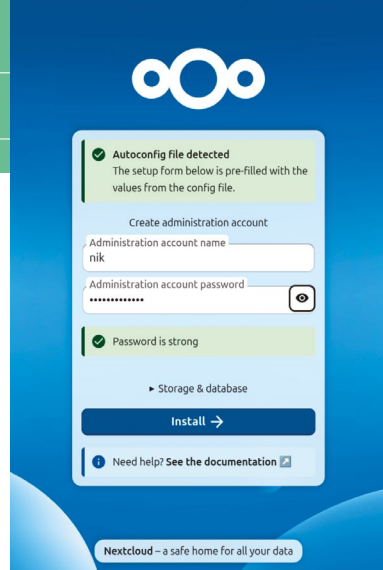
Change each instance of “[secretpassword]” to an actual password of your choice, comprising at least 25 characters. The passwords don’t need to be the same in each instance, and the only one you need to make a note of is the one beside “JWT\_SECRET”, as you’ll need to enter it in Nextcloud later in the process. Once you’ve done this, save and close the file; in nano this is done by pressing Ctrl-X, followed by Y, then Return.

Docker will use the contents of this file to download and set up the assets that you need. To kickstart the process, enter these two commands to step into your project folder and launch Docker:

```
cd eo
docker compose up -d
```

You can monitor what’s happening in the Terminal window, with progress gauges for every element. How long this takes will depend on the speeds of both your server machine and its broadband connection.

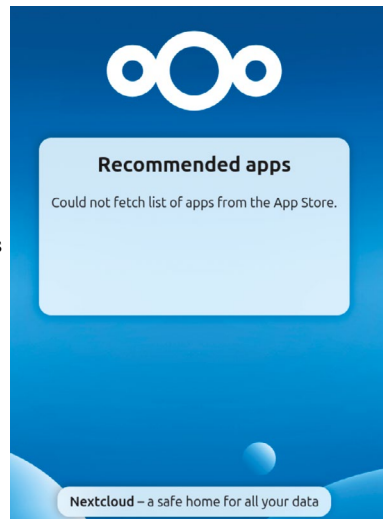
Once it’s finished, the Euro-Office document server and Nextcloud front-end should both be accessible over your local network via a web browser: for our server, called drax, the addresses are <http://drax.local:8090> respectively; obviously for your own setup you should replace “drax” with the name of your host. If you can’t reach the Nextcloud web



**LEFT Start Nextcloud and create an administrator account**

interface or the document server, you might need to allow ports 8080 and 8090 through the firewall; on Ubuntu that’s achieved with the following commands:

```
sudo ufw allow 8080
sudo ufw allow 8090
```



**ABOVE Don’t panic if you see this: reload the web interface to skip to the first-run wizard**

page, using the same address as shown above. You should now be delivered to the welcome wizard and, when you’ve clicked through it, the Nextcloud dashboard.

If you now click the icon showing nine boxes on the Nextcloud toolbar, you’ll see an option labelled Office. However, if you click this you’ll see that the default productivity offering is very sparse, with support only for Nextcloud’s built-in Text editor. For the full feature-rich, Office-compatible editing experience you need to connect it to Euro-Office.

This is easy to do, but it requires a little preconfiguration, as Docker is quite locked down by default and the standard restrictions would prevent the two containers from communicating with one another. To remedy this, switch back to your Terminal prompt, and type each of the following commands, pressing Return after each one. Once again, some of these domains include our hostname (drax.local), which you should naturally change to your own hostname.

```
docker compose -f ~/eo/docker-
compose.yaml exec -u www-data
nextcloud-app.php occ config:system:set
trusted_domains 0 --value=localhost
```

```
docker compose -f ~/eo/docker-
compose.yaml exec -u www-data
```

**You can monitor what’s happening in the Terminal window, with progress gauges for every element**



```
nextcloud-app.php occ config:system:set
trusted_domains 1--value=127.0.0.1
```

```
docker compose -f ~/eo/docker-
compose.yml exec -u www-data
nextcloud-app.php occ config:system:set
trusted_domains 2--value=drax.local
```

```
docker compose -f ~/eo/docker-
compose.yml exec -u www-data
nextcloud-app.php occ config:system:set
trusted_domains 3--value=drax.
local:8080
```

```
docker compose -f ~/eo/docker-
compose.yml exec -u www-data
nextcloud-app.php occ config:system:set
trusted_domains 4--value=nextcloud-
app
```

These lines add the relevant hostnames and IP addresses to

Nextcloud's trusted\_domains list, plus the container in which Nextcloud itself is running, so that incoming connections from these locations will be accepted.

With these changes made, you're ready to install the front-end connector that lets Nextcloud talk to your Euro-Office server. To do this, return to Nextcloud in your browser and click your initial in the top right corner; then click Apps, click in the search box at the top of the sidebar and search for "office". At the time of writing the connector still bears the name of the OnlyOffice project that Euro-Office is based on, so look for an app called "ONLYOFFICE", then click the "Download and enable" button.

When the button changes from "Download and enable" to "Disable", click your initial icon again, and click

**BELOW** Download the office suite from Nextcloud's app store

**BOTTOM** You can create new office documents from the Files module

"Administration settings" on the menu that appears. Click Nextcloud Office in the sidebar's Administration section, then enter your document server address and the secret key that you made a note of earlier. The server address is your hostname, followed by the port number, so in our case it would be `http://drax.local:8080`. Click Save.

## Using your office suite

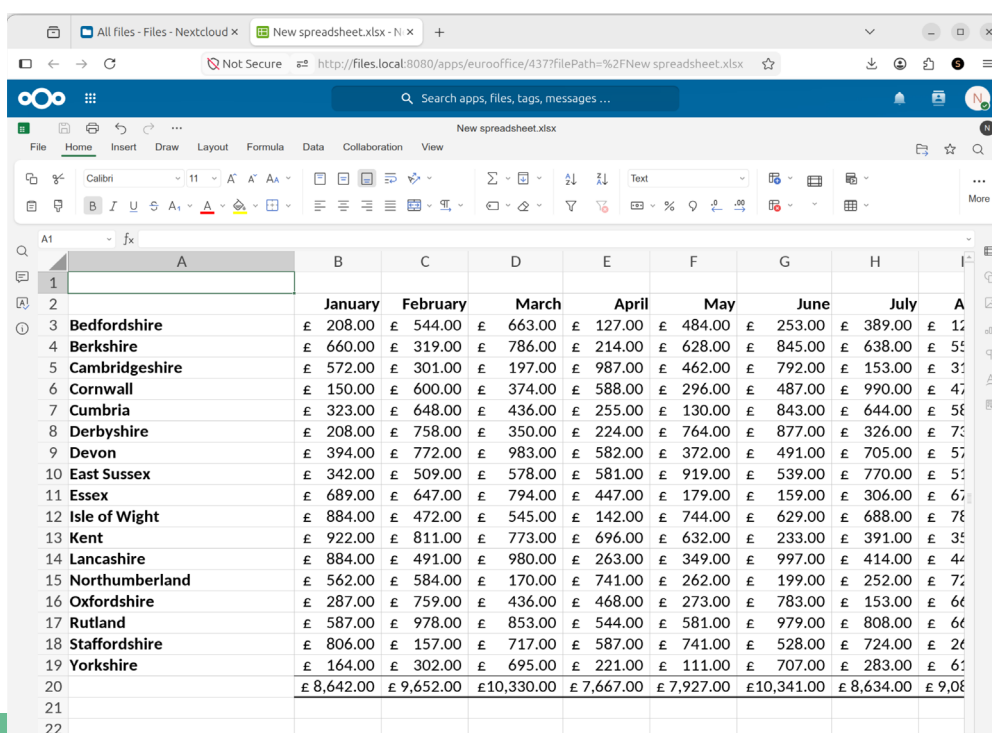
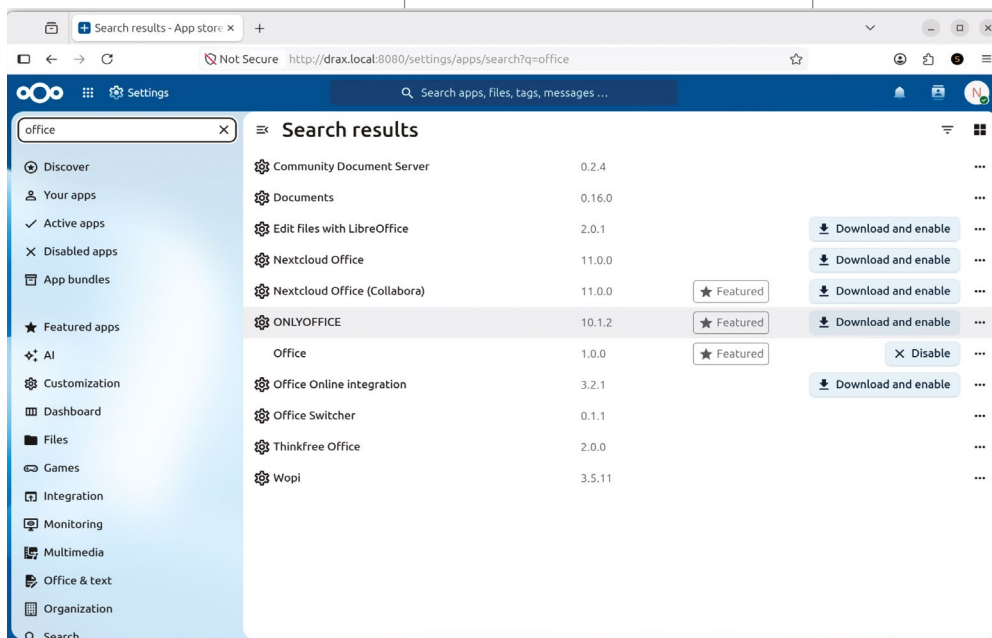
You've now completed the process of setting up your self-hosted cloud office suite – congratulations. To get started editing your first document, click the block of nine squares on the Nextcloud toolbar and select Files in the menu. When the Files module opens, click +New followed by "New document". Give the file a name and click Create. Because document rendering is handled by the server, the web interface should feel snappy even on lightweight hardware.

Note that, while Euro-Office is compatible with Microsoft Office file formats, it doesn't come with all the same fonts: if you want to use defaults such as Aptos or Calibri, you'll need to copy them across from a Windows machine. For example, if we wanted to make Arial available in Euro-Office we might first of all copy the TTF file from `C:\Windows\Fonts` into our Ubuntu home directory, then use the two following commands to copy it into the container and refresh the document server's font cache:

```
docker cp ~/arial.ttf euro-office:/usr/
share/fonts/
docker exec -it euro-office /usr/bin/
documentserver-generate-allfonts.sh
```

Another potential gotcha to look out for is that we're accessing our office apps via regular HTTP. This is easier than using HTTPS, which requires you to generate and install a security certificate, but it may cause your browser to see Euro-Office as unsafe and prevent you from copying and pasting text into and out of documents. Depending on your browser, you may be able to fix this by adjusting your security settings, or by installing an extension to re-enable the clipboard.

Finally, while you enjoy the benefits of using your own, self-hosted office suite, remember that the trade-off is that you're also solely responsible for administration. Make sure you keep Docker, Nextcloud and the document server regularly updated – as well as the OS the whole thing is running on – and set up a suitable backup system to ensure that a hardware failure can't wipe out your entire workspace. ●



# Reviews

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## CyberPowerPC Analog U7 RTX Next Day SY3127

We love the chassis, especially when it's packed with such great components for this price



SCORE ★★★★★

PRICE £2,083 (£2,499 inc VAT) from [tinyurl.com/384cyberpower](https://tinyurl.com/384cyberpower)

One of my highlights of CES 2026 was visiting CyberPowerPC to see its all-new MA-01 chassis. While the American company normally uses off-the-shelf PC cases, it designed this one from the ground up and packed it with clever touches – all there to enhance cooling, reduce noise or improve aesthetics.

The most obvious sign of this is a collection of three knobs on the left-hand side of the chassis. These give you direct control over the RGB

fans' colours, patterns and brightness, with the top button handling colour selection, the middle brightness and the bottom button selecting modes such as solid, breathing and rainbow. It takes a while to get your head around the system, but I enjoyed playing with it.

CyberPowerPC also includes angled vents on the inside, with the idea being to push air towards the core components on the motherboard – particularly useful for anything covered in heatsinks such as M.2 SSDs. I'm not convinced this will make a huge difference, but it also adds to the styling because the vents create indirect lighting for the six RGB fans tucked behind the vents (three at the bottom, one at the rear, two at the side).

Add the three RGB fans for the liquid cooler and there's no shortage of noise-making fans, so I recommend you download MSI Center and activate its Cooling Wizard fan control module. With this in

**ABOVE** The Analog U7 RTX is a great-looking, powerful PC that's also great value



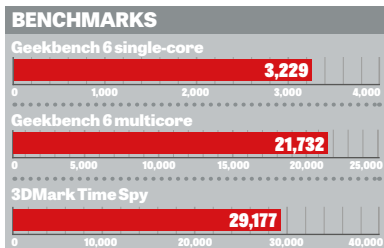
**BELOW** Three knobs on the side of the chassis let you adjust the fans' RGB lighting

place, and once I'd applied a few tweaks, I could barely hear any fan noise from the PC in day-to-day use. You can also take control of the machine's RGB settings using the Mystic Light software module, but where's the fun in that?

One final word on looks. CyberPowerPC bases the Analog U7 RTX on the Satin Dark Steel Gray case (there are also silver and off-white versions), which has an extremely subtle tone to it. I'm reminded of the prototype car finishes you see in car magazines, such is the nature of the matte coating – almost as if someone has applied an undercoat and it's waiting for a final gloss. The look stands apart from any other chassis I've seen, right down to the subtle MA-01 logo at the rear left of the chassis.

### ■ Core setup

As this is a "next day" system, you get what you're given in terms of components. Although you do have one big





decision to make: along with the Intel-based system I tested, CyberPowerPC UK (the British arm of the company, which is based in Gateshead) is selling an AMD system based around an AMD Ryzen 7 9800X3D. The specs are otherwise identical – aside from the motherboard, of course – so if you prefer AMD then search for the Analog R97 RTX SY3124. As we went to press, both systems cost £2,500 inc VAT.

Personally, I would lean towards the Intel version as it's built around the Core Ultra 7 270K Plus CPU. This excellent chip is part of Intel's Arrow Lake Refresh range, and remains competitively priced despite its all-round power – one of the reasons CyberPowerPC can supply the whole system for £2,500.

The Core Ultra 7 270K Plus includes 24 cores, eight of which are Performance-cores with a turbo boost up to 5.5GHz. That's why this PC is so competitive in Geekbench 6's single-core test, with a return of 3,229. But it's multicore tasks where the chip really flexes its muscles, as reflected by 21,732 in Geekbench 6 and 2,371 in Cinebench 2024. If this were the AMD version, I would expect a very similar single-core result in Geekbench but a multicore score of around 18,000.

CyberPowerPC sensibly opts for 32GB of RAM – supplied as a pair of RGB-topped XPG DDR5-5600 modules – to provide support, with two empty DIMM sockets available should RAM ever become affordable. However, most people should be happy with 32GB; it's certainly enough for gaming. The only exception that springs to mind is *Microsoft Flight Simulator*.

## Gaming speed

It's fantastic to see an Nvidia GeForce RTX 5080 graphics card in place. This ensures playable frame rates in demanding titles at 4K with top settings, as I saw when I put the Analog U7 RTX through its paces across six demanding titles. In descending order, this system averaged 145fps in *Dirt 5*, 131fps in *Far Cry 6*, 114fps in *Borderlands 3*, 104fps in *Shadow of the Tomb Raider*, 85fps in *Cyberpunk 2077* (RT Ultra) and 37fps in *Black Myth: Wukong* with Cinematic presets.

When I dropped down to 1440p, all of the games other than *Black Myth* (60fps) and *Cyberpunk 2077* (117fps) averaged over 150fps. With the right monitor – one that supports 144Hz refresh rates or above and

Nvidia G-Sync Premium – you're going to enjoy an amazingly solid picture. Poor performance in games will be entirely down to you, I'm sorry to say.

If you find you run out of space on the supplied 2TB PCIe Gen4 SSD – a speedy Corsair MP600 Pro that returned 7GB/sec sequential reads and writes in CrystalDiskMark – then there's room for two more on the MSI Pro Z890-S WiFi motherboard. And you can easily add two SSDs (3.5in or 2.5in) using a caddy on the right-hand side of the chassis, tucked into a cavity under the bottom three fans.

That caddy's immediate neighbour is a CoolerMaster Elite 1,000W 80+ Gold modular power supply, which means a future RTX 5090 upgrade isn't out of the question. During our testing the Analog U7 RTX peaked at 704W, with a typical idle rate of around 90W.

## Ease of access

Before you access any of these components, you'll need to dust



**ABOVE** A GeForce RTX 5080 card provides playable frame rates in demanding titles at 4K

**"I struggle to find anything to criticise here. Even the warranty is a generous five years... In today's climate, it offers superb value"**

**BELOW** Angled vents on the inside push cool air towards the core components



down your screwdriver, with a pair of crosshead screws securing both sides of the chassis in place. They're not necessary once the PC is sitting on your desk, as the sides remain firmly in place without them, but I would rescrew them in just in case. With the tempered glass side removed, it's easy to access the two available PCI Express x16 slots sitting below the graphics card (that card blocks one other PCIe slot).

Even though I welcome both vacant PCIe slots, I wonder how many people will take advantage. That's because this high-end MSI motherboard offers Wi-Fi 7 and a 2.5Gb Ethernet port, plus support for RAID0, RAID1 and RAID5, plus a rear-mounted Thunderbolt 4 port. Quite a CV. Nor is this PC short of USB ports. Two USB-A ports and one USB-C port sit

on the front of the chassis (along with a 3.5mm audio jack), while six more USB-A ports lie vacant on the backplate alongside a second USB-C connector. This sits under the

Thunderbolt 4 output, but it's still speedy thanks to a USB 3.2 Gen2x2 rating (20Gbits/sec).

All of which means I struggle to find anything to criticise here. Even the warranty is a generous five years, with the first two years covering parts and the first year including collect-and-return cover so you won't need to worry about courier costs. The same applies to the equivalent AMD SY3124 version.

Whichever variant you choose, there's the extra benefit of next day delivery if you order before 2pm. That means you can't configure the system, but it's impossible to argue with CyberPowerPC's choices. In today's climate, it offers superb value – and that's why it jumps straight onto our A List for enthusiast PCs.

**TIM DANTON**

## SPECIFICATIONS

24-core (8 P-cores/16 E-cores) Intel Core Ultra 7 270K Plus processor • MSI Pro Z890-S WiFi motherboard • 32GB XPG DDR5-5600 RAM • 16GB Nvidia GeForce RTX 5080 graphics • CyberPowerPC Elite ARGB 360mm AIO liquid cooler • 2TB Corsair MP600 Pro PCIe Gen4 SSD • CyberPowerPC MA-01 Mid-Tower Gaming Case • CoolerMaster Elite 1,000W 80+ Gold PSU • Windows 11 Home • 235 x 460 x 498mm (WDH) • 5yr warranty (1yr C&R, 2yr parts) • power: 91W idle, 704W peak



# Valve Steam Machine

No match for gaming PCs, but this console-like system is a convenient choice for playing your Steam library



**SCORE** ★★★★★

**PRICE** 512GB, no controller, £733 (£879 inc VAT) from [tinyurl.com/384steam](https://tinyurl.com/384steam)

Following the success of the handheld Steam Deck, the Steam Machine sees Valve bring the Steam gaming platform into the living room and onto the TV. This isn't the first time the Steam Machine idea has been tried out: a small number of SteamOS-powered mini-PCs were briefly offered under the same brand about a decade ago, from manufacturers including Alienware, Asus and Zotac. However, this is the first time that Valve has made the device itself, and this time I expect the Steam Machine to stick around.

It's an open question as to whether the Machine should be called a PC or a console. Certainly its format is more console-like, being a compact cuboid with a built-in power supply that should slot neatly beneath your television. The integrated LED strip is perhaps overly showy, with 17 RGB lights that glow to represent the Steam Machine's system status, but this can be customised with a pattern of your liking or turned off altogether.

You can also replace the plain magnetic faceplate with your own design: if you order the Steam Machine with a 2TB SSD, it comes with a fuzzy cloth-like red plate or

one with a dark wood texture. For those who like to get creative, the company promises to release model files so you can 3D-print your own.

At the same time, the number of ports dotted around the Steam Machine give it a distinctly PC-like feel. On the front, you'll find a pair of USB-A sockets, a microSD card slot and the power button; at the rear there's DisplayPort, HDMI, Ethernet, two USB-A ports and a single USB-C port.

## ■ Gaming proposition

Compared to a typical gaming PC, the Steam Machine is hardly an all-conquering proposition. The processor is a semi-custom AMD Zen 4 chip with an integrated AMD RDNA 3 GPU. The standard 16GB of system RAM is fine, but the GPU has only 8GB of GDDR6 memory, while most of the cards in gaming PCs have 12GB or 16GB. Our graphs opposite show that the Steam Machine doesn't compete with dedicated builds from Acer and CyberPowerPC. (It also makes far less noise, which is simply a non-issue for the Steam Machine.)

This doesn't mean you can't get an enjoyable gaming experience. I loaded up *Resident Evil Requiem*, set the resolution to 2,560 x 1,440 – without any upscaling or advanced

**ABOVE** The 2TB model ships with a fuzzy cloth-like red plate

features such as hair strands – and found the game ran smoothly through the Cedarbook Apartments section. As the main character sneaked past zombies, took on a boss and escaped through the other side of the building the frame rate sat mostly between 60 and 70fps, although there were a few conspicuous drops to around 20fps during environmental transitions.

When I pulled up older games, the experience was excellent. 2018's

*Soulcalibur VI* ran flawlessly in 4K, easily keeping up a consistent 60fps with maximum graphics settings. It's a noticeably better experience than the Steam Deck: Valve claims the Machine is six times as powerful as the handheld console, and games such as *Forza Horizon 6* and *Red Dead Redemption 2* played quite happily on the Steam Machine. I could even enjoy games that barely run at all on the Steam Deck, including *Black Myth: Wukong*.

The Steam Machine's limitations become visible when you try to play modern games at the highest resolutions. Valve has said outright that "1080p is the system default to ensure a good gameplay experience out of the box", but there's nothing stopping you from going into Game Settings and manually changing the



**ABOVE** The compact Steam Machine will look great beneath your TV



display resolution to 4K. Try it, though, and you'll probably need to enable frame interpolation to keep things smooth. For example, in *Red Dead Redemption 2* at Medium settings the Steam Machine managed only 20fps at 4K; enabling FSR 2.0 in Performance mode boosted this to 60fps. On *Forza Horizon 6*'s Ultra settings, the game ran at 30fps at 4K, but turning on FSR 3.1.5 Performance nabbed an extra 10fps that made it a more pleasant experience, if still not perfectly smooth. Then again, if you're playing on a TV and sitting on the opposite side of the room, you're unlikely to see a big difference between 1080p and 4K anyway.

## ■ Getting inside

One advantage of the Steam Machine over a regular living-room console is upgradability. A small pry tool pushed into two purposeful-looking indents on the base lifts the back cover right off; unscrew the fan and you can lift out the entire inner assembly in one piece. Whether you've bought the 512GB model or the 2TB one, the SSD can be freely swapped out for a bigger one – you can use any standard M.2 NVMe drive, and pop it in with only a couple of screws.

The system RAM can be upgraded too, although this is harder as you must remove the giant heatsink to access the twin SODIMM slots. Given how tightly packed the Steam Machine is, with many cables and ribbon cables to daughterboards throughout the outside of the heatsink and PSU, this is a more fiddly operation than I think many Steam Machine owners will want to try. On the plus side, the use of daughterboards means it should be possible to replace broken ports, and Valve has said it will partner with iFixit to produce repair manuals, as it has with the Steam Deck.

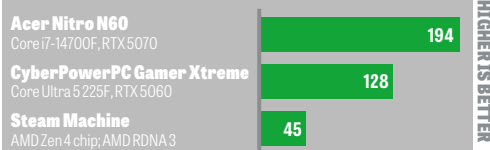
## ■ Desktop mode

The Steam Machine is of course designed primarily for gaming, and one of the big attractions of SteamOS is that it can be fully operated from a standard handheld controller.

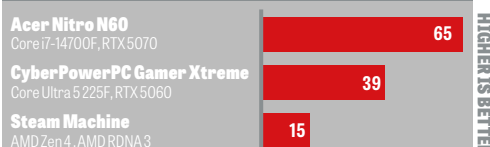
However, it's built on a foundation of Linux, and if you connect a keyboard and mouse you can fire up the KDE Plasma desktop and use Linux applications as you would on any other Linux PC. Using the Steam Machine in this mode feels



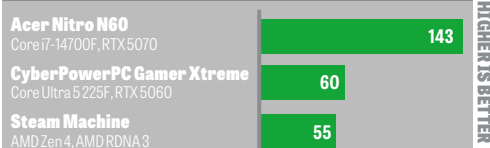
### SHADOW OF TOMBRAIDER (1080P, HIGHEST, FPS)



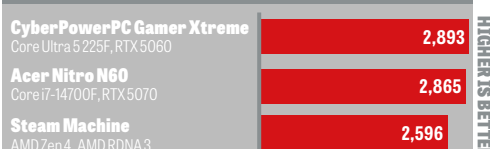
### CYBERPUNK 2077 (1080P, RT ULTRA, FPS)



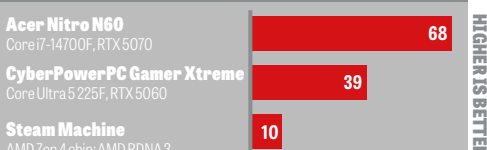
### RED DEAD REDEMPTION 2 (1080P, MEDIUM, FPS)



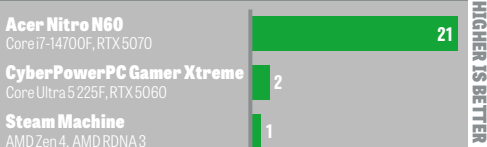
### GEEKBENCH 6 SINGLE CORE



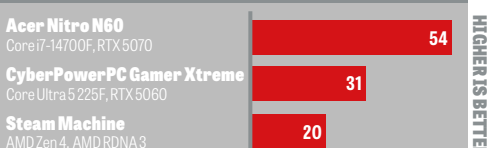
### SHADOW OF TOMBRAIDER (4K, HIGHEST, FPS)



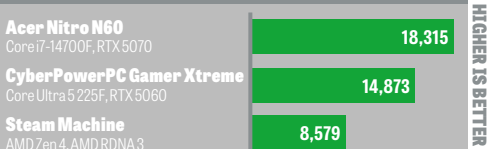
### CYBERPUNK 2077 (4K, RT ULTRA, FPS)



### RED DEAD REDEMPTION 2 (4K, MEDIUM, FPS)



### GEEKBENCH 6 MULTICORE



similar to docking a mid-range laptop – it's fine for everyday desktop apps, but don't expect workstation-class horsepower.

Still, I would have liked a way to dual-boot SteamOS and Windows so that I could run all my apps in a familiar environment. The Valve web page says that a dual-boot capability is coming, but there's no word on when.

## ■ Bigger ecosystem

The Steam Machine works well as a standalone gaming station, but it also integrates nicely into the wider Steam platform. You can start playing a Steam game on the Deck, in the Steam app on any mobile device or even on a gaming PC elsewhere in the house, then save it to the Steam Cloud, plop down on the couch, turn

on your Steam Machine and resume the same game on the big screen. Of course, you could do that with any living-room PC, by switching the Steam client into Big Picture Mode, but the Machine is a



**ABOVE** The Steam Controller costs an additional £59 if you buy it with the Machine

**“The Steam Machine is cute, fun and endearingly versatile, with a vast library of games both old and new”**

**LEFT** The huge fan barely makes a noise, even when pushed

neater box. And one distinctive benefit of the Machine is that if you also have a Steam Deck, you can use an SD card to move entire games directly between the two devices.

Ultimately, the Steam Machine doesn't reconcile the PC and console experiences. Aside from anything else, the current cost of components makes it much more expensive than a console, and since the games aren't optimised for a standardised specification, there's a PC-like element of fiddling to get things

looking sharp and smooth.

All the same, demand is high: you will have to wait weeks for a system if you order today. I understand the demand. For casual living-room gaming the Steam Machine is cute,

fun and endearingly versatile, with the extra convenience of desktop mode and a vast library of games both old and new. **ANDREW E FREEDMAN**

### SPECIFICATIONS

6-core/12-thread custom AMD Zen 4 chip • custom AMD RDNA 3 graphics (28 CUs, 110W TDP) • 16GB DDR5-5600 RAM • 2TB NVMe PCIe Gen4 SSD • Wi-Fi 6E • Bluetooth 5.3 • USB-C 3.2 Gen2 • DisplayPort 1.4 • HDMI 2.0 • 4x USB-A 3.2 Gen1 • 1GbE • microSD card slot • 300W internal power supply • SteamOS 3 • 156 x 162 x 152mm (WDH)

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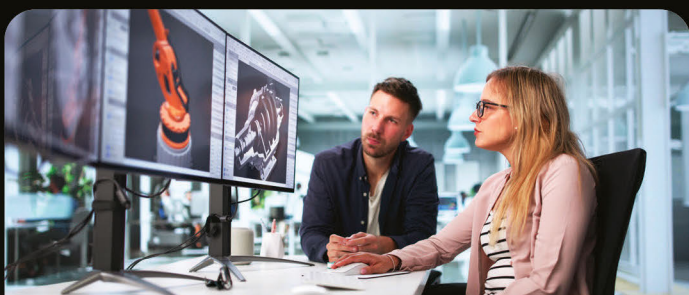
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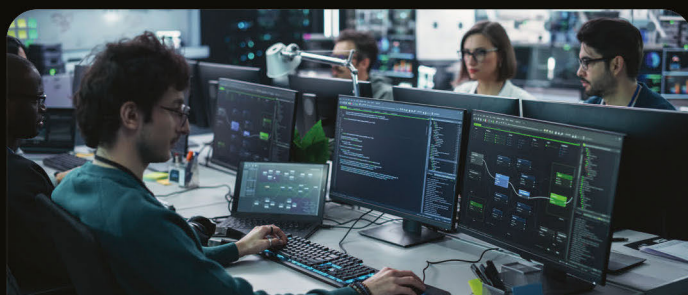
Media & Entertainment



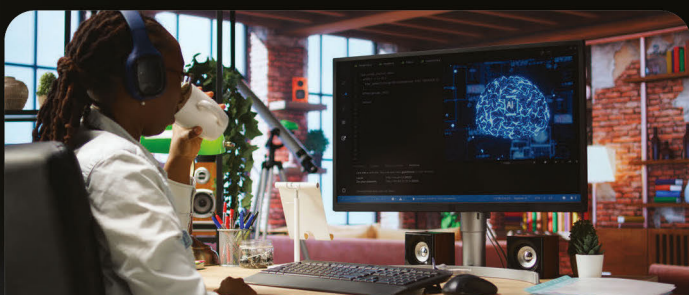
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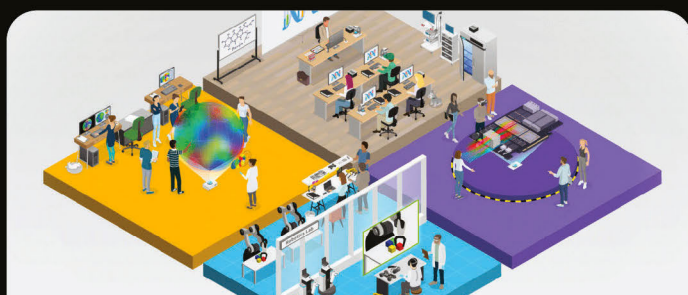
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SCAN<sup>S</sup>

# Lenovo Yoga AIO i Gen11 Aura Edition (32in Intel)

An eye-catching design is backed up by the 4K OLED display and great day-to-day performance

SCORE ★★★★★

PRICE £2,120 (£2,544 inc VAT)  
from lenovo.com

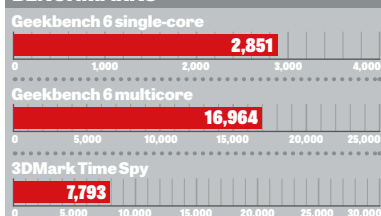
The new Lenovo Yoga AIO i Gen11 Aura Edition is a sight to behold. With its upside-down V-shaped design, transparent “chin” and an incredibly thin but capable computer built into the stand, it’s quite unlike any PC I’ve ever seen.

Capable, but expensive. There’s currently only one configuration available, priced at £2,544; that comes with an Intel Core Ultra X7 358H, 32GB of RAM and a 1TB SSD. It’s a decent enough spec, but you’re paying a premium for the design.

I can’t complain about that, though, as in my view this is the best-looking PC you can buy right now. From a normal sitting position the display looks like it’s floating over the desk; you don’t see the stand at all, and the effect is mesmerising. I’m also pleased to note that the illumination below the screen can be customised via Windows 11’s native RGB controls; this is the first opportunity I’ve had to try these out, and I found them easy to use, with plenty of settings and options to play with.

Almost as striking as the design is the screen itself. The 32in 4K OLED panel offers 10-bit colour depth at 165Hz, making Windows animations, scrolling and games feel extremely smooth. It’s bright, too, reaching up to 1,000cd/m<sup>2</sup> brightness with HDR content, and has excellent colour performance: 99% DCI-P3

## BENCHMARKS



coverage is ideal for video editors and photo artists.

On the right-hand side of the display you’ll find a convenient USB-C port and a 3.5mm audio jack; the rest of the connectors are located around the stand, including a single USB-A port behind a door on the side, two more USB-C ports, two USB-A ports and an HDMI port sit at the back.

Performance and thermal design are nicely balanced. This thing is whisper-quiet for 99% of the time you’ll be using it, but there’s plenty of power on tap when needed: a Geekbench single-core score of 2,851 and a multicore score of 16,964 tell you that the computer within will breezily handle heavy multitasking, AI workloads and complex data processing. Storage is speedy, too, with the CrystalDiskMark benchmark reporting read rates of just over 7GB/sec and write speeds of 5.8GB/sec. Boot times, app loading and file transfers are nice and fast.

The Yoga AIO even makes a competent gaming machine. The Intel Arc B390 GPU has more horsepower than your usual integrated graphics, and while it won’t run the latest games at their highest settings you can get a very good experience at 1080p or 1440p. I do, however, wish Lenovo offered a discrete GPU option for those who need more.

There are aspects of the design that I’m not so fond of. First, the upside-down V-shape has a bigger footprint than most all-in-ones. On a small desk, you might find the display is slightly too close to you, or the stand ends up uncomfortably

close to the edge of the desk. A grippy underside ensures it won’t actually slide off, but it’s still unnerving.

This design also isn’t great for access to the USB and HDMI ports: I found it physically impossible to reach around the back of the stand when I was sitting in front of it. For a device targeted at creators, it would surely have benefited from a few more USB connectors too, plus an Ethernet jack and

an SD card reader.

The transparent chin, meanwhile, looks striking, but if you want to keep it free of dust and fingerprints then be prepared to clean it daily. I don’t know how fingerprints even end up there, as I never intentionally touched the device in that area, but somehow I was always cleaning them off.

The last thing I don’t like about this computer is a quirk of the built-in speaker system; whenever the audio device is active, I can hear a hissing noise. It’s so noticeable that I sent my

original test unit back to Lenovo thinking it might be defective, but the second sample has the same problem. You can silence the hiss by plugging in external speakers, but such

workarounds shouldn’t be necessary on a computer at this price. Hopefully it can be fixed with a firmware update.

Despite its imperfections, the Lenovo Yoga AIO i Gen11 Aura Edition is definitely one of the most desirable computers around. On balance, I can accept the fiddly port access, and the lack of a serious gaming or professional-grade GPU, because the whole thing is so jaw-droppingly good to look at and use. I actually find myself feeling proud to have this computer sitting on my desk, and you can’t say that about many PCs. **ZAC BOWDEN**

## SPECIFICATIONS

16-core (4 P-cores, 8 E-cores, 4 LPE-cores) Intel Core Ultra X7 358H • Intel Arc B390 graphics • 81.5in 165Hz 3,840 x 2,160 non-touch OLED • 32GB LPDDR5X-9600 RAM • 1TB M.2 PCIe Gen4 SSD • Wi-Fi 7 • Bluetooth 5.4 • 16MP IR webcam • HDMI 2.1 • Thunderbolt 4/USB-C 4 • 2 x USB-C 3.2 Gen2 • 3 x USB-A 3.2 Gen2 • USB-A 2 • 3.5mm combo jack • 2 x 2W speakers • Lenovo 800 wireless mouse and keyboard • Windows 11 Home • 721 x 64 x 509mm (WDH) • 8.5kg • 1yr C&R warranty

ABOVE The stunning Yoga AIO looks unlike any other all-in-one PC



“From a normal sitting position the display looks like it’s floating over the desk; you don’t see the stand at all, and the effect is mesmerising”

LEFT The rear ports are tricky to access when the computer is sitting on a desk



ABOVE The stand takes up more space than a conventional all-in-one PC



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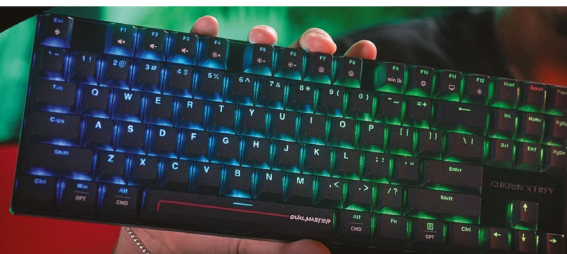
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## Dell 14S

Not the most exciting 14in laptop, but the build quality and OLED panel lift it into recommended territory

SCORE ★★★★★

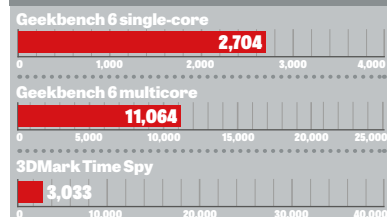
PRICE As reviewed, £1,041 (£1,249 inc VAT) from dell.com

**D**ell has wisely abandoned its “Plus” naming system for laptops that sit between the entry level and its XPS range, kicking off with the Dell 14S. While it uses plastic for the palm rest and keyboard surround, the lid and base are both made from a durable aluminium alloy. The result is a well-built laptop that should survive life’s knocks, and it comes with a one-year on-site warranty. If you want more support, including help with software, then consider the three-year Dell Care Plus package for an extra £239.

The 14S only comes in “Frost Blue”, a plain, silvery finish that looks more attractive on this 14in laptop than when stretched over the 16in frame of the Dell 16S opposite. It helps that the 14S is relatively light at 1.5kg, and with an almighty battery life of over 21 hours you can be confident when taking it on your travels.

That battery life result looks even better when you consider the presence of an OLED panel. You can specify a more traditional LCD panel with a higher resolution – 2,560 x 1,440 versus 1,920 x 1,200 – but you’ll miss out on the rich colours here: it covers 100% of the DCI-P3 gamut and beyond. Colour accuracy is also superb with an average Delta E of 0.53, while whites look spot on thanks to a 6514K colour temperature.

### BENCHMARKS



### BATTERY LIFE



The only negative is that brightness peaks at 307cd/m<sup>2</sup>, but it’s still bright enough to read outside thanks to OLED’s perfect contrast. Don’t let that put you off choosing this display.

One of the reasons the battery lasts so long is Intel’s highly efficient Core Ultra 7 355 processor, which pushed the system to solid multicore scores in Geekbench and Cinebench 2024: 11,064 and 592 respectively. There’s enough power to last for many years, and it packs a 49TOPS NPU that exceeds the Copilot+ PC criterion. Unlike the Dell 16S, you can’t specify the Dell 14S with a Core Ultra 9 386H chip, so if you frequently edit video or compile code I suggest you look elsewhere.

Intel has also been stingy with the integrated graphics in these chips, with only four of its Xe cores compared to a dozen in the Ultra X7 and Ultra X9 members of the Core Ultra Series 3 family. This means compromises if you want to run even moderately demanding games: *Borderlands 3*, *Shadow of the Tomb Raider* and *Dirt 5* only broke 40fps on the 14S when I dropped the settings to Low.

The laptop is much better suited to streaming TV and films, even if it doesn’t have the incredible brightness of the OLED panel in the Lenovo Yoga Slim 7x Gen11 (see p56). The pair of 2W speakers produced far better results than I expected, with Morgan Freeman’s voice coming through with exceptional depth and clarity in Netflix’s *Our Universe*. I missed the

woofers of the Lenovo when playing music, but the 14S still produces superior sound to most laptops.

Dell sensibly splashes cash on the mics as well, with clear audio to accompany the not-so-impressive 1080p webcam. It’s usable, but there’s a lot of noise in low-light conditions. Adding a webcam won’t be a problem, with one USB-A port on either side along with two Thunderbolt 4 ports. These open up plenty of possibilities when it comes to expansion, whether it’s through external storage or adding multiple monitors.

There’s also an HDMI 2.1 port, which will almost certainly come in handy one day.

I can’t get so enthusiastic about the keyboard, which is a lifeless affair with minimal key travel. While I accept that people have differing takes on keyboards, surely everyone wants cushioning? The best thing I can say is that its black keys look good against the silver-grey frame, especially when the backlight kicks in. I have no complaints about the touchpad, though, which is well proportioned and responsive.

If the 512GB SSD in this spec is too small, you can upgrade to 1TB for £100 or 2TB for £400. Or you can replace it yourself, with the SSD, wireless card, battery, fan and speakers all user-replaceable. Simply follow the clear instructions in Dell’s service manual.

Despite my feelings about the keyboard, Dell deserves credit for the 14S. The OLED screen is a joy, the speakers surprisingly good, it’s extremely well built and the battery life is simply astonishing.

Gaming aside, there’s more than enough power on tap here if you choose the Core 7 355. So long as Dell doesn’t follow Apple’s lead and hike the price, it’s also good value.

**TIM DANTON**

**ABOVE** The 14S is decent value and will keep going for ages away from the mains



**“The OLED screen is a joy, the speakers surprisingly good, it’s extremely well built and the battery life is simply astonishing”**

**LEFT** The “Frost Blue” aluminium finish is unexciting but durable

**BELOW** Two Thunderbolt 4 ports are among the laptop’s connectors

### SPECIFICATIONS

8-core (4 P-cores, 4 LPE-cores) Intel Core Ultra 7 355 processor • Intel Graphics • 16GB LPDDR5X-7467MT/s RAM • 14in 120Hz OLED non-touch display, 1,920 x 1,200 resolution • 512GB M.2 PCIe Gen4 SSD • Wi-Fi 7 • Bluetooth 5.4 • 1080p IR webcam • HDMI 2.1 • 2x Thunderbolt 4/USB-C 4 • 2x USB-A 3.2 Gen1 • 3.5mm combo jack • 70Wh battery • Windows 11 Home • 314 x 224 x 15.3mm (WDH) • 1.5kg • 1yr on-site warranty • part code: DL14260





## Dell 16S

A solid mid-range 16in laptop that meets the needs of most home users, but we prefer the smaller version

SCORE ★★★★★

PRICE As reviewed, £1,083 (£1,299 inc VAT) from dell.com

If the Dell 14S opposite doesn't have a big enough display to meet your needs, there's always this 16in alternative. While Dell describes it as "sleek" and "stylishly engineered", I can only agree with the first statement: 15.3mm thick is commendable on a value-focused laptop. Style is always in the eye of the beholder, but the design's lack of visual flourishes looks dull when stretched this wide.

It's well put together, though. The lid and base are made from aluminium alloy, contributing to the laptop's 1.8kg weight, and if you ever need to replace the battery, SSD, speakers or Wi-Fi card you'll find clear instructions on Dell's support pages. You'll have to remove several crosshead screws, but the base unclips easily.

You can't replace the memory as it's embedded onto the board, which means choosing the specification carefully. The Intel version of the 16S is built around Core Ultra Series 3 chips, with the Ultra 5 322, Ultra 7 355 and Ultra 9 386H on offer; our test unit included the 355 with 16GB of RAM. With only eight cores it isn't the fastest, but a single-core result of 2,666 in Geekbench 6 and 10,959 in the multicore section show it can cope with tougher tasks. If you want more

cores, upgrade to the Core Ultra 9 386H as this includes 16 courtesy of an extra eight Efficiency cores.

Whichever you choose, you'll get a capable NPU and weakish GPU. Our system stumbled to 3,097 in 3DMark Time Spy, with a 24fps average in *Dirt 5*, 26fps in *Shadow of the Tomb Raider* and 19fps in *Borderlands 3*.

Those results were all at the panel's native resolution of 2,560 x 1,600 at Low settings (dropping down to 1200p saw the games' respective frame rates increase to 39fps, 39fps and 44fps).

This non-touch VA display is all Dell offers with the 16S.

It's no stunner, covering only 71% of the DCI-P3 colour space and 95% of sRGB. An average Delta E of 0.67 shows that colour accuracy is fine, as is a peak brightness of 415cd/m², but whites could be cleaner.

Our test system included 512GB of storage, with an extra £100 buying 1TB and a 2TB drive costing £300 more. I'd consider paying for a 1TB drive, not least because our 512GB drive performed inconsistently: sequential reads are fine at over 4GB/sec, but sequential writes varied from 80MB/sec to 200MB/sec when I ran CrystalDiskMark. That reflects my experience copying files from an external drive too, with a 50GB mix of files taking more than half an hour despite using a Thunderbolt 4 port.

This, alongside a second Thunderbolt 4 port, sits on the left-hand side next to a USB-A port and HDMI 2.1 output. A second USB-A port and 3.5mm jack are on the right. That's a capable

**ABOVE** Despite the width of the 16in display, the keyboard is missing a few keys

**LEFT** The 16S lacks visual flourishes, but is a well-built laptop

**"If Dell paid as much attention to the keyboard and screen as it has to the speakers, it could be walking away with an award"**

**BELOW** The selection of ports is decent, but the USB-A ports are stuck at 5Gbits/sec

line-up, even if the USB-A ports are stuck at 5Gbits/sec, while the inclusion of Thunderbolt opens up the possibility of daisy-chained 4K displays.

Another welcome surprise comes in the form of strong speakers. There aren't any woofers, so don't expect miracles, but the two 4W tweeters do an excellent job of delivering loud, detailed sound, including

respectable bass. I'd be quite happy listening to music on this laptop. I'm less enamoured by the 1080p webcam due to overcompression, but this – along with the mics – captures good enough video for web calls.

Dell supplied our unit with the numeric keypad version of the keyboard, but you can switch to a plain keyboard as on the 14S (there's no cost difference). Either way the typing action is unexceptional, with no obvious cushioning or effort to aid touch typists. The half-height up/down cursor keys feel squashed, and these function double as PgUp and PgDn. Dell also sacrifices the right Ctrl key, which is a pain for those of us who constantly use it for shortcuts. At least the touchpad is big; you don't get the luxury of a glass coating, but that's to be expected at this price.

There are other nice-to-haves. It's great to see Wi-Fi 7, and you get a year's on-site warranty. I also applaud this laptop's repairability and build quality. If Dell paid as much attention to the keyboard and screen as it has to the speakers, it could be walking away with an award – as it is, I'd look elsewhere.

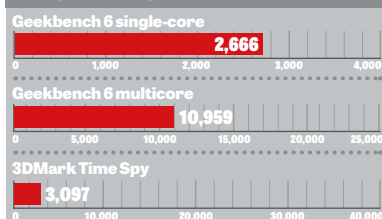
Including the heavily discounted Dell 16 Plus from last year, which is a little heavier but offers similar levels of performance to the Core 7 355 here.

TIM DANTON

### SPECIFICATIONS

8-core (4 P-cores, 4 LPE-cores) Intel Core Ultra 7 355 processor • Intel Graphics • 16GB LPDDR5X-7467MT/sec RAM • 16in 120Hz VA non-touch display, 2,560 x 1,600 resolution • 512GB M.2 PCIe Gen4 SSD • Wi-Fi 7 • Bluetooth 5.4 • 2MP IR webcam • HDMI 2.1 • 2 x Thunderbolt 4/USB-C 4 • 2 x USB-A 3.2 Gen1 • 3.5mm combo jack • 70Wh battery • Windows 11 Home • 357 x 251 x 15.3mm (WDH) • 1.8kg • 1yr on-site warranty • part code: DL16260

### BENCHMARKS



### BATTERY LIFE



## Lenovo Yoga Slim 7x Gen11

A stylish ultraportable that packs plenty of processing punch thanks to the latest Snapdragon X2 Elite chip

**SCORE** ★★★★★

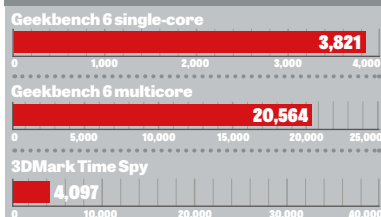
**PRICE** As reviewed, £1,467 (£1,760 inc VAT) from lenovo.com

**I**gnore the price above. While £1,760 inc VAT is correct for the specification on test, I would push you firmly towards the bottom model in Lenovo's range, which sells for £1,050 inc VAT. It comes with a lesser processor, half the RAM and a 512GB SSD, but this laptop's appeal lies in its design and quality.

Besides, even that £1,050 model will be fast thanks to its Snapdragon X2 Plus X2P-42-100 CPU. I state that with confidence because last month we reviewed the Yoga Slim 5x with the X2 Plus inside, so we know how it performs. The top-end model I test here includes an X2 Elite X2E-88-100, and it's faster, of course: 3,821 versus 3,201 in the single-core Geekbench test and 20,564 versus 12,011 in the multicore section. Arguably that level of power is overkill for an ultraportable anyway.

Qualcomm has worked hard to boost the gaming performance of its Windows laptops, and a 4,097 result (1,820 for the X2 Plus) in 3DMark Time Spy is higher than a Core Ultra 7 355. In practice, though, we hit issues with the Epic and Ubisoft launchers required for *Far Cry 6* and *Borderlands 3*, so only have results for *Shadow of the Tomb Raider*: 23fps at 1200p with High settings, 30fps

### BENCHMARKS



### BATTERY LIFE



Low. Despite Qualcomm's best efforts, gaming isn't this laptop's strength.

Instead, battery life remains the biggest selling point for Snapdragon-powered laptops. In light use it lasted over 19 hours, likewise when playing back a Full HD video. It recharges quickly too, hitting 42% after 30 minutes. But the real plus here is how slim and light this laptop is, with a footprint little larger than this magazine and a weight of only 1.2kg.

It's also extremely well built, with an aluminium base and lid. While a single year's collect-and-return warranty is okay, if you plan to travel with this laptop then investigate the upgrades on offer at time of purchase: Premium Care Plus costs £150 for three years, and that gives you on-site repair, battery cover and data migration support.

Lenovo supplies a comprehensive guide on how to replace the components yourself, with the M.2 SSD, Wi-Fi card, battery there for the taking. Some replacements will need the expertise of repairers such as our own Lee Grant (see p113), but there are clear instructions for everything from the USB-C ports to the speakers to the display. So long as Lenovo makes spares available, of course.

You can choose from four OLED panels, starting with a non-touch 1,920 x 1,200 affair. Upgrades include touch and a higher resolution of 2,880 x 1,800. I put the non-touch high-res panel to the test and it's fantastic: it covers 100% of the DCI-P3 gamut, with a peak SDR brightness of 518cd/m<sup>2</sup>. It goes beyond 1,000cd/m<sup>2</sup> in HDR content, as indicated by its DisplayHDR 1000 True Black certification. Watching *Our*



**ABOVE** This stylish, well-built laptop packs the latest Qualcomm chip

**"The real plus here is how slim and light this laptop is, with a footprint little larger than this magazine and a weight of only 1.2kg"**

**LEFT** The aluminium lid and base offer plenty of protection

**BELOW** All three USB-C ports support 40Gbits/sec USB4

*Universe on Netflix* showed this off brilliantly, with the opening credits jumping off the screen.

Lenovo also packs a fine set of speakers, but that didn't surprise me as there is a pair of 2W woofers inside to accompany the 2W tweeters. Music sounds fantastic and game soundtracks pump along too.

For once the webcam doesn't let the side down, with sharp visuals, accurate colours and a fine pair of microphones. It also supports Windows Hello and has an electronic shutter to avoid hacking eyes.

You activate the shutter using a slider on the right-hand edge, next to the power button and one of three USB-C ports. All support the super-fast USB4 standard (40Gbits/sec) and you can use any to connect a monitor and to power the device. The only downside is that Lenovo doesn't include any USB-A ports, but you do get Wi-Fi 7 and Bluetooth 5.4.

To finish things off, Lenovo includes one of the best keyboards you'll find on a consumer laptop. There's enough depth to each key press – and a big enough gap between the gently contoured keys – to ensure quick typing speeds. I was very happy to switch to this laptop after using the

Dell 14S and 16S (see p54 and p55). The only downside is function doubling on the cursor keys.

All of which means that I would be delighted to carry this laptop with me on trips. Even with the Snapdragon X2 Plus inside it will be quick, while 512GB should be enough for most people's needs. The single necessary upgrade, to my mind at least, is the higher-resolution display, which only adds £50 to the £1,050 price. Which makes the Lenovo Yoga Slim 7x Gen11 a bargain, provided you don't want to play games.

**TIM DANTON**

### SPECIFICATIONS

18-core Qualcomm Snapdragon X2 Elite X2E-88-100 processor • Adreno X2-90 graphics • 80 TOPS NPU • 32GB LPDDR5X RAM • 14in 120Hz non-touch OLED, 2,880 x 1,800 resolution • 2TB M.2 PCIe Gen4 SSD • Wi-Fi 7 • Bluetooth 5.4 • 9.2MP IR webcam • 3 x USB-C 4 • 70Wh battery • Windows 11 Home • 344 x 235 x 13.9mm (WDH) • 1.2kg • 1yr C&R warranty





## pro-series



£549.99

**CPU** AMD RYZEN 5 8500G  
**Core** 6 Cores - 12 Threads  
**Clock** (3.5/5Ghz Turbo)  
**Mob** ASUS TUF A620M-PLUS WIFI  
**RAM** ADATA 16GB DDR5 5600Mhz  
**M.2** WD 1TB M.2 nVME SN5100  
**GPU** AMD RADEON Graphics  
**Case** KOLINK Observatory HF MESH  
**O/S** \*NO OPERATING SYSTEM\*  
**PSU** BUILDER 500W PSU



£1099.99

**CPU** AMD RYZEN 5 9600X  
**Core** 6 Cores - 12 Threads  
**Clock** (3.9/5.4Ghz Turbo)  
**Mob** ASUS PRIME B850M-A WIFI  
**RAM** ADATA 32GB DDR5 5600Mhz  
**M.2** WD 1TB M.2 nVME SN5100  
**GPU** NVIDIA RTX5060 TI 8GB  
**Case** CIT RANGE aRGB - Black  
**O/S** \*NO OPERATING SYSTEM\*  
**PSU** CIT 700W PSU



£1599.99

**CPU** INTEL Core i5 14600K  
**Core** 14 Cores - 20 Threads  
**Clock** (2.6/5.3Ghz Turbo)  
**Mob** ASUS B760M-K  
**RAM** ADATA 32GB DDR5 5600Mhz  
**M.2** ADATA 2TB S70 Blade M.2 nVME  
**GPU** NVIDIA RTX5070 TI 16GB  
**Case** CORSAIR 4000D FRAME RS aRGB  
**O/S** \*NO OPERATING SYSTEM\*  
**PSU** BEQUIET 850W Gold PSU

## Aurora RANGE



£749.99

**CPU** INTEL Core i3 14100F  
**Core** 4 Cores - 8 Threads  
**Clock** (3.5/4.7GHz)  
**Mob** ASUS B760M-K  
**RAM** ADATA 16GB DDR5 5600Mhz  
**M.2** WD 1TB M.2 nVME - SN5100  
**GPU** NVIDIA RTX3050 8GB  
**Case** GAMEMAX Abyss Mini RGB  
**O/S** MICROSOFT Windows 10/11  
**PSU** CIT 600W Bronze PSU



£1099.99

**CPU** INTEL i5 14400F  
**Core** 10 Cores - 16 Threads  
**Clock** (Turbo 4.7Ghz)  
**Mob** ASUS B760M-K  
**RAM** CORSAIR 32GB DDR5 6000Mhz  
**M.2** ADATA 2TB M.2 NVMe  
**GPU** NVIDIA RTX5060 8GB  
**Case** CORSAIR iCUE 4000X  
**O/S** MICROSOFT Windows 10/11  
**PSU** CIT 700W FX PRO PSU



£1599.99

**CPU** INTEL Core i7 14700KF  
**Core** 20 Cores - 28 Threads  
**Clock** (3.4/5.6Ghz Turbo)  
**Mob** ASUS PRIME Z790-P WIFI - DDR5  
**RAM** CORSAIR 32GB DDR5 6000Mhz  
**M.2** ADATA 1TB S70 Blade M.2 nVME  
**GPU** NVIDIA RTX5070 12GB  
**Case** CORSAIR iCUE 4000X RGB  
**O/S** MICROSOFT Windows 10/11  
**PSU** C/MASTER 850W Gold PSU

www.palicomp.co.uk







# Asus ROG Strix Scar 18 (2026)

There are many hits here – including a stunning mini-LED panel – but enough misses to dodge an award



**SCORE** ★★★★★

**PRICE** RTX 5090, £4,417 (£5,300 inc VAT)  
from rog.asus.com

**T**his 18in gaming laptop makes a loud first impression, from its stellar mini-LED display to the scrolling marquee lighting on its lid. But at this price the Scar 18 must prove it can hold up against Razer's Blade 18 (see issue 383, p64) and Lenovo's Legion 9i Gen10 (see issue 382, p75) before it can claim a spot at the top.

It's certainly a heavyweight contender. At 3.7kg it's 500g heavier than the Razer, 200g more than the Lenovo and considerably thicker than both: 35mm at its rear compared to 29mm. The Scar 18 is clearly destined for life on a desk or table. It's a solid machine, though, showing minimal flex no matter how I abused it. Only the lid is metal, with the rest of the construction thick plastic.

The doorstopper of a 450W power unit will add yet more weight on your travels, although the Scar 18 lasted for a highly respectable five hours under light use. That's with all the RGB lighting switched off, but I'd persist with the striking Aura Sync lightbar around the base of the laptop, if not the RGB-lit ROG logo on the lid. Both are configurable in terms of colours and patterns in the Armoury Crate app.

The lid also has a feature called AniMe vision, a diagonally scrolling

marquee of text via LEDs that shine through holes in the lid backing. You can pick from the preconfigured logos or add your own text effects.

The bottom line is that, unlike the Razer Blade 18, the Scar 18 couldn't do anything more to look like a gaming laptop: it's designed to be seen.

## ■ Play the game

It's here to be played on too. We tested the Scar 18 with an RTX 5090 inside, with up to 175W of dedicated power. Our system came with 32GB of RAM, but only a single SODIMM. That's a blunder, as you need dual-channel RAM on a system such as this; the price above (part code G835LXG-TQ391W) includes 64GB of RAM.

You can see how our test unit performed in the graphs opposite, but I started putting the Scar 18 through its paces playing *007: First Light* at 3,840 x 2,400 with all detail settings maxed out. This proved too demanding – I saw 26 to 32 frames per second in most scenes. Enabling DLSS more than doubled the frame rate, making the game supremely playable.

However, in our labs tests the single-channel RAM held it back compared to its rivals. Typically, it was a few frames behind the Lenovo and Razer, with that gap growing smaller when the GPU was the most important factor. For instance, in

**ABOVE** The Scar 18's mini-LED display is stunning once it's been configured properly

**"The Scar 18's 'Nebula' HDR display is its crowning feature. With a 3,840 x 2,400 resolution, it ticks all the boxes"**



**ABOVE** With its RGB logo and configurable text display, this is a laptop that's designed to be noticed

*Cyberpunk 2077* at RT Ultra, it was only 2fps behind the Razer Blade 18 with 71fps versus 73fps. I strongly suspect the gaps would disappear, and might even reverse, with dual-channel RAM.

We saw the same pattern in our productivity benchmarks. Not in the single-core Geekbench test, where the Scar 18 topped the table, but in the multicore section where the RAM bandwidth is clearly more important. Still, it proved competitive in our 4K-to-1080p Handbrake transcoding test, completing it in 2mins 13secs – a little ahead of Lenovo but a few seconds behind Razer.

## ■ Screen spectacular

The Scar 18's "Nebula" HDR display is its crowning feature. With a 3,840 x 2,400 resolution, mini-LED backlighting with 2,000 dimming zones, a 240Hz refresh rate and Nvidia G-Sync, it ticks all the boxes.

However, out of the box, HDR is disabled, the refresh rate is capped at 120Hz and G-Sync is unavailable. For best results, the GPU must be put in "Ultimate" mode in Armoury Crate, which is effectively a MUX toggle that disables the integrated graphics. On reboot, G-Sync, the 240Hz refresh rate and a very effective feature aimed at



esports players called “Extreme Low Motion Blur” then become available.

You can toggle the mini-LED backlighting control between one zone, multi-zone balanced or multi-zone strong. These settings produce very different images – one-zone provides the deepest contrast, multi-zone balanced is the dimmest but evens out the contrast to make dark scenes appear brighter, and multi-zone strong is the brightest and most vibrant. I stuck with the latter for almost everything.

But there are even more settings. Armoury Crate includes many colour modes via a feature called GameVisual – choose between racing, scenery, RTS/RPG, fps, cinema, eyecare, vivid and e-reading. It also provides colour temperature and gamut settings.

Finally, to get HDR working, it must first be enabled in the Windows Settings app. Back in Armoury Crate, you’ll find GameVisual, colour temperature and gamut settings, Extreme Low Motion Blur, and mini-LED backlighting settings are no longer available. That’s the trade-off.

## Key points

Gamers will love the keyboard. The keys require enough actuation force that resting your fingers on WASD or the arrow keys won’t produce accidental presses, and plenty of tactile feedback means you’ll know exactly when a key is at the top or bottom of the stroke.

I found the keyboard less joyful when typing, but I still hit my usual word rates. But with so much space a shrunken number pad is a miss, while there’s no right Ctrl key and the arrow cluster isn’t separated out, so there are no dedicated Home, End, Page Up or Page Down keys. Asus at least provides five dedicated macro keys, which are configurable in the Armoury Crate app. I also love the mechanical touchpad, with an expansive surface and a smooth surface coating.

The Scar 18’s quad-speaker array delivers an expansive sound stage, making it easy to pinpoint the footsteps of approaching enemies for instance. Bass is muted, though, resulting in explosions and gunfire that don’t stir up as much excitement as they could. Don’t expect much from the 1080p webcam, either, with soft and washed-out images.

### GEEKBENCH 6 (SINGLE CORE)

|                                                                      |       |
|----------------------------------------------------------------------|-------|
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 3,237 |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 3,216 |
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 3,170 |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 3,128 |
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 3,103 |

HIGHER IS BETTER

### HANDBRAKE

|                                                                      |              |
|----------------------------------------------------------------------|--------------|
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 2mins 2secs  |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 2mins 3secs  |
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 2mins 12secs |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 2mins 13secs |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 2mins 15secs |

LOWER IS BETTER

### BORDERLANDS 3 (1200P, BADASS, FPS)

|                                                                      |     |
|----------------------------------------------------------------------|-----|
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 193 |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 164 |
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 157 |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 156 |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 143 |

HIGHER IS BETTER

### BATTERY LIFE (GAMING)

|                                                                      |            |
|----------------------------------------------------------------------|------------|
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 1hr 26mins |
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 1hr 22mins |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 1hr 11mins |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 1hr 9mins  |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 1hr 2mins  |

HIGHER IS BETTER

### GEEKBENCH 6 (MULTICORE)

|                                                                      |        |
|----------------------------------------------------------------------|--------|
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 20,754 |
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 20,166 |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 20,058 |
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 19,800 |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 17,629 |

HIGHER IS BETTER

### 3DMARK TIME SPY

|                                                                      |        |
|----------------------------------------------------------------------|--------|
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 23,522 |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 21,231 |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 21,222 |
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 19,950 |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 16,614 |

HIGHER IS BETTER

### FAR CRY 6 (1200P, ULTRA, FPS)

|                                                                      |     |
|----------------------------------------------------------------------|-----|
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 126 |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 121 |
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 120 |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 117 |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 114 |

HIGHER IS BETTER

### BATTERY LIFE (WEB SURFING)

|                                                                      |             |
|----------------------------------------------------------------------|-------------|
| <b>ROG Strix Scar 18 (2025)</b><br>Core Ultra 9 275HX, RTX 5080      | 5hrs 40mins |
| <b>Razer Blade 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090    | 5hrs 31mins |
| <b>ROG Strix Scar 18 (2026)</b><br>Core Ultra 9 290HX Plus, RTX 5090 | 4hrs 59mins |
| <b>Lenovo Legion 9i Gen10</b><br>Core Ultra 9 275HX, RTX 5090        | 4hrs 23mins |
| <b>Alienware 16 Area-51</b><br>Core Ultra 9 290HX Plus, RTX 5080     | 3hrs 34mins |

HIGHER IS BETTER

## Upgrade away

Getting inside the Scar 18 couldn’t be easier: simply slide the latch below the palm rest, slide the bottom panel forward and lift it away. You don’t even need tools. Upgrade possibilities include two M.2 slots, the battery and those all-important SODIMMs.

Other plus points? Its mini-LED display is breathtaking when properly configured, while the AniMe scrolling marquee and macro keys elevate its appeal. I haven’t gone through all the ports, but everything is here,

**BELOW** Chunky and weighty, you won’t want to be lugging it around very often

including two Thunderbolt 5 ports. With dual-channel memory in place, I’m confident it will deliver in terms of performance too.

The ROG Strix Scar 18 falls short of a Recommended award due to the amount of faffing around to get the best results, and the misses I identify throughout the review, but it still adds up to an imposing gaming laptop. **CHARLES JEFFERIES**

### SPECIFICATIONS

24-core (8 P-cores, 16 E-cores) Intel Core Ultra 9 290HX Plus • 24GB Nvidia GeForce RTX 5090 • 64GB DDR5-6400 RAM (32GB tested) • 18in non-touch mini-LED display, 240Hz, 3,840 x 2,400 resolution • 2 x 1TB M.2 PCIe Gen4 SSDs (RAID0) • Wi-Fi 7 • Bluetooth 5.4 • 1080p IR webcam • 2 x Thunderbolt 5 • 3 x USB-A 3.2 Gen 2 • HDMI 2.1 FRL • 2.5GbE • 3.5mm combo jack • 90Wh battery • Windows 11 Home • 399 x 298 x 23.1-35mm (WDH) • 3.7kg • 1yr limited warranty • part code: G835LXG-TQ391W



# Asus ROG Zephyrus G16 (2026)

A sleek, lightweight gaming laptop with impressive battery life and a suitably chunky price

**SCORE** ★★★★★

**PRICE** 32GB/2TB/RTX 5080, £3,250 (£3,900 inc VAT) from [uk.store.asus.com](https://uk.store.asus.com)

**Y**ou know what to expect from an Asus ROG Zephyrus laptop: slim design, solid battery life, vivid display and strong CPU and GPU performance. And that's exactly what the 2026 update to the G16 delivers.

At 2kg, it's far lighter than most gaming laptops – even the 2026 Razer Blade 16 (see issue 382, p77) weighs 2.1kg – and it's extremely skinny, with a maximum height of 17.9mm. The Blade 16 is skinnier, but only by half a millimetre.

Asus sticks to its familiar all-aluminium chassis, with a shiny chrome stripe that runs on an angle across the lid. The Asus Republic of Gamers logo is subtly embossed on the lower left-hand corner, leaving the rest of the design understated.

In fact, combined with slim display bezels, a smooth keyboard deck and an edge-to-edge touchpad (this consumes the entire vertical space between the keyboard and the edge of the palm rest), the inside deck of the laptop is as sleek as a MacBook's, maintaining the Zephyrus' modern aesthetic.

The top-firing quad-speaker audio system achieves impressive volume with crisp clarity, so you can live without a pair of headphones. It's

loud enough to be heard over the fans, which will inevitably kick in during games.

Not only is the 16in OLED display punchy, it also boasts Pantone validation for colour accuracy. Our testing backed this up with an average Delta E of 0.22, but in terms of gamut coverage it's closer to sRGB (113% volume) than it is to DCI-P3 (80%). Colours still look great, though, helped by a 469cd/m<sup>2</sup> peak brightness in SDR content and 1,052cd/m<sup>2</sup> for HDR films and games.

How fast is it? Our test system came with a powerful duo of Core Ultra 9 386H processor and GeForce RTX 5080 graphics, along with 32GB of RAM, which combined to produce a solid set of results in our tests at

1440p with top settings: 33fps

in *Black Myth*:

Wukong, 54fps in

*Doom: The Dark*

Ages, 52fps in *F1*

23, 30fps in

*Cyberpunk 2077*

(RT Ultra) and

95fps in *Shadow of*

*the Tomb Raider*.

On average it

was about

25% slower

than the Razer Blade 16

we tested with its RTX 5090.

Those results all came without the aid of DLSS. I was easily able to achieve frame rates of 200fps or higher on first-person shooters such as *Doom: The Dark Ages* on Ultra settings at the panel's native 1600p resolution, with DLSS enabled. Highly optimised titles such as *Baldur's Gate III* and *Final Fantasy XIV: Dawntrail* averaged well above 100fps even without super sampling.

**ABOVE** Slim, light and powerful, the new ROG Zephyrus is a fantastic laptop

**“Plugged in, it will perform well in productivity tasks: a return of 16,960 in Geekbench multicore is excellent for such a slim laptop”**

**LEFT** The eye-catching chassis lid is a solid, all-aluminium affair

**BELOW** A maximum height of 17.9mm means it will easily slip into a rucksack

So you're getting proper gaming performance in this compact laptop.

While it will only last about an hour when gaming, the Zephyrus G16 kept going for almost 14 hours in our web-surfing battery life test, beating the commendable 12hrs 36mins of the Blade 16. However, the Zephyrus G16 is less portable than it appears due to the 250W power brick, which weighs

600g. You don't need to be

Rachel Riley to calculate that that brings the total carrying weight

of the G16 to 2.6kg.

Plugged in, it will perform well in productivity tasks: a return of 16,960 in Geekbench's multicore test is excellent for such a slim laptop, as was its 3mins 9secs in our Handbrake 4K-to-1080p transcoding test; both results are similar to the Blade 16, with 16,971 and 3mins 17secs.

So the ROG Zephyrus G16 has plenty to recommend it, before I come to the downsides. Top of the list: price. Even in the light of current pricing hellscapes, it's tough to justify £3,900 for our test unit's spec, dropping to £3,400 if you're happy with an RTX 5070 Ti GPU. Those prices include a 2TB PCIe Gen4 SSD, but unlike the ROG Strix Scar on p58 you can't add another.

I'm also disappointed that Asus has failed to improve the keyboard from last year's model. I expect something more premium for the price.

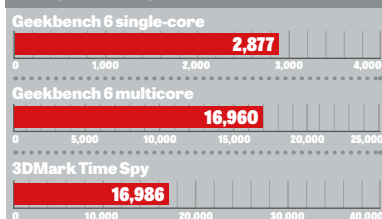
If you have the cash, this is a versatile gaming laptop that will fit into most rucksacks. However, I would wait in the hope of a price drop – or swallow the cost and buy the more rounded Razer Blade 16, which also costs £3,900, instead.

**MADLINE RICCHIUTO**

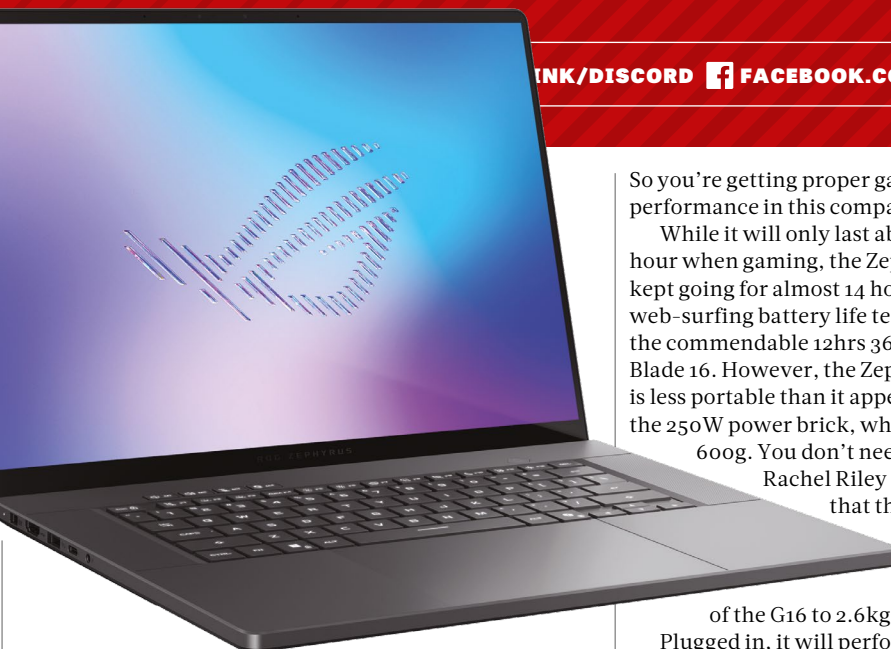
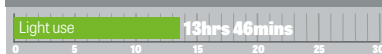
## SPECIFICATIONS

16-core (4 P-cores, 8 E-cores, 4 LPE-cores) Intel Core Ultra 9 386H processor • 16GB Nvidia GeForce RTX 5080 graphics • 32GB LPDDR5X-8533 RAM • 16in non-touch OLED display, 240Hz, 2,560 x 1,600 resolution • 2TB M.2 PCIe Gen4 SSD • Wi-Fi 7 • Bluetooth 6 • 1080p IR webcam • Thunderbolt 4 • USB-C 3.2 Gen2 • 2 x USB-A 3.2 Gen2 • HDMI 2.1 FRL • SD card reader • 3.5mm combo jack • 90Wh battery • Windows 11 Home • 354 x 246 x 14.9-17.9mm (WDH) • 2kg • 1yr C&R warranty • part code: GU606AW-TB007W

## BENCHMARKS



## BATTERY LIFE





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10 DEVICES 2YR LICENCE 75GB CLOUD STORAGE

■ [tinyurl.com/norton360premium](https://tinyurl.com/norton360premium)

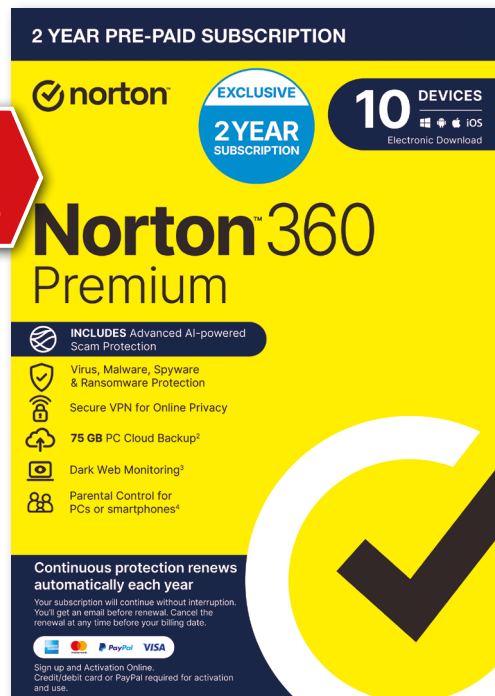
We've negotiated this exclusive deal for *PC Pro* readers. No subscriptions, just a one-off bargain price of £19.99 compared to the regular £179.99 charge. That buys you two years of cover from the powerful Norton Security suite across ten devices, and there's no danger of being hit with hiked renewal fees.

Because it's the Premium version, you get a host of extra tools. Top of the list is the full version of Norton VPN, both to protect your identity and provide a way of watching British TV while you're abroad.

There's also 75GB of cloud storage for secure backups, while Norton's Dark Web Monitoring service will alert you if private details – such as your email address and passwords – have been compromised online.

Norton Parental Control provides tools to see exactly what your kids are up to on their various devices, allowing you to set browsing times and restrictions, and you also get GPS location monitoring for Android and iOS.

To round things off, Norton Password Manager generates and stores passwords across all your devices. All this for £19.99? Did someone say bargain?



## WINDOWS 11 PRO

### FULL LICENCE

for **£69.99**

1 PC PERPETUAL LICENCE

■ [tinyurl.com/windowspro11](https://tinyurl.com/windowspro11)

Welcome to our best ever offer for a full, perpetual licence for Windows 11 Pro: just £69.99 for a limited time. You can install this on a PC you've built from scratch or if you're moving from an older version of Windows.

Whatever your motives, a Windows 11 Professional OEM licence is a great choice. The first reason is simple: price. Microsoft charges £119.99 for a retail licence of Windows 11 Home, and a staggering £219.99 for Windows 11 Professional. By choosing an OEM licence – and avoiding the many dubious sources of licences you may find online – you cut that price substantially.

Unlike Windows 11 Home, Windows 11 Pro enables you to connect to a business domain. It also provides BitLocker to encrypt whole drives. Best of all, you can create and host virtual machines using Hyper-V, which is ideal for testing new software or, if you're a developer, seeing how your software performs on a fresh OS.

Visit the store for our other Microsoft offers, including Microsoft 365 Personal for £69.99 and Microsoft 365 Family for £89.99.



## AVAST ULTIMATE SUITE 2025

for **£25**

10 DEVICES 2YR LICENCE

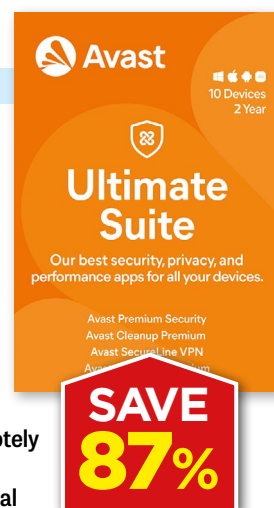
■ [tinyurl.com/pcproavast](https://tinyurl.com/pcproavast)

We've secured an 87% discount on the security suite that swooped to victory in our recent Labs (see issue 375, p78). £25 buys you protection, a VPN and a range of handy tools for two years across ten devices. That includes PCs, Android devices, iPhones and Macs.

Along with a powerful antivirus engine, Avast can help you spot ransomware and stop hackers from remotely taking over your device. You also receive Avast SecureLine VPN, adding an additional layer of protection. That costs £45 per year all on its own. The latest edition also includes AntiTrack Premium to block trackers as you surf the web, plus Avast Cleanup, a one-stop system maintenance toolkit.

Android and iOS users benefit from core antivirus and browsing protection, and a stack of anti-theft features that let you remotely locate, lock or wipe your device, use the camera to take a shot of the thief, or have the device automatically lock if the SIM is replaced.

The £25 cost includes a two-year subscription for ten devices, compared to £194.99 if you bought the products individually.





# Lenovo Chromebook Plus 2-in-1 Gen10

A dim display, but otherwise this budget laptop surprises for its build quality and fantastic keyboard

SCORE ★★★★★

PRICE £380 (£456 inc VAT)  
from amazon.co.uk

I'm accustomed to being disappointed by Chromebooks – too often they feel like the cheaper, poorer cousin of a “real” laptop. But the Lenovo Chromebook Plus 2-in-1 Gen10 is an exception. Despite the very reasonable price, this is not just a regular Chromebook but a “Chromebook Plus”, indicating that it meets Google’s higher-tier standards of performance and features. And it really feels like a premium product, with great build quality, an excellent keyboard and plenty of power for typical ChromeOS tasks.

The design is superb. If you told me that Lenovo had reused the chassis from a £1,000 Yoga laptop for this Chromebook generation, I'd believe you without question. The all-aluminium casing is solid, with a high-quality hinge for flipping between operating modes, so opening and folding the laptop into tablet or tent mode feels smooth and secure. The inside of the hinge has nice detailing on the vents, and there's a pleasing ribbed pattern on the bottom panel; around the edges you'll see two USB-A and two USB-C ports plus a handy microSD card slot. The slim bezels of the display are topped with a tasteful bump for the integrated 5MP webcam. You can choose from a serious Luna Gray finish or an attractive Cosmic Blue colour option, which really sets this 2-in-1 apart from ordinary Chromebooks.

As I've mentioned, the keyboard is a treat, too. Laptops in this price

range often have cramped, plasticky keyboards, but here you'll find nicely spaced keys with a crisp activation and comfy key travel, along with a touchpad that's just on the right side of large. I could happily work on this Chromebook all day and entirely forget I was using a low-cost computer.

The Intel Core 3 N355 processor won't win any benchmark races: the Lenovo 2-in-1 Gen10 underperformed rival Chromebook Plus models in the Geekbench 6 benchmark in both single and multithreaded modes, and its JetStream 2 and WebXPRT 4 scores also lagged behind the competition. Still, there's definitely enough power here to run all the apps you're likely to be running on a Chromebook. It's more than capable of streaming video and managing your emails, and thanks to a decent 8GB of onboard RAM you can keep a dozen or more browser tabs open without major slowdowns.

It can even handle PC-style gaming, via the preinstalled Nvidia GeForce Now app. Recent server-side upgrades mean you can stream games such as *Baldur's Gate III* over the internet with High or Ultra visual settings, without stuttering or excessive frame drops.

The Lenovo Chromebook Plus 2-in-1 Gen10 does have a few weaknesses. One of the big attractions of Chromebooks has always been their all-day battery life, and in our web-surfing test the Lenovo ran for a respectable 8hrs 33mins on a full charge. Nowadays, though, that's

ABOVE This superbly built laptop belies its extremely low price

**“If you told me that Lenovo had reused the chassis from a £1,000 Yoga laptop for this Chromebook generation, I'd believe you”**



LEFT The display has a decent resolution, but struggles in sunlight

BELOW The sturdy hinge lets you position the laptop in tent or tablet modes



considered acceptable rather than good: last year's Lenovo Chromebook Plus 14 lasted over 13 hours in the same battery test, while the Acer Chromebook Plus 514 Spin lasted for more than 14 hours. So while the Lenovo Chromebook Plus 2-in-1 Gen10 may well get you through a working day, it doesn't have that extra gas in the tank that other models offer.

The most noticeable bit of cost-cutting is the display. The Chromebook Plus standard requires a Full HD IPS screen, and the Lenovo Chromebook Plus 2-in-1 Gen10's display actually goes above and

beyond with a 1,920 x 1,200 resolution and full touchscreen capabilities. However, while the glossy panel looks vibrant in a regular office setting, it easily succumbs to glare from nearby

bright lights, with a measured average brightness of 277cd/m². That could be a problem if you wanted to work, stream or play games outside, or even just next to a window. Colour performance is rather flat, too, with the screen covering only 65% of the sRGB gamut, so if you want to do any photo editing on a Chromebook, we suggest you seek out a model with a brighter, more colour-accurate display.

Despite its downsides, the Lenovo Chromebook Plus 2-in-1 Gen10 remains very likeable, thanks to that premium build quality, fantastic keyboard and dependable performance. Sure, it doesn't offer best-in-class battery performance, and the screen won't produce cinema-grade colour, especially not in challenging conditions. For the price, though, what you do get is remarkable. If you're looking for a lightweight laptop with a professional feel on a tight budget, the Lenovo Chromebook Plus 2-in-1 Gen10 could well be the perfect choice. **MADELINE RICCHIUTO**

## SPECIFICATIONS

8-core Intel Core 3 N355 processor • Intel graphics • 8GB LPDDR5-4800 RAM • 14in 60Hz IPS touchscreen, 1,920 x 1,200 resolution • 128GB UFS 2.2 storage • Wi-Fi 6E • Bluetooth 5.3 • 5MP webcam • HDMI 1.4 • 2 x USB-C 3.2 Gen2 • 2 x USB-A 3.2 Gen1 • 3.5mm combo jack • microSD card reader • 50Wh battery • Chrome OS • 313 x 227 x 17.5mm (WDH) • 1.5kg • 2yr RTB warranty • part code 83LN002GUK

## BENCHMARKS

Geekbench 6 single-core

1,166

Geekbench 6 multicore

4,275

3DMark Wild Life Extreme

1,040

## BATTERY LIFE

Light use 8hrs 33mins



# Huawei MatePad Pro Max

If only this iPad Pro-rivalling tablet had the software to match its excellent hardware

SCORE ★★★★★

PRICE PaperMatte, £916 (£1,100 inc VAT) from consumer.huawei.com

**T**he Huawei MatePad Pro Max is a high-end, big-screen tablet, with prices starting at £1,000. Unlike rivals from Apple and Samsung, though, it justifies the price by including a keyboard case and a 100W charger in the box.

It looks great, with a spacious 13.2in display and slim bezels. My test model came with Huawei's anti-reflective PaperMatte finish, which feels smooth under the finger while remaining visible in bright sunlight. The OLED panel pumps out punchy colours, while the 144Hz refresh rate keeps scrolling and gameplay smooth. Peak brightness matches the 13in iPad Pro and the Samsung Galaxy Tab S11 Ultra at an excellent 1,600cd/m<sup>2</sup>, for an all-round superb viewing experience.

It's not only the screen that looks great. The MatePad Pro Max is seriously slim, at 4.7mm, yet it doesn't feel fragile – the metal unibody chassis is solid and the build quality is top-notch. It's light too, at 509g with the PaperMatte display; that's around 15% less than the 13in iPad Pro.

The keyboard supports gesture controls, which are useful when the tablet's propped up in laptop mode. You can swipe three fingers up the trackpad at any time to return home, swipe in from the side to switch apps, or swipe up and hold to enter a multitasking view.

For greater creative control, the optional Huawei M-Pencil Pro stylus glides across the screen when handwriting notes, and is comfortable to hold for extended sketching sessions. Desk-based note-taking is clunky, as the rear camera bump causes the tablet to rock as you move the M-Pencil around, but I like the way the stylus snaps magnetically to the top edge of the MatePad Pro Max, and there's a dedicated space for it in the keyboard case.

Inside the MatePad Pro Max you'll find Huawei's Kirin T93 Pro chipset and 12GB of RAM. This power couple handled everything I threw at it, from gaming to sketching to watching 4K video; even in the side-by-side multitasking view, I saw no significant slowdown.

It keeps going, too. I played *PUBG* for two hours on high graphics settings and the MatePad Pro Max lost only 20% of its charge in that time, so you should get at least eight hours of gameplay out of a charge, or much longer if you restrict yourself to web browsing, social scrolling and video streaming. When I did finally run out of power, the 100W charger got me back up to 65% in 30 minutes. Reverse charging is supported too, so if your smartphone is running low on juice, you can borrow charge from the tablet.

Photography isn't usually a priority for tablets, but the 50MP rear camera on the MatePad Pro Max is capable of taking nice shots in good lighting. The limiting factor isn't the camera quality so much as how cumbersome it is to hold up a 13.2in tablet.

The real problem with the MatePad Pro Max is the software. The US imposes broad legal restrictions on the supply of technology to China-based Huawei, and consequently the MatePad Pro Max uses Huawei's own

HarmonyOS in place of Android. This is easy to use, but doesn't include any Google apps or services – so no Play Store, no Gmail, no Gemini, no Google Maps, no YouTube. While you can download apps from Huawei's own

App Gallery store, it suffers from the same restrictions. Not only will you not find any Google apps here, you'll look in vain for names such as Amazon, ChatGPT, Facebook, Instagram, Spotify, WhatsApp... you get the idea. Because the underlying platform isn't Android, you can't even download APKs from elsewhere and cheekily sideload them.

It's not a total write-off. I could watch YouTube videos, access social media and explore Amazon using the

built-in Huawei web browser. You can still get various non-US apps, including Snapchat, TikTok, CapCut, Temu and Telegram. And because Microsoft has successfully obtained a

licence to supply Huawei with certain software, you can download Microsoft 365 and Outlook. Even so, if you're considering buying the

MatePad Pro Max, you'll need to carefully consider whether it will run the apps you want to use.

The Huawei MatePad Pro Max looks and feels great. It's a big tablet that's somehow also slim and light, the PaperMatte screen means you can use it outside with ease and it's very pleasing that you get a keyboard case and charger included. Unfortunately, the severe lack of mainstream apps makes this tablet hard to recommend. It's only a sensible choice if you have specific needs that can be met by Huawei's App Gallery – and know your requirements won't change over the lifetime of the tablet.

**JOHN McCANN**

## SPECIFICATIONS

9-core 2.8GHz/2.3GHz/1.7GHz Huawei Kirin T93 Pro SoC • Maleoon 935 graphics • 12GB RAM • 13.2in 144Hz OLED touchscreen, 3,000 x 2,000 resolution • 512GB storage • 50MP rear camera • 12MP front camera • Wi-Fi 7 • Bluetooth 6 • USB-C 3.2 Gen1 • 9,760mAh battery • Harmony OS 4.3 • magnetic keyboard • 289 x 4.7 x 196mm (WDH) • 509g • 1yr RTB warranty

**ABOVE** The MatePad Pro Max is a superb tablet that rivals the iPad Pro for quality

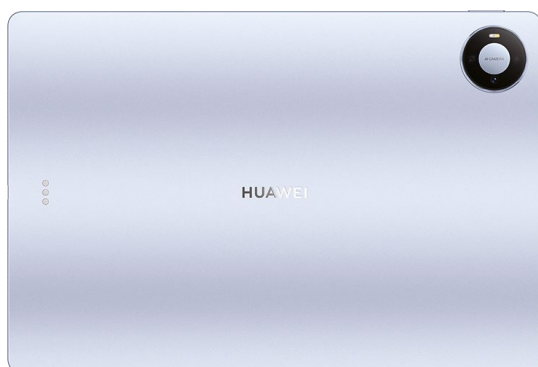
**"If you're considering buying the MatePad Pro Max, you'll need to carefully consider whether it will run the apps you want to use"**



**ABOVE** The optional M-Pencil Pro stylus is great for note-taking and sketching

**RIGHT** At only 4.7mm the tablet is slim, yet it doesn't feel fragile

**LEFT** Unusually for a tablet, the 50MP rear camera takes nice snaps in good lighting





# Amazfit Active 3 Premium

A good-looking, fully featured fitness tracker that rivals the major names for a far lower price

SCORE ★★★★★

PRICE £142 (£170 inc VAT)  
from uk.amazfit.com

Over the past few years, Amazfit has produced a range of affordable yet highly capable activity-tracking watches. You might expect the “Premium” model to be the more expensive version of a standard Active 3 watch, but in fact the “Premium” moniker merely serves as an assertion of quality. Despite the upmarket branding, it’s still affordable by fitness watch standards.

The design is sharp, with a circular body in a choice of Atlas Blue, Apex Silver and Aero White finishes. Other watches feature larger displays, but the circular 1.3in screen is big enough to be readable on the run. The underside is tastefully colour-matched to the supplied bands for the Atlas Blue and Aero White colours, while the Apex Silver one is all silver with a black strap. Sapphire glass and a scratch-resistant coating protect the casing from scuffs; I didn’t hurl my review unit to the ground to test its durability, but I’m confident that it will stand up to typical runs, rides and workouts.

The strap is a standard polymer-style, of the sort we’ve seen on dozens of other watches. It attaches to the body via pins like a traditional watch, which adds a touch of class and gives you access to zillions of replacement options, although it’s a fiddly process.

To make full use of the Amazfit Active 3 Premium you’ll need to install Amazfit’s Zepp smartphone app, which offers a simple dashboard and collectable achievement badges for step goals, monthly targets and much more. Early releases of this app were clunky, but I’m pleased to say that it’s now pretty slick.

Once you start training with the watch, you can dig into a deep suite of metrics, including details about your



running style such as stride length and ground contact. You can also try out a selection of guided workouts, designed to help build your speed and endurance. While running is clearly the main focus, there are features for tracking a range of activities, including cycling, swimming, elliptical and strength training exercises.

When you’re done, the app does a great job at showcasing your fatigue level, to help you avoid

overexertion and recover safely. It might sound like a lot to take in, but fear not – the Zepp app is intuitively laid out, and provides plenty of help and information if you need it.

The app also provides a custom metric called “HybridCharge”, which tracks your sleep, heart rate, activity and recovery to recommend how hard you should push your workout on any given day, also taking into account subjective inputs such as stress and overall health. This works well: one day during testing, I’d struggled to sleep and had an early start at work, and the watch

**ABOVE** The Active 3 Premium is a stylish fitness tracker that undercuts its rivals

**“Not only does it have a bunch of excellent features that rival the best in the business, it’s also a great-looking wearable”**

**LEFT** The watch is available with a range of faces and straps

**BELOW** Apps include full-colour maps with GPS navigation

sympathetically recommended that I should take a rest day. This isn’t a unique feature – it’s very similar to Fitbit’s Daily

Readiness score – but unlike many of its rivals, Amazfit doesn’t lock this information behind a monthly subscription. In fact, the only optional add-ons are regular fitness reports and Zepp Aura, which promises advanced sleep tracking and stress management.

On that note, previously I’ve rarely bothered to monitor my sleep patterns, but the Amazfit Active 3 Premium made me want to dig deeper, and even without the subscription it offers plenty of data to do so. I was surprised to see how often I was waking in the night without realising it, and Zepp Aura includes relaxing music to help you settle back down.

The Active 3 Premium isn’t loaded with smartwatch features, but it supports basic notifications and contactless payments via Amazfit’s Zepp Pay platform. Impressively, it also includes full-colour, offline maps with turn-by-turn GPS navigation, so you can follow a preset route or explore freely and always find your

way back home, even if you’ve come out without your phone. Amazfit claims the watch will run for 12 days on a charge; my experience has been closer to ten days, but that’s still respectable

considering how much data it’s collecting day in, day out.

My only gripe with the Amazfit Active 3 Premium is that it doesn’t automatically detect when you’re starting an activity and offer to track it. As someone who often forgets to hit the button before setting out, I appreciate it when devices such as the Apple Watch give me a nudge.

That’s more or less the only thing I’d change about the Amazfit Active 3 Premium, however. Not only does it have a bunch of excellent features that rival the best in the business, including excellent sleep and overall fitness tracking, it’s also a great-looking wearable, while undercutting the price of even the cheapest offerings from Apple and Garmin.

**LLOYD COOMBS**

## SPECIFICATIONS

Custom processor • 1.3in 466 x 466 OLED touchscreen (up to 3,000cd/m²) • 32GB storage • Bluetooth 5.3 • GPS • UWB • NFC • eSIM • single mic • single speaker • PPG biometric sensor (heart rate, blood oxygen, stress) • altimeter • gyroscope • water resistance to 5 ATM • 365mAh battery • Zepp OS 5 • 45 x 11 x 45mm • 38g • 2yr RTB warranty





## Pebble Time 2

Probably not worth our one-year wait, but this modern spin on the classic has many upsides

SCORE ★★★★★

PRICE \$225 from [repebble.com](http://repebble.com)

**E**ric Migicovsky listed the first Pebble watch on Kickstarter in 2012, going on to sell over two million devices before the American company was devoured by Fitbit in 2016. Since then, Fitbit itself was bought by Google, with the Pebble brand all but forgotten till Migicovsky decided to go back to his roots in 2025.

There are now four products on the roster: the mono Pebble 2 Duo, the more stylish Pebble Round 2, the Pebble Index 01 ring (for recording thoughts rather than movement) and the product I backed on Kickstarter early last year: the Pebble Time 2.

Like all Pebble products, the Time 2 errs on the side of simplicity. There's no OLED display, only colour e-paper, no GPS. You get a six-axis movement sensor (which includes a gyroscope), heart-rate monitor, compass and that's it.

Compared to modern-day smartwatches, using the Pebble Time 2 feels like stepping back in, well, time. I'm so used to AMOLED displays that it took me a couple of days to get used to peering down at my watch to see information, with only a backlight to assist. Even now, after using the Time 2 for a month, I wish it was easier to see details at a glance.

In our increasingly frantic times, though, it's a pleasure to use such a simple interface. The left button takes you back one step, while pressing the middle button on the right gives you access to the similarly minimalist pre-installed apps. For example, there's a stopwatch, workouts, health, weather and alarms. This is also where you adjust settings and choose between installed watch faces. The top and bottom buttons on the right are for navigation (up/down), and that's pretty much all you need to know to get around.

Without GPS this can't be considered a fitness watch, but it does automatically track activity. Go for a



**ABOVE** The Pebble Time 2 is one of four new products from the rejuvenated firm

walk and it will keep note, rewarding you with a "great job" style message at the end along with a summary of time and steps. Its enthusiasm would normally be irritating, but somehow Pebble gets the tone right, with a variety of phrases that felt

more like my inner voice giving me a gee-up than a crass AI telling me how great I was.

The Time 2 has kept me company on many runs over the past month, and again I learned to appreciate its simplicity. All I want to know when I run is my heart rate and how long

I've been running, which is exactly what the Time 2 displays on its screen. I'm happy to leave Runkeeper on my phone to track distance and pace. When you're done, you can sync any activities with Google Health.

Other than Walk and Workout, that's it for pre-installed health apps. However, this is where the third-party app ecosystem comes in. For

example, there are apps that use your phone's GPS to add distance and average speed to the on-screen display, while Strava GPX turns your activity into a GPX recorder for syncing with Strava.

There's also a plethora of games out there, many of them developed over a decade ago for the original Pebble watches but that still work. Games for Pebble lets you play chess, blackjack and solitaire on your watch. Tiny Bird is a Flappy Bird port. MiniDungeon is there for those who prefer to battle dragons, and there are countless more.

The Pebble Time 2 works with iOS and Android, and I never experienced any dropouts. The Pebble app is intuitive while offering plenty of control – for example, over which apps can send you notifications. This is also a great place to check out the latest apps, with many specifically designed for the Time 2's colour screen.

In terms of comfort, I have no complaints about the Pebble Time 2. It sits snugly on my wrist, and the supplied 22mm-wide silicone strap fits perfectly (you get a small and large version in the box). One of the Time 2's biggest benefits is a battery life measured in weeks, and that makes it fantastic for sleep tracking. I find myself charging it once every

fortnight, and I'm sure it would be longer if I didn't push the heart-rate monitor with regular runs. It's only a shame that Pebble couldn't squeeze a USB-C connector directly on the

watch; instead it uses a tiny magnetic charger that I fear I will one day lose.

One other point: Pebble's warranty says you only have 30 days to claim for defects, and this is a small firm. This makes buying the Time 2 a risk, and as you're buying direct from the US you may struggle if something goes wrong.

Compare the Time 2 to the Amazfit Watch Premium 3 opposite and it loses out on every single category, aside from battery life and charm. While I can't wholeheartedly recommend it at \$225 – it's now on general sale but you may have to wait a couple of months for delivery – I think it's a great choice for those who yearn for simpler days but still want vital notifications to appear on their wrist. **TIM DANTON**

### SPECIFICATIONS

64-colour 1.5in 200 x 228 e-paper touch display ● 6-axis IMU ● heart rate sensor ● compass ● IPX8 ● mic and speaker ● 30m water resistance ● battery capacity not stated ● PebbleOS ● 36 x 10.9 x 43mm (WDH) ● 33g ● 30-day warranty



**"Compared to modern-day smartwatches, using the Pebble Time 2 feels like stepping back in, well, time"**

**LEFT** The simple interface makes it easy to track activities

**BELOW** Third-party apps add a range of functionality



# Your bonus software

Total value  
this month  
**£120**

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

## Norton Identity Advisor Plus 2026

Just about every aspect of modern life happens online. Whether it's shopping, registering for services or dealing with suppliers and the government, barely a day goes by without your personal information being shared online in some form or other. And should it fall into the wrong hands, there's significant potential for it to be misused.

■ **One-account, one-year licence worth £20**  
■ **uk.norton.com REQUIRES Windows 7 or later; online activation**

While it's difficult for any of us to monitor everywhere that our data might be exposed, Norton Identity Advisor Plus can do it for you – spotting personal information where it shouldn't be and warning you right away, so you have a chance to make changes before a leak becomes a problem. And this month we're giving every reader a one-year subscription.

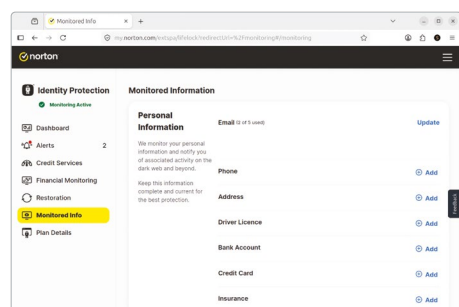
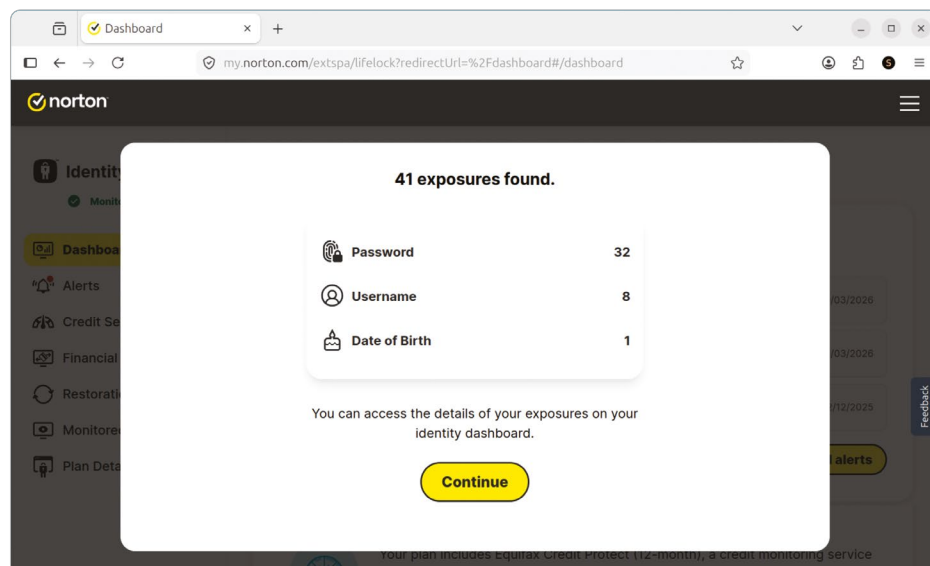
To get started, you'd simply need to enter the information you would like to protect. The service will then continually monitor the internet to check whether that information has been shared on online forums, the dark web and other unwanted places. If it does appear you'll be notified right away, so you can cancel your bank cards, warn financial

institutions about any suspicious activity and change the logins to your online accounts.

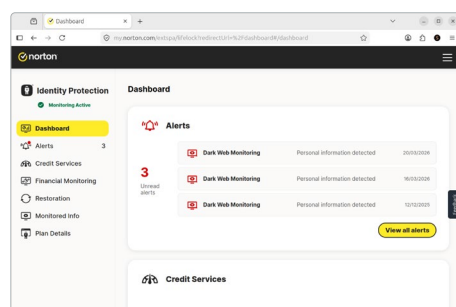
As well as gathering information that you've freely shared online, or using phishing techniques to extract information without your knowledge, more technically minded hackers can also attack the databases that businesses use to store all manner of personal information. This data won't necessarily be valuable in its own right, but it could give them the tools they need to commit additional crimes. For example, if they have access to your phone number, email address, previous address, mother's maiden name and so

on, they may be able to convincingly impersonate you. That's why monitoring even apparently benign leaks is important.

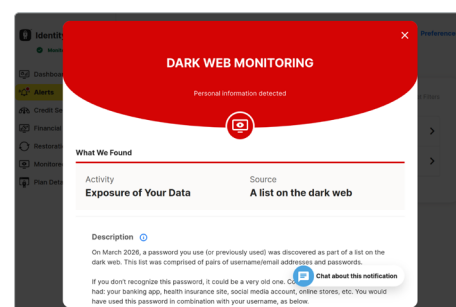
Identity Advisor Plus is a service rather than a piece of software, so there's nothing to install on your PC: simply add the activation code to your Norton account, enter payment details for renewal at the end of the first year (this can be cancelled before it's due) and wait for an alert – or visit the Identity Advisor website whenever you'd like to check the data it's gathered. It's compatible with Edge, Firefox, Chrome, Opera and Safari, and is available as an app for iOS and Android.



**ABOVE** You can enter a wide range of different types of information to be monitored



**ABOVE** The dashboard is a central location for all alerts relating to your personal information

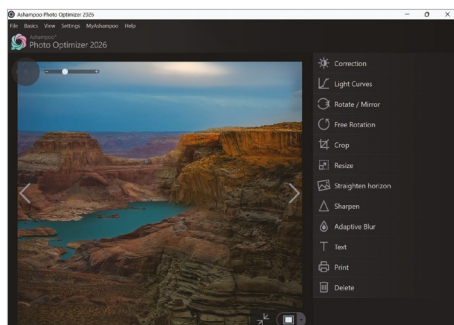


**ABOVE** If something's been exposed, Norton Identity Advisor Plus will flag it right away



## Ashampoo Photo Optimizer 2026

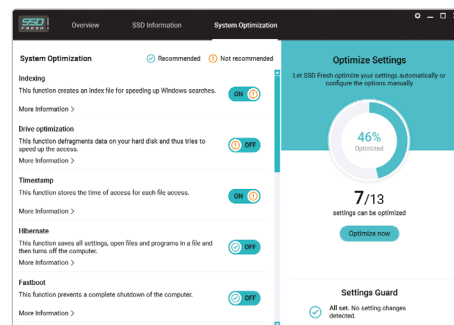
- Easy-to-use tool for tuning and fixing your digital images; select one or more images and apply effects in a couple of clicks
- Crop, resize, rotate, sharpen, blur and more. Use sliders and curves to get the effect you need
- Optimise an entire folder full of photos in one go, then export in a range of popular formats



■ Full product worth £30 ■ [ashampoo.com](http://ashampoo.com)  
 ■ **REQUIRES** Windows 10 or later; 150MB drive space; in-app registration

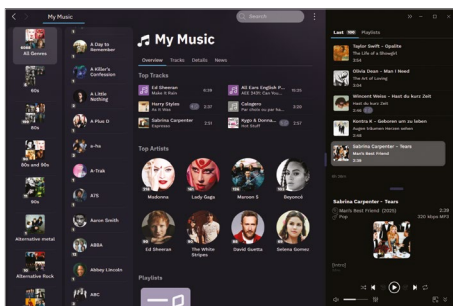
## Abelssoft SSD Fresh 2026

- Optimise your drive's indexing and prefetch settings; defragment your data for faster access
- Keep your SSD or hard drive running optimally to help keep your computer feeling nimble
- Try out different settings to achieve the best possible results for your machine and usage patterns



■ Full product worth £20 ■ [abelssoft.net](http://abelssoft.net)  
 ■ **REQUIRES** Windows 10 or later; 50MB drive space; in-app activation

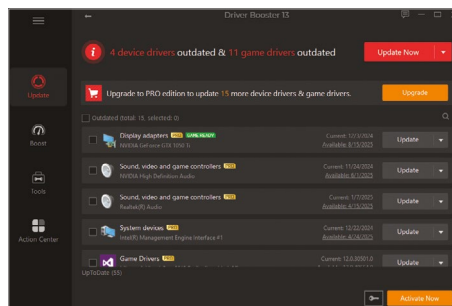
## Audials Music 2026.1 SE



■ Full product worth £20 ■ [audials.com](http://audials.com)  
 ■ **REQUIRES** Windows 10 or later; 250MB drive space; in-app activation

- Search for your favourite tracks online, then stream or download them
- Can also work with music libraries on your local machine, including your iTunes music collection
- Download and convert videos for later viewing

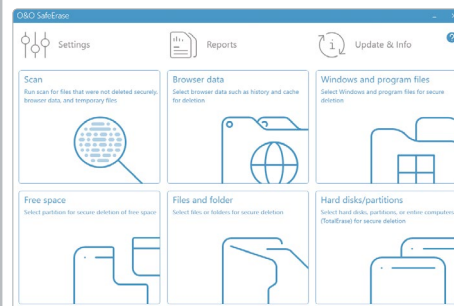
## Iobit Driver Booster 13 Pro



■ Six months of updates worth £10 ■ [iobit.com](http://iobit.com)  
 ■ **REQUIRES** Windows 7 or later; 50MB drive space; in-app activation

- Scan your PC for outdated drivers, then download and install replacements with a click
- Scans automatically, producing a detailed report in seconds
- Update drivers individually or all at once

## O&O SafeErase 20 Professional



■ Full product worth £20 ■ [oo-software.com](http://oo-software.com)  
 ■ **REQUIRES** Windows 10 or later; 300MB drive space; in-app activation

- Completely delete data from your hard drive by overwriting it, so it can't be recovered
- Choose from five data destruction methods recognised by the US Department of Defense
- Wipe "free" space containing remnants of files

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## Balance Phone Kids

Effectively blocks social media, streaming and infinite scrolling through a minimalist user interface

SCORE ★★★★★

PRICE £233 (£279 inc VAT) from [thebalancephone.com](https://thebalancephone.com)

**T**he Balance Phone Kids is a rare thing – a device that’s designed to discourage you from using it. As the name implies, it’s aimed at children, to help them avoid inappropriate and time-wasting activities. However, it’s also a perfectly viable phone for adults wanting to break their own smartphone addiction.

In fact, the only thing that makes this model child-focused is the hardware, a low-cost handset that shouldn’t cause too much pain if lost or broken. The version I tried was based on a Samsung Galaxy A16, but Balance has just switched to the more recent A17. The regular Balance Phone uses the exact same software, but costs £379 and is based on the Samsung Galaxy A37; there’s also a Pro model that costs £679 and uses a Samsung Galaxy S25 handset.

If you already own a Samsung smartphone, you can install the Balance OS software. However, you’ll have to pay a £69 annual subscription to keep it going. It really must be a

Samsung phone as well, because Balance uses Samsung’s Knox platform to implement security and device management. And be warned, if you go down this route there’s currently no official way to restore your phone to its original state.

The Balance software is built on Android, and when you first set up your phone you may recognise the basic Android background and user interface. After that you’ll encounter a new pop-up that walks you through the configuration process for Balance. One of your first tasks is to select which eight apps or features you want to appear on your homescreen; these are presented in the most



**ABOVE** The interface on the homescreen is about as basic as you can get

**“Without social media apps clamouring for attention you quickly drop the habit of grabbing your phone every five minutes”**



**ABOVE/LEFT** We tested the version based on a Samsung Galaxy A16, so not the most modern handset

working on timed alerts to prevent you getting sucked into a news feed.

With my curated selection of functional apps, I found using the Balance Phone a calming experience. Normally, whenever I pick up my phone I’m distracted by a notification or eye-catching app, but with the Balance Phone that doesn’t happen: if I opened my phone intending to check my email or Slack for work, that’s just what I did. This helped me feel more productive and focused, and I didn’t get any sense of being blocked from what I wanted to do – more that I wasn’t being pulled in different directions by things I’d never intended to do in the first place.

In fact, the worst thing about the experience was the Samsung A16 hardware. This low-cost handset has a decent screen but a cheap processor, with the result that Balance OS often felt sluggish. I noticed lots of delays in Slack when participating in

channels or leaving them, and scrolling around Spotify and Gmail felt jerky, undermining the sense of efficiently getting things done.

Hopefully this is better on the newer A17 model, and one would hope it’s not an issue at all for the pricier handsets. Note too that the Balance Phone Kids doesn’t support 5G, and video recording is limited to 1080p at 30fps.

Hardware issues aside, the Balance software impressively does what it promises. Without social media apps clamouring for attention you quickly drop the habit of grabbing your phone every five minutes. And the overall way the interface looks and operates feels more healthy and productive than a typical smartphone. You’re not lost among pages and pages of apps, but more focused and able to get things done quickly and without distraction – so you really can find a better work-life balance. **BOBBY HELLARD**

### SPECIFICATIONS

8-core 2.2GHz/2GHz MediaTek Helio G99 SoC  
 ● 4GB RAM ● Mali-G57 MC2 graphics ● 6.7in 90Hz AMOLED screen, 1,080 x 2,340 resolution ● 128GB storage ● microSD card slot ● dual nano-SIM ● IP54 ● triple 50MP/5MP/2MP rear cameras ● 13MP front camera ● Wi-Fi 5 ● Bluetooth 5.3 ● NFC ● 5,000mAh battery ● USB-C 2 connector ● Android 16 with Balance OS (software support until 30 November 2030) ● 78 x 7.9 x 164mm (WDH) ● 200g ● 3yr RTB warranty



# Unihertz Titan 2 Elite

A pocketable 5G Android phone with a QWERTY keyboard, AMOLED screen and serious shortcut power

SCORE ★★★★★

PRICE \$490 from unihertz.com

**Y**our eyes do not deceive you. Believe it or not, in 2026, the Titan 2 Elite is a phone with a physical keyboard. It doesn't feel like a gimmick, either. Made of aerospace-grade CNC aluminium with an anodised finish, the Titan 2 Elite feels like a high-quality, premium device, whether you choose it in striking orange or serious black. It's the same width as a standard smartphone but far squatter, as the photo to the right reveals. I found it nestled comfortably in my hand and also appreciated its more compact form in my pocket. At 163g it's significantly lighter than most modern smartphones, too.

The 4in touchscreen can feel cramped at times, not least because Android apps aren't normally designed for a square-ish screen. This is less of a problem than you might expect, though: when you're writing an email or working in Google Docs, you don't have a virtual keyboard covering up half of the display, so the usable screen area is similar to what you'd get on a regular full-face phone. It helps that the screen looks so punchy, with a bright AMOLED panel and a 120Hz refresh rate. And while the visual effect could hardly be described as cinematic, I was perfectly happy watching TV episodes on the small screen.

Of course, the main attraction is the keyboard. There's no denying that the keys are tiny, but a slight bevel on each helps your fingers find the right place to press. It's extremely reminiscent of old-style BlackBerry



phones. After a brief period of acclimatisation I found I was typing at a decent speed, with many fewer mistakes than I'd normally make on a touchscreen keyboard.

Overall, I found the "typing experience" to be both faster and less frustrating than with an on-screen keyboard.

The keys are touch-sensitive, and activating the optional cursor and scroll controls lets you swipe your finger across the keyboard to navigate on screen. This makes it quicker and easier to navigate, edit and correct text than any other phone I've used. You can program the function keys too – for example, to set up a shortcut to open a particular app, or to copy and paste text. And you can assign the additional red button on the side to anything you do regularly, such as opening the camera.

Don't expect miracles here, but Unihertz – a Chinese company that specialises in niche smartphones – provides a well-balanced duo of 50-megapixel main and telephoto camera modules. The company is coy about optical magnification, only advertising a digital-assisted zoom factor of up to 20x. Both cameras capture decent images as long as the lighting conditions are right: for holiday snaps, or taking reference images on business trips, the Titan 2 Elite is perfectly adequate.

The phone is powered by the distinctly mid-range MediaTek Dimensity 7400 chipset, but it comes with a generous 12GB of RAM and 256GB of storage. Paying another \$100 buys you a Dimensity 8400, 512GB of storage and a "Pro" at the end of the phone's name. You can expand the

storage with a microSD card, or use the slot to install a second SIM. While this isn't a high-end spec, it's more than sufficient for productivity apps, including the full Google Workspace suite. I didn't see any performance problems in Lightroom or mobile games either, with the biggest hindrance being the size of the screen.

In terms of compatibility, any app you can run on a regular Android phone will work on the Titan 2 Elite. As soon as I signed into Google, all my apps and services were available with no red flags. The phone also has integrated NFC with support for Google Pay, and fingerprint unlock. It all confirms the reassuring sense that you're using a "real" phone rather than a proof of concept. The Elite comes with Android 16, and Unihertz promises OS upgrades all the way to Android 20.

During my testing of the phone, I was pleasantly surprised by the Titan 2 Elite's battery life, which consistently lasted a full day without issue – even when I was making a few calls, answering emails, updating Word docs and listening to music. Charge it every night and it shouldn't let you down.

Overall my experience with the

Titan 2 Elite was very positive. Every time I wanted to write an email, post on social media or chat with friends, I felt appreciative of the keyboard, while rarely sensing that the design

was holding me back from doing anything in particular. I love the look of the phone too, which bridges retro and modern styles – although I do wish Unihertz had taken the old-school vibe further and included a 3.5mm headphone jack.

I don't expect physical keyboards will ever make a major comeback on smartphones, but anyone who does a lot of text entry or editing on the move ought to give this phone serious consideration. Nor does it hurt that it's smaller and lighter than the mainstream. It's not so hot for gaming or creative use, but the Unihertz Titan 2 Elite sets out to fill a real and specific niche, and it does so brilliantly. **ALISTAIR JENNINGS**

## SPECIFICATIONS

8-core 2.6GHz/2GHz MediaTek Dimensity 7400 SoC • 12GB RAM • Mali-G615 graphics • 4in 120Hz AMOLED screen, 1,080 x 1,200 resolution • 256GB storage • dual nano-SIM • microSD card slot • dual 50MP/50MP rear cameras • 32MP front camera • Wi-Fi 6E • Bluetooth 6 • NFC • 4,050mAh battery • USB-C 2 connector • Android 16 (4 major updates) • 75 x 10.4 x 118mm (WDH) • 163g • 1yr RTB warranty

**ABOVE** The Titan 2 Elite will delight BlackBerry fans

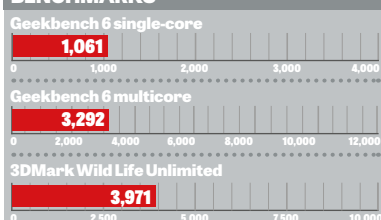
**LEFT** Despite its unusual shape, it still sits comfortably in the hand

**"Overall, I found the 'typing experience' to be both faster and less frustrating than with an on-screen keyboard"**

**BELOW** The red button on the side can be assigned to common tasks



## BENCHMARKS



## Potensic Atom 3

A fantastic beginner's drone, with up to 40 minutes of flight time and great AI subject tracking

**SCORE** ★★★★★

**PRICE** Standard kit, £283 (£340 inc VAT) from amazon.co.uk

**W**e loved Potensic's last drone, the lightweight Atom 2 (see issue 369, p72), and the Potensic Atom 3 looks very similar. It's slightly larger, however, and a tiny bit heavier at 249g. It feels more robust and better built, and thoughtful design tweaks make it easier to access the USB charging port, microSD card slot and power button.

Perhaps a more significant change is the upgraded camera. The Atom 3 features a new  $\frac{1}{1.3}$ in sensor, which picks up more detail than its predecessor. The quickest shutter speed has been reduced to one 25,000th of a second too, so you can now capture blur-free footage of fast-moving subjects such as cars or motorbikes.

The results look great. You can shoot in resolutions up to 4K at 60fps, and optionally record in portrait orientation at 2.7K resolution. Digital zoom options let you get closer to your subject, at the expense of fine detail. The three-axis brushless gimbal design is more effective than the two- or one-axis gimbals found on some cheap drones, and helps to capture stable footage even in mildly windy conditions; my test clips were beautifully smooth, even while panning. Colours are vivid and rich in the default capture mode, but if you're aiming for professional-grade results, you can shoot in P-Log for increased dynamic range, and grade the footage yourself in post.

There's a selection of QuickShot programmes, too, which use AI subject detection to lock onto a subject and perform various movements, such as follow, rocket, spiral and parallel tracking. These work very well for quickly creating eye-catching content to share.

As well as video footage, the Potensic Atom 3 can capture stills at 12MP and 50MP resolutions. Again, I

was impressed by the image quality of these: colours are stunning, and in good light I found landscapes were clean and sharply focused. You can also take advantage of the 2x digital zoom, but this results in visible fuzziness and a loss of detail.

The camera's one weakness is low-light performance. Once the sun gets low, the camera struggles to resolve details in the murk; there is an AI-assisted Night Mode, but I felt this made my videos look artificially pumped up, without fully getting rid of noise and grain in the dark areas. Night Mode also drops the frame rate to 25fps, which means motion blur becomes an issue, especially when panning. Overall I'd recommend simply not using this drone for night shoots.

In flight, the Atom 3 claims a maximum range of 16km (around ten miles), a big step up from the 10km of its predecessor. Officially it can handle winds up to level five, which is pretty standard in this price range; in practice I've found that's fine for the UK, as long as you don't want to film in a storm.

Unfortunately, my biggest grievance with the Atom 2 hasn't been addressed. Like its forebear, the Atom 3 doesn't feature any form of collision avoidance, so you must keep your eyes carefully on the screen to ensure the drone doesn't crash into anything. Almost all other drones in this price range have at least basic obstacle sensing, so it's a definite mark against the Atom 3, and another good reason not to take this drone out after dark.

As well as upgrading the drone itself, Potensic has introduced

**ABOVE** The Atom 3 has a maximum range of almost ten miles, but you'll need to keep an eye out for obstacles



**LEFT** The upgraded camera lets you shoot in resolutions up to 4K at 60fps

**"The Potensic Atom 3 is compact and lightweight, it's easy to fly and it captures high-quality video and stills"**

**BELOW** The drone's controller is easy to use and responsive, or you can use an app

a new controller option. The old controller was basically a pair of grips that clipped onto your smartphone, but the new RC PTD2 is a standalone unit with its own 5.5in touchscreen. I've found this extremely responsive in my testing, and easy to use in both direct sunlight and low-light environments. Alternatively, you can still control the Atom 3 from the free Potensic Eve app for iOS and Android. This is similar to the excellent DJI Fly app, with an intuitive interface that beginners will have no problem getting to grips with.

A final strength that's worth mentioning is battery life. The Atom 3 is rated for 40 minutes of flight with the standard Smart Battery, increasing to 50 minutes with the Smart Battery Plus. That's notably longer than competitors: for instance, the DJI Flip claims only 31 minutes between charges or battery swaps (see issue 366, p62). In practice I got about 35 minutes out of the standard battery, but that was in windy conditions, and while frequently switching between modes and reviewing images between shots. An optional charging hub lets you recharge three batteries at once in just under 90 minutes, or around 135 minutes if you're using extended batteries.

The Potensic Atom 3 makes an excellent introduction to aerial exploration and photography. It's compact and lightweight, it's easy to fly and it captures high-quality video and stills. Its big limitations are the lack of collision-avoidance sensors and poor low-light performance; if you want to fly in more ambitious settings and more challenging conditions, the DJI Flip might be a better choice. For all-round ease of use and image quality, however, the Atom 3 hits the mark brilliantly – it's one of the best beginner drones you can buy. **NIKITA ACHANTA**

### SPECIFICATIONS

50MP camera (84° FoV, 4K video at 60fps) • 2,590mAh battery • microSD card slot • Wi-Fi 5 • remote controller • GPS, GLONASS, Galileo, BeiDou • 148 x 62 x 91mm (WDH, folded without propellers) • 249g • 1yr warranty







# Join us for the weekly PC Pro podcast

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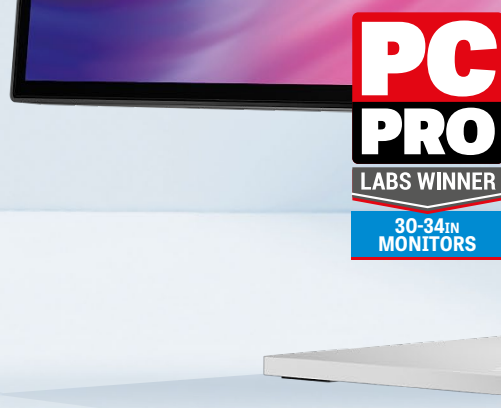


# BRILLIANT MONITORS

Give your eyes an upgrade

We put 17 monitors through rigorous tests to discover which offer the best mix of value, quality and features





**W**hat are you looking at? We don't mean to offend, but are the colours drab? Is your screen annoyingly reflective? Do whites look muddy? Perhaps it's simply too small. Maybe you're perfectly happy with it, but would like a second display.

Whatever the case, we think choosing a monitor is more important than any other part of your computing setup. With so many people now working from home, the chances are that you're staring at that screen for hours at a time. Or perhaps you're looking to roll out new monitors to your business. In which case your decision is even more important. Go too cheap and you'll have annoyed workers squinting at screens. Why not invest in something that will make people happy – and more productive?

But these days image quality, resolution and screen size are only part of the buying decision. Out of the 17 monitors on test, 15 include USB-C video inputs for connecting and powering laptops. Nine include wired networking ports. Four include webcams, three of which are 4K or above. Almost all include speakers. The point being that you're not simply buying a monitor: you're buying a pivotal part of your desk setup, mimicking the features of high-quality docking stations from years gone by.

For the past month, we've put these 17 monitors through their paces to decide their strengths and weaknesses. Now it's up to you to find your perfect partner: read the feature comparison table overleaf, find out how to make the right buying decision on p76, and enjoy our in-depth reviews from p78. Chances are, you'll find a monitor that's just right.

**CONTRIBUTOR: Tim Danton**

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|------------------------------------------|-------------------------------|-----------------------|------------------------|-------------------------------------------|-----------------------|-----------------------|-------------------------------|-------------------------------------|
|                                          |                               | LABS WINNER           | RECOMMENDED            |                                           | RECOMMENDED           |                       |                               | RECOMMENDED                         |
|                                          | Amazon Basics 27-inch Monitor | AOC U27E4CV           | BenQ MA270S            | Dell Pro P 27 USB-C Hub Monitor (P2726HE) | Eizo FlexScan EV2720S | HP Series 5 Pro 527PQ | Iiyama ProGraphic HB2701UHSNP | Lenovo Yoga Pro 27UD-10             |
| Overall rating                           | ★★★★☆                         | ★★★★★                 | ★★★★★                  | ★★★★☆                                     | ★★★★★                 | ★★★★☆                 | ★★★★☆                         | ★★★★★                               |
| Price                                    | £83 (£99 inc VAT)             | £200 (£240 inc VAT)   | £750 (£900 inc VAT)    | £196 (£235 inc VAT)                       | £389 (£467 inc VAT)   | £150 (£180 inc VAT)   | £416 (£499 inc VAT)           | £1,083 (£1,299 inc VAT)             |
| Supplier                                 | amazon.co.uk                  | ballicom.co.uk        | scan.co.uk             | dell.com                                  | jp-uk.co.uk           | hp.com                | scan.co.uk                    | lenovo.com                          |
| Part code                                | C27M2020UK                    | U27E4CV               | 9H.LNVLATBE            | P2726HE                                   | EV2720S-BK            | 9D9SOUT#ABU           | HB2701UHSNP-B1                | 67E5RAC2UK                          |
| Service & support                        |                               |                       |                        |                                           |                       |                       |                               |                                     |
| Warranty                                 | 1yr limited                   | 5yr limited           | 3yr limited            | 3yr advanced exchange                     | 7yr limited           | 3yr limited           | 5yr limited                   | 3yr limited                         |
| Brand satisfaction <sup>1</sup>          | N/A                           | 85%                   | 94%                    | 91%                                       | N/A                   | 84%                   | 93%                           | N/A                                 |
| Reliability <sup>1</sup>                 | N/A                           | 87%                   | 96%                    | 92%                                       | N/A                   | 89%                   | 95%                           | N/A                                 |
| Customer support <sup>1</sup>            | N/A                           | 72%                   | 83%                    | 82%                                       | N/A                   | 78%                   | 83%                           | N/A                                 |
| EPEAT rating                             | ✗                             | Gold                  | ✗                      | Gold                                      | Gold                  | Gold                  | Silver                        | ✗                                   |
| Display                                  |                               |                       |                        |                                           |                       |                       |                               |                                     |
| Panel size                               | 27in                          | 27in                  | 27in                   | 27in                                      | 27in                  | 27in                  | 27in                          | 26.5in                              |
| Resolution                               | 1,920 x 1,080                 | 3,840 x 2,160         | 5,120 x 2,880          | 1,920 x 1,080                             | 2,560 x 1,440         | 2,560 x 1,440         | 3,840 x 2,160                 | 3,840 x 2,160                       |
| Aspect ratio                             | 16:9                          | 16:9                  | 16:9                   | 16:9                                      | 16:9                  | 16:9                  | 16:9                          | 16:9                                |
| Pixel density                            | 82ppi                         | 163ppi                | 218ppi                 | 82ppi                                     | 109ppi                | 109ppi                | 163ppi                        | 166ppi                              |
| Panel type                               | IPS                           | IPS                   | IPS                    | IPS                                       | IPS                   | IPS                   | IPS Black                     | QD-OLED                             |
| Curvature                                | ✗                             | ✗                     | ✗                      | ✗                                         | ✗                     | ✗                     | ✗                             | ✗                                   |
| Key specifications                       |                               |                       |                        |                                           |                       |                       |                               |                                     |
| Peak brightness (SDR, stated)            | Not stated                    | 400cd/m²              | 450cd/m²               | 300cd/m²                                  | 350cd/m²              | 350cd/m²              | 450cd/m²                      | 1,000cd/m² (HDR)                    |
| Static contrast ratio (stated)           | 1,500:1                       | 1,200:1               | 2,000:1                | 1,500:1                                   | 1,500:1               | 1,500:1               | 3,000:1                       | 1,500,000:1                         |
| Display colours                          | 16.8 million                  | 1.07 billion          | 1.07 billion           | 16.8 million                              | 16.8 million          | 16.8 million          | 1.07 billion                  | 1.07 billion                        |
| Colour depth                             | Not stated                    | 8-bit + FRC           | 8-bit + FRC            | 8-bit                                     | 8-bit                 | 8-bit                 | 8-bit + FRC                   | 10-bit                              |
| HDR support                              | ✗                             | HDR10                 | DisplayHDR 400         | ✗                                         | ✗                     | HDR10                 | DisplayHDR 400                | DisplayHDR 400                      |
| Maximum frequency (vertical)             | 100Hz                         | 60Hz                  | 70Hz                   | 120Hz                                     | 60Hz                  | 100Hz                 | 60Hz                          | 120Hz                               |
| Claimed response time                    | 4ms                           | 4ms                   | Not stated             | 5ms                                       | 5ms                   | 5ms                   | 4ms                           | 0.03ms                              |
| Adaptive sync?                           | ✓                             | ✓                     | AMD FreeSync           | ✗                                         | ✗                     | ✓                     | ✗                             | FreeSync Premium Pro, Nvidia G-Sync |
| Video inputs/outputs                     |                               |                       |                        |                                           |                       |                       |                               |                                     |
| DisplayPort (version)                    | 1 (1.2)                       | 1 (1.4)               | ✗                      | 1 (1.4)                                   | 1 (1.2)               | 1 (1.2)               | 1 (1.2)                       | 1 (1.4)                             |
| HDMI (version)                           | 1 (1.4)                       | 1 (2.0)               | 2 (2.0)                | 1 (1.4)                                   | 1 (1.4)               | 1 (2.0)               | 1 (2.0)                       | 1 (2.1)                             |
| USB-C (power rating)                     | ✗                             | ✓ (90W)               | ✓ (Thunderbolt 4, 96W) | ✓ (100W)                                  | ✓ (70W)               | ✗                     | ✓ (96W)                       | ✓ (140W)                            |
| Daisy chaining                           | ✗                             | ✗                     | ✓                      | ✓                                         | ✗                     | ✗                     | ✓                             | ✓                                   |
| Other                                    | VGA                           | ✗                     | Thunderbolt 4 out      | DisplayPort out                           | ✗                     | ✗                     | DisplayPort out               | DisplayPort out                     |
| Ports & docking                          |                               |                       |                        |                                           |                       |                       |                               |                                     |
| RJ45 (1GbE unless stated)                | ✗                             | ✓                     | ✗                      | ✓                                         | ✗                     | ✗                     | ✓                             | ✗                                   |
| USB-A (generation)                       | 4 (USB 3.2 Gen1)              | 4 (USB 3.2 Gen1)      | 2 (USB 3.2 Gen2)       | 2 (USB 3.2 Gen1)                          | 4 (USB 3.2 Gen1)      | 4 (USB 3.2 Gen1)      | 3 (USB 3.2 Gen1)              | 2 (USB 3.2 Gen2)                    |
| USB-B                                    | ✓                             | ✗                     | ✗                      | ✗                                         | ✗                     | ✓                     | ✓                             | ✗                                   |
| USB-C (generation)                       | ✗                             | ✗                     | 2 (USB 3.2 Gen2)       | 2 (USB 3.2 Gen1)                          | ✗                     | ✗                     | 1 (USB 3.2 Gen1)              | 2 (USB 3.2 Gen2)                    |
| Headphones socket                        | ✓                             | ✓                     | ✓                      | ✗                                         | ✓                     | ✗                     | ✓                             | ✗                                   |
| Other                                    | ✗                             | ✗                     | ✗                      | ✗                                         | Line out              | ✗                     | Extra USB-C                   | ✗                                   |
| STAND FEATURES                           |                               |                       |                        |                                           |                       |                       |                               |                                     |
| Adjustable height                        | ✗                             | 150mm                 | 150mm                  | 150mm                                     | 169mm                 | 150mm                 | 150mm                         | 110mm                               |
| Portrait mode                            | ✗                             | ✓                     | ✓                      | ✓                                         | ✓                     | ✓                     | ✓                             | ✗                                   |
| Tilt angle (forward/back)                | 5°/20°                        | 5°/30°                | 5°/20°                 | 5°/21°                                    | 5°/35°                | 5°/20°                | 5°/23°                        | 5°/22°                              |
| Swivel angle (left/right)                | ✗                             | 180°/180°             | 15°/15°                | 45°/45°                                   | 172°/172°             | 45°/45°               | 180°/180°                     | ✗                                   |
| Other features                           |                               |                       |                        |                                           |                       |                       |                               |                                     |
| Webcam                                   | ✗                             | ✗                     | ✗                      | ✗                                         | ✗                     | ✗                     | ✗                             | ✓ (4K)                              |
| KVM                                      | ✗                             | ✗                     | ✓                      | ✗                                         | ✗                     | ✗                     | ✓                             | ✗                                   |
| VESA mount <sup>2</sup>                  | ✓                             | ✓                     | ✓                      | ✓                                         | ✓                     | ✓                     | ✓                             | ✓ (in box)                          |
| Built-in power supply                    | ✗                             | ✓                     | ✓                      | ✓                                         | ✓                     | ✓                     | ✓                             | ✗                                   |
| Speakers                                 | Power not stated              | 2 x 2W                | 2 x 3W                 | ✗                                         | 2 x 1W                | ✗                     | 2 x 2W                        | 4 x 7W woofers, 2 x 3W tweeters     |
| Cables supplied <sup>3</sup>             | HDMI                          | DP, HDMI, USB-C       | HDMI, Thunderbolt 4    | USB-C                                     | USB-C                 | DP, HDMI              | DP, HDMI, USB-B, USB-C        | USB-C                               |
| Other                                    | ✗                             | ✗                     | Display Pilot 2        | Dell Display and Peripheral Manager       | Eizo Screen InStyle   | HP Display Center     | ✗                             | ✗                                   |
| Size & weight                            |                               |                       |                        |                                           |                       |                       |                               |                                     |
| Dimensions with stand (WDH) <sup>4</sup> | 611 x 230 x 456mm             | 614 x 222 x 400-550mm | 614 x 220 x 430-580mm  | 611 x 192 x 385-535mm                     | 612 x 230 x 376-545mm | 613 x 229 x 394-544mm | 614 x 225 x 404-544mm         | 611 x 184 x 464-574mm               |
| Weight with stand                        | 3.8kg                         | 6.8kg                 | 8.6kg                  | 6.5kg                                     | 8.5kg                 | 6.2kg                 | 6.7kg                         | 6.7kg                               |

<sup>1</sup> Monitor reliability rating in reader-voted PC Pro Excellence Awards 2025 (see issue 375, p30). N/A indicates not enough feedback to give a rating. <sup>2</sup> 100x100mm unless stated. <sup>3</sup> All monitors include power cables. DP = DisplayPort, TB4 = Thunderbolt 4. USB-B denotes a USB-B to USB-A cable. <sup>4</sup> Includes stand at its lowest height for monitors with height adjustment.





30-34in MONITORS

|                        |                              |                          | RECOMMENDED           |                                |                                                         | RECOMMENDED                     | LABS WINNER                          | RECOMMENDED                  |
|------------------------|------------------------------|--------------------------|-----------------------|--------------------------------|---------------------------------------------------------|---------------------------------|--------------------------------------|------------------------------|
| Sharp MultiSync EA272Q | ViewSonic ColorPro VP2766-2K | Acer ProCreator PE320QXT | AOC CU34E4CV          | BenQ Creative Pro PD3226G      | Dell Pro P 34 USB-C Hub Conferencing Monitor (P3426WEB) | Eizo ColorEdge CG3100X          | HP Series 7 Pro 732xk                | Iiyama ProLite XCB3497WQSNPH |
| ★★★★★                  | ★★★★★                        | ★★★★★                    | ★★★★★                 | ★★★★★                          | ★★★★★                                                   | ★★★★★                           | ★★★★★                                | ★★★★★                        |
| Price on application   | £187 (£224 inc VAT)          | £833 (£1,000 inc VAT)    | £234 (£281 inc VAT)   | £750 (£900 inc VAT)            | £490 (£588 inc VAT)                                     | £4,166 (£4,999 inc VAT)         | £600 (£720 inc VAT)                  | £292 (£350 inc VAT)          |
| sharp.co.uk            | quzo.co.uk                   | scan.co.uk               | misco.co.uk           | benq.eu                        | dell.com                                                | wexphotovideo.com               | hp.com                               | scan.co.uk                   |
| L50DD-EA272QB          | VP2766-2K                    | UM.JPOSS.004             | U32U3CV               | PD3226G                        | P3426WEB                                                | CG3100X-BK                      | B7JM6AA                              | XCB3497WQSNPH-B1             |
| 3yr limited            | 3yr limited                  | 2yr limited              | 5yr limited           | 3yr limited                    | 3yr advanced exchange                                   | 5yr limited                     | 3yr limited                          | 5yr limited                  |
| N/A                    | N/A                          | 91%                      | 85%                   | 94%                            | 91%                                                     | N/A                             | 84%                                  | 93%                          |
| N/A                    | N/A                          | 94%                      | 87%                   | 96%                            | 92%                                                     | N/A                             | 89%                                  | 95%                          |
| N/A                    | N/A                          | 82%                      | 72%                   | 83%                            | 82%                                                     | N/A                             | 78%                                  | 83%                          |
| ✖                      | ✖                            | ✖                        | Gold                  | Silver                         | Gold                                                    | ✖                               | Gold                                 | Silver                       |
| 27in                   | 27in                         | 31.5in                   | 34in                  | 31.5in                         | 34.1in                                                  | 30.5in                          | 31.5in                               | 34in                         |
| 2,560 x 1,440          | 2,560 x 1,440                | 6,016 x 3,384            | 3,840 x 2,160         | 3,840 x 2,160                  | 3,440 x 1,440                                           | 4,096 x 2,160                   | 3,840 x 2,160                        | 3,440 x 1,440                |
| 16:9                   | 16:9                         | 16:9                     | 16:9                  | 16:9                           | 21:9                                                    | 17:9                            | 16:9                                 | 21:9                         |
| 109ppi                 | 109ppi                       | 219ppi                   | 110ppi                | 140ppi                         | 109ppi                                                  | 152ppi                          | 140ppi                               | 110ppi                       |
| IPS                    | IPS                          | IPS                      | MVA                   | IPS                            | IPS                                                     | IPS                             | IPS Black                            | MVA                          |
| ✖                      | ✖                            | ✖                        | 1500R                 | ✖                              | 3800R                                                   | ✖                               | ✖                                    | 1500R                        |
| 350cd/m²               | 350cd/m²                     | 400cd/m²                 | 350cd/m²              | 400cd/m²                       | 350cd/m²                                                | 500cd/m²                        | 450cd/m²                             | 350cd/m²                     |
| 1,000:1                | 1,500:1                      | 2,000:1                  | 3,500:1               | 1,200:1                        | 1,500:1                                                 | 1,800:1                         | 2,700:1                              | 3,000:1                      |
| 16.8 million           | 16.8 million                 | 1.07 billion             | 16.8 million          | 1.07 billion                   | 1.07 billion                                            | 1.07 billion                    | 1.07 billion                         | 16.8 million                 |
| 8-bit                  | 6-bit + FRC                  | 8-bit + FRC              | 8-bit                 | 10-bit                         | 8-bit + FRC                                             | 8-bit + FRC                     | 10-bit                               | 8-bit                        |
| ✖                      | HDR10                        | DisplayHDR 600           | HDR10                 | DisplayHDR 400                 | ✖                                                       | HLG, HDR10, PQ Curve            | DisplayHDR 600                       | ✖                            |
| 75Hz                   | 120Hz                        | 60Hz                     | 120Hz                 | 144Hz                          | 100Hz                                                   | 60Hz                            | 120Hz                                | 120Hz                        |
| 6ms                    | 5ms                          | 4ms                      | 4ms                   | 1ms                            | 5ms                                                     | 15ms                            | 5ms                                  | Not stated                   |
| ✖                      | ✓                            | ✖                        | ✓                     | AMD FreeSync Premium           | ✖                                                       | ✖                               | ✓                                    | AMD FreeSync Premium         |
| 1 (1.2)                | ✖                            | 1 (1.4)                  | 1 (1.4)               | 1 (1.4)                        | 1 (1.4)                                                 | 1 (1.2)                         | 1 (1.4)                              | 1 (1.4)                      |
| 1 (2.0)                | 1 (1.4)                      | 2 (2.1)                  | 2 (2.0)               | 1 (2.1)                        | 1 (1.4)                                                 | 1 (2.0)                         | 1 (2.1)                              | 2 (2.0, 1.4)                 |
| ✓ (90W)                | ✓ (90W)                      | ✓ (90W)                  | ✓ (90W)               | ✓ (90W, Thunderbolt 4)         | ✓ (90W)                                                 | ✓ (94W)                         | ✓ (100W, Thunderbolt 4)              | ✓ (95W)                      |
| ✓                      | ✖                            | ✖                        | ✖                     | ✓                              | ✖                                                       | ✖                               | ✓                                    | ✖                            |
| DisplayPort out        | ✖                            | ✖                        | ✖                     | Thunderbolt 4 out              | ✖                                                       | ✖                               | DisplayPort 4 out, Thunderbolt 4 out | ✖                            |
| ✓                      | ✖                            | ✖                        | ✓                     | ✖                              | ✓                                                       | ✓                               | ✓ (2.5GbE)                           | ✓                            |
| 2 (USB 3.2 Gen1)       | 1 (USB 3.2 Gen1)             | 2 (USB 3.2 Gen1)         | 4 (USB 3.2 Gen1)      | 3 (USB 3.2 Gen1)               | 3 (USB 3.2 Gen1)                                        | 4 (2 x USB 3.2 Gen1, 2 x USB 2) | 5 (USB 3.2 Gen2)                     | 2 (USB 3.2 Gen1)             |
| ✓                      | ✖                            | ✓                        | ✓                     | ✖                              | ✓                                                       | ✓                               | ✖                                    | ✓                            |
| ✖                      | 3 (USB 3.2 Gen1)             | ✖                        | ✖                     | 1 (USB 3.2 Gen2)               | 1 (USB 3.2 Gen1)                                        | ✖                               | 1 (USB 3.2 Gen2)                     | 2 (USB 3.2 Gen1)             |
| ✓                      | ✓                            | ✓                        | ✓                     | ✓                              | ✖                                                       | ✓                               | ✖                                    | ✓                            |
| ✖                      | ✖                            | ✖                        | ✖                     | USB-C 3.2 Gen2 upstream        | ✖                                                       | ✖                               | ✖                                    | ✖                            |
| 150mm                  | 130mm                        | 150mm                    | 180mm                 | 150mm                          | 150mm                                                   | 155mm                           | 150mm                                | 150mm                        |
| ✓                      | ✓                            | ✖                        | ✖                     | ✓                              | ✖                                                       | ✖                               | ✓                                    | ✖                            |
| 5°/35°                 | 5°/20°                       | 5°/20°                   | 5°/23°                | 5°/20°                         | 5°/21°                                                  | 5°/35°                          | 5°/20°                               | 5°/23°                       |
| 90°/90°                | 45°/45°                      | 180°/180°                | 180°/180°             | 30°/30°                        | 30°/30°                                                 | 172°/172°                       | 45°/45°                              | 45°/45°                      |
| ✖                      | ✖                            | ✓ (4K)                   | ✖                     | ✖                              | ✓ (1440p)                                               | ✖                               | ✖                                    | ✓ (2,560 x 1,944)            |
| ✖                      | ✓                            | ✓                        | ✓                     | ✓                              | ✓                                                       | ✖                               | ✓                                    | ✓                            |
| ✓                      | ✓                            | ✓                        | ✓                     | ✓                              | ✓                                                       | ✓                               | ✓                                    | ✓                            |
| ✓                      | ✖                            | ✖                        | ✓                     | ✓                              | ✓                                                       | ✓                               | ✓                                    | ✓                            |
| ✖                      | 2 x 3W                       | 2 x 5W                   | 2 x 5W                | 2 x 3W                         | 2 x 5W                                                  | ✖                               | ✖                                    | 2 x 5W                       |
| USB-C                  | HDMI, USB-C                  | DP, HDMI, USB-B, USB-C   | HDMI, USB-C           | DP, HDMI, TB4                  | DP, USB-B, USB-C                                        | HDMI, USB-B, USB-C              | DP, HDMI, TB4, USB-C to USB-A        | DP, HDMI, USB-B, USB-C       |
| Human sensing          | ViewSonic Display Portal     | Stylus                   | ✖                     | Display Pilot 2, Hotkey Puck 3 | Dell Display and Peripheral Manager                     | Monitor hood                    | HP Display Center                    | ✖                            |
| 612 x 250 x 378-528mm  | 613 x 207 x 409-539mm        | 726 x 321 x 282-528mm    | 808 x 275 x 482-662mm | 714 x 242 x 186-636mm          | 816 x 229 x 393-543mm                                   | 721 x 290 x 428-583mm           | 714 x 235 x 449-599mm                | 807 x 240 x 443-593mm        |
| 9.2kg                  | 5.5kg                        | 10.1kg                   | 10kg                  | 9.7kg                          | 10kg                                                    | 12.3kg                          | 8.4kg                                | 9.7kg                        |

# 11 key things to look for when buying a monitor

Before you jump into individual reviews, it's worth considering the bigger picture when selecting which display is right for you

## 1. HOW BIG SHOULD YOU GO?

Farewell 24in monitors. While there's still a market for them, for us 27in is now the minimum. However, you also need to consider the pixel density.

For demanding PC Pro readers, we recommend a minimum of 100 pixels per inch (ppi). You'll notice a huge jump in sharpness if you choose a 27in monitor with a 2,560 x 1,440 resolution – that works out to 109ppi – compared to one with a 1,920 x 1,080 resolution and its text-fuzzy 82ppi. If you're a photographer then you'll appreciate the greater sharpness of a 27in 4K screen. Likewise if you're a spreadsheet junkie who wants to cram as much data into view as possible.

Eyesight also comes into play here. If you often find yourself increasing the dots per inch beyond Windows' recommended settings, you'll appreciate higher ppi panels.

Your next decision is whether to choose the wider aspect ratios of a 32in or 34in panel. If you switch from the 16:9 of a typical screen you'll notice how much extra space there is when you move to a 21:9 aspect ratio.

## 2. COLOUR SPACES

Monitor manufacturers often talk about coverage of colour spaces. Most often, they will specify sRGB coverage. This is a conservative colour space, which was created at the birth of the internet. The IT industry later developed new colour spaces: Adobe RGB, DCI-P3 and Display P3. Adobe RGB ensures the colours on screen will match with what emerges from a professional printer. DCI-P3 is now the standard Hollywood studios work to. And Display P3 is Apple's space, created to improve upon sRGB, and is very similar to DCI-P3. The best monitors have been calibrated at the factory to match those colour spaces.

But what matters to most of us is that we see pleasant colours on our screens. Anything below 60% of sRGB looks dull, with richness increasing as you approach 100% – and beyond, as a monitor can stretch beyond any single colour space. This is what we mean by *volume* (the total amount of colours represented by a monitor) versus *coverage* (what percentage of a colour space a monitor covers).



**ABOVE** Acer takes a radical approach with its 32in ProCreator aimed at creatives

But it doesn't need to be complicated. If you want vivid colours, look for a monitor that quotes 85% or above for the DCI-P3 space.

## 3. CONTRAST & COLOUR ACCURACY

**If you switch from the 16:9 of a typical screen you'll notice how much extra space there is when you move to a 21:9 aspect ratio**

Ten years ago you could base a buying decision on high levels of contrast and the promise of a Delta E below 2. Delta E is a scale from 0 to 100 that measures the difference

**BELOW** Many of the best monitors come with pre-calibrated colour spaces

colour and what your monitor actually displays. A monitor's stated contrast ratio and Delta E were once great proxies for quality, but these

days even cheap monitors often have a claimed contrast ratio above 1,000:1 and an average Delta E below two.

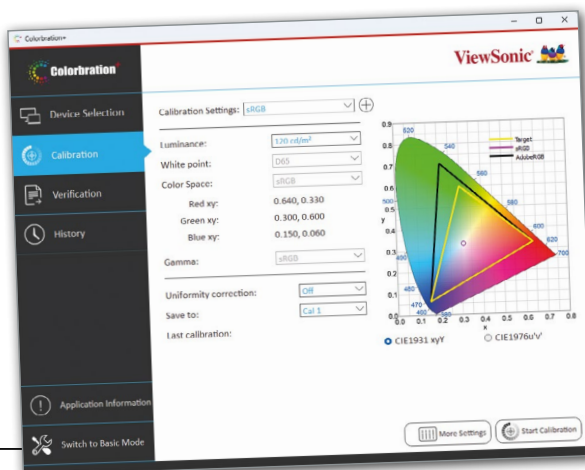
However, if you see a monitor with an IPS panel (see "Types of panel", below) with a contrast ratio of 2,000:1 then that does suggest it includes a high-quality panel and should result in more impactful images. These are often referred to as IPS Black displays and are well worth looking out for.

## 4. BITS AND HDR

Scan the "Display colours" line in our feature comparison table on p74 and you'll see that they range from 6-bit to 10-bit panels. As you might expect, more bits typically equals greater colour coverage. And a higher price.

A 6-bit panel covers 262,144 colours, but that's not enough for modern tastes. That's why every 6-bit panel here adds a technology called frame rate control, or FRC. This quickly alternates between different colour shades to simulate the desired shade.

FRC is so effective that few would be able to tell between a 6-bit + FRC panel and a true 8-bit panel, and both claim to cover 16.8 million colours (16,777,216, or  $256^3$ , to be precise). Many manufacturers also use FRC to boost their 8-bit panels to 1.07 billion colours (1,024<sup>3</sup>). This matches the range of colours provided by 10-bit panels.





You'll also see some manufacturers list their monitors as "HDR-ready" or supporting HDR10. However, neither guarantees you'll enjoy HDR video with the impact you might hope, and even screens with VESA DisplayHDR 400 certification won't blast you away. If you love playing games in HDR, or watching HDR video, look for DisplayHDR 600 or 1000 certification.

## 5. TYPES OF PANEL

This group test reflects the type of panels you will generally find when looking for a monitor. All the monitors here use either in-plane switching (IPS) or vertical alignment (VA) panels (sometimes referred to as multiple vertical alignment, or MVA). IPS panels tend to give cleaner whites, so are often favoured for business use, while VA panels tend to offer greater contrast and lower response times. They're also easier to bend so are usually found in curved monitors.

One monitor in this Labs, the Lenovo Yoga Pro 27UD-10, has an OLED panel. These are normally only found in gaming monitors, which are outside the scope of this Labs. Where IPS and VA panels use a number of LED backlights that shine through to provide illumination, every pixel in an OLED has its own source of light. Thus they can each be switched off, to give the distinctive inky black that you won't find on standard displays.

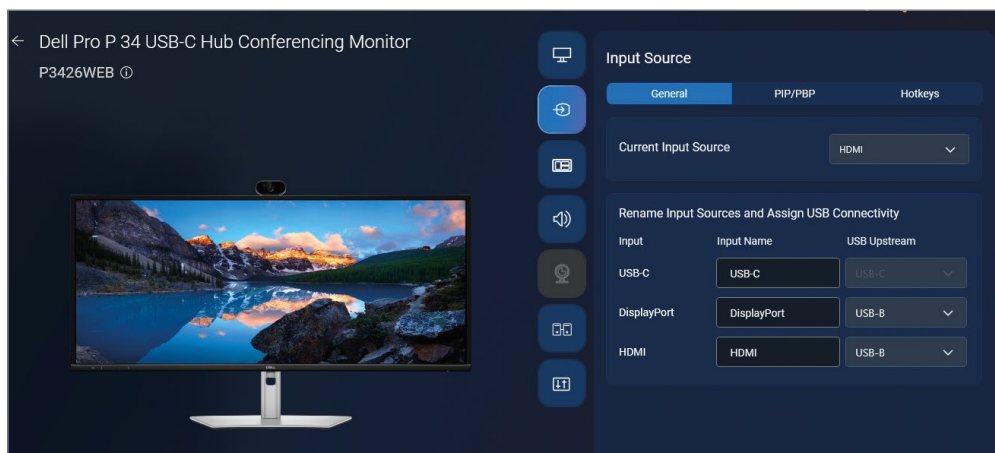
## 6. CURVED vs STRAIGHT

Some people swear by curved monitors, especially gamers as it helps them feel more immersed in games. Even more so if you opt for a setup with two, or even three, curved monitors. This month, two monitors have a 1500R rating, which means that if they formed a circle around you the radius would be 1.5m (1,500cm). They both use VA panels, while the Dell Pro P 34 uses an IPS panel with a 3800R rating. A circle of such monitors would have a far larger 3.8m radius.

## 7. REFRESH RATES AND RESPONSE TIMES

Another big change in recent years is the move to faster vertical refresh rates. Some monitors stick to the familiar 60Hz, which is fine for everyday use. However, switching to 100Hz and 120Hz means a more "solid" image that you may notice when browsing through documents or websites. It also helps in gaming, although with specialist gaming monitors the speeds now hit 240Hz and beyond, to match the frames per second generated by high-end cards.

To avoid tearing in games – that glitch where you pan across and the



**ABOVE** Several monitors include software that goes beyond the OSD

scene seems to jump – you should look for support for adaptive sync technology. This aims to synchronise the output from the graphics card perfectly to what appears on your screen. Many manufacturers use their own technology, but AMD also provides its FreeSync tech for free and charges for FreeSync Premium (which helps at lower frame rates).

**IPS panels tend to give cleaner whites, while VA panels tend to offer greater contrast and lower response times**

Finally, gamers should look for low response times; 5ms is okay, but gaming monitors will go far lower. Particularly OLED panels, which measure response times in fractions of a millisecond.

## 9. FLEXIBLE CHOICES

All but one of the monitors in this test – the Amazon Basics 27in – includes a height-adjustable stand. Ideally, the top of the screen should be at eye level, or slightly below, to avoid straining your neck by looking upwards.

You'll never regret having a flexible stand, so look for the capability to pivot it through 90° and have the ability to tilt a generous amount. Eizo and Sharp win here, with their monitors providing a superb 35° backwards tilt compared to the typical 20° to 25°.

**BELOW** Curved monitors typically use bendier MVA panels



Having a VESA mount slot means you can buy an arm or wall mount.

## 9. LOOK AT THE WARRANTY

Monitors are pretty reliable, but if something goes wrong you'll be extremely pleased to have paid a little more for a display with an on-site exchange warranty, as the company will swoop in, remove your faulty screen and replace it with a working unit. Most monitors include a "limited" warranty where the manufacturer will arrange collection and attempt to repair it, usually within 14 days. Also look for the length of warranty that's bundled. Incredibly, Eizo now offers a seven-year warranty with selected monitors.

Fortunately, monitors are some of the most reliable equipment around, which we know from our annual PC Pro Excellence Awards 2025 (see issue 375, p30). You can see how satisfied our readers were with each company in the scores in the feature table on p74.

## 10. SUSTAINABILITY QUESTIONS

Monitors are not a product that you'll be able to repair, so we're looking for circularity (how easy it is to reuse components at end of life), recyclability and the environmental cost of building and shipping each monitor.

We have to rely on the companies' own environmental claims and third parties for this. While imperfect, EPEAT certification is the best option we've found, as it examines supply chains for the parts used in manufacturing and delivers a wider verdict on each company's actions. This is summarised in the EPEAT rating on the feature table on p74.

## 11. ONE LAST THING

There's only one way to truly see how good a monitor is, however, and that's to read independent tests such as PC Pro's.



## AOC U27E4CV

You're buying a good-quality 4K panel, networking and USB-C docking for a quite remarkable price

SCORE ★★★★★

PRICE £200 (£240 inc VAT)  
from [ballicom.co.uk](https://www.ballicom.co.uk)

**D**on't listen to the naysayers: it turns out you can have it all. Only a year ago you had to give up something when buying a 27in monitor for under £300, whether it was resolution, image quality, networking or USB-C connectivity. But here we are in 2026, a year savaged by price rises, and AOC has put together a 27in display that has all those things.

Before you rush to order, make sure you're buying the correct model. AOC also sells the Q27E4CV and 27E4CV, which have 1440p and 1080p resolutions respectively. While we're always happy with 1440p across a 27in diagonal, with its still-sharp 109 pixels per inch, we're less thrilled by the fuzzy 82ppi of a 1080p screen. There are no such concerns with the 4K U27E4CV, with a razor-sharp 163ppi and more importantly the freedom to place two windows side by side with no loss of fidelity.

AOC also uses a high-quality IPS panel, with crisp whites and a highly respectable colour gamut. Stick to the native, out-of-the-box settings and it covers 89% of the DCI-P3 gamut and stretches to 132% of the sRGB space. So not such a wide gamut as the creator-focused Iiyama ProGraphic HB2701UHSNP, but more than enough to make films and photos look good.

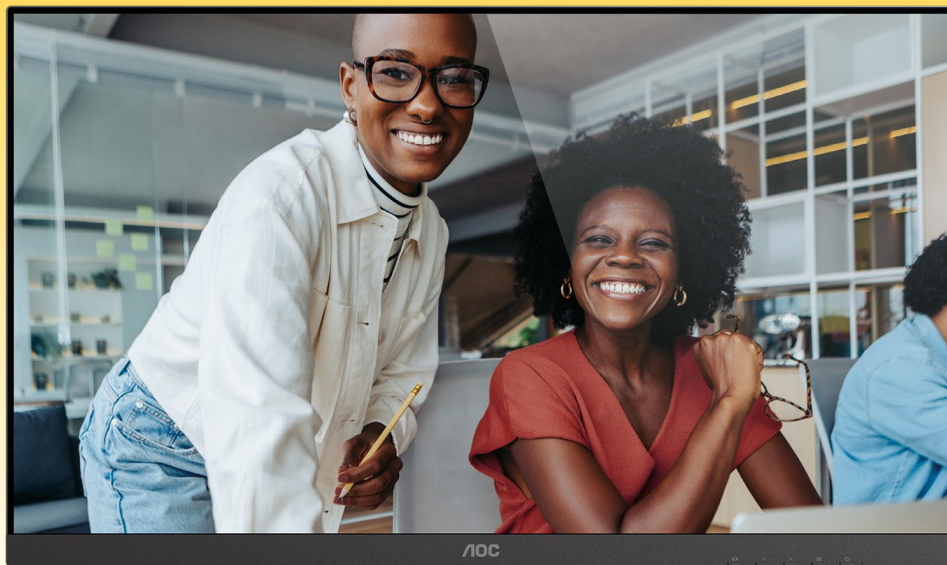
Despite the presence of HDR Effect presets for games and movies, this monitor's electronics and LED backlighting setup aren't sophisticated enough to deliver on HDR promises. But it does go bright: we measured 429cd/m<sup>2</sup> in the standard preset, beyond AOC's 400cd/m<sup>2</sup> claims. It also has better contrast than AOC specifies, with a peak of 1,309:1 in our tests. Blacks and shadow detail still can't match that of an IPS Black panel, but for this

price we aren't complaining. Likewise with colour accuracy, with the U27E4CV producing an average

Delta E of 0.35 and peak of 1.08. Scores we'd be happy to see from far more expensive panels.

We've mentioned the HDR Effect presets, and there are others you can flip between via one of the four shortcut buttons on the bezel. We weren't taken by any of them, although gamers may find it worthwhile to select FPS, RTS and Racing when in their preferred genre. This also pre-selects the best sharpness and response time settings (5ms grey-to-grey), and there's support for adaptive sync, but a maximum 60Hz refresh rate at 4K emphasises that this monitor isn't a top choice for gamers.

The OSD has a simple structure that makes it easy to navigate, and once you get to grips with AOC's navigation cues you should find yourself whizzing through the options. As with the AOC CU34E4CVF, the buttons are cheap and plasticky, but they work. There's little control over colour – other than switching to an sRGB colour space, which locks it down very effectively (95% coverage/96% volume) – but it's easy to switch



**ABOVE** This is an incredibly high-quality monitor for the price



**LEFT** The USB-C port provides access to the four-port USB hub

**BELOW** The screen can be rotated by 180°



between the four video inputs: two HDMI, DisplayPort and USB-C.

We strongly recommend you use USB-C as this is the only way to access the built-in wired networking and four-port USB hub. These are all Type-A and a relatively slow 5Gbps/sec, but it's good to see that two are easily accessible on the bottom bezel, with the second pair at the rear. Access to these is made easier by a 30-degree backwards tilt, and in theory there's 180 degrees of swivel, but in practice we found it simpler to physically rotate the whole 6.8kg unit. The 150mm of height adjustment is much more useful and again appreciated for a 4K monitor at this price.

There are no other extras – no webcam in particular – but AOC does stretch to a pair of 2W speakers. Will you be enjoying Mozart's "Requiem" on the U27E4CV? Absolutely not.

But it's fine for video calls or for having Radio 4 play low in the background.

We're not going to criticise when paying under £250 for a truly excellent monitor. At this price, you have no right to expect this much colour, this much detail and the sheer quality of its whites. Factor in its USB-C port – capable of 90W power delivery, enough for most laptops – along with the physical networking, and you have the basis of a cable-free environment. (Although the cable tidy clip at the rear of the stand is very basic.) If the AOC U27E4CV stays under £250, it's an absolute bargain and a deserving Labs Winner.



## BenQ MA270S

A brilliant alternative to the Apple Studio Display, with a top-quality panel backed up by top-quality electronics

SCORE ★★★★★

PRICE £750 (£900 inc VAT)  
from scan.co.uk

If you don't fancy handing over £1,499 to Apple for its all-new Studio Display, we suggest you consider the BenQ MA270S instead. For a start, you won't be hit with a £400 fee for the courtesy of a height-adjustable stand: BenQ provides it as part of the package (like everyone else in the monitor-selling industry). As standard, it also includes a "nano gloss" finish to match Apple's (which adds another £300 to the price) so you'll enjoy all the impact of a glossy panel but with minimal reflections. It doesn't do a perfect job from this point of view, but the reflections never bothered us in general use.

Saving money versus Apple isn't the only reason to opt for the MA270S. We know from testing done by our sister site Tom's Guide that the Studio Display covers only around 83% of the DCI-P3 gamut, while the BenQ goes up to 99% (depending on which colour mode you choose). Even the Studio Display XDR (see issue 381, p68), which costs from £2,999, tops out at the 83% mark. That means photographers and video pros will see more of the colours captured by their devices on the BenQ MA270S, and with an average Delta E of 0.43 and peak of 1.81 (versus the DCI-P3 space) you can absolutely trust that the colours you're seeing are accurate.

We're also fans of the Display Pilot 2 software BenQ supplies to control the MA270S. This applet, which sits in the taskbar, makes it easy to choose from the seven different colour options: M-book - designed to mimic the colour profile of MacBooks - Display P3, sRGB, Movie, Game, HDR and ePaper. There's also a User profile, where you can set the colour temperature, hue, saturation and even brightness uniformity. There's little need for the latter, though, as BenQ does an excellent job here out of the box.

Photographers should stick to the Display P3 option, which locks almost exactly to the DCI-P3 colour space with 96% coverage out of 98% volume, while the sRGB preset again mimics that colour space almost perfectly.

This ability to flick between colour spaces is one of the main things you're paying for compared to, say, the AOC U27E4CV.

Another area is resolution. The MA270S, like Apple's Studio Display family, packs a 5K panel with a 5,120 x 2,880 resolution that converts into a spectacularly sharp 218ppi.

To put it another way, you have around 77% more pixels to play with than a 4K panel. This provides exceptional levels of detail in photos, but also means that you can divide the screen space between your main system and two others connected over HDMI.

There's also the option to daisy-chain a second 5K monitor via the Thunderbolt 4 output. Your computer must meet certain conditions - M1 and M2 Macs don't support this feature, for instance - but if yours does you could have a twin-monitor setup for £99 less than a Display Studio with an adjustable stand. And you'll have a USB-C port left over to charge and connect peripherals.

**ABOVE** The BenQ MA270S is a fantastic choice for creatives



**LEFT** A Thunderbolt 4 output lets you connect a second 5K display

**BELOW** Unlike Apple's Studio Display, the adjustable stand comes as standard



So, compared to the Apple Studio Display, it's tough to find fault with the BenQ MA270S. Mac fans should definitely take note. But if you're buying for a Windows setup then there are a couple of omissions to take note of. For one, no wired Ethernet; for two, no USB-B port. Nor will gamers go wild over the thought of a peak 70Hz refresh rate, despite the tickbox support for AMD FreeSync.

Some might also find it irritating to install the Display Pilot 2 software, and it's necessary because the joystick on the bottom bezel only allows you to adjust brightness (BenQ states a 450cd/m² peak but it reached 486cd/m² in our tests), choose inputs and tweak the volume. The pair of 3W units here don't go super-loud, but we were happy using them to listen to music.

They're a solid choice for films, too. Again this is where a glossy panel

makes a big difference, and even though the DisplayHDR certification is only 400, far from the real deal of DisplayHDR 1000, watching *Our Universe* on the BenQ MA270S was a genuine joy. A high claimed contrast ratio of 2,000:1 (we measured 2,423:1) helps blacks to look their inky best.

All of which means the MA270S is no mere cut-price alternative to the Studio Display. This is a brilliant screen in its own right, and while we would love to see better HDR support and an RJ45 network port, it's a brilliant choice for Mac users and Windows devotees alike.



## Eizo FlexScan EV2720S

It lacks excitement, but this 1440p monitor delivers for quality, colour accuracy and rollout-friendly features

SCORE ★★★★★

PRICE £389 (£467 inc VAT)  
from [jp-uk.co.uk](http://jp-uk.co.uk)

**W**hen it comes to full-scale monitor rollouts, any sensible businesses will put Eizo and Sharp right at the top of their list. In that sense, this month sees a shootout between the EV2720S and the MultiSync EA272Q on p85, with both companies offering a level of support that rivals simply can't match. They each produce monitors with low failure rates and the promise of long lifetimes, and Eizo has just doubled down on this by offering the EV2720S – and six other FlexScan monitors – with a seven-year warranty.

Although there's no RJ45 port, admins can take control of the monitor settings via USB-connected computers thanks to Eizo's InStyle software. This will lock down settings such as brightness, but don't expect doing so will result in a huge difference to your electricity bill: at 200cd/m<sup>2</sup> this screen consumed only 16W, rising to a still efficient 23W at its peak brightness of 421cd/m<sup>2</sup> (higher than Eizo claims). If low power consumption is key for you, consider the Eizo FlexScan FLT (see issue 369, p68), which consumes a mere 6W at 200cd/m<sup>2</sup>.

The FlexScan EV2720S's OSD is extremely intuitive, with six touch-sensitive buttons sitting to the left of the power button on the bottom bezel. Your options change depending on context, so could be simple up/down navigation or scrolling through the video input options: USB-C, DisplayPort, HDMI and Picture-by-Picture. You don't get fancy levels of control over colour spaces, but all the basics are on offer: two user profiles, sRGB, Movie and DICOM (medical). Although frankly switching between them made minimal difference to colour output, which is 99% coverage of the sRGB

space with a 120% volume. You'll see a big change if you switch to Paper mode, though, as this adds a sepia finish that's perfect for reading long documents.

Colour accuracy is excellent, with an average Delta E of 0.28 and peak of 0.65. And while colours lack the depth of more colour-rich monitors with higher contrast – around 1,430:1

here – they're more than good enough for most tasks, and most importantly whites look clear. We also like the 2,560 x 1,440 resolution on a 27in panel, which means text looks sharp even if you don't get dizzying amounts of detail.

The EV2720S ships with a top-quality stand, although you can order it without one if you prefer an arm. And it comes in white as well as black. There's a generous 169mm of height adjustment, with a clever and striking design – as clearly shown by the photos – that allows the screen to drop right down to the foot of the base. The mechanism is as smooth as it looks. The screen can rotate into portrait mode in either direction, which could come in handy if you buy a pair of these monitors; note the slim bezel on the top, left and right sides.

We also love the way it can swivel through 172 degrees both left and right, while Eizo builds plenty of space in the

**ABOVE** The EV2720S is a fine choice for office rollouts



**LEFT** Unusually – and helpfully – the base is attached to the stand

**BELOW** The striking stand is extremely adjustable

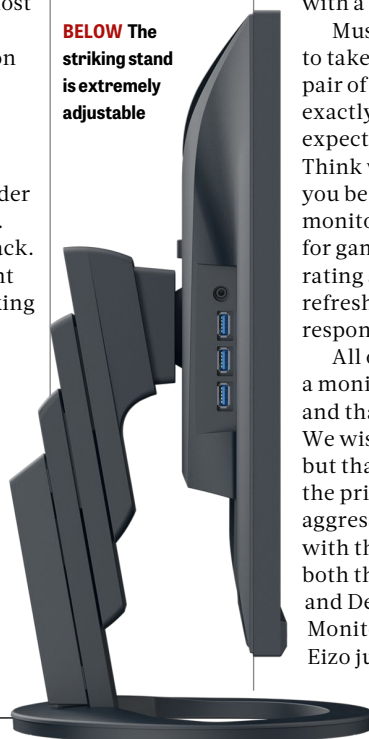


cable tidy for any chunky wires. It's also easy to assemble as the base comes attached (most monitors require you to screw this in, which adds a tedious step if you have hundreds of monitors to set up).

There are few things to criticise here, then, but anyone who wants to charge a powerful laptop from their monitor will be disappointed by the 70W maximum power delivery over USB-C. We should also point out that there's no second upstream USB-C port or USB-B port, so the four-port USB-A hub can't be shared with a second connected computer. One of those USB-A ports sits at the rear, while the other three are accessed from the left of the monitor along with a 3.5mm jack.

Music lovers are far more likely to take advantage of this than the pair of 1W speakers, which are exactly as tinny as you might expect from that power rating. Think web calls at best. Nor will you be surprised to hear that this monitor makes a rubbish choice for gaming, with no DisplayHDR rating and a traditional 60Hz refresh rate. At least the 5ms response time is okay.

All of which means that this is a monitor that knows its place, and that's on a desk in an office. We wish it had a network port, but that would have pushed up the price: around £500 is aggressive for a 27in Eizo monitor with this high a resolution. While both the NEC MultiSync EA272Q and Dell Pro P 27 USB-C Hub Monitor are fine alternatives, the Eizo just gets our nod ahead of them for larger businesses.





## Lenovo Yoga Pro 27UD-10

Absolutely amazing if you intend to play games and stream HDR video, and great for content creators too

SCORE ★★★★★

PRICE £1,083 (£1,299 inc VAT)  
from lenovo.com

We're used to seeing Samsung's Quantum Dot OLED tech in TVs and gaming monitors, but the Lenovo Yoga Pro 27UD-10 is something new. While it's ideal for playing games thanks to a 120Hz refresh rate, 0.03ms response time and support for both AMD FreeSync Premium Pro and Nvidia G-Sync, Lenovo has content creators in mind.

The biggest outward sign of this is the 4K webcam. This attaches to the top of the monitor and is kept firmly in place thanks to an integrated USB-C port and two metal pins. It can pivot through a 90-degree angle, staring straight ahead before twisting downwards to capture what's on your desk. At which point it flips the image, so viewers aren't looking at your desk contents upside down.

Nor do you have to mess around with separate microphones, with a four-mic array built in. It captured voices clearly, and we'd be happy to use it for general web calls, but most content creators won't be happy with the amount of reverberation and echo. Image quality is detailed and colours are rich – perhaps too rich. We felt it made faces look overly red.

We love the ambition Lenovo is showing here, but a high-quality webcam and audio setup need accompanying software to fine-tune controls. For now at least, Lenovo provides no such offering.

But don't write the Yoga Pro off just yet. Two big benefits of QD-OLED technology are wider gamuts and greater brightness, both of which came to the fore when watching *Our Universe*. This opens with dramatic scenes of starscapes and snow-covered mountains, and we haven't tested any monitor that can do it justice like the Yoga Pro 27UD-10 can. It helps that Lenovo packs in four 7W woofers and

two 3W tweeters to bring Morgan Freeman's narration and the superb soundtrack to life.

Not to mention the exceptional sharpness that comes from 3,840 x 2,160 pixels squeezed into a 26.5in panel.

Our tests confirmed the wide gamut, with the DCI-P3 setting (the default) covering 95% of that gamut with no overspill. The brightness argument is more nuanced: in general use, this monitor topped out at 249cd/m<sup>2</sup>. That may not sound like it's enough, but the effectively perfect contrast ratio of OLED means your eyes will perceive that as the same brightness as an IPS panel at 350cd/m<sup>2</sup> to 400cd/m<sup>2</sup>. Lenovo claims it will reach 1,000cd/m<sup>2</sup> with HDR content, and our experience backs this up.

Print designers will also appreciate that the Yoga Pro 27UD-10 has been pre-calibrated for the Adobe RGB colour space, and choosing that option locks down to 88% coverage with 90% volume. That's backed up by an average Delta E of 1.24. If you prefer clean whites, switch to the sRGB space, with the monitor again almost perfectly locking on: 97% coverage out of 99% volume, with an average Delta E of 0.54.

In theory Lenovo's Artery software controls monitor settings in Windows, but we couldn't access this. Luckily the OSD is easy to navigate, relying on



**ABOVE** The Yoga Pro 27UD-10 is great for gamers and viewing HDR content

**LEFT** A 4K webcam attaches to the top of the display

**BELOW** The stylish metallic stand offers a smooth 110mm of height adjustment



a joystick on the rear, and there are shortcuts that allow you to jump to the volume settings and switch between video inputs. While most buyers will mainly use the USB-C connection, HDMI and DisplayPort both sit ready. There's no USB-B port or KVM, but there's a DisplayPort out if you want to daisy-chain a second monitor.

We also applauded the inclusion of two USB-A and two USB-C ports, all rated at 10Gbps/sec thanks to support for USB 3.2 Gen2. That brings external storage into play, and while we'd have liked to see an RJ45 port, it's easy enough to slot a USB-to-RJ45 adapter into one of those four USB ports.

Nor can we complain about build quality, with a stylish metallic grey frame offering a smooth 110mm height adjustment. Few people will need more than this, nor do we mourn any built-in swivel as it's relatively light at 6.7kg, but you may miss having the option to pivot into portrait mode.

One final factor to note is that Lenovo doesn't integrate the power supply, so you'll need to find a place for the 400W unit, which is needed for all the greedy components; it can supply up to 140W of power over USB-C, far more than most monitors. The panel itself consumes 36W at 200cd/m<sup>2</sup> and 84W at its peak.

So to the big question: is the Lenovo Yoga Pro 27UD-10 worth £1,299? Only if you intend to consume a lot of HDR Netflix shows and love to game, because those are the only areas where the Yoga Pro whips the BenQ MA270S, which is even more tempting at almost £400 less.



## ViewSonic ColorPro VP2766-2K

A solid choice for anyone who seeks colour accuracy on a budget, but don't expect miracles

SCORE ★★★★★

PRICE £187 (£224 inc VAT)  
from quzo.co.uk

The AOC U27E4CV set a high bar for value for money in this Labs, but the ViewSonic ColorPro VP2766-2K sure runs it close.

One key feature is support for hardware calibration. Your first step is to download ViewSonic's Display Portal software, which provides a dashboard containing a bunch of handy apps. Colorbration+ will work with third-party calibrators and then save your preferred profile into one of the three slots on the monitor. However, on this monitor you're limited to the sRGB space; when we tried to create an Adobe RGB preset it said this wasn't supported, likewise DCI-P3.

ColorPro Display Manager is arguably the most useful app. This adds handy adjustment tools for people who suffer from colour blindness, but more handily duplicates the OSD settings. That makes it far less cumbersome to switch between what ViewSonic calls Color Modes: sRGB, Rec.709, DICOM, User, HDR and the three calibration options.

The lack of a DCI-P3 or Adobe RGB mode hints at something you should already expect at this price: that the panel's gamut is relatively limited. Out of the box, in User mode, it covered 99% of the sRGB gamut with a 121% volume, while it covers 84% of the DCI-P3 space.

The sRGB Color Mode locks down well to that space, with 92% coverage and 93% volume, with its strong colour accuracy reflected in an average Delta E of 0.73 and peak of 2.18. However, we preferred the whites from AOC's monitor, and note that the ViewSonic couldn't go as bright as its rival: it peaked at 343cd/m<sup>2</sup> compared to 429cd/m<sup>2</sup>.

We also need to mention ViewModes. These don't change

the underlying colour space but tweak settings such as colour temperature, response times and sharpening. For example, ViewSonic

encourages photographers to switch to the Photographic ViewMode, although we found that this made minimal difference compared to the default User mode.

Gamers have more to gain here, with ViewModes on offer for first-person shooters,

real-time strategy and even multiplayer online battle arena games. You can also adjust the gamma and sharpening to your liking, perhaps to bring out details in shadows. Another reason gamers might like this monitor is its 120Hz refresh rate and what ViewSonic calls variable refresh rate (VRR) and everyone else calls adaptive sync. Either way, supported games will match the refresh rate to the frames per second generated by your system.

ViewSonic provides a 120W external power brick, with up to 90W diverted to a connected laptop over USB-C. More than enough for most systems. Separating the power supply from the main unit enables the panel to be attractively slim, with all the connectors stuck at the rear: there's no DisplayPort, but you get one HDMI connector, one USB-A port, three USB-C ports (forward

**ABOVE** The ColorPro VP2766-2K is a fine choice for those on a tight budget

**LEFT** Connectivity includes HDMI and three USB-C ports

**BELOW** The monitor has a classy design that belies its low price



looking, but we missed having a second USB-A port) and a 3.5mm jack.

You also get a pair of 3W speakers as part of the deal, but once again we draw your attention to this monitor's price. Don't expect room-filling audio as from the Lenovo Yoga 27. Adjectives like "hollow" and "tinny" spring to mind, but the speakers are bearable if you simply want to play music in the background.

One area where the ViewSonic wins compared to most 27in monitors at this price is its looks, with the understated silver base complementing the thin black bezels well. With support for pivoting we can envision the VP2766-2K in a multi-monitor setup, while it's easy to swivel the panel through 90 degrees as the movement comes via the arm rather than the base. Add 130mm of height adjustment and you have a versatile offering.

One final surprise comes in the box. Like every manufacturer here other than Amazon, ViewSonic provides eco-friendly packaging, but it goes further by including a protective piece of cardboard with perforations to help you turn them into stationery holders (think pens and magazines). Not a reason to buy the VP2766-2K, but a nice touch.

Provided you temper your expectations around colour coverage – we're unconvinced it deserves the ColorPro branding – this is an attractive monitor. It includes a good-quality 1440p panel, plenty of connectivity and slick software-based controls. While we'd still choose the AOC for its 4K resolution and brighter whites, this is a solid alternative.



## Amazon Basics 27-inch Monitor

There's nothing wrong with the panel other than its low resolution, but it is indeed extremely basic

SCORE 

PRICE **£83 (£99 inc VAT)**  
from amazon.co.uk

**F**ollowing on from our "How cheap is too cheap?" feature last month (see issue 383, p26), we bought an Amazon Basics monitor to see how it would fare against the world's best monitor brands. First impression: it lives up to its name. The all-plastic stand, which wobbles when the screen moves, has no time for frivolities such as height adjustment or swivel, with only a limited tilt (5 degrees forward, 20 degrees back) to play with.

This is matched by the video inputs, with HDMI, DisplayPort and ye olde VGA sitting ready at the rear. The sole extras are a four-port

USB-A hub (plus USB-B port for connecting a PC) and a 3.5mm jack. Amazon includes speakers here as well, and they aren't as bad as we expected: the sound is dominated by treble, but music is listenable if a tad screechy at times.

There are other pleasant surprises, the main one being the colour coverage. This stretches to 84% of the DCI-P3 colour space and 120% of sRGB, and photos and films look genuinely good. We can't knock its colour accuracy either, with an average Delta E of 0.43 and a peak of

**RIGHT** The wobbly stand eschews features such as swivel and height adjustment



**ABOVE** The Amazon Basics monitor is not all bad for under £100



1.36. Even its contrast ratio is strong at over 1,400:1, while a peak brightness of 391cd/m<sup>2</sup> was far higher than we expected. Whites were also cleaner than we expected, while a top refresh rate of 100Hz and 4ms response times means gaming is definitely on the cards.

The next bright spot came via the OSD, which is so quick and easy to navigate – via a rear-mounted joystick – that we felt like sending this screen to AOC and Iiyama for lessons. While there aren't many options to wade through, you'll find it easy to switch between the presets such as Graphics, Movie, Action and Sports. We didn't find much difference – other than colour temperature – between them, but have a play.

Ultimately, however, we still recommend you buy a more expensive monitor. As we've explained elsewhere, we don't like the text fuzziness and lack of space that comes with a 1,920 x 1,080 resolution, and we also feel that USB-C should now be ubiquitous, even at this price. Nor are we impressed by the tricky-to-recycle plastic foam (you'll be lucky if plastic 6 is recycled in your area) or the meagre one-year warranty. It turns out that £99 is too cheap.

## Dell Pro P 27 USB-C Hub Monitor (P2726HE)

While we'd steer clear of this 1080p monitor, there's much to like about Dell's approach to affordable business screens

SCORE 

PRICE **£196 (£235 inc VAT)** from dell.com

**C**hoosing a Dell monitor is unlike most manufacturers: head to the homepage for Dell Pro P USB-C monitors and you can pick a screen size (22in, 24in, 27in or 34in), resolution (either 1,920 x 1,080 or 2,560 x 1,440 if you opt for 27in) and whether you have a webcam, speakers, a 1GbE port or a stand. If you choose 27in, Full HD, no webcam, no speakers and yes to Ethernet and a stand you'll be guided to the P2726HE on test here.

Before we come to the negatives, there are positives with this choice. For one, it includes a DisplayPort out for daisy-chaining. Two, it's a strong USB-C docking option: 100W of power delivery for connected laptops

is excellent, and you can also power two USB-C peripherals via a pair of ports tucked at the bottom left of the bezel; kudos too to Dell for making these obvious during the setup process. It's also an attractive and well-built display, with a generous 150mm of height adjustment, simple but effective cable tidy (a cutout in the stand), narrow bezels and support for portrait mode.

The other benefits are shared by all Dell Pro P monitors. First, the OSD is quick and intuitive, controlled via a joystick at the rear, so you'll have no trouble accessing this

**ABOVE** The screen's 1080p resolution makes text look fuzzy

**BELOW** Connectivity is a real highlight of this well-built display



monitor's features. We also like Dell's Display and Peripheral Manager software, which is particularly useful if you buy a matching Dell keyboard, mouse or webcam. We found the software works over HDMI, too.

Our biggest negative is the 1080p resolution. Not only is this limiting for any knowledge workers due to the lack of screen real estate, but on a 27in display you must suffer the graininess of an 81ppi pixel density. Nor is this a wide gamut display, covering 97% of the sRGB space with a 111% volume. Colours still look fine, helped by a 1,495:1 contrast, but there's no zing.

There isn't much point to switching colour spaces in the OSD either. While sRGB makes whites look whiter as it's extremely close to the 6500K ideal (the default is a cooler 5883K), the BT.709 space on offer makes minimal difference. Meanwhile the presets (Movie, Game, Warm, Cool) focus on colour temperature rather than meaningful change.

If you're set on buying a 27in Dell monitor with USB-C docking then we suggest paying an extra £100 or so for the P2726DEV, a 1440p display that retains the RJ45 port and adds a 1080p webcam.



## HP Series 5 Pro 527PQ

A basic monitor that lacks USB-C docking, but good value if you don't need any interesting extras

SCORE ★★★★★

PRICE £150 (£180 inc VAT) from hp.com

**T**he HP Series 5 Pro 527PQ is an old-school monitor. If it were human, it would still be using a chequebook and wearing a necktie. None of your fancy USB-C docking nonsense: you're getting HDMI and DisplayPort and you'll be happy. Its only concession to modernity is its looks, which hit the Venn diagram for both style and professionalism.

It's based around a 27in 1440p panel, which means text still looks sharp from typical viewing distances, and when we opted for the Native colour space we found whites suddenly looked much better, too. Its colour gamut stretches 22% beyond sRGB, which translates here to 85% coverage of the DCI-P3 space:



photos look punchy. There are no pre-calibrated colour spaces, only what HP calls its Enhance+ option. This theoretically enhances colours depending on what's on the screen, but we spotted no difference.

Other manufacturers could learn much from HP's five-way touchpad on the rear of the monitor, which makes it so simple to explore the OSD's options. If you prefer to use software, you can download HP Display Center, which adds PIN protection (there's also a Kensington lock slot) and makes it easy to update

**RIGHT** The elegant stand offers lots of height adjustment and swivel options

**ABOVE** This basic 1440p monitor is a great-value choice



the firmware. The Display Center also provides a handy estimate of power consumption for the eco minded; we measured 16W at 200cd/m<sup>2</sup> and 26W at our unit's peak of 379cd/m<sup>2</sup>.

We like the elegant stand, which offers 150mm of height adjustment and a smooth 45 degrees of swivel in either direction. The screen also pivots 90 degrees into portrait mode, and with slim bezels on the top, left and right we can certainly imagine this affordable screen in a multi-monitor setup. It would work particularly well with an HP monitor that supports daisy-chaining over DisplayPort, such as the HP Series 7 Pro 732xk on p92.

All the inputs sit on the rear of the unit, with a sturdy plastic cable tidy at the rear of the stand to help keep things in order. HP makes it easier to access two of the four USB-A ports by placing them closer to the left edge, with a USB-B port on hand to connect back to your host PC (without a USB-C input, you'll need this to access anything plugged into the USB-A ports).

Will the HP Series 5 Pro 527PQ blow your socks off? No. This is a plain, boring monitor that does its boring job well. If you don't need USB-C or support for specific colour spaces, it's a great-value choice.

## Iiyama ProGraphic HB2701UHSNP

This 27in 4K monitor for creatives offers impressive colour coverage, but we want more at this price

SCORE ★★★★★

PRICE £416 (£499 inc VAT) from scan.co.uk

**I**iyama's new ProGraphic range has designers, photographers and creators in its sights. That shows through the use of an IPS Black panel with a sharp 4K resolution, Pantone validation and preset colour spaces for DCI-P3, Adobe RGB, Display P3, Rec. 709, Rec. 2020 and sRGB.

We can't fault Iiyama's calibration. Choosing DCI-P3 means you'll lock down almost exactly to that space, with 95% coverage and volume, while Adobe RGB is almost as strong with 89% coverage and 91% volume. Surprisingly, Iiyama promises an unambitious average Delta E of less than 2 rather than less than 1, and



according to the colour calibration factory report its averages were actually 0.21 for sRGB, 0.54 for Adobe RGB and 0.44 for DCI-P3.

Our figures weren't as strong: we typically measured an average Delta E of around 1.5. However, if you spot any issues you can calibrate this device yourself (there's one free "User" profile); all you need is a £100 colorimeter.

Iiyama quotes a 3,000:1 contrast ratio, although our measurements were closer to 2,000:1. Still, colours are punchy, whites and blacks look good, and it reached a

**ABOVE** This is an excellent if rather overpriced monitor

**BELOW** The display is as flexible as it gets



peak brightness of 441cd/m<sup>2</sup>. An anti-glare coating does an effective job of minimising reflections, too.

There are a couple more nice inclusions. First its support for daisy-chaining via the DisplayPort output, then its docking-friendly features: a 1GbE port, three USB-A ports, two USB-C ports (in addition to the USB-C port for connecting a laptop, which can deliver 96W of power), while a USB-B port and KVM make it easy to share peripherals between your computers. This is a compact monitor, too, while the 150mm of height adjustment, pivot support and 180 degrees of swivel in each direction are as flexible as things get.

So why isn't the ProGraphic HB2701UHSNP challenging for awards? In part the clumsy OSD (not great for users who will want to frequently change settings), in part that DisplayHDR 400 certification won't impress anybody creating HDR content, in a very small part due to the poor 2W speakers.

But it's mainly down to the price, which needs to drop by a big chunk to provide a compelling reason for creative businesses and users to consider this over the existing, dominant brands.



## Sharp MultiSync EA272Q

The “human sensing” tech and integrated networking are welcome features in this business-focused monitor

SCORE ★★★★★

PRICE On application from Sharp

Sharp no longer manufactures LCD panels – other than in niches such as VR displays – but it’s a big player in the corporate display world thanks to its acquisition of NEC Display Solutions. This was completed in late 2025, which is why the NEC brand has disappeared from the MultiSync range. Here, we look at a 27in 1440p screen that, like the Eizo FlexScan EV2720S, has business rollouts on its mind. That’s why it’s so simple to assemble the EA272Q: screw the base onto the stand and it’s ready.

Sharp includes “human sensing” technology, so will dim the display by a rating you choose (by 80% by default) if it realises no-one is sitting

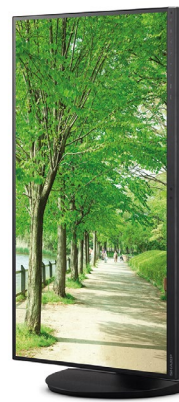


in front of the screen. It generally consumes more electricity than the Eizo, though, with 20W at 200cd/m<sup>2</sup> and 29W at its 350cd/m<sup>2</sup> peak. Alternatively you can activate Eco Mode 2, which pushes brightness down to 110cd/m<sup>2</sup> and lowers the power to around 14W.

These options are all available in the EA272Q’s text-based OSD, which is awkward to navigate compared to the Eizo but also packed with more choices. We just wish the text was less cryptic. For example, you can choose Standard, Text, Movie, Gaming, Photo and Dynamic (which uses the light

**RIGHT** Simply screw the base on to the stand and the EA272Q is ready to go

**ABOVE** The EA272Q is a great choice for business rollouts



sensor) presets, but they’re all listed under “DV MODE”. They won’t drastically change your experience – and gaming is hampered by the 75Hz refresh rate and 6ms response time – but it’s useful to have the option.

Sharp’s EA272Q offers far more connectivity than the Eizo, starting with an RJ45 port and USB-B input. It’s therefore more suitable for multi-computer setups, and there’s even support for daisy-chaining via a DisplayPort output. This accompanies the DisplayPort input, HDMI input and USB-C video connectors, with the latter offering 90W of power delivery. Again, superior to the Eizo’s 70W. All these ports sit at the rear, with only a 3.5mm jack sitting in an alcove to the left of the monitor (other EA272 monitors place USB ports here).

The pendulum swings back to Eizo for panel quality, with its wider gamut, much superior contrast and better colour accuracy. We also preferred the Eizo’s cleaner whites out of the box. Then we come to the FlexScan’s seven-year warranty compared to three years for the MultiSync. But ultimately many companies’ decisions will boil down to cost, so if you’re buying in volume it’s worth contacting Sharp direct or your reseller of choice before you plump for one over the other.

# Brightness deviation

We always measure brightness uniformity, but is it worth basing your buying decision on?

One of the advantages of OLED panels is that every pixel has its own light source, whereas IPS panels require LED backlights. When researching which monitor to buy, you often see W-LED, which refers to edge-lit backlights: this is the most common configuration, where a strip of white LEDs is placed across the edge of the panels (often just the bottom edge) and the light is then diffused across the display. Another type is full-array, which you’ll sometimes see in brighter monitors as they spread the LEDs around evenly.

More recently, we’ve seen the arrival of mini-LED backlighting – more commonly on gaming monitors and high-end TVs – which increases the density of LEDs so that you have hundreds of individually controlled zones that can be tweaked to match what’s happening on the screen.

Instinctively we all know that the perfect monitor will have an even



amount of backlighting behind every pixel, but manufacturers operate in the real world where costs matter. And in truth most people aren’t going to actually notice minor fluctuations in brightness, especially if they’re just using a screen for office work. With the naked eye, most people couldn’t discern between a superbly even display such as the Eizo ColorEdge CG3100X and the rather less perfect Dell

**ABOVE** The Dell Pro P 27 (left) has far worse brightness deviation than the Eizo CG3100X

Pro P 27: we show their measurements across 25 regions above.

So does deviation matter? For most people, no, so long as the differences aren’t awful – and thanks to our eyes making allowances, that means we can cope with drops of up to 25%. However, if your work is colour critical the amount of backlighting will have an effect on how colours look and therefore it could mislead you.



## Acer ProCreator PE320QXT

A bright, glossy 6K panel, adjustable easel-like stand and stylus support give this monitor artistic appeal

SCORE ★★★★★

PRICE £833 (£1,000 inc VAT)  
from scan.co.uk

**N**o-one could accuse Acer of lacking ambition with its ProCreator PE320QXT. It all starts with a 6K panel, with a 219ppi pixel density across a 31.5in diagonal. Next up, support for touch, whether with fingers or the supplied stylus. Then there's the clever hinged easel stand, which means the display folds almost flat against the horizontal. Acer even throws in a 4K webcam.

This ambition means it's taking Acer some time to iron out issues. We found the USB-C connection didn't work for either of our test laptops, forcing us to use the DisplayPort 1.4 input (there are two HDMI 2.1 inputs as well). Unfortunately the touch layer only works if you have a data connection with your laptop, so we ended up also using the USB-B input. Add the external power supply and we had three cables littering our desk. While we're being picky, there's no RJ45 port and both the USB-A ports are at the rear rather than on the side.

Still, once you've set up the PE320QXT it does make an intriguing choice for digital artists. We reviewed the 27in ProCreator three months ago (see issue 381, p71), but here you have a vast canvas on which to create. The clever stand means the monitor folds down to roughly a 30-degree angle, and while there is latency when pressing down the stylus tip we think digital artists will find much to enjoy. Just note the panel runs warm, so leaning your forearm against it won't be comfortable for long periods.

There's also plenty to like about this monitor for standard use. We were immediately struck by its clean whites and the sharpness of text, and it offers a wide colour gamut too. It comes pre-calibrated, with Calman

verification, although you'll need to keep calibrating it over time to ensure that those colours don't slip.

At native settings, the display covered 100% of the DCI-P3 gamut with a 121% volume, while switching to the DCI-P3 preset locked it down to that colour space: 97% coverage with a 98% volume. Its accuracy wasn't perfect, with an average Delta E of 1.61, although that

figure improved to 0.32 when we switched to the Graphics profile. The colours are accurate enough for generalists, but if your job depends on reds appearing exactly so then we'd push you to the far more expensive Eizo ColorEdge CG3100X.

There's no hood on offer here, and combined with the panel's glossy finish and no obvious anti-glare coating this isn't the best choice for an office with lots of overhead strip lighting. That said, it's bright enough – hitting a peak of 434cd/m<sup>2</sup> – that we weren't annoyed by reflections during testing. Plus, that glossy screen comes to the fore after hours, with DisplayHDR 600 certification showing in bright highlights during HDR films, while a pair of extremely capable 5W speakers meant we enjoyed listening to music and soundtracks on this monitor.

If only Acer had paid as much attention to the on-screen display. This relies on four buttons that sit on the underside of the bezel. These

**ABOVE** Acer's 6K touchscreen is an intriguing choice for digital artists

**LEFT** We found the USB-C connections to be buggy in our testing

**BELOW** The hinged stand lets you fold the display almost flat



include handy programmable shortcuts (brightness, for example) that work well, but navigating the full OSD caused us to swear in frustration on occasion as it's easy to press the wrong button by accident.

If you intend to connect multiple computers to this monitor, we recommend adding the picture-in-picture/picture-by-picture to the shortcuts. This is one area where the panel's 6K sharpness comes in extremely handy, with PIP modes allowing you to move the secondary source into each corner of the screen.

One final word goes to the webcam. It's sharp, with an extremely wide angle, and it can even capture what's happening on your desk if you swivel it downwards. It's high quality and there's a built-in mic array – we'd be happy using it for presentations as well as web calls. But it also reminded us of why we criticised the PE270XT for its lack of software: there's so much going on with this monitor that it needs clever apps to match the clever hardware. You're very reliant on Zoom, for example, playing nicely with the webcam.

Despite this criticism we gave the Acer ProCreator PE270XT five stars and a Recommended award, and its big brother is another strong choice. It drops a star because we're not convinced the easel-style drawing works so well across such a huge diagonal, and you're paying an extra £300 for the privilege. Nor do we like the fact that the USB-C connection appears buggy. But if you want a big screen and love the ability to draw, then the PE320QXT stands alone.



## AOC CU34E4CV

A good all-rounder for office work during the day and gaming at night, and we can't argue with the price

SCORE ★★★★★

PRICE £234 (£281 inc VAT)  
from misco.co.uk

**A**OC monitors have earned a reputation for great value for money, a reputation that will be done no harm at all by the company's CU34E4CV. For less than £300, you're buying a meaty 34in curved widescreen panel, USB-C connectivity, a wired network connection and a surprisingly generous five-year warranty.

Unlike the Iiyama ProLite XCB3497WQSNPH, you also benefit from picture-by-picture (PBP) and picture-in-picture (PIP) functionality. This isn't something we'd normally shout about, but having such a wide panel means it's quite natural to work on two computers side by side. In PBP mode, each computer is allocated 1,720 x 1,440 pixels, while the PIP mode gives you a choice of sizes and positions. It's a great feature to see at this price.

You'll almost certainly be using the USB-C port for connecting a laptop, with 90W of power delivery enough to keep most charging at full speed. That leaves two HDMI 2.0 ports and one DisplayPort for connecting secondary computers, with a USB-B port available if you want to share whatever devices are plugged into the four-port USB hub. Two of these USB-A ports sit on the underside of the bezel for easy access, with two more at the rear. There are no extra USB-C ports, which feels a little retro.

Like the Iiyama, we would describe the AOC's design as functional rather than beautiful. The square slab of a base keeps this 10kg monitor firmly in place – particularly useful when you're taking advantage of the 180mm of height adjustment, with a smooth motion that the Dell Pro P 34 would do well to emulate – but AOC has made little

attempt to add curves or any stylistic touches. Despite the slim bezels at the top and sides, we don't think anyone will be cooing over this monitor.

Its budget nature is also revealed in what we'll call the "OSD experience". This starts with the four cheap-feeling plastic buttons that control the on-screen display. AOC adds faint grey labels above each button, but they're tricky to see even in good

lighting, so it's wise for AOC to complement the physical labels with electronic replicas that appear when you press one of the buttons. Thankfully the OSD's structure is easy to understand, even if it will take

you a few days to grasp how AOC expects you to use the buttons to navigate.

As with the Dell and Iiyama, this panel is designed for office users rather than for demanding creatives, so there aren't many meaningful options when it comes to changing its gamut. You're getting what you're given, and that means 80% coverage of the DCI-P3 gamut and around 120% volume in the sRGB colour space. Keen photographers will need to buy a more expensive monitor if they wish to see every colour captured by their



**ABOVE** The immersive CU34E4CV is a fine choice for both work and play



**LEFT** The design is functional, but the heavy base keeps things nice and solid

**BELOW** A 34in curved widescreen panel for less than £300 is a tempting proposition



favoured camera. Nor should you expect amazing accuracy, with a decent average Delta E of 1.34 but a peak of 11.28 – that's quite a way off.

The one area where the AOC surprised us was for brightness uniformity, which was right up there with the far more expensive Eizo ColorEdge CG3100X. Commendable, but not a reason to buy this monitor, as we discuss on p85. Especially as the panel doesn't have the best viewing angles, with a change in contrast visible on white backgrounds as you move your head. At 342cd/m<sup>2</sup>, peak brightness narrowly missed AOC's 350cd/m<sup>2</sup> claims in our tests, but a contrast ratio of 3,391:1 ensures strong blacks. Whites are less striking out of the box, but we found these improved slightly when we switched to the sRGB colour space in the OSD.

Slightly off whites are to be expected from a VA rather than IPS panel, but in return you get strong curvature and with it more immersive gaming. There's also support for adaptive sync, HDR10, 120Hz refresh rates and 4ms grey-to-grey response times – the OSD even has a dedicated menu for tweaking settings for games. There are built-in speakers, too, but as these have neither balance nor bass we can guarantee you'll be reaching for your headphones within seconds.

So we have our criticisms of this monitor – including a cable tidy that's little more than a plastic clip, so we question how long it will last – but then keep coming back to the price. You're buying a solid all-round display, one capable of handling spreadsheets as well as it does games, for under £300. The Iiyama ProLite XCB3497WQSNP (note the lack of an "H" and thus a webcam) performs similarly – with its own pluses and minuses – for £10 more, making both screens solid budget choices.



## BenQ Creative Pro PD3226G

Specs are behind the curve in places, but a good choice for creatives who work in sRGB and DCI-P3 spaces

SCORE ★★★★★

PRICE £750 (£900 inc VAT) from benq.eu

**W**hen it was launched in late 2024, BenQ's Creative Pro PD3226G was at the cutting edge. Now, this 32in widescreen's specs look a fraction behind the times. Top of our list is a stated contrast ratio of 1,200:1, which now feels low for an IPS panel. It doesn't help that BenQ switches on its uniformity setting for all the preset colour spaces, and this cuts contrast in half: we typically measured around 600:1. This could be the difference between an object in shadows being visible or not.

The attempt to bring uniformity also affects peak brightness, with maximums of around 240cd/m<sup>2</sup> if you choose the Display P3, sRGB or DCI-P3 colour modes. Choose User 1 or User 2 presets, however, and you have manual control over uniformity: switching it off yields a peak brightness of around 385cd/m<sup>2</sup>.

As with the 27in BenQ MA270S, there's a preset to match the colour tone of Apple's MacBook displays, but here you can access the full OSD without downloading BenQ's Display Pilot 2 applet. The OSD is very easy to use, but for those who often flick between gamuts BenQ provides its wireless Hotkey Puck 3. The central dial is also a great way to adjust the brightness, and you can customise what the dial and buttons do in the OSD.

For example, you may want the 1, 2 and 3 buttons to switch between inputs, with HDMI and DisplayPort sitting alongside the Thunderbolt 4 port. This also supports laptops with USB-C ports and delivers up to 90W of power. It's great to see support for daisy-chaining too, and we were surprised to see that this 32in widescreen monitor pivots into portrait mode – buy two and you have a highly versatile setup.

Build quality is strong, with a slick 150mm of height adjustment. The monitor sits firmly on its wide, silver stand, which complements the black bezel around the monitor itself. If we're being picky we might point out that the amount of tilt (5 degrees forward, 20 back) and swivel (30 degrees left and right) could be more generous, but overall it's tough to dislike the physical design. Those who hate cables should note a basic cable tidy that attaches to the rear of the stand.

There are two USB-C ports on the back, while a trio of USB-A ports, final USB-C port and 3.5mm jack sit on the bottom bezel. BenQ also packs a pair of 3W speakers, with music listenable so long as it isn't dominated by bass. The only obvious omission – again shared with the MA270S – is the lack of an RJ45 port for wired networking.

The panel itself is a mixed affair. We're happy with the sharpness that comes from squeezing 3,840 x 2,160 pixels across a 31.5in diagonal, with text looking great from regular viewing distances. You don't get the sheer level of detail that comes from its sister offering, but most people can live with that. It supports DisplayHDR 400

**ABOVE** The Creative Pro PD3226G is a well-built, high-quality monitor

**LEFT** The solid silver stand provides a firm base for the screen

**BELOW** Support for portrait mode adds to the display's versatility



certification, which is always welcome even if it only guarantees that the brightest whites will reach 400cd/m<sup>2</sup>, while support for AMD FreeSync Premium, a claimed 1ms response time and 144Hz refresh rate are all definite ticks for gamers.

The panel itself is capable of great things, and luckily the OSD offers such control that you can play around to find what suits you best. For general working, we switched to a user preset then chose the P3 gamut, and pushed the brightness up to around 80%. This gave us the clean whites we love in spreadsheets and Word. If you stick to the presets, Display P3 offers the widest gamuts – 91% of DCI-P3 space – while sRGB locks almost perfectly to that colour space (93% gamut coverage and 94% volume). BenQ even offers a DualView feature, so you can have the left half of the screen in DCI-P3 mode, say, and the right hand side in sRGB.

All of which means that this is a high-quality monitor with excellent versatility: support for portrait mode, daisy-chaining, the wireless puck and plenty of gamer-friendly specs are all huge boons. But they come with negatives: this monitor's EPEAT rating is only Silver, there's no RJ45 port, and their obligatory use of uniformity with so little contrast to play with means we would generally avoid the preset modes. Note the lack of curvature, too, so this is a flat expanse of glass. The BenQ Creative Pro PD3226G is a fine monitor, but it just misses out on a Recommended award.



## Dell Pro P 34 USB-C Hub Conferencing Monitor (P3426WEB)

A high-quality webcam makes this a strong choice for daily web calls even if the panel isn't the very best

SCORE 

PRICE £490 (£588 inc VAT) from dell.com

In the past, webcams built into monitors have felt like an afterthought at best. Not so with the extraordinarily long-named Dell Pro P 34 USB-C Hub Conferencing Monitor (thankfully it's easily identified by searching for "P3426WEB"). Whatever you call the monitor, its 1440p webcam is a star feature, despite the fact it sits so small atop the screen. It produces excellent videos with clear (if a tad boomy) audio that we would be happy to use in daily calls. Colours are strong, details clearly discernible and the fact you can tilt the webcam down means that you don't have to adjust the whole panel to centre yourself in the frame.

This lifts the Dell well above the Iiyama ProLite XCB3497WQSNPH – a rival 34in monitor with an integrated webcam – although they both share support for Windows Hello and include a privacy shutter. Likewise a pair of 5W speakers, with Dell's offering again taking the lead by providing a more rounded sound than the Iiyama. If we're being critical, they lack bass, which was noticeable in certain tracks, but music is never massacred as it so often is with built-in monitor speakers.

The P3426WEB uses a curved IPS panel, but unlike the 34in AOC and Iiyama screens that curve is gentle; almost unnoticeable when sitting in front of it, in fact. In theory, IPS panels offer clearer whites than their MVA counterparts, although we had to push brightness up to around 90% here for the bright whites we were hoping for. That also increases power consumption, but with 27W at 200cd/m<sup>2</sup> and 41W at the Dell's peak of 327cd/m<sup>2</sup> (a lower peak than

Dell claims, for our review unit at least), you won't see a massive jump in your electricity bill.

Don't expect eye-whacking colours, with the gamut limited to 79% of DCI-P3. This is a pragmatic decision by

Dell, as it could argue that office users – at whom this monitor is clearly aimed – won't be spending their time watching blockbusters on this screen.

That's true, but we would still have liked a richer gamut bearing in mind this monitor's price.

Incidentally, Dell does provide presets called Movie and Game, but neither wowed us. Instead, we stuck with the default, out-of-the-box setting, where colours were accurate – as shown by an average Delta E of 0.6 – and the colour temperature was a solid 6305K. Knowledge workers who spend their days in Word and Excel will prefer 6500K, where whites look "right", but 195K isn't a huge amount out.

There aren't many options to be found in the OSD, but as with all recent Dell monitors we've tested the P3426WEB's is easy to navigate via a rear-mounted joystick. You can also download Dell's excellent Display and Peripheral manager, which works over HDMI without any need for a USB connection if you're using a PC. But most people are surely likely to connect their main system over USB-C, as this reduces cable clutter courtesy of 90W power delivery.



**ABOVE** This gently curved IPS monitor is a great choice for video calls

Doing so also opens up access to the generous number of USB ports. One USB-A and USB-C port apiece are available via a drop-down expansion port that otherwise sits hidden on the bottom bezel, with a further pair at the rear. Due to the sheer size of the panel these are tougher to access, despite a respectable 21 degrees of backwards tilt, so it's worth thinking about what you want to connect there permanently (such as a USB dongle for a wireless mouse) during setup.

There's nothing fancy about this monitor's cable tidy, essentially a cutout at the front and rear of the stand. This means cables stay hidden if you keep the panel at the bottom of its 150mm of height adjustment, but they become visible as you move it up. Dell could also learn lessons from Eizo on the smoothness of its mechanism, which feels basic and makes a grinding noise as the panel goes up and down. Dell wins for looks, though, with the silver stand and base contrasting nicely with the slender, black bezels.

If it were £100 less this monitor would walk away with an award as it excels in several key areas, but we hoped for a wider-gamut panel at this price. If you want to extend the basic three-year warranty to five years you'd normally have to pay another £78, but at the time of writing Dell was offering a tempting upgrade to five years of ProSupport, which includes 24/7 software support and advanced exchange of faulty equipment, for £32.

All of which means that if you're after a 100% work-focused monitor, and will take advantage of its excellent webcam, then this is a good choice even at the published price.

**LEFT** The ports at the rear are slightly tricky to access

**BELOW** The silver stand contrasts nicely with the black bezels



## Eizo ColorEdge CG3100X

This 30.5in panel is ideal for creators, designers and editors where colour range and accuracy is everything

**SCORE** ★★★★★

**PRICE** £4,166 (£4,999 inc VAT)  
from [wexphotovideo.com](https://wexphotovideo.com)

**S**ome monitors are cut from different cloth. Such is the case for Eizo's ColorEdge CG3100X, which has professional designers and video editors in its targets. The idea is to make a heavy up-front investment in the confident knowledge that it will keep delivering accurate colours for many years to come. The warranty lasts for five years, but such is the build quality that we would expect it to last for a decade and beyond. Eizo also provides a six-month guarantee of no bright sub-pixels, which is worth having when you consider its 4,096 x 2,160 resolution – one step beyond 4K.

Another key element to its longevity is the built-in calibrator. You can activate this manually or keep to the default schedule of every 200 hours of use, at which point it will update its profiles for eight different colour modes: BT.2020, BT.709, DCI-P3, PQ DCI-P3, HLG BT.2100, Adobe RGB, sRGB and CAL. There's also a user preset available if that gamut of gamuts doesn't cover what you want.

Each calibration takes only a few minutes. The inch-long colorimeter, which is built into the display's top bezel, swings into view, at which point a series of colours appears in the tiny sliver of screen beneath it. You can keep working throughout.

While colour accuracy is up there with the best, with low average Delta E figures across sRGB, DCI-P3 and Adobe RGB, it's the wide gamut and exceptional brightness uniformity that hammers home the quality. Switch to Adobe RGB and it locks down to that colour space, with 91% coverage and 94% volume, with similarly strong figures for DCI-P3: 95% coverage, 99% volume. In short, you can trust what you see. And its uniformity is spectacular, with a

worst result of around 4% brighter measurement than the centre – other monitors here would dream of having that as their average. It comes at the minor expense of peak brightness; if you prioritise uniformity, as is the default, the panel will peak at around 420cd/m<sup>2</sup> rather

than the stated 500cd/m<sup>2</sup>.

Eizo is the only one of the manufacturers here to tell you the brightness in the OSD – itself a phenomenon as it's so easy to follow. You can stick to lower brightnesses here as the monitor ships with a hood that magnetically

clips on and shields against ambient lighting. HDR video editors should note that with no support for DisplayHDR 600 or higher, you won't be able to see exactly how your work will appear on an HDR TV, but this is where the perceptual quantization (PQ) option comes in, highlighting areas of the image that are clipped. It also supports hybrid log-gamma (HLG) in the BT.2100 colour space.

One more feature photographers and video editors will appreciate: 4K zoom. You can access this via the OSD, where you then choose whether to zoom in to the centre, top left, bottom left, top right or bottom right of the screen. If you use this feature regularly, set one of the touch-sensitive buttons on the bezel to activate it.

Eizo also provides its ColorNavigator 7 software, which opens up a heap more colour options. Meanwhile, IT

**ABOVE** A built-in colorimeter means that colours will always look perfect



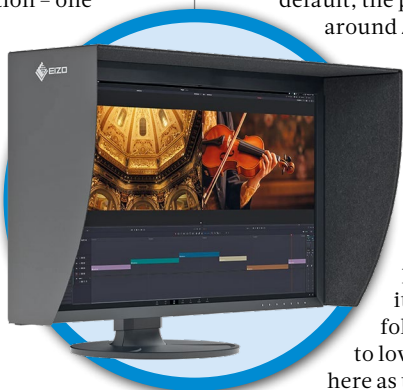
**LEFT** The CG3100X ships with a hood that shields the screen from ambient lighting

**BELOW** The ports are easy to access

teams will appreciate the ability to remotely manage a fleet of these Eizo monitors, so long as you take advantage of the RJ45 port. Despite the CG3100X coming out last year, Eizo sticks with DisplayPort 1.2 and HDMI 2.0 rather than 1.4 and 2.1, but this makes sense as the screen is limited to 60Hz rather than the bandwidth-hungry 120Hz panels. The DisplayPort supports up to DCI 4K at 4:4:4 10-bit, HDMI up to 4:4:4 12-bit. Or you can connect over USB-C, with 94W of power delivery. The final rear-mounted port is USB-B, with four USB-A ports sitting in an enclave on the left-hand side of the monitor.

All the ports are easy to access thanks to a generous 35-degree rear tilt and 178 degrees of swivel, and the solid stand makes sharing your screen with neighbours reassuringly simple. There's no support for pivot mode, and relatively thick bezels almost give this monitor a retro feel, but it hits all the right ergonomic notes thanks to 155mm of smooth height adjustment. And while Eizo doesn't seek EPEAT certification for its ColorEdge monitors, you can take comfort from the fact that the CG3100X's housing consists of more than 85% recycled plastic; Eizo's sustainability credentials are second to none this month.

As we often say, though, what matters most when buying expensive equipment is how long it will last. Even if you upgrade to a new suite of ColorEdge models in five years' time, the CG3100X will keep delivering the goods for its second owner in the same way that Apple products often do. If you'll take advantage of its colour range and its long-term accuracy, this £4,999 monitor is superb value for money.





# tom's guide<sup>★</sup>

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## HP Series 7 Pro 732xk

The high-quality 31.5in IPS Black panel is the star, but it's backed up by superb connectivity and features

SCORE ★★★★★

PRICE £600 (£720 inc VAT) from hp.com

**W**e were reminded of Goldilocks when testing the HP Series 7 Pro 732xk. The Eizo ColorEdge CG3100X is a magnificent monitor but expensive. The Dell Pro P 34 packs all the connectivity any hybrid worker could desire, but the panel isn't good enough for us to love. The HP Series 7 Pro is just right, with a superb IPS Black display backed up by heaps of features and connectivity. Even the price is right, to the point where the 732xk may even be too alluring: no units were in stock at the time of review, so you may need to wait a while.

It's worth waiting for, because HP has picked a brilliant 31.5in panel with a 4K resolution. That not only provides sharper visuals than 34in rivals with a 3,440 x 1,440 display – 140 pixels per inch versus 110ppi – but means you can comfortably fit three windows side by side.

But the real reason we love the HP Series 7 Pro 732xk is its colour coverage. IPS Black panels are more premium than standard IPS panels, and that shows in 96% coverage of the DCI-P3 space and stunning 95% coverage of Adobe RGB. Those are the sort of figures we'd expect to see from a monitor aimed at creative users, and it's backed up with superb colour accuracy.

All of this means that 4K video looks fantastic, and we're delighted to see support for DisplayHDR 600. The stars shone particularly brightly in Netflix's *Our Universe*. Gamers have cause for cheer too, with a 120Hz refresh rate, support for adaptive sync and a 5ms response time; there is motion blur on fast-moving objects (typical of IPS Black displays), so we'd still recommend a gaming monitor if you're constantly playing FPS games.

If you spend most of your time in Word and Excel, though, you'll love this monitor's whites. They're among

the cleanest of all the monitors we've tested this month, as reflected in the panel's 6540K colour temperature when we switched to the sRGB colour space.

That's extremely close to the 6500K ideal. And just to cap it off, HP makes it easy to switch between the calibrated colour spaces – Display P3, sRGB, Adobe

RGB and BT.709 – while providing three user slots if you prefer to calibrate the monitor yourself.

You can switch between the colour spaces via a shortcut key built into the five-way touchpad at the rear of the monitor, while another lets you activate the picture-by-picture function where you can display the output from two computers side by side (there's also a picture-in-picture option). HP packs plenty of inputs here, too, with DisplayPort, HDMI and USB-C as per usual, but also a Thunderbolt 4 option. It's also a brilliant choice for daisy-chaining, with both a Thunderbolt 4 output and a DisplayPort output.

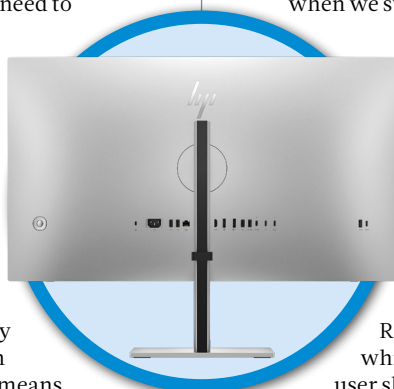
And there's more. HP provides five USB-A ports on the rear, with one sitting closer to the left edge – as you look at the monitor – to make it easier to access. A further USB-C port sits next to it, this time for adding peripherals. Because all of these ports support USB 3.2 Gen2 and its 10Gbits/sec transfers, external SSD drives are a workable option. The final cherry is an RJ45 port that goes up to

**ABOVE** The HP Series 7 Pro has a fantastic IPS Black display



**LEFT** Connections include a Thunderbolt 4 input and output

**BELOW** The compact silver stand is extremely adjustable



2.5Gbits/sec for wired networking, with a Kensington lock nearby if you want to lock it down physically too.

IT admins can manage connected HP Series Pro monitors using the HP Client Management Script Library, a set of PowerShell modules, while end users should download HP Display Center. This is an excellent app that not only lets you control day-to-day settings, effectively duplicating the OSD, but also to recalibrate colour spaces or create your own. There are plenty more advanced settings too, so we recommend you explore the options. One thing you won't find is a volume switch, for HP decided not to include speakers with this monitor, nor a webcam, so if you're looking for an all-in-one videoconferencing solution we would point you to the Dell Pro P 34 instead.

Before we finish, we have yet more words of praise for the stand. The silver metal base is pleasingly compact, stealing minimal space from your desk, but provides a firm foundation for this flexible monitor:

it swivels easily 45 degrees in either direction, has a generous 150mm of height adjustment and pivots smoothly into portrait mode. The Sharp and Eizo panels tilt back further, which is occasionally useful, but that's us being as fussy as Goldilocks.

And she's right, as this isn't quite the perfect screen: no speakers, no webcam, limited tilt, mediocre brightness uniformity. However, with so many things counting in favour of the HP Series 7 Pro 732xk we have no hesitation in making it the Labs Winner for larger monitors. Let's hope it comes back into stock soon.



## Iiyama ProLite XCB3497WQSNPH

A 34in business monitor that includes all the mod cons for a surprisingly aggressive price

SCORE ★★★★★

PRICE £292 (£350 inc VAT) from scan.co.uk

If you're on the hunt for a widescreen monitor for less than £400, this month sees an all-out battle between two equally great-value screens: the AOC CU34E4CV and Iiyama ProLite XCB3497WQSNPH, with roughly £70 separating them. However, we should mention that Scan sells the XCB3497WQSNP, which drops the H suffix and the webcam but is otherwise identical, for £290.

Is the webcam worth the £60 premium? For most people, probably not. It adds the convenience of support for Windows Hello, but the camera itself is a plain Jane model despite its high 4.5MP resolution. It will be fine for the occasional web call, and provides plenty of detail (up to 2,816 x 1,584), but the images are a little washed out and the mics could do with a boost. It's fixed in place so also lacks the flexibility of better webcams, such as the Dell Pro P3426WEB's; you'll need to adjust the angle of the whole monitor to frame yourself. We do appreciate the privacy cover, though, while a white LED makes it obvious when the camera is active.

However, the camera is only one of this screen's many talents. To start with it's a true docking monitor, with 95W of power delivery over USB-C together with 1GbE wired networking. You also benefit from four USB ports: two are Type-A, two are Type-C. Connect a keyboard, mouse, external storage (although they're all limited to 5Gbits/sec transfers) or a dedicated webcam and you can share them between connected PCs thanks to the USB-B port. It's great to see two HDMI connectors alongside the DisplayPort socket, too.



Iiyama includes a KVM to make this process easier, although there's no picture-by-picture or picture-in-picture feature. A shame, as a 34in panel with a 3,440 x 1,440 resolution works well in these situations.

It's a 1500R curved screen, which means a circle formed of these monitors would have a radius of 1.5m. That compares to the 3800R (3.8m) of the Dell Pro P3426WEB, and the bigger curve is obvious on a desk. There's an argument for both approaches – the ProLite's curve means games in particular are more immersive – but it also reflects the choice of panel. Here, it's VA rather than IPS, and that means you lose out on the Dell's crisp whiteness. If your life is all spreadsheets and no play then we would push you to the latter technology.

VA has its own plus points, though, including greater contrast – 2,756:1 here compared to 1,356:1 for the Dell – and historically lower response times. Iiyama doubles down on this by adding support for AMD FreeSync Premium and providing a 120Hz refresh rate. The speakers are also more than good enough to enjoy games on, and even some music. Sure, a dedicated speaker will produce better bass and detail, but they aren't the tickbox feature of some other monitors here.

The panel itself has a limited gamut, maxing out at 120% of sRGB. That results in 84%

coverage of DCI-P3, which is fine. As is an average Delta E of 0.83, with anything less than 1 imperceptible to the human eye. We're also happy with a peak brightness of 373cd/m<sup>2</sup>, more than Iiyama claims, as around 200cd/m<sup>2</sup> is plenty for all but the brightest of rooms.

Don't expect much control of colours in the OSD, with Iiyama focusing on the out-of-box office experience rather than targeting designers or twiddlers. There are its customary i-Style profiles to choose from, including Game, Cinema, Scenery and Text, but these adjust settings such as colour temperature and sharpness rather than shifting the panel's colour gamut.

You access these controls via an easy-to-use joystick tucked underneath the bottom bezel in the middle, and you should find yourself zipping through options once you learn what the icons mean. Unlike Dell and Eizo, Iiyama doesn't provide extra software to avoid the OSD or for asset management.

However, this is a screen that should last. Iiyama always performs well in our annual service and reliability survey, and we were impressed to see that the company backs up this monitor with a five-year warranty. And while we wouldn't call the ProLite XCB3497WQSNPH the most stylish of screens, it feels well built, with a smooth 150mm of height adjustment, plenty of backwards tilt and a wide 45 degrees of swivel in either direction.

Sure, the image quality can't match the far more expensive HP, but whether you choose the version with or without a webcam, you get a lot of monitor for your money.

**ABOVE** This curved widescreen display is great value at £350



**LEFT** A 4.5MP webcam sits on top of the display

**BELOW** The stand offers lots of swivel, tilt and height adjustment options





## How we test

Details of the exhaustive procedures we put each screen through

**A**s with all our testing, where possible we use a mix of real-world and technical tests to determine the quality of the products. Here, that means using each monitor as our daily work screen to see not just how enjoyable it is to look at but its usability: how intuitive is the on-screen display, how well engineered is the stand, how convenient are the ports?

We also explore the OSD in depth to see what options it provides users. In particular, we will praise screens that allow people to switch between colour profiles – say from sRGB to DCI-P3. But only if that switch is effective, which is where our technical tests come in.

These use an X-Rite i1 Display Pro HL colorimeter in tandem with the display calibration and open-source profiling software, DisplayCal. We measure each display's maximum brightness in  $\text{cd}/\text{m}^2$ , its contrast ratio and colour temperature, and each panel's colour gamut as a percentage of the sRGB, DCI-P3 and Adobe RGB gamuts. We take these measurements in the default setting (as supplied), and in those colour profiles if available.

We also test the evenness of the LED backlights by measuring brightness and contrast across 25 points on the screen. In addition, we test each monitor's colour accuracy (using the sRGB profile if available) from a central point on the screen. This process measures how close the display colours are to their intended shade. The difference is measured in the unit of colour difference, Delta E: the higher the figure, the poorer the match.

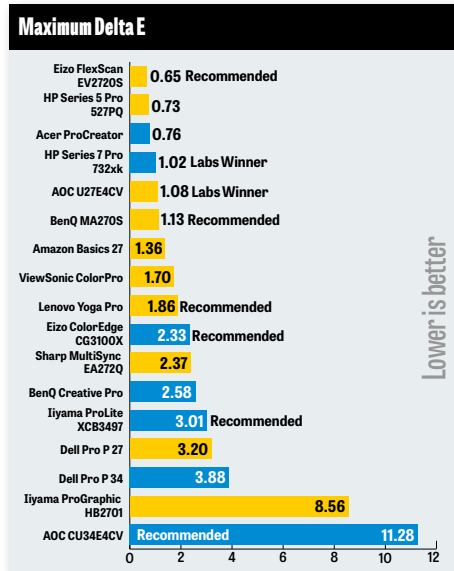
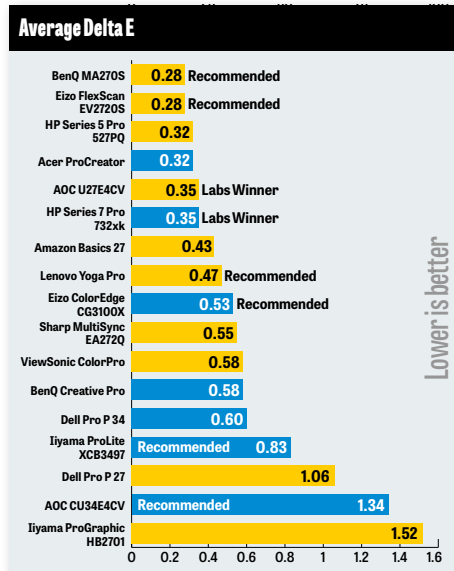
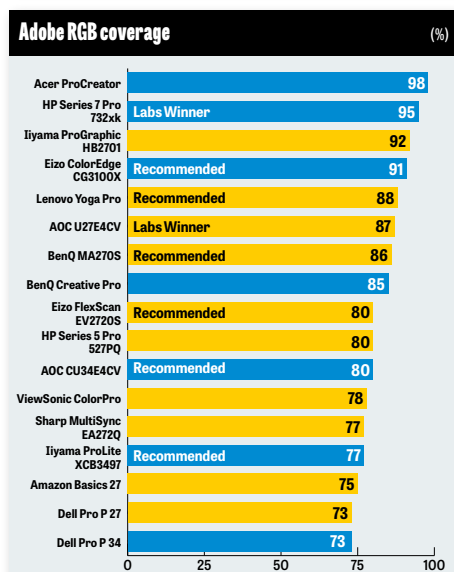
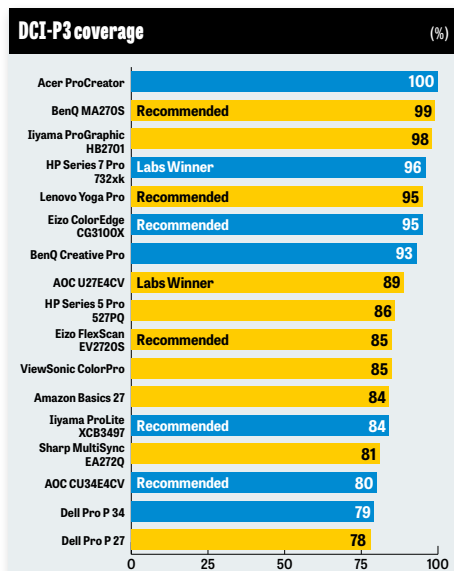
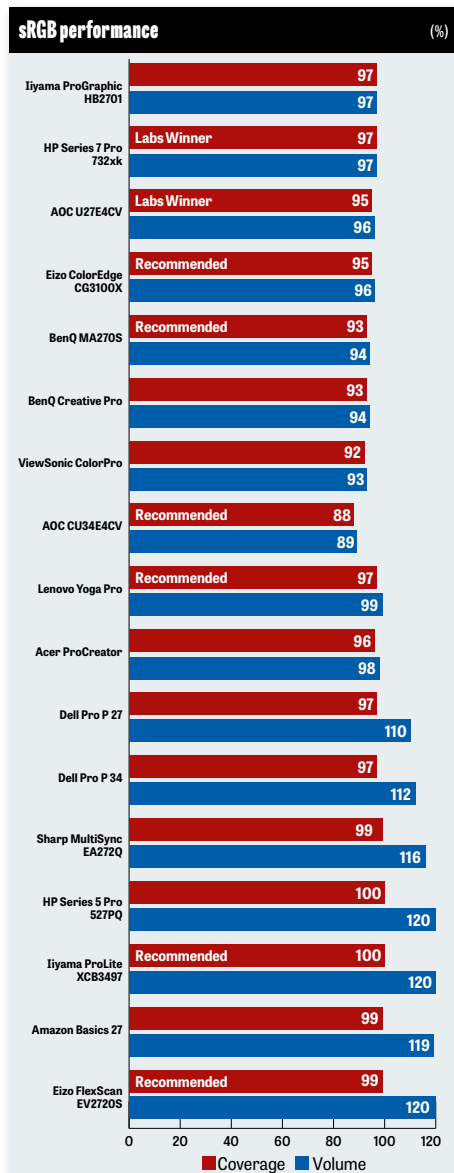
Finally, we check the power consumption of each monitor at  $200\text{cd}/\text{m}^2$  and at its peak brightness.



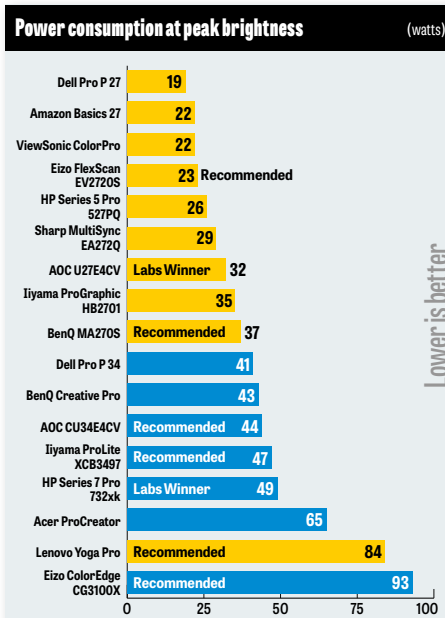
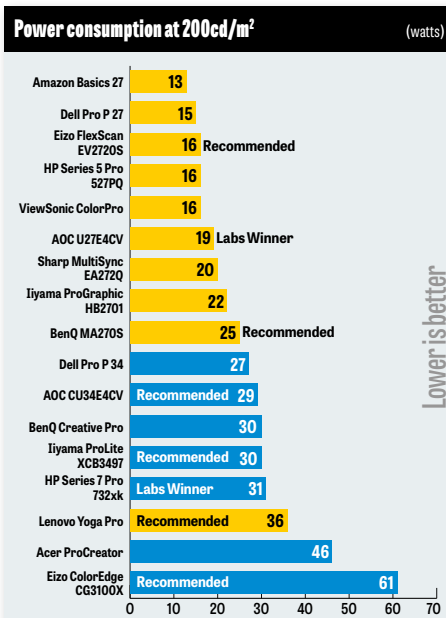
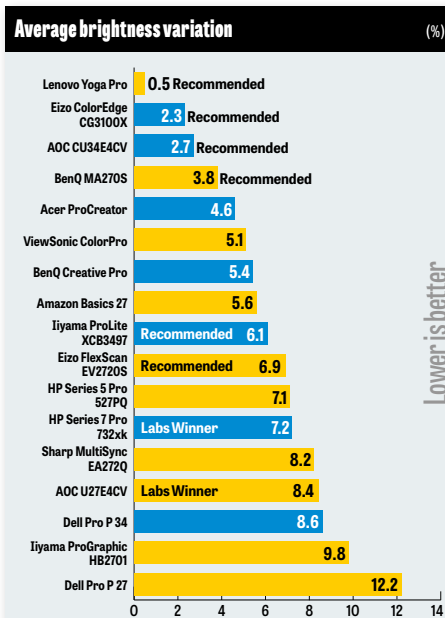
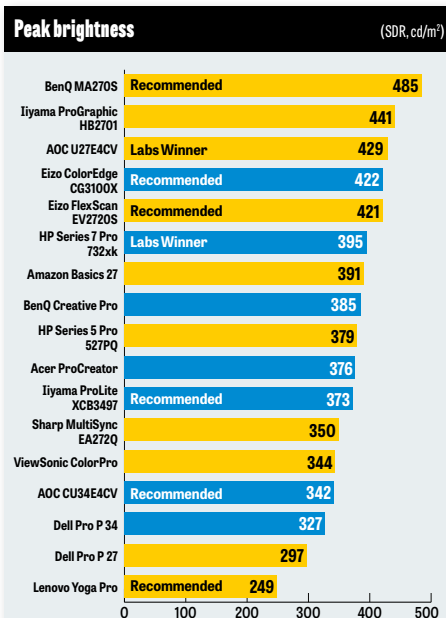
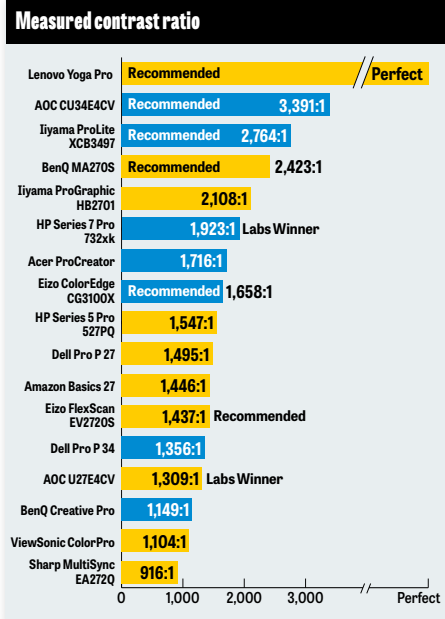
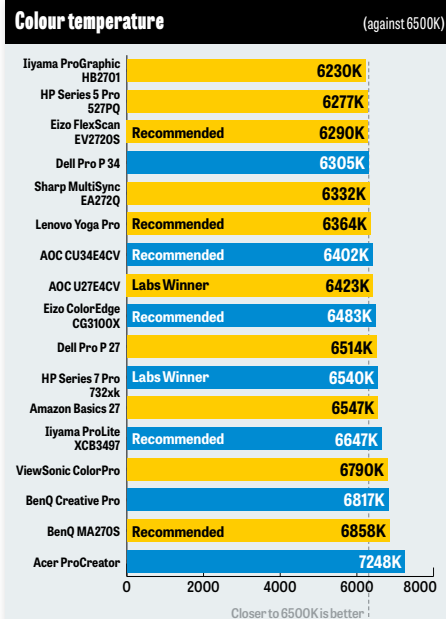
**ABOVE** An X-Rite i1 Display Pro HL colorimeter helps us determine a display's image quality

## Quality test results

**COLOUR TESTING** Note that colour space testing was performed in the monitor's relevant mode (such as sRGB or DCI-P3) if available. If not, we used a 6500K colour temperature. If that wasn't available, we used the default mode. The ideal is for a monitor to achieve 100% sRGB coverage and 100% volume: a big difference between the two values shows the panel isn't tuned to that colour space.







## View from the Labs

While it's always a pleasure to compare the world's best monitors, the ending is rarely a happy one

I love writing a *PC Pro Labs*. It's a privilege to test and compare all the best products currently on sale, and to then distil weeks of testing into pithy reviews that help guide *PC Pro* readers into making the right decision.

There's also a delicious sense of completion when you finish. After so much effort, I'm always glad to hand it over to our production editor to make sense of my confused phrasing and grammatical curios.

But I confess, too, to a sense of sadness. I could only test the supremely brilliant Eizo ColorEdge CG3100X for four days as Eizo needed the sample back for a show. The brilliant BenQ monitors are now sitting behind me packed up in boxes, ready for collection. It's also been a real pleasure to test the latest high-end offerings from Iiyama, Lenovo and ViewSonic.

While the productivity-focused monitors haven't always sent a tingle of excitement down my spine, they have ensured my desk looks relatively tidy. Right at the start of this Labs I determined to take advantage of built-in RJ45 ports, USB-C charging for my laptop and built-in USB hubs to minimise the number of cables that infest my desk space. Cables recreate so fast that watching rabbits can only applaud.

And now comes the long goodbye. Over the next few days, couriers will collect the boxes that have dominated my office shed for the past four weeks. Soon empty nest syndrome begins, tears welling in my eyes as I think of the monitors that once sat in front of me.

Don't get me wrong: occasionally a monitor is left behind, usually because it costs the company too much to courier it back to its European base and go through the administrative hassle of returning it to stock as "seconds". But sadly it's never the monitor that I fell in love with during the Labs.

So, what am I left with this month? The one model that I bought specifically for this Labs: the Amazon Basics 27-inch Monitor. Which will be heading into my garage for storage, unless anyone would like to email me - editor@pcpro.co.uk - to explain why they can give it a home. ●



Tim Danton is editor-in-chief of *PC Pro*, but could quite happily spend all his time testing monitors. He's odd like that.

# The Network

Practical buying and strategic advice for IT managers and decision makers

## Buyer's guide

# Protect your business with a UTM appliance

Threats to SMBs are only ramping up, but unified threat management security appliances could hold the answer. **Dave Mitchell** explains what to look for



**B**usinesses that think they are too small to be of interest to cybercriminals are woefully misguided, as it's precisely this cavalier attitude that makes them easy pickings. The financial fallout from a successful cyberattack could be many times higher than the price of protection and, in the case of ransomware demands, could even drive smaller businesses to extinction.

The 2026 Cyber Threat Report ([tinyurl.com/384breachreport](https://tinyurl.com/384breachreport)) from ISP Beaming revealed that UK businesses were targeted by an average of 1,988 cyberattacks every day during the first three months of this year. The UK government's Cyber Security Breaches Survey 2025/2026 ([tinyurl.com/384breachsurvey](https://tinyurl.com/384breachsurvey)) makes equally grim reading: it identified 43% of UK businesses that had experienced a cyberattack over this period, which equates to around 612,000 businesses – and that's only those that were able to identify a breach and were willing to report it.

If you want to stay safe in 2026 you need to reduce your attack surface, and one easy way to do this is to invest in a network security solution. The latest unified threat management (UTM) security appliances offer the perfect solution as they provide an incredible range of security measures at pocket-friendly prices.

In this month's guide, we review network security solutions from four of the big names – DrayTek, Sophos, WatchGuard and Zyxel. We've selected products suited to a wide range of environments and tested them in the lab to help you choose the best protection.

### Close to the edge

UTM security appliances are easy to deploy. They sit on the network edge, where they can inspect all inbound and outbound traffic and block malware and suspicious activities. This makes them ideal for businesses with limited on-site IT expertise as they integrate everything into one easily managed device.

It's important to maximise your investment by choosing an appliance that doesn't become a bottleneck as your business grows. Look at the amount of internet traffic being generated and choose one that has the capacity to handle current loads but also the hardware to cope with future demand.

Vendors quote a range of performance stats in their appliance datasheets, but don't be

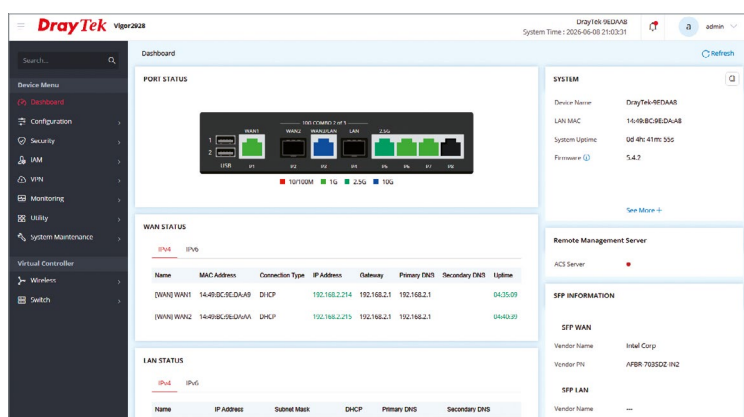
**"Some solutions augment malware protection with cloud sandboxing to protect against zero-day attacks"**

swayed only by the raw firewall throughput numbers. These are arrived at by testing with lightweight UDP packets and don't reflect real-world usage.

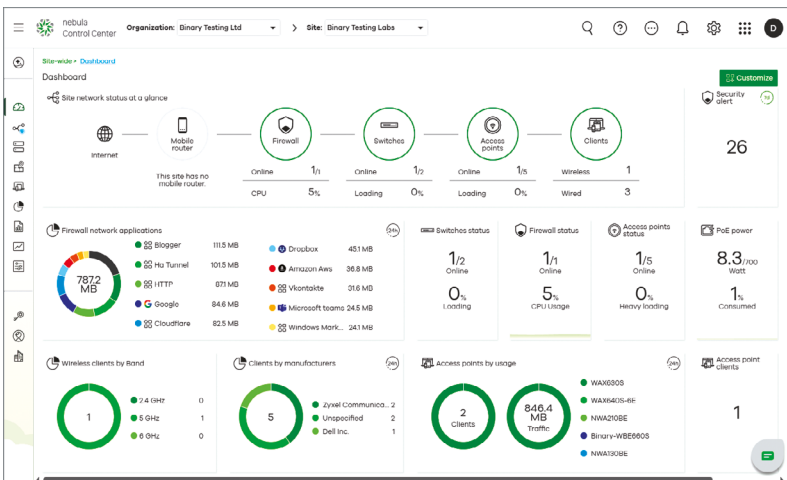
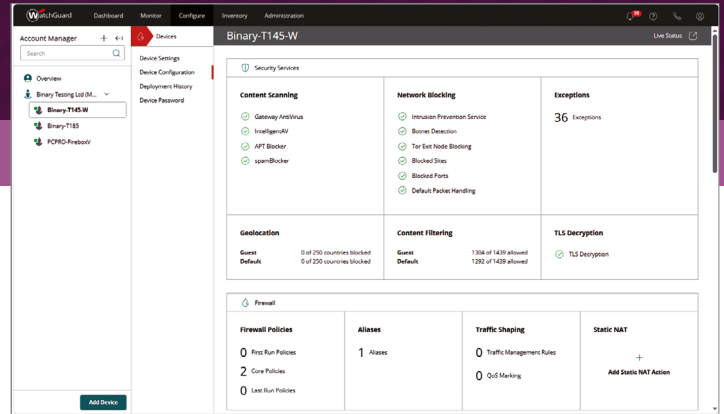
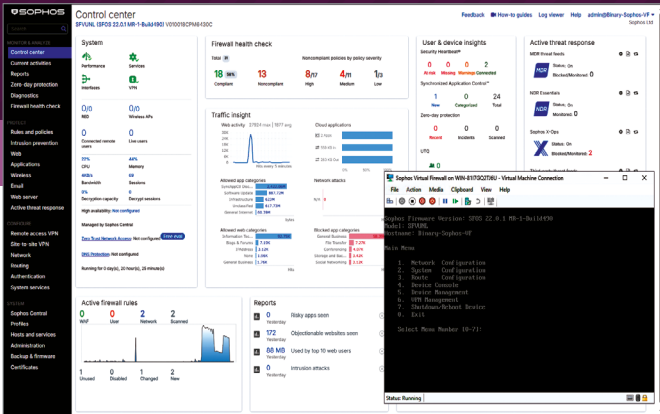
Services such as anti-malware and intrusion prevention services (IPS) are far more demanding so use these lower figures as a baseline when sizing the appliance.

Most internet traffic is now encrypted, which the appliance must decrypt, inspect and then re-encrypt. These processes place a heavy load on the appliance's CPU so pay particular attention to the quoted HTTPS throughput numbers, as these will invariably be the lowest.

**BELOW** DrayTek's Vigor 2928 offers multiple 10GbE ports and great WAN redundancy features







**ABOVE LEFT** We had no problems hosting the Sophos Firewall Virtual on our Hyper-V host

**ABOVE** All WatchGuard security policies are accessed from one page in the cloud portal

**LEFT** All Zyxel's security appliances, switches and APs can be managed from the NCC web portal

appliance can protect them as well. It's easy as you just need to move your existing wireless access points (APs) behind the appliance on its LAN side so it can inspect their internet traffic and enforce security policies.

Alternatively, look for appliances with a wireless gateway feature, as these can centrally manage the vendor's own wireless APs. Smaller businesses that want all their network services under one roof should consider appliances with an integrated wireless AP – we have one product on review that does both and offers the latest Wi-Fi 7 services.

Businesses that have invested in virtualisation can skip the hardware completely if they wish, as some vendors allow their security appliances to be hosted as virtual machines (VMs). We test one solution which we hosted on our Hyper-V server and found that it offers all the same security features as the vendor's hardware appliances.

Businesses that need to deploy UTM appliances to remote sites and branch offices should consider vendors that offer cloud management. These provide cloud

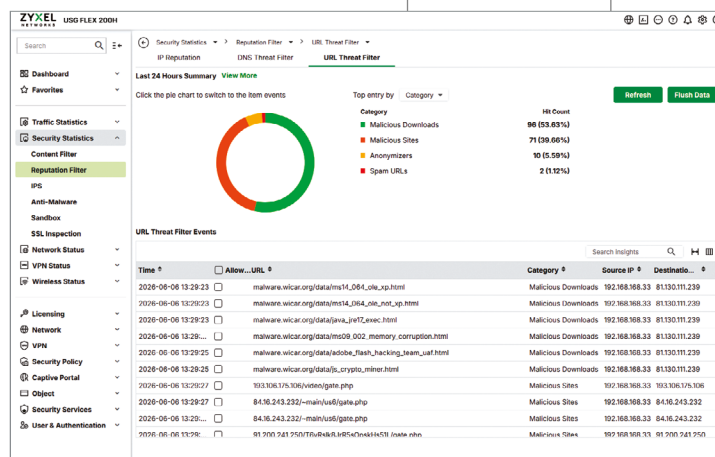
## Feature creatures

The latest UTM appliances offer a remarkable range of security services, many of which are non-negotiable. Malware protection is essential as this checks all web traffic and downloads for malicious content and viruses and blocks them at the gateway so they don't get onto your network.

Some solutions augment malware protection with cloud sandboxing to protect against zero-day attacks. They block downloads of new and unknown files, send them to a safe remote environment and "detonate" them to see if they harbour any nasty payloads.

DNS (domain name system) filtering is equally important. The appliance intercepts web requests and checks them against a database of known malicious websites before allowing them through, which can be very effective against botnets and command and control traffic. Web content filtering offers big productivity gains; this allows you to decide which website categories users can visit and block access to those hosting online games, shopping sites and so on.

Deep packet inspection (DPI) goes beyond examining a packet header and can peer inside to see what data it is carrying. This brings application controls into play, and the best products can inspect network traffic at the L7 application layer and use



thousands of signatures for managing access to common applications and categories such as social networking.

The biggest decision facing SMBs is deciding which security services they need. The good news is the majority of vendors offer a range of subscription services. The most flexible subscriptions provide a pick-and-mix buffet so you can choose the features you need, stay within your budget and upgrade the appliance with more features when the time is right.

## Joined up security

Forward-thinking businesses are taking a wireless-first approach to their networks, and a security

**ABOVE** Zyxel's clever Smart Sync feature allows the USG Flex 200H to be managed locally and in the cloud

portals so you can remotely monitor and configure all your appliances regardless of their location, with the best vendors including this service for free. Essential firmware upgrades and signature updates across multiple appliances are also easier to manage as the cloud portal can run these automatically to ensure you're always on the latest versions.

Most UTM vendors force you to choose between local and cloud management to avoid configuration issues. However, one appliance in this guide can do both, with its Smart Sync feature ensuring that any changes made using one interface are always synced to the other.



## DrayTek Vigor 2928

A smart SMB security router with great WAN redundancy features, lots of high-speed ports and a very low price

SCORE ★★★★★

PRICE £242 ex VAT  
from broadbandbuyer.com

**D**rayTek's Vigor 2928 looks to have a network connection for every occasion as this unassuming desktop security router is bursting with high-speed ports. You have 10GbE SFP+ fibre plus gigabit copper for WAN duties and a switchable 10GbE copper multi-gig port for WAN or LAN connections, while standard LAN services are handled by one 10GbE copper, one 2.5GbE and three gigabit ports.

DrayTek is the master of WAN redundancy, with the Vigor 2928 supporting two active internet connections in failover or load-balancing mode, while the USB-A 2 ports can be used to add LTE modems for backup links. If that's not enough, the 2928 boasts a stonking raw firewall throughput of 9.3Gbits/sec, supports up to 50 concurrent VPN tunnels and delivers the whole package at a very tempting price.

Deployment is swift. After a mandatory admin password change, you'll find the smart DrayOS 5 web interface provides easy access to all features. The dashboard opens with a status overview and graphic of the



**ABOVE** The Vigor 2928 is positively bursting with high-speed network ports



ports, with all services accessed from a neatly organised sidebar menu.

We connected both the gigabit and 10GbE SFP+ WAN ports, which automatically created a load-balanced redundant link. We did note that the SFP+ ports don't have status LEDs on the appliance and the web console graphic doesn't show them as active either, although you can verify their connections from the WAN status panel below.

Failover services are accessed from the WAN configuration menu, where you can add the third WAN port and USB LTE modems as members. Assigning priorities determines when each one is called up for action, and enabling the Failback option reverts back to the primary WAN link when normal services are restored.

A default set of filters is applied by the appliance's SPI firewall, and you can add your own URL/IP reputation, IP address and content filter policies. Simple web filtering using keyword matches is included, and it's worth considering DrayTek's optional web content filtering (WCF) service, which provides 83 URL categories that can be blocked or allowed.

**"DrayTek is the master of WAN redundancy, with the Vigor 2928 supporting two active internet connections in failover or load-balancing mode"**

Once the appliance has been registered with a MyVigor cloud account, you can activate a 30-day WCF trial with a one-year subscription costing around £50. WCF activation also enables DrayTek's IP reputation filter service, which employs a scoring system to determine threat levels of inbound traffic and block malicious IP addresses.

Further security features include DrayTek's identity and access management (IAM), which enforces zero-trust security. This uses policies that allow you to define access privileges and ensure users and devices can only use permitted network services and resources.

When creating IAM users, you assign a password, provide an email address, a mobile number for SMS if required and enable multi-factor authentication (MFA). Resources are assigned to IAM users and groups, with conditional access policies

controlling access further with time schedules, source IP addresses and MFA re-authentication when a session timer runs out.

VPN tunnels can be used for secure site-to-site or remote worker connections. For the latter, DrayTek's EasyVPN protocol does all the hard work for you. Remote workers can quickly establish a secure link by entering their credentials or a one-time password sent to them by email or SMS. EasyVPN supports IPsec, WireGuard and OpenVPN and, if a connection is unsuccessful on one type, it will automatically try the next available.

DrayTek's Vigor 2928 offers a stunning range of hardware features and a solid set of protection measures for a great price. The extensive WAN redundancy services and multiple 10GbE ports make it ideal for SMBs and remote sites with high-speed FTTP connections that need secure, always-on internet access.

### SPECIFICATIONS

Fanless desktop unit • 10GbE SFP+ and 1GbE WAN • 10GbE LAN/WAN • 10GbE, 2.5GbE, 3x 1GbE LAN • 2x USB-A 2 • external PSU • 241x165x43mm (WDH) • 2yr RTB warranty

**DrayTek Vigor 2928**

System Time: 2020-06-08 19:10:41

Security / Firewall Filters

URL/IP Reputation Filters

Enable URL/IP Reputation Filters: ☒

Note: To use URL/IP Reputation, activate and manage the license on [Reputation & Services](#)

High Risk: 0, Suspicious: 20, Moderate: 40, Low Risk: 60, Trustworthy: 100

**DrayTek Vigor 2928**

System Time: 2020-06-08 21:03:31

Dashboard

PORT STATUS

WAN STATUS

| Name       | MAC Address       | Connection Type | IP Address    | Gateway     | Primary DNS | Secondary DNS | Uptime   |
|------------|-------------------|-----------------|---------------|-------------|-------------|---------------|----------|
| [WAN] WAN1 | 14-0B-BC-9E-D4-A8 | DHCP            | 192.168.2.214 | 192.168.2.1 | 192.168.2.1 | 192.168.2.1   | 04:15:09 |
| [WAN] WAN2 | 14-0B-BC-9E-D4-A8 | DHCP            | 192.168.2.215 | 192.168.2.1 | 192.168.2.1 | 192.168.2.1   | 04:40:39 |

LAN STATUS

| Name       | IP Address  | Subnet Mask   | DHCP | Primary DNS | Secondary DNS |
|------------|-------------|---------------|------|-------------|---------------|
| [LAN] LAN1 | 192.168.1.1 | 255.255.255.0 | On   | 8.8.8.8     | 8.8.4.4       |

SYSTEM

Device Name: DrayTek-9EDA48

LAN MAC: 14-0B-BC-9E-D4-A8

System Uptime: 0d 4h:41m:10s

Firmware: S4.2

Remote Management Server

ACS Server: \*

SFP INFORMATION

SFP WAN

Vendor Name: Intel Corp

Vendor PN: AFB-7035D2-R2

SFP LAN

Vendor Name: ---

Vendor PN: ---

**BELOW/LEFT** The Vigor 2928 provides good security features in a neat interface





# Sophos Firewall Virtual

## Virtually perfect network security that's cheaper than a hardware appliance and just as easy to deploy

SCORE ★★★★★

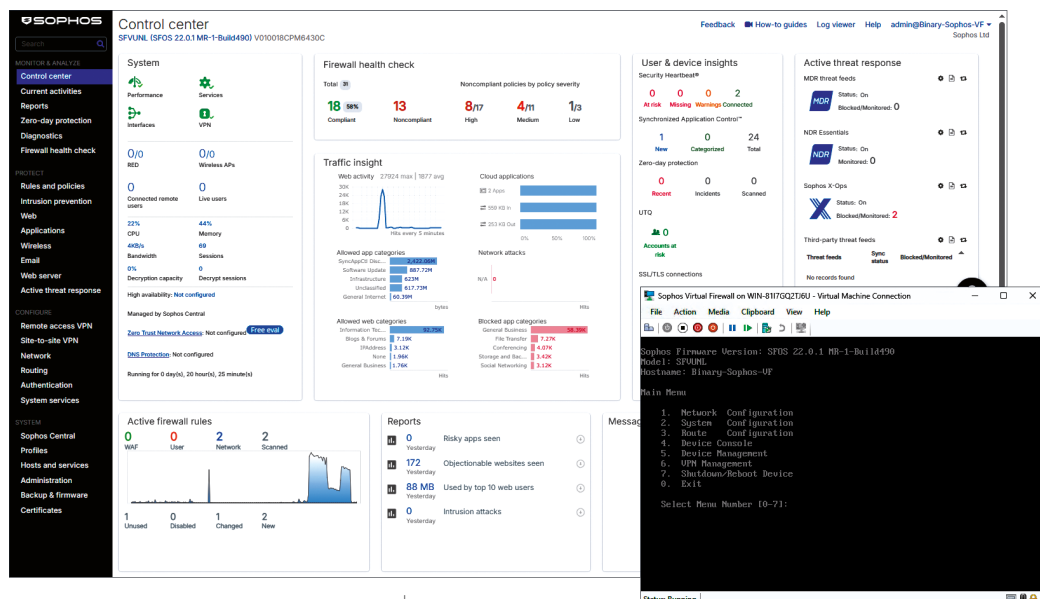
**PRICE 1 core/2GB RAM from £354 exc VAT from enterpriseav.co.uk**

Hardware security appliances can come with a price premium, but for businesses invested in virtualisation, there's Sophos Firewall Virtual (SFV). This flexible solution supports all popular hypervisors and delivers the same extensive security features as Sophos' XGS on-premises appliances.

Licensing starts with one vCPU core and 2GB of RAM, and goes up to unlimited cores and memory. You can upgrade your licence at any time. There's a range of flexible licensing options, with the XStream Protection bundle enabling everything including the network, web and zero-day protection modules, deep packet inspection, central orchestration and enhanced 24/7 support.

We tested SFV on a Dell PowerEdge host running Windows Server 2025 and the Hyper-V role. The ZIP file downloaded from the Sophos site contains primary and auxiliary virtual hard disks (VHDs), and you start by creating a new virtual machine (VM) and assigning the primary VHD and a vSwitch, which will be the appliance's LAN connection.

Next you add the auxiliary VHD and a second vSwitch for the appliance's WAN connection and power it up. Further installation is deftly handled



by a quick-start wizard, which updated the firmware to the latest SFOS v22, requested an admin password change and set up the LAN and WAN connections for us.

Protection starts immediately as the wizard enables a default set of firewall security policies that include web filtering, anti-malware and zero-day cloud sandboxing. If you want to try it out, the wizard can assign a temporary serial number for a 30-day trial of the unlimited version with all security services enabled.

Hyper-V deployments don't support the FastPath hardware acceleration feature of the XGS appliances, but otherwise SFV provides exactly the same security measures. It uses policies to combine firewall rules, service filters and time schedules with other functions such as web and application filtering, intrusion detection and email anti-spam for all common messaging protocols.

Application filters are extensive. Sophos provides over 3,800 predefined apps, and you can create multiple

**ABOVE** The Sophos virtual firewall can be locally managed and accessed remotely from Sophos Central

custom policies that can be applied to specific firewall rules. Web filtering services are just as good: you have over 90 categories you can block or allow, and a predefined set of policies are included to get you started.

The Control Center web console provides a detailed overview of firewall health, network activity, security issues, web traffic and detected network attacks, as well as blocked and allowed apps and web categories. SFV discovers active cloud applications

and allows admins to block, sanction or tolerate them by applying a QoS rule to control their bandwidth usage.

A redesigned dashboard has a new active response service status panel for

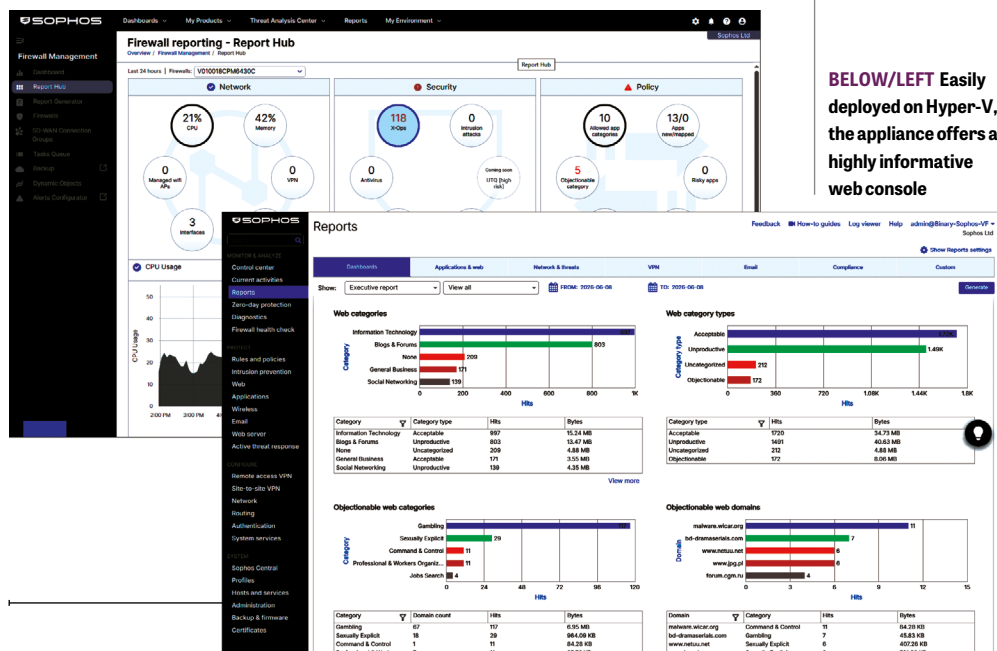
Sophos' MDR threat feeds, an NDR Essentials machine learning component and an X-Ops advanced threat and zero-day protection module.

Remote management from the web portal is enabled by registering the SFV, which brings the Synchronized Security feature into play. This uses a heartbeat to monitor systems running the Sophos Intercept X endpoint agent and isolate them if malware is detected. Enable traffic logging on your firewall rules and you'll be presented with an outstanding range of reporting services. You can keep a close eye on firewall, malware, threat, application, web content filtering, anti-spam activity and much more.

Sophos Firewall Virtual is a great choice for businesses that want to virtualise all their network protection. It supports plenty of hypervisors, is easy to manage and delivers the same tough security measures as the XGS hardware appliances.

### REQUIREMENTS

Microsoft Hyper-V • VMware ESXi 7 • KVM • Citrix • Nutanix Prism



**BELOW/LEFT** Easily deployed on Hyper-V, the appliance offers a highly informative web console



# WatchGuard Firebox T145-W

Delivers joined-up wired and Wi-Fi 7 network security plus great cloud management at an appealing price

SCORE ★★★★★

**PRICE** Appliance with 3yr Total Security Suite, £3,152 exc VAT from broadbandbuyer.com

WatchGuard's Firebox T145-W stands out not just for its fire-engine red chassis but also for its powerful hardware package and excellent range of security measures. Targeting small businesses, branch offices and storefronts, it combines wired and wireless protection and is one of the first desktop security appliances to bring integral dual-band Wi-Fi 7 services to the table.

The T145-W replaces the T45-W (see issue 348, p98). The new 1.8GHz quad-core MediaTek SoC offers the same 3.9Gbits/sec raw firewall throughput, but delivers respective speed boosts of 27% and 46% for scans with all UTM services enabled and HTTPS content inspection. It's all change in the network department, as the T145-W takes the five gigabit ports of its predecessor, replaces one with 2.5GbE and adds a high-speed 10GbE SFP+ port.

It's good to see WatchGuard holding firm on costs; the price we've shown for a three-year Total Security Subscription is almost the same as it was for the T45-W when it launched three years ago. This enables an

incredible range of security services, including gateway antivirus, anti-spam, web content filtering, application controls, intrusion prevention services and an advanced persistent threat (APT) blocker with cloud sandboxing.

You also get WatchGuard's reputation enabled defence (RED) cloud-based URL filtering, DNSWatch to monitor client DNS requests and block access to known malicious domains, and ThreatSync XDR for collection, correlation and automated responses to threat events. WatchGuard also offers the non-wireless T145 and both models have enough power to run the Cylance AI-based IntelligentAV malware scanning engine.

You can manage the appliance in standalone mode, but both the Basic and Total Security subscriptions include access to the WatchGuard Cloud web portal for remote management, with the latter extending log and report data retention to one year and 30 days respectively. We opted to go straight for cloud management and found it easy to configure: we registered the appliance with our WatchGuard support account, allocated it to our site and chose the management and monitoring option, which disables the local web interface.

The redesigned cloud portal dashboard makes it easier to see your

**ABOVE** The Firebox T145-W stands out not just for its eye-catching design



**"WatchGuard's Firebox T145-W offers a wealth of enterprise-class gateway security measures at an affordable price"**

**BELOW** The security appliance can be remotely managed from the cloud portal

WatchGuard products and their status. The threats dashboard provides an overview of all detected malicious activity, and you can drill down into them for more event information.

The portal makes light work of configuration as all appliance network, firewall and security settings are accessed from one page. The default mixed routing allows networks to be segmented and you can create multiple wireless SSIDs with guest networks, assign either or both radios to each one, apply WPA3 encryption and enable Wi-Fi 7 MLO (multi-link operations).

The content-scanning section provides access to both AV scanners, the APT blocker and spamBlocker for applying anti-spam policies to inbound SMTP, IMAP and POP3 traffic. The network-blocking section

covers botnet detection, IPS, port and site blocks and detection of Tor (The onion router) exit points.

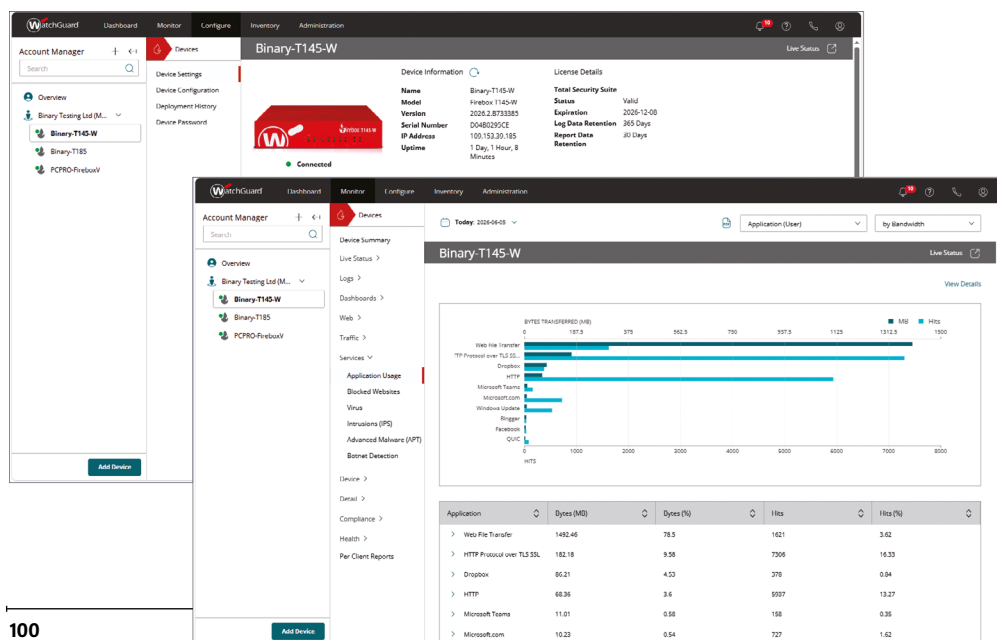
The content-filtering section is used to configure WatchGuard's WebBlocker and

application control services, with the former offering 169 URL categories that can be allowed, blocked or set to display a warning page to users. App controls are equally extensive, with nearly 1,300 predefined app and protocol signatures provided, and both services can be applied to a firewall rule by assigning a single action policy.

WatchGuard's Firebox T145-W offers a wealth of enterprise-class gateway security measures at an affordable price, making it a great choice for SMBs and remote offices. The integrated Wi-Fi 7 services make it even more versatile, and it's easily managed and monitored from WatchGuard's smart cloud portal.

## SPECIFICATIONS

Desktop fanless chassis • quad-core 1.8GHz MediaTek MT7988A CPU • 4GB DDR4 RAM • 16GB eMMC • 1x 2.5GbE • 4x 1GbE • 1x 10GbE SFP+ • dual-band Wi-Fi 7 • 2x USB-A 3.2 Gen1 • RJ45 serial port • external PSU • 210 x 230 x 44mm (WDH) • web browser or cloud management • warranty included in subscription





## Zyxel USG Flex 200H

A powerful and richly featured security appliance at a great price, with Zyxel's Smart Sync service adding extra flexibility

SCORE ★★★★★

**PRICE** Appliance with 1yr Gold Security licence, £790 exc VAT from [broadbandbuyer.com](http://broadbandbuyer.com)

Zyxel's USG Flex 200H offers SMBs and branch offices a highly affordable gateway security solution and has a neat trick that makes it stand out from the crowd. Whereas most competitors force you to choose between standalone and cloud management, Zyxel's Smart Sync feature lets you use both, with any configuration changes made in one automatically synced to the other.

It's a powerful appliance, too. Zyxel's new uOS firmware and improved hardware specification delivers an impressive raw firewall throughput of 6.5Gbits/sec and a creditable 1.8Gbits/sec with the anti-malware and intrusion prevention services (IPS) enabled. This fanless desktop model sports two 2.5GbE and six gigabit ports, which can all be configured in software for WAN or LAN duties.

Prices start at £705, which gets you the appliance and a basic one-year Entry Defence licence. However, the Gold Security licence costs only an extra £85 and enables a wealth of protection measures. It takes Zyxel's IP reputation filter and SecuReporter cloud service and adds

anti-malware, web content filtering, IPS, application patrol and cloud sandboxing, with a further two-year Gold licence costing around £610.

You also get a Nebula Cloud Control (NCC) Pro Pack upgrade, which enables email alerting, scheduled firmware updates, configuration backups and a one-year log retention period. You also get the Device Insight service on the appliance, which provides full visibility on all connected wired, wireless and BYOD devices, details such as their MAC address and detected OS, as well as options to block selected ones.

Deployment is a breeze. The appliance's local web console runs a wizard that requests an admin password change, sets up your chosen WAN port and asks you to register it with your NCC account. From here on you can use either console to manage the appliance, and any changes made in one will be synced to the other, with our tests showing this taking around 30 seconds.

The security services are all accessed from the relevant menu in the local console or from one page in the NCC portal. Most can be enabled with one click, and for the anti-malware service you can request that specific file types such as executables and ZIP archives are

**ABOVE** The Flex 200H offers a fast raw firewall throughput of 6.5Gbits/sec



**"Whereas most competitors force you to choose between standalone and cloud management, Zyxel's Smart Sync feature lets you use both"**

checked against Zyxel's cloud threat intelligence database.

The web content-filtering service offers 105 URL categories that can be blocked or allowed, while Zyxel's DNS threat filtering intercepts DNS queries and blocks known malicious domains. Profiles for the application control service can include any of the thousands of predefined signatures, or you can choose from 26 categories to block all access to services such as media streaming and social networking.

You can keep a close eye on activity as both local and NCC consoles offer heaps of monitoring and reporting features. The local console provides dashboards with charts and graphs of all services,

the top apps, detected threats and sandbox activity, and you can use the security statistics section to drill down into the

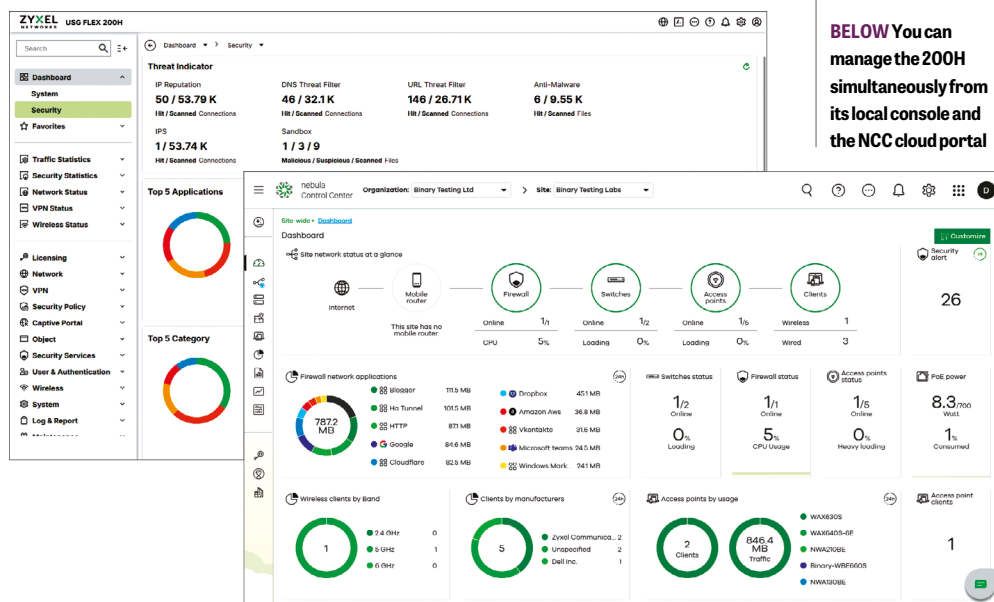
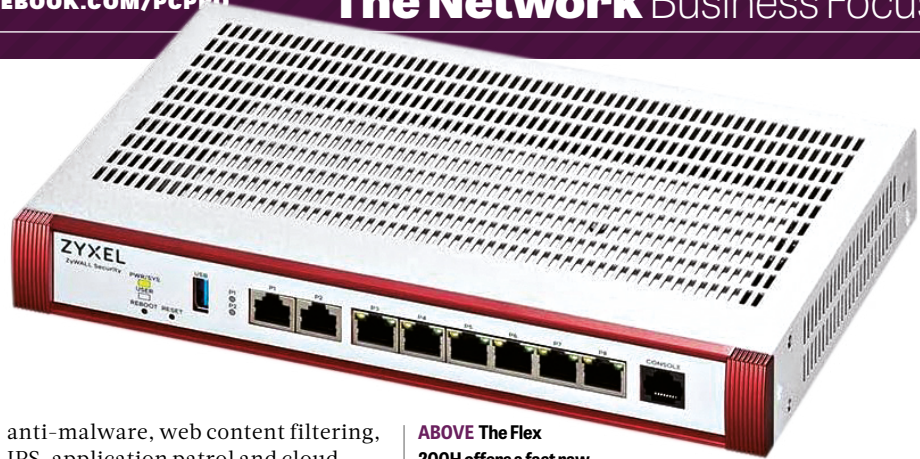
individual services for more detail.

The NCC dashboard can be customised with a range of widgets, and those provided for the firewall display the top ten network applications, CPU utilisation and security alerts. Selecting the latter transports you directly to the SecuReporter cloud portal, which offers an incredible amount of detail on all security events, with the smart AI-powered SecuPilot feature highlighting the most severe threats and providing valuable remediation advice.

Zyxel's USG Flex 200H is an undeniably powerful and very affordable security appliance. The Gold Security Pack offers an impressive set of protection measures, and Zyxel's Smart Sync feature delivers unified local and cloud management.

### SPECIFICATIONS

Fanless desktop chassis • 2 x 2.5GbE • 6 x 1GbE • USB-A 3.2 Gen1 • RJ45 console port • external PSU • 272 x 187 x 36mm (WDH) • 1yr Gold Security Pack licence • 5yr limited warranty



**BELOW** You can manage the 200H simultaneously from its local console and the NCC cloud portal



## Jabra PanaCast U30

This VC bar makes every meeting a plug-and-go affair, with great video quality and smart management features

SCORE ★★★★★

PRICE £591 exc VAT  
from best4systems.co.uk

Equipping all their small meeting spaces with videoconferencing (VC) kit can be an expensive endeavour for businesses, but Jabra's PanaCast U30 offers a cost-effective solution that doesn't compromise on features. This affordable VC bar targets BYOD users and aims to make meeting setup a breeze and improve their experience by delivering the same smart AI-powered video analytics as Jabra's higher-end products.

The U30 comes with an 8MP 4K camera with a 120-degree field of view (FoV), while its six beamforming microphone array handles speaker tracking. It has a single internal speaker mounted to the right of the lens and comes with a hinged wall mount bracket; Jabra's optional desk stand costs around £135.

The camera has a USB-C port for BYOD meetings or connection to a permanent room computer, while the HDMI in and out ports are for the room monitor and content sharing. There's gigabit and Wi-Fi 5 networking for local access to the camera's web console and remote management using Jabra's Plus cloud portal. The USB-A port is used to connect accessories and the 3.5mm audio port provides discrete assistive listening systems (ALS) output.

Initial provisioning is simplified as the box has a sliding panel on the

underside for accessing the camera's ports so you can configure it using the browser wizard, fit the spare panel seal to secure the contents and send it to its final destination. When the camera is installed, it shows a built-in wallpaper on the attached monitor with clear instructions for connecting a host computer.

The camera runs Android 13, and its integral video analytics offers a choice of viewing modes with Jabra's Virtual Director focusing on and following active speakers using the automatic lossless 3x digital zoom. Intelligent zoom keeps all participants in the main view, panoramic view shows the entire meeting room and the single stream dynamic composition simultaneously displays up to four of the most recent speakers with a full room view below.

Further features include Jabra's intelligent meeting space, which applies a custom virtual perimeter to ensure the camera focuses only on the defined meeting area. You also have people counting and a detection system that stops reflections of other people on glass walls from being included as participants.

That's a lot to play with, and we were able to access all settings from the camera's local browser console and our Jabra Plus cloud account. The latter allowed us to remotely assign

ABOVE The PanaCast U30 offers high-quality video and audio output



**"We used Teams and Zoom and were impressed with video quality, with the camera presenting a sharp image and great colour balance"**

custom camera configurations, monitor meeting-room activity and apply automatic firmware updates. A future portal update will allow custom wallpapers to be downloaded to the camera. Jabra also offers its Direct Windows and macOS apps for businesses that don't want to network the U30.

Jabra makes meetings a swift process: users connect their laptop via the USB-C cable, start their choice of VC app and, if their device supports DP-alt mode, share their screen on the monitor. We used Teams and Zoom and were impressed with video quality, with the camera presenting a sharp image and great colour balance.

The virtual director tracking is very smooth. It took around two

seconds to identify the active speaker and follow them as they moved around the meeting room.

Intelligent framing kept all participants in view, and the dynamic

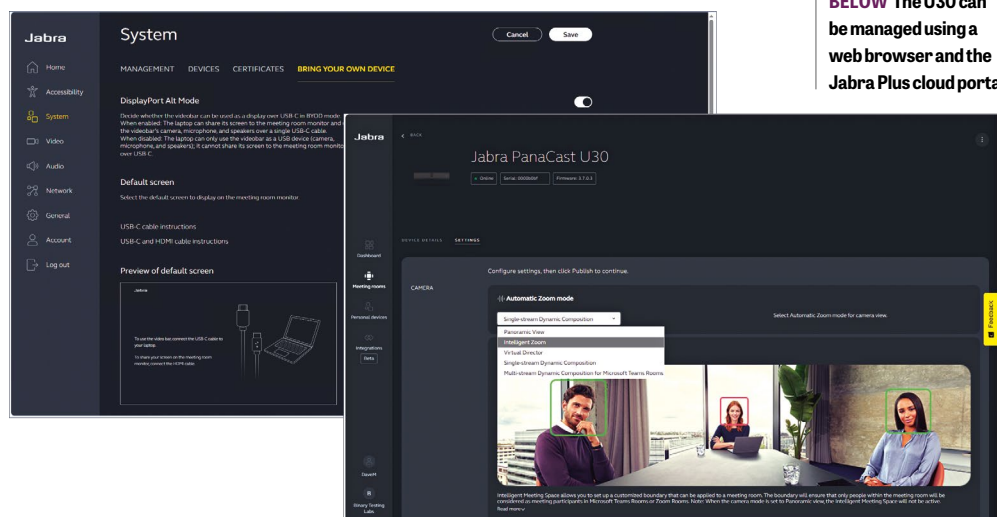
composition impressed us with its smart split-screen views.

Audio quality is clean with a warm bass, and we found volume levels of 60% easily enough for most huddle rooms. The mic array worked equally well, with remote participants saying they could hear us clearly up to four metres away and the built-in noise suppression keeping keyboard clackers and paper rustlers firmly out of the conversation.

The PanaCast U30 is a top choice for businesses seeking an affordable all-in-one VC solution for small spaces. It's easy to deploy and use, offers a powerful set of AI-driven viewing modes and can be locally and remotely managed. **DAVE MITCHELL**

### SPECIFICATIONS

8MP 4K camera • 120° horizontal FoV • 3x lossless digital zoom • 6-mic beamforming array • internal speaker • 1GbE port • Wi-Fi 5 • Bluetooth 5.2 • HDMI in • HDMI out • USB-C 3.2 Gen1 (DP-alt) • USB-A 2 • 3.5mm ALS • Android 13 • integral wall mount • external PSU • 529 x 65 x 108mm (WDH) • 1.5kg • 2yr limited warranty



BELOW The U30 can be managed using a web browser and the Jabra Plus cloud portal





## TP-Link Omada EAP725-Outdoor

A superbly built external dual-band Wi-Fi 7 AP with a good turn of speed and a big choice of management options

SCORE ★★★★★

PRICE £146 exc VAT  
from broadbandbuyer.com

TP-Link offers an extensive range of external wireless access points (APs), and the EAP725-Outdoor is its first to deliver weatherproof Wi-Fi 7 services. The sturdy metal chassis and thick polycarbonate shell look capable of shrugging off any type of weather: it has 6kV lightning protection and can operate between -30°C and +70°C, while its IP66 rating means it's fully dust-tight and can handle powerful jets of water from any direction.

The EAP725-Outdoor delivers great built quality for a low price but it's only a dual-band AP, with its BE3600-rating offering two spatial streams each for the 2.4GHz and 5GHz bands. It claims maximum speeds of 688Mbps/sec and 2,882Mbps/sec respectively; the US version has a higher BE5000 rating as it supports 5GHz 240MHz channels.

A smart feature is its flexible aerial configurations: for each radio, you have two internal directional and two detachable omnidirectional antennas. The AP can automatically switch between them as it detects when the external aerials have been attached, or you can manually choose from three different configurations.

The AP supports standalone or cloud management using TP-Link's Omada platform. In standalone mode, the web console's quick-start wizard offers a choice of AP or repeater modes and requests a new username and password, after which it removes the default admin account for security.

Up to eight SSIDs per radio can be created, and the wizard asks you to configure the first two and provide new encryption keys. The web console provides easy access to all features and includes options to create MLO (multi-link operations) SSIDs and select default, indoor or outdoor operational modes for the antennas.

For performance testing, we connected the EAP725-Outdoor to the lab's Zyxel XMG1930-30HP multi-gig PoE++ switch, which confirmed a 2.5GbE connection and a PoE+ power draw. Our test hosts were a Lenovo Windows 11 Pro desktop client equipped with a TP-Link Archer

ABOVE TP-Link's EAP725-Outdoor offers weatherproof Wi-Fi 7 services

**"Performance is good, it can be locally or cloud managed, and it has what it takes to handle the great British weather"**

BELOW The AP supports standalone or cloud management and delivers good wireless speeds

TBE550E Wi-Fi 7 PCIe adapter and a Dell PowerEdge Windows Server 2022 system connected over 10GbE.

To test maximum raw speed, we used the OpenSpeedTest HTML5-based tool and ran the server component of our Windows Server host. With a 2.4/5GHz MLO link on the Windows 11 client showing a connection speed of 3,570Mbps/sec, we pointed its browser at the OpenSpeedTest server address and port and watched it report back with excellent close-range upload and download rates of 306MB/sec and 201MB/sec. Moving the AP ten metres away and into an adjoining room saw respectable upload and download rates of 267MB/sec and 165MB/sec.

For remote management, you can choose from TP-Link's hardware and free software on-site controllers or use its cloud-based versions. The latter has extra appeal as TP-Link offers the Omada Essentials cloud controller, which provides a base set of management and monitoring features for smaller businesses and is free.

To cloud-manage the EAP725-Outdoor, we used the Omada iOS app to scan the QR code on its base and add it to a site in our Essentials account. The interface is more basic than the licensed cloud version as you don't get

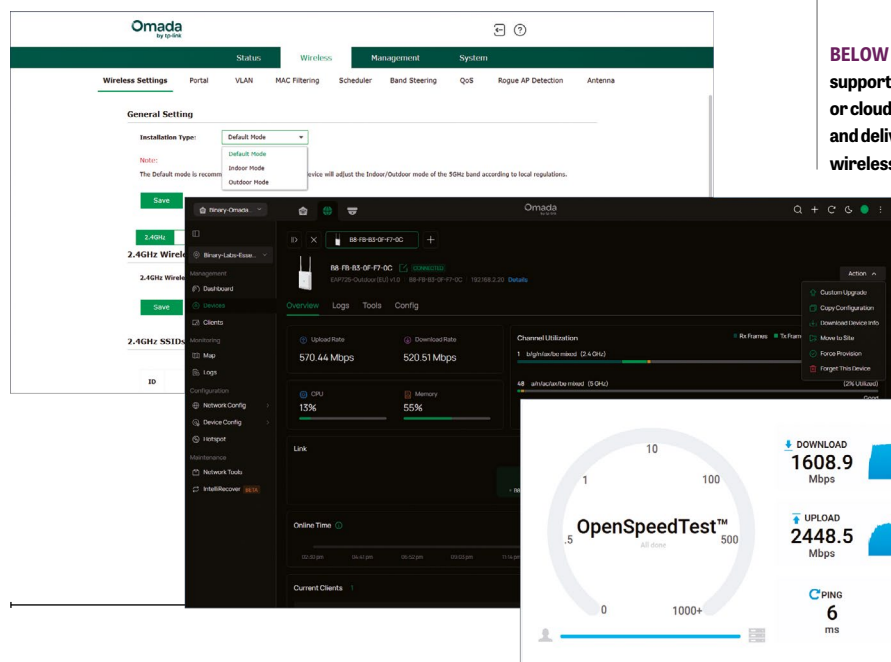
the multi-tab dashboards and site health monitor, but its network view does provide plenty of information on cloud-managed devices, the top SSIDs and clients, and wireless signal strength and channel utilisation charts.

Omada Essentials supports the same number of SSIDs as standalone mode, and the AP's Config page provides options for setting the antennas' operational mode. Cloud management enables many extra features: wireless coverage can be extended using meshing, any SSID can be set as a guest network with L2 isolation, and captive portals assigned to selected SSIDs by creating profiles using customised portal splash pages and a choice of authentication methods.

TP-Link's EAP725-Outdoor is an extremely well built and very affordable external Wi-Fi 7 solution. Performance is good, it can be locally or cloud managed, and it has what it takes to handle the great British weather. **DAVE MITCHELL**

### SPECIFICATIONS

BE3600 dual-band 2.4/5GHz 802.11be • internal and external aerials • 2.5GbE LAN/802.3at PoE+ • BLE 5.2 • IP66 rating • pole/wall mount kits • 208 x 55 x 160mm (WDH) • 1.3kg • limited lifetime warranty







# Brownfield IT Preserve, upgrade or replace?

Many businesses are built on legacy systems.  
**Steve Cassidy** explores the tricky question of  
when it's time to upgrade

**J**ust imagine: you're the IT manager in a small business which, rather suddenly, is bought up by an older, bigger business. Their IT estate is all about onsite servers and heavily locked-down desktops. As a much younger and faster-moving operation, you're 99% iPad and cloud-driven. How is the amalgamated business going to operate?

Simple question, tough answer. Let's start by defining some terms: newer, smaller organisations are often built on "greenfield" technologies – meaning they can do a defined job without having to accommodate legacy technologies hanging over from previous ways of working. Brownfield environments, by contrast, are ones where existing data, applications, processes and so forth are entrenched, and any new projects or deployments must be fitted around them.

It's important to recognise that the terms aren't objective standards – what counts as "entrenched" might depend on the perspective, skillset and job history of the observer. Indeed, greenfield and brownfield technologies often coexist, especially in diverse companies with several distinct specialisations. If you need to reconcile the two – as in our example above – the question to ask is which parts of the existing estate are still doing valuable work, and which merely endure because no-one wants to invest in replacing them.

## The four fates of a brownfield system

There are four ways to handle brownfield IT. You can keep it running as is; upgrade it in place to keep up with growing demands, perhaps with more RAM or newer software components; virtualise it; or throw it out and fully replace it with something new. Each route carries its own mixture of cost, disruption and technical awkwardness.

### ● Keep

**Likely cost:** Low

**Business disruption:** Low

**Technical complexity:** Initially low, but the longer you keep legacy systems running, the more difficulties you may be storing up for the future

### ● Upgrade

**Likely cost:** Medium

**Business disruption:** Less than switching to a whole new IT paradigm

**Technical complexity:** May be harder than you think – older platforms aren't always well supported

### ● Virtualise

**Likely cost:** Medium





**Business disruption:** Should be zero, if done properly

**Technical complexity:** Moderate, but the virtualised system should be easier to manage than ageing physical hardware

## ● Fully replace

**Likely cost:** High

**Business disruption:** Considerable

**Technical complexity:** A major project – but sometimes the right call for the business

## Greenfield and brownfield technologies often coexist, especially in diverse companies

### Why greenfield projects are rarely as clean as they look

Greenfields are rarely as empty as the name suggests. New systems still have to work within the existing network, existing security policies and the whole existing structure of the business model, and in practice you might find your “greenfield” experience is almost as limited as a brownfield one.

Let’s use the simple example of moving to a new office with managed internet access and Wi-Fi ready to go. This may look like a very attractive clean start to a small business, but it comes with numerous embedded pitfalls and risks. Let me speak plainly: I really hate putting businesses on someone else’s network. If your business depends on connectivity – and whose doesn’t? – it’s absolutely vital to own your network. You need to be able to get into, inspect and tweak whatever gadget is in charge of handing out IP addresses and accessing the

**ABOVE** Many businesses are built on systems that have evolved over many years

**RIGHT** Even very old hardware may still be perfect for modern tasks

internet. Otherwise from day one you’re having to fit everything around a system you can’t change, and digging yourself ever more deeply into a brownfield scenario.

Your best solution in a situation like this is to raise your technological game a little and see if your wireless base station can be configured as a multi-network router, or loaded up with static routes that tell packets aimed for your new environment to go via the existing firewall or access device. This sounds very complex before you try to do it, but it’s actually quite simple to implement – just be sure to spend enough money to get a decent user interface, and no messy private definitions of VPNs, VLANs and so forth. You can think about it like this: on the very first, most exploratory day, it’s both safe and useful to set up an inter-network bridge – and once you have it working, why take it out again? Running across multiple networks is very unlikely to be a problem unless you encounter some deep brownfield application software with peculiar ideas about licensing and subnet configuration, and that’s grounds for taking a wholly different approach anyway.

### Why old systems may still be worth preserving

Just because a system has been running for decades doesn’t mean it necessarily needs replacing. Email and document archives are a favourite case in point: even quite switched-on business owners are often unaware of just how much brownfield technology is propping up access to the decades of information that they depend on every day.

To younger IT professionals, it may be a shock to learn that there are some companies who, even in 2026, have let the PC revolution entirely pass

them by. One company I recently visited had begun developing its IT function at the start of the 1950s, and more or less stopped once it had achieved its defined goals. Despite my best efforts to introduce them to the wonders of post-2000 technology, they opted to stick with the old system; since it still did everything they needed it to, replacing it would have meant a big expense and disruption for no business benefit.

Car rental kiosks and bigger retail outlets are other places where you may still see terminals that date back to the pre-personal computer age. Although these may look archaic, they often have enviable usability features such as high-end mechanical keyboards that let the user slam in a search or transaction in a matter of seconds.



**RIGHT** Don’t rush to dispose of decommissioned brownfield IT

## Red flags in legacy IT

**It’s rare to be presented with an absolutely blank-slate company network. Whether you’re an external consultant, an incoming IT manager or an old hand tasked with integrating legacy systems, the handover is likely to come with of a tattered notebook full of scribbled notes about past crises and configuration quirks. This makes the definition of a red flag a bit difficult, because almost everything in the book needs close attention.**

**Whatever happens, you’ll probably have to run through a forensic phase of changing admin passwords, quite often on a midnight-raided basis. It’s also now vital to extend that forensic diligence to the passwords held for web and cloud admin sites. Be warned, though – some poorly written but business-critical apps don’t take kindly to admin password changes on a whim, no matter how urgent your need might be. Some support desks have an unfriendly attitude too, especially to anyone calling in on their first day on the job.**

If you wanted to replace those terminals, you’d be well advised to proceed with caution. You may find that replacing the keyboard with a modern touchscreen is deleterious to both productivity and morale. What matters is not the age of the technology, but how well it supports the workflow.

My final bit of advice is this: don’t fall into the trap of sending all the old brownfield kit off to the landfill as soon as the shiny new tablets, phones and cloud accounts arrive. Holding on to the original manifest gives you flexibility with users and their poor data-keeping habits – and it also means you can still resurrect the old system on demand if need be. That’s a powerful safety net against teething troubles with the new IT, or

limitations that only become apparent over time.

## Where legacy IT becomes a business risk

Businesses with different technology histories tend to have different approaches to security. Smaller, younger firms may have grown up with guest access enabled for every device on the network; larger companies with a weighty brownfield estate are more likely to insist on long passwords and cryptic usernames. The problem isn't necessarily the policy itself, but the fact that any future deployments and projects will have to fit into it. A prevailing assumption of free and easy access creates a security risk that grows progressively with the breadth of the IT function; excessively strict access requirements may necessitate bodes and back doors for interoperability that completely defeat the original intention.

Often the brownfield IT itself comes with baggage in this area. Lots of commercially developed Windows software from the 1990s expects to be run with all sorts of administrative privileges. Most security consultants view this with justified horror, but things can actually get worse once you start trying to manage wayward security expectations within an Active Directory environment. Faced with hundreds of 20-year-old ACLs, group memberships and dependencies, you might well feel inclined to ditch the whole setup and move to a greenfield replacement – but the nature and presence of all those permissions, identities and application assumptions can make it very difficult to migrate your data repository anywhere else.

## Bridging old and new systems with virtualisation

We've mentioned virtualisation as a means for dealing with brownfield IT, and I'm surprised by how few small businesses seem to take this route. Virtualisation doesn't cure all the issues associated with brownfield, but it's the cleanest way of preserving an old server or application while reducing your dependence on a specific bit of hardware. On first walking into a client's premises of any size or type, the first things I usually do are dig an old PC out of the junk room and rebuild it as my own workstation, write down a simple map of what resides where and set about making virtual copies of all the servers.

Virtualisation is a fantastically handy process for anyone who wants even just to showcase options for brownfield IT. Apart from anything else, it can open eyes to options that managers may not have realised were



possible. One client I visited was horrified to learn that their Exchange server was rapidly running out of storage, and quite disbelieving of my proposal to address the issue by moving the entire thing into a VM image running on a spare machine.

This was partly because the senior management had come to view their precious, decades-deep email archive as a vital and irreplaceable repository,

**ABOVE** Multiple legacy systems can be consolidated into one virtual environment

**Virtualisation is a fantastically handy process for anyone who wants just to showcase options for brownfield IT**

## Cloud can be brownfield, too

If there's any environment where brownfield liabilities can hide, it's the cloud. Cloud servers can seem to relieve you of an extraordinary range of responsibilities – but once you've accumulated a few years of mailboxes, integrations and billing dependencies, it's often no easier to unpick yourself from a cloud provider than it would be from an old server.

The largest cloud players even lay painful traps for the unwary. I can't be the only person who's signed up for a cloud-hosting trial, ticked every available config box and instantiated some monster 16-core virtual server because hey, it's a free trial. A year later, dozens of connections and dependencies had grown up between the cloud and our hybrid server farm; when the impressive bill arrived for the next year of service, we had to pay up simply to buy time to unpick it all.

In this case, the brownfield aspect isn't to do with staff turnover or commercial fortunes – it's built right into the core fabric of the service proposal. Just because the cloud feels new, that doesn't mean it can't lock you in just as tightly as a classic mainframe.

with legal status and a duty of care and so forth. The idea of ditching the physical server sounded like Armageddon to them; when I later reported that I had aborted and wiped three experimental attempts in the process of completing the project, they were aghast. Taking them through the virtualisation exercise was, in the end, far more valuable as a learning process, than as a machine backup.

Don't be under any illusions as to what virtualisation can and can't do, however. One of those semi-mythical stories of IT manipulation

concerns a couple of household names in banking that went through a merger process. As part of the merger, the businesses agreed to combine their two IT platforms, with a view to simplifying operations – and cutting their IT headcount.

The technologists followed the letter of the merger plan, but rather than undertaking the massive task of merging the two systems into one unified platform, they simply moved both mainframes into virtual machines running on a single server. This was undeniably an efficient and reliable way to achieve the goal; it's also a memorable illustration that virtualisation is a way to manage the constrictions of brownfield resources, not necessarily to escape them in the way the bosses had hoped for.

## How to decide what to keep, upgrade, virtualise or replace

As I've hopefully made clear, both greenfield and brownfield IT have their place. To decide whether you ought to keep, upgrade, virtualise or fully replace a legacy system, you need to collect some information on the nature of the business and the network – which systems users rely on, where the data lives and what might break if something changed.

This is not an activity amenable to a software wizard or an AI. It's best done by talking to users about their jobs and themselves, right down to how they think about their own skill levels and their requests for smarter services. With this information you can help the management layers understand the pros and cons of being up to date – a worthy challenge, and your chance to help them make the right decisions about what can be preserved and what really needs to be replaced. ●





# Private 5G networking

Fed up with wayward Wi-Fi? Darien Graham-Smith looks at the pros and cons of switching to cellular technology

## Wasn't Wi-Fi 7 supposed to answer all our needs? Why do we need 5G?

Wi-Fi 7 is great as far as it goes, but it has its limitations: performance drops off over distance, roaming between access points isn't always seamless, and latency can be unpredictable. For businesses that need consistent coverage, the 5G standard has many advantages, including tight timings, much greater range and clean handoff between transmitters. To be clear, we're not talking about setting up a cellular backhaul for your internet connection, but using a private 5G network as a primary means of connecting to internal resources.

## Does this mean we have to install phone masts in our office?

You certainly don't need a full-sized mast: a few ceiling-mounted cellular transmitters, similar to Wi-Fi APs in size and design, should be enough for most small and mid-sized businesses. Alternatively, you can lease a virtual private network from a national 5G provider that already covers your area. All you need then is a local gateway appliance to bridge cellular traffic into your local network.

## Can we keep our existing firewalls, switches and management tools?

Modern cellular systems use standard IP routing, so for most businesses there's no need to build a separate network, or rearchitect your existing one – clients connected via 5G can be treated as just another network segment. However, security and management tools may be unable to connect directly to endpoints through the gateway, so you might need a separate administration solution.

## What happens if the public 5G carrier suffers an outage?

If you're running your business over a private segment of the public 5G network then, sadly, an outage will have exactly the effect you'd expect – locking you out of your own network. You can assume that the provider will do everything they can to get the service back up and running, but you may be unable to operate in the meantime, and you're unlikely to get any compensation for the downtime. If you're considering using 5G to connect and control business-critical systems, that's a good argument for investing in your own infrastructure.

## Do we need a whole new team of experts to manage all this?

To deploy and manage a private 5G network you probably will need some specialist expertise – and this is a strong argument in favour of leasing 5G capacity, rather than setting up your own cellular network. Providers such as BT and Vodafone can provide a cloud-based management dashboard that lets IT staff take care of everyday administration without having to get hands-on with the underlying telecoms technology. The biggest process upheaval might be the need to track and manage SIM cards or eSIMs.

## Is it likely to be a sensible investment for our business?

Cellular infrastructure is expensive – we're talking five figures at least for a mid-sized installation. On top of that, you'll need to equip all client devices with cellular adapters, and for local deployments you'll have to deal with some legal paperwork to license your use of the 5G radio spectrum. Clearly, it's not a model that makes sense for everyone. However, for sprawling warehouses or large open-air campuses, a few 5G transmitters can replace dozens of Wi-Fi APs while providing a faster, more reliable service – and that could well be worth the investment. ●

## Should we wait for 6G?

According to the current industry timetable, the first commercial 6G networks are due to come online in 2030. That's not so soon that you need to start planning for it right away, but it's close enough that senior managers might be hesitant to invest in 5G. Could any infrastructure installed now be obsolete in a few short years?

Happily, the answer is no. First of all, the arrival of 6G won't mean that 5G stops working. Major cellular providers are expected to keep 5G services active well into the 2040s, and if you're running your own network you can keep using it for even longer. Since 6G devices will be backward-compatible, a

5G corporate network will continue to work with future 6G adapters and SIMs.

Even better, as and when you do decide to upgrade to 6G, it's likely to be far easier than you expect. Forget about the costly and disruptive transition from 4G to 5G – the industry has learnt its lesson, and the new 6G standard uses the same core architecture as 5G. To switch, you'll simply need to replace your transmitters with 6G-compatible ones and update the server software. 5G and 6G client devices will be able to transparently coexist and interoperate on the next-generation network, so you can migrate endpoints at whatever pace suits you.

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# Real world computing

Expert advice from our panel of professionals

JON HONEYBALL

**“None of these companies is making any money. Nor is there a meaningful path to profitability”**

**Much of the business world is already hooked on AI services, but spiralling costs and a lack of transparency suggest a crash may be on the way**

Something doesn't add up. It's a bit like Pooh Bear looking for his friend: "The more he looked inside the more Piglet wasn't there."

I am referring to the business model for large AI platforms. They continue to consume almost obscene amounts of cash from investors. They require data centres, complete with power and often water requirements that are simply off the chart. And they are opaque about their costs.

Some clarity might come later this year with the (possible) stock market flotation of several of the big players. This requires something called an S-1 filing from the US Securities and Exchange Commission (SEC), which details the business finances and where the directors think the business can grow. Investors use the S-1 to decide whether it's a good buy or not.

There's no better recent example than SpaceX's S-1, which you can find on the SEC website at [tinyurl.com/384spacex](https://www.sec.gov/edgar/sec Edgar/1333/spacex). It's a fascinating if somewhat brain-scrambling read, and experts far better than me have commented on it at length. The S-1 for OpenAI and Anthropic, should they come to the market, will be a cleaner read: SpaceX isn't just the rocket launching company, but the X platform, its Starlink satellite internet platform, and also the company's XAI AI platform. OpenAI and Anthropic will simply offer AI capabilities.

However, everything I've read suggests that none of these companies is making any money. Nor is there a meaningful path to profitability. It seems that everyone is juiced up on the dream that there

will be true artificial intelligence one day, and that it will be a "winner takes all" outcome.

Yes, a true artificial intelligence might come, but then so might unsupervised full-self-driving from Tesla to allow me to sit in the back of the car and have it drive me home from the pub. One day soon, hopefully, but I'm not holding my breath.

Meanwhile, the costs keep spiralling. The current model of "pay us a monthly fee" might be attractive to users, because it places a hard cap on the monthly spend, but it can be financially toxic for the AI provider. You might think that Moore's Law will apply in this space, but the processing requirements for these platforms just keeps rising. And the latest chipsets from Nvidia aren't getting cheaper.

Hence the push to move customers, especially businesses,



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**BELOW** SpaceX's stock market flotation was different from other AI companies'



to a token-based pricing model. This hasn't worked out so well either, with Uber reporting that it exhausted its 2026 budget for AI by April, soon after its 5,000 engineers started using Anthropic's Claude Code toolset. Between February and March, the utilisation went from 32% of engineers using it to 84%. And I've read that 70% of code commits then came from AI, with 11% of backend commits involving no human.

There's no question that the tool is offering an entirely new wave of power and capability. The problem is the pricing.

On 13 May, Anthropic announced that subscribers who use Claude will be billed separately for such agent tools, starting mid-June. Which has led to something of a panic in the boardroom of companies that are trying to use AI tools either to increase productivity or reduce headcount. Or both.

I pay Perplexity \$24 a month for my Perplexity Pro account. I hadn't run into any usage limits until I was recently in Taipei for a week, where I found its image-recognition and translation tools to be invaluable. Take a photo, drop it into PP, tell it to translate. Within seconds it had read all the Chinese writing and delivered it to me in English. Which

was great, right up until the point where it said that my account was empty. I topped it up to keep going.

But here's the problem for me. I really like Perplexity Pro, and I think paying \$24 a month is good value. However, if you ask it a question, it doesn't tell you how much the answer cost. It's likely to be trivial for a simple "enhanced web search" query, but ask it to





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do a more complex task that can take tens of minutes and the cost will be... well, we just don't know. This opacity is becoming a real problem, especially if the AI companies expect me to ramp up my utilisation, giving it more complex, often automated and repetitive, tasks. What user is going to be happy having AI on their phone, only for it to run out of cash halfway through the month?

So we need a new set of management tools, both for businesses and for users, to ensure that the cost base is both under control and transparent.

This opens up another can of worms. Anyone who has used an AI engine knows that they're fallible. They can hallucinate, come up with the wrong answer, and just plain get things wrong some times. That doesn't devalue the overall experience, but having to pay for the wrong answer will undoubtedly sour the experience, especially for home users. We might forgive a small cost in the pennies, but not if the bill is higher. And you'll only find out once the task has been answered, because the AI engine can't really guess accurately and say "this is going to cost over \$2, do you want to continue?"

Despite all of that, the capabilities of code creation, document analysis and so forth are truly incredible. It simply has to be matched to a workable cost profile and privacy.

## A question of privacy

Which brings us to the next problem for the huge AI engines. I may not want to send my question up to the cloud for it to munch on it and send me the result. I'm happy for the world to know that I'm asking "Is motorbike parking free at Churchill Square car park in Brighton?", but privacy becomes a much bigger worry if I want to upload a pile of highly confidential information and ask it to do analysis on it. Or personal information from my email, calendars or banking.

It doesn't matter how much the AI fanatics want to wave their hands around and say "it will be safe". Or to counter with "well, it's all in Gmail and OneDrive". It isn't, and it won't be for the foreseeable future due to all of those data concerns, however paranoid they may be.

Which is one reason I was so interested in Nvidia's announcements about new Windows laptops. At the recent Computex show in Taipei, which we covered in depth in this magazine last month, there was a huge Nvidia presence. Intel and AMD weren't invisible, but everywhere you looked there were Nvidia logos and banners. Every major maker of Windows machines announced they would be building new laptops and desktops based around the Nvidia RTX Spark superchip. This is a Windows-on-ARM device, running 20 ARM cores, a Blackwell GPU with 6,144 CUDA cores, up to 128GB of RAM and up to 300GB/sec of memory bandwidth. And the memory can be dynamically allocated between the CPU and GPU in a highly AI-model-friendly way.

Just like Apple's M chips, you might say. But it doesn't matter if Nvidia is coming late to the party: the important point is that it has staked its flag on the high-end laptop and desktop market, and it's serious.

Microsoft announced its new Surface Laptop Ultra based around this platform, and it's going to be a monster. It will probably come with a monster-sized price tag too, because this sort of hardware is going to burn a hole in your credit card. It is, however, a real shot in the arm for Windows on ARM. And notice to Intel and AMD that there's a new sheriff in town.

You might think that this is a threat to Apple's M dominance at the high end. Far from it: it's actually a



**ABOVE** Nvidia's Jensen Huang unveiled the RTX Spark chip at Computex in June

**"Nvidia has staked its flag on the high-end laptop and desktop market"**

**BELOW** Apple had big AI news at its recent developer event



huge boost for Apple. Why, you might ask? Because a primary use for this sort of hardware is to push AI processing down to the local device itself, with no need to go to the cloud. This RTX Spark chip can run up to 1 petaflop of AI computing, and Nvidia claims it can run models with up to 120 billion parameters, entirely held on the local device.

This is going to be very potent indeed, because it will usher in a new line of secure, self-hosted AI engines that tick all the boxes: no runtime costs, full privacy of the data, and operational available even when disconnected from the internet.

Apple has announced essentially the same thing, although it has gone further by offering local, secure engines that will run on a wide range of devices, including your phone. Apple came under a lot of criticism for its initial announcements and lack of deployment for AI technologies a couple of years ago. I'd agree that it was badly handled. But then again, it dropped the ball on managing the story on the Vision Pro, too.

Apple clearly took the decision that local, along with trusted cloud models, were the way to go, and went about building this new MLX framework to allow for this. It has launched, at least in the developer betas of the forthcoming September releases of iOS and macOS, on the version 27 platforms.

The range of phone hardware that can run the full models is quite limited, as you might expect given the RAM demands, but the iPhone 17 Pro





and the Air are supported. I put the 27 beta 1 onto my Air and sat back while the new Siri did an index of all of my data on the device. This took considerably longer than I expected – several hours – and required me to leave the device plugged into power. But now I have local AI models running on the phone that can answer specific questions that are relevant to me and my data.

It goes further than that, too. With my permission, it's possible for this local AI engine to run and control local apps as well. I'm somewhat hesitant at the thought of saying, "Hey Siri, book me on the 17.15 flight to Berlin by British Airways next Thursday, and then for that evening book me into that hotel on Alexanderplatz that I stayed in last autumn, and use the company credit card". I'm sure we'll get there, but my natural caution is quite a roadblock at the moment.

My "digital me" needs to be under my control, and on my devices. Not in the cloud running on an AI engine with an unknowable cost basis.

## Are you available?

Then there's the question of cloud engine availability. Recently, the White House gave Anthropic 90 minutes to block access to a couple of its newest engines. There are multiple claims and counterclaims about what happened, but it's clear the White House instructed Anthropic to remove access to anyone who is a non-native American, or is outside of the USA, on national security grounds.

Given that it's essentially impossible to police usage to this level of granularity, Anthropic decided to disable the models for all users. The White House was tipped off by Google, it seems, which is both a shareholder in Anthropic and also a competitor. Curiouser and curiouser, said Alice.

But the repercussions of this have been seismic. Finally, users have been forced to wake up to the inescapable reality that cloud computing, of whatever type, is all fine and good, providing you have access to the toolsets.

Now no-one has ever expected Microsoft to pull the plug on Microsoft 365. Or Google for its offerings. Or for platforms such as Azure and AWS to just go offline, by presidential decree. Configuration screwups and hardware failures are acceptable, but government interference is a wholly new level of scary.

So here's the question that's focusing the attention of boardrooms around the globe, outside the USA. Should we build a business-critical, line-of-business application based on an AI engine or technology from the USA and open to the whims of the White House?

Is this an acceptable risk? Many companies are saying "woah". You might use some AI tools to help with coding, and can switch between them. You can offer a range of tools and pulling one of them might not be business-critical. Indeed, in the recent Anthropic/White House bust-up, JP Morgan restricted staff in its Hong Kong office from using Anthropic

tools, worried about falling foul of US export regulations. All of which means that if you build your line-of-business platform on one specific tool set, you might wake up tomorrow and find it isn't there. And isn't it interesting that

Microsoft is apparently testing the open-source DeepSeek models from the Chinese AI company for use in Copilot Cowork, in an attempt to try to rein in costs. Satya Nadella recently posted a long essay on X titled "A frontier without an ecosystem is not stable" ([tinyurl.com/384nadella](https://tinyurl.com/384nadella)).

He said: "The last thing any of us want is a world where every company across every sector is ceding value to a few models that eat everything they see. If all the value is accrued by only a few models, the political economy will simply not tolerate it. There is no societal permission for an AI future that hollows out entire industries."

And that's a shot across the bows to the big players such as OpenAI and Anthropic. Along with Google, Meta, Amazon and, of course, Microsoft itself.

The arrival of the new hardware, in the shape of RTX Spark and M6 processors, is the opening salvo in the next era of AI processing. It's hugely exciting to watch.

## Synology at Computex

As part of my trip to Computex in Taipei, I spent most of a couple of days with Synology. I was going to write more about it this month, but AI has rather dominated my thinking. It was an excellent visit and we covered a lot of ground, although I always want to go deeper into the raw technology than these companies seem willing.

**ABOVE** Anthropic was forced to remove access to its models after a request from the White House

**"Hardware failures are acceptable, but government interference is a wholly new level of scary"**

**BELOW** Synology's DSM 7.4 will only work on Synology-branded hard disks





One new capability announced is data management on the NAS, whereby it can do a comprehensive job of deduplicating data. It's apparently in the new DSM 7.4 release, which has just come out. I downloaded it onto one of my Synology NAS boxes and, to repeat my Pooh Bear comment, the more I looked the more it wasn't there. That's because the company has locked this down to work only on Synology NAS devices that have Synology-branded hard disks fitted. It won't work if you use any one of the myriad high-quality third-party drives such as IronWolf Pro.

To say I am annoyed is an understatement. Over dinner, I spoke to one of the Synology team who confided that they were not in favour of the Synology-branded hard disk lockdown that I've covered before. But apparently it did wonders for the business cashflow, and I guess accountants rule the world. I will come back to 7.4 next month when I've had more time to play with it.

## iCloud storm

One of the things I appreciate in my Apple ecosystem is the ability to hide my real email address. My devices can generate a third-party email address which is then automatically forwarded to my inbox. This means I can break this forwarding rule at any time, and any email sent to my relay email address just gets dumped on the floor. This is useful when signing up to websites that require an email address.

Apple recently announced it was changing the relay address to xxx@private.icloud.com and Twitter blew up on the news, with people claiming it would allow domains to block the private.icloud.com address name and hence prevent you from using this cloaking technique.

Intrigued, I went to my settings. And all of them are randomstring@privaterelay.appleid.com. Which could be blocked at the privaterelay.appleid.com address level today anyway. I have concluded that the change to private.icloud.com is unlikely to break anything or lock me out. Sometimes the echo chamber of social media is simply too much like hard work.

 jon@jonhoneyball.com

## LEE GRANT

# "Commodore's understanding of its user base should be mimicked by all tech companies today"

**The launch of a new RAM format should be a world exclusive, but it's kicked into second place by memories of the world's greatest sandwich filling**

**R**ecently, the Grant family has been through a bit of a house shuffle. One box that I dragged out of the attic space contained many pieces of old tech that I suppose should now be put in a museum. At the bottom, wrapped in a towel, was a Commodore Amiga 500, which I purchased over two decades ago hoping to relive some nostalgic moments. I recall being thoroughly disappointed by what appeared on the screen, feeling that the blocky graphics and belching sounds didn't match the halcyon memories of when I owned a different Amiga 500 in the late 80s.

Of course, it's my brain that's mistaken and not the Amiga, which I still love despite my deceitful memories. However, there's one element of the Amiga that highlights Commodore's understanding of its user base, which should be mimicked by all technology companies today.

Flip open the A500's user manual, then shuffle through to Appendix F and you'll discover electrical schematic diagrams of the machine's layout. Want to know the rating of capacitors C811 to C816 on the 5V rail? Commodore didn't hide this information, citing security or IP protection nonsense. It shared it with the users and ensured that every machine came with a copy. In my mind, the Amiga 500 was the



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**"The Amiga 500 was the greatest home gaming machine of the 80s and it was designed to be repairable"**

**BELOW** The Amiga 500 came with schematic diagrams of the machine's layout

greatest home gaming machine of the 80s and the manufacturer designed it to be repairable.

Around four decades later, I'm staring at a laptop and wishing that Lenovo would take a leaf out of Commodore's book. The machine is an IdeaPad 3 with an AMD Ryzen CPU, 8GB of RAM and a nasty habit of crashing at random moments, much to the annoyance of its owner.

Once the machine was on the bench, I observed the annoying crashes and spotted the occasional bit of full-screen graphical distortion before it plunged into the abyss. This visual clue made me suspect VRAM (memory that runs the graphics), but the AMD Ryzen CPU inside the Lenovo doesn't have any. Systems such as these borrow from the standard system memory to run the show, so I dug into the machine to see what sort of memory setup Lenovo had inflicted on its customer.

Its 8GB of RAM comprised a single 4GB SODIMM (small outline dual in-line memory module) alongside a 4GB SODUMM (soldered on default unfixable melded monstrosity). I removed the SODIMM chip and watched as the soldered-on RAM failed miserably once again.

Many years have passed since I first bent your ears in this magazine about the abuse of fixed RAM in laptop builds. It's a penny-pinching manufacturing move that immediately removes the ability to upgrade or (easily) repair a machine. Although this Lenovo had





a replaceable SODIMM, there isn't a way in the BIOS for a user to make it exclusive, thus telling the machine to ignore the faulty soldered-in mess. Once the non-replaceable RAM goes wrong, it takes a professional repairer to put it right. I choose these words carefully, as the term "professional repairer" is often cited in right-to-repair legislation as the people who will get access to the tools, documentation and software that will enable them to fix things. Here in the UK we don't yet have that, so there isn't a mechanism for me to acquire any technical documentation from Lenovo about this laptop and, without any of that, laptops deliberately designed to use SODIMMs are e-waste.

Thankfully, the reality of the world doesn't match the ridiculous legal shackles of punitive right-to-repair restrictions, and documentation restricted to one area finds a way of escaping into the wild. For that reason, I unearthed the schematics for this Lenovo laptop quite easily from a repair forum. Have I broken the law by viewing publicly accessible information? Who knows, but "to repair is to rebel", as it says on my FixFest T-shirt.

## Schematically speaking

Although there isn't a software switch to disable the soldered-on RAM, there is a hardware one. On page 7 of the schematic sits a nonsensical table headed with "Board ID" that lists the many hardware configurations with which this board leaves Lenovo's factory. The one I'm interested in is "Board\_ID[2,3,4,5] 0001", which is listed under the description of "Micron 8GB". There are other descriptions for Hynix 8GB (0000), Samsung 8GB (0011) and SMART 8GB (0101), but Micron is the brand Lenovo has used on this machine. The last column of the table is headed "Stuff R" and contains the key to the mystery, though it's hard to tell at first glance as the four references don't make too much sense: RC1612, RC1610, RC1607, RC1606.

These are resistor references, and further down page 7 is a schematic that links the Board\_ID variants to pairs of resistors. This board uses "Board\_ID[2,3,4,5]". Following the schematic line for Board\_ID[2], I hit the resistor pair of RC1611 and RC1612. The schematic shows that RC1611 goes to the laptop's 3V power line and RC1612 goes to ground, so these are pull-up and pull-down resistors that help to set a default voltage level, creating a logical high (1) or low (0) signal. RC1611 goes to 3V (high or 1) and RC1612 goes to ground (low or 0). Following the schematic lines for Board\_ID[3], [4] and [5] shows us that RC1610 and RC1607 go to ground (low or 0) and RC1606 goes to 3V (high or 1).

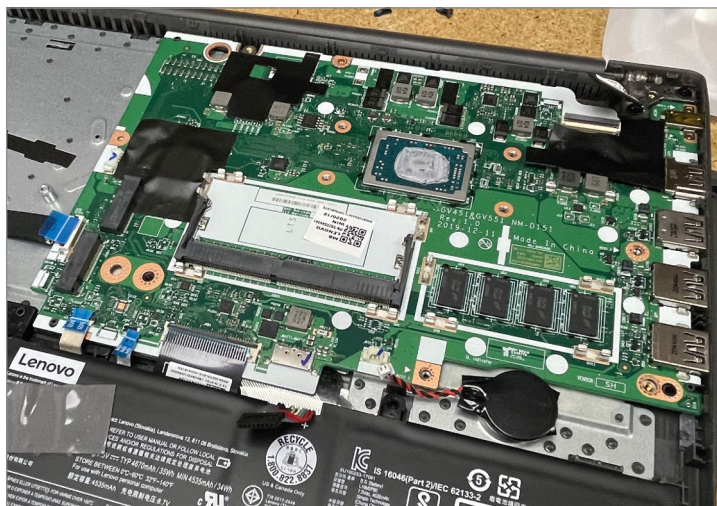
The presence of these resistors creates the logic code 0001, which instructs the motherboard management chip that it's running in "Hynix 8GB" mode. By manipulating these resistors, it's possible to flip the motherboard into a different mode. Listed in the table below 0001 is 0010, described as DIMM ONLY. Bingo! With the adjustment of a few resistors, I could get the Lenovo to ignore the soldered-on RAM and use only the SODIMM.

The first two resistor requirements for 0010 matched the current configuration but the last two were different. I could move RC1607 to RC1608 without issue, but the resistor present at position RC1606 was a 10kΩ and position RC123 required only a 2kΩ. So the plan was set.

**ABOVE** Laptops that use soldered-on RAM are bound for e-waste without schematics

**"Have I broken the law by viewing publicly accessible information?"**

**BELOW** Can you spot the resistor?



Just shift two resistors and the machine would be back in business.

## I'M BOARD!

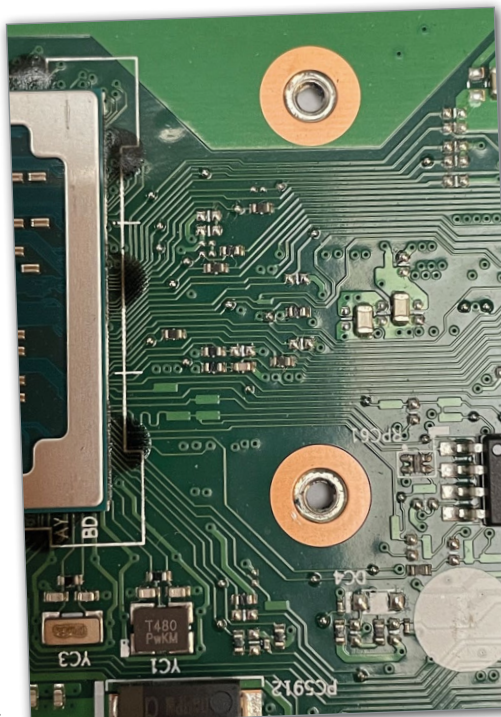
Of course, there was another hurdle to lurch over. A schematic diagram is only a visual interpretation of the electrical layout of a circuit, simplified to be read by humans. What it doesn't show is the location of the resistors on a circuit board, so although I knew I had to put a 2kΩ chip at position RC123, I didn't know where that was. Glaring at the motherboard was also little help. There are some circuits where each component's name is silk-screened to the PCB, allowing easy assembly and repair, but this is laptops we're talking about, where humans are not part of the building process. There were no silk-screened markers for any of these components.

In addition, I'll also mention that these resistors are built to the 0402 package size, which means, as I hardly need tell you, that they each measure 1 x 0.5mm in size. Otherwise known as rather small. Although I'd worked out which resistors to move, I couldn't find them.

To solve this issue, I needed a boardview file. Unlike schematics, boardviews are illustrative maps of the circuit board, created by manufacturers for their engineers to view complex multi-layered PCBs. Once again, boardview files fall into the restricted category of "OEM documentation", so it was by some miracle that I found one that had been

placed in a public internet forum.

Using the boardview file, I could locate the unmarked components, which were spread out on both sides of the motherboard. I'll casually gloss over the next bit, which involved a microscope, a 400°C hot air gun and a very delicate hand. Desoldering components roughly the size of a grain of salt is fun, but one cough or tremor and the blasted thing pings from the tweezers, never to be seen again. As it happens, I didn't have a 2kΩ 0402 to attach to





RC123, so using the schematic, I borrowed an unused one from another location on the board, only possible thanks to information I probably shouldn't have had.

Although I'd followed the logic, checked my calculations and taken extra care with the soldering, I remained uncertain if all this faffing about would actually work. I'm pleased to say that it did. By modifying the resistor layout, I'd disabled the SODUMM and told the motherboard to use only whatever was plugged into the DIMM socket.

This repair illustrates why the requirement to gain access to the correct documentation is vital to any circular economy strategy. Without some benevolent fixer (or rule-breaking anarchist, you decide) this machine would have been heading for the waste skip, hitting the end of its lifecycle years too early. Another important point is that this repair required no parts, so it's a fix using no new raw materials. Win, win, win, win.

## Breaking Lenovo's curse

While Lenovo is on the ropes, let's finish it off with a left hook to the spares department. Earlier in the year, a customer arrived with a Lenovo laptop with a broken screen. The machine was a refurb, so the customer had paid only about £80 for it, which is a vital metric when considering a repair, doubly so when pricing up a touchscreen.

Regular readers will know that I've not had a massive amount of luck with Lenovo and screens (see issue 376, p114, and issue 380, p113), so I was keen to prove that I wasn't cursed. As it happens, the Lenovo parts store had a screen for this unit at the princely sum of £158.88. This is robust for any screen but completely out of the question on a machine that cost £80. "Never mind," I assured the customer, "I'm sure one of my suppliers will have something that will fit." You'd think that after all these years I'd learn not to make heroic promises.

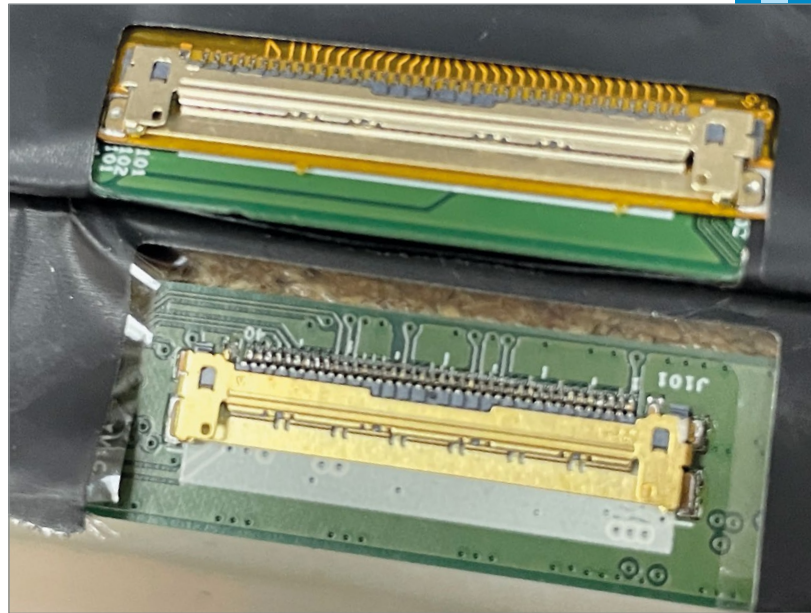
Opening the machine, I noted that the panel Lenovo had used was a B140HAK01.1. I ordered one from my supplier and a few days later attempted to bolt it into the Lenovo's frame, but the 40-pin connector didn't fit. Modern laptops (mostly) use a 30-pin connection

back to the motherboard, but 40-pin was de rigueur when this refurbished Lenovo was brand new.

What the suppliers had sent was a B140HAK03.2, which was very close to what I'd ordered but not quite. It's a bit like ordering a margherita pizza but receiving a pepperoni. The original screen's 40-pin connector was 25mm wide, whereas the wrong-replacement's 40-pin connector was 20mm. Interestingly, my supplier doesn't list widths on its site, just pin counts. After a communication exchange, the new screen went back and I was assured that a genuine B140HAK01.1 would be dispatched ASAP. I grovelled to the customer, fully aware of my reckless promise, and kept my fingers crossed.

Five days later the postman was barely out of the door before I'd torn open the package, and I'm pretty sure he was still close enough to the building to witness my yelp of frustration as I pulled out another B140HAK03.2 panel. Another phone call sent my account manager down to the warehouse to discover that all of the supplier's B140HAK01.1 stock was B140HAK03.2s as its "system" had decided that the two parts are interchangeable. So back in the post that went, and I made another shameful call to assure the customer that I wasn't a complete muppet.

There's more than one trade supplier for laptop screens in the UK, but finding a decent one can be tricky. Although my usual stockist failed to supply a part, the returns process was seamless (and they paid) and this isn't always the case. Always pay close



**ABOVE** The Lenovo connectors sent by my supplier both had 40 pins, but one was 5mm wider than the other

**"You'd think that after all these years I'd learn not to make heroic promises"**

**BELOW** Is it worth spending £158.88 on a new screen for a laptop that cost £80?

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attention to company returns policies because there can be a shock when your faulty "UK stock" part has to be returned, at your expense, to somewhere in China.

Having located another reputable supplier, I was overjoyed when a genuine B140HAK01.1 finally arrived. The fit into the Lenovo frame was flawless and the 40-pin connections melded together perfectly, just like cold stuffing and mayonnaise do within a thick sandwich (just me?).

I fired up the laptop to check that the panel hadn't suffered transport damage, and at that point noticed that the touch control wasn't working. As this is built into the B140HAK01.1, it means (after a re-check and clean) that this panel was faulty. I contacted the supplier and their helpful suggestion was, "Have you flashed the BIOS?". Several sharp exchanges followed and the screen was returned, but before I could phone the customer they turned up at the shop.

Under their arm was another refurbished Lenovo, which they'd bought so I could harvest the screen. To my eye, it was clear that this version was a much newer generation and the cross-compatibility of the screen wasn't guaranteed. During this discussion, the customer underwent a revelatory thought process and realised that they preferred their new-old Lenovo more than their old-old Lenovo.

Happy that the issue was resolved, the customer left the shop with both machines, meaning that the final score from Bankfield Lane was Lenovo screens 4, Lee's profit and loss nil. Hopefully, my luck will improve before I attempt to fire up an Amiga 500 that's been dormant for 20 years.

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ROIS NITHUAMA

# “Removing context that materially changes meaning is not simplification. It is distortion”

**We expect social media companies to distort the truth and omit important contextual information, but we should expect better from the government**

**T**here is an old legal warning: hard cases make bad law. It doesn't mean that tragedy should be ignored, or that the people harmed deserve anything less than compassion. It means that cases which provoke the strongest emotional response can tempt governments to substitute urgency for analysis and broad prohibition for careful design. That's never good. There are excellent reasons we don't allow hard cases to determine the direction of travel.

Over the past decade, a stream of tragic headlines has raised the profile of social media as a factor in the deaths of a number of young people. Dangerous online challenges, contact with predatory strangers, bullying, isolation, anxiety and ordinary childish curiosity have caused immeasurable harm. We have seen the faces of the children and watched grieving parents make heartfelt pleas to shut down any number of websites to protect other families from experiencing the same loss. You cannot argue with their motives. Against that background of such tragedies, the British government undertook to protect children from the dangers associated with social media.

This is why hard cases require discipline rather than speed. The fact that a case is heartbreaking may make action more necessary, but it doesn't make every proposed action wise. Policy made in the shadow of grief should be especially careful, because grief narrows attention. It fixes the eye on the harm that has already occurred and can make any intervention feel morally preferable to hesitation. But careful design is not hesitation. It is how government distinguishes between acting,



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**“There are very good reasons we don't allow hard cases to determine the direction of travel”**

**BELOW Children can be easily exposed to the very worst parts of the internet**

appearing to act and acting in a way that will survive contact with reality.

## Eight out of ten cats said they preferred Whiskas

On 15 June, the government announced plans to ban social media for children under 16. Brilliant. Well, that's that sorted, then. It is not as though children have ever devised a way around a rule imposed by adults.

And we learn that this is coming not a moment too soon. Why? Well, according to the government's website, the decision followed “overwhelming public demand for action”, with “nine in ten parents” backing a ban on social media.

Nine in ten parents? That's a claim you might struggle to get past the Advertising Standards Authority. You will have to forgive my scepticism. At a time when the government is warning about chronic and persistent disinformation on the very platforms it's seeking to restrict, its own communications display a remarkable lack of care, sophistication and diligence.

There is no qualification beside the statement. It simply says “nine in ten parents”. Read literally, that means nine out of every ten parents. Of

course, governments and researchers do not need to question every member of a population before drawing conclusions about it. Properly constructed representative surveys allow findings from a sample to be applied more widely. But that isn't what happened here.

The fact sheet does not say nine in ten parents surveyed. It does not say nine in ten respondents to an open consultation. It does not tell the reader that the respondents were *self-selecting*, or that the government itself says *they should not be regarded as representative of parents and carers nationally*. Read that last line again. I would repeat it here for emphasis, but the editor will think I'm simply trying to beef up my word count.

Those are not minor methodological footnotes. They determine what the figure means.

The government could have said that nine in ten parents and carers who answered the relevant question in the full-length consultation supported a minimum age. That remains a substantial finding. It may provide evidence of strong feeling among those who participated. But it's not the same as establishing that nine in ten British parents support the policy.

There may be any number of explanations for the wording. It may have been compressed for readability. It may have passed through several hands. Someone may simply have decided that “nine in ten parents” made a cleaner and more persuasive line. None of those explanations makes the published statement more reliable. And we must prioritise reliability.

Information issued by governments

is easily discovered, instantly shared and frequently repeated. It must therefore be especially credible. Institutions do not possess an unlimited reservoir of public confidence from which they can make casual withdrawals. Nor is it an answer to say that the necessary qualification can be found somewhere else on a government website.

The ordinary citizen shouldn't have to leave a government fact sheet, locate the underlying consultation documents,





examine the methodology and discover that the headline claim means something materially narrower than the words on the page suggest. The responsibility lies with the institution publishing the information.

More fundamentally, why would the reader begin such a research project? The fact sheet contains no warning that the claim requires qualification. A person who trusts it has no reason to suspect that further investigation is necessary.

This is not pedantry. It is the difference between reporting the views of a self-selecting group and making a claim about an entire population. A number doesn't become accurate merely because it can be traced to a spreadsheet. It must also be described honestly. Context that materially changes the meaning of a statistic is not optional detail to be deposited elsewhere; it's part of the fact itself.

The same is true of any claim placed before the public. Information can be technically defensible at the level of its individual components and still create a materially false impression when important qualifications are omitted. The words may be narrowly supportable. The conclusion invited by them may not be.

That matters not only because people need reliable information to make decisions now, but because published claims persist. Once a statement appears on an authoritative website, it can be quoted by journalists, repeated by politicians, indexed by search engines, incorporated into reports and relied upon in later debates. Each repetition increases its apparent authority while carrying forward less of the context in which the original claim was made.

Over time, the qualification disappears and the line survives. A finding drawn from a self-selecting consultation becomes "nine in ten parents". An allegation becomes an established event. An early account produced under uncertainty becomes the version retrieved years later by someone who has no reason to know that the evidence subsequently changed, weakened or was never conclusive in the first place.

This is how poor communication becomes more than a momentary lapse. The public record does not simply preserve information; it lends information authority. What is published today may become the evidential starting point for a decision made months or years from now. If the original statement is incomplete,

overstated or deprived of material context, the defect can travel with it.

Corrections and qualifications are therefore not cosmetic. Nor is it enough to place them somewhere else and expect the reader to excavate them. The institution making the claim must ensure that the meaning conveyed on the page is supported by the evidence available to it.

### Not like that, like this

The verbal dexterity involved in dropping the context is itself a form of distraction: a linguistic sleight of hand of precisely the kind social-media platforms are routinely accused of. The number is real. The description attached to it is not. The qualification that would allow the reader to understand what the number actually means has simply vanished.

Simplifying complicated information is often necessary. Removing context that materially changes meaning is not simplification. It is distortion. Whether that distortion is accidental or deliberate is a separate question.

That is especially troubling here. The government's case for restricting social media rests partly on the argument that platforms expose children to information without the warnings, context or safeguards necessary to understand the risks. Dangerous challenges may be presented as harmless entertainment. Extreme behaviour may be stripped of its consequences. Edited clips may circulate without the facts

**ABOVE** A social media ban for under-16s is expected to be in place by early 2027

**"In an age of information abundance, context is not a luxury"**

**BELOW** Liz Kendall, the former science, innovation and technology minister, announcing the ban



needed to interpret them. We are rightly exercised by platforms that make material compelling by making it incomplete.

But surely the standard cannot apply only to Silicon Valley. It must apply to every institution that publishes information intended to shape public opinion and behaviour, including the UK government.

When I first thought about writing this article, my intention was that it would be a tongue-in-cheek examination of the workarounds, borrowed accounts, false ages and other devices that young people will inevitably deploy to retain access to platforms that prohibition may only make more attractive. Instead, it has become an argument for truth in public communications.

Not an argument for impossibly high standards. Just reasonable ones. Check the facts. Describe them accurately. Attribute claims properly. Distinguish evidence from assertion. Preserve material context. Correct mistakes visibly. Don't make the reader conduct an investigation to discover what your words should have said in the first place.

If government condemns social-media companies for publishing material without sufficient context while doing the same thing on its own platforms, who exactly retains the moral high ground?

Public trust is not maintained by insisting that institutions are correct. It is maintained by demonstrating that they are careful. Citizens can tolerate uncertainty. They can tolerate disagreement. What corrodes confidence is the sense that important qualifications are being omitted in pursuit of a cleaner headline.

In an age of information abundance, context is not a luxury. It is part of the fact.

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DAVEY WINDER

# “If the attacker can’t get in one way, they’ll just try something else”

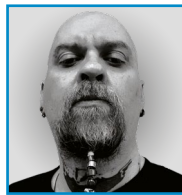
**The infostealer pandemic shows no sign of stopping, but there are ways to fight back – starting with becoming aware of all the emerging threats**

**I**t would be understandable if you thought that software vulnerabilities were the primary cybersecurity threat facing both business and consumer users alike. I mean, the highly respected Verizon 2026 Data Breach Report ([tinyurl.com/384verizon](https://tinyurl.com/384verizon)) recently warned that software flaws have overtaken stolen credentials for the first time when it comes to the initial access routes used by attackers. The Verizon analysis found that about 31% of all breaches begin with the exploitation of a vulnerability, and that this is the first time in 19 years it has surpassed stolen credentials in this regard.

But here’s the thing: real-world security isn’t binary. There are no simple yes-or-no tickboxes when it comes to the threats out there. Sure, risk analysis is crucial before you start spending money and committing resources to defensive strategies, and that’s the same for home users as it is for commercial ones.

I’m reminded of another old chestnut: that to assume makes an ass out of you and me. Assuming that attackers will use one initial access method makes about as much sense as thinking politicians will deliver on their promises after you’ve voted for them. Your MP will toe the party line if they want to get any real power, and a threat actor will deploy a multi-layered attack strategy if they want to access your networks and data. So, while managing software vulnerabilities is important, if the attacker can’t get in that way, they’ll just try something else.

Cue the Identity Theft Resource Center’s report in early June ([tinyurl.com/384idtheft](https://tinyurl.com/384idtheft)), which revealed that unauthorised access to devices has surged by 78% in the past year. Not quite, but almost doubling. This threat



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**“There are no simple yes-or-no tickboxes when it comes to the threats out there”**

now accounts for 27% of all security breaches. What’s more, a quarter of victims experienced two or more incidents at the same time, which doesn’t surprise me at all. After all, once a device is compromised, it can quickly trigger a series of cyber issues that affect many accounts, creating a domino effect.

At the heart of this identity crisis, if you’ll excuse the hyperbole, sit two different yet related things: phishing and infostealer malware. I’m not going to waste time explaining what phishing is or how AI has transformed it from naive scamming attempts into a sophisticated, targeted fraud threat, as you are educated folk and I’ve covered that extensively over the past year or so in these pages. Instead, let’s take a look at infostealer malware, shall we? Acksherly, I do need to mention phishing, as it remains one of the most common ways to get you to install the malware in the first place. But that’s it, I promise, as far as the social engineering threat stuff goes.

## Infostealers: the lowdown

So, infostealers – what are they? Malware that steals information, duh! More specifically, they target login credentials, including passwords and, sad to say, authentication/session tokens, in many instances. According

to my friends at the KELA threat intelligence platform, a stonking four million unique devices were infected by infostealer malware during the course of 2025. This yielded almost 350 million compromised credentials. Which is a lot, but pales into insignificance if you take into account sources such as databases of collated infostealer log datasets: doing so pushes the 2025 total in excess of 2 billion records.

Want something more recent? Okey dokey, how about the 124 million unique individual passwords added to the Have I Been Pwned (HIBP) database of compromised credentials in one hit during June 2026? The passwords were in addition to some 56 million unique associated email addresses that had been compiled by an unknown threat actor and made available in online crime marketplaces from what HIBP referred to as “hundreds of millions of stealer log records”.

This should come as absolutely no surprise to anyone. Not only that there are so many infostealer logs out there, but that they’re accessible to cybercriminals looking to use the information in so-called credential-stuffing or brute-force initial access attacks. This is where the same compromised credentials can be thrown at a range of different accounts using the same username and password combo in short order by employing automated systems.

There’s no shortage of people looking to make use of such data, and no shortage of people able to exploit the malware-as-a-service platforms that have made infostealer deployment available to anyone willing to pay the fee to hire them. The barrier to entry is certainly not a technical one any more, as these systems are pretty much point and shoot.



**RIGHT** Verizon’s Data Breach Report highlights the rise of infostealers, which are available for the cost of a cup of coffee





Nor is there a huge financial barrier to jump. These platforms can be accessed for the equivalent of a Starbucks coffee a day when rented for a month at a time. The only barrier to entry is locating them (very easily done, although I'm not providing any clues here) and getting some kind of validation that you aren't law enforcement but a "genuine" cybercriminal (which is just as easy, and I'm staying just as quiet about that, sorry).

## New names, same old threat

You should also draw minimal comfort from news of law enforcement takedowns. Yes, these impact the underlying infrastructure used by criminal operators, and yes the makeup of these groups changes due to a combination of internal power struggles and new alliances being formed. But the threat itself remains solid. So, while names such as Lumma, StealC, Redline, Katz and ClickFix might ring bells thanks to coverage in the tech and cyber press (doffs cap, you're welcome), focusing too hard on individual threats is a futile exercise.

That said, let's look at one threat to get a better understanding of how this type of malware operation works.

I've opted to use the Infiniti Stealer as the example here for several reasons, not least that it targets macOS platforms. I'm afraid you're not safe because it incorporates a threat model that has proven hugely successful against Windows users, namely ClickFix, so it covers many bases.

Cybersecurity researcher Stefan Dasic, assisted by malware binary analysis from Marcelo Rivero, both working at Malwarebytes Labs, have noted that "to our knowledge, this is the first documented macOS campaign combining ClickFix delivery with a Nuitka-compiled Python stealer". In other words, the payload is coded using Python, and then compiled with Nuitka to produce a macOS binary. That makes it a whole lot harder to spot using common defensive technologies than typical Python-based malware.

ClickFix is a "hack-your-own-computer" threat that employs basic social engineering to bullshit unsuspecting users who are likely bored with repetitive authentication tasks. They're thus primed to unthinkingly complete a faked Cloudflare CAPTCHA that instructs them to enter this macOS friendly sequence: Command+Space \> open

Terminal \> paste the command strings that lead to the Infiniti Stealer infection itself.

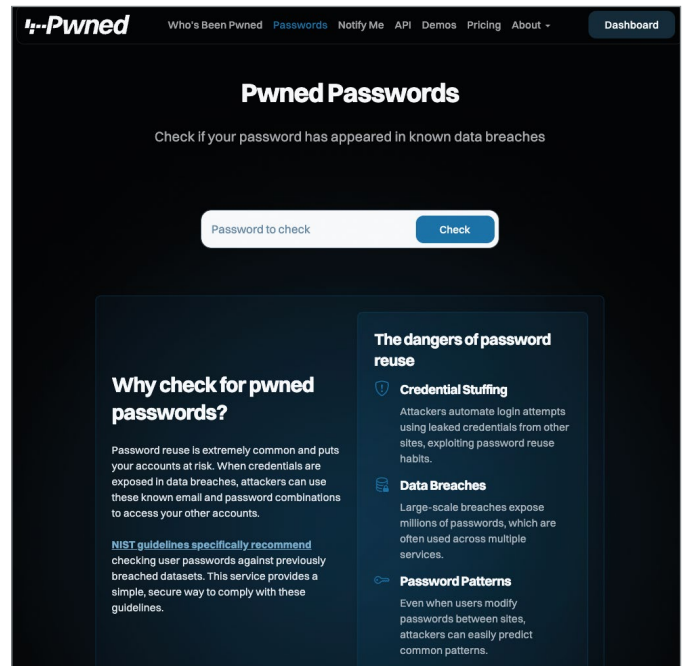
"Because the user runs the command directly, many traditional defences are bypassed," said Dasic, so there's "no exploit, no malicious attachment, and no drive-by download." What there is, however, is malware that the user themselves unknowingly initiates. This steals, and I hope you're sitting down: credentials from Chromium-based browsers and Firefox, macOS Keychain entries, cryptocurrency wallets, plaintext secrets in developer files such as .env, and screenshots captured during execution.

As the Malwarebytes Labs report explains ([tinyurl.com/384infiniti](https://tinyurl.com/384infiniti)), once the user is presented with the fake verification page and follows the instructions to paste what they think is a "verify you are human" test command string into the macOS terminal, what actually happens is that this resolves to a URL, hosted on the same domain, that has the first payload in the form of a Bash script that:

- Decodes the embedded payload
- Writes the Stage2 binary to /tmp
- Removes the quarantine flag
- Executes the binary via nohup
- Passes the command-and-control server and authentication token as environment variables
- Deletes itself and closes Terminal via AppleScript

This takes us to the second stage, the dropped binary in the form of an Apple Silicon Mach-O executable. The executable is compiled using Nuitka's onefile mode, used to package the Python application by compiling the source into C and producing a native binary. This results in something that is much more complex for defensive static analysis tools to detect.

The final stage is the decompression of embedded data, launching the Python Infiniti Stealer itself, which checks to see if it's running in any known analysis environment. It



**ABOVE** Check your passwords for compromise at Have I Been Pwned

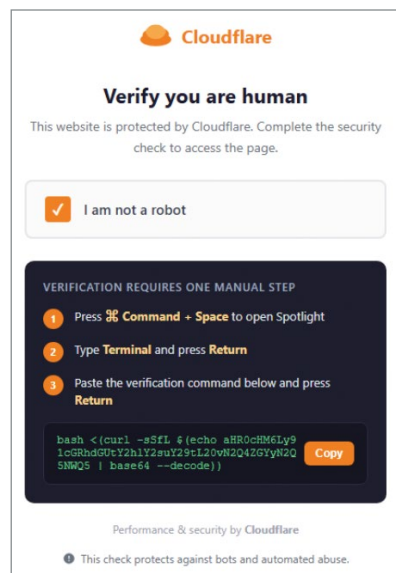
**"Infostealers are incredibly efficient and incredibly scalable"**

**BELOW** The Infiniti Stealer macOS ClickFix attack in action

also introduces a randomised execution delay to evade automated analysis systems, before beginning the task of stealing stuff. Once it has stolen stuff, and that's the correct technical term as far as I'm concerned, it sends a Telegram message to the threat actor and queues the credentials for server-side password cracking.

And what kind of attacks are these initial access methods used in? Take your pick from any exploit that requires account credentials to establish a network foothold, from sophisticated espionage operations to commonplace ransomware campaigns. Infostealers are, put as simply as I can muster, incredibly efficient and incredibly scalable. This is what has driven them to the top of the initial access resources tree, with the capability of compromising truly staggering volumes of personal and corporate accounts in relatively short order.

Tech research firm Comparitech undertook a statistical analysis of the dark web's compromised credentials pipeline ([tinyurl.com/384comparitech](https://tinyurl.com/384comparitech)). It analysed 447,000 credential leaks, dumps and breach threads across cybercriminal forums containing 1.1 million stolen user records, dating from 2013 to 2026. Report author Paul Bischoff and researcher Mantas Sasnauskas talk of a five-stage compromised credentials criminal supply chain – although the first





Continued from previous page

and last are somewhat moot as they involve stuff that's happened before those credentials hit the criminal forums and how they're used when they leave them, respectively.

This leaves us with the wholesale, trade and aggregation stages to consider. Wholesale acts as the marketplace for stolen passwords, vividly illustrating the supply side of the password economy. The trade phase is where the compromised data is posted, sold, traded and reposted across hacker forums. While you might imagine this is all done as commercial transactions, you would be wrong: some of the data is simply shared as free downloads between cybercriminal conspirators as some kind of kudos-seeking show, one assumes.

This leaves us with the aggregation stage, where compromised passwords and other credentials are compiled into so-called combolists. The most valuable of these are deduplicated across various breaches, making them especially attractive to attackers.

## How to block attacks

So how do you go about mitigating the risk of infostealer malware attacks? Good question, the answer to which comes by way of, once more, concentrating on the security basics: active defence monitoring, proactive access management, employee awareness training, multi-factor authentication, and incident response plan management.

From a consumer perspective, I always recommend using a password manager as this brings strong, unique passwords into the mix without having to remember them all, while at the same time reducing the risk of reuse across accounts and services. Doing this reduces the credential-stuffing threat.

Above all else, though, switch to using a passkey if the option is available. You won't find passkeys in infostealer logs as they're much harder to compromise. Oh, and if a CAPTCHA or other verification system asks you to open a run dialog or Terminal window, and then enter commands that you don't even understand, don't.

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STEVE CASSIDY

# "Picking the right server hardware is a matter of keeping everything simple and minimal"

**What do old cameras, medical greyscale monitors and a wild selection of switches have to do with networking minimalism? You're about to find out**

I don't get many visitors, so it was a pleasant surprise to welcome a father/son pairing to help with a spring-clean down in the server basement room. It should have been a short visit but extended to many hours, as the young chap soon revealed an insatiable curiosity about everything on the shelves.

Getting past the camera shelf, holding as it does the Apple QuickTake 100, my spare Nikon D2 body and several dusty pre-digital SLR bodies and lenses, took 15 minutes on its own. The thing about the QuickTake 100 is that it doesn't honour the theatre of photography: you press the shutter and the picture is taken, but without the auditory cue of a shutter clicking to and fro. Lots of early QuickTake subjects had no idea whether the picture had been taken or not.

It's just over 16 feet from the door to the inner stairs. It took us seven minutes as my visitor slowly worked his way through the implications of what a device like this might imply, either when first launched or now, some 30 years later. Not quite realising the strength of his need to enquire, I stopped off by my now superannuated Sony DSC-R1, which is equipped with a Zeiss lens, two viewfinder options and a self-important double beep when it thinks it has correctly acquired whatever you wanted to take a picture of.

"Now, that's more like it!" was the reaction. The DSC-R1 certainly looks



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the part, festooned as it is with switches and knobs, plus a massive lump of glass for a lens. There's also a fancy rotating viewfinder screen, for all the budding vloggers when it launched back in 2011.

I had to burst his bubble. The truth was that the ancient Sony was in such good order because its various modernised features were collectively more of a pain in the rear than a great aid to making fantastic photos. This was the first camera I'd found that didn't just include facial recognition; it actively stopped me taking pictures without gurning humans somewhere in the frame, until I found the menu entry to turn that off in software.

The camera I used a lot more was hidden away in a crowded bookcase upstairs. All I remembered at that moment was that it was a Lumix, and it stood out because it didn't have an electrically powered zoom. You had to twist the barrel with your hand to zoom in on your subject: quick, rewards practice, and made the battery last several days instead of one long afternoon. This, along with a lot fewer buttons, provided the ability to snapshot not just a formation of fighter jets in the King's Birthday flypast, but each individual plane.

BELOW LEFT Apple's QuickTake was one of the first consumer digital cameras

BELOW RIGHT The Sony DSC-R1: a pain in the derriere





## Falling flat

I realise that cameras aren't vital components in your core business infrastructure, so you may be wondering what this has to do with you. Well, as luck would have it, the next stopping point for this enquiring young chap was by my antique flat-screen display. He quickly passed by my super-early IBM T210 because when it's not running there's nothing odd about it to the average eye: instead, my young friend jumped directly to the Barco display beside it.

This is now thoroughly obsolete, but you can look at the successor device at [tinyurl.com/384barco](http://tinyurl.com/384barco). Designed for looking at X-rays, it's normally found hooked up to a controlling PC workstation and being stared at by radiographers with urgent patient diagnostics to deliver. What, you might ask, was it doing in a jobbing consultant's basement junk room?

My answer felt simple to me, but clearly needed more than one try with my audience-of-one. I used to hook up the Barco when writing articles with as few distractions as possible. Not that it had any internal magic for blocking eBay or any of my other time-wasting sites: actually, I could just drag and drop windows from the principal display over to the Barco. Colour simply wouldn't show up while the Barco had the window.

That's not because I was driving the greyscale display with an enormously specialised greyscale graphics card – most of the time I was using it with a base station driven by an early Fujitsu tablet PC. The Barco's singular contribution was that it can take almost any input digital video signal and turn it into an inherently balanced, eye-friendly greyscale image. Pull a Word window onto this thing and the background looks like a calm parchment type of grey, with the text a cool and calming black.

Back in the day, me and a few writer chums took a risk on a batch of these monitors. One of them ended up in the Hague, where its merits were very apparent to a friend who authored a couple of two-million word tomes on international law using his Barco screen. All of us who took advantage of the batch for sale say the same thing: that a greyscale screen makes it far less likely that you'll goof off when you should be writing.

Colour displays are a persistent alluring temptation, popping with garish advert panels even on plain reference sites you have a legitimate

reason to be examining. With your words on the Barco, the hypnotic call of distractions is opposed.

Understandably, my young friend didn't see this as an advantage. He wants a curved 4K gamer's special, with a big enough graphics card that a 60in pixel array doesn't blip when his animated, anime screensaver kicks in.

I can't remember what we all paid for our Barcos, but I'm pretty sure it wasn't much over £200. So, why are these screens no longer earning their keep? Because something in Windows XP's device drivers caused the extra high-resolution displays to drop into a fuzzy, blocky, lower-resolution mode. If manufacturers didn't fill in the specification sheet or .INF file in full, then suddenly those device drivers marked the missed-out devices as untrustworthy.

This goes to show that minimalism can cut either way: it makes sense for graphics card companies to limit the variety of devices they support, just as it makes sense for the owner of a PC not to have to fork out big money after an upgrade on the helpfully shortened list of supported cards.

We moved past the Barco and the T210 IBM in our tour. My basement has two rooms, divided by a breeze-block wall and a half-flight of steps: at the bottom of the steps is my server row, the storage 10GbE switch, the premises 1GbE switches, and half a dozen live fibre optic interlinks.

I had already broached the general idea of minimalism, and how it could help with setting limits in network design and equipment selection. But like a lot of my visitors to the basement, this young chap took a quick headcount of all the separate, baleful sets of status LEDs round my shelves and said, "You can't tell me this lot is minimal tool!"

Oh, but it is.

## Minimalism and servers

This is where the analogies become strained. If you're a



**ABOVE** New Barco diagnostic displays cost thousands, but my old model was a £200 bargain

**"My basement is home to network NAS boxes with delusions of grandeur"**

**BELOW** My main server-side task provider is an ancient Mac Pro



fibre nut, you can put virtual machines inside physical hypervisors on disks that can be 70 kilometres away. My basement, on the other hand, is home to network NAS boxes with delusions of grandeur, complete with mixed network speeds and a menagerie of server-grade devices.

I'm also terribly lazy with servers: if they're already running then I'm happy to leave them that way. I have an exceptionally aged Mac Pro as my main server-side task provider, because those machines took the same kind of RAM as the bigger PC servers of the later 2000s. This meant I could upgrade the Mac Pro's 24GB of RAM by retiring a few older corporate-standard PC servers, which was worth doing just in terms of the temperature

in the basement.

Yes, I know that few corporates would risk their daily bread on just one machine supplying DHCP addresses and DNS lookups both inside and out. Conversely, I don't know many small businesses with full redundancy in all their core infrastructure and internet access services either. Besides which, that Mac is getting on for at least eight years old in its current configuration, a degree of stability that's let me play around with many different configurations of alternative servers without that terrible feeling you get at about 4pm when you have to make the call to leave it in or restore it to start-of-day condition.

I'm sure my more experienced readers will be on the edges of their seats where the matter of virtual machines, servers and minimalism is concerned.



This is a minefield, to put it mildly: on the one hand you feel like it's big-school time when trying to stand up a modern VMware dedicated server machine; but that pales beside the sheer duplicity of a Docker environment, where the major gains are all about keeping the various guest machines absolutely in lockstep with one another, so the virtualised container VMs are as similar as peas in a pod. Only, while everyone seems to agree that Docker's stated intention of making on-demand provisioning quick and simple is entirely understandable, the amount of work you must do to achieve such an aim is described using phrases such as "high cognitive load" in the introductory documentation.

I think the most valuable asset for a smaller business is a clear view of exactly how much server hardware you need to run the company. I quite understand that this can be a big ask, what with the inconvenience of actually having a business to run, which is why I think drastic measures may be required. This includes throwing out any virtualisation platform that needs a high and specific skill level to actually live with, week on week.

For me, by far the best hypervisor platform for minimalist approaches in business is Microsoft Hyper-V. Every lesson you've learned in decades of wrangling any Windows machine can be applied to Hyper-V guest VMs, the host itself, the connecting workstations. Yes, all of it.

This is a lot more minimalist than having to read ream after ream of Linux-based hypervisor documentation before you can get any handle on what's going on. Yes, I quite agree with the flag-wavers for Oracle VirtualBox that it's free, which represents savings of several thousand pounds over Hyper-V. But really, how much time spent does this price difference represent? This is an occasion when spending a few thousand buys you literally decades of peace of mind.

### A quick case in point

I've referred to my high alpine clients now and again here. They're a great example of a smaller business – but a rich one – whose options are constrained by being at an altitude of

2,200 metres. Everything must run, and stay that way, through two four-month long peak seasons, either side of Easter. User support visits are sometimes undertaken while dodging metres of snowfall, and picking the right server hardware therefore is definitely a matter of keeping everything simple and minimal.

We did well on that score. Even the madness of the lockdown years didn't disturb the server's reliability. Eventually, there were some deep and apparently unfixable issues with the software product they were 100% immersed in every single working day; issues so bad that, after some persuading, the software house wrote a formal letter of apology to the Swiss tax men, identifying themselves as the reason why the small business hadn't submitted its tax returns before the deadline.

I wasn't even faintly surprised to hear that my customer had parted ways with this software house. Less expected was the attitude coming off the new software house, which had

**ABOVE Oracle VirtualBox may be free, but it's no match for Hyper-V**

**"This is an occasion when spending a few thousand buys you decades of peace of mind"**

**BELOW A server in the Swiss Alps has to be minimalist to cope with the conditions**

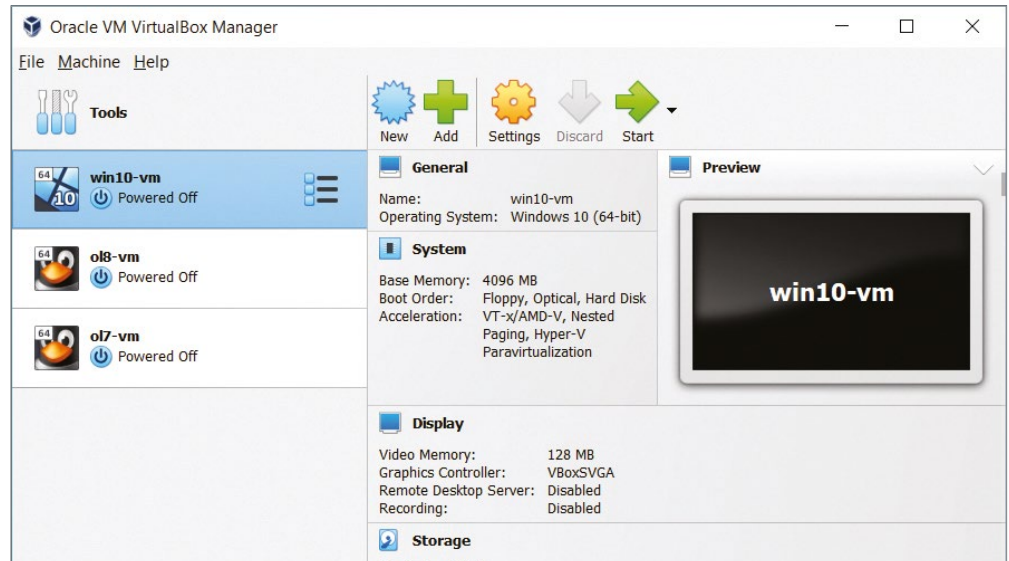
come highly recommended. They seemed unable to distinguish my work from that of the preceding software house, and were therefore very nervous indeed at the idea of being given the old server – now five years old and a veteran of lockdown, winter storms, hacked accountancy firms, and the freeze/boil climate of a Swiss office building in the high Alps.

Here's where thinking about minimalism really paid off. I left them and their trail of tentative, uncertain emails until the very last minute, and then built them a spanking clean virtual machine as their database server. One totally free of history or interference. It took them some time to acknowledge just how clean their new server was, and just how easy it would be to retire the one messed about by the preceding contractor.

Eventually, we did indeed turn off the old, badly corrupted and heavily abused old VM, and moved the files making up its disks over to an iSCSI share on a reasonably modern office-grade NAS box. "It barely matters where it is, because we're not going to need to re-open those VM volumes" I explained.

I eventually realised that what they were doing was assuming that unwanted complexity in the server setup had been responsible for the megascale corruption screw-ups that so interested the tax authorities. They kept looking for "the English sabotage", seeing my input as a competitor, not a collaborator. One case in which the master of minimalism in design is Occam and his razor, at least if you're a somewhat paranoid software supplier.

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# Retro

Inspirational stories from computing's long-distant past

For more than two decades, computer magazines didn't just sell pages packed with news, features, reviews and opinion; they sold games and applications too. Tapes, discs, CDs and DVDs packed with software were attached to the cover, eventually escalating into a full-blown covermount arms race. They reshaped the economics of magazine publishing and drove circulation to new heights and, for readers, the value was often extraordinary.

Readers could grab a copy of QuarkXPress 5.01 from *Computer Shopper* in January 2007, saving around £880, while also getting



**LEFT** PC Pro's publisher Future Publishing pioneered the concept of covermounting in the UK

and the idea stuck firmly in Anderson's mind.

"The experiment showed that software could significantly lift the circulation of an issue," he told PC Pro. It could also still make a profit. "The crucial thing we did in that experiment was to raise the cover price," he said. "That paid for the extra cost of producing the tape and we still got the circulation surge. Ironically VNU shut down that magazine before they saw the improved circulation numbers. But the idea lived on."

## Tape expectations: the covermount years

hold of titles such as Paint Shop Pro, StarOffice and CorelDRAW. More into games? Why not enjoy a host of classics from *The Secret of Monkey Island* and *Wing Commander* to *Need for Speed* and *X-COM: UFO Defence*, courtesy of PC Gamer.

Packed with demos and full releases, these covermounts helped readers to build software libraries while offering an early glimpse of new technology. They also proved to be a good test bed. PC Pro offered the beta 2 test version of Microsoft Office in 2006, allowing readers to check out the software suite ahead of its retail launch. There's no doubt readers loved them.

### ■ Visionary thinking

The idea to bundle software with magazines emerged in the 1980s when the team behind *Personal Computer Games* magazine decided to include a flexi-disc with issue three in February 1984. The flexi-disc, containing four of the five type-in game code listings printed in the magazine, was designed to be played on a standard record player turntable. It enabled users to record the computer data on to an audio cassette, which could then be loaded into a ZX Spectrum, VIC-20, BBC Micro or Dragon 32.

David Crookes reflects on how cover tapes, CDs and DVDs transformed sales for magazines in the UK and gave readers extraordinary access to PC software

A few months later, in October 1984, *Computer and Video Games* magazine attached a 7in flexi-disc containing the Spectrum version of *The Thompson Twins Adventure* to the cover of issue 36 in October 1984. But it was *Personal Computer Games*' next move that arguably proved most pivotal. Edited by Chris Anderson, the magazine cover-mounted a cassette on the December 1984 issue that included ten game demos for the Spectrum and Commodore 64 computers. There was a noticeable positive impact on sales,

Packed with demos and full releases, these covermounts helped readers to build software libraries

Indeed it did. After leaving VNU, Anderson went to work for Newsfield, where he became the inaugural editor of the Commodore 64 magazine *Zzap!64*. After editing the first three issues, he handed the reins to Roger Kean and left to found Future Publishing, which launched with *Amstrad Action* in September 1985.

Edited by Peter Connor, who also worked on *Personal Computer Games*, the magazine was aimed at users of the Amstrad CPC 464 and 664. Despite showing a great deal of promise, it struggled to sell and Anderson was understandably worried. Was his dream of owning a publishing company about to hit a brick wall? The third issue introduced some early changes including type-ins and new sections, but Anderson knew he needed to do something even more dramatic if he was going to turn the company's fortunes around.

For issue four – the Christmas issue – Anderson gave every reader a gift. He increased the number of pages to 116 and popped a cassette on the cover that included two unreleased games developed by Ocean Software: *Kung Fu* and *Number 1*. The impact was almost immediate. Although Anderson had copied the strategy implemented

at *Personal Computer Games* and temporarily increased the cover price from £1 to £1.50, the magazine flew off the shelves. In the process, it saved Future Publishing from going bust.

"You could definitely argue that it turned *Amstrad Action* from a likely failure into a success," Anderson said. "We were a tiny startup with barely enough in the bank to pay each print bill, and the circulation numbers of the first three issues just weren't high enough. Circulation doubled on that cover tape issue and then a good portion of the gains continued in subsequent issues, now that more people had discovered the magazine. The whole operation turned cashflow positive and we were off to the races."

## No way back

Anderson was fortunate in being able to bag such eye-catching, complete games. "I'd built a good relationship with David Ward of Ocean and he was magnificent in encouraging new magazines to be in the space," Anderson said. "He was our first big advertiser, and I always saw him as one of the visionary thinkers.

"It was an absolutely amazing moment when he agreed we could use those games. He charged us nothing for them. I just saw the act as a good promotion of the Ocean brand. I guess they decided that they weren't quite at commercial release level but from our point of view they were fantastic and our readers thought they had been given something truly incredible."

The company decided to repeat the trick for issue eight, adding a cassette with a complete game, *The Covenant*, worth £9.95, along with demos of *Get Dexter*, *Swords and Sorcery*, *Doomsday Blues* and *Battle of Britain*. There was another tape for issue 16, the next Christmas issue. Each time, the move gave circulation a boost.

It also firmly established the idea of a cover tape, and other magazine publishers began to take note. While *Amstrad Action* didn't offer monthly tapes on Amstrad for six years, confining them to special occasions such as the magazine's anniversary and Christmas – "there weren't many David Wards out there," Anderson explained – cassettes on covers were popping up elsewhere. Software developers and publishers were also beginning to see the benefit of creating demo versions of their products.

Future Publishing remained at the forefront of this wave. When it rebranded *Your Spectrum* to *Your Sinclair* in January 1986, it used a cover tape to attract readers. But it had to start looking over its shoulder.



For while *Your Sinclair* began to get regular tapes from May 1987, its main competitor, *Crash*, offered a tape – the Sampler, complete with seven demos – in October 1987. It was the first salvo in what would end up in a cover tape war. And there was some resentment.

Roger Kean, Newsfield's co-founder and *Crash*'s first editor, spoke to the website Eurogamer in 2017 and said the "financial implications of sourcing games for the tapes, plus the huge cost of manufacturing and then sticking the damn things" on the covers had a knock-on effect. When tapes became regular, the number of magazine pages had to fall. *Crash*'s illustrator Oliver Frey also had to change how he approached the design of the publication's iconic covers.

But there was no question of backing down. It became clear that offering tapes was hugely beneficial, so they became part and parcel of many a magazine's overall package by the end of the decade. Publishers felt they needed to put a lot of effort into bagging the best software they could, and magazines ended up going head to head on the strength of what they could mount on the cover. *Sinclair User* also joined the fight, and the number of titles being included on each tape began to rise. The gloves were well and truly off.

## Tape wars

To attract more buyers, magazines sought exclusives and they battled to get hold of demos for the latest

**ABOVE** *Amstrad Action* and *Amiga Power* were at the forefront of the covermount craze

**BELOW** *Your Sinclair* packed its tapes with lots of demos and complete games



**Magazines ended up going head to head on the strength of what they could mount on the cover**

games. Some went as far as asking developers to produce games for them. *Dizzy 3* and *a Half* was a mini-adventure created especially for *Crash* that served as an intro to the budget game *Magiland Dizzy*. Similarly, *Seymour: Take One* was written exclusively for *Your Sinclair* and *Amstrad Action*.

The Commodore 64 magazine market wasn't immune to all of this. Newsfield's *Zzap!64*

magazine had a one-off tape, the *Zzap! Sampler*, in June 1987 but also began regularly mounting them on the cover. And then Future Publishing launched *Commodore Format* in 1990 and attached cover tapes each month from the first issue.

"By this time, cover tapes had been around for ages," said *Commodore Format*'s launch editor Steve Jarratt. "We were also deep into the lifespan of the Commodore 64 and the Spectrum so there was an enormous amount of software sloshing around." Although budgets for the tapes were low, some reasonable money exchanged hands. *Commodore Format* paid £2,000 to Simon Pick for the unreleased shooter *Revolution*.

When *Zzap!64* was rebranded as *Commodore Force* with the January 1993 issue, the situation escalated further. This magazine attached two cassettes to a single issue and included titles such as *The Blues Brothers* just 18 months after it had been released as a full-price title in the shops. But while readers were loving the abundance of software they were getting, it began to feel as if the tapes were the magazines' main attraction. Journalists could justifiably feel annoyed that their work was being overlooked.

"I think we did a great magazine. I think *Commodore Format* is one of my best magazines," Jarratt said. "We worked really hard to make it funny and informative. But you would sometimes feel that we were working on a backing board for a cassette and it did devalue the market after a while because there was so much free stuff knocking around."

There was also pressure on those putting the cover tapes together. Richard Fairhurst, who created the *Amstrad Action* cover tapes, said his job was to make a duplicable master. "But I never, never got the original code for commercial games," he said. "Most of the games were pretty old



and the original code had been long since lost. I only ever got the same retail copy as everyone else, and that retail copy, of course, would have a custom copy-protected loader. So I had to 'crack' the protection to extract the game, and then build a new, unprotected version that the duplicators could use."

As time went on Fairhurst also negotiated the software. "There was a monthly budget – £550, I think – and with that I could do what I liked," he said. "Most software houses had abandoned the Amstrad, so I could always find a few who were happy to get a few hundred quid for no work on their part. I topped it up with homebrew and PD [public domain] software from people I knew."

## Age of disc-oversy

The expectation for cover-mounted software ensured the trend continued on the PC and 16-bit home computer magazines. "The commercial benefits were obvious," said Anderson. "You just had to do the maths. This was a major promotion that paid for itself with every copy sold through the raised cover price that the 'gift' made possible."

"Future extended the idea to floppy disks on *PC Plus* magazine. Later, based on the same logic, we got other unlikely combinations to work, like a classical music CD on the cover of *Classic CD*. It even took us into an entirely different niche when a couple of cross-stitch hobbyists pointed out to us that you could include a tiny cross-stitch kit on the cover of the magazine for an affordable amount of money. Hence the launch of the very successful *CrossStitcher Magazine*."

There were floppies on the front of the likes of *ST Format*, *CU Amiga* and *Amiga Power*, the latter being focused on games. *PC Zone* and *PC Format* also carried them and, later, there was a move to CD and DVD in the PC space.

Again there was resentment. In 2007, our very own editorial fellow, Dick Pountain, described *PC Pro*'s disc as "wretched". "Why wretched?," he asked in his column. "Because assembling and mounting that disc costs money that might have been spent on other editorial. After all, we are in the words business, not the software business. But we have to keep doing it as long as all our competitors do, because we can't take the risk that you might switch brands if we stopped. The logic is that of the Cold War nuclear arms race, where neither side could quit, and there's a constant tendency towards escalation."

## No-one in the US seemed to have bothered to look at what was going on in little old England



**ABOVE** Magazines offered in-depth tips on how to use the cover software

This feeling was strong, especially when multiple discs became the norm. "It was like mutually assured destruction," said Jarratt, who briefly edited *Amiga Format*. "You know, you get a nuclear weapon, we'll get two nuclear weapons then you get three nuclear weapons. It would go from we've got some shovelware to we've got a proper app to we've got a brand-new app and now we've got extra discs. I can certainly envisage there being a waterfall of them on one magazine at one point."

Even so, Future Publishing continued to use cover mounts to its advantage. "Ten years after proving the success of this model in the UK, we were able to enter the US market with exactly the same strategy, allowing *PC Gamer* and *CD-ROM Today* to break into arguably the

**BELOW** Remember these? *PC Pro* cover discs contained lots of utilities and games



world's toughest publishing market," Anderson said. "No-one there seemed to have bothered to look at what was going on in little old England."

The idea arguably reached its height when Future Publishing launched the *Official UK PlayStation Magazine* and included a playable demo CD on the front. It's widely believed that the magazine's envious circulation – which peaked at a record 453,571 – was in large part due to that disc.

"I'd like to think the magazine was also pretty decent," said Jarratt. "But my God, that demo disc. It became a licence to print money. Sony did the disc. It wasn't like a cassette or floppy which could be mastered at any place – it was a black CD and needed to be mastered at a special place. Sony took a big slice of the pie but it was instrumental to the success of the magazine."

## Destructive times

Today, the situation is very different. You won't find physical media on the front of computer magazines, partly because of the internet, and partly because computers don't have CD, DVD or disk drives as standard. There are also far fewer publications dedicated to individual consoles. "The internet manifested itself across every part of our lives so [cover discs] didn't make sense, financially," Jarratt said.

You will, however, still find magazines giving software away. Turn to page 66 of this magazine and you'll see full packages worth far more than the magazine's cover price. There has also been the odd surprise, such as when the Raspberry Pi's official magazine took covermounts to a whole new level by attaching a computer, namely a Raspberry Pi Zero, though that's now going back 11 years.

If you want to relive the magazine cover disc era, you'll find the Internet Archive has copies of old *PC Gamer*, *Amiga Format*, *ST Format*, *PC Format*, *CU Amiga* and *Computer Shopper* floppies, CDs and DVDs, giving access to gems such as *Christmas Lemmings*. You'll also find examples on eBay for relatively small sums.

Even so, it's difficult to recapture the magic of those times when readers would often rely on magazines not only to provide them with information but software too. Yet the memories do remain. "I recall playing the *Destruction Derby* demo from the *Official UK PlayStation Magazine* and they had a whole bunch of cars in this big sort of dirt arena," Jarratt said. "I didn't buy the game but I played that demo for hours and hours and hours. It was of tremendous value." ●

# Futures

The trends and technologies that are the shape of things to come

## The rise of robot wars

Drones over the skies in the Middle East. Robots winning positions in Ukraine. Warfare is going robotic – and it's scary how unprepared we are, finds **Nicole Kobie**

**U**krainian pilots won a position back from Russia in April, capturing a pair of their rival's fighters.

There's nothing special in that, you might think, except here those Russian fighters were robots that were overpowered by Ukraine's own remotely controlled drones and robots.

Iran also turned to drones this year. They hit Dubai airport, ships attempting to slip through the Strait of Hormuz, and even – possibly, according to recent reports – swarmed and downed an American fighter jet. The Israeli Defense Forces (IDF) has long used robots for reconnaissance, but has added remote-controlled bulldozers for demolition and “suicide drones” known as loitering munitions that explode to kill anyone nearby.

We've already passed one terrifying milestone: an AI-powered robot killing a human soldier without oversight. Ukraine recently revealed – as reported by former *PC Pro* staffer Matthew Sparkes, now at *New Scientist* ([tinyurl.com/384newscientist](https://www.tinyurl.com/384newscientist)) – that two years ago its military tested ten AI-driven drones in “Terminator mode”, in which they kill everyone in an area. A couple of

soldiers are believed to have been killed in the trial, which hasn't been used again, as the country generally has a policy against using AI to make such final decisions.

And in the UK, our recently announced Defence Investment Plan includes £5 billion dedicated to drones and autonomous systems. We know that this will include both “strike and surveillance drones”, according to the government's own explainer ([tinyurl.com/384govtdrones](https://www.tinyurl.com/384govtdrones)).

In short, robots are already at war, some remotely controlled by pilots and others boosted by AI or programmed for

specific tasks. That includes drones, which are widely used for reconnaissance but have now become weapons in their own right, and AI systems to analyse intelligence and even suggest targets.

### Changing the face of war

“In essence, there has been tremendous change, and I believe we are still in the early hours of AI and robotics' influence on warfare,” said Ezenwa Olumba, Leverhulme Early Career Research Fellow, Aston University. “It is no

longer only about how large and expensive your weapons and forces are, but also about the kind of technology you have, how cheaply you can deploy it, and how effective it is.”

Ukraine clearly thinks bots are the way forward: under siege from Russia, it has deployed 25,000 unmanned ground vehicles for everything from holding the frontline to running supply lines. It has an aerial fleet that includes both commercial quadcopter

**BELOW** Ukrainian personnel prepare drone missiles for take-off





models and AI-assisted strike drones that can carry massive warheads.

It even has robots at sea: satellite-linked speedboats stacked with rocket launchers and missiles have damaged infrastructure and warships. Most of these systems are remotely controlled – reportedly often using commercial gaming controllers – with connectivity possible thanks in large part to Elon Musk’s Starlink but also mobile networks. There is some AI and automation, in particular with fallback technologies to return to base or elsewhere if signal is lost, but that remains limited so far.

## The debate over killer robots

Robotics, drones and AI are clearly the future of war – but whether or not they should be continues to be debated.

On one hand, proponents argue that using machines in battle helps protect human soldiers. Indeed, Ukraine’s President Volodymyr Zelenskyy said in a speech in April that drones and robots had been used in 22,000 missions in the previous quarter alone. “Lives were saved more than 22,000 times when a robot went into the most dangerous areas instead of a warrior,” he said.

Remote-controlled warfare protects soldiers when it’s your side using them; on the receiving end it’s a different story, and civilians are unquestionably being put in danger so that soldiers can battle at a safe distance.

But at the core of the debate is autonomy. Sending a remotely piloted drone into a warzone still leaves a human at the kill switch, even if the distance makes accuracy a challenge. This will inevitably lead to the deaths of innocent people. Letting AI make that decision exacerbates the problems, both technical and ethical.

“LAWS [lethal autonomous weapon systems] can reduce the number of soldiers placed directly in danger,” Olumba told *PC Pro*. “They can also enhance speed, surveillance, precision and the ability to operate in areas that are too dangerous for human combatants.”

Then there’s the flip side. Arming a machine with weapons and autonomy feels like a gamble that could go dangerously wrong – these systems still make basic mistakes, after all – and it shifts decisions about death in war even further away from those who should be making them.

These automated weapons also raise serious concerns about human security, human rights, accountability,

sovereignty and incorrect targeting, Olumba added, saying that we need to find ways to use these systems ethically in ways that advance collective security and protect vulnerable people – and build guardrails that protect us from unpredictable operations.

“The issue is not only that a machine may misidentify a target or that there

## “I believe we are still in the early hours of AI and robotics’ influence on warfare”

may be a programming error,” said Olumba. “The deeper concern is that these systems can be deliberately used to target and kill people, especially in places already made vulnerable by war, extraction and global inequality.”

Given that, the UN has called for laws against machines that have the power and discretion to take human lives without human control. “There is no place for lethal autonomous weapon systems in our world,” UN secretary-general António Guterres said last year ([tinyurl.com/384guterres](https://www.tinyurl.com/384guterres)). “Human control over the use of force is essential... We cannot delegate life-or-death decisions to machines.”

But UN members have been debating the issue for more than a decade, with no hard action yet taken – and even if international law banned autonomous killer robots and drones, such laws are regularly broken during times of war. What country will stop developing such weaponry and risk being left behind, after all?

Groups such as Stop Killer Robots and Amnesty International are pushing for controls over LAWS, but the pushback is also led by industry – or at

**ABOVE** Ukraine has deployed sea drones armed with missiles



least some in the industry. Boston Dynamics was one of many robotics companies to sign a declaration banning its customers from attaching weapons to its Atlas or Spot robots; rivals Agility and Unitree also signed, among others. Anthropic made headlines this year for refusing to grant unrestricted access to its AI to the US military for domestic mass surveillance and to create fully autonomous weapons, a move that cost it government contracts in the hundreds of millions, at least in the short term.

## Democratising war with drones

As ever, when it comes to weaponry, militaries will use whatever they can get their hands on, hence the rise of relatively cheap drones in warfare. “The democratisation of lethal autonomous weapon systems, whether drones or ground robots, has changed warfare in many ways,” said Olumba.

He added: “AI and robotics are now gamechangers in warfare, and any country ignoring them does so at serious risk.”

Many dismissed how important cheap drones could prove in war, doubting they would have much impact. “But Ukraine’s ability to withstand Russia, first with what are now old-fashioned TB2 drones and later with greater expertise in FPV drones and other weaponry, shows how small, cheap and effective technologies can outpace heavy and expensive weapons,” Olumba said.

In another example, Iran has wreaked havoc on its neighbours by flying a low-cost drone into an airport amid its war with the US and Israel, and striking back using traditional measures could mean sending missiles worth millions. “Iran’s so-called ‘poor man’s missile’, the Shahed-136 kamikaze drone, shows how relatively cheap weapons can disrupt the plans of



**ABOVE** A Russian Shahed-136 drone missile is targeted by Ukrainian forces

much stronger powers such as the combined US and Israeli military armies,” Olumba added.

## The autonomous arms race

So far, autonomy isn’t really an issue for drones and robotics – that Ukraine example was a test that hasn’t been repeated, and merely instructed the machine to kill everything, rather than specifically target anyone.

While there are many lethal weapon systems that can monitor, target, select and attack autonomously, most still retain some mechanism that allows human control or intervention.

We aren’t yet at the point where thousands of drones, robots and armed humanoids could simply be sent to the front line and work in full coordination, says Olumba. “That would be another level entirely,” he added. “If such coordination becomes possible, people at the receiving end of these autonomous weapons will find it extremely difficult to defend themselves.”

That said, automation via AI is working its way into warfare. The US Maven Smart System – which Anthropic has now stepped away from – was developed by Palantir for the US Department of Defense as a warfare platform, analysing data including real-time video and satellite imagery, organising resources and identifying potential targets. Right now, no decisions to strike are taken without a human commander – but given the furore with Anthropic, it seems that is a future possibility for the US.

In the meantime, while autonomy is developed and AI rolled out, there are other ways to expand the use of these systems. “The idea of drone swarms is already being tested in Ukraine, where groups of drones have worked alongside ground robots to support offensive attacks on Russian front lines,” said Olumba.

So far, the war robotics mostly look like miniature tanks, travelling via tracks with guns mounted atop. But South Korea is rumoured to be investing

in humanoid robotics and dog-like designs, turning to Boston Dynamics’ current owner Hyundai to fill in military gaps due to demographics. These would be for non-combat roles such as surveillance and logistics, reports suggest, but it’s hard to imagine robotics failing to follow the same route as aerial drones in expanding from reconnaissance to weapons.

The next phase is teaching those systems to work together, letting them coordinate using autonomy without driving up costs. “Imagine aerial drones, ground robots, maritime systems and AI-enabled command systems all operating in concert. That is where military innovation is heading,” said Olumba. “The real race is no longer just about building autonomous weapons, anyone who tries hard a bit can do that. The real race is about making different autonomous weapons systems work together effectively, cheaply and at scale.”

## What this means for war – and us

Robotics and AI on the battlefield aren’t science fiction, but the next step of military development. “If South Korea is considering the use of humanoid robots to address shortages in military personnel, that is no longer a futuristic idea,” said Olumba. “We are already seeing ground robots increasingly used in Ukraine to undertake tasks that would previously have required human soldiers.”

Militaries of the world may be eyeing these innovations with an intrigued eye, but the rest of us humans may see this as nightmare fuel – particularly those unfortunate enough to live in current conflict zones, which are now becoming testbeds for killer tech.

“We also need to ask where these weapons are being tested,” said Olumba. “The major drone wars today are not taking place in the Global North but being fought in places such as Sudan, Ukraine and Myanmar. This matters so much because the risks are often carried by people outside the so-called Western world, while many of

## War robots – of the past

A short history of key events in the development of robotic soldiers.

### Tracked mines and teletanks

Sending machines in to do the dirty work may feel like a new technique in war, but the idea was in use during World War II with the German army’s Goliath tracked mines. These were controlled remotely but weren’t deemed particularly successful at the time – perhaps because it was easy to sever the cable and leave the machine stranded – but the idea was expanded during the Cold War by the Soviet Union, which used wireless radio transmitters to control a tank fitted with everything from machine guns to flame throwers and bombs.

### Shakey’s sneaky tactics

In the 1960s and 1970s, a team at the Stanford Research Institute (SRI), led by Charlie Rosen, developed the world’s first robot that could autonomously navigate and manipulate objects. Seeking cash from any source possible for the expensive project, Rosen was asked by military would-be funders if the robot could carry a gun. He promised it could manage two or three – despite the fact it was an armless server on wheels that never left the same four rooms and earned its name because it shook so hard all the time.

### Boston Dynamics and Big Dog

Like SRI, robotics firm Boston Dynamics earned its early funding from military sources, notably DARPA, for which it created the terrifying-looking Big Dog. It was designed to help soldiers carry equipment over long distances, but many of the company’s follow-ups had a military vibe: RHex, a flat bot designed to cover rough terrain; Sandflea, a spybot that could launch itself ten metres in the air; and Petman. This was the Protection Ensemble Test Mannequin, which could walk, squat and do push-ups, and was designed to test gear for soldiers. That later evolved into the humanoid robot Atlas, famous for its backflips and dance routines, which the company is now developing for use in factories and beyond.



### America’s Predator drones

The US has been using drones in war as far back as the 1950s, later using them for reconnaissance missions for the war in Vietnam. The remotely piloted MQ-1 Predator took on the task of flying spy bot for the military in 1995, but after 2001 the US slapped on Hellfire missiles, starting an era of combat drones beginning with strikes in Afghanistan but expanding to Somalia, Pakistan, Libya and Yemen that would eventually kill tens of thousands of people – including hundreds of children.

### Hermes, Professor, Thing and Fester

This quartet of robots was deployed during combat operations in the US war in Afghanistan in 2002. Hermes was used to search caves before US troops arrived in the area. The metre-long, 30cm-tall tracked robots could trigger mines, carry cameras and even use weapons – including a grenade launcher and shotgun, though their main job was to spot danger rather than engage in it.

**LEFT** The MoD cancelled the Type 83 destroyer project in favour of command hubs for autonomous drones

the benefits, profits and technologies are tied to global systems of power.”

Whether we’re capable of building truly autonomous robotic soldiers to fight our wars for us or decide to ban such technologies, one thing is clear to Olumba: “The worst and the best are yet to come in terms of how AI and robotics will shape humanity and the earth.” ●





# PC PRO

## Next month

**ON SALE**  
Thursday 3 September

### Features



**Do real work with AI agents**  
ChatGPT Work and Claude Cowork can do serious work on your computer. Find out how to get the most from them in next month's feature.

### Features



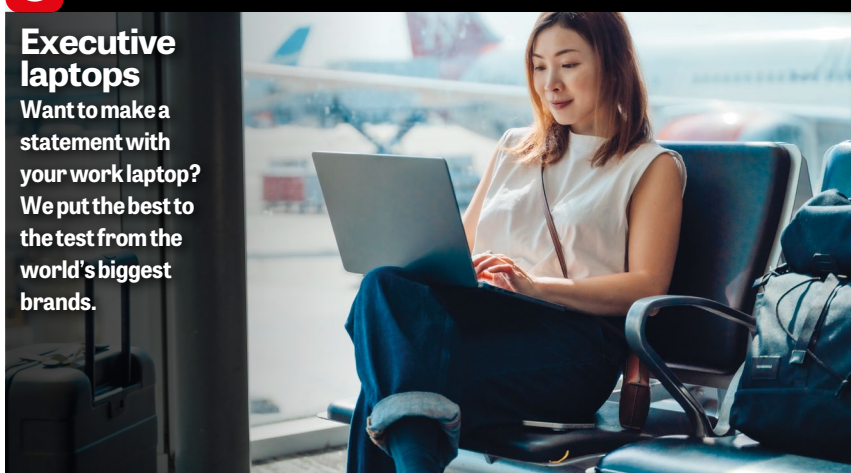
**Robots: a golden age at last?**  
We discover how close we are to humanoid robots in the workspace and at home. Could CPUs, language models and mechanical robots push us closer to a breakthrough?

### Feature



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### Retro



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A new museum has just opened, and this one contains hundreds of retro operating systems from Windows to System to GEOS and more.

### The Network

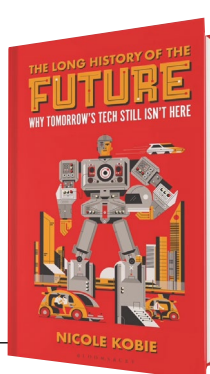


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# Jon Honeyball is yearning for simpler days when TVs took a minute to warm up... and then just worked

**I** am fed up of software and services deciding what I want. Since the early days of Clippy, and Bob before that, software vendors have tried so very hard to drop some annoying assistant into my workspace. But now it's being taken to insufferable levels.

"Do you want fries with that?" is a reasonable question when ordering a burger. "Can I help you with your document formatting?" is an intrusion, which turns into "throwing laptop across the room" irritation when it screws everything up. Think things will be better with full-blown AI systems? Think again.

The marketing nonsense goes like this: "Check my emails from Rob, maybe a month ago, about that restaurant in downtown Manhattan he likes. It might have been Chinese food. Then make the reservation. And book me onto a flight the day before, business class but not BA, and find me a good hotel that has air con in the room. Use the company credit card to pay for any reservations and costs. Oh, and don't forget to invite Rob."

It sounds very smart. But the number of ways that this could go wrong is almost unimaginable. Airlines can't run a decent app or website as it is, so layering an AI engine on top is courageous at best. And how will Barclaycard react to me reporting a fraudulent payment when I admit my AI agent had full access? This is a hypothetical case, of course, but it's where we're heading.

Then consider the growing complexity of interactions with our household appliances. I had to replace a TV in our kitchen last week. After ten years of solid service our Samsung gave up the ghost, and at that ripe age it was unlikely to respond to appropriate levels of engineering spend. I bought a new one, the Samsung QE48S90F, only quivering

slightly when I saw the phrase "Smart AI TV" embedded into its full name.

It's a lovely TV, but my pathway to finding a programme now includes fighting through a riot of onscreen noise. Apps I don't want to use. Complex menus with a user interface that makes little sense. Samsung's insistence you sign up for an online account. Two remote controls! Having to work out whether I want "Ambient mode" or "Art mode".

Clearly it isn't a mere TV. It's an experiential interface I should engage with fully. It should become a mainstay of my existence when at home, one whose endless list of helpful widgets and nagging notifications are too good for me to ignore.

**T**his is why it's so refreshing to fire up "pure" software like LibreOffice, if only

to recall what productivity software looked like before it was taken over by hostile helpfulware. It's the equivalent of going for a spa break after a month of working 14-hour days.

At the same time, the built-in help has almost become useless: hours can be lost navigating half-baked help centres. Far better to tell Perplexity Pro what I'm trying to do and see if it can point me in the right direction.

I'd happily throw another 50 quid at Samsung for the "Dumb" option on setup. A TV that shows what appears at the HDMI ports. I have a Sky Q box and an Apple TV: those are my sources of watchable material. I don't want all this stuff loaded up again into the front end of my TV. I don't want AI-driven screen settings that take into account room brightness. I want a screen.

At what point will companies realise their newest baby isn't going to be the centre of my universe, and that offering a "Shut The F\*\*\* Up" mode is a really big winner for many people?

Oh, and part of that "Dumb" payoff upgrade would be the guarantee that the TV doesn't connect to the internet under any circumstances, other than to check for firmware updates. I don't want my TV taking screenshots every second for some remote data centre to try to work out what I'm watching, so that even more targeted advertising can be aimed at me in the front of my TV.

**O**ur world doesn't rotate around you attempting to control our lives. We don't want AI thrust into our daily experience, we don't want data

**"We don't want AI thrust into our daily lives, we don't want data scraping and we don't want stuff forced in front of our eyes"**

scraping and we don't want stuff forced in front of our eyes. The same applies to any other software.

Sony had the right idea back in the 1980s. For students of history, go look at the Profeel range from 1980, the KX-20HF1 ([tinyurl.com/384sony](http://tinyurl.com/384sony)). The screen was a screen. There was a tuner module if you wanted it. Speakers could be added. It was simple, it was genius, it was a design classic.

In every meaningful way, the Sony KX-20HF1 is technically inferior to the Samsung QE48S90F. But how I yearn for the days when a TV took a minute or more to warm up, and you knew it was time for bed because the national anthem started playing at 11pm.

■ Jon Honeyball is contributing editor to *PC Pro*. Dear Samsung, he does not wish to use generative wallpaper or access "useful daily information" on his TV when it's meant to be switched off. Catch him on the *PC Pro* Discord server: [pcpro.link/discord](https://pcpro.link/discord)



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