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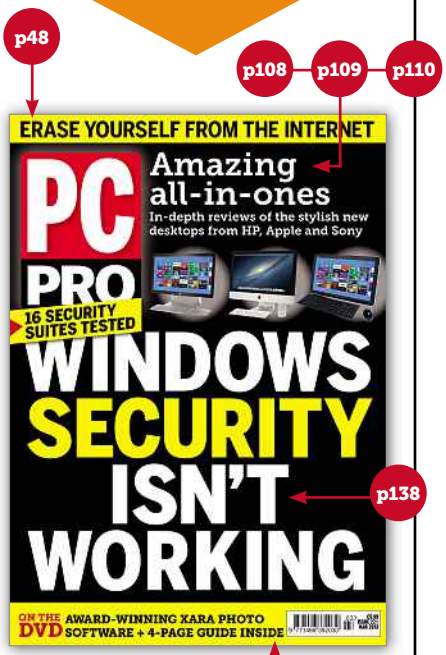

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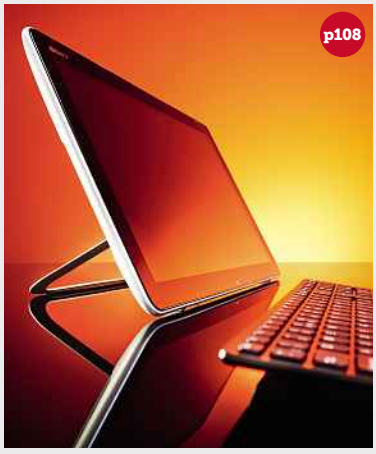

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Ofcom's Mr Nice Guy must go. BARRY COLLINS sends in his application

It's been almost three years since I called in a *PC Pro* blog post for Ofcom chief executive Ed Richards to resign (see **www.pcpro.co.uk/links/221prolog**). Alas, he doesn't appear to have received the memo, so we continue to rub along with the regulatory equivalent of the lion from *The Wizard of Oz*.

Nice guy Eddie doesn't like to upset people, least of all the lovely folk who run Britain's mobile and broadband companies. When they misbehave – lying to customers about the broadband speeds they're likely to receive, or failing to give customers an estimated speed when they ring up to order broadband – Eddie doesn't lose his rag. He murmurs something about "consultations" or "voluntary codes of conduct" and goes back to his crossword, like one of those hands-off parents who let their feral pack of kids run riot on the bus while shooting you a "what can you do?" look.

The angriest I've seen him is when I pointed out in one of his press briefings that the speed test figures Ofcom was quoting were technically impossible. His top lip almost quivered. Almost.

To be fair, even a sleeping lion won't endure constant provocation. When Ofcom's own exhaustive research proved that average broadband speeds were less than half of the advertised headline figures, even Steady Eddie was moved to act. Sort of. In 2010, Ofcom implemented the world's most convoluted system for allowing people to leave their broadband contract – without penalty – if their actual speed was "significantly below" what their ISP promised.

What counts as "significantly below"? Here's what the code of conduct says: "If asked to explain further or asked to define 'significantly below', the ISP should provide information on the access line speed achieved by the bottom 10th percentile (or above) of the ISP's similar customers ('the minimum guaranteed access line speed') and explain that if the customer's actual access line speed is below the minimum guaranteed access line speed, then it will follow the process set out in the 4th Principle," which eventually allows customers to leave within three months of starting a contract.

Got that? As clear as a pint of Guinness, isn't it? What it essentially boils down to is: if you think your line is running like a three-legged dog, ring your ISP and it should tell you how slow the speeds are for the bottom 10% of its customers. If your speeds are slower (as determined by the ISP, not you, of course), and you're still within the first three months of your contract, you might be able to leave. Who can say fairer than that, eh?

While we're on the subject of fairness, hands up if you think it's right that service providers can ratchet up tariffs midway through your two-year contract and not give you the option of telling them where to stick it. Is that a hand at the back I can see? Is that you, Ed?

Yes, pretty much all of Britain's mobile networks have implemented such price increases over the past year or so, taking full advantage of another weasel clause in Ofcom's regulations that allows them to increase the price of contracts as long as there's no "material detriment to the customer".

How anyone can argue that a price increase isn't of material detriment to the customer is beyond me. Even Ofcom appears to think it's a tad fishy. So it's going to come down like a ton of bricks on service providers that attempt to pull off this stunt in the future. Sorry, I meant "soon consult on ways to address consumer concerns and ensure they're being treated fairly in this area". Because Ofcom can't do anything without first consulting the very companies it's meant to be regulating, just to check it isn't being too mean to them.

> Consumers need a regulator that's prepared to drag recalcitrant companies over the coals, not in for a cup of tea

Ofcom's own About page states that its "general duties should be to further the interests of citizens and of consumers" and that "meeting these two duties is at the heart of everything we do". Making consumers jump through hoops to escape sluggish broadband providers and allowing mobile networks to change the terms of agreed contracts doesn't make it seem like it's putting much heart into it.

Ed Richards has failed in his principal duty to protect consumers, and so he must go. Consumers need a regulator that's prepared to drag recalcitrant companies over the coals, not in for a cup of tea and a chat. So I offer myself for the greater good; I'll even do the job for a quarter of Richards' £365,000 salary. Your country needs me, not Steady Eddie.

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BARRY COLLINS was the editor of *PC Pro*. He may be back next month – he suspects he may have trouble fitting in at his new employer.

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Windows apps have potential but it's too late for Windows RT, says DARIEN GRAHAM-SMITH

I'm calling it now: Windows RT – the cut-down version of Windows 8 that runs Windows Store apps on ARM hardware – is dead. RT devices will probably hang about in the shops for the time being, but if you're looking for the next big tablet platform you might as well bet on OS/2.

The idea of an app-only version of Windows 8 for tablets isn't necessarily a bad one. I personally think the interface looks ugly, but you can't deny that it works smoothly, and I'm sure the experience will only grow more pleasant as the app market matures.

That's just the thing, though: Windows 8 needs more apps. High-profile, exclusive apps that everyone wants. The Windows Store has been a moderate success so far, but it has a long way to go before it can be called a serious rival to the Android and Apple stores.

That cripples Windows RT, which relies greatly on the store for its appeal. Microsoft hasn't made official sales figures available, but the consensus among analysts seems to be that, over the crucial Christmas period, shoppers eschewed RT in their droves. Of course, this may not be solely down to the state of the Windows Store: it probably doesn't help that most people – you know, normal people, like your mum and your mates in the pub – didn't actually clap eyes on a Windows RT tablet during the festive period.

It's worth pausing for a second to reflect on that. Porting the Windows Store framework to ARM – and throwing in Office to sweeten the deal – must have entailed some serious development costs for Microsoft, not to mention big budget commitments for maintaining the new codebase in the future. Yet bafflingly, the actual product of all this investment has so far been barely visible. The Surface RT wasn't in UK bricks-and-mortar shops at all until 14 December – far too late for the Christmas rush – and the two loyal OEMs that have produced their own RT models (namely Asus and Samsung) have kept their launches similarly modest.

All right, you might say, but if the Windows Store isn't yet competitive then surely there's no point in prematurely flooding the high street with RT tablets? Well, yes and no. Marketing can't, on its own, make a successful product, but it can certainly jolly things along. The Surface RT isn't an unpleasant device to look at and touch. If people had been given a chance to try it out for themselves during the festive period it could only have helped sales, and spurred app development. Now that chance has been blown, I suspect it's going to take much longer for the Windows 8 app ecosystem to get to where it needs to be.

This timing question that really pulls the rug from under Windows RT. When the project was conceived back in 2011, ARM was the champion of low-power hardware. But in 2012, we've seen its designs face increasingly credible challenges from Atom-based smartphones. In the coming year, Intel's Clover Trail platform looks set to do the same on tablets, and come next Christmas, Intel should be close to releasing its 22nm quad-core Bay Trail chips, which – on paper – promise to pull ahead of ARM in terms of performance and power efficiency.

Even if Intel doesn't quite manage to pull that off, x86 has inherent advantages over ARM. I'm not saying the tablet format is well suited to legacy desktop apps, but being able to run them gives x86 a dimension of versatility that ARM can never match. And from a hardware and OS development point of view, it's certainly more attractive to have only a single codebase to think about, and a single device driver architecture. In short, the Atom doesn't need to get very much better before Windows RT starts to look like a liability.

> The consensus among analysts seems to be that, over the crucial Christmas period, shoppers eschewed RT in their droves

I don't expect Microsoft to formally kill off Windows RT in the foreseeable future – even if the platform isn't making money, the mere fact that it's out there makes an important statement about Windows 8. Nor can I really say Microsoft was wrong to develop it in the first place. It would have looked very bad if the first Windows 8 tablets to arrive had been technically inferior to their established rivals; buying into ARM ensured that wasn't the case.

However, now that box has been ticked, it's hard to see what more Windows RT has to offer. That's why I'm calling it now. I think RT's work is done, and I expect the platform to quietly fade from view during the coming year – giving it, I believe, a good chance of becoming the shortest-lived version of Windows ever.

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DARIEN GRAHAM-SMITH is *PC Pro*'s technical editor, and a man who has been in this business long enough to know how foolish it is to make grand predictions.

Blog: www.pcpro.co.uk/links/dariengs
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FEEDBACK

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Scratching the Surface

I read *PC Pro* and Jon Honeyball's columns with interest, but his constant criticism of Microsoft (*see issue 220, p70*), and his love for Apple, seems inappropriate. Microsoft has made mistakes while pioneering an industry – who can forget the Internet Explorer monopoly debacle – but a decade later, Apple exhibits much greater control over its own devices.

With the Surface RT, Microsoft has done something bold and unexpected. However, rather than praise or even acknowledge this achievement, Honeyball focuses on the absence of macros and its lack of suitability for power users. It's designed for home and student users, and they won't care.

For years Honeyball has been a strong advocate of Microsoft preventing unsigned code on Windows, which wipes out legacy apps in one swoop, but now it's happened because of a change of processor architecture – and suddenly Microsoft is being "unfair".

It isn't worth waiting for the Intel-based Surface Pro, either; it will cost twice as much and lack the benefits of lifestyle tablets.

Let's hope that macros and desktop apps are included in version two but, for the time being, let's not be churlish; Microsoft has made a unique device that many people like. It's certainly worth acknowledging that rather than praising Apple for including the new Lightning connector on its iPhones and iPads. ALAN INGRAM

Contributing editor Jon Honeyball replies: Continual criticism of Microsoft? Nonsense – I've heaped praise on its server, tools and cloud technology divisions. Office 365 is an excellent piece of work, and I'm happy and proud to run my business on it.

My issues with Surface RT are that there's no upgrade path on the software, and you can't obtain advanced features even if you pay for a business licence.

Contrast this with an Intel-based device, where more money gets you more functionality. Microsoft's ARM-based Surface RT is supposed to be the long-lasting Holy Grail that businesses have been waiting for while avoiding iPads, but Microsoft has delivered a half-baked product – and its sales back this up.

Regarding Lightning, I think interconnect standards matter, and Lightning is far more clever and interesting than USB 3.

Tech City broadband

The government recently announced £20 million of funding to improve London's internet connections, and also said that it's working with the Greater London Authority to ensure that the requirements of Tech City entrepreneurs and companies are met.

Why can't these companies and individuals deal directly with ISPs? Normally, that's what would happen – but in this case, they have to ask the Tech City Investment Organisation, which then has to go to the government. The entire process will end up taking years.

They would have more success if they cut out the middlemen. Usually, a development such as Tech City would set bells ringing as ISPs tried to quickly sell packages, but this government-funded fiasco means that ISPs won't bother – instead, they'll simply wait for public funding to come through and eventually boost their profits.

Meanwhile, companies in Tech City sometimes have to use 3G just to secure reasonable internet connections. WILBERT3

A taxing issue

You've recently discussed the tax arrangements of Google, Amazon and other companies on the *PC Pro* podcast, and I think I have a different perspective as someone who lives in Ireland and runs their own business.

In many discussions about tax, it seems that everyone forgets the amount of VAT, social insurance, local and income tax generated from the salaries of employees who work for these companies.

For instance, since Amazon makes less than a 1% margin, I'd much rather have the 20% VAT on its sales than the 26% corporation tax on that tiny margin. And Google's quoted £6 million tax on £2.5 billion revenue – was there no VAT involved in this, either?

If Google wants to minimise its tax in the UK and needs to do less work in the country, I'm sure other countries – including Ireland – will form an orderly queue to secure those jobs.

From the outside, the recent tax controversies look like a political stunt, and I'm disappointed that so many appear to be engaging in it. SIMON MARTIN

Why no wireless?

I largely agree with your recent article on business broadband (*see issue 219, p74*), but I was disappointed by the exclusion of wireless internet service providers, or WISPs.

My company, Attend 2, provides connections that run at 5Mbits/sec or more. We're ideal for small companies that can't get reliable wired broadband and, more importantly, we don't have to wait until after installation to tell you what speed you'll get. We can install within two weeks, and our record is a 50Mbits/sec leased line that was installed in less than 24 hours after the initial phone call.

I'll concede that the market is fragmented, and there are often vast differences between the service, speed and stability some operators promise and provide – a problem that also afflicts wired operators.

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STAR LETTER

I liked Nicole Kobie's column on rural broadband (*see issue 220, p22*). I live in south Wales, and there are seven cabinets near me – five of which have been upgraded to fibre-to-the-cabinet (FTTC). The two that haven't been connected are the furthest away from the exchange.

The local exchange has local-loop unbundling, and both Sky and TalkTalk provide between 18Mbits/sec and 24Mbits/sec, and those who use BT Wholesale get around 8Mbits/sec. I'm situated at the bottom of the road, near a cabinet that hasn't been upgraded to fibre, and I get 1.5Mbits/sec on a good day. A fibre-to-the-node (FTTN) connection passes within 2m of a cabinet that hasn't been upgraded. It's located on a wide pavement with no homes nearby, and is also close to a streetlight that can provide it with power.

Ofcom says that the uptake of FTTC is disappointing, but surely if you want more people to sign up, then it makes sense to connect cabinets where users would see the greatest improvements? Friends who live closer to the exchange are happy with their relatively fast speeds and don't see the need to pay an extra £10 per month for fibre.

My neighbours and I, though, can't watch streaming video – and downloading an hour of TV takes five or six hours. We'd be more than willing to pay extra every month to go from 1.5Mbits/sec to 24Mbits/sec.

There might be more users on those middle, connected cabinets – but I bet there would be more next-generation access take-up on the slower ones. LES SAVILL

This month's star letter wins a Corsair Neutron 120GB SSD worth £100
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That said, there are companies that have been around for a long time, which I think are worthy of mention, especially when you consider the benefits.

Our typical installations cost between £700 and £1,000, and even building a customised 30ft mast costs less than fibre could outside of London.

The hardest part is convincing people that WISPs are as secure and reliable as other business broadband offerings. I don't expect the press to give such services much coverage, but I would have hoped an article on business broadband might have given us more of a mention. DOMINIC HAMPTON

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BLOG BITES

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The release of Windows 8 has seen a rush of "hybrid" devices hit the market: Ultrabook-style laptops with screens that twist, flip and turn into tablet configurations. Manufacturers love them, but features editor David Bayon isn't convinced – he reckons they're overly complicated and compromised when it comes to laptop and tablet operation.

"I totally agree – it's something that's cool and new, placed ahead of practicality and ergonomics. It's possible that one day the materials will be available to make a 500g hybrid device with a brilliant keyboard and smooth OS, and it will sell like hot cakes. In the meantime, though, keep tablets and laptops separate." **PAUL**

"I don't understand the obsession with having a single unit – even some two-part devices couple together mechanically. Years ago, we discovered that separate keyboards and mice were better for desktops; eventually tablets and separate keyboards will supplant laptops – if you want them together, put them in a case." **JOHNAHIND**

"I want an 11in Windows 8 tablet, weighing just more than an iPad, with a detachable keyboard and a Core i5 processor. But processors aren't efficient enough; you can't use a Core i5 and keep a tablet thin, light and with good battery life. It may happen in the future but, at the moment, we're left with compromises." **JIMMYN**

"What's wrong with a traditional convertible tablet PC? I used to have the HP tc440, which worked with a stylus. I remember typing away, stylus in hand, and using the stylus instantly, which was easier than switching to the trackpad. It had foibles, but I think Windows 8 is the right OS for this kind of functionality." **ATTIG**

"I use an iPad with a keyboard almost all of the time, and a bit of lateral thinking is required. I love the idea of the Asus VivoBook S200E with its touchscreen, but I hate the idea of having a notebook with a swivelling or twisting screen – these devices are just too heavy and bulky to work for tablet use." **BILL MASLEN**

"Hybrids are useless. I ran a Windows hybrid years ago because it sounded cool, but I used it as a laptop 95% of the time. I now use an iPad alongside a regular laptop – it means I have a second screen for browsing the web, and I can use the iPad for leisure with the laptop remaining as a work machine." **WINNIETHEWOO**

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NEWS

IN-DEPTH REPORTS, ANALYSIS AND OPINION

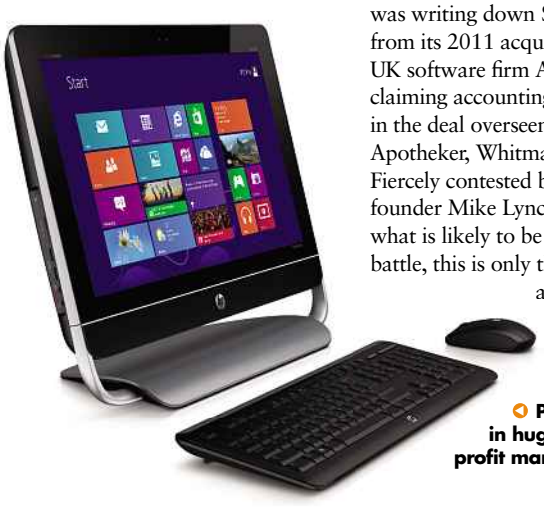
Can HP stay on top?

Are HP's legal and corporate problems diverting attention from its market-leading PC business? Nicole Kobie investigates

CEO Meg Whitman is the latest pair of hands struggling to get a grip on the beleaguered PC giant

Another CEO. Another multibillion-dollar write-down. More negative headlines. Once again, HP appears to be in dire trouble. But do such high-profile, high-level woes hurt HP's key business?

HP is the largest PC maker in the world – although after six years at the top it's barely hanging on to the lead over Lenovo. But if the overall challenges in the PC market – slowing sales, mobile competition, the weak economy – weren't enough to contend with, HP seems intent on causing as much trouble for itself as possible.



PC sales bring in huge revenue but profit margins are small

In November, Meg Whitman – the company's third CEO in two years – announced the company was writing down $8.8 billion from its 2011 acquisition of the UK software firm Autonomy, claiming accounting improprieties in the deal overseen by Léo Apotheker, Whitman's predecessor. Fiercely contested by Autonomy founder Mike Lynch ahead of what is likely to be a bitter court battle, this is only the latest drama at HP. As well as its high turnover of CEOs, it's had to contend with the shutting down of webOS – highlighting its struggle to be a business services firm as well as a consumer hardware manufacturer.

Numbers game

HP's latest full-year results don't make for cheerful reading, with losses of $12 billion compared with $7 billion profit the previous year. It wasn't helped by $18 billion in write-downs for Autonomy and Compaq, as well as for parts of its Services division; sales were also down across the board, with PCs down 14% and printers sliding 5%. Only software bucked the trend, growing 14%. Looking at these figures, it's easier to understand Apotheker's decision to buy Autonomy for $11 billion and spin out the PC group.

On the other hand, half of HP's $120 billion revenue was from the Printing and Personal Systems (PPS) group, with $35.7 billion from PCs and $24.5 billion from printers, worth a total $5.3 billion in profit. Software contributed a mere $827 million. PCs and printers keep the money coming in, but software is the only division that's growing, leaving HP walking a tightrope between the two.

PC sales on the slide

This situation has become more precarious as PC sales slide. IDC's market analysis takes in all "smart connected" devices – comparing desktops, laptops, tablets and

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Bad buys

HP isn't the most successful shopper. Not all of its acquisitions were failures – its recent purchases of networking company 3Com ($2.7 billion), 3PAR ($2.35 billion) and ArcSight ($1.5 billion) are all viewed as successes. However, in the past 18 months alone, HP has written down almost $25 billion from four of its biggest deals – one analyst told an American newspaper that the only "silver lining" of its recent troubles was that HP didn't have enough money to make any more major acquisitions.

• HP buys Compaq for $25 billion in 2002; writes down $1.2 billion a decade later.

• HP buys EDS for $14 billion in 2008; writes down $8 billion in 2011.

• HP buys Palm for $1.2 billion in 2010; writes down $885 million a year later.

• HP buys Autonomy for $11 billion in 2011; writes down $8.8 billion in 2012 – of which $5 billion is attributed to "improprieties" in accounting.

smartphones. Under that measure, HP falls to fourth place, because it's "virtually non-existent in the mobile space".

iSuppli analyst Craig Stice said HP faces the same challenge as other PC makers: tablets. HP is re-entering the tablet market, but with Windows instead of webOS. Stice warned hybrid laptop/tablet prices are still too high, especially compared to cheap media tablets. In other words, margins are going to get tighter; HP's PC margins are currently 3.5%, printers are steady at 17.5%, but software brings in 27.5%.

And that's one reason Stice thinks the PC division is healthier as part of HP. "The PC business is a double-edged sword," he told *PC Pro*. "It's a big revenue producer… its PC revenue was a third of its earnings. The sharp side of the sword is the margins. It's an extremely cut-throat business out there. Especially when the economy's struggling, there tend to be pricing wars."

During tough times, the PC business can be propped up by HP's other departments. "One thing HP has going for it – and it's an advantage over the other PC players – is it does have other business units that help with margins," he said, pointing out that servers, services and printers "subsidise the PC business".

Printers

Like PCs, printers are an area where HP is the global leader – and like PCs, it's a market that isn't seeing much growth, Gartner analyst Sharon McNee told *PC Pro*. "Parts of the market are iffy, and as a whole, certainly in the consumer space, people are printing less," she said.

That's partially down to financial and environmental concerns, with businesses digitising documents and installing print-management software, which is exactly where Autonomy's document-management software comes in. "We'll see more of that in the market," McNee said. "If you look at the print hardware space, there's not a lot of innovation, but certainly in the software space there is." The printer division needs the software side to succeed, and the rest of the company needs the cash from printer sales – McNee commented that printers "absolutely" help prop up the rest of HP.

HP is returning to tablets with the ElitePad, running WIndows 8

Better together?

Torn out of HP, the PPS group would be a company turning over $60 billion sales a year – albeit a shrinking one. Would PPS be better off going it alone? "There are definitely two sides of the coin, and you could argue either way," Stice said. "In my opinion, HP would be better keeping it under the HP umbrella. You really do get an advantage in being a one-stop shop and a services company, where businesses can go for all their needs, for a PC, printer or a server. Standalone, it becomes difficult; the margins are tough."

If HP can break into the mobile market with innovative products, that could change – its ElitePad is due out this year, while a new line of superfast inkjet printers are set to arrive in February.

But HP's investment in R&D is $3.4 billion, much less than it has paid out for its acquisition mistakes. Despite that, HP isn't far behind rivals, Stice says. "The PC market was very stagnant for a decade – it wasn't just HP," he said. "Is it in the forefront of the PC industry, and doing things that nobody else is doing? I can't say that it is, but at least it's moving with the industry."

Innovation aside, the leadership issues and Autonomy battle could hit sales. Stice commented that HP's brand remains strong "and not every consumer out there follows what's going on with the politics at HP". For businesses, it could be different. "On the corporate side, where there's more of an investment going into HP for a period of time, they're looking long-term at how stable [HP] is, and how stable it will be in two years," he said. "That's where things could hurt a little."

HP depends on printer sales to prop up the rest of the company

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TOP STORIES

READERS REACT TO THE MONTH'S TECH NEWS

1 Price and battery life of the x86 Surface revealed

Microsoft confirmed prices for the Windows 8 Pro version of its Surface tablet, but the announcement was marred by concerns over its claimed four-hour battery life.

The x86 version of Surface running Windows 8 on an Intel Core i5 chip will start at $899 for a 64GB version and $999 for 128GB, both without the keyboard covers. UK prices hadn't been revealed at the time of going to press. The ARM version, running cut-down Windows RT, starts at $499 for a 32GB version.

Microsoft revealed that battery life for Surface with Windows 8 Pro would be half that of the Surface RT – which puts it at around four-and-a-half hours. The more powerful Intel machine was always likely to consume more energy, but it's competing with Ultrabooks and tablets that have a battery life of eight hours or more.

What we said: "We've been waiting anxiously for the Surface with Windows 8 Pro, as full-fat Windows on an Intel tablet certainly appeals," said news editor Nicole Kobie. "But as the release draws closer, the shine's starting to wear off. Four hours of battery life simply isn't enough – HP's ElitePad promises twice that, and it's also running the full version of Windows.

"A top-of-the-line, cutting-edge product will demand a premium price – but who is going to shell out Ultrabook prices for a tablet that requires you to carry the charging cable? Talk about missing the point, Microsoft."

What you said: Opinion was divided on pricing, with only a minority of *PC Pro* readers willing to pay a premium. "Who is going to pay $899 dollars for a tablet, keyboard or not?" asked Ulfarus. "I think I'll just get a decent desktop at that price."

Skarlock was more tempted: "I want one – it fulfils my requirements for a laptop, tablet and general computer."

Battery life was more of an issue. "I get longer life from my cheap Windows 7 laptop bought for less than £300," said rjp2000. "What was Microsoft thinking?"

Jaberwocky said that it wasn't Microsoft's fault. "That just demonstrates ARM chips' power efficiency."

2 MPs' report slates Home Office snooping plans

MPs and Lords have called for significant revisions to the controversial draft Communications Data Bill, which aims to collect transmission details of emails and other online activity.

The bill – dubbed a snooper's charter – was criticised in a report as being "overkill" by politicians, who said such a law should "strike a better balance between the needs of law enforcement and other agencies, and the right to privacy".

According to the report, the evidence behind the £1.8 billion budget estimate wasn't robust and the potential return on investment cited by the Home Office was "fanciful and misleading".

The Home Office argued the bill was required to help security services close a gap in online data they have trouble collecting; however, under the proposals, a significant chunk of data would remain unavailable.

What we said: "Not many people would dispute the idea that everything possible should be done to catch terrorists and criminals, but it's the blanket approach, particularly without a warrant, that's worrying," said contributing editor Stewart Mitchell. "If the security forces want to keep tabs on serious criminals, they should be able to convince a judge of the importance of access to data, and then throw as much wire-tapping trickery as they like at the problem.

"To wrap up everyone else's data at the same time makes no sense, especially when criminals can circumvent the system."

What you said: Readers were almost unanimously against the bill, with wittgenfrog pointing out that "this bill merely uses technology to achieve what the Stasi could not: the ability to keep tabs on us all, all the time".

Despite the criticism, some readers felt such surveillance was inevitable. "The government will use the magic words: 'terrorism', 'organised crime', 'for the children', and 'if you have nothing to hide'… and that will be that," said Chambler.

Josefov disagreed, saying the bill will grab attention. "People don't care about 'the computer stuff' but start saying that it will cost billions and we'll see if the public won't react."

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3 BT to charge £1,500 for fibre on demand

BT revealed it would charge an average £1,500 for on-demand connections that would offer fibre-to-the-premises (FTTP) in areas already covered by the company's fibre-to-the-cabinet (FTTC) network.

The plans could be a boon for companies and large blocks of flats – or even data-hungry homeowners – that would otherwise fall outside of BT's plans for such connections, which currently offer speeds of up to 330Mbits/sec, with 30Mbits/sec upstream.

BT said that most premises inside its existing fibre footprint were within 500m of a network node. Laying the remaining fibre will cost an average £1,000 for those businesses, although it will be cheaper for premises closer to access points, and more expensive for those where the cable will have to run further. There's also a fixed £500 installation fee for all premises. Fibre on demand will be rolled out across the network by the end of the year.

As part of a push to increase FTTP adoption, the company also said that it was reducing the wholesale prices for the services already available from £60 to £38 per month, which could mean cheaper prices for customers, if providers pass the savings on.

What we said: "Compared to the ludicrous cost of dedicated fibre links for businesses, BT's fibre-on-demand prices seem reasonable, and it would be interesting to know how much of the cost of each installation BT is bearing," said editor Barry Collins. "However, businesses must be cautious. Standard FTTP products come with no SLA or guaranteed repair times."

What you said: Although the costs aren't insignificant, readers felt they compared well with previous technologies. "I paid much more for a leased line before ADSL existed, and more recently this £1,500 package was equivalent in cost to installing a two-way satellite system," said Gindylow. "There's no way I would have secured 330Mbits/sec on a dish."

Readers weren't entirely sure what they'd do with such speeds, however. "FTTC is enough for me, but it's nice to have the option," said PiRa.

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TALKING POINT

Members of the *PC Pro* team tackle the month's big issue

Sales of desktop PCs have stalled. Analyst firm IDC doesn't expect them to recover soon, predicting flat sales growth to continue for the next three years. At the same time, sales of laptops and tablets continue to climb, and the latter looks set to overtake desktops soon within a year or two.

This shift isn't surprising. While desktops remain a cheap, upgradeable computing option, laptops have caught up in terms of processing power, offering enough for even the most demanding consumer tasks, such as video editing, while people using their PCs for little other than checking Facebook or Twitter can easily manage with a tablet or smartphone.

Q Will you buy another desktop PC or switch to mobile alternatives?

Technical editor, Darien Graham-Smith: I've always loved the modular, upgradeable desktop format, and I probably always will. I realise that upgradability no longer seems like the urgent consideration it once was. However, I think this is a temporary state of affairs. The very nature of computing all but guarantees that, sooner or later, some revolutionary new technology will come along that taxes today's systems to their limits. The old long-term hunger for more and better hardware will be revived, and hermetically sealed Ultrabooks and MacBook Airs will start to look very restrictive again.

Senior staff writer, Mike Jennings: For me, it isn't a question of buying another desktop PC, it's a question of when I'm going to upgrade the rig I currently have. I use my system primarily for gaming, and my high-end graphics card copes with everything I can throw at it. I'll definitely be buying a new PC at some point in the future, but it won't be soon – upgrading individual components is enough for now.

Features editor, David Bayon: If I'd answered this question six months ago, I'd have said no. I have a laptop, a tablet and a smartphone, along with consoles for entertainment, so there's little appeal in another box that will sit in a back room not being used. Then I became bored, as you do. On a whim, I built a mini gaming rig to go under the TV. It has high-end components in a tiny chassis, and it's great – I found I wanted to use it more than its living room location would allow. So it moved out of the living room and is now used more than any of the other devices – even my smartphone.

Editor, Barry Collins: This is a shameful admission for an editor of a PC magazine, but I've never had my own desktop PC. I used to tinker with my parents' PC as a teenager, and of course I've used plenty here in the office, but I've never actually bought one of my own – I've always been a laptop man. And now, for the first time in my life, I'm considering buying one – that's if you can count a Mac mini as a desktop PC. I have my smartphone and tablets for browsing the web, but I need something more powerful than my ageing Dell Inspiron for editing photos. The sub-£500 Mac mini delivers more processing power than any similarly priced laptop, yet can be tucked away discreetly in our back bedroom. So I want a desktop PC, but for reasons that are entirely different to the rest of you.

Darien: If you think a £500 Mac mini's powerful, take a look at what you can get in a microATX format for the same price these days. We're talking full-fat Ivy Bridge processors (none of your mobile parts here), with twice the storage, discrete graphics cards and plenty of accessories. True, a mini-tower isn't as compact and bijou as Apple's wunderkind, but when I'm shopping for a PC I'm more interested in its capabilities than its looks.

Mike: Maybe the full-sized tower PC is actually what's being threatened. They're bulky and loud; thanks to increasing component efficiency, it's simple to fit a Core i7 processor, high-end graphics card and super-fast SSD in a case that's little bigger than a shoebox. If you can do that, why go bigger?

Darien: For me, a desktop system is about more than a box: it's about a big monitor, a comfortable keyboard and a physical workspace that's set up the way I like it. I don't see myself ever wanting to give up those things, even if all the actual processing is being performed by a wirelessly connected micro-PC tucked safely in my pocket. Perhaps in years to come I'll be able to get by without a desktop computer, but not without a desktop.

Bayon: I know the original question was about desktop PCs, but Barry's hit on something: he has a smartphone and tablet for browsing the web, and wants a small PC to do more serious work, much like myself. Could it be laptops that are starting to lose their relevance? Are we heading towards the norm being a tablet for the web and a small PC for everything else? Probably not, but it's interesting that two of us are heading in that direction…

Barry: Especially as the Xbox and tablet apps are catering for our gaming needs... stone the crows. We've just killed the laptop.

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Q&A

Ubuntu on an Ultrabook

Barton George reveals how he convinced Dell to release a version of its XPS 13 Ultrabook running the open source Ubuntu

Ubuntu has returned to Dell's laptop line-up – but this time, it isn't only on low-cost devices, but a Recommended award-winning Ultrabook. Already on sale in the US, the XPS 13 Developer Edition Ultrabook is expected to head to the UK soon. We spoke to the leader of the so-called Project Sputnik, director of marketing for Dell's web vertical Barton George, to find out more.

Q Where did the idea for this project start?

A We were looking at developers and how to better serve these people – they're the key influencers and really the kingmakers in this industry.

> "Developers are the key influencers and really the kingmakers in this industry"

It was an idea that was going to be tricky to get through the machine here, as it's not going to be huge volumes. Then I learned about an internal innovation programme that was being started up. I thought: perfect, this is the vehicle I need… to help it grow up. The other key thing that happened since we pitched this idea is the XPS 13 came along. Not only did I have a vehicle via the innovation fund, but there was a really sexy, compelling laptop to offer it on.

Q What did you have to do to make it work – why is this different than installing Ubuntu yourself?

A The main thing is to get the drivers working. For example, the touchpad was a big sticking issue right out of the gate – it didn't work as it should. That's the part that drives Linux users crazy; they'll load it on a laptop and drivers aren't ready for it. It also comes with a small set of developer tools and utilities, and then there's access to these open source projects that we're just starting now – the cloud launcher and the profile tool.

Q Will other laptops also be offered with Ubuntu?

A Right now we do have a smattering of offerings with Ubuntu on them. They're particularly selling overseas, in China and India. What we're doing here is putting it on a high-end unit, whereas the other ones are for the cost-conscious buyer. What we'd like to do next is try to find a high-level beefy [laptop] we can offer it on. I though it would be great to do this as a beauty-and-the-beast line-up.

Q It's early days, but how are sales going so far?

A They're going pretty well… but more exciting has been some big companies have approached us about this. Two gigantic European manufacturers have said they're really interested, and a retailer in the States. Initially, we saw this as a way to add value to our web customers, but the reality is web-type developers are everywhere these days – they can be at big retailers, they can be anywhere.

Q It was higher priced than the Windows version, but the price was dropped. What happened?

A It was an oversight. The intention has always been to make this less expensive than Windows. We've heard loud and clear that is something that's very important to this community.

No porn ban for UK internet

The government has ignored calls from MPs and newspapers to force ISPs to block adult content at the network level, marking a win for digital rights campaigners – and *PC Pro*.

A group of MPs, led by Conservative Claire Perry (*pictured*), wanted broadband users to be forced to "opt in" to view adult content including pornography, saying that the government's existing efforts to encourage ISPs to offer free parental-control software didn't offer sufficient protection. Pressure from Perry, the *Daily Mail* and *The Sunday Times* pushed the prime minister to hold a consultation on the issue – to which we submitted a response in September (see **www.pcpro.co.uk/links/221news1**), as part of an ongoing campaign to educate consumers and MPs alike on the technical failings of such filters.

In the consultation report, the government admitted network-level filters can't capture all inappropriate content; risk "overblocking" sites; don't prevent other problems such as bullying; and don't encourage parents to learn about online safety and work with children to keep them safe.

The consultation results suggest parents agreed – only 14% of the 3,509 respondents supported default filtering at the network level. More than a third of parents who responded said parental-control software can be useful, but suggested it needs to be paired with "active parenting" and education.

Instead of a filter, ISPs will be asked to not only offer free parental-control software as they do now, but to "actively encourage" parents to set it up and ensure the person managing the controls is over 18; public Wi-Fi will also block adult content.

Jim Killock, executive director of the Open Rights Group, praised the government for listening to parents and others who sent in responses, adding "default filtering would disrupt harmless websites and fail parents, so we are glad the government has rejected it".

He told *PC Pro*: "It's difficult to say if the *Daily Mail* will stop its campaign, but the myth that the public is clamouring for this has been busted."

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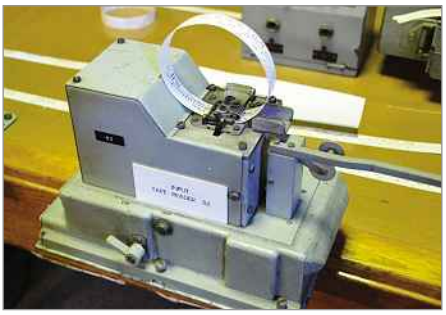
Harwell Dekatron REBOOTED

World's most dependable computer is back in action at Bletchley Park

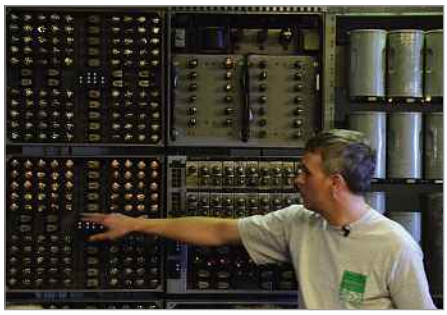
The Harwell Dekatron was built in 1951 to automate mathematicians' calculations, which they previously did by hand. Now, it's been rebuilt by The National Museum of Computing as part of its efforts to restore historical computers. The 2.5-tonne monster isn't fast – it was out-calculated by an academic on a hand calculator – but it is dependable: it was once left running unsupervised with a box of tape for ten days. To see our video, go to **www.pcpro.co.uk/links/221infographic**.

Two of the surviving creators of the Harwell Dekatron, Dick Barnes and Ted Cooke-Yarborough, attended the reboot

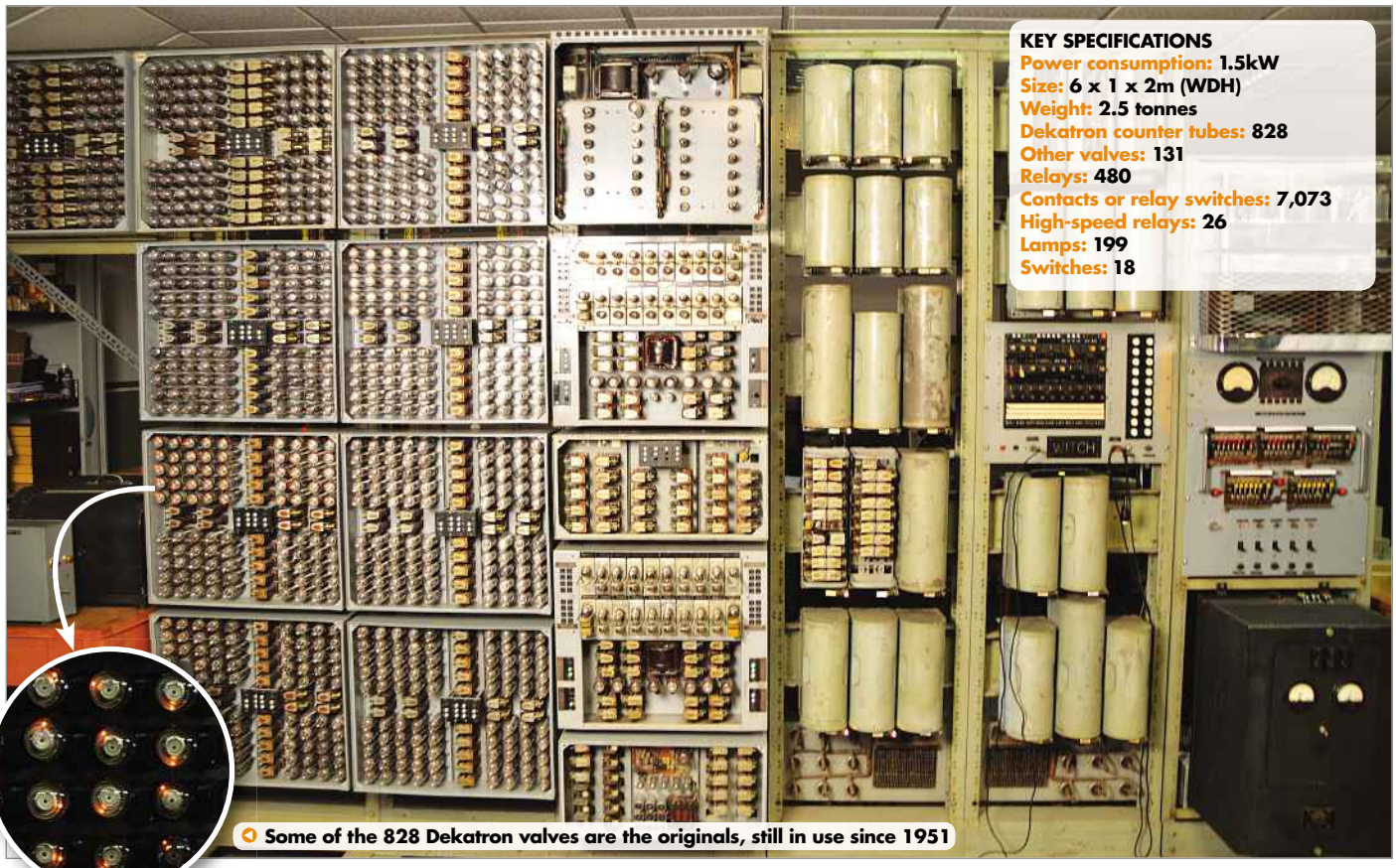
Programs for the Harwell were typed onto tape using specialised typewriters – this was the last piece to be found in storage



The volunteer rebuild team also uncovered a box of mystery programs, including software "loops" such as this one



Delwyn Holroyd led the rebuild, and explained how the Dekatron valves count in decimal digits, not binary



Some of the 828 Dekatron valves are the originals, still in use since 1951

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*HP Web Jetadmin was awarded Buyer's Laboratory Inc.'s highest rating of 5 stars. See www.hp.com/go/wja for April 2011 BLI evaluation report. HP Web Jetadmin is free and can be downloaded at www.hp.com/go/webjetadmin. Model shown: HP LaserJet Enterprise color flow MFP M575c with optional 500-sheet media tray and printer cabinet.

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Apple shouldn't be applauded for making Macs in the US, argues NICOLE KOBIE

Tim Cook took to major US network NBC during prime time to make a dramatic proclamation that Apple was returning manufacturing work to the US. Not all of it, or even most of it: merely one line of Macs, as yet unnamed, will be sold with "Assembled in America" engraved on the back. The rest, notably the iPhone and iPad that make up the bulk of Apple's sales, will continue to be built in China.

Criticism was instant. Campaign group SumOfUs labelled it a "PR stunt", designed to repair the damage to Apple's reputation caused by labour problems in China, and to give the company a warm, fuzzy glow ahead of key Christmas sales. Analysts at iSuppli agreed, saying it "appears to be a symbolic effort to help improve its public image".

And of course, it is; after making shiny gadgets, PR is what Apple does best. But in this case, it may have missed its mark – after all, 60% of its customers are outside the US.

Sure, some commenters on the NBC story welcomed the news, saying they wanted to "buy American". But why would anyone in the UK care if an iMac is stamped with "Made in the USA"? Why would one of the growing number of Chinese customers? The Chinese origins of Apple products haven't held back sales, nor should they – why exactly would an Apple fan in San Francisco care that her MacBook Pro is glued together in North Dakota, when her accompanying iPhone and iPad have been shipped around the world?

> Apple is a global firm – it should reward the workers, wherever they are, on whose backs it has climbed to such success

Cook said it isn't about who is buying Apple gadgets, but who is making them: he feels a responsibility to boost American jobs. Shifting even one line to the US will do that, but it won't necessarily benefit a local company. As iSuppli notes, most of Apple's laptop production is completed by Taiwanese firm Quanta, which already has manufacturing plants in the US – and Apple is likely to stick with it for domestic production. There's also speculation that much of the work will involve robots, limiting the number of jobs.

The shift is ironic, as Cook is widely credited with moving jobs out of the US in the first place – he was the master of Apple's supply chain. And, clever man that he is, Cook appears to have timed his US job creation goal right when it's starting to make sense to move the work back. It may seem unlikely that US manufacturing could save the company money, but making configurable devices closer to home makes sense for shipping costs and delivery times. Indeed, iSuppli pointed out that Lenovo – the Chinese PC giant – is also shifting some production to North Carolina. (Unlike Apple, it didn't see the PR benefit or simply couldn't convince NBC to give it a slot of free airtime, so the move went largely unnoticed.)

In the West, we bemoan the loss of manufacturing jobs to China – even the wonderful Raspberry Pi project took flak for making its cheap computing boards in China, and won plaudits for shifting some production to the UK. But why? Jobs are important, but these are ones we don't seem to want. Cook said the iPad and iPhone work wasn't staying in China because of cost – manufacturing, of which salary is one part, makes up a tiny $8 of the total bill, according to iSuppli. The real reason is a lack of skills. They have them, we don't – and because of that, they've earned those jobs, assuming we still place meritocracy ahead of Sinophobia.

That doesn't mean that the US and other Western nations aren't capable of tech work. The Gorilla Glass that goes on every iPad is made in Kentucky, and many of the Samsung chips it buys are made in Texas. Both firms earned that work, and those are the best places to carry it out.

While Apple's headquarters are in the US and it was founded there, it's a global firm – the iPhone in your pocket was designed by a Brit, backed by an American, uses a Korean chip and was built by a Chinese worker. Instead of rewarding whinging American politicians worried about unemployment rates, Apple should reward the workers, wherever they are, on whose backs it has climbed to such success.

Rather than claiming kudos for shifting a tiny slice of production to the US, it would be more impressive to stay in China and invest heavily in labour. Apple could boost pay, improve factory conditions and offer a free ice cream every Friday, and still make only a small dent in its massive margins. And by doing so, it may force tech rivals to do the same.

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NICOLE KOBIE is *PC Pro*'s news editor. She isn't surprised that no-one wants to move jobs to her Canadian homeland. It's cold there.

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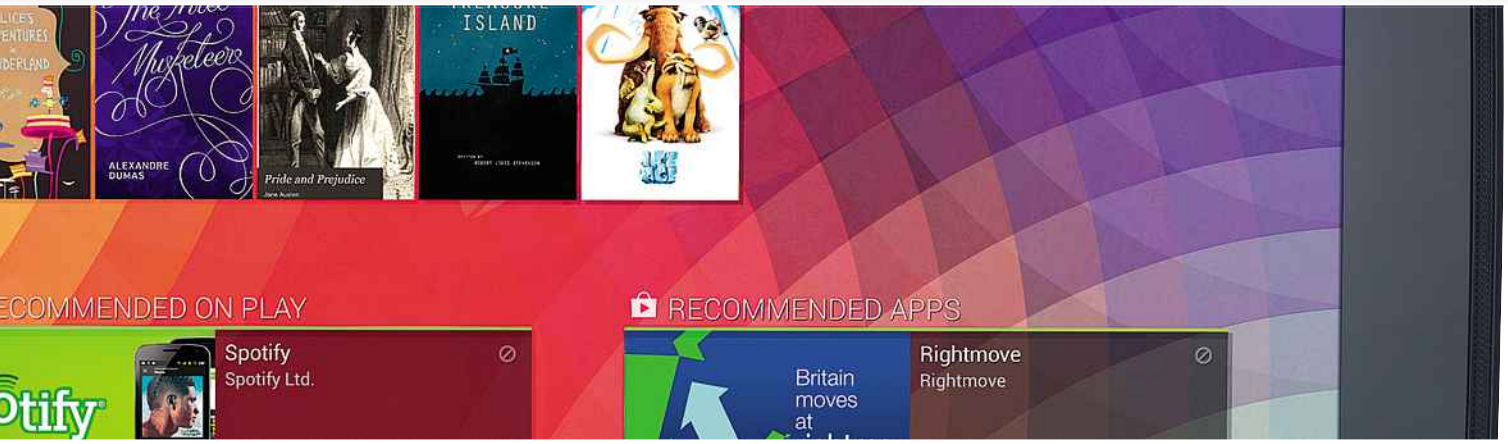

Do devices from the same manufacturer really work better together, or is that just marketing nonsense? David Bayon finds out

Apple users swear by their iDevices, Microsoft fans froth over Windows 8, and Google has its fingers in every pie these days – but for the millions of us who don't feel the need to side exclusively and obsessively with one brand, what are we missing out on?

In this feature we throw ourselves into the world of the big three players, to see if their devices really work together as well as they claim. But we're not gullible here at *PC Pro*. We also explore the mix-and-match approach to see if you can enjoy the best of all worlds simply by buying the best kit for each job – regardless of brand.

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Apple

Much as we loathe the word "ecosystem", there's one company that has long understood the concept better than most. For years, users have been kept within Apple's walled garden, whether it's through the weight of the DRM on their iTunes collections (until it was dropped in 2009) or simply the wealth of apps that most users have accumulated over time. If you bought into the shiny world of Apple when the iPhone first arrived, it's more likely than not that you're still there now.

That's with good reason, as few could deny that Apple's many devices work together smoothly. From MacBooks and iMacs, through iPhones and iPads, to the Apple TV and even Time Machine backup devices – and all with iCloud floating above and AirPlay whooshing files around – for some time it's been possible to work and play almost entirely through this one company's products.

App simplicity

Even Android enthusiasts must concede that Apple handles the link between smartphone and tablet apps more elegantly. Buy an app for the iPad and more often than not, you can download a tailored iPhone version as well. Finding each is vastly easier, too, thanks to a full tablet section in the App Store – something Google still hasn't enforced. On the rare occasion that a device is launched with a new aspect ratio or resolution, the App Store's big names catch up remarkably quickly – usually within a matter of weeks – and Apple's control over the hardware means you can be certain before you buy that an app will run smoothly on your device.

There's also the Mac App Store, which contains higher-priced desktop applications but is still tied to the same Apple account used on iOS. You don't have to purchase software in this way for the Mac, and many prefer the freedom outside Apple's walls, but doing so means you can easily download all of your apps onto a new Mac from one location, and apply updates. No more faffing about with product keys and scratched discs.

iCloud

That single login makes it easy to stay on top of your various purchases and downloads across several devices, and that simplicity is further enhanced by Apple's iCloud. In the same way that a Gmail account gradually made us into Docs users, and then introduced us to Google Drive, Apple's devices lead users straight into setting up an iCloud account with 5GB of free storage – and as of this summer, 150 million people had done so.

At a basic level, it's a syncing tool. It marries your email, contacts, calendars, bookmarks and so on, working across OS X Lion and Mountain Lion, and iOS 5 and upwards – and Windows devices too. It also frees iPhone and iPad users from the ties of iTunes, allowing devices to be backed up wirelessly to – and restored from – iCloud. It lets you easily download purchases made on one device to all of your others, as well as sync Safari and iBooks pages across devices. You can set up a Photo Stream so your snaps are uploaded on the fly, and it enables Apple's Find My iPhone service, for locating lost and stolen handsets, and more recently, the Find My Friends feature.

Separately, but on the same Apple ID, is iTunes Match. For £22 a year, you can let Apple safeguard your music collection by scanning your tracks and either finding a match in its huge database, or uploading any unknown tracks. Then, on up to ten iTunes-compatible devices, you can stream or download any of your tracks from anywhere with a data connection – and at 256Kbits/sec, regardless of the quality of the original file. On iOS devices the tracks also download as they play, so you'll gradually create an offline collection of favourites.

At the tail end of 2012, iTunes Match came under serious threat for the first time from Google's new music service. However, getting the full Google Play Music experience on an Apple device is only possible through the browser, which is less flexible and convenient than simply leaving your iPad's Music app playing in the background. Still, Google Play Music is free, so Match users have nothing to lose by uploading their tracks and trying it out.

PROS AND CONS

Pros

✓ Quality of kit is universally high
✓ Apple TV and AirPlay work superbly
✓ Fully supported by app developers

Cons

✗ Expensive hardware and services
✗ Difficult to get out once you're in

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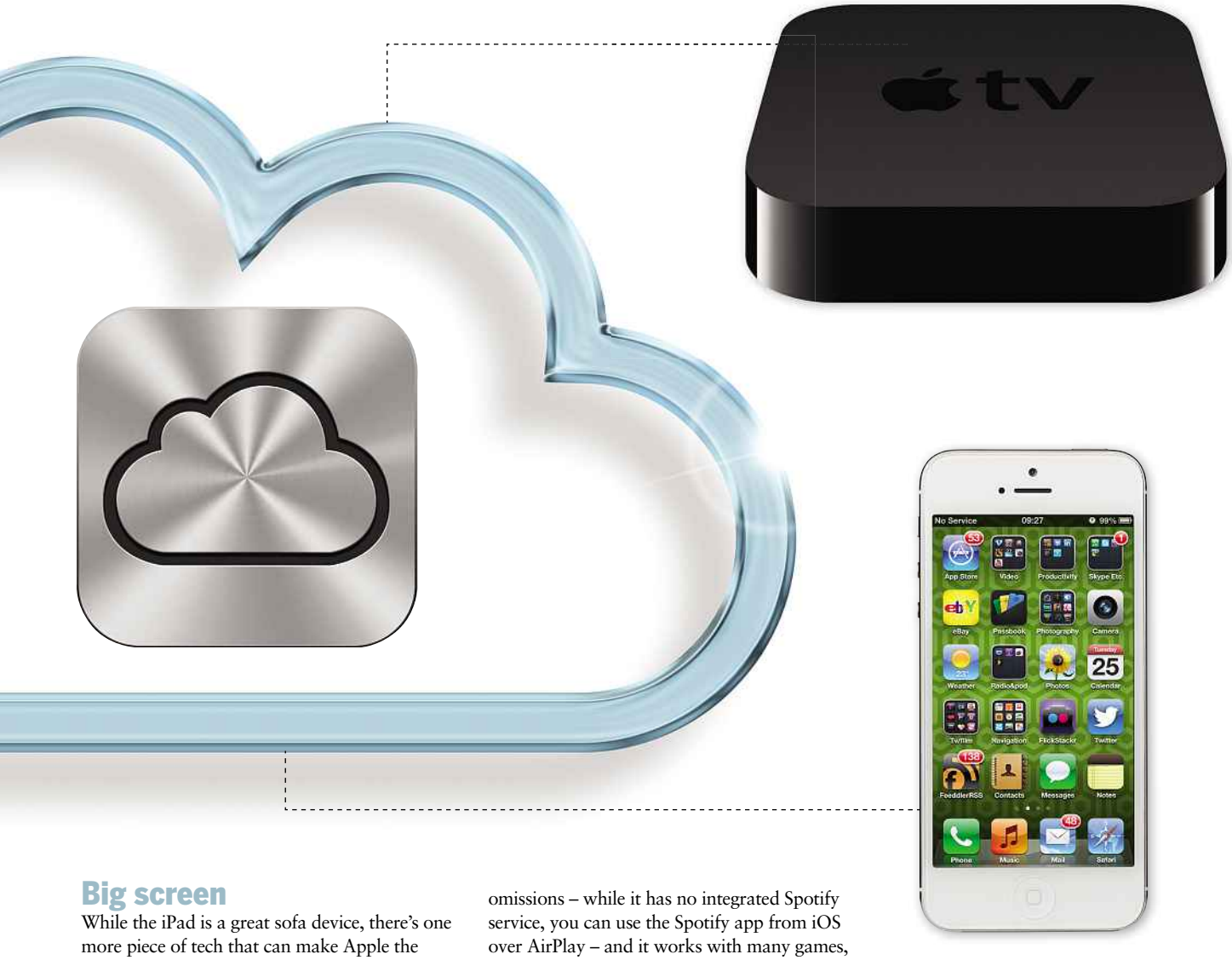

Big screen

While the iPad is a great sofa device, there's one more piece of tech that can make Apple the core of your living room: the Apple TV. Tiny, silent and stylish, it works seamlessly on its own or with other Apple devices to pull down a wealth of internet content, including Netflix and YouTube, and it includes the full iTunes library of films and TV programmes for rent or purchase. That applies to music, too, which is great if you have your TV connected to a good set of speakers.

The interface is second to none, making the task of finding, downloading and playing content as effortless as any device we've seen. The remote that's included with the Apple TV is simple to use, or you can download the Remote app for an iPhone or iPad, which makes entering text search terms much easier. In contrast, the complexity of an Xbox controller can often frustrate non-gamers. Apple TV pulls in anything you've uploaded to iCloud, giving you further reason to shell out for iTunes Match.

The feature that makes it more than just another set-top box is AirPlay, which lets you push content from an iPhone, iPad or Mountain Lion-equipped Mac to the Apple TV over Wi-Fi. This circumvents some of Apple TV's omissions – while it has no integrated Spotify service, you can use the Spotify app from iOS over AirPlay – and it works with many games, too, turning your TV into a rather limited games console.

AirPlay's main function, however, is to mirror the content onto the big screen. How successful it will be in your home depends on your Wi-Fi connection, and on the type of content you want to mirror.

Unsupported services such as BBC iPlayer can be fudged by setting AirPlay going with supported content – playing a song from the Music app, for example – then switching to the video you want. Alas, it won't work with everything; try premium content such as Sky Go and you'll find the video can't be streamed to the Apple TV.

The big picture

Only six months ago we could have said Apple's integration from the pocket to the desk to the sofa was unparalleled, but the arrival of Windows 8 means there's another way to commit yourself fully to a single company's products. Both have their advantages.

We'd argue that for ease of use, simple networking, and the overall quality of devices in all areas, Apple is hard to beat. Its iMacs and MacBooks routinely top the *PC Pro* A-List, and it's taken several years for Android to become a genuine rival to iOS. When it comes to apps, iOS is still the clear leader.

However, you can't have it all if you choose the Apple way. While the iPad is a great gaming device, you'll only find a handful of OS X devices with powerful enough discrete graphics cards for desktop gaming, and even then many big-name titles aren't available. No-one could argue mirroring the iPad over AirPlay comes close to the experience of gaming on the Xbox.

Still, when we talk about buying Microsoft devices from top to bottom, we're talking theoretically for now – the Surface is relatively new, and Windows 8 will take time to become popular. By contrast, there are countless users who already live within the Apple ecosystem, and have done for some time. That's as much a lifestyle choice as it is an endorsement of the hardware, and that's something other companies can only hope to replicate.

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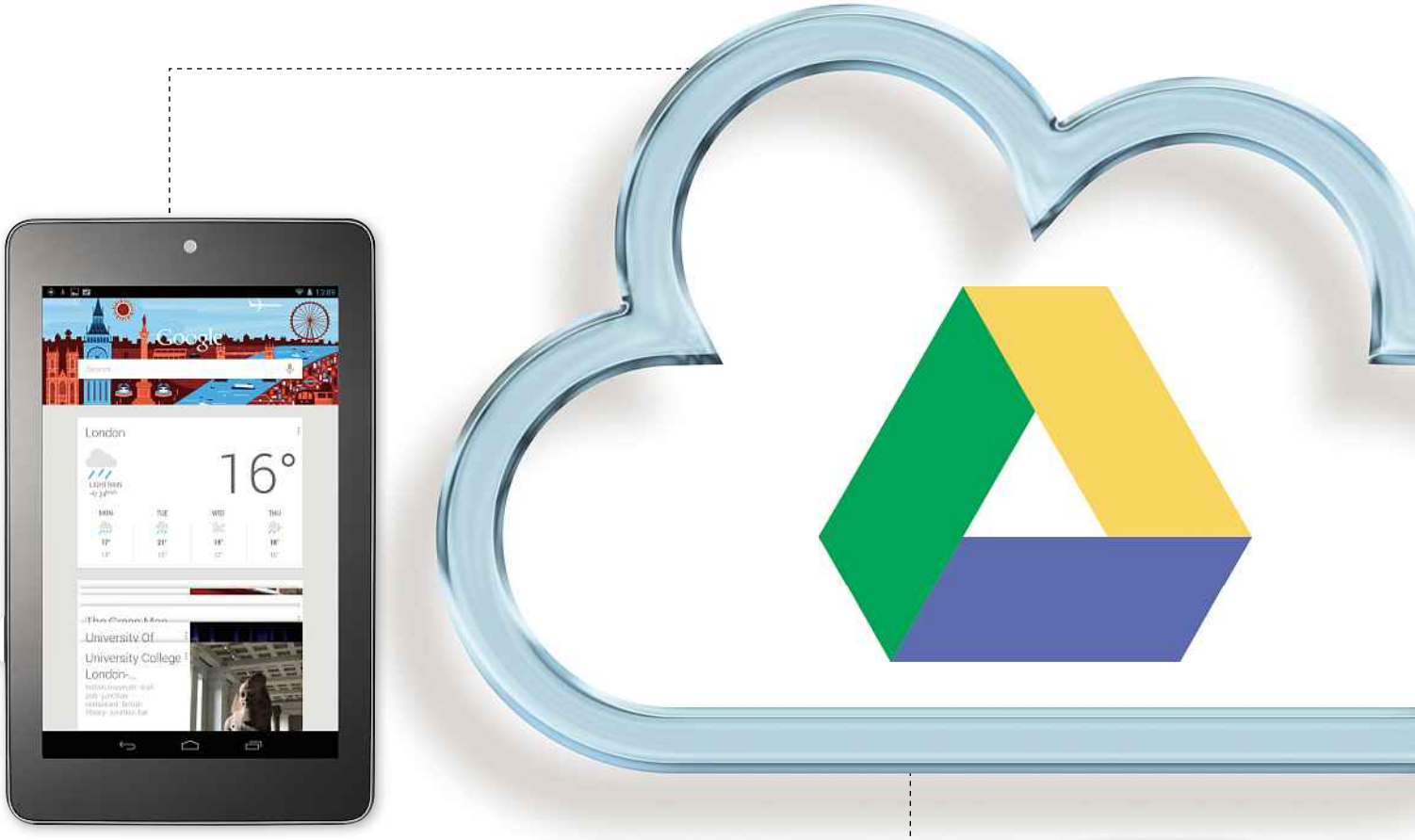

Google

On the face of it, Google is at a disadvantage when it comes to taking over the home. With the exception of the Chromebook, which we'll come to later, it has no real desktop operating system, and therefore relies heavily on mobile to get its wares into consumers' hands – something it's pushing harder with each partnered hardware release, such as last month's Samsung-made Nexus 10.

This isn't to say it has no desktop presence; in fact, it has a presence almost as ubiquitous as that of Microsoft.

We use Google to search the web, to send emails, to chat to friends, to store, edit and collaborate on our files – and that's without considering the behemoth that is YouTube. The Google+ social network hasn't exactly caught on with consumers, but it's yet another way that Google is attempting to be a core part of our everyday lives.

The difference between Google and its two main rivals is that its Android platform is a little more standalone in nature, even if that's something Google is trying to change. Your Android smartphone and tablet might share apps – gradually increasing in quality and quantity since Android 4 arrived – but you probably won't be hooking them up to a big screen, even if you're one of the few who have invested in a Google TV.

Google's TV struggle

Whether it's an LG Smart TV with Google integration or an Apple TV-style box such as the Sony NSZ-GS7, it's safe to say the number of people even aware that Google has a TV presence is pretty low.

In our review of Sony's Google TV device (web ID: 376831) we bemoaned the lack of proper Google Play store access: you get access to a limited array of Google TV-compatible apps, but the hardware lacks the processing muscle to give the user free rein. However, it does have a Netflix store and links to Amazon content, and you can stream video from services such as iPlayer using the web browser.

We had issues playing some file formats, such as MKVs, and the reliance on the bundled remote control instead of an official tablet or smartphone app is an oversight that will surely be rectified sooner rather than later. You could also use an app such as Plex: it lets you stream media from a laptop or PC to a Google TV using a tablet or smartphone as the remote.

Google TV is by no means a bad product, and as the apps increase and the licensed

services grow, we hope it will become something that people will want under (or in) their TVs by version two or three – as the Apple TV has. However, considering it costs more than £150 and comes in a variety of different forms, it lacks the ease of use and consistency of interface that would make it a consumer favourite; we can't see many non-techie households embracing its foibles out of loyalty to the Google brand.

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Cloud focus

If the TV experience is hit and miss, the situation is much better with audio – and this brings us to the first of Google's excellent cloud services. November saw the launch of Google Play Music, a free cloud storage and syncing service to which users can upload up to 20,000 tracks, then access them from other devices. It's up against Apple's similar iTunes Match service, which costs £22 a year.

This is one area in which being on an Android device has benefits, as the app is by far the nicest way to stream or download your music. By contrast, on all other platforms you'll have to use the browser, download a third-party app or perform a bulk download of the whole collection using the rudimentary Music Manager application for Windows or Mac.

Then there's the cloud-based Chromebook; Google has persevered with this concept through its uninspiring beginnings to reach its current state as an affordable and rather appealing device (*see p116*). Starting at £229 for the new Samsung-made ARM-based models, it's now cheap enough to compensate for its reliance on an internet connection.

Of course, in the home that shouldn't be a drawback, and Chrome OS's offline apps have improved, with recent software updates preparing the Chromebook for any unexpected periods off the grid. The OS now has a proper desktop, and although the Chrome browser still sits at the heart of everything, Google has added full Drive integration into the basic file browser to make it as easy as possible to use the Chromebook with your other devices.

In fact, Google Drive is one of the company's biggest strengths, offering most of the file-syncing features we've come to expect from cloud services, but crucially combining them with the productivity of Google Docs. We use Docs for all sorts of collaborative and organisational tasks in the office, and its word processor and spreadsheet functions are fine for basic editing of Office files – albeit more for the content than the formatting. Extra tools such as Google forms and Fusion Tables are genuinely useful for students and home workers. The whole suite may not feel as immediately familiar as Microsoft's Office Web Apps, but the popularity of Gmail means many people already use it purely out of convenience.

PROS AND CONS

Pros

✓ Most of us already use Google services
✓ Much lower cost of entry than Apple
✓ Android is improving rapidly

Cons

✗ No serious desktop OS – yet
✗ Google TV needs a lot of work

Mobile

It goes without saying that Google Drive is also a must-have app for Android, and smartphone and tablet users can easily connect their Gmail accounts out of the box. Which device they use is a question that gathers more potential answers with every passing month: right now, the Samsung Galaxy S III, and the Nexus 7 and 10 tablets top our recommendation lists, but it's a constantly changing roster.

Growing from its smartphone roots into a flexible all-round mobile OS, Android has put the company into many homes, even if Samsung, HTC and others tend to take the glory; some owners don't even realise the connection with Google. It's also rapidly becoming a great way to consume content, with devices such as the Amazon Kindle Fire taking the Android core and laying a shopfront over the top for less experienced users.

You don't really need a PC to get the most from Android devices, and most syncing software is made by the handset manufacturers rather than any kind of centralised iTunes-style hub. That isn't necessarily a bad thing, and simply syncing all of your accounts and files with Google's servers is how many people keep themselves backed up.

Google home

There are plenty of apps in the Play store that let you use your smartphone as a music player, or your tablet for streaming video, and Google's wide range of web services are well established and tough to beat. Even the Chromebook has evolved from rather a joke into a genuinely viable laptop replacement – at least for certain niche users.

Google has become a strong player in the home, but there's no escaping the nagging realisation that it's less an ecosystem and more a collection of disparate elements. While you could argue that someone who uses Drive, Music and an Android phone is buying into the Google platform, they're almost certainly still using Windows or a Mac for their daily tasks. That final piece of the puzzle is likely to elude Google in the long run.

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Microsoft

The newest all-round player is Microsoft, now that its Surface tablet and Windows Phone 8 handsets have been released. However, the company's biggest strength is arguably the Xbox 360 – a ready-made route into the living rooms of 70 million homes around the world.

Microsoft has been hard at work refining the Xbox experience to be as much like Windows 8 as possible, redesigning the dashboard with Live tiles to get people used to the OS's layout. Whether that's a good thing is open to debate – from all the TV content and advertising on the homescreen tiles, a new user may not even guess that the Xbox 360 is primarily a games console.

That's deliberate, and it's because Microsoft wants the Xbox to be more than that. It has on-console deals with Sky, BBC iPlayer, 4oD and Netflix, along with its own Xbox Video service. It has added to (and perhaps, in the long run, made obsolete) the Last.fm and Muzu.tv apps with Xbox Music, a Spotify-like service for downloading and streaming music to tablets and smartphones. It's all tied together with a revamped Bing search function that pulls in both Microsoft and third-party results, plus a revamped IE for Xbox, and all of Microsoft's entertainment services incorporate Kinect.

Integration

Microsoft has watched Apple successfully integrate iPhone and iPad development, all the while working to push out its own solution: the universal codebase for Windows 8 and Windows Phone 8 apps. Thanks to an array of versatile hardware, all of which will have the Windows Store installed as part of the new OS, Microsoft hopes apps will become something we associate with all devices, not only smartphones and tablets. Windows RT – the cut-down OS that runs on the first Surface devices – will only run these Windows Store apps, so making them appeal widely to consumers is vital.

Even if you don't opt for a Surface – or if you're waiting for the full-fat Pro version to arrive – we've seen impressive touchscreen Ultrabooks and convertibles. All-in-one PCs are also a major focus, and the arrival of screens that slide all the way down to horizontal removes the lingering doubt about reaching out to touch a vertical display. The same full-screen Windows Store apps can run from a tablet right up to an all-in-one PC.

However, the most important element of all is cross-platform development. If you buy a Windows Store app on your laptop, it will be available on your Windows 8 tablet too. Freebies and incentives have been thrown at developers to carry apps over to Windows Phone, with the eventual goal of big-name apps that work on every device – and all tied to your Microsoft account in the same way that an Apple login has so much invested in it.

It's interesting to note the difference in philosophy. Where Google and Apple link app usage across phone and tablet, Microsoft has chosen to pair tablet and PC – which shows the company's desire to make Windows 8 a work-capable OS. If it can successfully push Windows Phone 8 into the mix, it will have the kind of integration that even Apple can't match.

Second screen

That brings us to Xbox SmartGlass. Carrying the Xbox 360 experience over to Windows tablets and phones – and, it should be pointed out, to Android and iOS – it gives you a more intuitive way to control entertainment on your console. The app turns your handheld device into a keyboard and remote control, complete with live rewind and playback gestures, and makes it easier to browse the internet on a big screen – although the shaky Internet Explorer app for Xbox won't have you throwing out your laptop. It works both ways, too, so if you purchase a film on your tablet, you can send it to the TV via an Xbox, like Apple's AirPlay.

If Microsoft's big promises are to pan out, SmartGlass will also be a contextual second-screen companion. Early demos have shown a tablet hosting an interactive map of Westeros while *Game of Thrones* plays on the big screen, and games such as Halo 4 and Dance Central 3 show stats and playlists on your mobile while you play – a concept around which Nintendo is basing its new Wii U console.

There isn't a whole lot of live content of that ilk just yet, and all of this requires the Xbox to be running, so SmartGlass won't add extras to programmes watched via a Sky or Virgin box. But if you already watch TV via your console – and if studios and developers embrace the app – it could challenge Twitter as the smartphone distraction of choice while watching TV.

Microsoft's Games app on Windows Phone 8 will pull in your Xbox gamer profile and friends list, and Windows Store apps have also begun to use Achievements from the console experience. It isn't flawless yet: if you don't have a data connection you may find that your progress in an Xbox Live game vanishes until you're back in Wi-Fi range.

PROS AND CONS

Pros

✓ Xboxs are already in millions of homes
✓ Almost any PC will run Windows 8
✓ Apps can work from phone up to desktop

Cons

✗ The Windows Store is bare right now
✗ Developer support remains uncertain

Cloud

The glue that potentially binds things together is SkyDrive. The cloud storage service is a core part of the new OS, with both a Windows Store app and integration with Windows Explorer on the desktop. A corresponding app for Windows

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Phone and a full web portal linked to Hotmail mean that files are accessible everywhere with the one Microsoft login.

You get 7GB of storage for free, with additional 20GB, 50GB and 100GB tiers costing £6, £16 and £32 a year, and SkyDrive's feature set is gradually growing. Recent updates have added selective folder syncing and the vital Share function, and you can open documents directly into Microsoft's Office Web Apps; these are broadly similar to Google Docs, but have better formatting and compatibility with desktop Office documents.

You can save files into SkyDrive directly from within Office, and any applications that use the Windows Explorer save dialog will offer SkyDrive in the list of locations. Where it falls behind, however, is with third-party support: on a non-Windows device, you won't yet find many apps offering to share to SkyDrive alongside the near-universal Dropbox options. Hopefully that will change though.

The Microsoft home?

Many of the approaches here are similar to those of Microsoft's rivals, but when it comes to the connected home, Microsoft has a huge head start on Apple in the form of the Xbox. Apple TV may be smaller and more stylish, and integrate with more panache, but it isn't already sitting under several million British TV sets. What originally launched as a games console – and these days it's a superb one – has proved to be something of a Trojan horse as Microsoft has continued to push features into its software. From the sofa, Microsoft is hard to beat.

The other big advantage is the integration between desktops, laptops, tablets and phones; it's the only platform on which you can conceivably work seamlessly on a file across all four devices without having to deal with multiple environments and file compatibilities. You could argue that users who have invested in OS X will have Apple's productivity apps on their iOS devices, but there's no denying Microsoft's platform is strong in this respect.

The huge question that lingers is whether people will understand how all the Microsoft parts complement one another. It's one thing selling a non-techie user a £40 upgrade to their laptop's OS, but persuading them to switch from their beloved iPhone or their trusty Nexus 7 will prove more of a challenge.

The consistent interface design across Microsoft's devices will help to an extent, but Microsoft isn't stupid – the launch of iOS and Android versions of the SmartGlass app is an acknowledgment of the huge number of people who are quite happy with the devices they already have.

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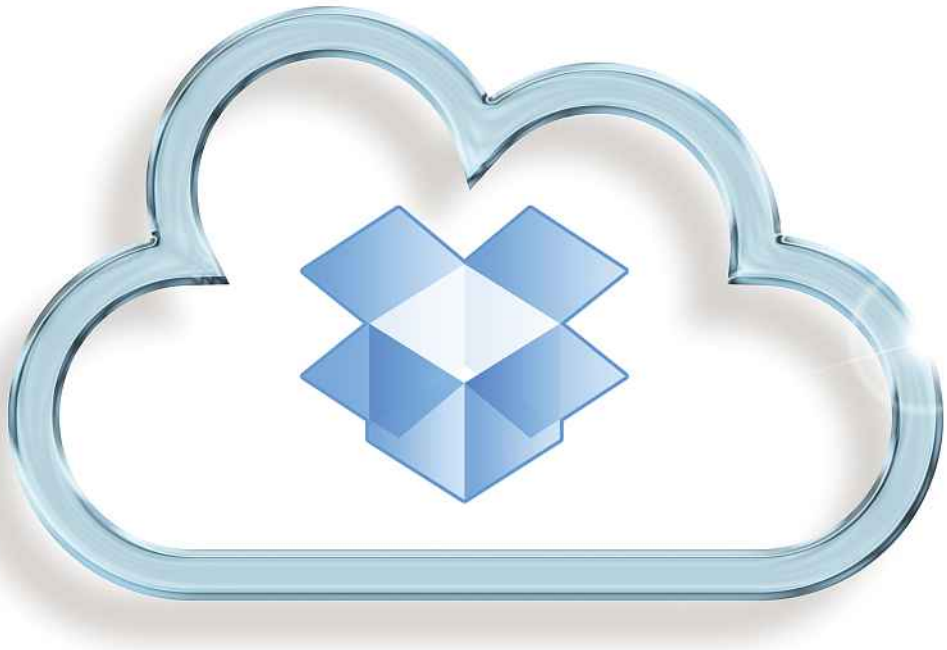
The mix-and-match approach

We've looked at the three big-brand attempts at monopolising all of your computing needs, but for most people it isn't realistic, or even desirable, to dive fully into one camp. We've all accumulated gadgets and PCs of various makes and models over time, so starting from a blank slate is rarely an option.

Does that mean you should keep buying the same manufacturer's products to match those you already own? Or, once you get past the marketing, can the mix-and-match experience be just as smooth and well integrated?



Choosing a base

Although starting from scratch would be nice, the reality is that most of us already own a PC or laptop. Fans on either side may disagree, but the good news is that the old Windows or Mac dilemma isn't anywhere near as difficult as it may once have been. These days, many applications work fine on both platforms, although there are still major exceptions – most notably, patchy OS X support for many new games at launch.

You might think pairing your choice of desktop OS with its mobile sibling is a must, but that doesn't apply to any great extent either. The iPhone can easily be synced with iTunes in Windows; if you use a Mac, most Android handsets include compatible third-party syncing software, and that's if you even choose to sync with a computer at all. All three mobile platforms can be set up and used on their own thanks to the cloud. Spotify and the various other cloud music services mean manually getting a music collection off a hard drive and onto a phone is no longer necessary.

> "We've all accumulated kit over time, so starting from a blank slate is rarely an option"

There are still a few areas where the choice of OS on a laptop or PC does makes a difference, though – even more so now that Windows 8 has arrived.

Opposing philosophies

As we briefly mentioned earlier in this feature, it's interesting that Microsoft approaches device and app integration from a different direction to that of Apple and Google. Rather than focusing on the relationship between the phone and the tablet, as Android and iOS do, the various Windows 8 arms were built primarily to connect together the tablet and the PC – a decision that's opened the floodgates to the current wave of capable all-round laptop-tablet hybrid devices.

When you add the seamless transition between desktop and tablet when buying and installing Windows Store apps, it's clear a Windows 8 tablet makes a great partner to your existing PC – as long as you upgrade that to Windows 8 too. We won't even try to pretend that the Windows Store is overflowing with quality apps right now, but it's a big enough platform that we're sure developers will give it a fair crack in 2013.

Hopefully, that will extend to Windows Phone 8 as well, to go along with some impressive recent handset launches.

The flipside to that is the question of app design. Many would argue that the reason behind Apple's approach is that there's a much more natural relationship between how we use a tablet and a smartphone, and that's certainly true if your handheld devices aren't used primarily for work.

If you remove the need for an office suite and a comfortable keyboard to type on for long periods from the equation, it's hard not to lean towards the phone-tablet approach, where Angry Birds need only be purchased once for use on both of your portable devices. It's early days yet, but which approach eventually seems more natural may well depend on the take-up of Windows 8.

Some applications remain native to one platform, but the number is shrinking

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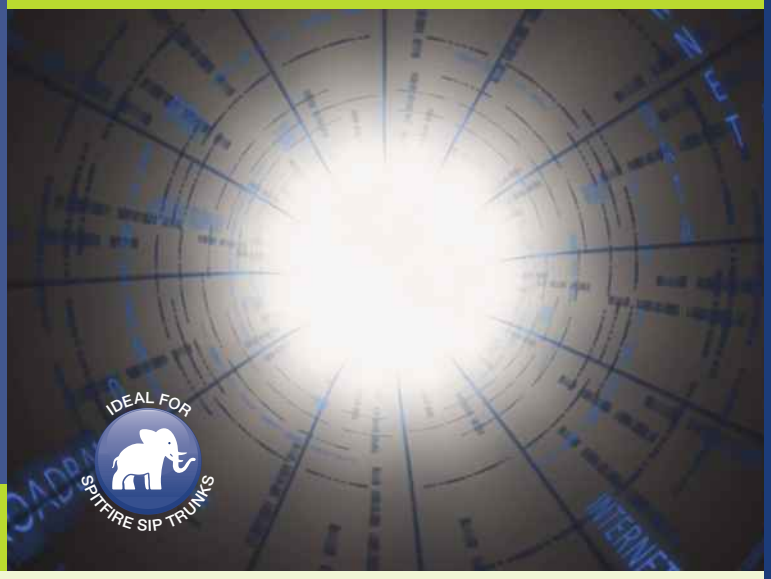

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The SmartGlass app adds features to the Xbox – but it runs on iOS and Android, not only Windows 8

Crossing platforms

So what do you lose by mixing platforms? The manufacturers would like you to believe it's a whole list of important things, but they'd be mad to close the door on the vast numbers of consumers who are platform-agnostic.

Therefore, iTunes runs on Windows, the SkyDrive app is in the Google Play store, and you can control your Xbox with the SmartGlass app on any iOS device. You'll rarely find yourself completely locked out of an important service by choosing the other side – and if you do, third-party developers are remarkably good at coming up with apps that replicate withheld functions.

That isn't to say the cross-platform experience will always be smooth. The new Google Play Music service might appeal to iPhone owners who don't want to shell out for iTunes Match, but there's no doubt the best user experience comes via the native Android app. Windows and Mac users wishing to upload their music must use a basic manager utility, then access their tracks through the browser – which is also the only way iOS owners can play tracks without downloading a third-party app. On the other side, Apple's cloud music service can be accessed via iTunes on a PC, but you won't be able to use it on Android or Windows Phone handsets.

Likewise, each platform will still have its exclusives. If you're a Mac user, for example, you can pair Tweetbot across OS X and iOS, and there are all manner of calendar, note-taking and other productivity apps that only exist across the Apple platform. It may not sound like much, and there's almost always an equivalent on other platforms, but some specialist applications may swing the decision.

The cloud effect

The gaps are wider and more noticeable when you try to combine different types of device, particularly when bringing the TV into play. There are tangible benefits to be had by pairing an Xbox with a Windows 8 device, most notably the integration with Xbox Music, and the same applies to Apple TV and iTunes Match.

Although Microsoft has said that it's working on Xbox Music apps for iOS and Android, at the moment you'll need to buy carefully to avoid having to set up different cloud services for different devices.

Unlike in many other areas, for cloud services there's a persuasive argument that none of the big three should be your first port of call.

As much as iCloud, SkyDrive and Google Drive have their roles to play on their various platforms, they all lack the true cross-platform, multi-application support of Dropbox. All manner of third-party software has direct Dropbox integration, and it's getting an increasing foothold on Android thanks to preinstallation deals with major manufacturers and networks. Integration with iOS is more constrained, but many apps have made it a primary feature, whether it's syncing your passwords in 1Password or saving files in iA Writer.

That doesn't mean you should eschew the other cloud services. Having vital files mirrored across several services will ensure they're always accessible, and also make it easier should you end up falling into a pattern of buying hardware from one manufacturer more frequently than the others.

Google Play Music is available on other platforms, but is best on Android

Decision time

From all of the above, it might appear that there's little to lose by mixing and matching as you shop from an A-List that ticks back and forth between the big names. However, that's forgetting the one factor that always plays a bigger part than an objective analysis will consider: convenience.

It's convenient for a user to have one account that's linked to every application, song and file they own, which is why all three manufacturers have invested heavily in making their cloud services as attractive as possible. It's convenient for a user to only have to learn one interface, which is why Microsoft is hard at work making the Xbox dashboard match up with the Windows 8 Start screen.

> "Manufacturers would be mad to close the door on all of the platform-agnostic consumers"

It's also convenient (and economical) to reuse cables and cases, and to be able to reinstall a significant collection of old purchases on a new device.

Convenience is the reason that, for a long time, so many of us have used Dropbox for everything, even though newer alternatives may better fit our current needs.

It's why people automatically upgrade to the new iPhone every two years despite a growing curiosity of what the other side might have to offer. And it's why making the right choice at the beginning is becoming more important with every new device launch.

Although you might not be able to start completely from scratch, choosing your next purchase based on the products you already have in your home has a lot of merit.

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IS AMAZON EATING ITSELF?

Tax scandals, DRM controversies and no sign of a profit: Stewart Mitchell investigates Amazon's increasingly choppy waters

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For millions of us, Amazon long ago replaced the high street as the first port of call for everything from books and consumer gadgets to DVDs and digital content. The company has it all, and at low prices; it's so big it's almost synonymous with online shopping – yet somehow this global behemoth still fails to make ends meet.

The company's focus on winning customers through ever-lower prices has, on the face of it, been a success. Last year's company results showed revenues of $48 billion, which, if it were a country, would nestle Amazon neatly between the GDP of Slovenia and Guatemala.

Yet in its latest quarterly figures, the company recorded a loss of $274 million on earnings of $13 billion. Heavy spending on Kindle hardware has led to higher costs, even as it has emerged that the company paid woefully little in UK taxes. A flood of negative publicity has opened Amazon up to further questions over how it could possibly fail to make money when paying minimal sales tax in so many jurisdictions. Could it be that Amazon's business model is fundamentally flawed?

"$50 billion start-up"

The Amazon model – an online version of stack 'em high, sell 'em cheap – has been brilliant in growing its customer base. The problem for investors in the company is that the constant push into new markets makes it difficult to assess its real value.

"Amazon doesn't disclose its margins, so we're flying blind," says Lawrence Haverty, a portfolio manager with publishing and media investment company Gabelli Multimedia Trust. "If you looked at Amazon financially and you didn't know what it did, you wouldn't want to own it. It makes a very inadequate return on investment capital."

Haverty believes Amazon makes such thin margins on its huge inventory that there's little wonder the business isn't making money in many of its activities, which now range from retail and cloud hosting to hardware and platform design with its Kindle range.

"It's hard to conclude that in any of its non-cloud businesses it makes anything resembling an economic profit," he says. "The market doesn't hold [CEO] Jeff Bezos accountable to earn a competitive return – it gives Amazon a free pass to get into these markets with a very low margin structure and then do something else." Haverty suspects that, considering how Amazon is running its business, the company isn't ever going to make enough of a profit to justify its stock price. "Right now this is a $50 billion start-up – it isn't making a return against $50 billion of volume."

From the consumer's point of view this is all good news, but retailers are normally in business to make money. According to analysis from investment house Qineqt, over the past five years Amazon has traded at profit margins of 2.72% – slim, but acceptable given the scale of the operation. In the past year, however, that margin has tumbled to 0.69%.

The problem? Amazon makes nothing from those sales; in fact, analysts believe the company is making a loss. The model follows the Gillette school of marketing by which you sell razors for next to nothing in the expectation of making money on replacement blades. In Amazon's vision, Kindle ebook sales and other content on its Fire tablets will recoup the investment in subsidised hardware – but there remains a suspicion that the company isn't making much on that content either.

"INSTEAD OF RAISING PRICES TO INCREASE PROFIT, AMAZON'S FOCUS IS ENTERING NEW MARKETS"

Buying into the Kindle

Instead of raising the prices of its products to increase profit, Amazon has focused on entering new markets. Much of the recent decline in profits can be put down to its investment in the Kindle. But even after this investment, the company has made it clear it doesn't expect to make money from the hardware, preferring again to focus on new customers.

"Our approach is to work hard to charge less," said Bezos in the recent company statement. "Sell devices near break-even and you can pack a lot of sophisticated hardware at a very low price point. Our approach is working – the $199 Kindle Fire HD is the best-selling product across Amazon worldwide."

In a trawl of Amazon's top 20 best-selling ebooks for the Kindle, the average price was only £1.78; seven of those cost a ridiculous 20p (*see p39*). Whatever the split between Amazon and the publisher in each case, the company will be making mere pennies after administration, distribution and platform costs. This aggressive tactic may be working to increase sales, according to experts, even though it could prove costly in the short term.

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"People that buy a Kindle as their starter for digital books are going to build their entire libraries around that ecosystem," says Joe Magyer, an Amazon specialist and senior analyst at The Motley Fool, a financial services company. "If you buy into it, you're likely to stick with Amazon, and that will serve it well over the long term; it could be a good investment even though it's killing gross margins. Amazon has to balance the razor and the blades; if you sell the razor at break-even or at a loss, and people don't come back and buy the blades, then you're not doing well."

Even Amazon accepts it may struggle to sell its new platform at a profit, and that it can't be sure customers will come back to fill their devices with videos, music and books.

"We may have limited or no experience in our newer market segments, and our customers may not adopt our new offerings. These offerings may present new and difficult technology challenges," the company warned in its 2011 results statement. "In addition, profitability, if any, in our newer activities may be lower than in our older activities, and we may not be successful enough in these newer activities to recoup our investments in them."

According to analysts, Amazon is trying to use subsidised hardware and cheap ebooks to squeeze Apple into lowering its prices to match. It's a bold gamble given Apple's healthy bank balance and userbase.

"Both Amazon and Google are in a good position because they don't need to make money on the hardware, and that's a good thing in the long term because making money in consumer electronics hardware is incredibly difficult," says Magyer. "Amazon and Google are trying to kill the economics for the other hardware guys. Amazon can't make good margins while trying to ruin it for Apple by making it scrimp on margins."

However, a brief look at Apple's results for the same quarter in which Amazon made that $274 million loss highlights the difference that can be made by a solid margin on hardware and a ready supply of content. With Apple's iPad mini starting at £269, compared to the basic Kindle Fire at £129, Apple is making good money on each device – something that contributed towards the company's $8.2 billion in profits for the quarter.

It isn't yet clear whether Amazon's content deals established in the UK for films and television will make a better contribution to its bottom line than ebooks.

"WITH RIVALS PROVING FAR MORE FLEXIBLE, AMAZON'S TIGHT CONTROL COULD BACKFIRE"

The DRM threat

Although literature on the bestsellers list is cheap – probably because dirt-cheap books sell more copies – well-known books are often more expensive on Kindle than hardback, which makes little sense to consumers. There's little point in buying into the ebook ethos if the titles you really want to buy are cheaper in print form.

And once you have bought into the Kindle, it isn't easy to buy content from elsewhere, with the company using DRM controls and occasionally exercising its ability to remove content that falls foul of its terms and conditions.

Amazon scored a PR own goal in October by removing content from a user's device, claiming the Norwegian woman had bought the content while a linked account was being used improperly. As media commentator Martin Bekkelund said in a blog that went viral and provoked widespread criticism of Amazon: "This shows the very worst of DRM. If Amazon thinks you're a crook, it will throw you out and take away everything that you've bought. And if you disagree, you're totally outlawed. With DRM, you don't buy and own books, you merely rent them for as long as the retailer finds it convenient."

People who grew up buying books were, not surprisingly, miffed when Amazon's "rental" model raised its head. With rivals such as Kobo proving far more flexible, Amazon's tight control could backfire. Apple was eventually forced to remove DRM from its iTunes tracks to keep customers happy; repeating such a move on the cheap Kindle could prove costly.

Taxing issues

Amazon is just one of many global corporations well versed in making the most of international tax systems to pay as little as possible in UK taxes. But the fuss isn't restricted to these shores.

"Amazon has been given an advantage by the [US] government because, until recently, it hasn't had to pay sales tax on what it sells – and it still isn't making a profit," says Haverty.

Amazon maintains that it pays the taxes it's required to by law, but scrutiny into such corporate practices is growing. If governments seek to close the exploited regulations, Amazon stands to lose one of its key competitive advantages – something to which the company readily admits.

"During the ordinary course of business, there are many transactions for which the ultimate tax determination is uncertain," Amazon told investors in recent statements. "We are subject to audit in various jurisdictions, and such jurisdictions may assess additional income tax liabilities against us."

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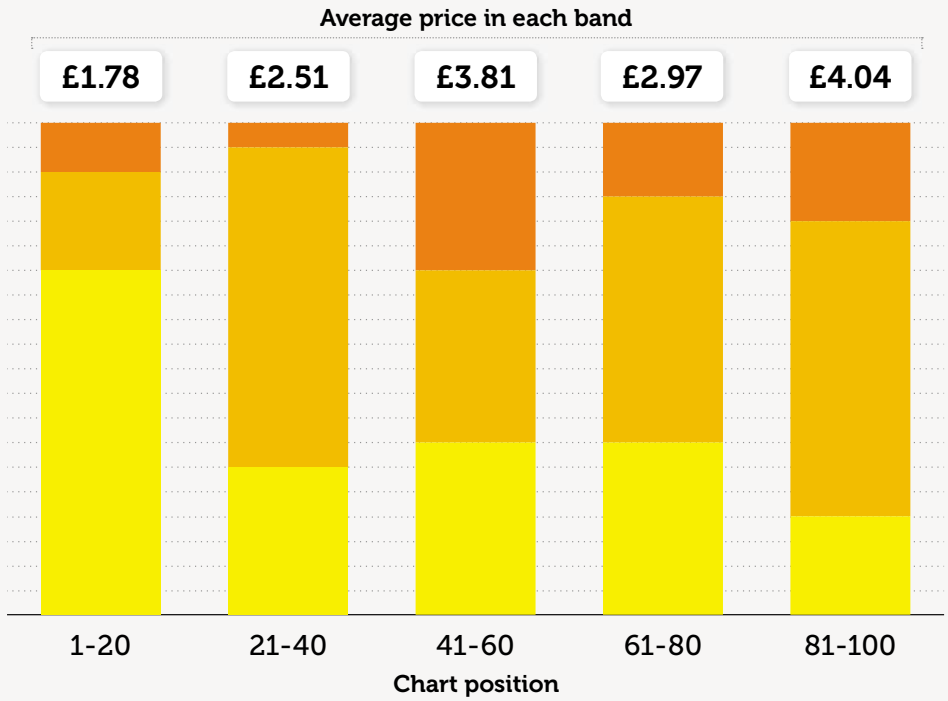
PRICE OF AMAZON'S TOP 100 KINDLE BOOKS



There were 14 ebooks in the top 20 selling for less than £1, which demonstrates the huge power of Amazon's aggressive sales. Seven of those 14 ebooks were on sale for only 20p.

Reputation damage

While the favourable tax position may remain and make it easier for Amazon to turn a profit, the reputational damage is harder to assess, with UK companies protesting: a media storm saw many headlines echoing *The Guardian*'s "Amazon: £7bn sales, no UK corporation tax".

According to British retailers, the 27% tax they pay is money that could be invested in their future, through lower prices to attract more customers or through better distribution systems. They are at a disadvantage compared to Amazon.

"If you're giving 27% of your profits to the exchequer, rather than being domiciled in a tax haven and having much more, you'll be out-invested and ultimately out-traded," Andy Street, CEO of John Lewis, told Sky News.

Yet although the UK's independent booksellers have tried to cash in on Amazon's bad publicity by launching a "we pay our taxes" campaign, it's unclear whether it will have any impact. According to the TaxPayers' Alliance, it's seen only marginal support for boycotting Amazon because it remains the cheapest source for many goods.

"People we've spoken to are more concerned about the loopholes in the system than any company," said a spokesperson. "I've seen a few comments about people buying from elsewhere; at the moment people are hard-pressed, with high costs of living, so if they can save a few bob when they're doing their shopping, they'll continue to do so."

In addition, Amazon has alienated some authors and publishers with its pricing strategy, publishing books below cost price. For example, when Ken Follett's *Winter of the World* went on sale at 20p instead of its recommended price of £11.64, his agent Al Zuckerman branded it "absurd and outrageous".

However, in a vignette that highlights that even if it isn't profitable, Amazon remains hugely influential, the agent later chose not to elaborate when we contacted him. "It's too ticklish a subject," said Zuckerman. "I don't want to comment on this because we have too many authors whose livelihoods depend on Amazon."

The future?

Without allies in its key markets, Amazon could find itself increasingly marginalised. There are no administrators circling yet, but the fact remains that a company with such an enormous customer base should be making money, more so given the advantages it has over rivals, both online and in the UK.

Right now it's moving from market to market using aggressive pricing to entice more customers, but at some point it will have to focus on making money. Otherwise, when there are no more users to entice, Amazon might find it can't run a successful business with the ones it has.

"AMAZON HAS ALIENATED SOME AUTHORS AND PUBLISHERS WITH ITS PRICING STRATEGY"

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Toddler tech

Once upon a time, three-year-olds wouldn't be trusted with the remote control. Now they use iPads. Simon Brew explores the boom in toddler tech

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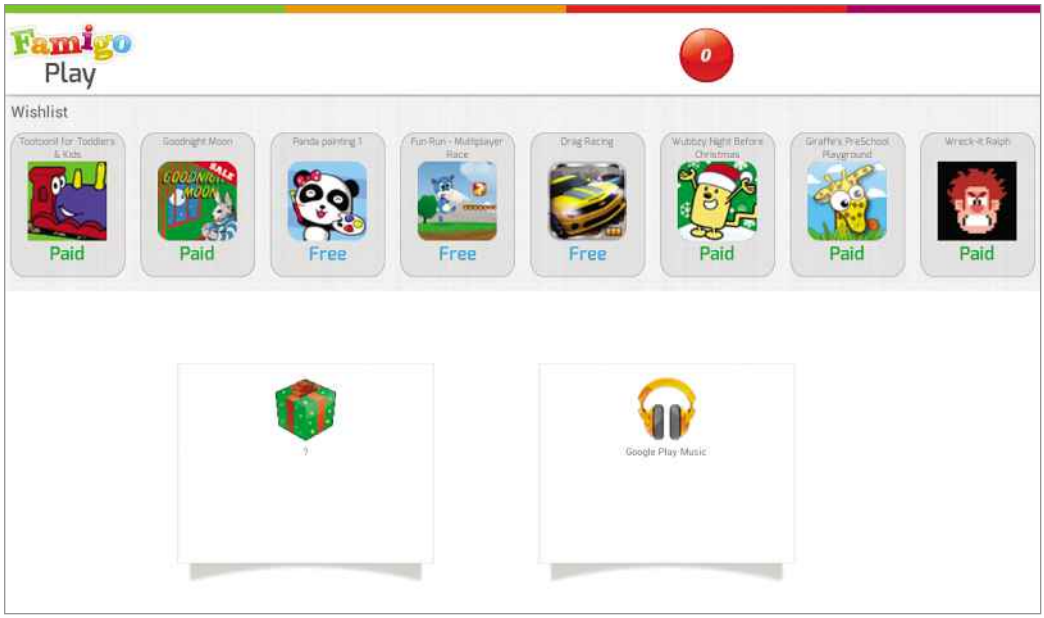
Young children have always possessed a magnet-like attraction to technology. In days of old, the challenge was to protect a desktop PC from tiny, curious fingers; today, surprisingly powerful devices are targeted directly at them.

From tablets in the finest Hello Kitty designs, to dedicated apps for "grown-up devices", it seems that, far from keeping infants and computing apart, there's a growing drive to bring them together.

But isn't this fraught with danger? Is it wise to give a curious three-year-old access to something as advanced as an iPad with a few suitable downloads on it?

There's an argument, certainly, that it's asking for trouble. Many parents balk at the idea of letting a toddler near the TV remote (and those of a certain vintage will happily recall fishing everything but a video tape out of the VHS player), so placing an expensive slab of technology in their mucky hands comes with inherent concerns.

Yet there are also strong, tangible educational benefits to the emergence of toddler-focused technology. After all, isn't it better to put a child in front of something that they can interact with, as opposed to another re-run of the Mickey Mouse Clubhouse?



Apps such as Famigo Sandbox let parents childproof any tablet or smartphone

Small steps

Technology for toddlers isn't a new concept. LeapFrog, for instance, earned its strong market position off the back of the LeapPad line of learning products – the first of these was introduced in 1999, and helped to usher in a generation of child-friendly educational computing devices. Arguably, the origins lie even further back, in products such as Texas Instruments' Speak & Spell range, which originated in 1978.

In 2013, though, the problem is that the technology is inherently more powerful. So, on top of the usual debate over how much time and access a toddler should have to screen-based devices, there's now also the very real possibility of them doing notable damage, at both a software (erasing files and changing settings) and hardware (lobbing a tablet down the stairs) level.

That hasn't deterred software developers, who have been keen to tempt parents with apps on both the Google Play store and Apple App Store. Both attract a combination of major publishers and smaller, independent developers, and both boast an extraordinary wealth of material, across a wide range of subjects and age groups. It's no exaggeration to suggest that the home educational software market has never been so vibrant.

LeapFrog LeapPad

The LeapPad was one of the most in-demand toys of Christmas 2011, and its successor, the LeapPad 2, inevitably builds on that. From the start, it's very clear that the manufacturer knows its audience. As this isn't an iOS or Android device, LeapFrog has full control over what it allows its users to do.

It's packaged in a bright case, with mounted controls, and it will run off AA batteries (it chews through them surprisingly quickly). There's a built-in camera on the LeapPad, with a pair of them on the LeapPad 2. The price is modest – now under £50 for the first-generation device. There are also excellent educational programs available for the LeapPad range, which you purchase via an app download or a cartridge.

The sting is the cost of that software. Cartridges retail for £20 apiece, with apps from £3.50 to much more than £10. You may save money on the hardware, but if you're planning on using a tablet in the long term, LeapFrog stands a sporting chance of parting you from much more money than that £50. That said, it's one of the few devices designed from the ground up with very young children in mind, and it ties hardware and software together particularly well as a welcome consequence of that.

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For parents used to trawling shops for appropriate learning aids for their youngsters, there are tangible upsides. It's possible to buy niche, affordable tools to help even the very young with their development, and unlike even a decade ago, it's low risk. A £1.49 app is far more attractive than a £20 add-on cartridge that's likely to stop working after a period of hard labour (or worse, be ignored altogether).

There are downsides too. On the LeapPad of 1999, a user couldn't alter crucial system defaults, nor could they find themselves online. Even the crudest of today's toddler-targeting tablets tend to allow both, with a device such as the Arnova ChildPad (*see below*) leaving youngsters one tap away from the perils of Google.

If the reasons for keeping toddlers and technology apart seem strong, there are even more compelling arguments for bringing them together.

Deb Steggall is the headteacher of Langley School in Birmingham. It's a special primary school for cognition and learning, and she told *PC Pro* that such technologies, when used in a complementary way, can prove invaluable. "Very young children are able to manoeuvre their way around the iPad with surprising alacrity," she says.

This is a crucial point. Tablets have managed to break down an interface barrier between young children and computers. Historically, for toddlers, the keyboard and mouse have always been a firewall preventing independent exploration. A touchscreen interface changes the situation entirely, as schools and parents have discovered.

"Tablets have broken down an interface barrier between children and computers"

In studies into using tablets for learning, the results have been positive. With the caveat that many studies seem to be tied to app developers somewhere along the line, the general consensus is that engagement with the material is improved when a student uses an iPad, although that comes with obvious budgetary problems.

Nonetheless, considering its relative infancy, the iPad and similar products are already proving useful tools in education.

Safe and sound

Deb Steggall argues that "the iPad should be treated as an alternative experience rather than a replacement for a book".

When questioned as to the robustness of the hardware itself, she told us that "several local schools have given children iPads to take home. The instances of damage are relatively low considering usage. Having said this, they're protected with relatively robust covers".

Furthermore, it isn't only covers that keep tablets safe in the hands of young children (although many are available, for a range of prices). On the software side, there are some compelling downloads that can offer security and peace of mind.

Famigo Sandbox, an app for Android and iOS, creates a safe, secure sandbox for minors, and eradicates worries such as a child making in-app purchases, or installing and running inappropriate apps. Unless in parent mode, you can't do either.

Famigo scales its services for different users, but in toddler mode (targeted at users aged one to four), the home button simply redirects to the sandbox.

There are still choices for pint-sized users to make, however. For instance, they can choose apps from a curated list to go onto their wishlist; it requires a parental login, either on the tablet itself or the Famigo website, to green-light the installation.

For the modest price of just over £3, with a free trial available,

Arnova ChildPad

Selling for just under £100 and preloaded with Android 4, the Arnova ChildPad announces itself as a "tablet for kids" on the front of its fairly basic box. Its specification isn't much to get excited about – a 1GHz processor, 1GB of RAM and 4GB of storage – but the software it's looking to run is relatively modest too.

We had a mixed experience with the ChildPad. Setting it up for the first time, it's clear that it's little more than a standard Android tablet with some brightly coloured backgrounds and bundled apps to appeal to its intended audience. Be aware that the home button is active, and the Google logo at the top brings up a web-facing search screen; no attempt has been made to lock down the device.

The apps are middling. A picture-matching game kept our four-year-old volunteer content, although it kept crashing. Further titles were keen to direct us to the app's Facebook page, or try to sell additional content. A free cartoon was bundled, too, although we suspect the star attraction – and the product boasts this on the box – is the inclusion of Angry Birds.

The ChildPad isn't terrible. The biggest problem, outside of the low-quality screen, is the navigation buttons being permanently onscreen and active. Our young volunteer frequently found herself looking at puzzling menus when she just wanted to sort her pictures. Furthermore, selling something as a tablet for kids when it still needs work from the parent to make it child-friendly is a questionable approach.

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Famigo should rank highly on any concerned parent's list.

Microsoft has placed the same concept in the core of Windows Phone 8 with the introduction of Kid's Corner. As the name suggests, this cordons off a restricted area intended for youngsters (although not exclusively so), and contains barriers that prevent inappropriate content from seeping through. You can now pass your phone to your offspring knowing they'll be restricted to approved apps, instead of dialling random numbers and blowing raspberries.

The price

For all the talk of smartphones and tablets being placed in the hands of the very young, the key problem facing parents is the cost. Most homes have a family computer that a youngster can use for education, while a tablet is often seen as a luxury. Inevitably, though, the success of mainstream tablets has inspired some lower-budget piggybacking.

A quick search for children's tablet computers reveals lesser-known names such as Arnova, Kurio and nabi doing battle with LeapFrog and Apple.

Looking past the brightly coloured plastic on the growing number of sub-£100 children's Android tablets, they're pretty conventional devices. (They certainly don't move too far away from the non-child-centric Android tablets in the same price bracket.) Furthermore, the hallmarks of being a low-cost Android tablet are present and correct in those that we've tried: the screen quality tends to be quite poor, and the battery life limited.

Still, there's an argument that you get a surprising amount for your money – as long as you're willing to do a little work yourself. Many manufacturers are happy to gather and preinstall a collection of decent-looking (but not necessarily decent) children's apps.

If you take a cheap Android device, remove what comes with it and spend some time choosing apps more appropriate to your child's needs, it could still prove an educational bargain.

Understandably, many would still prefer others to do that for them, and as such, it's traditionally been proprietary devices that have dominated the very young sector of the market. However, even companies such as LeapFrog, Fisher Price and VTech have evolved for a post-iPad world.

There are clear pros and cons with devices such as the aforementioned LeapPads, and VTech's InnoTab. On the plus side, these are designed from the ground up to be educational tools, and that's reflected in the build (big, chunky and colourful tends to be the preference), the interface and the software. The available "apps" are generally consistent in their style and interface, which makes them easy to pick up. The downside is that you're beholden to a limited selection of software at comparatively high prices.

To iPad or not to iPad?

The question, then, is this: does this growing cadre of children's tablets offer benefits over an iPad laden with educational apps? The savings in cost alone are sizeable, and for any parent worried about their toddler inflicting damage, there's added peace of mind to be had in a specific, toddler-friendly piece of hardware.

However, the iPad is more robust than it's often given credit for, and the huge customer base means many established experts in educational software tend to gravitate towards it. Furthermore, as each subsequent generation of iPad is released, a second-hand older model becomes more tempting; the original iPad is perfect for engaging a toddler, and second-hand prices have begun to fall below the £200 mark.

Parents now have choices that weren't available even five years ago. The mainstream penetration of the touchscreen interface may be the best thing to happen to educational software for a long time, and the burgeoning array of learning devices for the very young is testament to that.

That said, no matter how robust the hardware might be, in our experience there's nothing more likely to break it than a very small child…

The Fisher Price iPad option

There's an element of "if you can't beat 'em…", but accepting that many parents have resigned themselves to their youngsters using their iPad, Fisher Price has targeted them with a cunning product. Entitled the Laugh & Learn Apptivity Case, it both protects an iPad, and, through use of suitably garish colours, makes it even more attractive to a toddler.

There's a range of free apps, and they're recommended for users six months and older. Apple will be pleased…

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INSPIRING
BETTER
BUSINESS

"Elephants inspired me."

'This is my story'

"For quite some time I didn't believe I could run my own business. I desperately wanted to, but fear was holding me back.

It reminds me of a story I heard about an elephant who had been chained up for so long he gave up trying to escape. It was only after he was set free that he came back to life.

Hearing that story came at the right time for me. I was inspired to start my own business and find freedom myself, breaking free was a lot easier than I first thought. So you could say I owe my success to that elephant!

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CAN YOU DISAPPEAR FROM THE INTERNET?

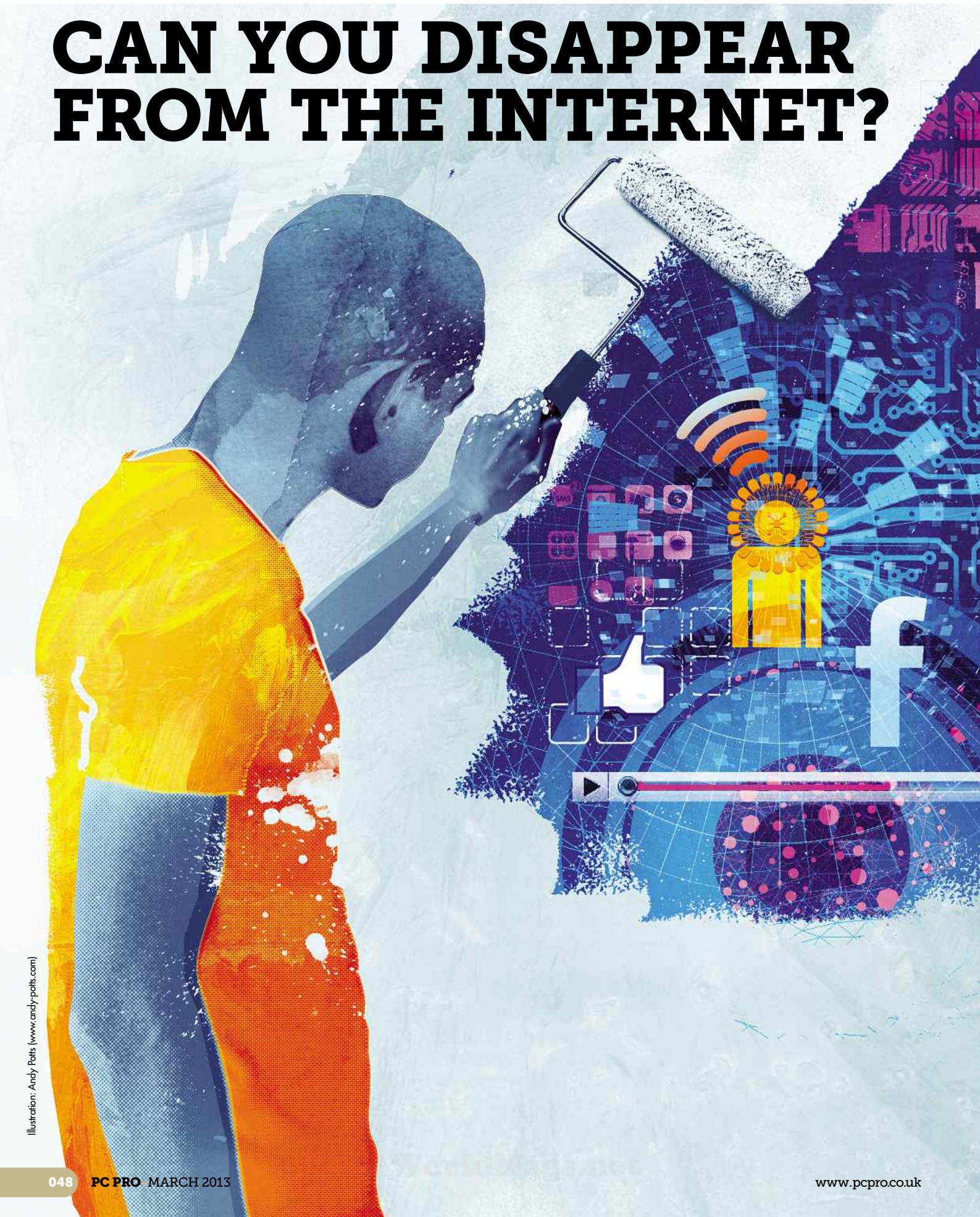
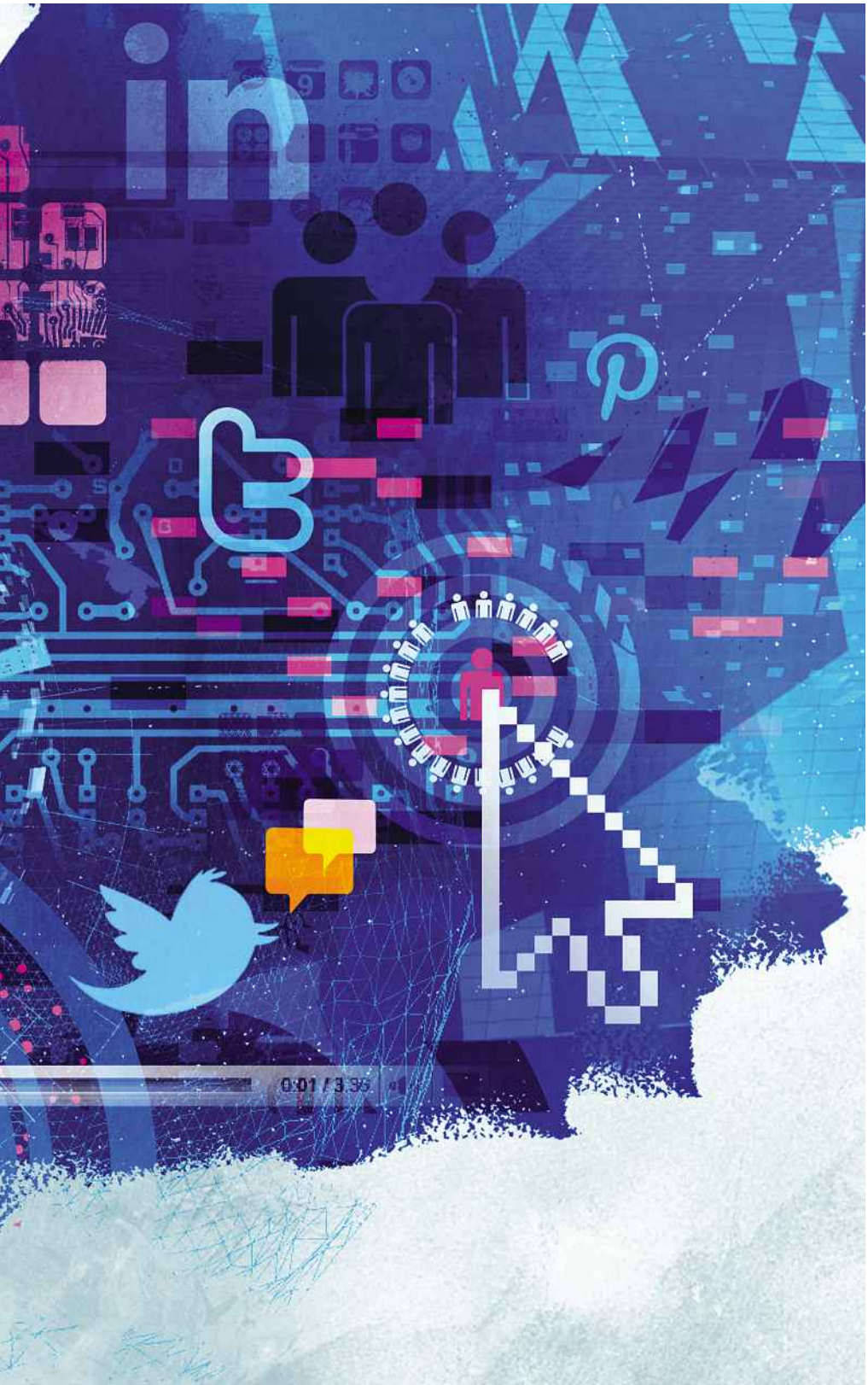


Illustration: Andy Potts (www.andy-potts.com)



Whether it's social networks or shopping sites, the internet plays a vital role in modern life. But what if you want to erase yourself entirely? Joe Martin finds out if it's even possible

Once it's online, it's online for good. That's the lesson many people learn the hard way through social media, as personal messages go public and private photos end up in places they were never intended to be. But although these extreme cases make the headlines, we still put too much of ourselves online every day – and getting that back can be a frustrating task.

We live in an increasingly connected world, where our digital identities are replicated and spread over a thousand servers and services. For the most part, that's no bad thing; sites such as Facebook are a great way to keep up with friends, while letting Amazon remember your address is a handy time-saver.

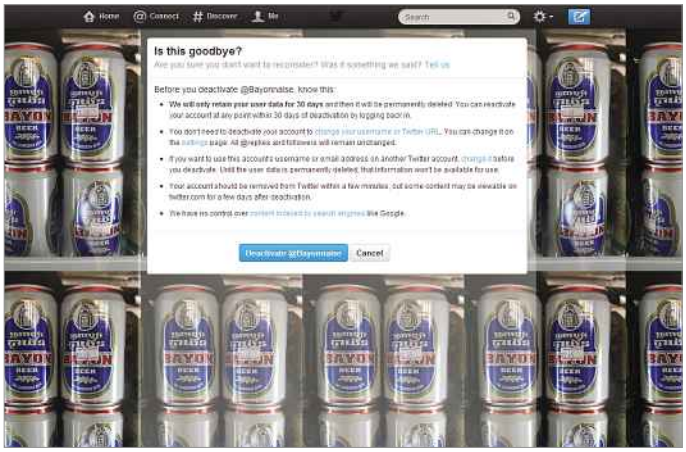
The price paid for these conveniences is high, though: we surrender our privacy and information to companies, which can then use this data as they see fit. Most, such as Facebook and Amazon, will typically use the information to send targeted advertising – which is annoying at worst. Less scrupulous services will sell on our details, or cynically manipulate us into staying subscribed for longer.

And those are the ones we know about. Ask yourself this: in all your years online, how many sites and services have you joined... then left behind as the next big thing came along? Do you remember what you posted on that music forum in 2004? Or which services you tried for webmail before Gmail? We're only human, so it's natural that we forget these services as we move on to new and better ones. The problem is, they don't forget us. And just like a drunken Friday night photo, that data can end up in places you never intended it to go.

A private eye

Whether you're considering wiping your digital past or just want to avoid being targeted, the first step is to understand what you can demand of companies that have your data. This is pretty easy in the UK, as the 1998 Data Protection Act outlines our basic rights. These include the right to access and correct any data held about you, and the right to the support of the Information Commissioner's Office (ICO) should that request be denied. The law applies to any company processing personal information within the UK, regardless of where it's based.

The Data Protection Act isn't a totally effective weapon, however. While you have the right to access and correct your data, the act also allows a company to charge you for the privilege. There's currently no provision for forcing a company to wipe your data either, and although EU commissioner Viviane Reding is campaigning for a "right to be forgotten", progress may be slow as relevant bodies consider the proposal.



Twitter takes 30 days to delete your personal information

"Its implications for the information society need thinking through carefully – as does the challenge of making this right work in practice," a spokesperson from the ICO told us.

"We can see the desirability of an individual being able to request the removal of information where there's no compelling reason for its retention. However, an insufficiently qualified right to be forgotten could have serious implications for freedom of expression and for the maintenance of the historical record. An example might be where a public figure tries to use the right to remove embarrassing content from a newspaper archive."

There is some good news for consumers, however. First, the Data Protection Act forces companies within the UK to explain how data will be used and to communicate any changes to that as they occur. This is why there's always a hullabaloo when Facebook updates its privacy policy – the company has to tell everyone what it's doing and deal with the reaction. It's also how we know that Facebook keeps track of information such as which profiles and photos you've been looking at; it then uses this to surface relevant information intended to keep you on the site.

THE UNTOUCHABLES

Some online services, such as WordPress and Skype, don't let you delete your accounts at all – or deactivate them. The only way you can distance yourself from them is to update them incorrectly. To do this, you'll need to set up a new free email address under a fake name – JoeBloggs123@gmail.com, for example – then update your profile details to reflect the false identity. The company will probably still have some of your old information, but at least it won't be able to use it very effectively.

The Data Protection Act allows room for interpretation on what data companies are allowed to keep, decreeing that no personal data can be held for longer than is "required". The legalese surrounding the clause is hazy at best, but if you're quitting an online service such as Facebook or Twitter and want to leave no trace on its servers, then this is currently your best legal argument. Companies such as banks may be allowed to continue storing data for legal or operational reasons, but keeping it for profit or "just in case" isn't a valid reason, as you may want to remind an obstructive customer services agent.

Prevention over cure

While useful in a few cases, this clause can be difficult to enforce, so prevention is easier than cure. Unless you're dealing with a particularly benevolent company, there often isn't a simple way to totally remove your own data – and some will go to unusual lengths to disguise that. Facebook wouldn't let users delete their accounts until as late as 2010, for example, and even now it confuses the process by offering two options: deletion and deactivation.

The difference? A deactivated account can be tagged in photos and posts, will still receive email alerts (which have to be opted out of separately) and can be reactivated at any point. Deleting your account will overcome all of this, but it's an option buried in a labyrinth of FAQs and privacy options. You can access it more easily by visiting **www.pcpro.co.uk/links/221dfn1**, but even then the company will retain some of your personal information.

Still, Facebook is better than some of its peers. Twitter takes a month to delete your account, for example – although it's at least automated if you deactivate your account and stay signed out for 30 days. Note, Twitter claims no control over any of your tweets that have been cached by search engines.

WordPress won't let you delete your account – only your blogs and comments, all of which have to be dealt with individually, assuming you have the relevant permissions. We contacted the company to find out why it was structured this way, but received no response (*see The untouchables, left*).

For all the deletion dodging practiced by social networks, there are a few sites that offer a comparatively simple process for clearing your information, and online stores are generally the most reliable. This is probably due to the legal scrutiny they fall under as a consequence of holding your credit card details, address details and so on.

Take Amazon, for example. The giant of online retailers may have faced criticism earlier this year over how it handles its own finances, but when it comes to your data, it offers a robust selection of options for erasing it wholesale or piecemeal. To wipe your search history and browsing data, visit **www.pcpro.co.uk/links/221dfn2**, where you can also tell Amazon not to collect this information in the future. To delete your entire account, just contact the customer services department once you've cancelled existing transactions, and a representative will handle your request personally. Easy.

What's more, deleting your Amazon account at its root allows you to break links to other sites in the Amazon network, such as Javari and Kickstarter. This isn't something that's true of other online networks such as Google, where each sub-service will be affected differently. Deleting your overall Google account will erase your Gmail to the extent that the username can't ever be reused, even by you, but any Google Groups you've joined will still be able to email you at secondary addresses, so you may need to deal with those individually.

> "It's often personal sites that pose a problem for reputation-management services"

Thankfully, there are steps you can take to ease the headache. The Google Dashboard (**www.google.com/dashboard**) details most of the hidden information Google collects about you, linking through to the privacy policies and FAQs for each service you use. This can act as a handy checklist to follow up on once you've deleted your primary Google account, which is done at **www.google.com/settings/account**.

A little help

The fact that Google Dashboard acts as a checklist highlights one of the biggest challenges in erasing all of your online tracks. Those who've been online for a decade or more will have lost track of all the things they've signed up for, leaving a trail of idling Myspace and Friends Reunited profiles.

Tracking down these unwanted services will be tricky and tedious, but companies such as Reputation.com will help – for a price. Founded in 2006, it has become one of the largest in the field at managing the online

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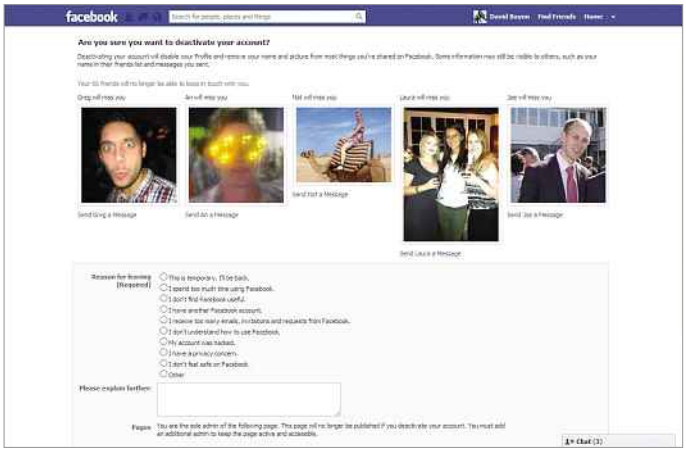
visibility of individuals and companies. Reputation.com claims it can wipe your information from more than 3,000 corporate databases and block the efforts of more than 200 companies that regularly track online behaviour. Couple that with privacy-protecting best practices, such as disabling cookies in your browser, and your online identity should be somewhat masked.



Deactivating Facebook won't completely remove you from the site

The company claims it can also deal with more personal problems. Typically, these services are used by companies that want to combat fake reviews and bury damning articles, but they're also available to individuals who want to change how they appear online – if they want to appear at all.

"We focus first on removing the data you want protected from sites that expose it, through a combination of partnerships and technology," says Noah Lang, vice president of business development at Reputation.com. "Our technology then monitors for the data you've protected and, if it resurfaces, we remove it. We also monitor for new sites that may expose personal data online and alert our users if their data appears."

Reputation-management companies have drawn criticism over the years for their rates and methods, but they claim their exclusive partnerships with personal data aggregators allow them to achieve a lot in a short time.

In fact, rather than large, data-collecting corporations, it's often personal sites that pose a problem for reputation-management services. If your ex-partner has written an embarrassing blog post about you, all you can really do is send a cease-and-desist letter in the hope of scaring them into submission – and you can do that yourself. Sites such as ChillingEffects.org offer advice on online privacy, as well as templates for formatting and sending your own cease-and-desists to webmasters.

The trouble is that a cease-and-desist letter is usually used as a scare tactic – a formalised threat of legal action should the recipient continue posting objectionable content. It isn't legally enforceable (that's the difference between a cease-and-desist order, which is issued by a court of law, and a cease-and-desist letter, which anyone can send), and if someone calls your bluff then your only recourse is to pursue full legal action. This won't only prove expensive, but will probably be unsuccessful too; arguing against the right to free speech is something only adulterous celebrities seem able to pull off.

Worse still, cease-and-desist letters can often serve to create the opposite effect to that intended and attract attention to the data you're trying to hide. It's a phenomenon popularly known as the Streisand effect, after the singer tried to have a photo of her house removed from a website, inadvertently prompting a publicity storm that proved far more intrusive than the original image. It's the reason many reputation-management services prefer to use search-engine manipulation to bury unwanted data, rather than trying to delete it directly.

Even paying to hide your data instead of destroying it can have ironic twists. After all, you're handing your data to one online service in the hope of combating another – a notion that plays into the cyclical, self-perpetuating nature of the internet. It's a fact that also hints at the sad truth of any endeavour to destroy your virtual identity; your data ultimately isn't your own, and as long as you're even vaguely participating in society, you'll never be able to vanish completely.

Services such as Reputation.com help to track down all information about you online

FACEBOOK PRIVACY

Of all the companies that collect your personal data, Facebook is probably the biggest, and even if you aren't ready to delete your account, managing your privacy is still vital.

"We typically advise users to 'lock down' their Facebook accounts entirely from public view," says Reputation.com's Noah Lang. "This includes controlling past posts, since Facebook doesn't apply privacy choices to past posts, and indexing for search engines."

To do all this, you'll need to navigate Facebook's maze of menus and deliberately separate Account and Privacy controls, both of which can be accessed using the dropdown menu in the top-right corner. Here, you should set your default post visibility to either only your friends or a custom-made list of people you trust, and using the Past Post option will uniformly limit the visibility of previous posts and content to friends only.

To prevent Google from seeing your Facebook profile, disable Public Search within the Apps, Games and Websites sub-section, where you should also turn off instant personalisation if the option is available in your region.

Search engines aren't the only method through which people will find you, however. It's worth adjusting your How You Connect settings, too, also located on the Privacy page. This enables you to limit how people search for you even on Facebook, as well as blocking messages and requests from anyone who isn't a friend of a friend.

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GET MORE OUT OF YOUR PC WITH OUR COMPREHENSIVE ADVICE

Stay secure online with a password manager

Save yourself from remembering dozens of passwords. Davey Winder explains why you should place your faith in password managers

When an online service suffers a data breach – as recently happened to eHarmony, LinkedIn and Yahoo – there's a risk that an intruder will discover your password and gain access to your account. That danger is multiplied if the compromised password has been used across multiple sites.

Passwords present an online dilemma; seemingly every service you use online requires a password, and for those passwords to be secure, they have to be complex. However, unless you're blessed with savant levels of memory, it's impossible to remember half a dozen mixed-case, alphanumeric, special-character inclusive, lengthy random keys – so it's no surprise that people resort to reusing passwords.

This is where password managers come in – they do the remembering for you. But how do you pick the right one? What questions should you be asking of such applications, and is such an approach actually secure?

How safe are password vaults?

It's been argued that using a password manager is "putting all your security eggs in one basket" – and with good reason: if you keep all your login data in one place, then any hacker successful in compromising it has been handed the keys to your online kingdom. At first glance, this may seem like an instant deal breaker. From a risk perspective, it requires a breach of only one service to have a domino effect on every other service you use.

Yet the actual risk of compromise is far less than if you reuse one password across multiple sites. In this scenario, you're relying on dozens of sites keeping your data safe. It takes only one of them to suffer a breach and all the others are compromised as a result. Regular readers of *PC Pro* will be only too aware of how many popular internet services have suffered breaches over the past couple of years, with password databases being high on the list.

Meanwhile, the major players in the password manager sector haven't suffered any breaches – with one notable exception. Certainly, there's been no successful compromise of encrypted password hashes. Even the one exception, when LastPass security was possibly breached at the start of 2011, seems not to have caused catastrophic damage. LastPass noticed a traffic anomaly, rather than the theft of any data, and reacted immediately by forcing all users to change master passwords before their stored information could be accessed. For extra security, the change was required to be from a known IP address or confirmed with email

> "The risk of using a cloud service to save passwords isn't as great as it may seem"

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Password manager tips

1 Password manager software keeps "all your eggs in one basket", so ensure that your chosen application allows you to make backups of your password database – in a secure fashion, with the backup data remaining encrypted.

2 It may seem desirable to be able to recover your master password from the application vendor, should you forget it, but making this possible would introduce a number of weaknesses into the security equation. First, how could you satisfactorily prove that you were the person asking for the data recovery and not just someone with access to your device? Second, if the vendor knows your master password then a rogue employee could use it to access your password vault. And if the vendor can decrypt and access your database, hackers could do the same. Removing this possibility keeps you much safer from intruders, and also prevents law-enforcement from successfully demanding the keys.

3 Essentially, password managers are just big notebooks (albeit super-secure ones), so it's essential to think about the risk of others taking a sneaky peek at them. Always delve into the configuration options and reduce the shutdown time-out to as short a period as possible. Defaults can vary from minutes to a couple of hours, leaving way too much opportunity for a screen to be readable while you're away from your device. This becomes particularly relevant with mobile devices such as smartphones or tablets. Always opt for the minimum time-out and, if possible, set your software to automatically lock the vault when switching between applications or going into any kind of sleep mode.

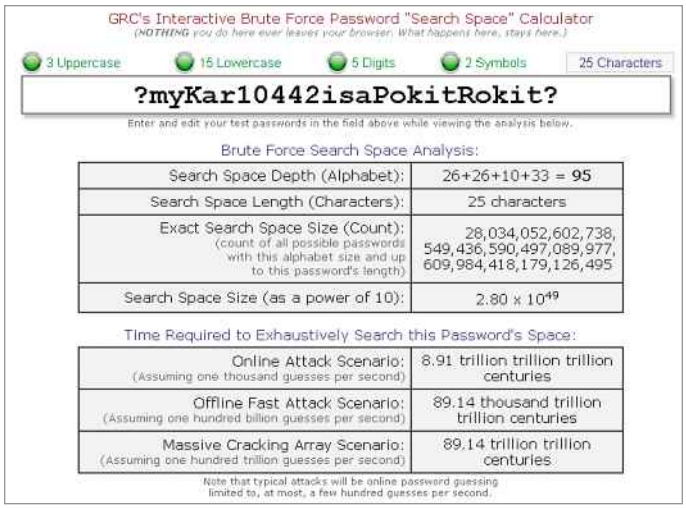
4 Some password managers will make it easy to migrate from a competitor: for example, LastPass has import routines for many file formats covering the big players in the field, and RoboForm will happily import from LastPass. However, some of these processes rely on the use of easily readable CSV files, which introduces an obvious element of risk. Whichever export process you use, make sure you completely delete these files once they've been imported using a secure file-deletion tool.

validation. Even if password hash files were downloaded (and it isn't clear that this was the case), as long as those users had followed the recommended advice regarding master password strength and complexity, their password vaults remained safe.

Passwords in the cloud

If you're a typical *PC Pro* reader then you probably use a number of different devices running various operating systems during the course of a day. If your password vault sits on your Windows laptop, but you have access to only an iOS device at the time, then you're in trouble. A password manager that keeps your passwords "in the cloud" gives you the convenience of accessing your passwords from any device, anywhere, at any time – but it means the actual database file isn't under your direct control. A local store on your laptop or a removable USB drive is less of a target to hackers than a centralised cloud password store.

The risk of using a cloud service isn't as great as it may seem. Services such as LastPass use SSL for data transfer, in addition to your data being encrypted with 256-bit AES, and have a policy of not receiving private data that isn't already locked down with your master password (which is never known to the company). By using local encryption and decryption on your PC, with locally created one-way salted hashes, and making brute-forcing of master passwords all but impossible by utilising a large number of PBKDF2-SHA256 iterations to create them, the number of attack vectors is reduced considerably.



A complex password should be easy to recall, but very difficult to brute force

The bigger question is what happens if a cloud service is unavailable – or, worse still, if the provider goes bust? Keeping an off-site backup of your password database, encrypted with an application such as TrueCrypt, answers the latter half of the question, but it won't help you when you need access to a site or service and are stranded in the field without your password.

Local clients, with your encrypted database stored on the device from which you're accessing them, aren't reliant on third-party balance sheets or network connectivity. Even if the vendor goes out of business, you have the application installed and it still works. Such clients work on only the devices supported by the vendor, but 1Password supports Mac, Windows, iOS and Android platforms, while the open source KeePass has ports available for Linux, Windows Phone, BlackBerry and even PalmOS – in addition to the usual OS suspects.

So what happens if you lose the phone that stores your local client password manager, or your laptop dies? This isn't a problem if you keep an encrypted backup somewhere else,

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or if you have the same database on multiple devices. By using 1Password, for example, you can sync your encrypted password database to Dropbox; from there, it will sync with any device running another instance of the local client. Since the password database itself is strongly encrypted before it arrives at Dropbox, even if Dropbox should itself suffer a breach, the risk of exposure is minimal. These hybrid password solutions combine the best of both worlds: the security of local storage and the convenience of the cloud. They remove the risk associated with a single point of failure.

Master password security

Many password manager applications combine two features that make for strong protection – namely, the ability to generate random and complex password strings, and the ability to automatically log the user into the service or site using those passwords.

Since you don't have to remember each random string, each password can be as long and complex as you like, which adds to the security of your access. And if the login process is being handled by the application then you don't even have to know what the password is in the first place.

The one password that needs to be long, strong and complex, but very much known to you, is the master password; it acts as the encryption key to lock away all the others. A password manager is only ever as secure as this master password, so it needs to be a good one.

The idea of having to memorise a password that's at least 12 characters long, which includes both cases, both numbers and letters, and special keyboard characters for good measure, sounds much worse than the reality. I use a master passphrase of more than 15 characters and change it every three months, yet have never once forgotten it.

The key, if you'll excuse the pun, is to abandon the truly random approach here and go for something you'll remember – but in a format that makes it difficult for a human to make a guess or a machine to use brute force. You can combine words, with mixed cases and special characters in-between, throw in a few numbers and still have something that's memorable but almost uncrackable. For example, the easily recalled phrase "my car is a pocket rocket" could be turned into a strong passphrase with the use of some misspelling and capitalisation, the addition of the numerals from your number plate and a couple of question marks to make it "?myKar13isaPokitRokit?".

If the master password is your key to password file security, then encryption is the

> **"The one password that needs to be long, strong and complex is the master password"**

The LastPass Security Challenge

All password manager software should generate complex passwords. You should ensure that it allows you to specify the overall password length, the number of digits and special characters to be included, and whether duplicates are allowed – and it should provide an indicator of the resulting password strength as well. You can then easily use the password generator function to replace your existing site passwords with much stronger ones.

LastPass' Security Challenge feature puts your chosen passwords under scrutiny

To help with your overall security, LastPass offers its "Security Challenge". This feature analyses your overall password security by checking for identical passwords used across multiple domains, guessable passwords and those vulnerable to dictionary attack. It will also take into account whether or not you use multifactor authentication to access LastPass, and audit the total number of logins you store in the software, on the basis that a small number of passwords in your vault implies more that haven't been moved there yet. Once your overall security has been analysed, the checker gives you a score, and provides a breakdown of areas where it can be improved.

Many programs will automatically generate extremely secure passwords for you

Don't forget your master password: if the vendor is following secure practices, it won't be able to tell you what it is

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lock that protects that file. LastPass and 1Password, for example, encrypt your data locally on your device using the master password, so that any data stored online in the cloud is already encrypted before it arrives.

Security matters

It's a given when choosing a secure password manager that it should use a high level of data encryption. In practical terms, this means a minimum of 256-bit Advanced Encryption Standard (AES) or equivalent algorithm. One common myth, which we touched on earlier, is that your passwords become vulnerable as soon as they're stored in the cloud. The truth is that as long as your password data files are encrypted and protected by a secure master password – one that isn't written down or reused elsewhere – then your passwords are safe even when stored online. In order to compromise them, an attacker would first have to compromise the password service, then crack the encryption protecting your password file. It really isn't any more risky than if the password file were stored locally, as your laptop or USB drive could always be stolen; it's the encryption that's important.

For the truly paranoid it's possible to strengthen your password vault further. Some password managers – RoboForm and LastPass Premium, for example – allow for the use of biometrics, by way of a fingerprint reader, to replace the master password for access. Both LastPass (Premium) and KeePass support the use of YubiKey hardware two-factor authentication tokens. These can be purchased cheaply online, and provide a time-variant secure login code when the button on the USB stick is pressed, by simulating a USB keyboard. This 128-bit code (which means the number of possible combinations is three followed by 38 zeroes) is unique every time the device is used and, as such, can't be copied and reused. Adding a requirement for something you physically have (the YubiKey token) to something you know (your master password) considerably strengthens the access security to your password vault.

Password managers aren't a magic bullet against those who would steal your data, and shouldn't be regarded as a replacement for other essentials, such as security software and large doses of common sense. The autofill function of a password manager can make it harder for malware to capture live login data (a keylogger will fail since no keystrokes are being made), but it doesn't make it impossible; a man-in-the-middle attack could still compromise your security once you've logged in.

All the same, software that makes it practical to use regularly changed, truly random and complex passwords is a powerful security tool – and one that's increasingly becoming essential.

Password managers: the big four

LastPass
www.lastpass.com

LastPass doesn't adopt the local client approach, but relies on an access-anywhere, server-based storage model. The free version provides the basic functionality you'd expect, including one-click login, automatic form-filling, cross-browser synchronisation, secure import/export, encrypted backup and restore, secure password generation and a security checkup that analyses the strength of your passwords. Pay $12 per year (£6.50) for the Premium edition of LastPass and it starts getting even more serious about functionality, adding support for mobile platforms including iOS, BlackBerry, Android, Windows Phone, Symbian and even webOS. Plus, Premium users receive two-factor authentication support for YubiKeys and USB drives. LastPass suffered from some negative media coverage over a potential security breach early in 2011, but its response was pretty positive, and new security features now provide even better protection.

RoboForm
www.roboform.com

RoboForm has been protecting passwords since 1999, and offers one of the most flexible vault services around. It's available in a limited functionality, free version, providing an encrypted password store for ten logins and an auto-fill function. You'll need the Desktop 7 version (costing £19.95) for unlimited logins and multiple profiles on a single PC. The real flexibility comes from adding RoboForm Everywhere for Windows, Mac and mobile into the mix. This offers cloud-based synchronisation across mobile devices, but at a further cost – currently £7.95 for the initial one-year licence, after which it increases to £13.95 per year. You also receive multiple encryption profiles from which to choose, a secure password generator, the ability to import data from other vaults, and support for USB memory sticks.

KeePass
www.keepass.com

KeePass takes an open source approach to password managers and, as such, is often touted as the vault of choice for the sysadmin or advanced users. While the number of advanced tweaking options makes it suited to enterprise use, it's also straightforward for consumers – and it's free. There's 256-bit AES encryption of the entire database, along with SHA-256 hashing of the master password for security, with the usual array of password generation and login completion that you'd expect. Primarily a local client, with your passwords stored on your device, KeePass supports Dropbox for cloud synchronisation too. Like LastPass, KeePass supports the use of YubiKeys for two-factor authentication, but there's no premium to pay for this additional security measure. There are good import and export options, plus a staggering number of supported platforms, including Linux. Since it's open source, there are also myriad third-party plugins available to extend functionality.

1Password
www.agilebits.com/onepassword

1Password started life within the Mac marketplace, but has extended to embrace iOS and Android devices, and the Windows desktop. It's another hybrid local/cloud client, offering a client installed on each device along with an encrypted password database – but with the option to synchronise these in the cloud via Dropbox. Only the Android version is free. Other than a 30-day trial, you have to pay for 1Password, and for full flexibility you need to purchase a client for each device, costing £31 for Windows or Mac, and £10.49 for a universal iPhone and iPad app. Decent import options, a secure password generator and the ability to store more than login data (such as software licence keys, notes and credit card details) are coupled with strong encryption and a UI, which varies according to platform, but is consistently attractive and intuitive.

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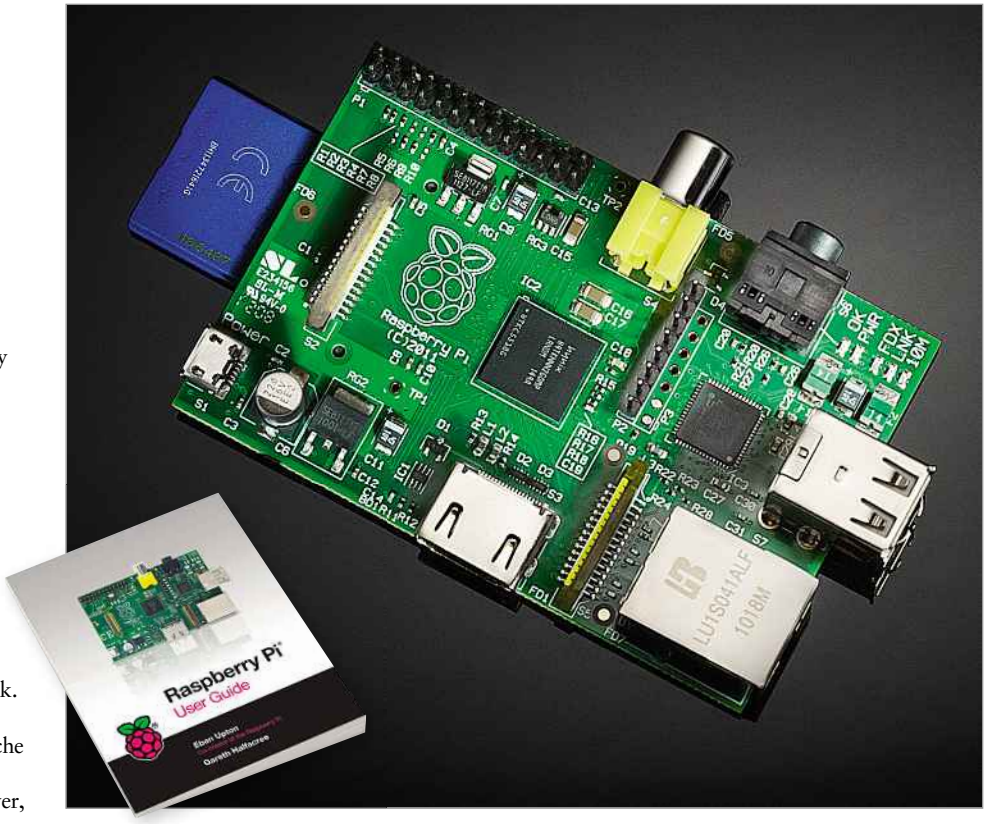
HANDS ON

The Raspberry Pi as a web server

You don't need a powerful server to host a website or blog: with a little configuration, the Raspberry Pi is more than equal to the job

The tiny Raspberry Pi has captured the imaginations of computing enthusiasts all over the world. In this special extract from *The Raspberry Pi User Guide* (authored by Raspberry Pi co-creator Eben Upton and *PC Pro* contributor Gareth Halfacree), we show you how to set up the device as a functional, energy-efficient web server, complete with WordPress support.



"Although the Raspberry Pi is significantly less powerful than most devices you'd find in a data centre, that doesn't mean it can't act as a useful server in a home or business environment. Despite a small amount of memory and relatively underpowered processor, the Pi's low power draw and silent running make it a great choice for serving low-traffic, simple pages to a local network or even out onto the internet.

Many modern web servers run a combination of Linux, Apache, MySQL and PHP – commonly referred to as a LAMP stack. Linux provides the underlying operating system; MySQL the database back-end; Apache the web server; and PHP a scripting language for dynamic pages. Using a LAMP-based server, you can run quite complex packages ranging from CMSes such as WordPress to interactive forums such as phpBB. All of this is possible with the Raspberry Pi, so long as you don't expect performance similar to that of a powerful commercial server.

Installing a LAMP stack

If you're running the recommended Debian distribution for the Raspberry Pi, you already have the Linux portion of a LAMP stack installed. The next step is to install the missing components: Apache, MySQL and PHP. At the terminal or console, type the following commands to install these packages:

```
sudo apt-get update
sudo apt-get install apache2 php5
php5-mysql mysql-server
```

This will prompt the Apt Package Manager to find a number of dependencies required to get a fully functional LAMP stack running. These packages and their dependencies take up a lot of room on the Pi's SD card – around 113MB in total – so if you haven't resized the root partition on the SD card, you may need to free up space.

Installation of the full LAMP stack can take some time on the Pi. Don't panic if the system appears to freeze for a minute or two; the installation should continue normally after. Partway through the installation process, MySQL will prompt you for a password. Pick a secure one, since this protects the MySQL database – which, depending on what your web server is designed to do, can store usernames, payment details and other personally identifiable information. Also make sure you pick a password you can remember. You'll be asked to confirm the password – to check for errors – and then the installation will continue.

When the software installation has finished, both the MySQL and Apache servers – known in Linux parlance as daemons – will be running in the background. To check that the

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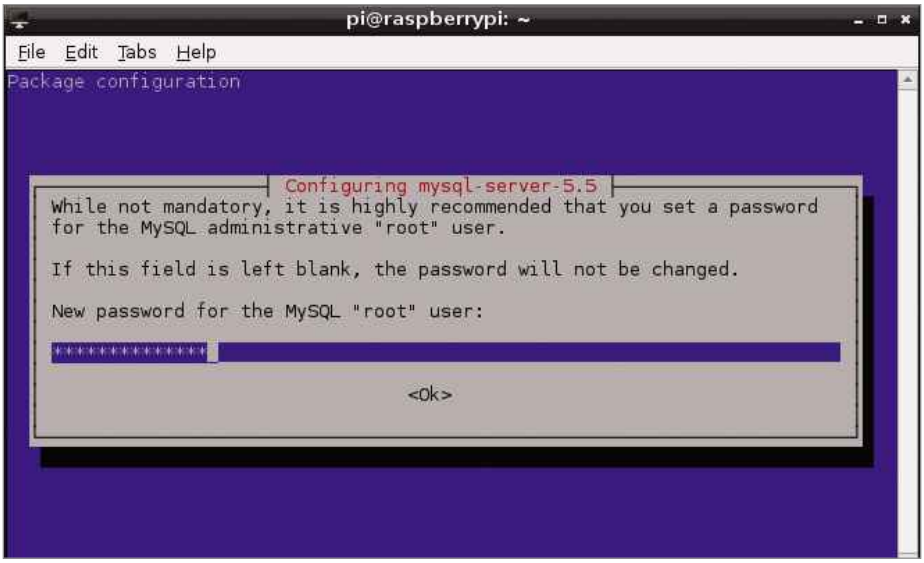

Be sure to pick a secure password – your personal data may depend on it

Saving RAM

Web servers work best with plenty of memory. To ensure maximum performance, switch the Raspberry Pi's memory partitioning to a 224/32MB split and don't run a graphical user interface (GUI) at the same time. WordPress is particularly memory intensive. For best results, use the Raspberry Pi as a headless server and use a web browser on another computer connected to the network to access the WordPress Dashboard at **http://ipaddress/wordpress/wp-login.php**. Accessing the WordPress Dashboard directly on the Raspberry Pi can result in a very long wait!

server is working correctly, use another computer to connect using a web browser. In the address bar, type the IP address of the Pi to display the default Apache installation page. If you're not sure what IP address the Pi is using, type ifconfig at the terminal and look for the IP address listed in the eth0 section, or the section corresponding to the network adapter in use on your Pi if you're not using Model B's built-in Ethernet port.

The final step is to confirm that the PHP scripting module is loaded correctly in Apache. This module is important: it allows the Apache web server to run PHP scripts to serve dynamic content. Without a working PHP module – or an alternative module for another scripting language such as Python – Apache is able to serve only static pages. To test the Apache PHP module, create a new PHP script file using the following command, typed as a single line:

```
sudo sh -c 'echo "<?php phpinfo(); ?>" > /var/www/phptest.php'
```

This command creates a new file called PHPTEST.PHP in the /var/www directory. This file tells PHP to create an information page for diagnostic purposes. Visit this using either a browser on another computer by typing **http://ipaddress/phptest.php** (replacing ipaddress with the IP address of the Raspberry Pi) or on the Pi itself by typing **http://localhost/phptest.php** into the address bar.

When you've finished testing, remove the PHPTEST.PHP file with the following command:

```
sudo rm /var/www/phptest.php
```

With the LAMP stack installed and working, you can now create your own websites that will be served by the Pi. As long as the sites aren't too complex, and don't receive too many simultaneous users, the Pi should be able to cope with the task admirably – and the device's small size and extremely low power draw more than make up for any slowdown should your site become popular.

> "Some of the most popular news sites in the world are built on a WordPress platform"

By default, files for the web server are stored in the /var/www folder, which is writeable only by the root user. To adjust where Apache looks for its files – to move the website onto more capacious external storage, for example – edit the text file 000-default found in the folder /etc/apache2/sites-enabled. For more information on configuring Apache, PHP and MySQL, type the following commands at the terminal or console:

```
man apache2
man php5
man mysql
```

Installing WordPress

One of the most popular blogging platforms around, WordPress is an open source project that offers an attractive web-based interface for creating rich websites. Some of the most popular news sites in the world are built on a customised WordPress platform. To install WordPress on the Raspberry Pi, type the following command at the terminal or console:

```
sudo apt-get install wordpress
```

Like the LAMP stack, WordPress comes with a selection of dependencies. You'll need to make sure you have around 37MB of free space on the Pi's SD card for the full installation, in addition to the 113MB required for the LAMP stack. If you have enough free space, type Y to continue the installation process. When WordPress has finished installing, its default

Once your server is up and running, you should see this page

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Installing WordPress is a quick and simple process

installation directory – /usr/share/wordpress – needs to be linked into the /var/www directory in order for Apache to see the files. Type the following command at the terminal:

```
sudo ln -s /usr/share/
wordpress /var/
www/wordpress
```

Linking a file or directory is different to moving it: the files for WordPress now exist in both /usr/share and /var/www simultaneously, without taking up any extra space on the Pi's SD card. If you've told Apache to use a different directory for the default website, change the linking command accordingly. Next, run the WordPress MySQL configuration script using the following command, as a single line:

```
sudo bash /usr/share/doc/wordpress/
examples/setup-mysql -n wordpress
 localhost
```

This adds a new database into MySQL, installed as part of the LAMP stack, for WordPress to use. This database stores your user accounts, posts, comments and other details. Once this script has completed, you'll be told to visit **http://localhost** in a browser on the Raspberry Pi to continue the installation. This instruction is slightly incorrect: the address you need to visit to finish the WordPress installation is **http://localhost/wordpress**.

Fill in the form that loads in the web browser, picking a descriptive name for your site and setting a secure but memorable password. Be sure to change the Username field from admin to something more secure. When you've filled in all the fields, click the Install WordPress button at the bottom of the page. Installation will take a minute or two to complete, and then a page confirming the successful installation of WordPress will load in the browser. To start using WordPress, click the Log In button at the bottom of this page to log in with the username and password you chose earlier.

Before you can access WordPress from another computer, you'll need to create an additional configuration file. This is created by linking the existing configuration file – set up for local access – using the following command, typed as a single line:

```
sudo ln -s /etc/wordpress/config-
localhost.php /etc/wordpress/config-
ipaddress.php
```

Web options

Although Apache is the most common web server, there are others. If you find the performance of Apache too slow, experiment with Lighttpd – a lightweight web server designed to use less memory than Apache. It can be installed under Debian with the command sudo apt-get install lighttpd.

Replace ipaddress in this code with the IP address of your Raspberry Pi. If you've given the Raspberry Pi a hostname in DNS, you can also create a configuration file for that hostname using the same command, but replacing ipaddress with the chosen hostname. If you don't have a hostname, simply use the Pi's IP address. For example, the command for a Pi on IP address 192.168.0.115 would be:

```
sudo ln -s /etc/wordpress/config-
localhost.php /etc/wordpress/
config-192.168.0.115.php
```

To complete configuration for external access, choose General from the Settings menu on the left side of the WordPress Dashboard, and set the URL to match either the IP address of the Pi or the chosen hostname.

The WordPress software includes an automatic update feature that ensures your installation is running the latest version. WordPress is often the target of malware attacks, and frequent updates are released to patch security holes or add features. However, when installed via APT, WordPress lacks the permissions required to keep itself up to date. To correct this, type the following command at the terminal:

```
sudo chown -R www-data /usr/share/
wordpress
```

This gives the www-data user – the account used by the Apache web server – the rights to change files located in the /usr/share/wordpress folder. This will allow automatic upgrading to operate when chosen from the WordPress Dashboard. For more information on using WordPress, visit the official website at **www.wordpress.org**.

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You can set most important settings within the WordPress interface

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HANDS ON

Create apps in Basic for Android, part 2

Darien Graham-Smith demonstrates how to create graphical Android apps with dynamic layouts

In part 1 of our introduction to Basic for Android, we saw how simple it is to create Android apps in this low-cost development environment. This month, we'll look at some advanced features and functions you can include in your apps. If you missed last month's instalment, download it from **www.pcpro.co.uk/links/221id1** – or you could just dive straight in. B4A is highly accessible and builds on established programming principles, so if you've ever written a BASIC program before you'll find it easy to hit the ground running.

Adding graphics to your app

Last month we saw how easy it is to place Android views – buttons, labels and so forth – on the screen and plumb in code to make them all work together. However, an app built entirely out of standard system UI elements will look drab and characterless.

In B4A, it's easy to add custom graphics to your app. As an example, let's imagine we're creating a simple stopwatch app with three custom buttons: start, stop and reset. We might start by positioning these as regular buttons in the Designer, then modify their properties to make them appear as custom images rather than the default appearance.

To do this, click on "Add Images" in the Designer and select the files you want to use – most popular file formats are supported. In our example, we've chosen three royalty-free images from Find Icons (**www.findicons.com**).

The images don't immediately appear onscreen; adding them just makes them available for your interface to use. To attach the "play" image to our first button, we must change which sort of "Drawable" it is, from the default mode to one with its own set of customisable properties. We do this by selecting the button and changing its Drawable property from DefaultDrawable to StateListDrawable.

When you change this setting, you'll see a new set of properties. Set EnabledDrawable to BitmapDrawable and a property will appear entitled "Image file". Click in the blank space next to this for a dropdown menu showing your imported images. Choose the appropriate icon and the Designer view will update to show your image, scaled to fit the area of your button (you can change this behaviour by adjusting the image's Gravity property). The name of the button is superimposed on the graphic, but this is just for convenience within the Designer – if you check the button's Text property you'll see it's blank, and there'll be no text overlaid when your code runs.

You can also specify additional images (or colours or gradients) for when the button is pressed and when it's disabled.

Animation

If you're interested in writing games, you'll want to know how to animate your views. Let's create an example app that moves a spaceship randomly around the screen. This involves using library functions that aren't available in the B4A trial – the full version is required.

We'll start by creating a panel in the designer; this will be our play area. We'll use the GradientDrawable mode to give it a colour gradient, and we'll set the Corner radius to ten to give it rounded corners.

Next, we'll place our spaceship – we've used a charmingly retro image, once again from Find Icons – in its starting position. For this we'll use an ImageView, a type of view that houses a graphic, and we'll set its parent property to specify the panel rather than the activity. This means the spaceship can move only within the play area – it won't be visible if it goes off the edge – and its dimensions and co-ordinates will be relative to the panel rather than the activity.

"An app built entirely out of standard system UI elements will look characterless"

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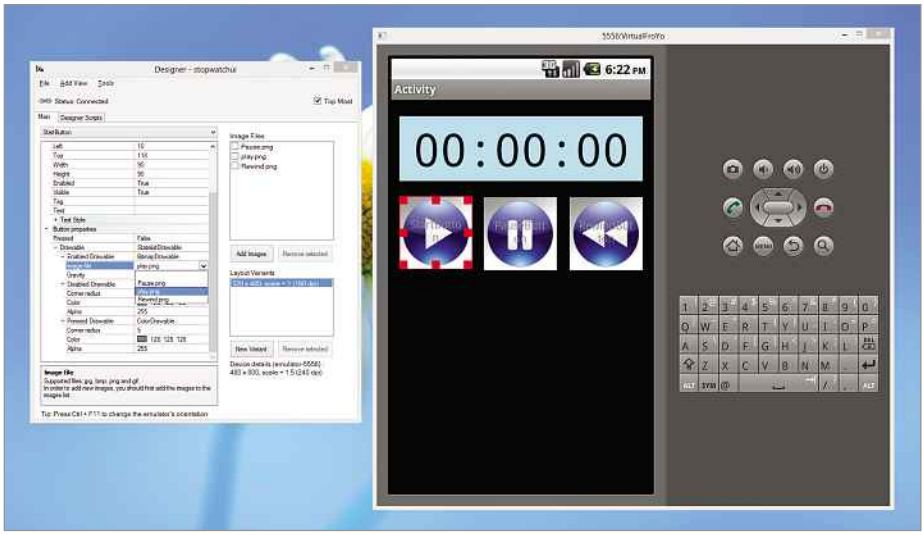


Place your images on buttons and other Android views to give your app personality

As before, we click Add Images to load our spaceship, and adjust the Image file property of the ImageView to display it. We've used an image editor to give the graphic a transparent background, so it sits neatly on top of the playfield, and saved our layout under the name "spaceship-layout". Now it's time to return to the editor and create the necessary code to make the spaceship move. Here's what we've come up with:

```
Sub Process_Globals     ' This sub must
always be present, even when it has no
content
End Sub

Sub Globals
        Dim spaceship As ImageView
        Dim playArea As Panel
        Dim animate As Animation
        Dim newX, newY As Int
        Dim moveTimer As Timer
        End Sub

Sub Activity_Create(FirstTime As
Boolean)
        Activity.LoadLayout("spaceship-
layout")
        moveTimer.
Initialize("moveTimer",1000)
        moveTimer.Enabled = True
End Sub

Sub moveTimer_tick
        newX = Rnd(0, playArea.Width)
        newY = Rnd(0, playArea.Height)
        moveShip
End Sub

Sub moveShip
        animate.InitializeTranslate
("Animation", 0, 0, newX-spaceship.Left,
newY-spaceship.Top)
        animate.Duration = 750
        animate.Start(spaceship)
End Sub
```

As this code illustrates, animations in B4A are objects. They're configured via methods and properties, and activated using the Start method, passing the target object as a parameter. We've used the InitializeTranslate method to set up a lateral movement, but with other methods we could animate the alpha (opacity), scale and rotation of our spaceship. These tools are all found in B4A's external Animation library, so if you want to compile this program for yourself, you'll need to add a reference to it. To do this, click to activate the Libs panel at the right of the B4A window and tick "Animation".

If you now try running this code, you'll immediately see that in Android animated objects return to their original position once the animation is complete. In our program, the spaceship repeatedly moves away from its original location then jumps back to its original position. Happily, this problem can be easily fixed as follows.

```
Sub Animation_AnimationEnd
        spaceship.Left=(newX)
        spaceship.Top=(newY)
End Sub
```

When an animation completes, an AnimationEnd event is raised, which we can check for with a regular event-handling sub. Within this sub, we use the SetLayout method to immediately move the spaceship to the position where the animation ended. To the user, it appears that the spaceship has moved to its destination and stayed there.

Finally, this program also illustrates the use of timers to trigger events. When the program first runs – that is, when the main activity is created – we set up a timer for one second (the parameter is in milliseconds) and enable it. Since our animation is set to last for 750 milliseconds, the result is a spaceship that moves, hesitates briefly, then moves again.

The program continues to run until externally terminated, but you could easily add elements to give the user more control, such as allowing him or her to adjust or suspend the timer. Alternatively, you could create an event handler for playArea_Touch, and program the spaceship to home in on the user's finger when the screen is tapped.

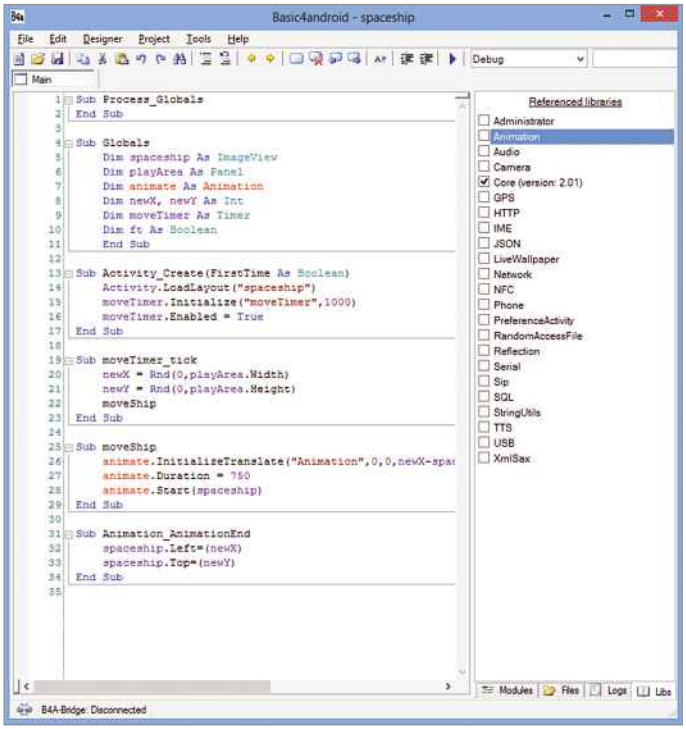
Handling multiple orientations

Our flying saucer program fits nicely on the screen in portrait mode, but if you turn your phone on its side – or press Ctrl-F11 to rotate AVD into landscape mode – the orientation changes and suddenly the play area doesn't fit on the screen any more. All the views keep their original positioning, relative to the top-left corner of the screen, but effectively, the screen itself changes shape.

The easiest way of dealing with this is to tell your app to always run in portrait mode (or if you prefer, always in landscape), and never rotate. You can do this from the B4A editor's menus – just go to Project | Orientations Supported and make your choice.

If you'd like to handle things more gracefully, however, you can make your app

Generating your personal encryption key is necessary so you can prove your identity and update your own apps on Google Play if need be



Animation functions aren't available until you click to include the relevant library

dynamically respond to orientation changes. If you've created a portrait-mode layout in the Designer, you can easily create a landscape-mode alternative by clicking "New Variant" and selecting the parameters for your new layout. You'll see that you can create as many variants as you like, to target not only different orientations but also different screen sizes and shapes. This is where using AVDs can pay off, as you can easily assemble a collection of virtual devices with different screen sizes on which to test your various layouts.

For our purposes, though, the "Phone (landscape)" preset will be fine. Select it and click OK; you'll see there are now two variants of your layout that you can switch between. When you add, remove or edit a view in one variant, all the others are automatically updated – but positioning changes affect only the current layout. This makes it easy to tailor your interface to suit a host of different devices.

You can also edit variants in a more dynamic way using the scripting abilities of the Designer; the tab in the main Designer interface lets you use simple code to define layouts, rather than having to manually drag and drop. You can also set element sizes in terms of percentages – for example, to specify that a panel should always fill 50% of the screen, regardless of the screen size and resolution. For more on Designer scripting, see **www.pcpro.co.uk/links/221id2** – and for more on working with different screen sizes, see *Lucky dips*, right.

All of the variants you create are saved within the same layout file, and Android automatically chooses the layout that most closely matches the user's screen size and orientation, so once you've set up your variants there's almost nothing more for you to do.

We say "almost", since you may find your program behaves unexpectedly if the user rotates their phone or tablet while it's running. Doing this causes Android to destroy the current activity and jump back to the Activity_Create sub to load the new layout. This might cause your app to look like it's abruptly restarted. If there's something you don't want to be repeated each time the orientation changes, you can test the FirstTime argument that's referred to in the sub declaration.

```
Sub Activity_Create(FirstTime As
Boolean)
        Activity.
LoadLayout("spaceship")
If FirstTime = True Then
        MsgBox("Welcome to my app!",
"")
        score = 0
End If
End Sub
```

What if you're not using the designer? As we saw last month, you can create and modify layouts in code, using the AddView and SetLayout methods (among others). You might choose to do it this way if, for example, you want to produce a layout that changes dynamically according to what's happening in your program.

In this case, you can easily determine the dimensions and orientations of the screen by checking the properties of the activity, and then direct your code accordingly.

```
If Activity.Height > Activity.Width Then
        ' [set up portrait layout here]
Else
        ' [set up landscape layout
here]
End If
```

File handling

Android apps don't automatically terminate when the user returns to the homescreen; they sit suspended in memory, ready for the user to return to. However, if the user presses the back button the app is terminated. Suspended process will also be killed if the device runs out of memory or reboots.

So you can't assume that variables and program state will survive between user sessions. If you want data such as the high score for a game or the user's current information to survive, you'll need to write it out to storage.

Sample code to keep a persistent high score value might look like this:

```
Dim myScore as Int
Dim hiScore as Int
If File.Exists(File.DirDefaultExternal,
"hiscore") Then
        hiScore = File.ReadString(File.
DirDefaultExternal, "hiscore")
Else
        hiScore = 100
End If

[...] ' Game code goes here

If myScore > hiScore then
        hiScore = myScore
File.WriteString(File.
DirDefaultExternal, "hiscore", hiscore)
End If
```

The general-purpose File object provides the methods and properties used for simple file handling. In the example above, we use it to check whether a file called "hiscore" is present in the default external directory (we'll talk more about this in a moment). If it is, we load its contents into an integer variable; otherwise, we set that to a default value. Later in the game, we can overwrite the file with a new value if the player achieves a higher score. You'll notice that B4A isn't at all fussy about variable types, allowing us to read raw data from a file and assign its value directly to an integer variable, with no conversion required.

The default external directory, where we've saved our high-score file, is a folder dedicated to our particular app, buried away (but publicly accessible) on the device's SD card. It's created automatically when needed and is a natural place to save persistent, app-specific data. You have other options, though. The File.DirRootExternal property refers to the root of the external storage

"When you add, remove or edit a view in one variant, all others are automatically updated"

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volume, so your program can access the user's own files, or create files in plain sight.

For sensitive data, another option is File.DirInternal, which is inaccessible to other apps and less liable to disappear should the user swap out their SD card. However, files written here are stored on the device's internal storage, which may be comparatively small, so use it thoughtfully.

A final location to be aware of is File.DirAssets. This is a read-only resource that contains copies of the files in your app's Files folder (a subdirectory of the folder where you saved the source code). If you used the Designer to add images to your layout, this is where they'll be stored. The entire contents of the folder are bundled and included with your app, so keep your Files folder as clean as possible or you'll be wasting the user's space. The Tools | Clean Files folder will automatically remove any unreferenced files from here – but use it with caution, since unused files are permanently deleted.

These methods and properties should provide everything a simple program needs, but B4A can handle more advanced tasks too. The RandomAccessFile library that accompanies the full version of B4A enables you to work with big data files without having to load them into memory in their entirety, and the SQL library makes it easy for your app to store and refer to entire databases of information.

Lucky dips

As well as different screen sizes and resolutions, different Android devices have different pixel densities. Some, such as the Nexus 7, pack the pixels so densely you can barely see them with the naked eye, while older smartphones have larger pixels. As a result, if you create a button that's 50 pixels square, for example, you might find that it's easy to press on one device but fiddly on another.

Android gets around this by letting you specify sizes in "density independent pixels", also known as dps or dips for short. These are virtual pixels that scale automatically to suit the display density of the device at hand. A button measuring 160 x 160 dips should always appear on screen at around 1in square, regardless of the screen type and resolution.

The B4A designer measures dimensions in dips. If you create an interface element with dimensions of 100 x 100, for example, it will be drawn using however many pixels are needed to obtain the correct real-world scale of around two-thirds of an inch. You can find out the absolute size of a view in pixels by reading its width and height properties, and you can convert any number of dips to pixels using the DipToCurrent() function, putting the number of dips as a parameter in brackets.

In fact, if you're moving or creating elements within your code, you may choose to forget about pixels altogether. Dimensions and distances can be specified in dips, or as percentages of the activity's horizontal and vertical dimensions. For example, if you want to position a 2in square panel halfway down the page, use the code:

```
myPanel.SetLayout(0, 50%y, 320dip,
320dip)
```

Many programmers advise avoiding pixel measurements altogether and specifying your entire layout in dips; this helps your app cope not only with a wide range of current screens, but with unimagined future ones too.

Submitting your apps to Google Play

The topics we've covered these past two months may not include everything you need to create an Android masterpiece, but you should now be well equipped to continue working on your own, making use of the extensive documentation on the B4A website, and its informative development discussion forums. It may not be long before you're ready to start distributing your creations via Google Play – and since B4A produces standard APK files, this process is fairly straightforward.

Our spaceship app shows how easy it is to create animated graphics

Before submitting your first app, you'll need to sign it with a private encryption key that proves you're the creator. A key can be generated from within the B4A editor by selecting Tools | Private Sign Key, entering your personal details and providing a password. Your key will be generated and saved in a keystore file (click Browse to choose a location and filename). Don't lose this file. Once you start submitting apps to Google Play, you'll need this key to update them. B4A will automatically use this key to sign compiled programs from now on, unless you load a new one via the same menu item.

You should also double-check that your Package Name and Application Label are set appropriately – you'll find these options under the Project menu. Select Project | Choose Icon to give your app a distinctive icon, and select Project | Application Version to give your app a version number and an identifying string.

Once the above is complete, it's time to generate your APK file. Set the compilation mode to "Release" – or "Release (obfuscated)" if you want to make your program harder for hackers to decompile – and hit the Run button. Now look in the source code folder and you'll see a directory called Objects. You'll find the APK for your program in here.

To upload your app to Google, you'll need to register as an Android developer, if you haven't already. This costs $25 – around £15 – and if you have an existing Google account it can be done in less than a minute at **https://play.google.com/apps/publish/signup**. Once this is approved, you'll be taken to the Google Developer Console, where you'll see a link to upload your app.

All done? Not quite. You'll now be required to upload at least two screenshots of your app in approved formats, and a large 512 x 512-pixel icon for your app, as well as listing details. It's worth spending some time on these details, since they'll represent the entirety of your "shopfront" in Google Play. If you want to charge for your app, you'll also need a Google Merchant account, which you can sign up for from the page.

"If you want to charge for your app, you'll need to sign up for a Google Merchant account"

When this is all done, scroll back up to the top of the page, select the APK files tab and activate the file you've just uploaded. Hit Publish and – as long as there are no errors in your submission to correct – your app will go live within a few hours. Congratulations! You're a published app author. Now all you have to do is sit back and wait for the money to roll in.

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COVER DISC

THIS MONTH'S CD & DVD – MARCH 2013

Get started with graphic design, smooth out shaky videos, tune up your PC and more

ON THE CD & DVD: FULL PRODUCTS

Xara Photo & Graphic Designer 6

This month's cover disc includes the full version of Xara Photo & Graphic Designer 6 with a year's licence. Whether you're an experienced graphic designer or a beginner, it's a fast and powerful way to create and edit both bitmap- and vector-based graphics.

The application includes an extensive range of templates and designs to help you get started. These cover logo creation and flash animation to calendars, invitations and business cards.

If you want to create your own works of art, there's a complete set of vector drawing and editing tools available, with advanced features including 3D extrusion, transparency and blending tools, shadow and colour alteration options and more.

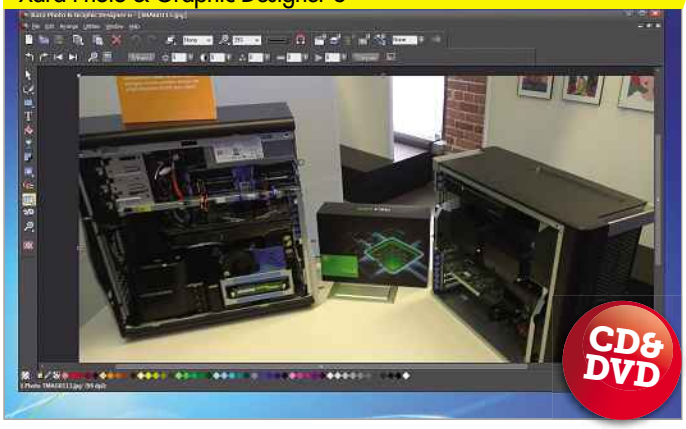
Xara Photo & Graphic Designer 6 is equally powerful when it comes to editing and touching up your photos. Brightness, saturation and sharpness can be adjusted, a one-click enhance option applies several tweaks at once, and more drastic edits can be applied with the Photo Clone tool and a content-aware resizing utility.

You can learn more about Xara Photo & Graphic Designer 6's capabilities in our in-depth tutorial on p68. To register your copy of Xara Photo & Graphic Designer 6, click the relevant link during the installation process, enter your details, and an activation code will be emailed to you.

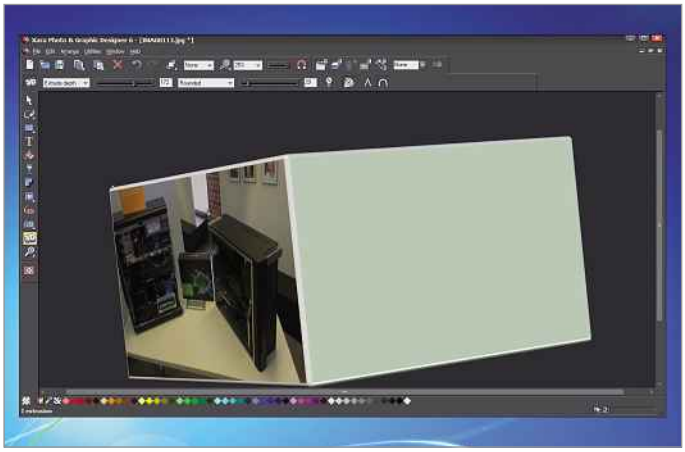
INFORMATION: As sold for £55; requires Windows 7/Vista/XP, and online registration

FOUR-PAGE TUTORIAL ON P68

Xara Photo & Graphic Designer 6



Dozens of options make photo editing a doddle, and in-depth tools should sate advanced users



3D modelling and extrusion tools make it possible to create good-looking 3D graphics and animations

You can even customise the web properties of files, from link behaviour to keywords and descriptions

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How to register
To register an application, open its page on the cover disc and follow the instructions in the Registration section

For full listing, go to:
www.pcpro.co.uk/links/221disc

pcpro_support@dennis.co.uk

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proDAD Mercalli Easy 2

Graphs illustrate how your video is wobbling, and this clever app analyses footage to reduce shaking and make it smoother

proDAD Mercalli Easy 2

Most smartphones record video, but a lack of image stabilisation means that video shot is often shaky. With proDAD Mercalli Easy 2, the effects of wobbly camera work can be all but eliminated from your footage.

Drop a video into the front-end and the software starts analysing the footage for horizontal and vertical panning, rolling, zooming and tilting. Colourful graphs show exactly where the most movement is found, and once the video has been smoothed out, you're given the option to look over its work and save the footage.

To register this application, enter the serial code GT4J-NNBQ-FAS3-GCSU-ZW5K-M6PQ-ASP0 during installation.

Mercalli Easy V2 SAL is the professional version of this software, and includes even more stabilisation tools. It's available for a 20% discount, at a cost of £65 instead of £80. To upgrade click the banner in the app, choose the upgrade option and use the code pcpro20-01 at the checkout.

INFORMATION: As sold for £13; requires Windows 7/Vista/XP, and serial code

Ashampoo Core Tuner 2

Core Tuner 2 provides in-depth access to every process and service on your PC, so you can prioritise some and disable others

ON THE DVD: BONUS FULL PRODUCTS

Ashampoo Core Tuner 2

It's important to take care of your PC, but not all computer optimisation tools allow power users to explore the processes that run on most systems. Ashampoo Core Tuner 2 does just that – and plenty more.

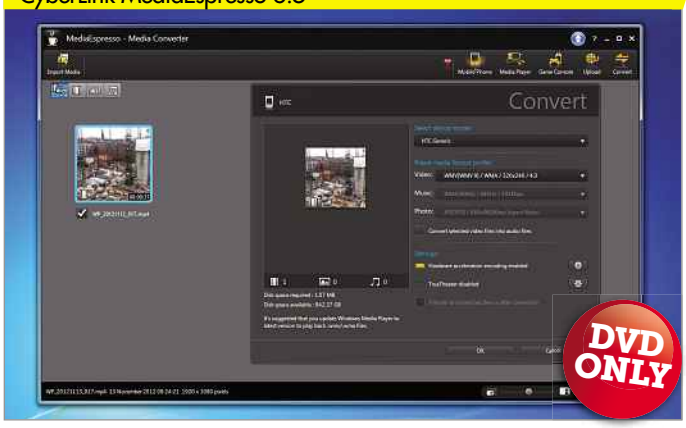
Core Tuner 2 lists every process running on your PC, and allows you to give one a temporary performance boost thanks to high-priority modes. Processes can be stopped and ordered to run on specific processor cores.

Profiles can be created to fine-tune your system for specific types of computing – a gaming one, for instance, is included by default – and Ashampoo's resource monitor illustrates the performance level of each processor core, as well as your PC's memory.

Other options help you manage applications that load when your computer is booted. If you want to take control of the many processes running on your PC, Core Tuner 2 is the answer.

INFORMATION: As sold for £13; requires Windows 7/Vista/XP, and online registration

CyberLink MediaEspresso 6.5



File conversion is simple, and the broad range of output devices ranges from mobile phones to games consoles

CyberLink MediaEspresso 6.5

CyberLink's MediaEspresso 6.5 serves up plenty of options for converting video, music and image files into the formats you need.

Support for a huge range of devices is included, from Apple's iPad and iPod touch to the Xbox, PS3 and PSP. Dozens of file formats are supported: AVI, MPEG, MOV and WMV to MP4, MKV and TiVo.

When it comes to output, you can choose from a variety of the most popular media formats, and the application is easy to use. Simply drag and drop files into the conversion box, choose an output profile and let the app get to work. It won't take long, either: it's optimised for multithreaded processors and GPU acceleration.

If you're impressed with CyberLink's media-transcoding prowess, head to **http://store.pcpro.co.uk**. You'll be able to buy CyberLink Media Suite 10 Ultra for £75 instead of its RRP of £180, a 58% saving. It's a powerful tool that includes Blu-ray support alongside 11 separate media management and editing tools.

INFORMATION: As sold for £35; requires Windows 7/Vista/XP, and online registration

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Introducing Xara Photo & Graphic Designer 6

Free on this month's cover disc, Xara Photo & Graphic Designer 6 does it all, from touching up digital images to designing sharp graphics

Xara Photo & Graphic Designer is a tremendously versatile application. For a start, you can use it to touch up your digital photos. It offers adjustment tools for correcting brightness, contrast, colour, curves and more – as well as a powerful Cloning tool for covering up blemishes, and a content-aware resizing tool that lets you easily change the shape of an image without distorting it. So if you ever need to tidy up or enhance the odd photo, Photo & Graphic Designer is a valuable addition to your toolbox.

Much more than this, Photo & Graphic Designer also offers a full suite of vector-based editing and design tools. With these you can draw perfectly smooth curves and shapes, which can be resized, reshaped, combined and transformed ad infinitum without losing their quality – ideal for when you want to create a logo, a graphic for a website or a work of art.

Unlike some drawing packages, Photo & Graphic Designer makes it easy to achieve professional-looking results. With a single click you can apply elegant shadow and transparency effects to your image elements. You can apply tasteful colour gradients and graduated fills – or, push the boat out and make things as garish as you dare. There's a whole library of special effects to play with, from deformation and distortion filters to blur and glow effects. And a powerful masking feature helps you work on selected areas of your image while leaving the rest untouched.

Clearly, there's plenty of depth to the software, but thanks to an extensive integrated help system you won't get lost. To help you get started, we've put together a series of walkthroughs that you'll find on the following pages, introducing vector editing, fills and transparency and photo enhancement.

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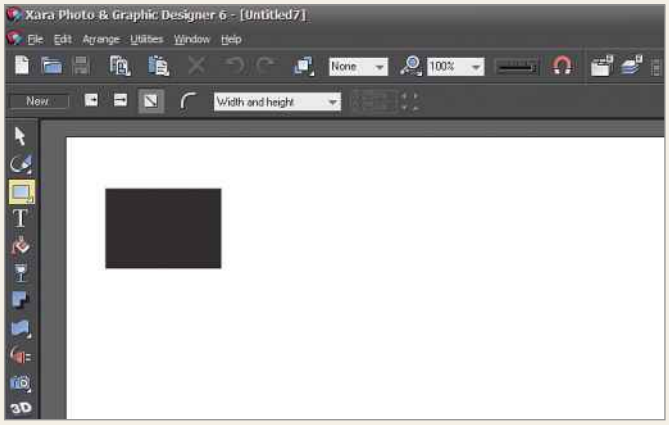
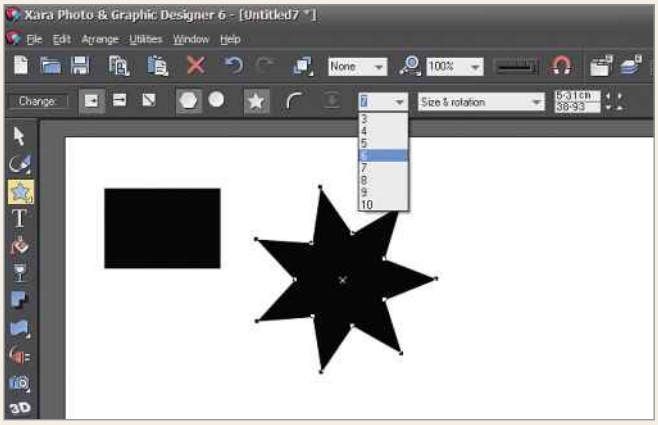
WALKTHROUGH

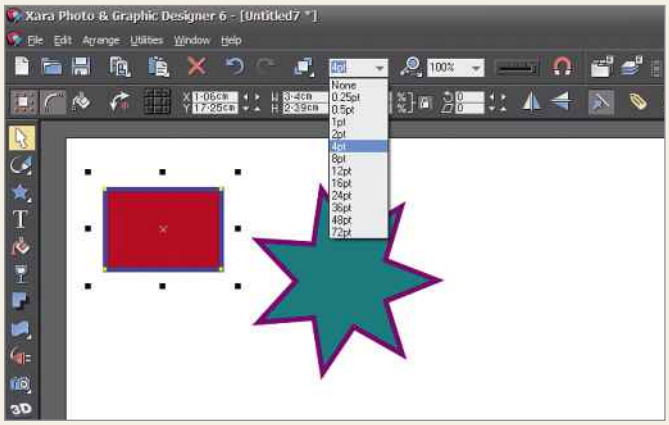
Vector editing



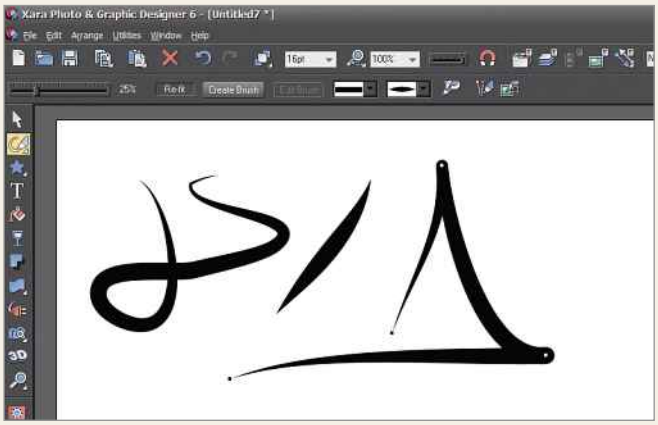
1 Hold down the left mouse button on the Shapes tool to see the basic shapes on offer. Select one and drag with the mouse to draw it on the page. You can resize a shape by dragging the handles at its corners. To move a shape, use the Selector tool (at the top of the tool strip) to drag it.



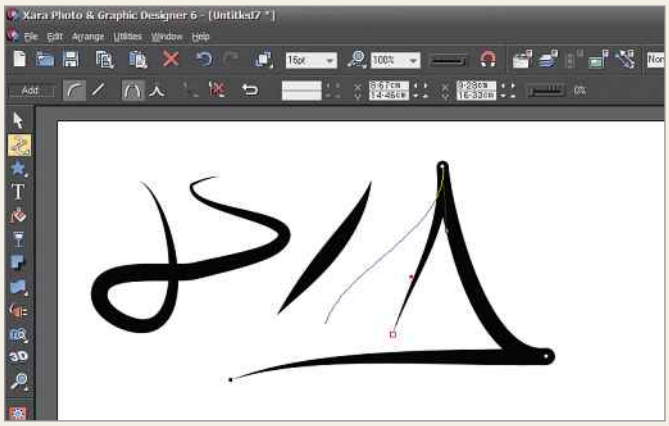
2 The strip along the top of the drawing area is the Info bar. You'll see options and icons here that affect the shape you're about to draw, or the one currently selected. The "star" shape has options that lets you draw all sorts of polygons. You can also round the corners of a shape.



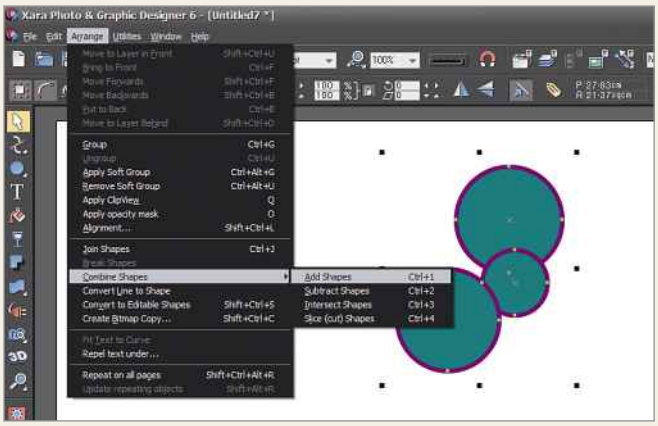
3 To change the colours of your shapes, click a colour from the Colour Line at the bottom of the window. Shift-click to change the colour of the line around it. If you can't see the line, it may simply be too thin; you can make it heavier from the dropdown in the main toolbar.



4 You can create custom shapes using the tools directly above the Shapes tool. With the Freehand and Brush tools, you can draw squiggles and curves in any form you like. A slider on the Info bar lets you apply smoothing, and the two dropdowns change the brush style and shape.



5 The Shape Editor tool lets you grab the handles of curves and lines and move them around, to refine your shapes into the desired form. The Pen tool lets you draw shapes in the old-fashioned way, by clicking to place points where you want them. Click and drag to form a Bézier curve, with handles to adjust the curvature.



6 You can also build up complex shapes from simpler ones. Shift-click to select two overlapping shapes, then go to the Arrange menu and select Combine Shapes | Add Shapes. Selecting Subtract Shapes cuts the front shape out of the one behind it. Try out the other menu options too!

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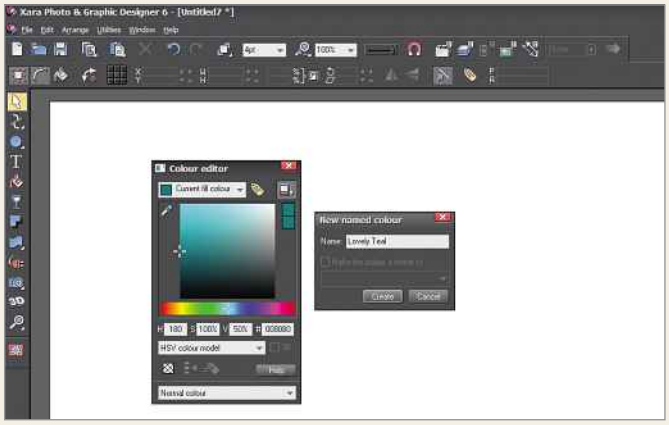
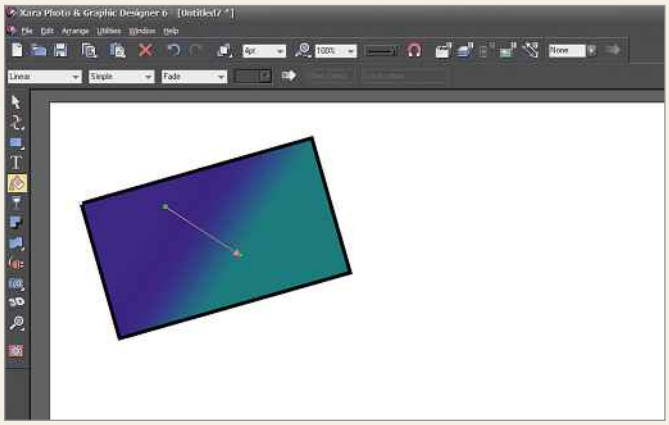
WALKTHROUGH

Colours and effects

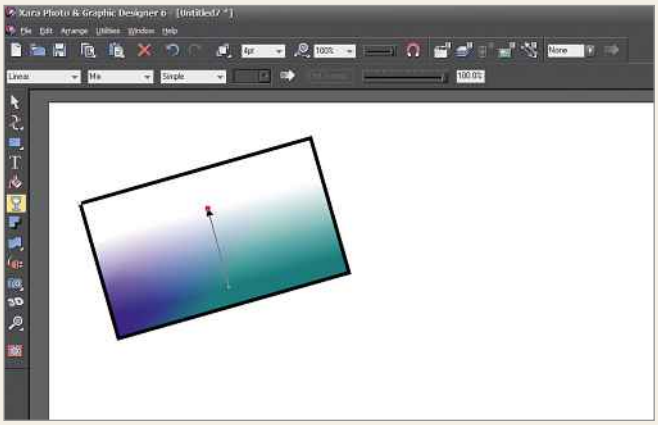


1 Clicking the multicoloured square at the far left of the Colour Line opens the Colour editor. From here you can create your own custom colours (click the Pencil icon to save and name a colour). If you later edit a named colour, elements coloured with it will be automatically recoloured.

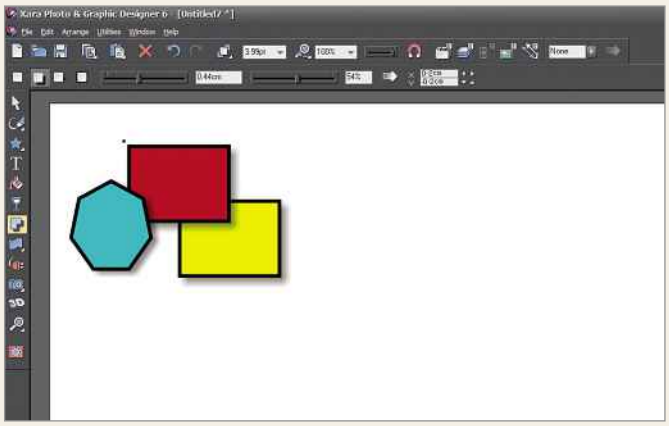
2 Now you can create more colours and specify them as shades of your original colour. To do this, simply select the parent colour from the dropdown while naming your new colour. When you next adjust your named colour, the same change will be applied to any shades based on it.



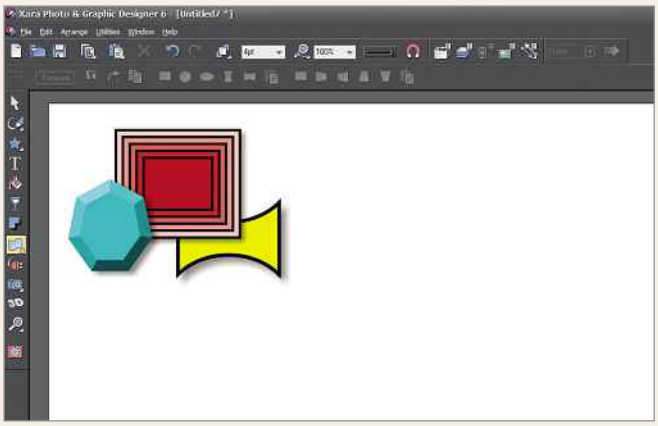
3 The Fill tool lets you apply gradients and colour effects to any shape. Select a shape, choose a gradient type from the dropdown, then drag to specify the gradient size and direction. Click the ends of the gradient arrow to change the starting and ending colours.



4 Click the Transparency tool and a slider appears allowing you to set the overall opacity of any object. You can also drag to create transparency gradients, so shapes and fills appear to fade out. To create feathering around an object's edges, use the slider at the right of the topmost toolbar.



5 Tasteful shadow effects can add depth to a scene. Click the Shadow tool and drag over an object to effortlessly create a drop-shadow, floor shadow or outer glow. The sliders adjust the weight and opacity of the shadow. You can change the shadow's colour by clicking on the Colour Line.



6 Other powerful tools include bevelling effects, contour effects and 3D extrusion. Xara Photo & Graphic Designer is extensible, too: click the little US plug icon to access "Live Effects", a selection of graphical filters that can be expanded by adding third-party plugins.

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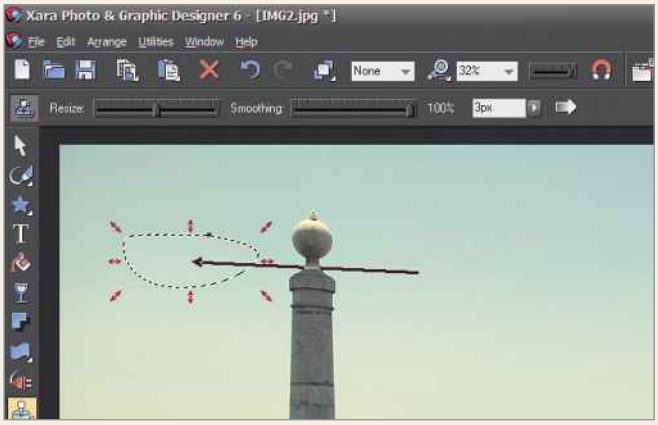
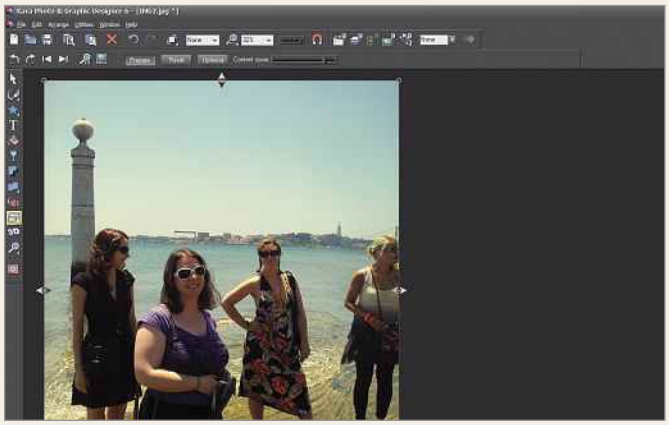
WALKTHROUGH

Photo editing

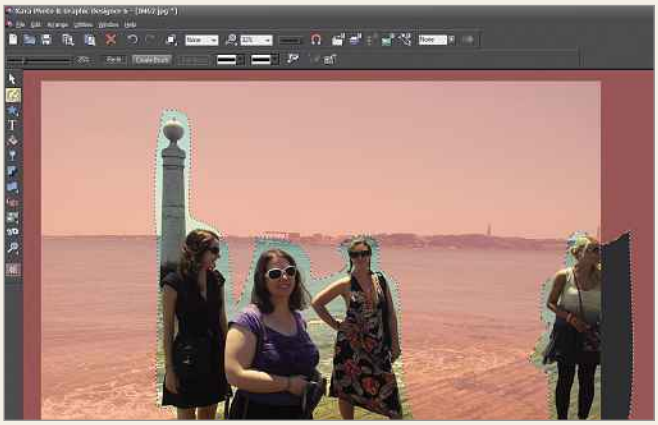
1 You can load photos directly into the program, or place them into a scene using the File | Import menu command. The Enhance Photo tool exposes sliders for tweaking brightness, contrast and other settings. The one-click Enhance button tries to improve your photo automatically.



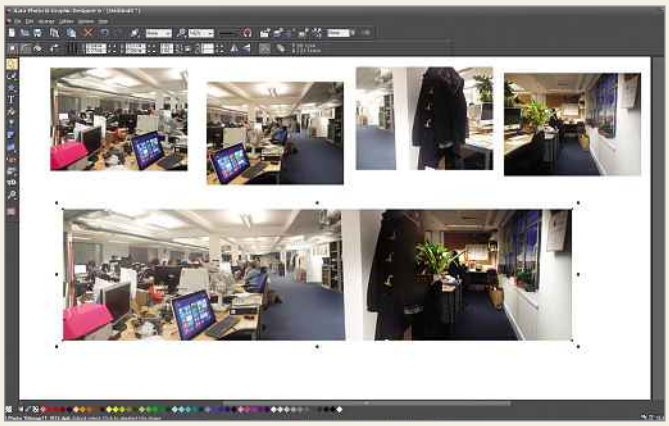
2 The Clone tool lets you edit unwanted details in a photo. To use it, draw a lasso around the area you want to replace, then click on another area of the photo to copy its content into that region. Sliders let you grow or shrink the region, smooth its shape and feather its edges.



3 Content-aware resizing lets you change the shape of a picture without stretching it or losing important information. Select the Resize tool, make sure you have a picture selected and click Prepare. You can then drag the handles at the edges of the photo to resize it.



4 Sometimes content-aware resizing will stretch or warp things it shouldn't. To prevent this, activate the Masking tool at the bottom of the tool strip and draw around the areas you want to protect before resizing. This Masking tool works with most effects and drawing operations.



5 The Panorama tool combines a series of photos into one sweeping view. To use it you'll need between two and six overlapping images to create your scene. Arrange them in order – left to right, select them all, then choose the Panorama tool to have them automatically merged.

6 Under the Utilities menu you'll find a tool called Optimise Photo for reducing the file sizes of your photographs. Select it and click on Advanced to see the effects of applying various levels of JPEG compression or reducing the resolution (click Preview to update the views).

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BUSINESS CLINIC

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DICK POUNTAIN wonders if today's tech start-ups are mere get-rich-quick schemes

Once upon a time I used to travel to Las Vegas, Taipei, Hanover or Tel Aviv in pursuit of new technology. These days, I don't go to many press events at all. As befits my status as a non-decorated veteran of the OS, browser and CPU wars, I now prefer to recline in a bath of warm asses' milk, nibbling bonbons and trying to maximise my views-per-photo on Flickr.

Nevertheless, the other day I was tempted to an event: the finals of Discovering Start-Ups 2012, which was held in the City. This was a competition – a sort of *MasterChef* for new tech ventures – organised by Cambridge Wireless and Silicon South West, and attended by high-powered potential backers from Google, RIM, Vodafone, Orange, Broadcom, Qualcomm and numerous venture capitalists.

The last time I'd been to a start-up presentation was a meeting with engineers on the science park in Cambridge, but this was quite different. For a start, there was the venue. I hopped off a 46 bus at Shoe Lane, walked down a small alley and emerged into Alphaville. I don't visit the City much, and although I was aware there's been a lot of building – the Gherkin, the Shard and so on – this still gave me a shock. What once was a small Dickensian square was now bounded by glittering, high-rise, all-glass offices, adorned below with swanky wine bars and purveyors of fancy coffees, chocolates and superior sandwiches. The venue was the only block *without* a 10-foot-high street number.

I saw around half the 20 finalists' presentations and there were some pretty impressive ideas on show: personal devices for monitoring everything from carbon footprints to skin cancers; low-power tracking devices; smart 4G antennae; ebook streaming and shared shopping services; even one that measures your emotional state in real-time and tells your therapist via your smartphone.

The winners included Anvil Semiconductors (**www.anvil-semi.co.uk**), which made silicon carbide power semiconductors that can improve the fuel efficiency of hybrid cars by 10%; and D-RisQ (**www.drisq.com**), which employs formal software validation techniques to reduce the development costs of complex systems by up to 80%, as used on the Eurofighter control computer. But what struck me most was how much the world has changed since my heyday.

I'm pretty used to talking to engineers with eccentric hair styles, woolly upper garments and a slight hint of Asperger's syndrome (as we're no longer allowed to call it) – and I used to enjoy the experience as they plunged deep into technical explanations, eyes burning with enthusiasm. Not any more. This was wall-to-wall white shirts and shiny suits, with few technical explanations pitched with any greater complexity than a BBC Four documentary. The really deep discussion was about patents, intellectual property and exit strategies.

Today's start-ups are nobody's patsies and go in with eyes wide open, the enthusiasm visible in their eyes being for a buyout by Google, Qualcomm or whomever within five years, for an eight- or nine-figure sum. I'm not saying this is a bad thing, and my nostalgia for those dodgy haircuts is limited. For years we've been moaning about the way British inventors have failed to exploit their discoveries – minor stuff such as the jet engine and television – and left it to the Americans to cash in, but that isn't going to happen any more. I've written here before about how it was ARM that really broke that bad habit, and this competition was part of a search for the next few ARMs.

> What worries me is that this emphasis on moving fast and getting out rich might eventually erode the innovative impulse

What worries me is that this emphasis on moving fast and getting out rich might eventually erode the innovative impulse itself; and if you think my concern is misplaced, check out the ridiculous patent wars raging between the world's mobile corporations. The Register recently ran an article called "Apple's patent insanity infects Silicon Valley", which reprinted a mind-boggling chart of who's suing whom for patent violations (see **www.pcpro.co.uk/links/221idealog**). It looks like a poster of the Krebs cycle that used to hang on our wall, only more complicated. Microsoft, RIM, Google, Samsung, Kodak, Oracle, LG, Huawei, HTC, ZTE and several more are all suing each other, and they're all suing and being sued by Apple.

Even *Businessweek* now proclaims that the start-up's creed must be "patent first, prototype later". The idea is that you should fully exploit all the golden eggs you have in the fridge, but there's a danger that in so doing you may forget to feed the goose...

DICK POUNTAIN is the editor of *PC Pro*'s Real World Computing section. He's still waiting for Google to buy him out.

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FEATURE

Choosing the right tablet for business

The tablets market is booming, but can these devices cut it in a business environment? Stuart Andrews looks at the pros and cons of each platform

Whether it's the ongoing consumerisation of IT, or just companies looking for a more flexible approach, businesses are beginning to take tablets seriously. IDC expects global tablet sales to hit 117.1 million this year, rising to a staggering 261.4 million units by 2015. Rival analyst Gartner expects business purchases of tablets to triple between now and 2016. While nobody believes tablets will entirely replace laptops and PCs, most manufacturers and analysts now expect them to play a big part in enterprise IT.

There are good reasons to join in. For roles in which mobility, flexibility and access to business data are more important than processing power or a large workspace, tablets are arguably the most convenient and usable device around. However, without the right rationale, planning and support, buying a fleet of them could be an expensive mistake.

The right device for the job

For Jamie Burgess, client solutions specialist for Microsoft, it's vital that the decision to buy tablets is backed up by a real business-use case, so that companies "understand what the user is trying to do". Some tasks can be managed with touchscreen devices and applications, while some are better suited to a laptop or even a desktop PC. Hybrid and convertible devices might seem to offer the best of both worlds, but if someone spends most of their day working on spreadsheets or setting up reports then a tablet makes little sense. Businesses should break down users into groups, and assess the potential benefits or otherwise for each group.

It may also be worth considering tablets as part of a wider shift in IT strategy. If you're moving from on-premises solutions to a cloud-based approach, or from single-user desktop PCs to a more flexible, pooled-resource model, tablets could fit in. An iPad or Surface with Windows RT is no magic bullet, but it could be the right tool in the right circumstances.

Management

Once you've decided who actually needs a tablet, the next question is how to manage them. "Manageability is one of the key things that IT managers have been concerned about in the past," says Adam Griffin, Dell's global tablet product manager. "If you have to manage a tablet device in your existing environment, then you want it to be as easy as possible."

This is where the choice of tablet and operating system becomes crucial. "If you have a client infrastructure that's based around Microsoft Windows and you bring in an Apple or Google tablet, then you have to manage that separately. The reasons why businesses have done so, even though it's a slight inconvenience to them, come down to what they see as the productivity benefits."

The iPad has advantages here, in that iOS has become a key focus for Bring Your Own Device schemes, and Apple has worked hard to support management features in iOS and

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Apple, Google or Microsoft?
Consumers have a big OS choice to make too. See p24

OS X. The recent iOS 6 update supports S/MIME secure email, locked-down profiles and the ability to lock an iPad to a single app, plus a supervised mode, which gives administrators the power to change iOS device security and usage profiles over the air.

There's much you can do with Apple's free Configurator tool, provided there's a Mac or OS X server in-house, and the OS also offers good support for VPNs and deployment of in-house apps through the Developer Enterprise Program. Smaller companies may get away with only Apple Configurator to manage a small fleet, although larger or more demanding enterprises will find a range of mobile device management (MDM) tools available.

With Android tablets, things are slightly trickier. Many companies still worry about a perceived lack of management tools and the security, hardware fragmentation and malware issues that plague the OS. Manufacturers are working to fight these perceptions, with Samsung's Approved For Enterprise and Motorola's Business Ready programmes guaranteeing support for common IT policies, encryption and robust MDM. Meanwhile, 3LM (a subsidiary of Motorola and so now owned by Google) provides an Android security, management and remote access platform with remote-wipe capabilities, access controls and remote installation of apps and updates on some devices.

If you're willing to subscribe to Google Apps, you can use its Device Policy app, which ties all of these management features into specific Android devices and Google Apps accounts. The administrator can set remote access rights and perform administrative tasks, and track, lock and erase devices remotely. However, at £4 per user per month, this may be further than some companies are willing to go.

Windows 8

In theory, management should be the big selling point of Windows 8. "When you take a Windows device into a Windows infrastructure, there are no hidden costs," says Microsoft's Burgess. "Assuming, for example, that they have a centralised management solution and they're looking at rolling out tablets, the bottom line is – essentially – that to roll out tablets is exactly the same as rolling out a laptop, providing it's a Windows tablet and it's x86."

In other words, a tablet running Windows 8 Pro is no more difficult to manage than a laptop running the same. It will work with the same System Center Configuration Manager tools as a Windows 8 laptop, and will take advantage of the Active Directory and Group Policy features that many IT managers already use to manage their existing Windows environments. Managers can use the new Group Policy Update features in Windows 8 to push out updates and configuration changes.

But what happens with an ARM tablet running Windows RT? Here things are less enticing. Microsoft's recommended approach is for the cloud-based Windows Intune service, offering management, security and a corporate app store for £9 per user per month. For small- and medium-sized businesses looking to outsource IT administration, this might not be a problem – particularly if a wholesale move to Intune is on the cards. If you prefer to keep everything in house, however, RT isn't for you.

> **"Tablets aren't inherently less secure than laptops, but are subject to the same concerns"**

Security

Tablets aren't inherently less secure than laptops, but are subject to the same concerns. "When you start to take data outside of the office, things become less secure," says Dell's Griffin. "Security has to be a key part of tablet devices, whether it's physical security or security of the data on the device."

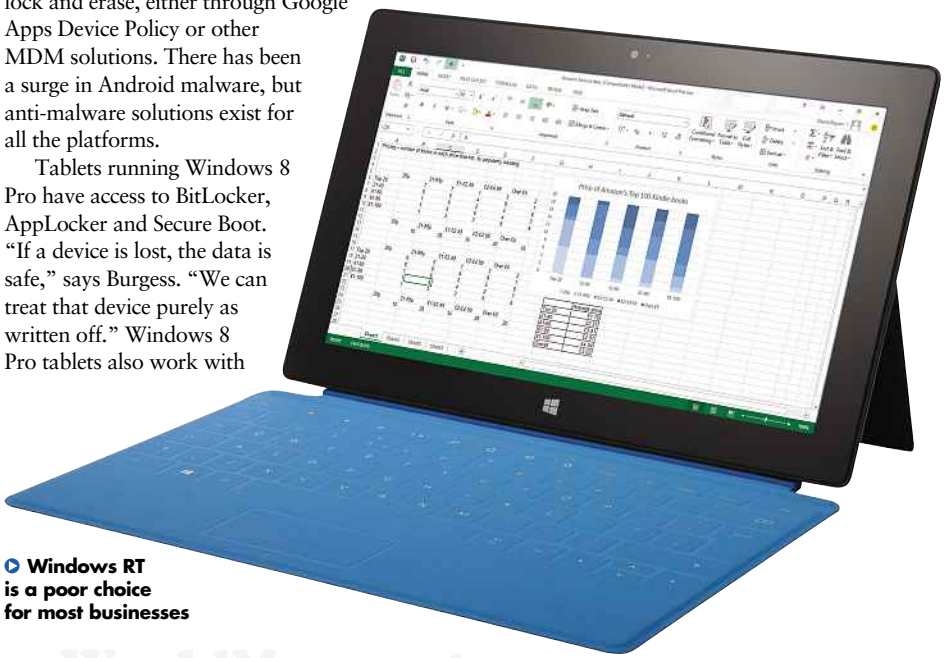
The closed nature of Apple's tablet OS helps with security to an extent: iOS includes built-in 256-bit hardware encryption and supports remote wiping and locking, while longer passwords can now replace four-digit pins. On the Google side, Android 4 introduced on-device encryption and support for remote lock and erase, either through Google Apps Device Policy or other MDM solutions. There has been a surge in Android malware, but anti-malware solutions exist for all the platforms.

Tablets running Windows 8 Pro have access to BitLocker, AppLocker and Secure Boot. "If a device is lost, the data is safe," says Burgess. "We can treat that device purely as written off." Windows 8 Pro tablets also work with Dynamic Access Control, allowing administrators to set different security levels depending on the device, user and location. For example, when out of the office, only a limited subset of files will be visible. Once again, Windows RT tablets need to be handled slightly differently; device-level encryption is supported by the OS, but not BitLocker encryption.

Beyond the security features built into the platforms, securing tablets is much the same as securing any device that leaves the office. Physical security is difficult, but discrete cases, mandatory strong passwords or pin codes, and robust policies can all help, along with setting up intelligent and effective ways to get data on and off the tablet. If a business uses encrypted USB sticks for data, then it makes sense to use tablets that support these (such as a Windows 8 Pro model), while properly secured cloud storage services are better than consumer alternatives or – worse – users emailing sensitive files.

"If something is simple to do then people will do it," says Burgess. "If the corporate way of doing something is difficult to do, then people will find their own ways of doing it." The trick is to make things so easy that people fall naturally into "your method, the managed method, the secure method – and then you can keep an idea of what's going on".

An alternative approach is to use a tablet as a client for cloud-based or virtualised applications, where all the data is stored on servers either inside the company or a trusted third-party data centre. "Many companies are thinking about desktop virtualisation or cloud-based solutions where data isn't actually stored on the device," says Dell's Griffin. "That's probably the most secure way of doing it, but companies need to look at their own infrastructure and understand what works for them."



Windows RT is a poor choice for most businesses

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Software

An investment in tablets also means an investment in software, whether it's buying new apps, commissioning bespoke ones or developing your own. This doesn't have to be expensive, but take time to evaluate all the options. Will a word processor open and save your documents without disastrous reformatting? Will a presentations app support the features in your PowerPoint presentations?

You also need to think carefully about workflow. If users are expected to work between Office on a company PC and another application on a tablet, how will they access and save documents? Might it be better to use SkyDrive or SharePoint and the Office Web Apps?

For obvious reasons, Windows 8 Pro tablets have an advantage here. You can run fully functional versions of existing Office applications – indeed, any Windows application – providing you have the licensing worked out. The one thing to beware of, as Burgess notes, is whether the applications concerned will work with a touch interface. "If you're moving to some devices that may, for now, be touch-only, then you may need to consider how the application will actually function. The worst thing people can do is take a non-touch application and try to shoehorn it onto a touch device."

Hardware and infrastructure

The hardware costs in a tablet rollout don't stop at the devices themselves. Physical keyboards, docking stations and stands are crucial for productivity applications, and in some cases you may want to look at larger-scale docking solutions that allow the tablet to power an external monitor and connect to a standard keyboard and mouse.

"Docking is a key thing," says Griffin, "and I don't think we can underestimate what docking will bring, particularly to the business market. As much as we all love tablets, they have an inherent flaw in that, if you really want to be productive, if you really want to get involved in a spreadsheet or a PowerPoint, or database work, customers tend to prefer a standard keyboard and mouse."

Several manufacturers, including Dell and Samsung, are going down exactly this route with Windows 8 Pro, delivering products that work as a tablet on the move, but that slot into a dock for more ergonomic desktop use. Others are pushing 11in or larger convertible form factors.

We'd advise taking a careful look at what you're getting. Are you getting PC performance in a versatile form factor, or are you paying an Ultrabook price for something with the power of a netbook? Tablets can be cheap, but once you add peripherals the cost advantages can slip away. Take the Surface with Windows RT, for example: at £399 plus £110 for the Type Cover, you might find a £500 laptop would better suit workers.

Support

Theoretically, tablets are easier to use and require less maintenance, all of which should – with time – help drive down support costs. All the same, as with any move from one system or application to another, you need to be prepared to support staff during the transition. Those used to traditional environments may need help finding apps, performing searches or even switching off the device.

One advantage of taking the Windows 8 route is that administrators can use the UE-V tool from the Microsoft Desktop Optimization Pack 2012 to capture and roll out a common group of settings, preferences and personalisations across multiple devices. If employees work across PCs and tablets, or you plan to pool tablets using roaming user profiles, this will ensure users see a familiar desktop, ready to work, on every device they use.

Tablet OSes

iOS

The most mature tablet OS, it's well supported by a busy app store, and is finding favour in some larger corporations. The iPad can be secure and manageable, although companies will need to invest in Mac infrastructure or third-party MDM solutions to support it.

Android

As an open system, and one vulnerable to manufacturer-led fragmentation, Android hasn't historically been as secure or manageable as iOS, although Google is working hard to improve security and management features. It's probably the least attractive OS for business use.

Windows 8 Pro

Here we have all the security and management features that Windows-based enterprises know and trust, plus compatibility with existing applications. However, Windows 8 Pro tablets have so far been expensive, while battery life hasn't matched ARM equivalents. There's potential to be the best business choice, but these issues need to be addressed.

Windows RT

Windows RT might suit a subset of users, but it isn't as secure or manageable a platform as Windows 8 Pro, and business app support needs work. Windows RT might succeed in the consumer space, but it has its work cut out if it wants to convince business customers. Is this Microsoft's missed opportunity?

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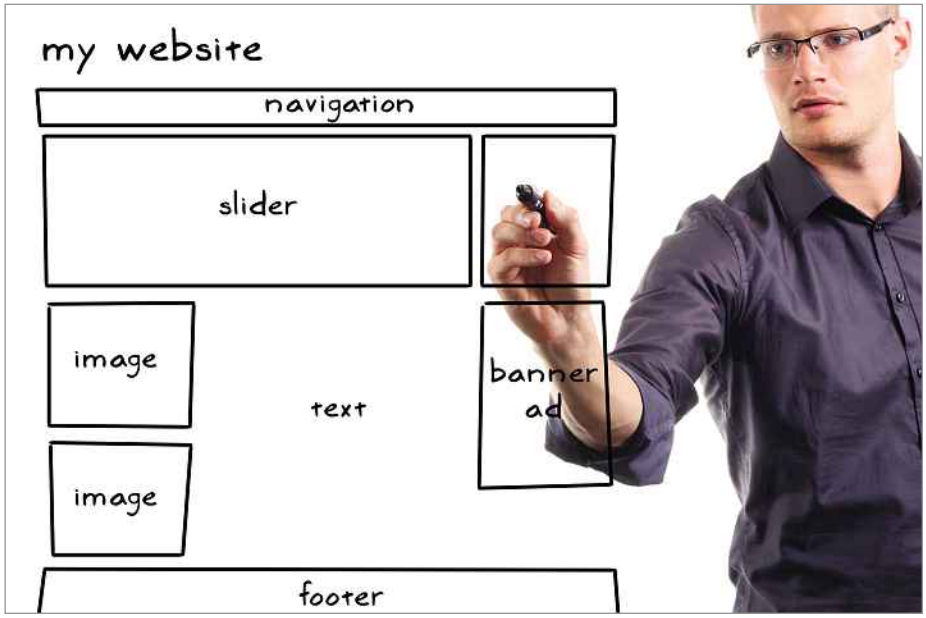
CAREERS

So you want to be a... UX designer?

Stuart Andrews explores the business of improving the user experience of websites and applications



There's no doubt about it: user experience (UX) design is one of the hottest careers in IT. Working with designers and developers, UX specialists strive to ensure that users of websites, apps and applications can do whatever it is they came to do, and have a good experience while doing so.

Despite the name it isn't a role that foregrounds visual style or technology know-how – although both have a part to play. Andy Budd, UX director for the consultancy Clearleft, likens it to being an architect. "User experience design is much less focused on just the aesthetics," he says. "It's also about how the technologies, the tools, the websites, the spaces and the products we design are being used, utilised and enjoyed."

The key role of the UX designer in modern web or application development is to understand and champion the user, ensuring that everything works logically and intuitively. "A lot of it is psychology and empathising with the user," says Adam Walker, a UX specialist at Red Gate Software. "We're trying to understand what they're trying to achieve, but also what's motivating them and frustrating them." David Travis, managing director of the consultancy Userfocus, agrees. He feels UX designers play a key role in that they "approach design from the perspective of the user, rather than from the perspective of technology." He believes UX specialists can make sure the final design "meets their needs, goals and desires".

> "Despite the name it isn't a role that foregrounds visual style or technology know-how"

The designer's role

UX design is a composite role, taking in aspects of information architecture (how you structure sites or applications and their data), interaction design (how people interact with products), visual design (how enjoyable it is to view and use) and usability (how smoothly the product works, and how effectively any sources of frustration are dealt with). In larger companies these disciplines may be split between different job titles, and there are good reasons for this. While some specialists are capable of balancing more than one role, it's rare to find one with a depth of expertise across the board.

Day to day, the job involves plenty of meetings with the various teams and stakeholders involved in the project, a lot of prototyping with sketches, architectural diagrams, functional wireframes and working mock-ups, and rigourous testing. While there are no universal working methods, UX designers will often research the different types of user, construct "personas" to represent them, and then model user flows that show how these personas might move through the product.

Practical testing is crucial, as Travis explains. "The way we test designs is by asking real users to do real tasks with the system. We then measure how quickly they achieve their goals, whether or not they succeed at the task, and how they feel about the experience. These three components – effectiveness, efficiency and satisfaction – generate real numbers that we can use."

"It helps if you have an understanding of human psychology," says Clearleft's Budd, "because a lot of the techniques we use are based around understanding cognitive biases or various types of behaviour, and because a lot of the research methods we use are taken from psychology."

Experience and education

This explains why a psychology degree is one proven route into UX design, although there are others, including dedicated human-computer interaction and UX design courses. Sadly, while there are excellent and up-to-date examples, the quality of these will vary, and they are no guarantee of a job. "There are a few universities now offering qualifications in subjects such as usability, but the people who teach these

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courses aren't practitioners – this means the courses are very theory driven," says Travis.

Many UX designers transition into the job from other disciplines, perhaps having worked on projects without a dedicated UX team, and so adopt the role themselves. Budd believes that this is still a viable way in, although one that becomes more difficult as specialists become more established. Another route is to work with agencies or consultancies, where you may initially be pressed into usability research and testing, but where you may have the opportunity to move into other areas later on.

Skills and attributes

Beyond an aptitude for research and basic psychology, other traits are desirable. "You need to be a good conceptualiser; you need to be a design thinker; you need to be focused on systems and how systems work; and you need to be able to visualise really complex information sets and process flows, and organise them in logical ways," says Budd.

Walker thinks it vital that you're "open to critical feedback, because you're exposing your designs to people, and you want them to break it so that you can go back and mend it – and make it better."

Walker also singles out patience – users don't always find obvious the things that you expect them to – and being a team player, but most of all, says Budd, UX designers must be able to identify with their users. "You need to be someone that can put themselves in the position of the user or one of many different types of user, and try to figure out, how the system will work and feel and how frustrating it will be."

These qualities may be higher up employers' wishlists than technical skills. "I think the technical skills are a bit over-rated," says Travis. "In my view, UX practitioners need other skills that are at least as important."

"In terms of technical skills, you don't actually need an awful lot," says Budd. "You're probably not a programmer, you're probably not building technology, although some of the better UX designers will be building HTML/CSS prototypes to test."

The main advantage of a technical understanding is that it allows you to know what's possible. "A lot of the best UX designers have a modicum of technical knowledge so they can actually say 'we're going to build this, and it will cost this much, and it's feasible'," says Budd.

Challenges and rewards

Practicing UX specialists point to two recurring challenges: a lack of time for prototyping and research, and the need to balance the requirements of the user with those of the business and the developers. "One of the challenges can be that you may understand the user, and you may understand the problem that you're trying to solve, but that doesn't necessarily mean that the design you come up with is the one you'll develop," says Walker. He feels designers must "understand the pressures that others are under. Product managers have budgets and there are limited resources, so it's never a question of trying to force through designs."

"If you're trying to balance the needs of an organisation with the needs of three or four different types of user, then you're always making trade-offs," says Budd. "That's interesting, but it can also be difficult."

Still, the rewards make it all worthwhile. First, this is a boom business, with salaries to match. Budd talks of a massive demand for experienced UX designers, and of jobs that pay anywhere between £40,000 and £60,000, with senior people going on to earn £100,000 or more. The website IT Jobs Watch puts the average salary for a UX designer at £45,000. "It's extremely buoyant at the moment, and so many companies are looking for good UX people," says Budd.

There are also less tangible rewards. Travis takes pleasure in training organisations in UX, watching as "one or two people take ownership of it in their company and then, when they ask me back a year later, I see the organisation applying these techniques on real projects". Walker, meanwhile, finds satisfaction in making tools easier to use. "It makes you feel that what you do is worthwhile when people are able to use your software without frustration."

The more user experience design affects the way we live and work, the more important it – and consequently those who specialise in it – will become. "We're not solving world hunger, but we're making people's digital experiences more enjoyable," says Budd. "It can be incredibly fascinating and interesting. We're designing the stuff that goes on the internet. We're designing the stuff that powers everybody's daily lives."

PROFILE

A day in the life of a UX designer

Name: Adam Walker
Job title: UX specialist, Red Gate Software
Experience: Five years with an online hotel booking service; five years on Red Gate's UX team

I get in at 7am most mornings. Breakfast doesn't start until 8.30am, and this gives me 90 minutes of quiet time where I won't be distracted. Red Gate serves a hot breakfast every morning; it's a part of the day where we can get together with people that aren't in our immediate product team. We're also provided with a free lunch, which brings the whole company together each day.

As part of the "agile methodology" we have a stand-up meeting every morning, so I check to see whether I've done the things I said I was going to do yesterday, and think about priorities for the rest of the day. If there's anything outstanding then I'll try to get through that before the stand-up. It's good to have that structure where you know what you've committed to, and you have to think about what you're going to commit to.

There really isn't a typical day – we can spend whole days in usability testing, phoning customers or going on site visits, and other days designing or in planning meetings. If testing, we get in touch with our customers, but also people who haven't used our software before. We give them a remote link to us so that they can use the latest version of the software, and we normally spend around an hour asking people to perform certain tasks.

We'll have meetings about what features we're going to develop, breaking down feature requests into user stories. Bringing the whole project team together to discuss something is more fruitful than one person trying to understand it by themselves, and we always approach everything we develop by asking ourselves what the user is trying to achieve. We're well integrated into the UX community, so some afternoons we might be planning conferences or running university workshops to share our experiences in the industry and understand the expectations of the students. Red Gate recruits a lot of graduates, so this is important.

"We always approach everything we develop by asking ourselves what the user is trying to achieve"

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ADVANCED WINDOWS & MAC

Office pollution in a changing atmosphere

Jon Honeyball argues that smaller, more nimble rivals are increasingly showing Microsoft the way in terms of flexibility and support

JON HONEYBALL

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With access to key Microsoft file formats, someone could port LibreOffice to iOS and Android

Last month I raised the ugly question of "what is Microsoft Office?", when I pointed out that we now have various versions of the suite named the same thing but with different functionality and capabilities. This has occurred because of the weak porting of Office Home & Student that is bundled with the Microsoft Surface with Windows RT tablet. It's lacking Visual Basic for Applications, the scripting language that's a cornerstone of much business use of Office. The Intel version of Office Home & Student has this capability, as indeed do the "full fat" versions available on Intel.

Microsoft has been polluting the name of Word, Excel and the rest of the suite for years, but this pollution was mostly constrained to the Windows Phone environment, where I suspect that many users were happy to accept that a "free" bundling of something called Excel on a tiny phone display wasn't going to deliver the goods of the grown-up version.

"Microsoft has done a good job of creating lightweight versions of Office tools"

Indeed, back then, you didn't even get proper round-tripping of your documents – in other words, if you created a document on the desktop version of the app, moved it into the phone and then saved it out and moved it back to the desktop you'd find lots of document features were missing. This situation has been improved considerably in recent times, much to everyone's relief.

Maintaining this round-trip ability has been important for Microsoft's web-based Office suite of applications. Built to counter the threat from Google Drive, Microsoft has done a good job of creating lightweight versions of these Office tools that actually look and work pretty well the same as the full versions. And once again, many users are quite happy to accept that an application running in your web browser isn't going to have quite the same abilities as a desktop app: context is everything.

As Microsoft moves away from its core Windows 32-/64-bit platform, and especially into the non-Windows tablet area, it faces an interesting problem. The reality is that it can, if it so wishes, deliver a full-powered experience. Anyone who believes that ARM-based iPads or Android devices aren't "up to the job" should take more note of what's happened over the past decade. Cast your mind back to the late 1990s and remember that we were running on what were by today's standards fairly slow processors. If they could run "full fat" Office then it should be even more do-able on today's chips.

However, Microsoft's chosen play is almost certainly going to be either to try to tie the applications to an Office 365 licence, or else to make them "companions" to a full desktop licence – it's entirely possible that they won't be sold as standalone applications at all. You'll still download them, of course, through the appropriate app store, but the licensing key to activate them will be in Microsoft's control. It might even be that the downloaded application can do a file open, edit and print, but can't save, an approach that has a long pedigree in the shareware products of the past; purchase and apply an Office 365 or desktop app licence and those vital locked-down functions will be unlocked. We'll see in the next few months how Redmond wants to play this.

But it's worth remembering that Microsoft's position is considerably weakened compared to

a decade ago. Back then, the file formats for Word, Excel and so forth were locked up as tight as corporate secrets. Want to know how the binary interchange file format (BIFF) worked in Excel? Sign this non-disclosure agreement and licence, please. And that was only the start of your problems. In those days, Microsoft was using a rather lovely technology called Structured Storage, where each individual file encapsulated an entire file system: if you peered inside there was no difference between a DOC file and an XLS file: both had the same structure and had various streams of data in them. It was just what was in the primary stream that defined it to be a Word document or an Excel spreadsheet.

Why did Microsoft go down this structured storage route? At the time, the world thought that compound documents were the future, where you might want to have a Word document with an embedded Excel spreadsheet or two, and that you'd want to shift seamlessly from one to the other. Getting into a structured storage file to manipulate its pieces required you to write a mass of Microsoft code, which hadn't been and wasn't going to be ported anywhere else, any time soon. With structured storage there was always the promise that we'd move over to a more client-server arrangement, allowing server control of the DOC file, which would in turn enable multi-user concurrent editing of complex documents. However, this promise came to nowt, as the Office team got bored with the idea and the world moved on to HTML and then XML. Add to this a few court cases and the Office team moved to the XML-based DOCX and XLSX family of formats, part of the motive for which was to have open file formats with publicly available specifications.

"On Windows, OneNote is arguably the best thing that the Office team makes today"

Over the years there have been a number of attempts to produce a rival suite to Microsoft Office. Some have been paid-for, some have been open source projects. It's certainly true to say that efforts such as LibreOffice (**www.libreoffice.org**) have resulted in strong platforms that offer plenty of features. Fortunately for Microsoft, though, many of its business customers have been tied up in rolling licences, and it's certainly true that many IT managers have shied away from such third-party Office offerings based on the simple reasoning that "no-one ever got fired for buying the real thing".

Is this going to change now? As the world moves away from desktops and towards a plethora of other types of device – from phones, to tablets, to TVs – there's no longer a need for an Office clone. All we need is Office file compatibility, and the move to DOCX/XLSX/PPTX by Microsoft makes it so much easier for a third-party developer to generate a really compelling and interesting new product that just happens to employ the Microsoft file formats.

A great example of this is OneNote. On Windows this is a top-notch product, arguably the best thing that the Office team makes today, especially when compared to the somewhat geriatric Word, Excel and PowerPoint, all of which are now entering their late twenties (which in the computer equivalent of dog years means they're collecting their pensions and staggering around in a Zimmer frame). OneNote's time has come with the arrival of tablets. It's type enabled, pen and ink enabled, can record audio and match pen/ink/type events to time points on the recorded timeline. There's no file saving – that's all done automatically. You can share OneNote books and work on them along with other users. By any standards, it's a thoroughly modern, interesting and worthwhile product.

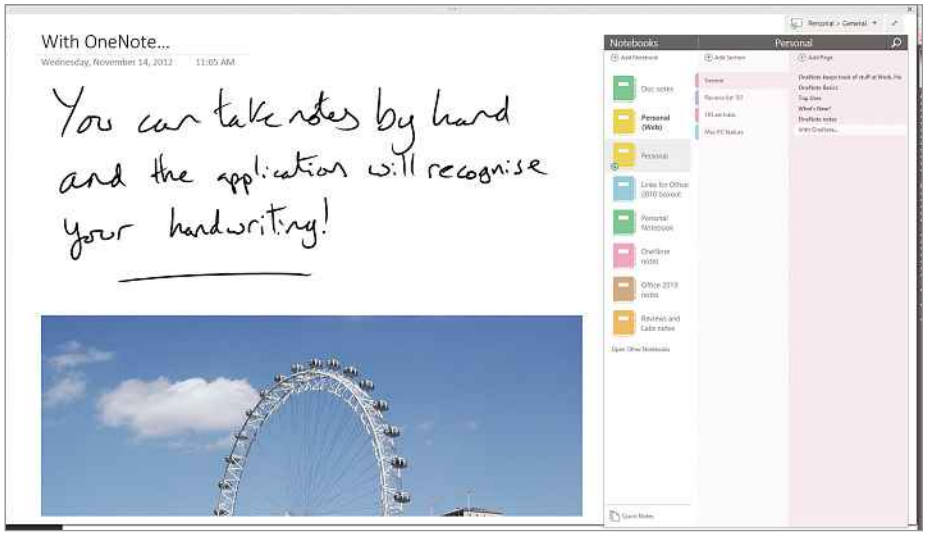
Microsoft has done an iOS port of OneNote, but to be honest it's a howling dog, with much of the best functionality simply missing, and while it doesn't actually destroy the OneNote file it's working on, it's somewhat galling to find key functions missing. That's why it's so refreshing to find a third party that's building an entirely new OneNote-alike application that works with your OneNote files unchanged, and offers far more functionality than Microsoft offers in its own Mac/iPad product.

It's called Outline (**http://outline.ws**). There are two versions – Outline and Outline+ – and this is a fast-moving company, releasing updates and new functionality every month or so. Outline is limited to 30 pages, syncing over USB, and is free, while Outline+ has no page limit, syncs over USB, Wi-Fi or Dropbox, and costs the princely sum of 69p. I'm sorry, I'll say that again: it costs the princely sum of 69 *pence*. There's an Outline Enterprise version coming soon that will add native support for SharePoint syncing too, and that will be a "$$$" purchase instead of the "$" of Outline+. Can I be cheeky by suggesting that probably means £2.07?

I've enquired about support for synchronisation over SkyDrive, and have been told that it's coming shortly, and I've asked for a "hot note" app for the iPhone too. The screen size isn't big enough to handle the full user interface, but a cut-down version that specially marks stuff that is currently important is just what I need. When you travel as much as I do, you constantly need access to plane reservation numbers, flight details, hotel and rental car reservations – store them in a special note in OneNote and my phone can immediately display this for me.

And what about a version for the Mac? That should be out by the time you read this for a mere $15 (I expect the UK price will be around £10). The first version will be read-only, a sensible move to ensure that there are no major nasties in it – after all, the big problem with any syncing data model is that a bug in one place might propagate across all the clients in no time at all. But at the time of writing, this read/write version is scheduled to arrive within a few weeks.

I'll confess that I love discovering small software companies such as this. They're fast, responsive, open to ideas, and they deliver. Bringing Outline to the iPad in direct competition to Microsoft might be seen as brave, but it isn't – far from it. Microsoft has shown that it's too old, too



Microsoft OneNote is perfectly suited to the touch-friendly interface of modern tablets

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tired, too big and too slow, and it will be attacked more and more by these low-cost, fast and responsive software developers who can steal its lunch now that the file formats have been opened up. Now who is going to take the LibreOffice codebase and port it to iOS? And to Android? Assuming it would be chargeable, there are tens of millions of potential customers at a tenner each – add that up, and it soon becomes real money. Let battle commence.

Office 365 and devices

I was having problems getting a new phone to connect to my Office 365 accounts. Office 365 is one of those services that's so good it's sometimes hard to remember just what an enormous improvement it offers over the tedium, hassle and drudgery of running a local Exchange server. I love Exchange Server and have been running it since the very first betas back in the mid-1990s, but it's something of an elephant in a china shop for a small business such as mine – and increasingly, it would seem, for larger firms too.

But there's one area of Office 365 that's hard to find but crucial to know about when something goes wrong. Log into the Office 365 dashboard, go to Outlook on the top menu, then choose Options | See All Options from the small dropdown at the top-right corner of the screen. This takes you back to a configuration window – choose Phone on the left-hand side. Here you'll find a list of all the mobile devices you've set up to work with this Office 365 account: there's a limit of ten devices, and if you change phones often, it's quite likely that you'll hit this limit. It's a hard limit, too, and old devices aren't automatically removed after a set period without a connection. The only way you'll recognise this problem for many devices is that they simply won't set up correctly on Exchange Server connection services. Go to this hidden corner of Office 365 and clear out all the devices you no longer need, then try to set up the email client on the mobile device again – it should work now.

The versatile Nikon D800 is capable of outputting uncompressed Full HD video

Tip from my Twitter friends...

While you're in this area of Office 365, take a look at retention policies under the Organise Email settings. The default for my type of plan is a "two-year move to archive" policy, but should you wish to set up a different policy for a folder or an account, you can do so here, then apply the settings as required.

Now I'll confess that "move to archive" sounds intriguing, especially as I have no idea where the archive is held within the online Office 365 service. I'll have to spend some time prodding at parts of the UI until I turn over the right stone and find it there.

No fun!

My only significant criticism of Office 365 is that too much of its configuration is rather too awkward to manage for those intermittent users who make up the smaller end of the SMB marketplace. You might well argue that we shouldn't be fiddling in there anyway, and using the services of a reseller who knows all these tricks instead. Maybe so, but where's the fun in that?

File systems for streaming video

File systems are tricky things. You want to move things forward and have the very best thinking, design and implementation, but at the same time yearn for backwards-compatibility and the ease of use that comes with ubiquity. New file systems don't come along very often, and when they do they can take some time to gain widespread support. NTFS was first seen in 1992, but ten years later there were still vendors supplying new hardware with the FAT32 file system. FAT16 was definitely of the floppy disk era; FAT32 improved things considerably, but it still had many of the underlying architectural limitations. All of that was fixed by exFAT, but how many digital cameras shipping today actually support exFAT? Precious few, I fear, despite the fact that Windows Vista, 7 and 8 and recent versions of OS X support it in a completely seamless way.

Recently I was in the market for a high-resolution video camera, something that could record at Full HD quality. My eyes fell upon the Nikon D800 – a DSLR that boasts excellent video capabilities. The advantage for me in particular is that it can take all the lenses I use on my D3X, and it takes stills at the increased resolution of 36 megapixels too. But the problem with the D800 is storage: it has a CompactFlash slot and an SD card slot, but to record Full HD with no compression pushes these technologies to the edge. What's needed is something that can take the Full HD video and store it uncompressed.

Fortunately, the D800 can output uncompressed HD video via its HDMI socket, which is a rare thing among current DSLRs. Enter the PIX 240 from Sound Devices, which is a small, robust, professional-grade video recorder that takes uncompressed Full HD video input and stores it on standard SSDs mounted on the side. But which format to use? Well, FAT32 would be a significant limitation with its maximum capacity of 4GB, while exFAT would be better but there may be licence fees payable to Microsoft. Sound Devices has gone with the UDF file system version 2.5.

Given that the SSD drive is mounted in a cage that includes FireWire 800, eSATA and USB sockets, it should be simple to pull the drive out of the PIX 240 and plug it into a waiting PC or Mac. Turns out that it likes to format the card in UFS format, for which there's now native OS support built into Windows Vista, 7 and 8, and Apple OS X too. Just plug in the drive and it mounts without complaint, and the files are directly editable using any decent video-editing program (I use Final Cut Pro X). The picture quality is significantly better than what you get from the CompactFlash and SD memory cards within the D800 itself.

So, in short, specific technical requirements for file systems aren't as much of a burden as they used to be, and in most cases there's better support out there than you might expect.

"New file systems don't come along often and can take time to gain widespread support"

Microsoft says it plans to revisit this limit to see whether it should be increased. Note that there's a limit on the number of devices you can remove within a given time frame, too, so if you keep adding and removing devices at will, you'll find yourself locked out.

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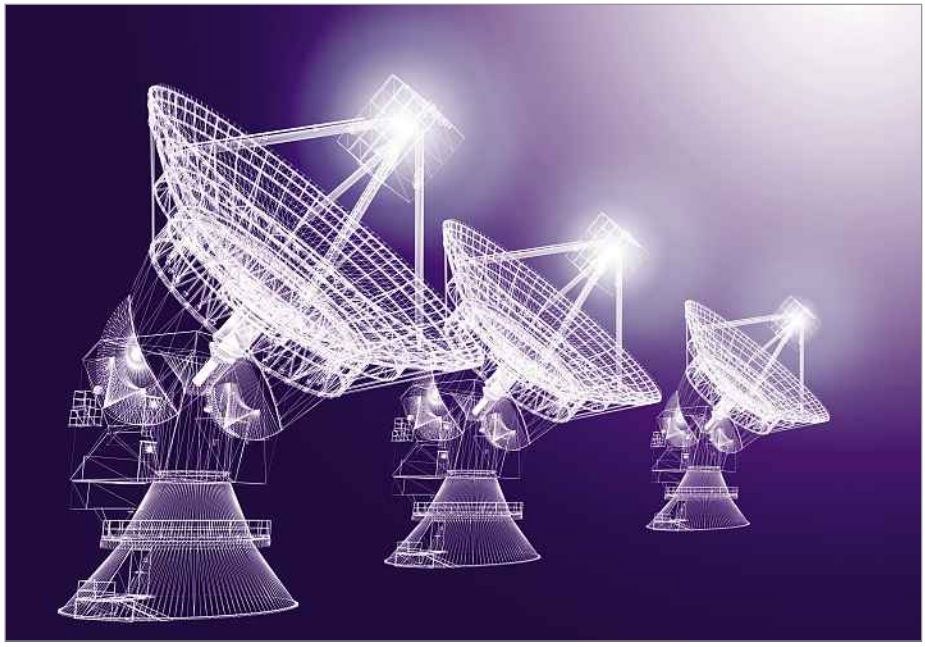
MOBILE & WIRELESS

Navigating through the radio soup

Paul Ockenden explores the wonderful world of wireless signals, and finds a useful tool for delving deeper into them

PAUL OCKENDEN

Owner of one of the UK's oldest web agencies, Paul works on award-winning sites for many blue-chip clients. Twitter: @PaulOckenden



Listen very carefully. Can you hear that noise? Can you hear the radio? No, I don't mean the FM radio booming from the car driving past, nor the mediocre sound of DAB wafting from the kitchen. I'm talking about all of the other radio signals buzzing around your head. Of course you can't hear them – not if you're mentally stable, anyway, which I prefer to assume you are. However, you can't even hear "normal" radio without some kind of receiver. The right apparatus allows you to watch and listen to broadcast stations, and exactly the same is true for all of the other wireless signals in the air – you need the right equipment to pick them up.

In order of increasing frequency, the electromagnetic spectrum is as follows: radio, microwaves, infrared, visible light, ultra-violet, X-rays, gamma rays. My old physics teacher taught me a good way to remember this – Rabbits Mate In Very Unusual eXpensive Gardens. I say good way, but whenever I try to remember this I'm never sure whether it's "very unusual expensive gardens" or "very expensive unusual gardens". Perhaps I've spent too much time visiting National Trust properties.

It's the radio part that we're really interested in, and that's generally accepted as running from 3kHz through to 300GHz, although the International Telecommunications Union (ITU) – the UN agency responsible for information and communication technologies – splits this space into 12 bands stretching all the way up to 3THz (or 3,000GHz). Each band is an extra zero wide (so 3kHz-30kHz, 300MHz-3GHz, and so on), which is simple enough.

The first three ITU-defined bands – ELF, SLF and ULF (for extremely, super and ultra low frequency) can be mostly ignored as they're mainly generated by natural phenomena such as lightning and earthquakes. ELF has been used for submarine communications because the signal penetrates a fair distance through salt water: it can take hours to send a simple message – we'll see why in a moment – but it's delivered to boats operating hundreds of metres below the surface. The logistics are complex, since the wavelength will typically be around a tenth of the circumference of the planet! Obviously, nobody is going to build an antenna that big (nor even a quarter-wave dipole), so instead these systems use parts of the Earth itself as the antenna. Huge poles are sunk tens of miles apart in areas of low ground conductivity, so that the current penetrates deep into the Earth. It's mind-boggling engineering, and only the Americans and Russians have ever built such systems (Britain once planned one in Scotland, but it was abandoned). Since the transmitters required are so huge, it's a one-way system – there's no way submarines can transmit back.

> **"While UHF is the band for now, SHF is set to be the band of the future for data comms"**

The first band you might think of as normal "radio" is VLF (band 4, very low frequency, 3-30kHz), which has such a low frequency it can't be used for voice communications, since the carrier wave frequency must always be higher than any signal you need it to carry – regardless of whether modulation is by amplitude (AM), frequency (FM), or whether you're dealing with analogue or digital signals (it is possible to bend the rules slightly by compressing digital data before transmission, however). As a result VLF is only really usable for slow, low-bandwidth data transmission.

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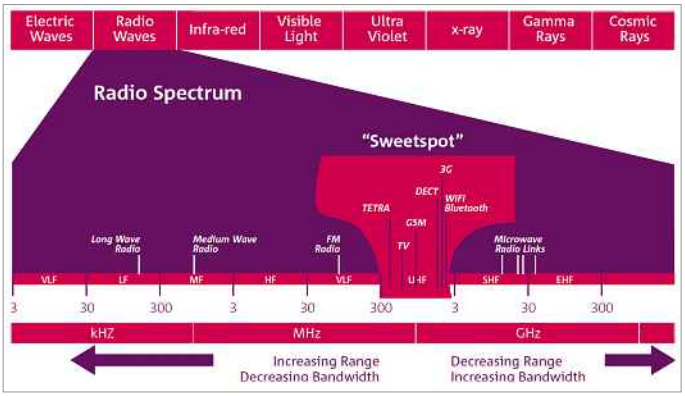


Ofcom published this overview of the UK's radio spectrum in 2005

Next comes LF (band 5, low frequency, 30-300kHz), whose main use is for aircraft beacons and weather systems, although the good old long wave, which sits at the top end of this band, will be familiar to those who follow cricket matches or church services. Remember that low frequency and long wavelength go together: as one number goes down the other goes up. Visualise some kids making standing waves in a skipping rope: the faster they wiggle their hands (higher frequency) the more wiggles they can fit in, so the peaks are closer together (shorter wavelength).

The MF (band 6, medium frequency, 300kHz-3MHz) band comes next, and its major use is for the medium wave radio service (does anyone still listen to MW?). MF also contains the 160m amateur radio band, and there are also a few navigation and global distress beacon applications. Next comes HF (band 7, high frequency, 3-30MHz), which many people think of as "shortwave" radio. Both broadcast radio stations and amateurs use this band, as well as military and aircraft-to-ground communications. Due to the way HF propagates – by reflecting or, more accurately, refracting off the ionosphere and bouncing back to Earth – this band is also used in over-the-horizon radars. The crude resolution of such radar makes it useless for targeting, but it still beats modern satellite wizardry for defence early warning systems.

After HF comes VHF (band 8, very high frequency, 30-300MHz), which is employed for FM radio, amateur radio, air-traffic control and instrument landing systems. TV used to operate here, too, but was moved in the 1980s to make room for our woefully inadequate DAB radio system. That DAB appears here is significant, though: it shows we're entering the part of the spectrum best suited to data communication, the so-called "digital sweetspot".

A major chunk of that sweetspot is occupied by UHF (band 9, ultra-high frequency, 300MHz-3GHz). It's there we find current digital TV broadcasts, mobile phone signals (GSM, 3G and most of the 4G flavours), good old-fashioned Wi-Fi, the TETRA trunked radio system used by the emergency services, DECT cordless phones, Bluetooth, wireless sensors for equipment such as weather stations and energy monitors, plus a few amateur radio bands. We start to encroach on the microwave spectrum at the top end of this band. Most of the signals crammed into this very crowded spectrum are digital nowadays, which enables much more stuff to be packed into the available bandwidth.

All the kit I write about in this column – phones, Wi-Fi and so on – operates within the UHF band, but having come this far I might as well complete the trip; next is the SHF (ITU band 10, super-high frequency, 3-30GHz) band. Here we find 5GHz Wi-Fi and satellite TV downlink signals. Almost all modern radar systems employ SHF, and a massive chunk (almost a third) of the band will be used by wireless USB as it becomes more widespread. This band is great for directional, short-range data communication, and recent developments in microwave integrated circuits mean the signal processing can now happen directly in silicon, rather than a processed signal having to be mixed with a high-frequency carrier. So while UHF is the band for now, SHF looks set to be the band of the future, with more and more of our data signalling moving into this spectrum.

The last but one of the official ITU bands – and the last really usable one – is EHF (band 11, extremely high frequency, 30-300GHz) with wavelengths between one and ten millimetres. Such signals suffer extreme attenuation by the atmosphere, so the band isn't suitable for long-range communication. The attenuation is caused because these signals stimulate the resonant frequencies of particular atmospheric molecules – oxygen, for example, has a huge absorption peak at around 60GHz – although that does mean that windows exist in the attenuation spectrum where no molecular culprit lives.

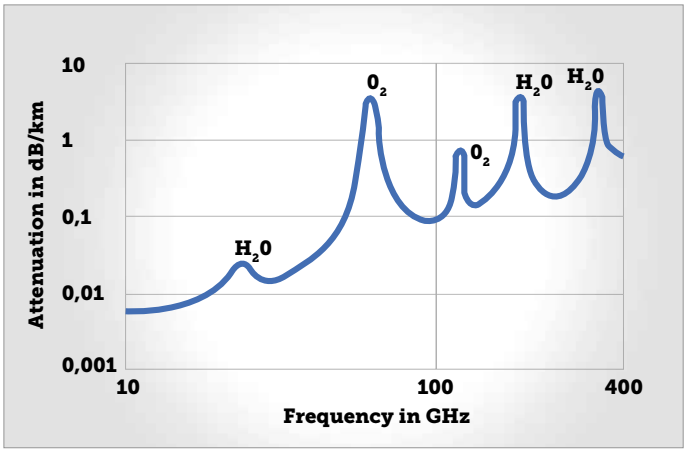
The upcoming Wi-Fi standard 802.11ad is actually designed to work at 60GHz, because oxygen absorption isn't too much of a problem over LAN-scale distances, and in fact becomes a benefit in that it means 60GHz can be used only for short-distance links and you don't need to worry about interference at longer ranges (at least not for terrestrial applications). That in turn means the same frequencies can be safely re-used nearby, and some countries allow unlicensed use of 60GHz.

Move slightly away from the oxygen absorption peak and the attenuation quickly drops off, and such frequencies are starting to be deployed for very-high-bandwidth communication links. The high frequency means you can pack in much more data than you could with a longer wavelength carrier. Those famous airport scanners that can see through your clothes also work in the EHF band, but more worrying than that is a reported use of this band as a weapon.

The US military is alleged to have a weapon that fires a high-power, directional beam of 3mm radiation, which is reported to cause an extremely painful burning sensation – as if the victim were on fire – even though no physical damage is caused. I used to work in the defence industry (defence is really a euphemism for offence), and I find such stuff very offensive. No physical damage, perhaps, but imagine the long-term psychological damage if you'd been subjected to it.

"RF Explorer is great for seeing what signals are out there, but there's much more it can do"

Finally, we arrive at THF (ITU band 12, tremendously high frequency, 300GHz-3THz), which is almost into the light spectrum since THF sits just below infrared. This band is used mostly for medical imaging, and although there has been a proof of concept experiment to transmit data at these frequencies, real-world applications are decades away.



In the EHF band, we start to see molecular absorption

The RF Explorer is the Swiss Army knife of digital communication

Drinking the soup

So how can we detect the various signals buzzing around our heads in a typical office or home environment? In a few cases, it's easy: just set your phone to manual network selection and it will show you the various 2G, 3G and possibly 4G signals available. Turn the dial on your analog radio and you'll hear the various broadcast stations (and amateur stations if your set offers shortwave). Select Autostore on your digital TV and you'll probably see a bar graph as it scans the broadcast TV bands and finds the stations.

For the Wi-Fi spectrum I've written here before about some of the wonderful Wi-Spy devices (*see issues 186 and 195*), which provide a nice visual display of what's happening around the 2.4 and 5GHz bands, showing not only wireless networks but also other devices that pump out such radiation, including microwave ovens.

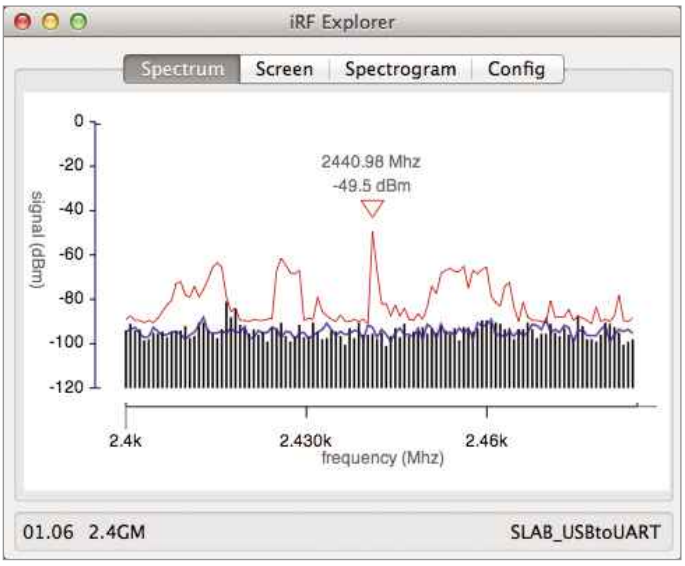
It would be nice to see the same kind of visualisation across the wider radio spectrum, wouldn't it? You can, but the necessary equipment is particularly expensive – the kind of kit you're more likely to read about over in Mr Honeyball's column rather than here. Recently, though, I stumbled across a brilliant little device called the RF Explorer, which is far more cost-effective – I bought one for £185 from UK distributor Cool Components.

This gadget was designed by Ariel Rocholl, and was originally intended to help pilots of radio-controlled models see what radio frequencies are in use locally. In fact, it's very much like those Wi-Spy devices, but aimed at a different audience. Initial versions of his device operated in narrow bands – 433MHz, 868MHz and 915MHz – but the latest model, the one sold by Cool Components, covers all the way from 15MHz to 2.7GHz, which is from the top end of medium wave radio (Capital Gold, or thereabouts) all the way through the various ISM bands, broadcast radio and TV and well past Wi-Fi.

The device's main display shows the selected range as a full spectrum analysis, with a graph showing the various peaks and troughs alongside the frequency and amplitude of the strongest signal detected. Since it's sometimes difficult to see rapidly changing signals, the device offers various display modes such as "peak hold" and "averaging" that can freeze them. The unit comes with two internal (switchable) receivers, a WSUB1G unit covering 240-960MHz (the base receiver for the unit), and a WSUB3G receiver fitted as an extension card – it's this that covers the whole 15MHz-2.7GHz range. You can flip between receivers using the menu and front-panel controls. The average noise level is about 10dBm lower with WSUB1G and the dynamic range is better, so it's useful to be able to switch when working with sub-gigahertz signals.

Why do I know that name?

Dirk-Willem van Gulik, who created the Mac software for the RF Explorer, is perhaps better known as one of the original founders of the Apache Software Foundation, and a contributor to the Apache web server codebase. He's currently chief technical architect at the BBC, where he's responsible for the design and construction of the back-end infrastructure to support all of the BBC's interactive services. We're lucky this busy man found time to write software for an obscure RF spectrum analysis tool!



You see more detail when connected to a PC, or in this case a Mac

On the top are two antennas, both of which screw into SMA connectors. There's a Nagoya NA-773 wideband telescopic antenna, which is for all sub-gigahertz frequencies, and a whip or helical aerial for the 2.4GHz band. If you're mainly working in one particular band (868MHz, say), you can buy a third-party antenna optimised for that frequency, so long as it has the requisite SMA connector.

At its most basic, RF Explorer is great just for seeing what signals are out there, but there's so much more it can do besides, from determining the best antenna orientation for your wireless router for optimum reception around your office or home, through to actually being able to see the digital data encoded within a signal in some cases. I don't have the space to go into details here, but if you're curious head over to **www.pcpro.co.uk/links/221mw** for more information.

Although the RF Explorer is a portable device, with a fantastic battery life of typically 16 hours, it also has a USB port and so can be connected to a computer to extend its functionality. In particular, when connected to a PC you'll get a far more detailed display. Ariel provides open source Windows software and Dirk-Willem van Gulik has also ported it to OS X.

The device is so sensitive that its designer suggests removing its antennas and screwing in SMA 50ohm dummy load attenuators, which you can pick up for around £5, if you know that you'll be travelling through areas of high radiation or strong electromagnetic fields (and this applies whether the device is switched on or off). I'd certainly advise this before taking it through an elderly airport security scanner in a third-world country. Likewise, if you'll actually be working with high-powered transmissions (perhaps close to a mobile phone basestation), you can use SMA attenuators to reduce the signal before it hits the RF Explorer. There are options in the device menus to set an "Offset dB" value, so that even with an attenuator attached you'll see the correct signal strength displayed on the screen.

The RF Explorer device is open source, and you could even build one yourself if you so desire. You'll find the schematics at **www.pcpro.co.uk/links/221mw1**, although I can't see why you'd want to build your own given the reasonable price of the ready-made device.

Rocholl is still working on upgrades to RF Explorer: he's currently looking to extend its top end from 2.7GHz to 5GHz, and there's also a back-burner project to enable the device to detect and display the digital data contained within a modulated signal. I think this would be cool: not only would you see the signal peak every time your wireless outdoor thermometer sent a reading back to its display, but you'd actually be able to see the reading. Okay, wireless thermometers aren't that exciting – but there's much more interesting digital data flying around in the radio soup nowadays.

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ONLINE BUSINESS

The new attention battleground

SEO is dead. Kevin Partner investigates how to exploit Google's increasingly dynamic search to make your business more visible

KEVIN PARTNER

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Online marketing is a battle for customers' attention, and its first aim must be visibility. There are essentially two ways to achieve that: through paid-for adverts or organic presence. Google's AdWords, with its very effective pay-per-click model, rules the former, while search engine optimisation (SEO) used to rule the latter – but that's all changing.

Although Bing has become a more spirited competitor since joining forces with Yahoo, Google still represents 90% of the search market, and I'm seeing signs that it's overhauling the way it presents results to stay ahead. The enhancements are subtle and gradual, but they offer real opportunities to businesses that spot the direction Google is headed and exploit it.

A few years ago, search results were textual lists of websites matching your query, but recently (and especially following Google's purchase of YouTube) its results have been supplemented with images and videos. Google is now taking the next logical step by returning different kinds of information for different queries. For example, if you Google "London" standard text results will be shown on the left, but in the right-hand column you'll see a Google Maps image, a description from Wikipedia, various statistics including weather data, followed by a sequence of thumbnails linked to "points of interest". Now search for "Richard Branson" and once again the biographical information comes from Wikipedia, but this time the sidebar is augmented with an eclectic list of films and TV shows related to Branson, and below that a "people also search for" list with links to other entrepreneurs.

Google has overhauled the way it presents search results, which is significant for SEO

This is all very nice, except that neither you nor I are big enough to get such red-carpet treatment from Google. But examine Branson's entry more closely and you'll notice two things: the picture used is his Google+ profile photo, and his latest Google+ post appears between the biography and thumbnails – Google+ is now being scoured as an information source on the same level as Wikipedia and IMDb. But there's one real difference between Google+ and Wikipedia when it comes to search terms – namely, that you have control over your own content on it. The modest effort I've made for my online retailer's Google+ Page has paid off with an information-rich side panel (including contact information) now appearing in the right-hand column of the search results.

> "There are real opportunities for businesses that spot the direction Google is headed"

Google is testing a new design, which employs a two-column layout, with the "search type" bar moved above the results to simplify implementing different interfaces for different searches on the same screen, and enable the right-hand column to be made much bigger. Over the next 18 months, I expect to see Google+ integrate ever more closely into the search engine (as with other Google products). Early on, Google tried pushing Google+ posts into its main search results, but this raised howls from search partners who saw their own entries pushed further down the rankings, and the search giant was forced to find other ways to weld its social network onto its cash cow. Harvesting it as a data source and adding a Google+ feed to the right-hand side of pages are two such ways, but it's the humble "+1" button that looks like it's having the most impact.

In the US, Google has introduced "personal searches" (although they don't seem to be available to everyone there yet). In a nutshell, these assume that if you've clicked the +1 button on any web page, or followed any Google+ Page or personal account, then you've approved these as relevant sources and they'll be likely to appear in your search results. For example, if you were in the market for a new

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ukulele (and why not?) you might visit various purveyors, and let's say you liked the look of the Tanglewood Cutaway Uke and indicated your approval by clicking +1 (along with, perhaps, the Facebook Like button). As so often with such whims you forget all about it, but a week later the craving returns and you search again for "ukulele". Now, beneath the ads and Wikipedia entry, appears your Google+ profile picture next to a link to that uke you liked. It's just too easy, so you buy it with a one-click purchase.

Adding that +1 button to its site proved fortunate for the music shop, as otherwise it would have been invisible unless it paid for an ad. And for this to work, neither the shop nor the buyer needed to be an active Google+ user. Only the shopper needed to possess a Google+ account – and if they didn't, they'd be prompted to "upgrade" to one when clicking +1. Hence the commercial power of Google+ depends more on its number of signed-up users (around 500 million) than the far smaller number who are regularly active (somewhere around 125 million). If you do nothing else regarding Google+, at least think about adding a +1 button to every relevant page on your site, which not only provides social encouragement to potential buyers but is a mechanism that connects you with your audience.

Topman is more visible in a Google search because it's created a thriving Google+ Page. Note also the newsletter sign-up built into the ad on the left

export to a compatible feed so, once set up, this will happen automatically. In my experience your clickthrough rate will be much higher, a good example of how data from other Google services can enrich AdWords. More recently, Google has added integration between Google+ and AdWords through the social extension, which is essentially a way to link together your page, website and all your ads from a campaign – the overall effect is that +1s on any of these are reflected onto the other two.

Let's say you have a Google+ page that has received 247 +1s, that you're not using the social extension and that a new visitor arrives at your online shop. They'll see your "we're on Google+" button, alongside the number 247 fetched from your page. If they click that button the number will increase to 248 on both your page and your shop, thus increasing your social credibility by a tiny amount, which is all very well but relies on people already knowing about you and visiting either your page or website – it isn't bringing in new custom. With the social extension you'd link the ad campaign (which is already connected to your shop) to your page. Now if a user clicks the +1 button on the shop, page or ad, the total will increase by one across all three of them, and whenever your ad displays it will show the total number of "plusses" for your business. Once this becomes a respectable figure, it not only enhances your credibility but – far more importantly – will attach the "liker" to you, like my ukulele.

"I wouldn't be surprised if Google+ overtook Facebook in raw user numbers in 2013"

Deeper engagement

I believe it's time to become more deeply engaged with Google+, and in particular Pages, since Google is starting to use these as a way to knit together business services, in the same way that Mail, Calendar, Drive and Picasa are linked via the Google+ account. Take AdWords as an example. AdWords pros will know you can add various "extensions" to your campaigns, the sitelinks extension being the most common – it enables you to specify several direct links from your ad to pages on your own site. These links will appear only if your ad occupies one of the top few positions, but when they do qualify they have a double effect. Not only do they make it simpler to direct customers to the relevant page, but they also make your ad larger and more noticeable, the net result being that the proportion of searchers who click such ads is far higher than normal, driving more traffic to the site (do check that they're converting, however).

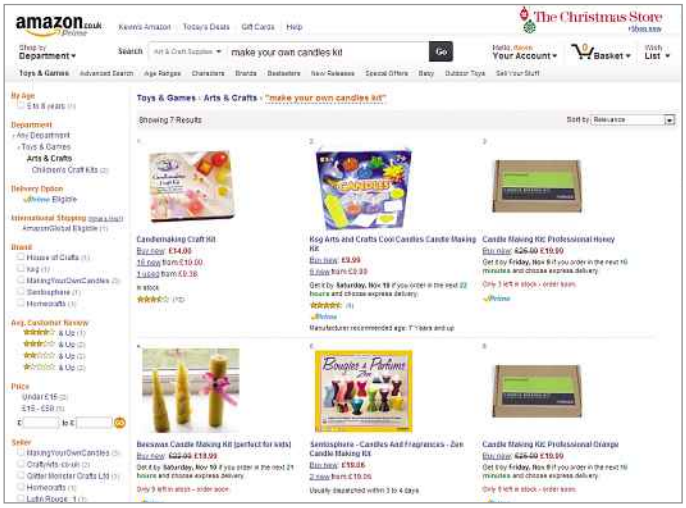
The product extension takes the feed from your Google Merchant account and displays links to the products Google thinks are most relevant beneath the ad. Some e-commerce packages offer an automatic

However, there's only limited space beneath each ad, so Google treats some extension types as more important than others. For example, if an ad has all of these extensions enabled – sitelinks, product and social – and appears in the top position, Google will prioritise the product links so that neither of the others are shown. If it appears in one of the next few positions, Google seems to prefer sitelinks over the others, depending on the search term. The upshot is that if you want your +1 score to appear beneath your ad, you shouldn't enable any extensions other than social. Searchers can still click the +1 button, and these will be counted on both page and site, but the total won't be visible under the ad: it's a question of which is more important to your campaign.

It feels as though the internet is turning into Googleweb, and I wouldn't bet against the giant's ability to pull this off. The effort involved in "upgrading" to Google+ has been made so minimal I wouldn't be surprised if it overtook Facebook in raw user numbers later in 2013. Its number of "active" users will remain far smaller, but that barely matters. To make money from advertising Facebook must draw you into its walled garden, whereas Google's adverts appear within its search interface and embedded into websites, so it can afford to keep the social network itself ad-free. For a casual +1-er, all that happens when they join Google+ is that their searches become more personal and relevant. At some point they might find themselves, like me, seduced by a social network more polished than Facebook's, with interactions that are less fluff-filled, but to imagine that the social networking side is Google's main purpose is to miss its point.

Google has always been a search company, and the true purpose of Google+ is to create a more relevant experience to help it retain its dominance. The company has found renewed focus since Larry Page became CEO, and search remains at its

I clicked the +1 button on a site selling instruments and when I next searched on Google, this popped up. A click takes me back to the shop



When someone clicks an AdWords ad paid for by Amazon, they're sent to a results page. Check these search terms to improve visibility

centre. Of its two main rivals Microsoft has a good search engine but no social network, while Facebook has the biggest social network but no search engine. Spotting the way the wind is blowing is a key skill for the online entrepreneur, and given the small effort required, I'm going to integrate Google+ as far as possible and see what happens. Never bet against Mountain View.

How to get Amazon and eBay to advertise for you

Learning AdWords isn't that difficult, but there is a way you can get the benefit of Google's ad system without signing up or spending a penny upfront. Search for just about any consumer product and Amazon or eBay will appear in the sponsored listings section. Click on these and you'll be taken to a search results page within that retailer's website, listing matching products. If your Taiwanese turtle-shaped loudspeaker makes the first page of these results, you're right in the shop window for no additional cost.

I explained the importance of appearing on the first page of Amazon's results in my last column (*see issue 220, p78*), and this use of AdWords to drive traffic reinforces the point. However, there's an important difference between optimising your Amazon listing to suit searches by customer on the website, and optimising it for Amazon's AdWords campaign. You can't assume the search page within the retailer's website will exactly reflect what the potential customer typed into Google, because ads can be triggered by a whole range of keywords but can launch only the one page with one search term.

Not knowing this almost cost my online retailing firm a lot of business. I regularly check the performance of our AdWords campaign by typing search terms into Google, using a browser that has never been attached to a Google account (so I know the results I'm seeing haven't been personalised). The search term "candle making kit" produced the expected results with Amazon's ad in top position and our ad immediately below it. I don't usually click the Amazon ad because I assumed it would bid for that specific term ("candle making kit") and send traffic to an internal search page with that same phrase. I also know that our kits rank well if you manually type this phrase into Amazon's search box, so I was surprised to see that on clicking Amazon's ad none of our kits appeared.

The problem was easy enough to spot: the ad links to a URL that generates the search term "make your own candles kit", which has a similar meaning to a human reader but not to Amazon's algorithm. I suspect it was split-testing ads, but I couldn't afford to risk our products being absent when potential customers clicked the link. Luckily, the solution was simple, as Amazon provides fields in the product description page of its inventory system for you to enter relevant keywords. I amended each of our products, waited ten minutes to give the changes time to propagate, and hit F5 to refresh; suddenly we'd gone from invisibility to dominance of this page – we were using Amazon's marketing spend to promote our products rather than giving our competitors a free run.

It's impossible to put an accurate figure on how much this was worth to us, but it's likely to be in the hundreds of pounds. Needless to say, keeping a weather eye on Amazon's AdWords experiments is now on my regular to-do list.

Search engine optimisation 2013

If you need any more convincing that you need to re-examine your understanding of SEO, take a look at this screenshot showing a search for "candle making" on Google.com with personalised results switched on (as they are by default). It's a pretty broad key phrase that I actively manage very carefully, and you can see my online retailer's ad appearing in the top position with a series of product links beneath it. I've clicked +1 on the ad (under an assumed Google+ identity), which has increased that number on the Google+ Page and the widget embedded in my online shop.

Amazon's own ad appears in position two and, guess what, if a searcher clicked that they'd also find the resulting list dominated by our products – so we get two bites at the pay-per-click advertising cherry for the price of one.

This Google+ user is a follower of the Making Your Own Candles page so they see a relevant post in position three, including a link back to our shop, which one imagines does its ranking no harm at all. The "head and shoulders" icon next to the hyperlink indicates this is a personalised result. Finally, in position four, there's a link to our main site – again a personalised entry – only there because this user clicked the +1 button on our homepage. For this user, at least, we dominate the results.

I believe encouraging users to recommend you by clicking +1 will become the new battleground for search engine marketing (SEM) in 2013. Now's the time to work on your SEM strategy to take advantage while others are still scratching their heads. Remember that success is achieved not by being the best but by being better than your competitors, and being there first.

By understanding the various sources Google uses for its search results, you can dominate the front page

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SECURITY & SOCIAL NETWORKING

How secure is your Wi-Fi network?

Davey Winder warns about new Wi-Fi vulnerabilities and questions the advice offered by security vendors

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A recent survey by web-hosting outfit UK2 in conjunction with YouGov (*see Unsafe, p91*) reveals that the British public isn't all that "bovvered" whether or not the public Wi-Fi hotspots they connect to are encrypted, although these same folk are more likely to check that their home Wi-Fi is secured. It obviously isn't merely a matter of security awareness but one of trust – misplaced trust in the hotel, coffee shop or pub that offers the free Wi-Fi service (or the provider behind it). It shouldn't need saying today that the WEP and WPA protocols are about as safe as Lib Dem MPs' seats, but now it appears that the Wi-Fi Protected Setup (WPS) protocol has been well and truly compromised too.

"WP what?" I hear you mutter. It's just that button you probably pressed to secure your wireless router when you set it up for your home or small-business network, the one that did away with manual security configuration and made wireless security so simple and quick. Or so you believed. The truth is rather less certain, because WPS is vulnerable to attack, although not through its big red button. A different aspect of WPS is an eight-digit PIN you have to enter instead of pressing that button, and it's this PIN version of the protocol that's been shown to be much less secure than everyone had assumed.

It seems that in order to crack the encryption via standard brute-force attack, hackers don't need to uncover all eight digits of that PIN – which would take quite a lot of time and computing resources – but have to decipher only the first four. That secure-looking PIN isn't actually so secure after all. Sure, your bank card employs a four-digit PIN, and both banks and customers seem happy enough to place their trust in that when placing it in an ATM, but there's a big difference between these two seemingly identical authentication scenarios. To take your money out of a cash machine, any would-be villain has to be both in possession of your physical card and able to guess or otherwise get hold of your PIN.

To gain access to your supposedly secure wireless network, however, they don't need physical access to your router, computer card or anything: they can just set their own computer loose on trying every possible combination.

There's a useful "how long to crack my password" calculator – called Haystack – at the Steve Gibson GRC security site (**www.pcpro.co.uk/links/221sec**), which is accurate enough for a rough estimate, although the maths boffins will tell you that it's far from perfect. The trouble is, security researchers have now released a tool called Reaver that can exploit this imperfection to enable anyone to crack the more simple WPS PIN and access the clear-text version of your router's WPA2 Pre-Shared Key (PSK), which is then revealed as a result. The full eight-digit PIN would have more than 100 million combinations, whereas the reduced-digit PIN has only 11,000 or thereabouts. It matters not one jot how complex the PSK lying behind the PIN is, because by using the WPS method you're in effect "protecting" your Wi-Fi network with a simple four-digit PIN.

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A quick Google search for PSK-hacking tutorials will demonstrate that even without this WPS PIN vulnerability, it's feasible to brute-force crack the PSK itself, but it takes so much longer that any prospective hacker would need a special reason to invest such time and resources into attacking your router. Reduce the time and resource requirement, however, and all of a sudden your router and Wi-Fi network become much more attractive as casual hacking opportunities.

It isn't all bad news, though, since you can simply disable the WPS feature on your router, thereby removing the PIN that tools such as Reaver will be looking for. I understand, but at the time of writing have no actual details to back this up, that a number of router manufacturers have either released or are working on firmware updates to close the vulnerability (one assumes by turning off the PIN – something for which not all routers have a user-configured option). Better still, start from scratch and set up your Wi-Fi network again using a really long and complex PSK to make those brute-force attacks impractical – think in terms of 32 characters or more, with the usual mixture of letters, numbers and special characters. Gibson's Haystack calculator that I mentioned previously will show that a simple four-digit PIN takes only a few seconds to crack, and with a powerful enough computer attack it will submit in an instant. That same calculator will tell you that a complex 32-character password would take 6.22 thousand trillion, trillion, trillion centuries to crack, even in the worst-case scenario attack using a massive processor array capable of a hundred trillion guesses a second!

WPA2 PSK, the pre-shared key implementation beloved by our stereotypical dangerous small-businessperson, was cracked a couple of years ago now, while WPA2 and TKIP are no longer secure options either. For many people Wi-Fi is quite simply wide open. WPA2 AES is still okay, as is WPA2 Enterprise with a RADIUS authentication server, and even WPA2 PSK with that 32-character key should be safe enough. WPA2 PSK actually supports passwords up to 63 characters, and since most wireless devices nowadays cache the password forever so you only have to enter it once, it isn't exactly rocket science to work out what you ought to be doing. Yet long passwords are still all too often seen as unnecessary and too complex. Sigh…

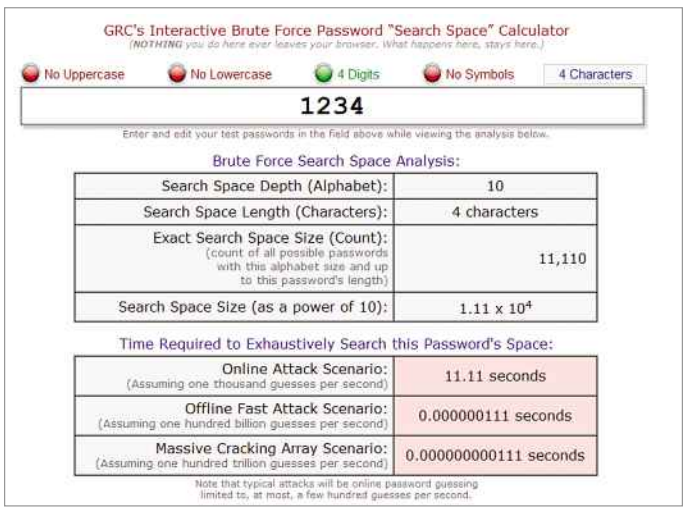
User-centric threatscape

It should come as no surprise to readers of this column that I believe the majority of IT security problems are better described as organic rather than mechanical, by which I mean that the users are the real problem rather than the malicious programming code or the bots that distribute it. And according to the latest security threat report from Sophos, it would appear that, at long last, people are starting to get that message, too.

> **"Users are the real problem rather than the malicious programming code"**

Of more than 4,300 folk around the globe who were surveyed, 61% felt that the biggest threats in the online security landscape come from users who don't do enough to protect themselves. This becomes even more of a problem when 20% also admit that social networking scams present the main current security threats, and if you put these two factors together – user apathy and social networking scams – you have a real recipe for disaster.

It doesn't take a genius to spot that the combination of new attack vectors employing integrated apps and social media platforms with increasingly diverse access methods (both in terms of devices used and locations they're used from) creates the need for a truly "protect everything, protect everywhere" strategy to deal with data security. Unfortunately, around 40% of users fall well below genius level by failing to understand that they're not merely part of the problem,



Hacking calculators such as Haystack should help frighten you into taking password construction more seriously

but are actually the conduit through which malware and compromised data can flow. Things are only going to get worse.

You may think that I'm being overly pessimistic, given that approximately 60% of people questioned in that survey understood the user-centric nature of data protection, but that would be to miss the point. That point is that the majority of cybercriminals are lazy good-for-nothings who will always take the easiest route to riches, and the easiest route as far as data and network breaches are concerned is the user with a rubbish password, or the small business with no understanding of patch management. The full security threatscape report can be found at **www.pcpro.co.uk/links/221sec1**, and is actually well worth reading.

Stupid security part 625

Every now and then, some well-meaning but completely bonkers advice comes my way, often from the most unlikely of sources. For example, it didn't particularly phase me to discover that a doddery relation of mine, well past his sell-by date, had a heavily infected computer despite having installed internet security software many years ago – he thought he knew everything there was to know about computers, but had failed to realise that you have to pay your subscription fee annually to continue to receive threat protection database updates...

I was phased, though, when an IT security vendor recently seemed to be suggesting that any business that publicly reveals its email address is somehow compromising its data security and putting itself at risk. I do understand that all risk is relative and that an exposed business email address must by definition create more of a corporate data security risk – from social engineers, phishers, hackers and cybercriminals – than if no such email contact points were ever disclosed. However, I also understand that the dictionary definition of an "address" is a place where a person or organisation can be found to communicate with, and that's just as valid for an email address as a street one. The whole point of having a business email address is to enable people, both potential as well as existing customers, to get in touch with you, and there's no point in having such an address if you don't let anyone know what it is.

So what were the folk over at the Websense Security Labs on about when they informed me that "thousands of businesses and consumers are putting themselves at risk each day by publicly revealing

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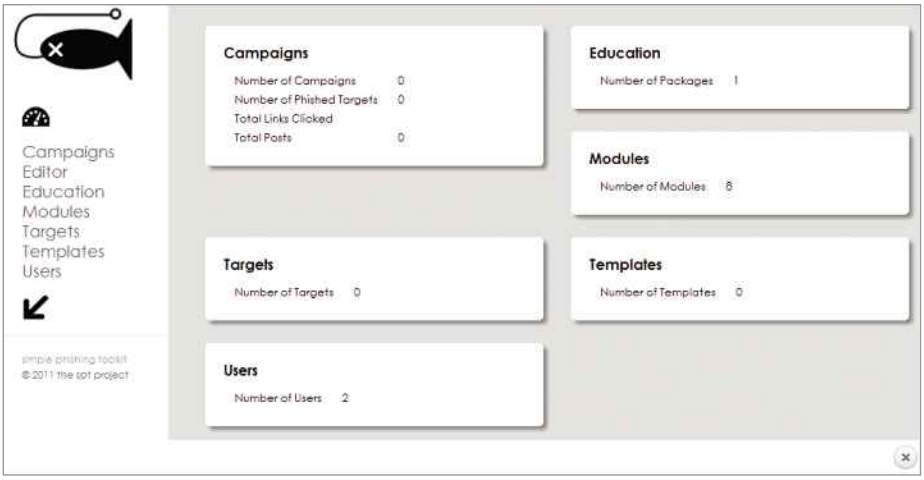

The SPT dashboard makes starting an in-house phishing awareness exercise easy

their email addresses on Twitter". The company went on to argue that because such addresses are "connected with their inboxes, social media identities and bank accounts", it leaves business users exposed to the potential for "advanced social spear-phishing attacks." The bizarre conclusion to WebSense's advice was that employers should "re-evaluate acceptable-use policies to discourage staff from sharing email addresses on Twitter".

I think that in this particular case, this overly protective security vendor was well intentioned and perhaps just got carried away with the email security risk message. Yes, there are people out there with bad intentions who will, and indeed do, target business users on social networks in order to infiltrate networks using the old social-engineering strategy known colloquially among security types as "spearphishing", because the attack is aimed at one individual within a specific department, rather than employing a scattergun approach by attempting to place a remote access trojan or similar malware inside the corporate network. By concentrating upon one individual, especially one who is active on Twitter or Facebook, it's sometimes possible to build up an accurate profile of that person, both personally and, more importantly, professionally.

For example, assuming the targeted person hasn't opted to make information available only to friends, it's all too easy to quickly scan their friends list and – after putting in a bit of graft – compile a dossier of their work colleagues and customers. Apply this to the conversations posted on the target's Facebook Wall to extract their business email addresses, and the bad guys now have all the necessary components they need to impersonate someone already known to that employee, and to exploit the basis of trust by attaching an "important document", or a link to something they "may be interested in", and hence provoke the click that will install the malware.

So, yes, I can see where the Websense chaps are coming from, but I'm afraid it all reminds me too much of Chicken Little. The sky will not fall in if you post your business email address on Facebook, and acceptable-use policies shouldn't be altered to make doing so a hanging offence. Apart from anything else, it's easy to guess these specific email addresses, given the standard address formats employed by just about every company – it's only going to be one of two or three variations. Tracking down which one is actually correct is just a matter of visiting the company's website and taking a quick peek at the "about us" page, or the list of contacts for their directors or sales executives.

In other words, telling your staff not to publish an already public email address on a social network is akin to standing in front of the sea and ordering the waves to retreat. Far better instead to address (if you'll excuse the pun) the real problem, which is once more that of user education. Ensure that your employees are aware of the kind of phishing techniques being used online, of the dangers of trust by association when using social networks, and why it's important not to become a link-clicking nutjob.

One way to do this, which appeals to the geek in me, is to use the Simple Phishing Toolkit (SPT), which isn't quite as dangerous as its name suggests. This open source toolkit makes it easy for a business to test just how phishing-aware its employees are, by creating the kind of lures that the bad guys are going to use and then deploying them to send less-security-savvy staff to a cloned decoy site you've set up using the supplied site-scraper tools. The idea is that this makes it possible to phish yourself, then to peruse a bunch of logs that will record which links have been clicked by whom – information that you can then use to target your training sessions at the employees who most need it.

Here's what the SPT developers have to say about it: "The SPT project is an open source phishing education toolkit that aims to help in securing the mind as opposed to securing computers. Organisations spend billions of dollars annually in an effort to safeguard information systems, but spend little to nothing on the under-trained and susceptible minds that operate these systems, thus rendering most technical protections instantly ineffective. A simple, targeted link is all it takes to bypass the most advanced security protections. The link is clicked, the deed is done. SPT was developed from the ground up to provide an easy-to-use framework to identify your weakest links so that you can patch the human vulnerability."

"A simple, targeted link is all it takes to bypass the most advanced security protections"

If you can identify which of your employees are most at risk of falling for phishing scams, then you can educate them and reduce the possibility of this actually happening. And before you say it, yes there will be some people who will use such a toolkit for evil. However, such open source phishing toolkits aren't new and existing resources such as Metasploit, which offer far more complex and advanced phishing opportunities, are already well exploited by the criminal fraternity. For example, SPT doesn't even have a data capture function, which reduces its utility to bad guys enormously. What it does have is the potential to be a great in-house resource for teaching employees what not to do. See it for yourself at **www.sptoolkit.com**.

Unsafe

Research by YouGov suggests that 56% of public Wi-Fi hotspot users in the UK don't check whether the network is secure before connecting, while 86% of them do secure home wireless networks. Furthermore, 42% said they'd use hotspots more if security was guaranteed, and 40% "worry" about bad guys snooping on their communications when using them. Nevertheless, 14% actually used public hotspots for banking, while 15% had used them to buy items using credit or debit card! Wireless networking isn't that secure right now, so wireless providers need to do more to make their public hotspots safer.

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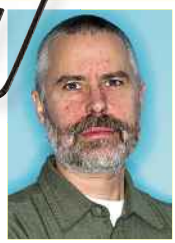
OFFICE APPLICATIONS

A month getting to know Office 2013

Simon Jones says Microsoft has fixed some of Office 2013's problems with the final release version, but too many frustrations remain



SIMON JONES

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I've been working with the release version of Office 2013 for about a month now: Microsoft made it available to Volume Licence holders and those with Microsoft Developer Network (MSDN) subscriptions just after I wrote my last column. So what's improved since the Preview, what's just as annoying, and has anything actually become any worse? My overall impression is that, while some of the Preview's bugs have been fixed, not much has changed. There are some improvements but I think I'd characterise these as being "less bad" rather than "better", if you get my drift.

The application icons are marginally less confusing as they're more easily distinguishable: the blue of the Word icon is now visibly different from that of Outlook, but Lync is still the same colour as Outlook. The glyphs used on these icons are clearer, but Lync with a yellow "Away" spot is still easily confused with Outlook showing a "New Mail" envelope: they're both the same blue with a white letter and a yellow blob in the bottom-left corner.

"While some of the Preview's bugs have been fixed, not much has changed"

There are now three colour schemes to choose from – White, Light Grey and Dark – or as we call them round here, "Blinding", "Boring" or "Dead". The White scheme is just as vile as in the Preview, with a headache-inducing bright white ribbon and application backgrounds. The Dark theme removes the application colour from the status bar and the File menu, replacing it with a dark mud colour. The application background becomes a gruel grey and the ribbon the sort of grey that you would see on an unwashed white van. The one thing this Dark scheme isn't is dark, it's merely less bright. The least offensive colour scheme is Light Grey, which keeps the coloured status bar and File menu but slightly tones down the blinding ribbon and application background. It's still very light and very boring.

The status bars on all the applications still use capital letters for all their messages, except for Outlook, which is a little muddled and says things like "THIS FOLDER IS UP TO DATE. NOW UPDATING Sent Items. CONNECTED TO: MICROSOFT EXCHANGE". Putting that folder name in mixed case just emphasises how strange it is to have the rest of the message in shouty capitals. At least Microsoft has toned down the status bar font so it isn't quite so in your face.

The ribbon tabs are presented in capitals too, but those provided by add-ins are still in mixed case. This includes add-ins from Microsoft, such as the "Load Test" and "Team" tabs in Excel provided by Microsoft Team Foundation Server. Having some tabs in mixed case and some in capitals results in a disjointed appearance. Microsoft has speeded up the transition of the caret, when it moves from one character to another, so that the animation isn't quite so noticeable; the selected range in Excel continues to annoy the hell out of me, however. Select a range of cells and they're outlined in green, which is the chosen application colour for Excel. Now select another cell and this green outline shrinks and slithers over to where you've just clicked like some kind of reptile – a completely unnecessary animation that makes my skin crawl. It doesn't

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add anything to the utility of Excel, and when you're presenting a spreadsheet to a remote colleague via Lync the animation smears, judders or just takes a long time.

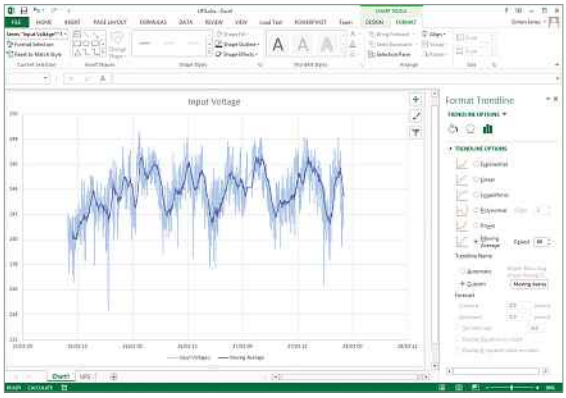
The ribbon text and icons still look very grey and washed out. The text is in a nice font, but none of it is black and the grey-on-grey makes it far harder to read than it should be. The icons use a palette of a few muted colours and are mostly grey with a single accent colour, but at least they're not as bad as those in Visual Studio 2012. When Microsoft introduced these UI changes in Visual Studio 2012, it claimed this was so the code you write would stand out more from the tools. I might accept this same explanation for Office, if Microsoft hadn't also changed the fonts and colours used in the standard document themes to make your documents more grey and muted as well. The default font for titles and headings used to be Cambria, Bold, in dark blue; in Office 2013, the title and heading font is Calibri Light – a much thinner font – and in a pale blue, which makes the headings stand out far less than they did in Office 2007 and 2010.

The default colour scheme has also ditched the bolder red, orange and purple in favour of lighter orange, yellow, green and grey. The old font and colour combinations are still available, but you have to choose them separately from the Design tab, since there isn't a built-in theme that lets you select them with one click. I strongly suggest that everyone looks at the built-in themes and style sets to see whether one of them matches your company's personality better than the default. You can also customise any theme with different fonts, colours and effects, and then save the result and make it your default theme. System administrators can distribute custom themes to all the users in a company so that everyone uses the same one, unifying the look of all your documents across Word, Excel, PowerPoint and Outlook. There's an Open XML Theme Builder application available on CodePlex, which introduced new features such as Theme Variants in PowerPoint, but it hasn't been updated since 2009 and so probably won't work with Office 2013.

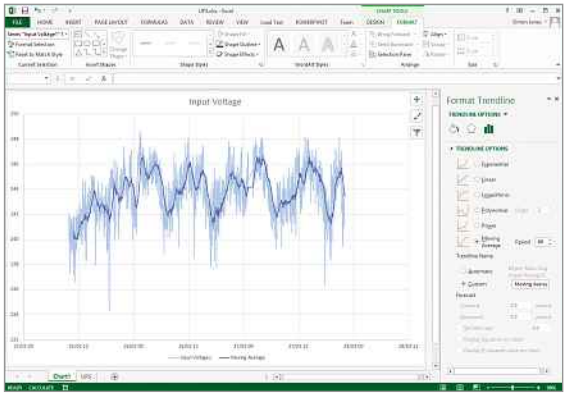
Visual Studio 2012 has a UI Theme Editor add-in that enables you to change the colour scheme from the default grey to any colour of your choice. You can't change the grey icons, but you can make the rest of the UI more bearable and distinct from your application and code. If Microsoft made such an add-in available for Office 2013 it would please a lot of the critics, myself included, who find the bright white or bland grey so unappealing.

One feature that has been removed from Office 2013, much to my disappointment, is the ability to add AutoCorrect entries directly from a misspelled word. Previously, when you right-clicked a misspelled word you could choose to correct the word, add it to the dictionary, or click AutoCorrect to correct the spelling, so it would always correct that particular misspelling from then on. This was handy for mistakes that were being made often, in that you could easily notify Word to compensate for this idiosyncrasy. Without this right-click shortcut, however, you now have to go to File | Options | Proofing | AutoCorrect Options and enter the word pair manually, which, needless to say, is a right pain in the posterior and just won't get done, so you'll end up wasting more time correcting common mistakes that Word used to correct for you.

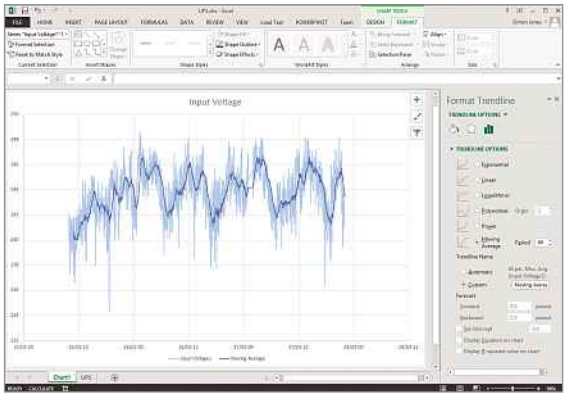
I can't think of any good reason for Microsoft to have removed this feature: it's "simplified" it right out of existence. I had hoped it was just an oversight in the Preview, but it appears to have gone for good, because you can't customise the right-click menu. The best you can manage is to put the AutoCorrect Options command onto the Quick Access Toolbar so at least you don't have to go round the houses via File | Options. Two AutoCorrect Options commands are presented when you go to customise the QAT or the ribbon: the one without an icon is the full dialog, while the one with an icon is the simplified dialog without access to the "AutoFormat As You Type" and "Math AutoCorrect" pages.



The blinding White colour scheme shows little or no distinction between the document and tools



The boring Light Grey scheme is little better, but the status bar is less obtrusive



The dead Dark Grey scheme is hardly dark. Notice how the add-in tabs on the ribbon aren't capitalised

Word 2013 custom XML improvements

Word's Custom XML features have been used by enlightened companies ever since Word 2007 to help automate document production. They enable Word documents to collect and show structured data from more formal systems, such as line-of-business databases, by embedding XML packets of data into the document and surfacing that data through content controls. This can be used, like document properties, to push data up to SharePoint and other systems, but also to pre-populate documents with data as they're created – for example fetching a customer's name and address from a central database and pushing it into a letter, rather than forcing the writer to type this data again and make the inevitable spelling mistakes. Other applications can get at the Custom XML data in Word documents without having to automate Word to do so – they simply treat the DOCX file as a zipped archive (which it is), then open the ZIP package and read or write one or more of the XML files it contains. Microsoft makes all the methods necessary to manipulate the packages available through the Open Packaging Conventions libraries in the .NET Framework, or you can write

Office 365

If you don't want to go to the expense and hassle of installing and running a new Exchange server then Microsoft will be very pleased to sell you subscriptions to Office 365, where it will take care of most of that for you, provided you have enough internet bandwidth to support it.

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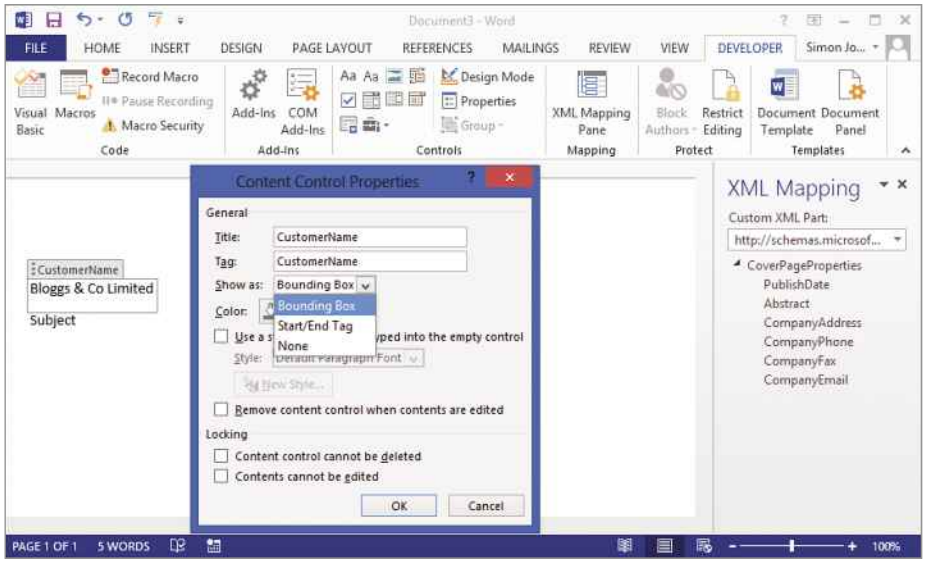
your own routines based on any library that supports ZIP files.

Word 2013 brings a couple of major enhancements to this system, including one to fix a major omission that's bugged any developer who's ever tried to use Custom XML parts before. At last Microsoft has added a Repeating Section content control so that you can show/enter whole tables of data into Word rather than only isolated fields from a single entity. There were workarounds – kludgy programming tricks to make rows repeat to show a table of data, such as invoice lines – but no built-in mechanism to do this or let the user type repeating data and have the document collect it in a structured way to be passed on to a database system. The Repeating Section content control can surround a paragraph or a table row that contains text and other content controls. It will automatically repeat itself for every entity in its XML packet, and the user can add new entities by clicking the blue "+" sign present on the last row, or delete an entity by using the right-click menu.

There's a new rich-text content control that allows text within it to be formatted and preserves that formatting by serialising it into the XML data. You can now choose how to show each content control – with an outline bounding box, start and end tags, or with no visual indication – and you can also choose the colour of the outline or tags. You can set this colour in the ContentControlOnExit event for sophisticated conditional formatting. However, I prefer to use the outline style for content controls since it disrupts the layout of the document less but still lets the user know when they're reading or writing structured data.

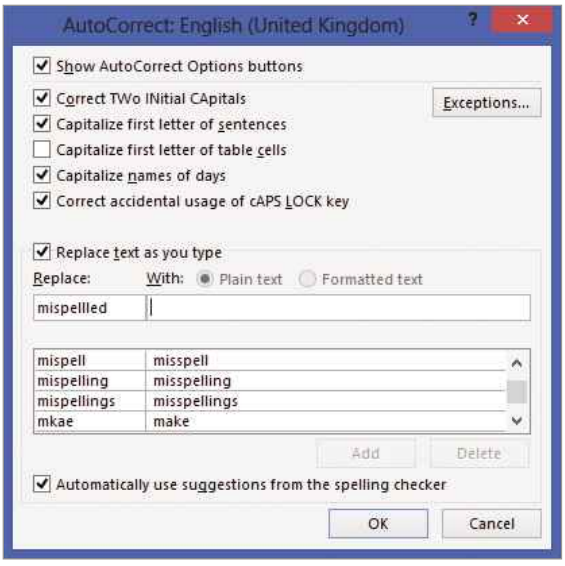


Custom XML controls in Word are now much more useful – and about time too

Another new feature is the XML Mapping Task Pane, which lets you add a custom XML part to your document and then insert content controls, or map existing content controls to that data. You can use an XML definition file typed in Notepad, or one output from another system to use that system's data definition. Once you've added the custom XML to your document, simply right-click the nodes in the XML Mapping Task Pane and choose Insert Content Control and the type of content control you want to use at any place in the document. Use the Developer | Controls | Properties command on any content control to pop up the Properties dialog and set more options such as the title and colour of the control.

> **"I'd be impressed if it was honest enough to say 'that's just the way we designed it'"**

The XML Mapping Task Pane in Word 2013 obviously owes its existence to a CodePlex project of the same name for Office 2007 and 2010; if you want these features for earlier versions then you can download that tool for free from **http://xmlmapping.codeplex.com**.



AutoCorrect entries, which could be added directly from the right-click menu, now have to be done manually

Office 2013 bugs

There are a few known bugs in Office 2013 that may trip you up, and Microsoft's list of known issues marks bugs as applicable only to the Preview code, despite some still being present in the release version. Here are some of the more common ones.

- Outlook 2013 doesn't show its Jump List when you right-click its taskbar icon. To fix this, unpin Outlook from the taskbar, close Outlook and delete the Registry key HKey_Current_User\Software\Microsoft\Office\15.0\Outlook\Setup. Open Outlook again and re-pin it. This bug is annoying as it can keep recurring even after you think you've fixed it.
- File | Share | Send As Attachment doesn't work if you have Outlook 2013 installed alongside an earlier version. To get around this, close the earlier version or create a new message and use Insert | Attach File instead. This bug applies only if you use the Office 365 Click-To-Run installer for Office 2013. Using the standard MSI installer will force you to remove any earlier version of Outlook.

Microsoft lists several workarounds for these bugs that boil down to variations of that tired old joke "Doctor, Doctor, it hurts when I do this"... "well don't do that, then". For instance, Microsoft's advice on the problem "Error when connecting to Exchange 2003" is "Workaround: Outlook 2013 isn't supported on Exchange 2003 and connectivity is blocked. Please connect Outlook 2013 to Exchange 2007, 2010 or 2013". This isn't much use unless you're a system administrator with the money, time and authorisation to upgrade your company's Exchange server. I'd be more impressed if the company was honest enough to say "that's just the way we designed it".

Exchange 2003 is ten years old, long out of mainstream support and, as with previous versions, Microsoft is using the release of a new version of Office to push people into updating its other ageing systems as well. If this comes as a surprise, you'll be shocked to learn that Office 2013 won't run on Windows XP or Vista, either. The list of known bugs, or rather the ones that Microsoft is confessing to (with their hilarious workarounds), can be found at **www.pcpro.co.uk/links/221oa**.

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WEB APPS & DESIGN

The graphical web returns to ground zero

Tom Arah takes a look at Adobe's plans to replace Flash with new tools and open standards, and sees plenty of reason for optimism

TOM ARAH

Set up his Edinburgh-based design company in 1987. As well as design work, he provides training and consultancy. Email tomarah@designer-info.com

Adobe plans to turn the standards-based web into a graphically rich, expressive platform

For more than 15 years, professionals wishing to push the web envelope beyond the capabilities of HTML turned to Adobe Flash (or, more recently, Silverlight). Now, though, the future of web browsing is moving to mobile browsers that no longer support these plugins, so what's the modern alternative? Without a plugin, the only way to do it is in the browser. Both Adobe and the web design community must follow Steve Jobs' advice from 2010, when he announced Flash wouldn't be allowed onto iOS: use open browser standards instead.

As Jobs put it then, "HTML5, the new web standard… lets web developers create advanced graphics, typography, animations and transitions without relying on third-party browser plugins (like Flash)… Perhaps Adobe should focus more on creating great HTML5 tools for the future, and less on criticising Apple for leaving the past behind." Put that way it sounds reasonable and straightforward, but Adobe disagreed – no surprise given Flash was its unique selling point, the rich web format that held together its entire Creative Suite (from Premiere Pro through to InDesign), and the basis for its future mobile plans.

> "Adobe has repositioned itself as a champion of next-generation HTML5"

Without Apple's support, and hence without cross-platform universality, the writing was on the wall, and so the rhetoric and Adobe's entire business strategy has changed. Flash in the browser is now rarely mentioned, and Adobe has repositioned itself as a champion of next-generation HTML5, taking Jobs' advice in launching a range of tools designed to set the benchmark for standards-based web creation.

The most significant of these is Adobe Edge Animate, which is designed to create the rich, animated, interactive web experience that previously required Flash. It costs $499, but to encourage take-up Adobe has added it to the apps available through Creative Cloud (*see issue 219, p97*) and has made this first release free – here's your chance to give your standards-based web projects a professional edge.

Back to the drawing board

So how does Edge Animate compare to Flash? Let's start with the drawing tools, and you're in for a shock since there are only three: the Rectangle tool, Rounded Rectangle tool and the Ellipse tool. Flash Professional's Deco tool for drawing animated fire or vegetation effects is long gone. You don't even get a Brush, PolyStar or even Pen or Path tools – in fact, you can't actually draw a straight line unless you fake it with a thin rectangle! It's back to the drawing board alright, but without any tools.

Edge Animate's formatting capabilities are no compensation, either. From the Properties pane you can choose flat colours for fill and outline of rectangles or ellipses, set the line width (solid, dashed or dotted), and that's about it. Special effects? A flat opacity setting and a shadow option, or to really impress you can set a different curvature for each corner of your rectangle. There are no gradient fills, no textures, no procedural effects, brush outlines, graduated transparency or blend modes. The message is pretty clear that you're supposed to do any serious artwork externally, so you might expect that Adobe has enabled you to cut and paste vector drawings directly from Illustrator into Edge Animate. You'd be wrong: the only route is via awkward export and import. Moreover, scalable vector graphic (SVG) images

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are automatically flattened, so you can't access their independent elements, which means you'd be better off using JPEG or PNG bitmaps unless you explicitly need resolution-independent scalability. As the help file puts it, "for the time being, it's safer to use PNG".

Edge Animate does at least let you add text within the program, although you can edit it only in an awkward little dialog box. Formatting includes control over letter, word and line spacing, as well as paragraph alignment and indent. It also includes size and font – but forget about advanced effects such as fitting text to a curve, or within an irregular shape (not that you can create one anyway). Worse still, don't expect to simply specify any typeface installed on your PC as you could with Flash – the default is those same old web font families of which we're all so familiar and heartily sick of (although Adobe's new Edge Web Fonts service may improve matters here).

Animation is handled via the Timeline panel, by specifying time-based keyframes and changing property values. It's very different from Flash Professional's frame-based approach and takes some getting used to, but it's certainly more modern and, as programs such as After Effects show, can be just as powerful. However, the power of property-based animation clearly depends on the properties on offer, and those are disappointing.

There are other limitations. Without frames you can't quickly create flick-book-style sequential animations, those "vector videos" with which Flash made its name. Neither can you create advanced effects such as animating along a custom motion path, shape-based tweening, 3D transforms, variable filter-based special effects or bone-based animation. It's all pretty static for a dedicated animation package.

So what about interactivity? As you'd expect, this is handled through scripting. To create a button, for example, select a drawn or placed element, then Open Actions and select an event (say click, mouse-over or touch), then enter the desired JavaScript code. To help with this Edge Animate has a range of prefabricated snippets for timeline handling (such as play, stop, playReverse), for managing your symbols and elements (hide, show, setVariable), and for loading a new page/URL. Put these snippets together and it's relatively straightforward to create simple interactions.

However, comparison with the latest Flash Professional is once again telling. Edge Animate offers only 16 snippets while Flash Professional CS6 offers dozens, but the real difference becomes apparent when you move beyond the presupplied samples. With Flash Professional's ActionScript 3 API you have full drill-down access to all the properties, methods and events of hundreds of classes ranging from Accelerometer through to XMLSocket, plus code IntelliSense and debugging capabilities. With Edge Animate, you're limited to controlling the capabilities of the browser through JavaScript, without any special coding or debugging support beyond syntax colouring.

> **"At least Edge Animate offers the sort of universality that Flash no longer can"**

Time to publish

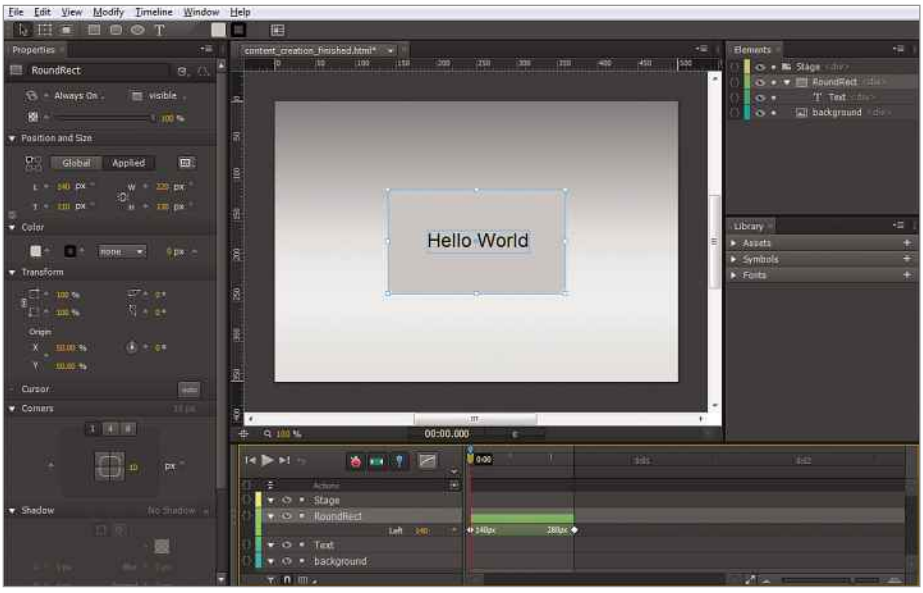
Okay, you've struggled through and are ready to publish. Using Flash you can generate a single, easy-to-deploy, highly efficient SWF file of less than 10K in size containing all the vectors, bitmaps, text and code, ready for streaming delivery to all supporting platforms and browsers via the Flash player. With Edge Animate your output is a hodgepodge of separate HTML, CSS, JavaScript and asset files, and even the simplest animation requires more than 200K of support code in the form of jQuery and the dedicated animation framework that Adobe built on top of it.

At least Edge Animate offers the sort of universality that Flash no longer can, and your animation should appear as designed on Android, Kindle, BlackBerry and the all-important iOS, thanks to shared reliance on the WebKit layout engine that Edge Animate employs (plus the current most popular desktop browsers – Chrome on Windows and Safari on Mac – are also WebKit-based). But remember that WebKit isn't the only target, because on the desktop there are Firefox, Opera and Internet Explorer, along with their increasingly important mobile incarnations. Thankfully, the latest version of each offers advanced support for HTML5 so your project should render more or less as expected (but only more or less).

A bigger problem is that not all your site visitors will be using the latest versions and, in particular, older versions of Internet Explorer offer only spotty HTML5 support, while IE8 and earlier can't render SVG at all. There are probably as many non-HTML5 desktop browsers as there are HTML5-only mobile browsers. There's a partial workaround thanks to the ability to turbo-charge older IE releases using Google Chrome0 Frame. This just about enables Edge Animate to claim web universality and seize Flash's crown, but asking visitors to download a plugin to view open content is both awkward and undesirable.

There's another problem, too. Getting your project to appear is one thing, but performance is another. No-one would claim that Flash was perfect, but both player and SWF format were designed from the ground up with one aim: to ensure consistent delivery and smooth playback over the web. With open-standards-based delivery, both renderer and JavaScript implementations are out of Adobe's hands and depend on widely varying browser implementations. This caveat in the Edge Animate FAQ is significant: "Please note that performance of animations are based on a number of factors, so it is possible to create content with less than optimal performance."

This is more than just an occasional issue. I loaded Adobe's Edge Animate showcase example (**www.pcpro.co.uk/links/221wa**) under recent versions of Chrome, Firefox and Internet Explorer, and discovered inconsistent layout (for example, the main strapline overflows onto two lines under Chrome), long load times, occasional executions problems (on one occasion Firefox froze), and generally jerky playback, especially of more complex



Compared to Flash Professional or Expression Blend, Edge Animate's creative power is dismal

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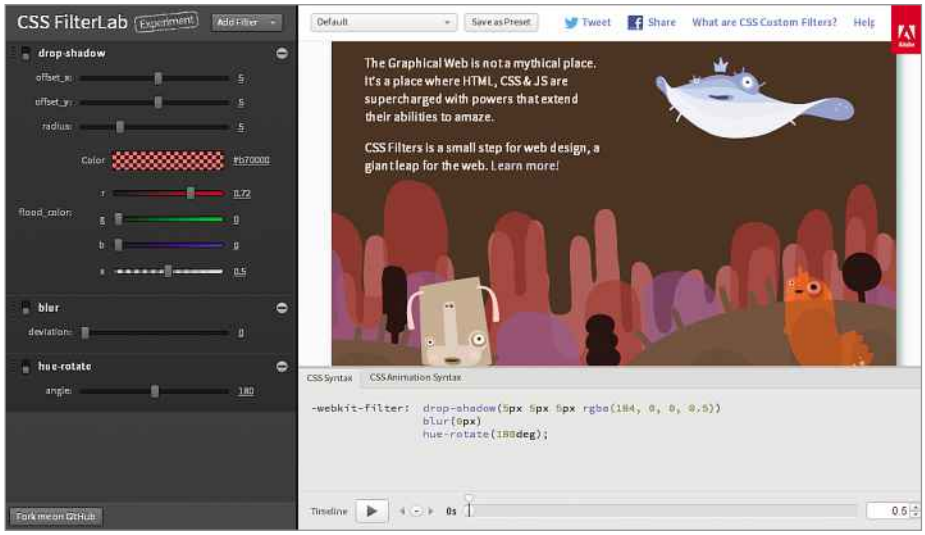
animations. Surprisingly, IE9 seemed to deliver the best performance, but even this wasn't as smooth as I'd expect with Flash.

The only way is up

Let's take stock. Compared to Flash, Edge Animate's drawing tools, creative options, animation capabilities, programmability, deployment and performance are awkward, underpowered and inefficient – and that's ignoring Flash's extra capabilities for video, Rich Internet Application development, console-quality 3D and so on. Edge's performance isn't only embarrassing compared to the cutting edge, but incredibly it offers less creative power than the very first release of Flash. This brave new world Steve Jobs promised is actually a step back 15 years.

So what's going on? Many will accuse Adobe of failing to deliver, even of sabotage to make Flash look good, but the problem lies with the technology on which Edge Animate is built. HTML was designed as a mark-up language for structuring hypertext content, with all presentational issues deliberately avoided. CSS has improved HTML's design capabilities immensely but it still isn't PostScript. Moreover, all usage of CSS, as with SVG, is dependent not only on the browser developers' varying implementations but on the lowest common denominator of the worst current implementation. If all you have to play with as a universal design platform is the element and some basic CSS, it isn't surprising that you'll end up desperately shuffling PNGs around.



Adobe is working on new CSS-based capabilities to improve browser-based design

> **"HTML and Edge Animate should finally catch up with what Flash 4 could deliver"**

There are reasons to remain positive, however. At least it's completely clear now that the battle has been conclusively lost: Flash and Silverlight are being driven out of the browser so an open web standard alternative is urgently required. That's precisely what Edge Animate delivers. Two-and-a-half years after Steve Jobs' bombshell, we finally have an open-standard alternative that more or less works, more or less universally, and more or less enables HTML to start moving into Flash's territory.

Yes, we're at graphical ground zero with HTML5, but this means the only way is up. Things should start looking brighter soon, as IE8 and below are flushed out of the system and it becomes safe for both Adobe and its designers to start deploying SVG and more advanced CSS3 features. With support for vectors, web fonts, richer formatting and transitions, HTML will radically improve as a creative platform. Presumably Edge Animate will take advantage, and PNG bitmaps will take on a supporting rather than starring role.

HTML and Edge Animate should finally catch up with what Flash 4 could deliver in the late 1990s, but that won't be the end of it. Along with the launch of its Edge tools (including Code and Reflow, which I plan to look at in a future column), Adobe also announced open-standard initiatives aimed at overcoming five limitations of current web design: the inability to deliver magazine-style flowing layouts; irregularly shaped text islands; blend mode effects; geometric transformations in 2D and 3D space; and cinematic effects such as blurs and colour transforms. To fill these holes it's championing new W3C modules called CSS Regions, CSS Exclusions, CSS Transforms, CSS Compositing and CSS Custom Filters, and working with browser manufacturers to implement them.

This isn't all. Visit Adobe's demonstration site at **www.thegraphicalweb.com** and the explanatory video (**www.pcpro.co.uk/links/221wa1**), and you'll see the company has a roadmap for rebuilding the web's graphic capabilities starting with HTML's core element. CSS and SVG are clearly crucial for this, but eventually <canvas> will be too. This HTML5 element allows a browser to write pixels directly to the screen as instructed by JavaScript. Using dedicated libraries such as WebGL it's even possible to render 3D shaders via the GPU – again something that Edge Animate should be capable of taking advantage of in future, along with <video> and <audio> once browser support becomes universal and stable.

How far can all this go? With web vectors, fonts, pixels, multimedia and ever-improving JavaScript performance and support frameworks, can we simply recreate the Flash Player using only these open standards? I doubt it. With Flash and Silverlight, Adobe and Microsoft were able to build dedicated rich design, application and performance capabilities from the ground up by targeting single, tightly controlled players. Trying to graft similar power onto a mark-up language that wasn't intended for graphic design, in a robust, reliable and efficient fashion across varying browser implementations is asking too much. It may be possible to raise the ceiling for HTML5, but not to break through it.

The loss of Flash and Silverlight placed a cap on the capabilities of the web platform, with the result that the richest experiences are being driven out of the browser and into the app stores. This isn't necessarily bad news for Flash and Silverlight developers, who are best placed to produce such apps, but inside the browser the only future is HTML. The good news for web designers is that while we have to work with an inferior platform for now, its quality looks set to improve comparatively quickly. Don't be too put off by the limitations of this first release of Adobe Edge Animate, because the standards-based web is about to turn into a far richer and more expressive platform, with which designers will still be able to produce stunning work.

Never again

There's one further consolation for us Flash and Silverlight users who face a forced return to the ground zero of HTML5-based authoring. Working within the browser rather than the player does indeed mean demotion from leading edge to lowest common denominator, but it's precisely this that will guarantee universality in future. Stay within the limitations of the web standards and no-one will ever be able to turn your work away from their devices, nor turn back the clock again.

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NETWORKS

Ten tips for handling your techie

Steve Cassidy shares helpful advice on how to deal with that most underestimated of PC resources – the friend who's an IT "whizz-kid"

STEVE CASSIDY

Steve mixes network technologies with human resources consultancy work. Read his blog at www.pcpro.co.uk/blogs/stevecassidy. Email cassidys@cix.compulink.co.uk

Hello. You've been given this to read because you've recently asked a friend or neighbour to look at your PC, and you're a bit puzzled by the leisurely pace at which the process has gone since they sat down in front of your machine. You probably know this person by reputation – other friends will have identified them as a professional in the IT business, or as a "whizz-kid". Incidentally, I'm 50 this year and people still call me a whizz-kid, so quite clearly the term tells you more about the speaker than it does about the subject.

Be that as it may, I'll explain to you why it is that so-called whizz-kids may well be completely stumped by the state of your humble home computer, which should at least give you something to read and fuss over without interrupting whatever it is they're doing. If this starting point surprises you, then it's probably as good a time as any for me to hand you the first in what will be ten snippets of wisdom.

"So-called whizz-kids may well be completely stumped by the state of your home computer"

Snippet one Fiddling with a "home computer" can require levels of concentration so high that your civilised conversational gambits will be utterly ignored. By far the best thing you can do is go outside and mow the lawn or wash your car and wait for the whizz-kid to resurface.

It's perfectly possible for a professional networks person to spend their entire working life using products with names that look similar to the ones you use, without them ever having seen the kind of problems that you encounter every day. However, if they're really good this won't present too much of a challenge, because (so long as there's another working computer they can use) they'll be pretty good at looking things up on Google. If you spot them doing this, don't make smart remarks about them not being as clever as they think they are. If you really do feel obliged to offer snark, then at least wait until you've seen how many words they type in as a search term: if it's four, then go back outside and continue washing the car; if it's six or more, go back outside and wash their car too.

Snippet two How long should the process take? What is a reasonable expectation? First answer is: at least an afternoon. Be prepared at the very least to cook them a meal or make them a sandwich, before you ask them to start. Asking "what do you computer people eat?" at 9.30pm, or failing to invite them to the family table while you're eating, is what's known in the IT business as being a "luser", and it's likely to cause them to weigh up whether the loss of reputation attendant on just walking out on you is greater than the reputation gain from fixing a nasty hardware or malware problem. And yes, the term "luser" is both a portmanteau of "loser" and "user" and a dig at the ambiguity of "user" status: people who only "use" things such as PCs often "use" useful people such as computer nerds, but we IT professionals are attuned to this subtle form of social abuse, so make sure you avoid committing it.

Most mid- to large-sized companies put plenty of preparatory effort, and behind-the-scenes defence, into their computer investments. That money – spent mostly in good design decisions and humming boxes in the server room – is paid back in the speed of recovery from even the faintest echo or tiny rumble of the kind of earthquake that can strike a home

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The best approach is to let the IT professional get on with it – without distractions

PC. What I'm trying to impress on you is that just because you see these IT people lazing about at work, and just because most end-of-day problems are magically fixed the following morning, don't be fooled into expecting that these same people would take the same time to unravel the mess that's on your home PC.

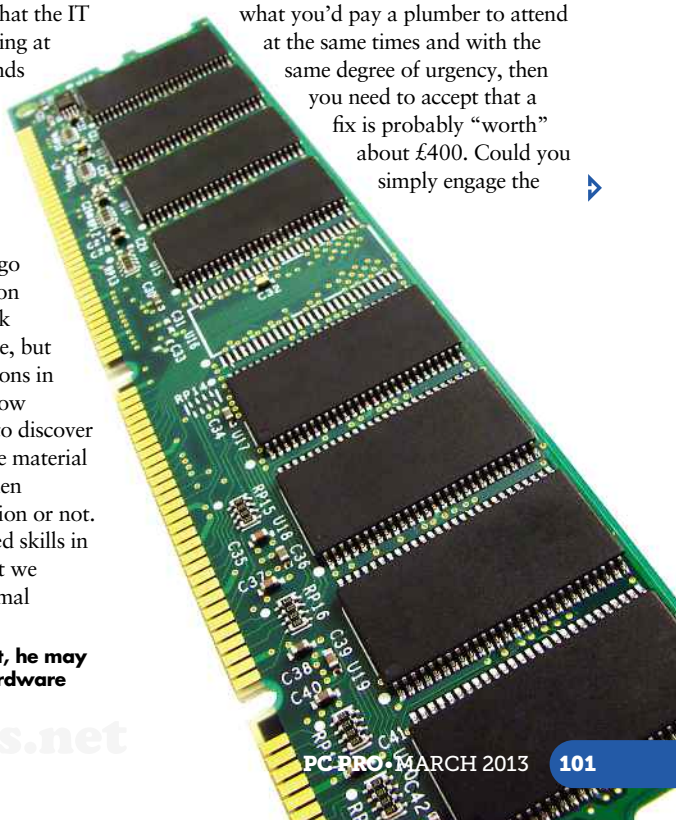
Snippet three As an exercise, guess just how many files there are on the average Windows home computer. Ask your friends (the non-computer ones at least) to guess too. I'm not going to tease you: it's between a quarter and a third of a million – and that isn't only your photos or music tracks. In any case, for a network guy there's very little difference between the files that make up the computer's software library and your pool pictures from Tossa de Mar. Unless you've been unusually tidy and well informed then just finding the places where you've scattered a trail of odd files may take a couple of hours in bad cases. If it turns out you've been using the password-storing features of Internet Explorer, Firefox and the like, and therefore have no other separate record of your logins to… well, these days, actually to *everything*, then asking him to magically retrieve all those passwords for you before he does anything destructive will at least double the time he requires, and will triple it on a Saturday because you won't then be able to ask for or test the new passwords, since most e-commerce services don't run a Saturday helpdesk. And no, I don't want you to write in and send me a list of the ones that do just to prove me wrong.

Snippet four If you've gone so far as to set up multiple user accounts on your family PC, then make sure that you have a list of all the places your family visits regularly on the web, and that you also have some idea of what your family gets up to while they're seemingly just sitting there quietly clicking the mouse. I'm not saying this is mandatory – the way you run your family is up to you – but make no mistake that the IT guy now sitting at your PC stands a high chance of discovering not only how you think you run your family, but also what your family thinks about it and whether they're sticking to your rules or not. This is the real reason why I advised you to go out and wash the car: my stated reason still applies – namely, these guys work better when they're left to concentrate, but if there should prove to be any skeletons in the family closet then you need to allow this hapless computer guy the room to discover them, decide whether any of them are material contributors to your problem, and then whether to bring them to your attention or not. That actually demands quite advanced skills in psychology and diplomacy, skills that we network people seldom have any formal training in, and which the popular perception of us promoted by programmes such as *The IT Crowd* suggests that we're unlikely to be congenitally endowed with either.

"Asking anyone to narrate what they're doing while troubleshooting is irritating"

Snippet five Don't hover or cross-examine. Showing an interest in the tools these guys are using, and following closely how they do what they do, is all very laudable, but asking anyone to narrate what they're doing while troubleshooting is both a basic error and an irritant. Just because people on TV look like that's what they're doing, don't confuse that trick with what happens right in front of you. Network and IT people are frequently subject to micro-management by stressed, ignorant or bullying bosses, and sounding even slightly like one of them is unlikely to win you the best possible grade of help.

Snippet six Work out your budget. If it's the case that your computer is your livelihood, and all you have is 50 quid in a pot on the mantelpiece, then say so upfront. If you can't spend much more than that £50, say so right at the start of the process, because that's enough for a stick of memory and a bigger hard disk given the skills and buying contacts of a network person. I shouldn't need to say at this stage that expecting a fix to be applied during a single visit on a Sunday, before you're about to email off your dissertation, when all the cheap disk shops are closed and Monday's the deadline, isn't likely to bode well for you or your relationship with your network-professional neighbour. If a half-day can be taken as a fair estimate of the average fix time, and you consider that it would be only polite to value a proper professional at, say, half what you'd pay a plumber to attend at the same times and with the same degree of urgency, then you need to accept that a fix is probably "worth" about £400. Could you simply engage the



If your IT guy knows your budget, he may be able to source some cut-price hardware

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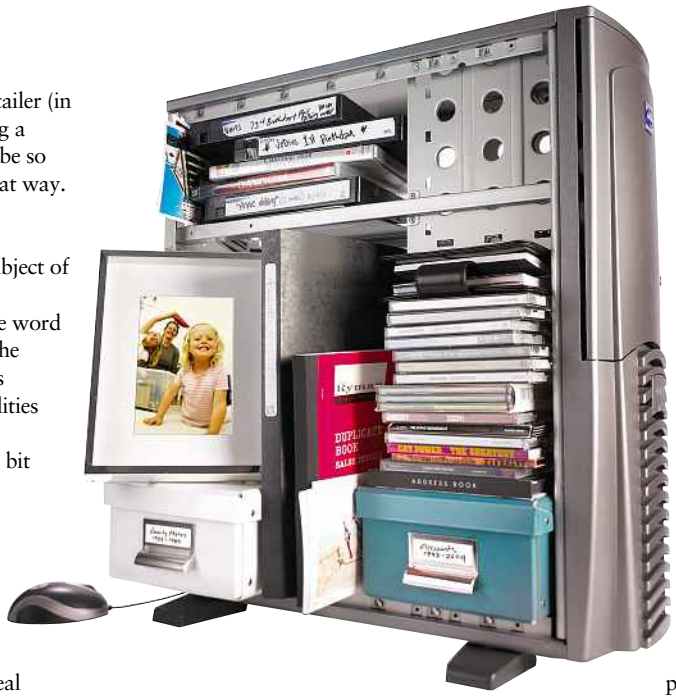
professional in a quick visit to a PC retailer (in person or online) with a view to buying a straightforward replacement? It could be so much easier for both of you to do it that way.

Snippet seven While we're on the subject of money, don't ask a network person to participate in your interpretation of the word "free". This is confusing territory for the home user in particular, with free trials that turn into paid-for lock-ins, for utilities that promise to protect you against "ransomware", which now look every bit as convincing as the removal tools for them… and that's before we consider bloatware (programs that claim to be valuable, but in fact consume the entirety of your machine when in operation), or even the confusing and often downright contradictory provisions of the 100% kosher, real-deal software vendors themselves.

One thing that may have changed since you were last down the pub with a self-confessed "computer person" is that the whole ecosystem of dodgy copies of Microsoft Office has dried up and blown away. Once upon a time there were effectively "free" copies, and yes, corporate IT people were given such things, but don't presume any offered copies are free of risk, to you or the documents you intend to create with them. And whatever you do, if you want your PC actually fixed, don't get sniffy with the guy when he says he can't get involved with free, cheap or knocked-off software. It's demeaning.



How many files are stored on the average PC? The answer might surprise you

Snippet eight Never, ever, whatever you may be thinking, ever try to play the "consumer rights" card after asking for help like this. Your consumer right as a computer user is a repaired machine with absolutely none of your data left on it, left in a perfectly empty, perfectly functional state. The only vendor that will take any care with your data (most people imagine that everyone does) is Apple, aided and abetted by its amazingly handy FireWire target disk mode hack.

Snippet nine Your reluctance to make backups over the years isn't the fault of the IT profession as a whole, and there's nobody you can sue when it all goes missing. Incidentally, those disks you can get from most high-street retailers, the ones with a nice plastic casing and a hot, buzzy little power supply, those aren't backup devices. Those are little mousetraps for your data, just waiting for the day when they can snap shut on many gigabytes of happy memories. A backup disk has two physical drives inside the case, or a cooling fan on the back that whirrs merrily when you give it work to do.

Snippet ten Slow PCs don't magically get faster as soon as a professional sits at them. If your PC takes 25 minutes to even show a desktop or a login prompt, then don't expect the whizz-kid to fix it in five minutes flat. It's possible to recover machines from such a state of sloth, but the recovery process will be drawn out and hard to estimate until really very close to the end. The best way to cope with painfully slow machines is to hand them over to your helpful nerd and tell him to attend to it while he's doing something else, since most of the entire day it will require to recover a painfully challenged PC is spent sitting watching progress bars, and if that's spent with the poor bloke sat on your dining room furniture, conversation is likely to get strained pretty quickly.

Stupid virtualisation trick of the month: helper VMs

Nobody really likes snapshots. These are the smart trick in everyone's hypervisor by which the files making up a VM are set to be read-only, and any changes are written instead to a snapshot file. The longer the machine runs, the bigger the snapshot becomes, until ultimately it exceeds the size of the basic VM itself and produces agonising slowdowns. And, of course, bad things happen if the cumulative size of your snapshots exceeds the available disk store.

The proclaimed advantage of a snapshot is that if the place where bad things are happening is inside the VM rather than outside it at hypervisor level, then you can roll back to where you started just by discarding the snapshots. Which is fine provided you're working within about a working day's worth of typical changes to a regular PC, but very far from fine if you're storing 100,000 transactions in a SQL Server database.

The neatest way to improve recovery time in a situation where snapshots are a bad fit is to use the concept of a "helper VM". This is most simply described as a bystander – a second VM that sits near to the one you're worried about (where "near" means "can use the same data stores and volume files"). A helper is, generally speaking, shut down while the lead role is active – in fact, one common setup is that the helper is a total clone of the lead role VM files. You're permitted to do this, whether inside VMware or Hyper-V, and you can even run both VMs at once, although this would be pretty pointless since the part where it goes wrong is in the networks layer, and there's precious little point being unable to get to one, or both, copies.

So the idea of this configuration is that as much as possible has been taken off the C drive of the VMs, and spread around one or more auxiliary data stores and disk volume files. Both lead role and helper have settings in the hypervisor to link those volumes to drive letters. Crucially, though, the helper also mounts the C drive of the lead role machine as a redefined drive letter. It boots from its own C partition, but can see the C drive of the lead role machine as if it were in bits on the desk and its hard disk stuck in a USB drive dock.

Most of you will already have realised that this is useful for deep antivirus scanning, although there are other scenarios where it can be applied, such as to split up configurations for collecting syslog files from a complicated WAN made up of many firewalls from the reporting server that has to slice and dice the output of all that paranoia.

Notice the temptation here to run two VMs (not necessarily clones) that map some drive letter to the same data store. This isn't a good use of a hypervisor's feature set, and pays off only with the most simple kinds of shared file accesses: if something must be shared then use a guest OS to carry the burden and logic of sharing, not the hypervisor.

Oh, and if you've strayed in here from the main body of the column, don't worry about this bit, it's techies-only stuff.

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Are we wise to trust so much of our lives to the cloud, wonders JONATHAN BRAY?

During a wistful moment this month, my memory was drawn to the early days of personal computing, and the beginning of my career on *PC Pro*. My first stint on the magazine began in 1996 (yes, it was that long ago folks). Back then I was still transferring files from PC to PC via floppy disk, and the Spice Girls were top of the charts.

Back then, the internet was an interesting aside, and clouds were exactly that – portents of rain, sleet and, on the odd occasion, an inch or two of snow. Since then, the world has changed out of all recognition; the Spice Girls have long gone (thank heavens), and clouds now occupy the centre of everything we do with our computers.

Cloud computing allows me to do things I couldn't even have dreamed of all those years ago. On Spotify, I can listen to a world of music wherever I can find a data connection. Dropbox allows me to work on files across myriad devices without having to think about saving a copy to a physical drive or disk. I can take photos on my smartphone and, as if by magic, they'll be waiting in a folder ready for editing on my laptop when I get home. In 1996, I didn't even own a mobile phone, let alone one with a built-in camera, and every new album required a trip to HMV.

Increasingly, cloud connectivity is also becoming an essential part of today's hardware. Smartphone makers have been at it for years, but there's now a phalanx of other devices joining in. Tablet-based ebook readers such as the Barnes & Noble Nook HD (*see p119*) and Amazon Kindle Fire rely on cloud services to supply reading material, apps, video and music. Samsung's Galaxy Camera (*see p112*) builds in 3G and Wi-Fi, combining the permanently connected, smartphone camera experience with a far better quality of photograph.

The latest Samsung Chromebook (*see p116*) takes the concept to the next level. Running Chrome OS, this lightweight, affordable portable runs everything in the browser – apps, word processors, spreadsheets, the whole shooting match. With a generous 100GB of Google Drive storage thrown in, you could potentially live your whole life in the cloud, with email, documents, music, video and games all stored on Google's servers.

This is all fine and dandy, but there's a catch. (There's always one of those, isn't there?) In the case of the Chromebook, the storage offer lasts only two years. If you want to add more files to Google Drive after this period has expired, you'll have to sign up for a minimum of $5 per month. It's the same story with other companies' seemingly generous offers. Buy a Samsung Galaxy S III or a Galaxy Camera and you'll receive 50GB of free Dropbox storage; fantastic, but you'll still end up paying for it after two years.

My concern is that, two years from now, we'll be using many more cloud services than Drive and Dropbox. And once we depend on those services on a daily basis, and those companies have won us over to the cloud computing model, encouraging us to leave our hard disk behind, who will prevent them from increasing their prices?

Could we reach the situation when we have to pay Spotify £30 per month just for the privilege of being able to listen to music, because we've given away all our old CDs? Will there be no more movies to watch or books to read unless we keep subscribing to Virgin Media, or buying Kindles and Nooks? What if all of our important documents are tied up in services that charge increasingly exorbitant fees for access?

> Those jumping aboard the cloud express could be hurtling headlong towards a future of spiralling costs

Just like commuters with no choice but to pay the massive fare hikes each year, those jumping aboard the cloud express could be hurtling headlong towards a future of spiralling costs and perpetual subscriptions.

I'm probably worrying about nothing. After all, right now, the positives of cloud computing and storage far outweigh the potential negatives. We've recommended the Chromebook this month precisely for those reasons – the good points (low price, comfy keyboard, portability and great battery life) far outweigh the bad.

We love the idea of the Galaxy Camera, too, and products such as these will continue to flow through the doors of the *PC Pro* lab, with an increasing number of them relying on the cloud to help them stand out. And let's face it, who would want to go back to the days of floppy disks and the Spice Girls? I know I wouldn't.

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We want your feedback – good or bad – on our magazine, website and apps. Please fill out our survey at www.pcpro.co.uk/links/readersurvey

JONATHAN BRAY is *PC Pro*'s reviews editor. He would like to reassure you that he absolutely, definitely isn't a closet Spice Girls fan.

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Photography: main intro, Danny Bird; cutouts, Hugh Threlfall; repro, Jan Cihak

Toshiba Satellite U920t

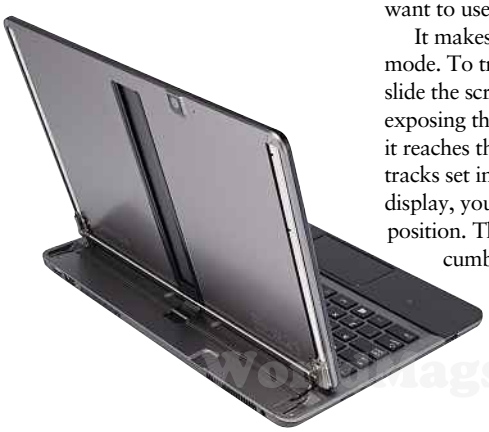
An ingenious slide-and-hinge mechanism lends this Windows 8 hybrid more flexibility than most; it's a pity that it's too big and heavy to use comfortably as a tablet

PRICE £748 (£898 inc VAT)
SUPPLIER www.laptops direct.co.uk

Windows 8 hasn't been out long, but it's already having a significant impact on the hardware market, with a swathe of innovative touchscreen portables and PCs launched in recent months. Toshiba is the latest to join the fun with the 12.5in Satellite U920t.

It's one of the new laptop/tablet hybrid brigade: a device that can be employed as a laptop, complete with full-sized keyboard and touchpad, but with a screen that folds flat against its chassis, facing outwards, so it can also be used as a tablet.

It sounds enticing, and to find it's slim enough at 20mm to be classified as an Ultrabook is encouraging, but get the Satellite U920t in your hands and the attraction fades. To start with, it's too heavy. It weighs 1.5kg, which is 200g heftier than the only other Windows 8 hybrid we've seen so far – the Sony VAIO Duo 11 (web ID: 377581) – and it's bulky compared to most standard Ultrabooks. Pick it up and your first instinct is to rest it on something; we certainly wouldn't want to use it one-handed.



An ingenious track and hinge mechanism means the Toshiba's screen angle is adjustable

It makes more sense in laptop mode. To transform the device, slide the screen slowly upwards, exposing the keyboard, then when it reaches the end of the special tracks set into the rear of the display, you haul it up into position. The mechanism is cumbersome compared to the lighter, pivoting panel on the VAIO Duo 11, but it's solid enough and has one critical advantage over its rival: the hinge is adjustable, so you can tilt the screen back and forth.

The larger size of the Toshiba U920t also means there's enough room for both a keyboard and touchpad, where the VAIO has only a trackpoint. The backlit keyboard is sensibly laid out, and a stiff base means typing is comfortable whether you're using it on a desk or propped up on your lap.

KEY SPECS

1.8GHz Intel Core i3-3217U • 4GB DDR3 RAM • 128GB Samsung PM830 SSD • Intel HD Graphics 4000 • 12.5in 1,366 x 768 TFT • HDMI • 2 x USB 3 • single-band 802.11abgn Wi-Fi • Bluetooth • Windows 8 64-bit • 1yr RTB warranty • 326 x 213 x 20mm (WDH) • 1.5kg (1.79kg with charger)

With the screen folded flat against its chassis, the Toshiba U920t can be used as a tablet, albeit a rather large, cumbersome one

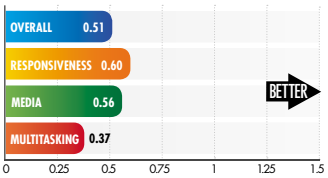
A sensible layout and comfortable key action means typing for long periods is a practical proposition

BATTERY: HEAVY USE 3hrs 30mins

BATTERY: LIGHT USE 5hrs 40mins

REAL WORLD BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



The touchpad is altogether less pleasing. It has a smooth surface and it's responsive, but the small size and horribly narrow integrated buttons make it fiddly to use. It lacks support for Windows 8's edge-swipe gestures; the only gestures that do work are the two-fingered scroll and pinch to zoom in and out. Disappointingly, there's no sign of a stylus either.

Happily, the rest of the design is far more practical. The screen housing feels robust and resisted our attempts at twisting it admirably. The base is rigid, and with the screen folded flat against the chassis things tighten up even further. Considering this isn't a standard laptop design, we're rather impressed with how well Toshiba has managed to screw everything together.

If there's one aspect we're not so keen on, it's the U920t's appearance. With an Ultrabook we expect brushed metal, smooth curves and sleek lines, but this is a butch and angular affair, built from plastic. An ugly muddle of textured and grey finishes contrasts awkwardly with the glossy, glass edge-to-edge touchscreen display, and the only saving grace is the rubbery coating on the rear. This makes it less slippery in the hand than if it had been finished in smooth aluminium.

Since this is an Ultrabook, connectivity isn't generous, but there's nothing major missing. The right-hand edge houses an SD card reader and a 3.5mm audio jack, and there are two USB 3 sockets – one on the left edge and one on the rear. There's even a full-sized HDMI output situated on the rear edge on the right-hand side. Wireless connections comprise single-band 802.11n, NFC and Bluetooth. GPS is included, although the U920t is too unwieldy to be a practical navigation device.

Performance

Inside, the Toshiba is powered by a dual-core 1.8GHz Intel Core i3-3217U processor, backed up by 4GB of RAM, and it scored 0.51 in our Real World Benchmarks. It isn't as quick as the Sony with its beefy Core i7, but it's a score that still means the U920t is capable of running most applications without leaving you twiddling your thumbs. In day-to-day use it proved perfectly responsive. Scrolling back and forth across the Windows 8 Start screen was smooth and glitch-free – unlike the jerky, occasionally frustrating experience we had with Toshiba's touchscreen all-in-one PC, the LX830 (web ID: 378235).

The U920t delivered the same fast, fluid response when browsing, zooming and panning in Internet Explorer, and startup times – aided by a 128GB Samsung SSD – were swift. Press the power button on the left-hand edge and the Toshiba U920t will boot into Windows 8 from cold in a mere 11 seconds.

Battery life brings it back down to earth with a bump, though. The Toshiba U920t ran out of juice after a disappointing 5hrs 40mins in our light-use test – a long way behind the VAIO Duo 11's 7hrs 6mins result. The glossy display isn't any better: its 1,366 x 768 resolution can't compete with the crispness of the Sony's 1080p panel, and it's dim at a measured maximum of 181cd/m². Outdoor viewing is completely off the cards, and it's only the fact you can tilt the screen back and forth that makes it usable under office lights.

Verdict

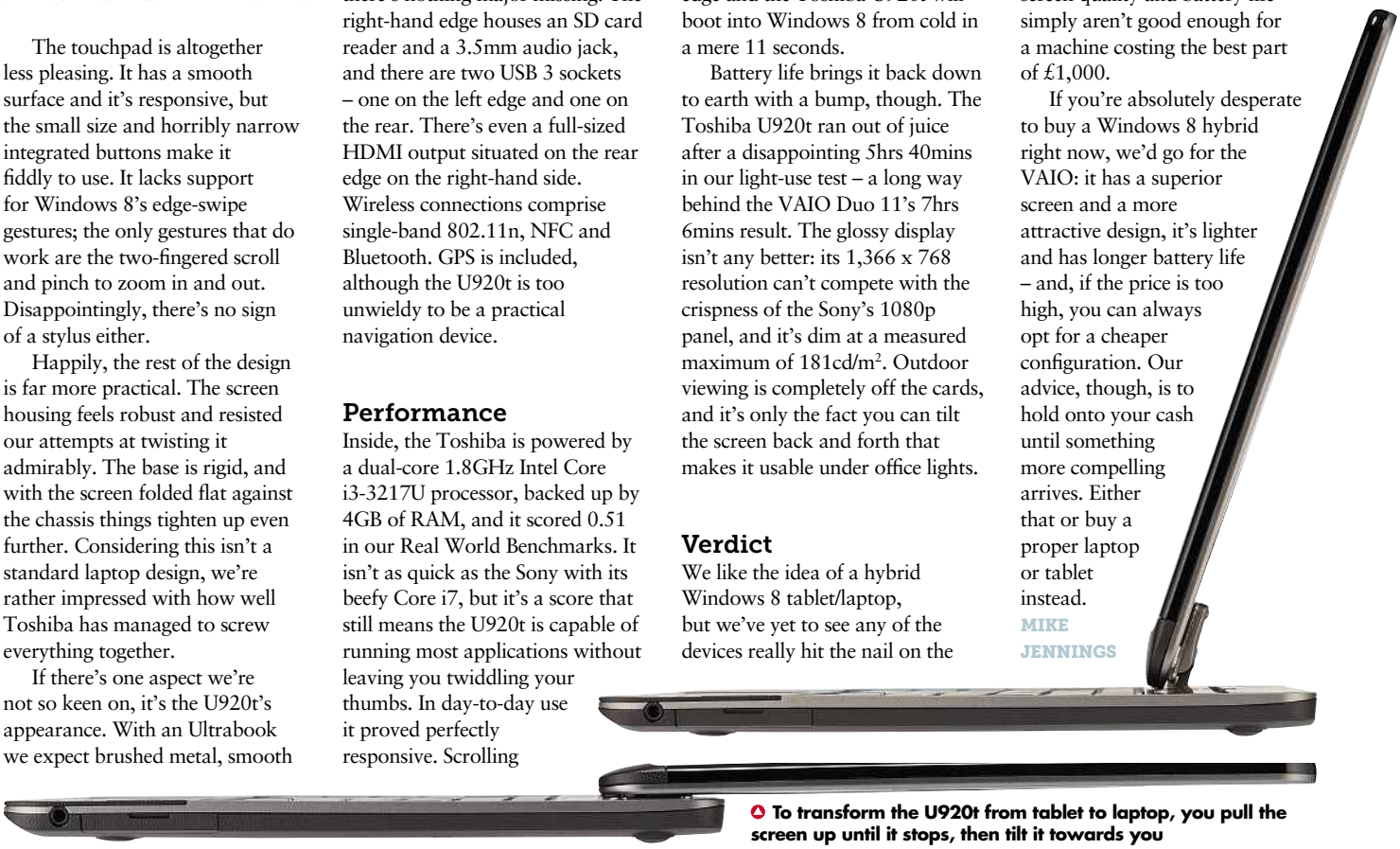
We like the idea of a hybrid Windows 8 tablet/laptop, but we've yet to see any of the devices really hit the nail on the head. The Sony VAIO Duo 11 suffered from ergonomic problems, and this Toshiba only adds to the disappointment.

OVERALL	★★★★☆☆
PERFORMANCE	★★★★☆☆
FEATURES & DESIGN	★★★★☆☆
VALUE FOR MONEY	★★★☆☆☆

It's too heavy and cumbersome to function well as a tablet, and although general build, usability and performance are all perfectly acceptable, the screen quality and battery life simply aren't good enough for a machine costing the best part of £1,000.

If you're absolutely desperate to buy a Windows 8 hybrid right now, we'd go for the VAIO: it has a superior screen and a more attractive design, it's lighter and has longer battery life – and, if the price is too high, you can always opt for a cheaper configuration. Our advice, though, is to hold onto your cash until something more compelling arrives. Either that or buy a proper laptop or tablet instead.

MIKE JENNINGS



To transform the U920t from tablet to laptop, you pull the screen up until it stops, then tilt it towards you

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Sony VAIO Tap 20

A battery-powered all-in-one? Sony scores for originality, but the benefits are marginal

PRICE £800 (£999 inc VAT)
SUPPLIER www.sony.co.uk

Let nobody accuse Sony of a lack of ambition with its initial Windows 8 devices. The slide-out VAIO Duo 11 (web ID: 377851) convertible was bold, if a little Heath Robinson for our liking. The VAIO Tap 20 is even more daring, adding a battery pack to a desktop all-in-one.

Now, let's be clear right from the start: the 3,500mAh lithium-ion battery sitting behind a removable panel at the rear of the device doesn't make this a tablet you'd want to carry any further than the dining room table. Not only does its 5.1kg weight make it about as portable as a bag of cement, but that battery lasted a mere 2hrs 27mins in our light-use test. Although the option to shift the unit from room to room without trailing a power cable around the house is a bonus, this isn't an iPad rival.

It is, however, a wonderfully versatile all-in-one. That kick-stand at the back folds flush into the casing, allowing the Tap 20 to be positioned at any angle, from almost upright to flat on the desk (or even your lap). We've seen braver souls on rival magazines even attempt to stand up the device in portrait mode, but it patently isn't designed for this – don't come complaining to us when it smashes into the desk at the merest prod. Nor is there any means of elevating the screen off the desk (besides commandeering a few encyclopaedias), which means you could be left hunched over the device when working.

The bog-standard accessories aren't tailored for Windows 8

The screen is impressive. Its 1,600 x 900 resolution is a tad meagre for a 20in panel, but there's no questioning its image quality. Skin tones are perfectly accurate and bright colours pop off the screen without veering into over-saturation. Videos deliver pleasing levels of contrast, and viewing angles are exemplary from the IPS panel – although you may want to draw the blinds, since the glossy screen does nothing to minimise reflections. Our colorimeter tests backed up the experience of our eyes, with an overall contrast ratio of 1,104:1 and perfectly acceptable scores for colour accuracy.

A Windows 8 all-in-one lives or dies by its touchscreen performance, and here the Tap 20 lives up to its name. It's responsive to a swish of the finger, with no evidence of the stuttering that marred the Toshiba LX830 (web ID: 378235).

That's just as well, because the bundled peripherals make no concessions for touch gestures or Windows 8. The pebble-shaped mouse is too slender for our liking and is equipped with only standard buttons and a scroll wheel. The keys on the wireless keyboard are comfortably spaced and have a satisfying depth of travel, but it's extraordinary to include a numeric keyboard yet forego Windows 8 shortcut keys. These are clearly standard-issue peripherals that haven't been tailored to the new OS, which is disappointing given the lengthy gestation of Windows 8.

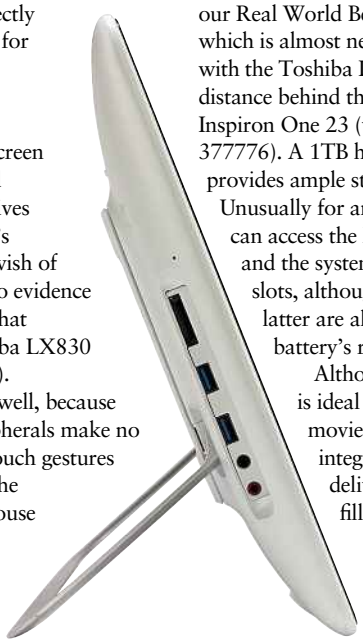
Inside the VAIO Tap 20 lies a dual-core 1.7GHz Core i5-3317U from Intel's mobile range, allied with 6GB of RAM. That's enough to power the Tap 20 to an overall score of 0.63 in our Real World Benchmarks, which is almost neck-and-neck with the Toshiba LX830, but a fair distance behind the top-end Dell Inspiron One 23 (web ID: 377776). A 1TB hard disk provides ample storage.

Unusually for an all-in-one you can access the hard disk bay and the system's two memory slots, although both of the latter are already filled. The battery's replaceable, too.

Although that screen is ideal for watching movies, and the integrated speakers deliver a bedroom-filling wallop of volume, there are huge gaps in the multimedia section of the Tap 20's CV. There's no optical drive, no TV tuner and no remote control; the £200-cheaper Toshiba LX830 ticks all of these boxes. It comes with only the standard version of Windows 8, so add another £50 to the asking price if you want Windows Media Center.

All of which leaves the Tap 20 marooned in no-man's land. On the one hand it can't be called a complete Windows 8 all-in-one, since it lacks core media-centre features and software. On the other, it's far too cumbersome to be a tablet, and its one unique feature (the battery) is mostly unnecessary – plus at £1,000 you're paying a premium for it.

It isn't a dreadful PC by any means: the screen is excellent, it's responsive and well designed. Once again, though, it's close but no cigar for a Sony Windows 8 device. BARRY COLLINS

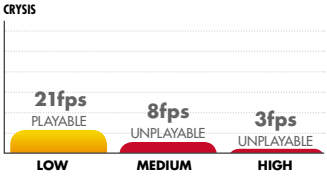


The Tap 20 is too bulky to be truly portable

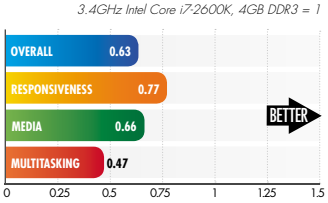
BATTERY: HEAVY USE 1hr 0mins

BATTERY: LIGHT USE 2hrs 27mins

3D BENCHMARKS



REAL WORLD BENCHMARKS



KEY SPECS

1.7GHz Intel Core i5-3317U • 6GB RAM • 1TB hard disk • Intel HD Graphics 4000 • 20in 1,600 x 900 touchscreen • 2 x USB 3 • single-band 802.11bgn Wi-Fi • Gigabit Ethernet • 1.3mp webcam • 3,500mAh Li-ion battery • Windows 8 64-bit • 1yr RTB warranty • 504 x 187 (45 flat) x 312mm (WDH) • Part code: SVJ2021V1E

OVERALL	★★★★☆
PERFORMANCE	★★★★☆
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★☆☆

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HP SpectreONE

A stylish, high-quality all-in-one that's pipped to the post by the iMac that inspired it

The SpectreONE looks uncannily similar to an iMac

» PRICE £1,000 (£1,200 inc VAT)
» SUPPLIER www.johnlewis.com

HP reserves the Spectre name for its premium products, and there's no denying the SpectreONE fits the bill. At first glance, however, you could be forgiven for thinking it isn't an HP device at all – from its silver stand to its stylish accessories, it looks like the latest from Apple's production line.

Thankfully, the SpectreONE soon impresses on its own terms. The screen is only 14mm thick, and the curved stand isn't much chunkier. The base narrows to a 4mm front edge, and the entire system looks very smart indeed.

There's no touchscreen, but HP hasn't left Windows 8's finger-friendly features completely by the wayside. Included alongside the wireless keyboard and mouse is a huge, clicky touchpad.

Again, it takes inspiration from Apple, and its Magic Trackpad, but it supports the full range of Windows 8 gestures.

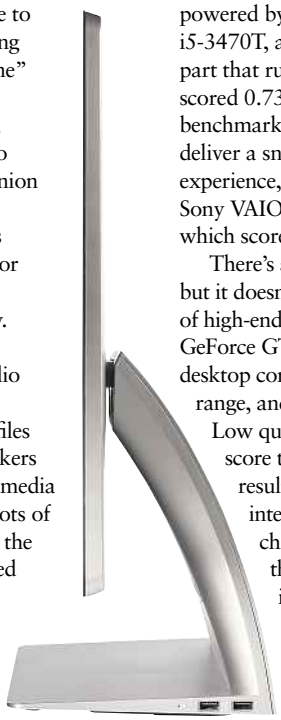
Two-fingered scrolling sees the Start screen and its apps move smoothly from side to side, pinch-to-zoom works well, and edge-swipes function exactly as you'd expect.

Pulling a finger in from the right opens the Charms menu, stroking from the left switches between open applications, and brushing in from the top opens the options menu at the bottom of the screen. The two buttons built into the bottom corners of the pad are responsive, too.

The mouse also has touch-based features. A small touch area sits between its two buttons, and responds to finger movements with a light buzz. It doesn't work as well as the touchpad – the scrolling motion is inconsistent – and the lack of Windows 8 shortcut keys on the wireless keyboard is disappointing; a shame, as the sensible layout and cushioned keystrokes make for comfortable typing.

As is becoming increasingly common these days, the SpectreONE lacks conventional media features such as an optical drive and TV tuner. You can stream audio and video to the system from a smartphone or tablet, though. The HP makes clever use of near-field communication (NFC) to pair the devices and establish a direct Wi-Fi link between them, after which content can be streamed back and forth. You can also use the NFC on your phone to log in, just by tapping it to the "TouchZone" on the base.

There are issues, though. You have to download a companion app, which is only available on phones running Android 4 or later, and we found performance patchy. Logging in worked perfectly, as did audio streaming, but we couldn't get movie files to stream. The speakers don't help the HP's media credentials: there's lots of bass, but the rest of the range sounds muffled and lacks nuance.



Components are housed cleverly in the PC's stand

Initially, we wondered how HP had managed to cram a full PC into such a slim case – in fact, it hasn't. The entire system is enclosed in the SpectreONE's 291mm-wide stand, a clever solution that means there's a degree of user upgradability. Remove a plastic panel and you'll find a memory and a mSATA socket free: even the hard disk caddy is easily accessible.

The one thing you can't access is the processor, but performance is adequate. The SpectreONE is powered by an Intel Core i5-3470T, a low-power Ivy Bridge part that runs at 2.9GHz, and it scored 0.73 in our application benchmarks. That's enough to deliver a snappy Windows 8 experience, and it's faster than the Sony VAIO Tap 20 (*see p108*), which scored 0.63.

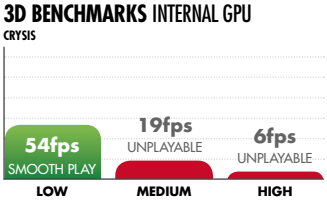
There's a discrete graphics chip, but it doesn't meet the demands of high-end gaming. The Nvidia GeForce GT 610 is the weakest desktop core in Nvidia's current range, and scored 54fps in our Low quality Crysis test – a score that outpaces the 21fps result of the Sony with its integrated Intel graphics chip, but falls far behind the 141fps score of the iMac 21.5in (*see p110*).

The 23in screen has the same 1,920 x 1,080 resolution as the iMac, and although it looked bluish and rather dim when we first switched it on, a little tinkering with the settings soon fixed it. Using HP's My Display software, we adjusted the contrast from 50% to 75%, and changed the screen's mode from "cool" to "warm".

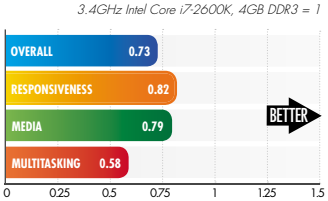
After that, brightness hit a respectable 248cd/m², colours became more realistic, and the contrast ratio of 1,180:1 gave images depth and solidity. It can't beat Apple's iMac, due to visible backlight bleed along the display's bottom edge and poor vertical viewing angles, but it's more than a match for most all-in-ones.

The HP SpectreONE looks gorgeous, the screen is decent, and there's even a modicum of upgradability, which is unusual in an all-in-one. The one sticking point is the £1,200 price – it's more expensive than the cheapest 21.5in iMac, which has a superior display and a far faster graphics card. MIKE JENNINGS

3D BENCHMARKS INTERNAL GPU



REAL WORLD BENCHMARKS



KEY SPECS

2.9GHz Intel Core i5-3470T • 4GB DDR3 RAM • 1TB hard disk • Nvidia GeForce GT 610 graphics • 23in 1,920 x 1,080 TFT • 2 x USB 3 • 2 x USB 2 • dual-band 802.11abgn Wi-Fi • Gigabit Ethernet • NFC • 1mp webcam • SD card reader • Windows 8 64-bit • 1yr RTB warranty • 528 x 60 x 417mm (WDH)

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★½☆

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Apple iMac 21.5in

An attractive new design and a host of small improvements combine to make a stunning all-in-one; it's Apple's best iMac so far

PC PRO RECOMMENDED

PRICE £1,474 (£1,769 inc VAT)
SUPPLIER www.apple.com/uk

A process of constant refinement has established the iMac as the best-looking desktop PC around.

Viewed head-on, you might wonder what Apple's changed with this year's model. Peer around the side, however, and it quickly becomes apparent: the 25mm edge of the previous-generation machine has been whittled down to an astonishing 5mm. The iMac isn't this thin across the whole width of the chassis. It bulges to a more accommodating 40mm in the centre where all the components are housed, but it still makes a considerable difference to the way this all-in-one looks. Approach it from an angle and it seems to float above the desk, suspended in midair.

Interestingly, Apple says this newer, sleeker iMac can't be manufactured using the old methods, so it now uses a technique called "friction-stir welding" to join the metal section below the screen to the rear panel.

Fancy production techniques aside, though, most of the rest of the design is familiar territory. The screen is still surrounded by a glossy black border, the silver "chin" houses the familiar Apple logo and the curved stand looks as good as ever. Build quality remains sturdy, despite the trimmer profile.

All the connections are located at the back of the screen – there are four USB 3 ports, two Thunderbolt connectors, a Gigabit Ethernet socket and a headphone jack. There's no room on the side for the SD card slot or an optical drive, however, so the former has been moved to the rear and the latter has been removed entirely.

What's inside?

This upgrade isn't merely superficial. Inside, Apple has made major alterations, principally to the iMac's storage subsystem. Instead of just a hard disk or SSD, there's the option to specify Apple's new Fusion Drive. This combines a 128GB SSD and hard disk to provide the best of both worlds – the speed and responsiveness of an SSD and the high capacity of a hard disk.

The idea is to store frequently used applications and files on the SSD for improved responsiveness, while keeping less critical data on the slower, platter-based hard disk. As you might expect, the operating system resides permanently on the SSD, and a selection of key applications is placed there, too, including Safari, iMovie, iCal and iPhoto. Over time, this changes as

KEY SPECS

3.1GHz Intel Core i7-3770S • 16GB DDR3 RAM • 128GB SSD • 1TB hard disk • Nvidia GeForce GT 650M graphics • 21.5in 1,920 x 1,080 TFT • 4 x USB 3 • 2 x Thunderbolt • dual-band 802.11abgn Wi-Fi • Gigabit Ethernet • 1mp webcam • SD card reader • Apple OS X Mountain Lion • 1yr RTB warranty • 528 x 175 x 450mm (WDH)

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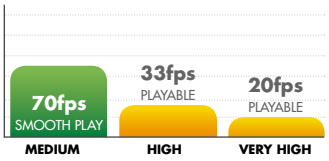
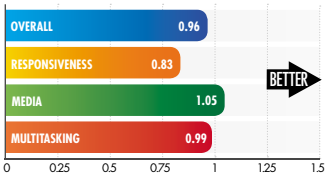
3D BENCHMARKS

CRYSIS



REAL WORLD BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



Apple's design team has been hard at work shaving millimetres off the chassis of the already svelte iMac. The new model's edge is now only 5mm thick

the system learns which apps and files you use most often, moving them to the SSD, and moving those that are rarely used back to the hard disk. (Note, however, that the benefits of the Fusion Drive aren't available to those who install Windows via Boot Camp – that's installed on the hard disk portion of the drive.)

The effectiveness of the system will only become apparent with prolonged use, but we can say categorically that the underlying hardware is excellent.

The iMac boots quickly, taking 15 seconds to reach the desktop, and the 128GB SSD is rapid. It scored 481MB/sec and 330MB/sec in AS SSD's sequential read and write tests – not much slower than the 497MB/sec and 340MB/sec achieved by our A-List SSD, the Samsung SSD 830 (*see p158*).

Apple also boasts that the 1,920 x 1,080 IPS display is "75% less reflective" than last year's model. That's a pretty meaningless statistic, but there have certainly been design changes. The glass front is now laminated to the LCD underneath, eliminating a small 2mm gap, and the anti-reflective coating has been altered. To our eyes, it's an improvement over previous models, although it still catches more reflections than a traditional, matte-finished monitor.

Regardless of reflectivity, the screen quality is outstanding. The brightness level of 469cd/m² outshines the 248cd/m² of the HP SpectreONE (*see p109*), and the contrast ratio of 1,024:1 is simply superb. Apple colour-calibrates all its panels at the factory, so we weren't surprised to discover colour accuracy was top-notch. With exceedingly broad viewing angles and no backlight bleed, it's a dream of a screen that's equally at home with colour-accurate photo editing and professional video applications as it is with displaying movies.

Even audio has been given an overhaul, with high- and mid-range notes from the slim speaker ports along the bottom edge sounding impressively airy, clear and full-bodied. They're fine if you only listen to acoustic and choral music, but beware – there's no bass at all.

Processor and graphics

As usual, Nvidia provides the GPU, and the part in question is a GeForce GT 650M – a mobile chip based on Nvidia's latest desktop cards. It scored 33fps in our 1,920 x 1,080 High quality Crysis test – which is better than the 13fps of the HP SpectreONE, and shows there's enough power to ensure the iMac is a strong option for a gaming machine.

It's accompanied by an Ivy Bridge processor – in this case, the low-power, quad-core Intel 3.1GHz Core i7-3770S. Aided by 16GB of RAM, this cruised through our benchmarks with a score of 0.96 – the second-fastest result we've ever seen from an all-in-one, and outpacing the 0.73 of the HP and its Core i5 chip.

Our concern here isn't speed, though, but heat. With all the components so tightly packed and only one internal fan, the new iMac can become toasty inside.

We stress-tested the system in Windows 7 and OS X and recorded peak temperatures of 100°C and 98°C under full load. The system never became unstable, and we don't expect people to run the CPU at 100% load constantly, but it's a concern.

Verdict

Fusion Drive, "friction-stir welding" and all the latest components clearly don't come cheap, with the review iMac costing a hefty £1,769 inc VAT. This is a lot to pay for a mere 21.5in all-in-one, but it's possible to drop the price to a far cheaper £1,099 by specifying a slower but still perfectly adequate Core i5 processor, less RAM and a marginally less beefy Nvidia GeForce GT 640M.

Unfortunately, you lose the Fusion Drive in the process, but with a display this good and a much faster graphics card, we'd still choose this over the pricier, Windows 8-based HP SpectreONE. MIKE JENNINGS

OVERALL	★★★★★☆
PERFORMANCE	★★★★★☆
FEATURES & DESIGN	★★★★★★
VALUE FOR MONEY	★★★★☆☆

Photography: main intro, Danny Bird; cutouts, Hugh Threlfall; repro, Jan Cihak

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See the Samsung Galaxy Camera's test shots
Visit www.pcpro.co.uk and enter web ID: 378649

Samsung Galaxy Camera

The best parts of a camera and smartphone combined make this a compelling choice

PC PRO RECOMMENDED

Built-in 3G and Wi-Fi make the Samsung an ideal companion for the travelling photographer, as you can upload photos on the move

PRICE £315 (£378 inc VAT)
SUPPLIER www.handtec.co.uk

Most cameras use proprietary firmware, but Samsung's latest snapper bucks the trend by running Android 4.1 instead. With a huge 4.8in touchscreen on the rear, that means not only can it take great pictures, but it can also run any smartphone app downloaded from Google Play or Samsung's own app store.

The size of the screen means it's larger than your average compact camera, but it's comfortable to hold, and despite the comparative lack of physical buttons (there are only power, shutter-release and zoom controls) the Galaxy Camera is intuitive to use. Rather than attempting to imitate a standard camera-button layout on the large screen, Samsung has bet the farm on a radical reimagining that sets all of the controls on virtual tumblers, reminiscent of SLR lens rings.

Each provides live feedback, so spinning through aperture, sensitivity or exposure compensation settings adjusts the onscreen display in real time. That's great news for beginners who need a little encouragement – and assistance – to step away from auto mode.

There's a range of built-in apps, including a tailored edition of Instagram, and video-editing software to trim and splice the 1080p footage that the Galaxy Camera records. Plus you get 3.87GB of integrated memory for installing your own apps and storing photos. You can supplement that storage with microSD memory, but take care when popping the card into the camera – right next to the microSD slot is a micro-SIM card slot and they look very similar.

Network connectivity is required to fully exploit Android's features, and to this end the Galaxy Camera has both 3G and Wi-Fi radios. It includes a SIM card tied to the Three network, with a month of free credit when first installed; it's up to you whether you want to renew it once your time is up or switch to an alternative network. Alas, you can't make phone calls, but you can use the Galaxy Camera to check your email and browse the web on the move.

Of greater interest to the travelling photographer is the option to upload photos, share them directly on social networks and, crucially, back them up remotely. To help with this, the Galaxy Camera is bundled with a two-year, 50GB Dropbox account. Pair the two and your camera will automatically upload every shot and video as it's captured, so when you get back to your PC they'll already be waiting in the synchronised folder. Transfer speeds will depend on your connection quality, but in an area with poor 3G coverage full-resolution images appear in a Dropbox folder 41 seconds after being shot. That's slow, but as it happens in the background, not unusably so.

Samsung's clever interface makes adjusting aperture, shutter speed and other settings a breeze

There's plenty of clever stuff going on here, but it's good to see that Samsung hasn't neglected the camera hardware. The device has a 16-megapixel, 1/2.3in backside-illuminated sensor and this is served by a 21x zoom, equivalent to 23-483mm on a 35mm camera. The maximum aperture ranges from f/2.8 at wide angle to f/5.9 at full telephoto. Shutter speeds in auto mode go from 1/8 to 1/2,000 of a second, and if you switch to manual you can push the maximum exposure as far as 16 seconds. Sensitivity ranges from ISO 100 to 3200.

It can't quite hold its own when compared with a traditional camera of a similar price, such as the Canon PowerShot S110 (*see p114*), which sacrifices resolution and zoom in favour of a larger sensor, a brighter lens (at the wide-angle end) and greater shooting flexibility.

However, the results are unlikely to disappoint in day-to-day use. Colours are accurate, and although there is softness in the corners of the frame, images are generally sharp. Macro mode only gets you to within 10cm of your subject, but the depth of field is impressively narrow, and the creamy blur surrounding the subject is even and attractive.

Even at the top of the ISO scale the results – while exhibiting grain – are never sufficiently noisy to suffer from serious loss of detail. If you need to refine the default sensitivity settings, exposure compensation stretches two stops in either direction, in increments of 1/3EV. Video quality is high, too, and the image stabilisation is effective, even at full telephoto. There's evidence of chromatic aberration, though.

The danger with such an outlandish device was always that the camera would take a back seat to the touchscreen and Android UI.

However, Samsung has pulled off the combination with impressively fine judgement. It's very much a competent pocket snapper with the bonus of smartphone-style internet connectivity thrown in, rather than the other way around, and on that basis it just about justifies the high price. NIK RAWLINSON

KEY SPECS

16mp 1/2.3in sensor • 4.8in 1,280 x 800 TFT • 23-483mm f/2.8-5.9 lens • Wi-Fi • 3G • microSD • Android 4.1 • 1yr RTB warranty • 129 x 19 x 71mm (WDH) • 300g

OVERALL	★★★★★½
IMAGE QUALITY	★★★★½☆
FEATURES & DESIGN	★★★★★★
VALUE FOR MONEY	★★★★½☆

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Nexus 4

LG and Google combine to produce the best Nexus phone yet, and at a great price, too

PC PRO RECOMMENDED

Android 4.2 introduces a new lockscreen system

PRICE SIM-free: 8GB, £199 (£239 inc VAT); 16GB, £232 (£279 inc VAT); from free on a £26/mth, 24mth contract

SUPPLIER http://play.google.com

Google's Nexus 4 smartphone attracted worldwide attention when it was first unveiled, selling out in a staggering 15 minutes. We've never seen a smartphone sell out so quickly, but there are good reasons why so many were so keen to get their hands on Google's latest handset.

The 8GB and 16GB versions are available SIM-free for only £239 and £279, which makes the Nexus 4 more affordable than every one of its flagship rivals, including the A-Listed Samsung Galaxy S III (web ID: 374950).

The software is a big draw, too; as with other Google-branded handsets, the Nexus 4 is loaded with the latest version of Android, and it will get future OS updates before other phones.

The version of Android in question is 4.2, and it boasts a surprising number of enhancements over 4.1. To start with, the lockscreen is much more versatile. You can swipe up to unlock the phone as normal, but also swipe right to go straight to the camera app, or left to reveal six alternative, customisable and interactive lockscreens.

Notifications can now be acted on directly: single taps return missed calls, open the text-messaging and email apps, and accept Facebook friend requests. Swipe down with two fingers instead of one from the top of the screen and a quick settings menu opens, instead of the notification drawer. It's a smart way of accessing commonly used options.

Google Now digs up more information than before, using email data to remind you about flights, restaurant reservations and local events or places of interest. The keyboard is new, boasting efficient, Swype-style gesture typing.

Thoughtful touches abound elsewhere. Triple-tapping activates a screen zoom feature. Instagram-style filters can be applied to pictures, with a finger-drag generating a before-and-after, split-field view. The camera app has been redesigned, with the settings listed in a circular menu, and the added ability to capture panorama-style 360-degree pictures.

There's no microSD slot to expand the memory on the Nexus 4

It's the best version of Android so far, and better still it's running on a very attractive handset. Built by LG, the Nexus 4 is smart and understated, with a glass rear that shimmers beautifully in the right light, and it has a classy Gorilla Glass front panel.

It's well built, comfortable to hold, and at 9.1mm only marginally thicker than the 8.6mm Galaxy S III. It's more attractive than the S III, but less practical: the battery can't be replaced, and there's no microSD slot for adding storage. There's no 4G version yet, either.

The Nexus 4 marks the smartphone debut of the Snapdragon S4 Pro CPU, and here this 1.5GHz, quad-core chip is partnered with an Adreno 320 graphics core and 2GB of RAM.

That's a killer line-up, and in benchmarks it kept up with the Galaxy S III. It scored 2,082 to surpass the Samsung's 1,782 in Geekbench, but took 1,902ms to finish the SunSpider benchmark, slower than the Galaxy S III's 1,344ms. In real-world use that translates to smooth, responsive navigation and web browsing, while demanding games such as Reckless Racing 2, Dead Trigger and Shadowgun play flawlessly. Both phones finished our 24-hour battery test with 60% remaining, which is average for a smartphone of this ilk.

The IPS screen is a stunner, too. At 4.7in, it's fractionally smaller than the Samsung's 4.8in panel, but at 768 x 1,280 it has a slightly higher resolution. It's pin-sharp, and a measured maximum brightness of 486cd/m^2 means it's incandescent indoors and easily visible outside.

The Nexus 4's single weakness is its 8-megapixel camera. It's fine for taking standard snaps, and excellent when shooting close-ups, but the Samsung's sensational shooter is better. The panorama feature, while fun to use, is flawed, with blurred areas appearing where the edges of frames meet.

It's a close-run thing between the Nexus 4 and the Samsung Galaxy S III, with the camera the only real area where the Samsung pulls ahead. When it comes to performance, build quality and screen, both phones are superb.

Which you choose depends on your priorities. If you're keen on getting the latest, cleanest version of Android, or you're a pay-as-you-go aficionado, plump for the Nexus 4. The £279 SIM-free price for the 16GB model is a steal.

With most people buying on contract, though, and current prices dead level, the Samsung's superior snapper and greater flexibility tips the balance in its favour. The S III remains our A-List choice by a whisker. MIKE JENNINGS

KEY SPECS

Quad-core 1.5GHz Snapdragon S4 Pro • 2GB RAM • 8GB/16GB storage • 4.7in 768 x 1,280 IPS display • quad-band GSM/GPRS/EDGE/3G/HSDPA • Bluetooth 4 • dual-band 802.11n Wi-Fi • 8mp stills • 1080p video • 2,100mAh battery • Android 4.2.1 • 1yr RTB warranty • 134 x 68 x 9.1mm (WDH) • 139g

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
FEATURES & DESIGN	★★★★★½
VALUE FOR MONEY	★★★★★★

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Sony Alpha NEX-6

A compromise-free compact system camera: a delight to use, and with first-class image quality

The NEX-6's new kit lens is absolutely tiny

PRICE £683 (£819 inc VAT)
SUPPLIER www.jessops.com

Not everyone wants to lug a bulky SLR around, but for a long time it was your only choice. These days, though, serious amateurs have a different option: high-end compact system cameras (CSCs), a genre now topped by the Sony Alpha NEX-6.

It's a seriously impressive piece of kit, with a detailed electronic viewfinder, interchangeable lenses, an accessory shoe, three rotary controllers and a premium price. It's significantly smaller than most other CSCs at this price, dispensing with the SLR-style viewfinder hump for a more streamlined brick-like shape. There's a reasonably substantial handgrip but not a huge amount of space for buttons and dials.

This limited space has been used well. There's a mode dial on top – a first for a NEX camera – a command dial encircling it, and the navigation pad doubles as a wheel.

ISO speed, drive mode and exposure compensation are a single button click away, and five other settings can be assigned to the customisable Function menu. We'd have liked a physical manual focus switch and a dedicated white balance button, but we're not sure where they would have fit.

The new 16-50mm kit lens is tiny, collapsing right down when the camera is switched off. It has a motorised zoom, and controlling this motor using the lens ring is surprisingly effective. The entire range can be traversed in a quarter of a second, but small, precise adjustments remain easy to make. It's also a sharp lens, with none of the corner softness we've seen from the bulkier 18-55mm kit lens bundled with other NEX cameras.

Wi-Fi is the latest must-have feature for cameras, and the NEX-6 obliges with a comprehensive set of functions. It can upload photos to Facebook via a Wi-Fi network, or create its

Canon PowerShot S110

Top-quality stills and video, plus a hatful of features – our new favourite small-sensor compact camera

The S110 offers a great deal of control for such a small camera

PRICE £293 (£351 inc VAT)
SUPPLIER www.more computers.com

Compact system cameras (CSCs) such as the Sony Alpha NEX-6 (*see above*) may hog the limelight, but there's still life in conventional compacts. These cameras' sensors are smaller than those used in CSCs, and they don't have interchangeable lenses, but they make up for it by packing in plenty of flexibility. The lens on the S110 can focus on subjects only 3cm away, and combines a 5x zoom with a wide f/2 maximum aperture. The latter offsets the smaller sensor to give comparable image quality in low light to a CSC with a 3x zoom kit lens and an f/3.5 maximum aperture.

The S110's aperture is only this bright at the wide end of the zoom range, though. For telephoto shots it only manages f/5.9, which is slightly darker than usual. So, while this camera performs well in low light for wide-angle photography, it isn't as competitive when you zoom in. Other compacts maintain a wide aperture throughout their zoom range, but the S110 is much slimmer and lighter than those models, at 27mm deep compared to the Panasonic Lumix DMC-LX7 (50mm), Samsung EX2F (51mm) and Canon PowerShot G15 (40mm).

Photographic control is unusually comprehensive for such a petite camera, with priority and manual exposure, HDR shooting and manual focus. The navigation pad doubles as a wheel for fast operation, and a ring encircling the lens can be assigned to various functions, from zoom to ISO speed. The 3in screen at the rear is touch-sensitive, so moving the autofocus point is a breeze. The menus aren't optimised for touch, but navigating them is simple.

The S110 isn't particularly quick at taking photos. We measured an average of 2.4 seconds between shots in normal use, while continuous mode ran at 1.9fps, or only 1fps for raw. There's a 10fps mode among the scene presets, but it only lasts for 10 frames, offers minimal control over other settings and the screen goes blank during capture. The 200-shot battery life is disappointing, too.

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See the NEX-6 and S110's test shots
Go to web IDs: 378553 and 378604

own hotspot for direct transfers to a smartphone or tablet. There's a remote control app with a live feed and shutter-release control, but it doesn't give access to other settings. We had no problems running the iOS app on an iPad, but the Android app wouldn't function properly on an HTC One V.

The NEX-6 can also download and install its own apps to expand the camera's capabilities. There are currently a couple of freebies supplying creative filters and basic editing, plus two more priced at £3.99 for advanced bracketing and multiframe noise reduction.

Elsewhere, the NEX-6 draws on the strengths of previous NEX cameras. Image quality is as high as we've seen from a CSC, with crisp details and extremely low noise. Automatic exposures are sometimes on the dark side, but the extra highlight headroom is welcome when processing raw files. Otherwise, a bit of exposure compensation provides an easy fix.

It's a nippy performer, with a 10fps burst mode and responsive general operation. Autofocus is fast, thanks to dedicated sensors built into the main imaging sensor. Video quality is excellent, and with capture up to 1080p at 50fps, plus full manual exposure control, it's perfect for more serious work.

Sony already dominates the CSC market for sensor quality, but it has never produced the perfect camera. With the NEX-6, though, the company has nailed it, with a smaller and sharper kit lens, faster autofocus performance, better controls and integrated flash. It's hard to imagine a more accomplished compact camera. BEN PITT

KEY SPECS

16mp APS-C sensor • 2.4 million dot electronic viewfinder • 16-50mm f/3.5-5.6 kit lens • 10fps burst mode • SDXC/Memory Stick Pro Duo slot • 1yr RTB warranty • 120 x 43 x 67mm (WDH) • 470g

OVERALL	★★★★★
IMAGE QUALITY	★★★★★
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★½

For features, though, the S110 is right up there. Wi-Fi is built in, giving drag-and-drop access to SD card contents from a networked PC. You can also pair the camera with an iOS or Android device when you're out and about. We had difficulty connecting to our third-generation iPad, but our test Android handset worked flawlessly, and we could browse the card contents, either as thumbnails or full screen, and transfer images at a choice of resolutions. Leave the app running and it will also keep a GPS log, enabling it to retrospectively geotag photos. This proved a drain on our phone's battery, however.

The 1/1.7in sensor is smaller than CSC sensors, but it's 50% bigger by surface area than the 1/2.3in sensors used in cheaper compact cameras. This has a marked effect on image quality. Photos taken in bright light are crisp and detailed, with only the slightest hint of noise in shadows. Noise reduction takes its toll on subtle details in low light, but the results are much better than from cheaper compacts. As long as you keep to the wide-angle end of the zoom, night-time shots under street lighting look fine when resized for sharing online. Video quality impresses, too, with smooth autofocus and exceptional detail in 1080p clips, but the soundtrack sounds muffled.

Shot-to-shot performance is the weakest area, but while that might annoy those used to SLR speeds, it won't bother casual photographers who want high image quality in a pocket-sized camera. For those who want maximum portability, the S110 is our favourite small-sensor compact. BEN PITT

KEY SPECS

12mp 1/1.7in sensor • optical viewfinder • 24-120mm f/2-5.9 lens • 10fps burst mode • SDXC slot • 1yr RTB warranty • 99 x 27 x 59mm (WDH) • 198g

OVERALL	★★★★½
IMAGE QUALITY	★★★★½
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★★½

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Samsung Chromebook

Big improvements to Chrome OS and solid hardware combine to produce a capable 11.6in laptop

PC PRO RECOMMENDED

The Chromebook's benchmark scores rival those of the new iPad

PRICE £191 (£229 inc VAT)
SUPPLIER www.amazon.co.uk

There was quite a fuss surrounding the first Chromebook, but after a big launch and plenty of marketing, it all fell rather flat. Google's first attempt at producing a proper operating system – Chrome OS – was intriguing, but far too limited in what it could do. A year and a half later, we have the next instalment, and Google has clearly been hard at work.

There are, in fact, two new Chromebooks, both from Samsung: one with a 12.1in screen, and the one we have on review here – the smaller, cheaper 11.6in model. And when we say cheaper, we mean it. The 11.6in Chromebook costs a full £121 less than the original – a considerable 35% saving – and also comes with a generous two-year 100GB helping of Google Drive online storage.

Despite the price the hardware is remarkably competent. At 1.09kg, it's lighter than the first model, and the ergonomics haven't suffered. There's still a sizeable keyboard with a well-designed layout, and the keys have enough travel for longer typing sessions. The multitouch touchpad is broad and sensitive and supports two-fingered scrolling.

Connectivity has improved. One of the two USB sockets on the Chromebook's rear edge has become a USB 3 socket, and there's now a full-sized HDMI output in addition to the SD card slot and 3.5mm headphone jack it had before.

The practical, matte-finish screen has a few more pixels, up to 1,366 x 768 from 1,280 x 800, but image quality is underwhelming. With a maximum brightness of only 219cd/m², it doesn't blaze with life, and pictures and videos lack a certain depth of colour.

With the screen set to just below mid-brightness, you can expect between nine and ten hours of continuous use from the battery with Wi-Fi off. You can expect that figure to fall closer to Google's quoted 6hrs 30mins with the brightness up and Wi-Fi on.

The Chromebook is powered by a dual-core 1.7GHz Samsung Exynos 5 ARM processor, which in the SunSpider JavaScript benchmark returned a score of 892ms. That's on a par with the fastest ARM devices, including the fourth-generation iPad (web ID: 378337).

Unfortunately, real-world performance doesn't live up to this early promise. It's a notch up from the original Chromebook, which couldn't even play normal BBC iPlayer content smoothly, but still feels underpowered.

Any Full HD video, whether streamed or loaded from local storage, is marred with jerks and stutters, and when there are more than a handful of tabs open in the browser, everything else begins to slow down – even typing in Google Drive can feel sluggish. That's a shame, since as long as you keep the number of open tabs to a minimum, web apps and general browsing is speedy, and boot time is a prompt 11 seconds.

One of the major criticisms we had of the first Chromebook, and by definition Chrome OS, was there wasn't enough scope for working offline. You lost your internet connection and the ability to do anything practical.

The latest version of Chrome OS takes a more pragmatic approach. Google Drive documents and other files can be cached to the 16GB SSD and worked on offline. Any changes made offline are then uploaded the moment you reconnect.

Chrome OS's new Windows-style desktop makes a difference, too. Taskbar icons provide quick access to each of the core Google Drive services, as well as search and wireless settings, and the addition of small app-like utilities, such as the calculator and Scratchpad, is another bonus. Then there's the handy Files app, which allows files to be copied and pasted between local storage and Google Drive, and provides basic photo-editing tools. All this adds to a sense that Chrome OS is no longer a curiosity, but a fully fledged OS, ready for work.

Chromebooks were always going to struggle to challenge Windows laptops or netbooks for straightforward appeal and flexibility, and Samsung and Google's first effort failed to recognise that fact. Overpriced and limited in scope, the original was only ever fit for early adopters.

This latest version is, by comparison, a breath of fresh air. Despite modest performance from the ARM processor, the improvements to Chrome OS and the addition of robust offline support mean it's no longer a quirky netbook alternative. Those looking for a low-cost, general-purpose portable should seriously consider one. JONATHAN BRAY

KEY SPECS

Dual-core 1.7GHz Samsung Exynos 5 Dual • 2GB RAM • 16GB SSD • 11.6in, 1,366 x 768 TFT • HDMI • Bluetooth • dual-band 802.11n Wi-Fi • Chrome OS • 1yr RTB warranty • 289 x 204 x 22mm (WDH) • 1.09kg (1.38kg with charger)

OVERALL	★★★★½
PERFORMANCE	★★½
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★★★

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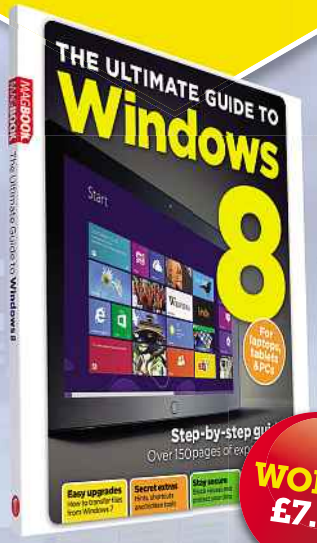

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Barnes & Noble Nook HD

A sharp screen, well-designed UI and a smattering of unique features can't make up for a half-empty app store

PRICE 8GB, £133 (£159 inc VAT); 16GB, £158 (£189 inc VAT)
SUPPLIER http://uk.nook.com

Full-sized tablets have fallen out of fashion – the compact market is where all the action is right now. First there was the Nexus 7, then Amazon came on board with the Kindle Fire HD, and even Apple has lumbered in with the iPad mini. Now it's the turn of US book-store giant Barnes & Noble to enter the fray with the Nook HD.

On paper this £159, 7in tablet looks to be right up there with the best of them. It certainly has the sharpest display, with a resolution of 1,440 x 900 and a pixel density of 243ppi. And it adds to that screen with a solid line-up of features and core hardware.

Inside the device is a 1.3GHz dual-core TI OMAP 4470 processor, one level up from the unit in the Kindle Fire HD, plus 1GB RAM, single-band Wi-Fi and Bluetooth. There's only 8GB of storage compared to the 16GB you get for the same price with its two main rivals, but there is a microSDHC slot to add up to 32GB more.

A standout specifications sheet is entirely academic if the device isn't attractive and usable, but the Nook HD is both. The chassis isn't as slim and light as that of the iPad mini, but it isn't far off. It weighs only 315g to the mini's 308g and the soft-touch chassis, scooped out at the rear, is comfortable to hold. It's a more pleasant design than the lumpen Kindle Fire HD, and if you don't like the white finish, which Barnes & Noble pretentiously calls "Snow", it's also available in a smarter-looking black.

The Nook HD's chassis is almost as slim as that of the iPad mini

Switch it on and the display immediately impresses. It's piercingly bright at its maximum setting – 445cd/m² – and although contrast isn't as strong as its competitors at 674:1, it's bold enough to provide a sumptuous viewing experience.

Text looks crisp and sharp-edged, with little pixellation, while photos are gloriously detailed and bursting with rich colours. Sit it next to a Fire HD or an iPad mini and images look a touch warmer due to a slight emphasis on the yellows, but this isn't a criticism. The glossy surface of the screen is less reflective than its rivals, too.

The Nook HD runs Android 4, but it isn't a "normal" Android tablet. It runs a heavily modified version of Google's mobile OS, which is tied in closely with Barnes & Noble's content offerings, and has no access to Google Play.

We like what Barnes & Noble has done with the UI. The homescreen is clean and welcoming, with a carousel of recent items displayed at the top and shortcuts to favourite items below. A field to search the device is situated at the bottom of the screen, and above this are five buttons that link to a full listing of all your content and apps, the web browser, email client and shop.

Everything is attractively designed and easy to find, and there are several excellent features that set this tablet apart. You can, for instance, set up multiple user profiles and apply parental controls that allow you to block certain features and content, so your little ones don't accidentally tap *Prometheus* when they want to watch *Pinocchio*.

There's a superb selection of reading tools, particularly Article View, which strips the text and images out of a web page or magazine and presents it in a more readable format. You can also clip individual pages from digital magazines and save them in a "Scrapbook" for later reference.

The Nook HD's user interface is delightfully simple

Much like the Kindle Fire, you can only buy books on the device from the Barnes & Noble store, and the same holds for newspapers, magazines, video and apps. For books and magazines this is fine: Barnes & Noble's store is both deep and wide-ranging, and a quick sweep of the bestseller list revealed few gaps in the store's offering. You can load EPUB books onto the Nook HD via Adobe Digital Editions, and there's also a reasonable selection of films to rent or buy. The Nook HD supports the UltraViolet online movie library, so you'll also be able to watch the digital version of any DVD or Blu-ray bought with an UltraViolet logo on it.

For apps, though, the selection is horribly limited. There's no BBC iPlayer, no official Facebook app, no Shazam or Flickr. Browse to the games section and you'll discover the choice is even more threadbare: you can purchase and install the latest Angry Birds Star Wars game, and old favourites Cut the Rope and Fruit Ninja also make an appearance, but after this the big-name titles tail off.

The Nook HD can't match the Kindle Fire HD for music features, either. You can drag MP3 files across via USB and play them on the tablet's preinstalled Music app, but there's no cloud-based streaming similar to Amazon's.

The sparse app store and thin selection of certain types of content hold back an otherwise excellent tablet. Although prone to the odd stutter, the UI is largely responsive, and in benchmarks the Nook HD performed well. In the SunSpider test it finished with a highly reputable score of 1,243ms and the battery lasted an impressive 12hrs 35mins in our looping video test.

If only Barnes & Noble would forego its own app store and install Google Play we'd be tempted to give it an award, or maybe even the iPad mini's place on our A-List. Instead, it just misses out on the honours. JONATHAN BRAY

KEY SPECS

1.3GHz dual-core TI OMAP 4470 CPU • 1GB RAM • 8GB/16GB storage • 7in 1,440 x 900 IPS display • stereo speakers • single-band 802.11bgn Wi-Fi • microSDHC slot • Nook 2.0.4 OS (based on Android 4) • 1yr RTB warranty • 127 x 11 x 195mm (WDH) • 315g

OVERALL	★★★★☆☆
PERFORMANCE	★★★★★☆
FEATURES & DESIGN	★★★☆☆☆
VALUE FOR MONEY	★★★★★☆

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Eizo FlexScan EV2316W

Sensible power-saving options, great build and solid image quality make this a decent business purchase

PC PRO RECOMMENDED

Sturdy build goes hand in hand with business-friendly ergonomics

PRICE £176 (£211 inc VAT)
SUPPLIER www.eizo.co.uk

While consumers put image quality above all else, buying monitors for business calls for a different set of priorities. Eizo's FlexScan EcoView range focuses on sensible design, desk-friendly ergonomics and reducing long-term running costs; we've taken a close look at the entry-level model, the Eizo FlexScan EV2316W.

The EV2316W squeezes a 23in, 1,920 x 1,080 panel into a slim, squared-off chassis, and the build quality is excellent. The sturdy stand gives 180mm of height adjustment, up to 30 degrees of backwards tilt, rotates into a portrait orientation, and swings smoothly left and right without you having to lift the base from the desk. A slight stiffness to the height adjustment means that the panel stays put once set, and a plastic clip at the rear ensures cables run neatly away from the rear of the stand.

Connectivity is ample. There are D-SUB, DVI and DisplayPort inputs, a two-port USB 2 hub, a 3.5mm headphone output and a 3.5mm audio input for the monitor's pair of 1W internal speakers. At the front, a strip of buttons provides controls for the monitor's onscreen display, quick access to volume and brightness controls, and also lets you toggle between the video inputs.

You can access the monitor's EcoView menu from here, too, which provides a series of power-saving tools. Auto EcoView automatically dims the backlight depending on the ambient light, and a movement sensor can be set to switch off the monitor after anything from five seconds to an hour of inactivity. Further power

Dell S2340T

A 23in, Full HD touchscreen to bring out the best of Windows 8, but it's seriously flawed

The double-jointed stand contorts into several positions

PRICE £420 (£504 inc VAT)
SUPPLIER www.amazon.co.uk

You don't have to buy a fancy all-in-one or hybrid to benefit from Windows 8's touch features – you can add a touchscreen such as Dell's S2340T to your existing PC instead. This 23in Full HD display combines multitouch capacitive technology with a highly adjustable stand, and an array of handy docking station features.

Getting the S2340T up and running is simple. Video connection is via HDMI or DisplayPort, and to enable the touchscreen a USB 3 connection is also required. With everything plugged into our Windows 8 host PC, the S2340T was ready to go in seconds, with no extra drivers or downloads needed.

The touchscreen layer beneath the monitor's glass panel supports ten-finger input, and it responded instantly to flicks and pinches. We soon found ourselves reaching out to tap links and swipe web pages up and down – it all feels surprisingly natural.

Alas, not all gestures work as well. In particular, we found support for Windows 8's edge-swipe gestures was patchy, and we frequently found we had to forcefully drag a finger onto the screen from the bezel to activate them.

That's a shame, since the S2340T has an array of features that would seem to make it the ideal Windows 8 monitor. It has a double-jointed stand, which not only tilts back and forth, but also rises up and down and folds back flat to leave the touchscreen pointing skywards. The display can be craned forward, too, and pulled down flush with the surface of the desk to make touchscreen operation more comfortable. Two cleverly positioned rubber bumpers on the monitor's lower edge ensure it doesn't move or clatter around when prodded.

It's well connected, too. Around the base are four USB 3 ports and a Gigabit Ethernet connection, plus 3.5mm headphone and microphone jacks. An integrated 1080p webcam is

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savings can be made with EcoView Optimizer, which adjusts the backlight to suit onscreen content. System administrators will appreciate the EcoView Net software, which runs on the host PC and makes it possible to set power-saving and display settings remotely over the network, and even lock the onscreen display completely.

Appropriately, the EV2316W is power-efficient. At full brightness, the Eizo draws 22W from the mains, but dropping the backlight to a more eye-friendly 120cd/m² sees the power draw fall to 14W.

Image quality is less notable. The TN panel means there's a noticeable colour shift as you move away from head-on, and colour reproduction isn't as exuberant and lifelike as models equipped with IPS panels. This isn't a monitor intended for professional photo editing, though, and for general office use it's perfectly acceptable.

The matte, anti-glare finish keeps distracting reflections to a minimum, ensuring onscreen content is clear and legible even in direct sunlight. Brightness hits a more-than-ample 240cd/m², and contrast reaches 800:1, avoiding the greyish blacks that afflict many TN monitors. Colour accuracy is excellent, too.

With a price that exceeds even IPS monitors such as Dell's superb UltraSharp U2312HM (web ID: 375760), this Eizo doesn't appear to be good value for money. In the long term, however, it makes more sense. With a good-quality TN panel, several handy power-saving features, and the reassurance of a five-year warranty, the FlexScan EV2316W offers businesses plenty of value. SASHA MULLER

KEY SPECS

23in 1,920 x 1,080 TN TFT • D-SUB, DVI, DisplayPort inputs • 2 x USB 2 • 2 x 1W speakers • 5yr C&R warranty • 540 x 246 x 360mm (WDH) • 5.7kg

OVERALL	★★★★½
PERFORMANCE	★★★★☆
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★☆

positioned in the upper bezel alongside a microphone array, and a pair of stereo speakers is hidden away in the base.

The webcam provides detailed – but noisy – images, and while the pair of speakers in the base are better than those that come with most monitors, their small size limits their potential. Music is reproduced crisply enough to remain listenable, but there's little bass and the maximum volume is modest.

Image quality is mixed. The monitor's IPS panel delivers colours that remain true whichever position the S2340T is viewed from, and the accuracy of those hues is admirable. Unfortunately, the touchscreen layer plays havoc with the monitor's reproduction of darker tones, with black appearing as a dark grey. We measured the maximum brightness at 221cd/m², which in normal circumstances would be ample, but here it isn't enough to overcome the poor black level, giving a disappointing contrast ratio of only 267:1. Photos and video consequently lack fizz, and darker scenes in movies and games look washed out and lacking in detail. It all looks rather lifeless next to the best monitors we've tested.

At £540, this multitalented monitor commands a considerable premium, but with so many shortcomings it simply isn't worth paying the extra cash for. You're better off sticking to a non-touchscreen monitor – such as Dell's excellent 23in UltraSharp U2312HM (web ID: 375760) – which provides far superior image quality at a fraction of the price. SASHA MULLER

KEY SPECS

23in 1,920 x 1,080 touchscreen IPS TFT • HDMI, DisplayPort inputs • 4 x USB 3 • Gigabit Ethernet • headphone output • microphone input • 2.1mp webcam • integrated dual microphones • stereo speakers • 3yr C&R warranty • 563 x 218 x 415mm (WDH) • 10.5kg

OVERALL	★★★☆☆
PERFORMANCE	★★★☆☆
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★☆☆☆

Be aware that the Philips hue bulbs are screw-in not bayonet cap

Philips hue

A quirky – if expensive and impractical – way of controlling your home lighting via your smartphone

PRICE £150 (£180 inc VAT)
SUPPLIER www.apple.com/uk

It takes quite something to over-engineer a light bulb, but that's what Philips has achieved. Its hue lighting kit comprises three screw-in bulbs, a wireless bridge and an iPhone app (the Android version is in beta) that lets you change the colour of the lighting in your house, whether you're at home or not.

This domestic version of the Blackpool illuminations is made possible by low-bandwidth ZigBee receivers fitted inside each of the kit's staggeringly expensive bulbs.

The app presents a wide choice of lighting presets, ranging from the simple Reading theme, which blasts white light at full glare, to more exotic choices such as the blue-tinged "Ski". The hue and brightness of each bulb can be tweaked individually using a series of sliders, and you can switch individual lights on and off at will.

More impressive is the option to take a photo on the iPhone and use colours sampled from it to set the colour of each bulb, allowing you to, say, match the lighting to your interior décor. However, the bulbs have a limited colour spectrum: don't expect them to match your dark-brown leather sofa, for example, or reproduce the subtle tone of the Farrow & Ball paint on your walls.

Elsewhere, style overwhelmingly triumphs over substance. Although you can set the lights to switch on and off at specific times, you can only set one such alarm at a time. Bewilderingly, there's no option to set up a recurring schedule for the lights to come on every day, handicapping one of the potentially most useful features – as a security light. It's possible to manually switch lights on and off remotely, but this smacks of buying a dog and barking yourself.

On the plus side, setup couldn't be easier. The lights react to commands from the iPhone in a heartbeat, and the 8.5W LED bulbs are energy-efficient and still splendidly bright. It's also a terrific way to scare the life out of your kids, pets and burglars.

Yet at £180 for the three-bulb starter kit, and £50 each for additional bulbs, it's an impractical extravagance that will surely only appeal to *Grand Designs* wannabes. BARRY COLLINS

KEY SPECS

3 x multicolour wireless light bulbs, 8.5W • 600lm (50W equivalent) • E27 screw-in fitting • lifespan – 15,000hrs/25,000 power cycles. ZigBee wireless bridge: 10/100 Ethernet socket • 2.4GHz ZigBee wireless • app available for iOS and Android (beta) • 2yr RTB warranty • 97 x 97 x 25mm (WDH) – bridge only

OVERALL	★★★☆☆
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★☆☆
VALUE FOR MONEY	★★☆☆☆

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The mixer, now with knobs on, forms the centrepiece of Cubase 7

Steinberg Cubase 7

A big overhaul of a heavyweight audio-production tool: Cubase has never been so sophisticated – or more complex

PC PRO A-LIST

PRICE £363 (£435 inc VAT)
UPGRADE £90 (£108 inc VAT)
SUPPLIER www.dv247.com

Music-production software has slowly evolved over the years, leaving hardware simulation behind in favour of more usable but abstract interfaces. However, loading up Cubase 7 for the first time feels like taking a step back in time. In this latest release, Steinberg has placed the mixer back at the heart of the software – and it's an enormous beast, resembling the kind that stretches from wall to wall in top-flight studios.

It's a dramatic change and there are plenty of useful new features. The Channel Strip is one of them, incorporating five insert effects in each channel. These comprise a noise gate, compressor, envelope shaper, tape or tube saturation and a limiter – a powerful combination for creating mixes with plenty of punch. The settings themselves aren't new, but having them a mouse-click away encourages routine and more extensive use.

The four-band channel EQ now includes high-pass and low-pass filters, and a spectrum analyser overlaid on the EQ curve to help fine-tune settings. It, too, is better integrated into the main mixer panel, with thumbnail-sized EQ curves that turn into bigger, editable curves when clicked. The mixer also includes routeing, inserts, sends, metering, picture icons and space for making notes. New cue mix controls mean it's now possible to create independent headphone mixes for multiple performers without having to commandeer the channel sends.

That's a lot to fit into a single screen, so thankfully there are options to hide the various channel types and mixer modules. Effects in the Channel Strip can show all of their controls or only one or two key parameters. There's an option to display only the channels that contain music between two points in time – great for tackling small sections of an enormous project – and it's also possible to save and recall mixer views, and to run text searches to jump to a specific channel.

All in all it's a great success, but we wouldn't fancy our chances if this was our first experience of audio production: there's a huge amount to take in. Even seasoned users will be bemused by the string of buttons for resetting solo, automation and bypass settings, which are represented by 13 single-letter abbreviations.

Most of the above is merely a repackaging of existing features, but there are new tricks and toys. The Q-Link button links selected channels together, so changes made to one are reflected across the others. It's also possible to set which modules in the mixer are linked. This is tremendously useful for a wide range of situations, from setting up groups of similar channels, such as a brass section, to performing sub-mix volume changes without getting tied into using the group busses.

There's a new track type called a Chord Track, where the chord sequence for a piece of music is defined and used to force MIDI parts to follow it; it's a bit like Quantise, but for pitch rather than timing. There's even a Chord Assistant that suggests chords based on the previous and next chord, and a variable complexity control. The results this produces can be odd, though.

The Chord Track comes into its own when used with the new Generate Harmony Voices command. This uses Cubase's powerful audio-pitch correction to generate virtual backing vocals from a lead vocal. They sing block chords by default, but it isn't hard to drag them around to give the voices melodic shape. The results aren't particularly natural-sounding, but we can imagine this being used for interesting creative effects.

Other new features include additional sounds for the bundled virtual instruments, and improved buffering to reduce the risk of drop-outs. Support for Hermode tuning in the built-in virtual instruments gives harmonies a purer quality. Voxengo's CurveEQ plugin is bundled, giving surgical control and the ability to clone frequency responses. The new A/B Comparison buttons are useful for trying out different plugin settings.

Over the years, Cubase feels as if it has been disappearing down the rabbit hole of uncompromising complexity, and this overhaul, thorough though it is, does little to alter that impression. But it's doing so in a bid to provide experienced users with the most precise and flexible tools; if that's the price of progress, on balance we'll take it. BEN PITT

OVERALL	★★★★½
EASE OF USE	★★★½☆
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★½

Cubase 7's Chord Assistant has funny ideas about what constitutes conventional harmonic progressions

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CyberLink PowerDirector 11 Ultra

A handful of welcome improvements isn't enough to edge this video editor in front of the pack

PRICE £58 (£70 inc VAT)
UPGRADE £37 (£45 inc VAT)
SUPPLIER www.amazon.co.uk

For years PowerDirector was the fastest consumer video editor around. Its unrivalled real-time preview performance was a huge benefit when editing processor-intensive formats, such as 1080p AVC with effects and overlays. The competition has caught up, though, with Sony Movie Studio Platinum 12 (web ID: 376474) and Adobe Premiere Elements 11 (web ID: 377164) both delivering similar levels of performance.

PowerDirector needs something special to re-establish itself, and the new features in version 11 are on the right track. There are improved colour-correction and ripple-editing options to compete with Sony's editor. The updated PiP (picture-in-picture) Designer for animating visual elements brings the battle to Adobe's door.

CyberLink's determination to cover every conceivable base also sees the addition of a content-aware editing module to help home users zone in on the best bits of footage. It tries to fix shaky video and lighting problems, often with reasonable success, and identifies sections with faces, panning and zooming. Ultimately, though, it can't tell you whether a section is boring or interesting. Version 11 also adds support for 4K resolutions for people shooting professional productions.

The new colour-correction functions bear a closer resemblance to the tools in Adobe Photoshop Lightroom than traditional video-editing software. Existing controls are joined by exposure, vibrancy, highlight healing and shadow controls, allowing for stronger colour correction without obliterating subtle colour variations. We still prefer Sony's colour-correction effects for their flexibility and clinical precision, but this is a big improvement.

We encountered a bug where applying the Highlight Healing and Shadow processes caused the preview to lapse into slow motion and lose audio sync, most noticeably at high preview resolutions. This was one of numerous bugs we encountered when PowerDirector 11 was first launched. Most of them are now resolved, but this one persists.

The new ripple-editing functions could be better, too. They dictate what happens to objects on the timeline when others are inserted, deleted or changed in length. The standard behaviour among most consumer editors is to shuffle objects along to make space or fill gaps, but this isn't always desirable, particularly when working across multiple tracks or when editing video in time with music.

Lightroom users will be right at home with the expanded colour-correction controls

Separate keyframe lanes for the various animation parameters give tighter control over how clips move around the frame

PowerDirector's ripple functions are powerful but highly confusing, with a different set of options to choose from depending on the action at hand. In all there are eight different items in the dropdown Ripple menu, which is thorough, but hardly user-friendly. Sony shows how it should be done, with a global ripple control, three easy-to-understand settings and entirely predictable results.

The best new feature is the PiP Designer. This offers separate keyframe lanes for opacity, scale, rotation, position, skew and 3D depth, allowing for complex animations without the consequent tangle of redundant keyframes. As before, you can define a curved path between two position keyframes, although precise trajectories can be tricky. It's much better than Sony's clumsy Pan/Crop tool, but Adobe still comes top here, not only for its Bézier curves between keyframes, but also its velocity settings. The latter helps animations appear more fluid than anything CyberLink or Sony can muster.

PowerDirector's real-time preview performance remains excellent, but the user interface can be slow to respond to user input. Some dialog boxes took a couple of seconds to appear, and adjusting the start and end points of clips took about a second to complete. It isn't a disaster, but rival editors feel more responsive.

There are various other minor irritations. The software warns when imported media doesn't match the project frame rate, but doesn't tell you how to change it. The AVC export options lack 1080/25p and 1080/30p presets. These can be defined manually, but only if you know what you're doing. And PowerDirector always launches with a pointless collection of sample photos and videos in the media pool, which it then offers to merge with any project you open.

There's no questioning the sheer quantity of features, with animated titles, freehand drawings, particle effects, Blu-ray and DVD authoring, subtitles and a range of semi-automatic editing functions. However, in the face of such accomplished competition, it isn't the most lovable editor. It isn't sufficiently better than Sony Movie Studio Platinum in any area to tempt us away. BEN PITT

OVERALL	★★★★☆
EASE OF USE	★★★☆☆
FEATURES	★★★★★
VALUE FOR MONEY	★★★★☆

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Apple iTunes 11

A more sprightly and better-looking iTunes, although not the deeper overhaul we were hoping for

PRICE Free
SUPPLIER www.apple.com/uk

Forget the iPhone 5; the unveiling that had us out of our seats with an un-British whoop in September was that of a new version of iTunes. For years we've moaned about Apple's bloated mess of a management tool – its antediluvian interface, clumsy synchronisation and huge memory footprint – so news of an overhaul was welcome.

In many ways, it's a much-needed improvement. The interface has been streamlined wherever possible. Gone is the sidebar, with the library sections moved to a dropdown menu in the top-left corner, and a Store button in the top right. Listings have some handy enhancements. Click an album cover and a full-width detail panel slides open beneath, complete with track listings and an "In the Store" button to buy related content.

Out goes iTunes DJ, replaced by Up Next. This allows you to queue tracks in a playlist that pops out from the playback area at the top, with its own contextual menu full of "Go to" options, ratings filters and Genius suggestions. Users can browse seamlessly between the library and store, creating playlists organically.

Switch to the MiniPlayer – a tiny floating playback control bar – and the Up Next list and all its related menus remain usable, as well as AirPlay functions, giving a surprising level of control in such a small window.

What we really wanted from iTunes 11 was evidence of a diet.

A streamlined interface and lighter footprint are good improvements

On our test Mac, an idle iTunes 10.7 occupied 89MB of RAM, rising to 343MB when browsing the store; after upgrading to iTunes 11, the same actions occupied 76MB and 221MB. As for peak memory use, the new version saved 38MB.

It's a step forward that sums up iTunes 11: necessary and welcome, but hardly earth-shattering. Syncing devices remain as clumsy as ever, and it's surprisingly buggy – some store pages were rendered erratically, and the "In the Store" link on albums gave us broken, unreadable fonts on some test systems. This was Apple's moment to make major changes, but iTunes 11 is just another incremental upgrade. DAVID BAYON

OVERALL	★★★☆☆
EASE OF USE	★★★☆☆
FEATURES & DESIGN	★★★☆☆
VALUE FOR MONEY	★★★★★

TeamViewer 8

Easy to use and cross-platform, TeamViewer delivers powerful remote access features

PC PRO RECOMMENDED

PRICE Free for personal use; from £439 for businesses
SUPPLIER www.teamviewer.com

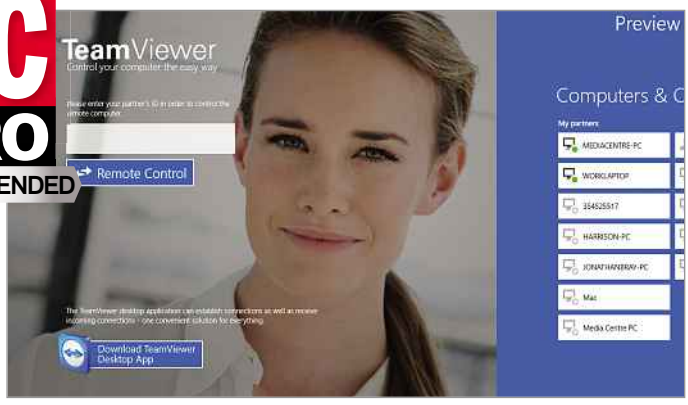
Whether you're at home and want to retrieve a file from the office PC, or need to fix a problem on a friend's computer, remote control software can save the day.

Our favourite tool for this job has long been TeamViewer. We've tried many similar products, but we always find ourselves gravitating back to TeamViewer because of its simple interface and reliable connection.

It's changed a lot since we last reviewed it with version 6 (web ID: 363775), but simplicity and ease of use remain at the core of TeamViewer's appeal. The QuickSupport tool is a small download and neither party has to register to use it.

Tools for initiating a remote control session, file transfers and online meetings are displayed in one window, and another docked to the side displays all of your TeamViewer-connected computers. You can remotely control Windows, Apple and Linux PCs, and also Samsung smartphones and tablets. Control can be initiated from all the above, and iOS devices, too.

Since our last review, scaling has improved, and the Android tablet app now works in landscape mode when logging in, as well as during remote control sessions. TeamViewer has introduced a Windows Store app for Windows 8 and RT, which works well, with



TeamViewer has added a Windows 8 app to its considerable arsenal

shortcut buttons for the core gestures via the context menu.

In this latest version, business users also receive several new features. Support staff using the software can now collaborate with colleagues, and there's a management console, available to customers with a Premium or Corporate licence. This provides administrators with web-based control over users, their passwords and permissions. There's also a logging tool that keeps tabs on connections, and can calculate fees based on pre-defined rates.

Overall, this is a solid upgrade to an already excellent product. The pricing structure may or may not be right for your business, but for private use it remains our favourite remote control app. JONATHAN BRAY

OVERALL	★★★★½
EASE OF USE	★★★★★
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★★½

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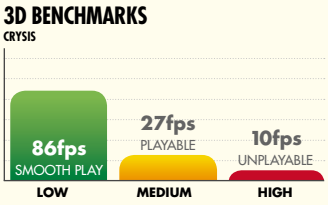
How we test

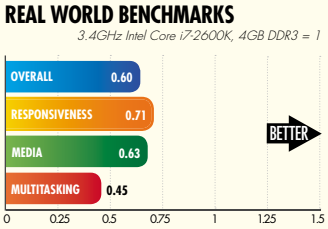
A REFERENCE GUIDE TO OUR BENCHMARKS AND TEST METHODS

Our benchmarks are designed to reflect the way people actually use computers today. We use current applications, as well as a set of general responsiveness tests, to get an all-round picture of a PC's or laptop's performance.

Responsiveness

With low-power netbooks now so popular, it's vital to know how responsive a system is. To measure this, we first time how long it takes to open documents and switch between a series of common applications, including Word and Excel, Acrobat Reader X and Internet Explorer. We then time how long the system takes to open, close and move dozens of Explorer windows.





Media

Our Media tests expose how well a system can process music, photos and video files. We use iTunes 10 to encode an album into AAC and MP3 formats, then Adobe Photoshop CS5 to work on a folder of 12-megapixel RAW photographs. We adjust the colours and curves, apply artistic sharpening and blurring, and save the results in JPEG format. Finally, we use Sony Vegas 10 to render a short 1080p video, with a picture-in-picture effect and a cross-fade transition.

Multitasking

To really test a system, we simultaneously run the iTunes and Photoshop tests, then launch our Responsiveness tests over the top. Finally, we time how long it takes the multithreaded Cinebench 11.5 renderer to produce a complex 3D scene.

Overall

We compare all timings with those of our reference platform: a 3.4GHz Core i7-2600K with 4GB of DDR3 RAM and a 7,200rpm hard disk. All desktops are tested at 1,920 x 1,080; we test laptops at the display's native resolution.

Each score is given relative to the reference platform: a score of 1.5 would indicate a PC that was 50% faster. We combine the three scores into an overall average, but we also show the breakdown of the three tests, so you can easily see a system's strengths and weaknesses.

3D benchmarks

We test 3D performance using pre-recorded sequences in Crysis. We use the game's Low, Medium and High quality settings in the resolutions of 1,366 x 768, 1,600 x 900 and 1,920 x 1,080 respectively. For really fast systems we replace the Low test with one at 1,920 x 1,080 and Very High quality. A system's 3D graphs (*see left*) will be coloured red, amber or green to indicate how smooth on average gameplay will be.

BATTERY-LIFE BENCHMARKS

Our battery tests are also designed to reflect the real world, so we aim to determine the battery's life for intensive tasks and everyday browsing.

In the light-use test, we optimise the system for power efficiency – Windows' power profile is set to Power Saver and we set the screen brightness as close to 75cd/m² as possible using an X-Rite i1Display 2 colorimeter. We disconnect the mains and run a script scrolling a selection of web pages until the system shuts down, giving you a realistic idea of surfing time.

For the heavy-use test, we engage Windows' High Performance power profile, set the brightness to maximum and run the taxing Cinebench 3D renderer to push the processor load to the limit. This gives a worst-case figure for battery life from a single charge.

BATTERY: LIGHT USE 3hrs 14mins

Focus on...

Displays

We test all monitors, laptops and tablet screens in the same way. We use an X-Rite i1Display 2 colorimeter to gauge colour accuracy (technically known as Delta E), maximum brightness, black level and contrast ratio. We also display a selection of our own high-resolution test images and Blu-ray videos to get a real-world perspective.

Tablets & smartphones

Tablets and smartphones are similar products, so we test them in largely the same way. We run a selection of browser-based speed tests (including the SunSpider JavaScript test). We also thoroughly test battery life by simulating real use: phone calls, browsing, playing a podcast, and leaving the device on standby for 24 hours.

Cameras

Cameras are tricky to test, as no benchmark we can carry out will give us definitive figures. Instead, we carry out a set series of shots in outdoor and indoor conditions, and at different angles, then judge the results by eye, analysing how sharpness, exposure, chromatic aberrations and noise impact overall image quality.

Printers

We test inkjets, laser printers and all-in-ones using ISO documents, our own magazine PDFs and carefully selected, high-resolution photographs. Every test is timed to the second and the output quality judged. We use every menu and interface, and calculate running costs using the quoted cartridge yields and retail prices.

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EXCLUSIVE

Supermicro RTG RZ-1280i

A low-cost Xeon E5-2600 rack server, but storage features are a mess and it's noisy

PRICE £1,668 exc VAT
SUPPLIER www.serversdirect.co.uk

Supermicro's RZ-1280i rack server is designed for businesses that need a powerful rack server for a rush job, but want to get the most of their investment in the long term. As one of the new RTG (Ready To Go) family, it's available from stock for overnight next-business-day delivery, but offers plenty of expansion space so it can keep up with demand.

To ensure the delivery terms are met, the RTG servers are available in only fixed configurations. The price includes a Silver warranty, which provides three-year, on-site, next-business-day cover during office hours on weekdays. Cover can be upgraded to a Gold warranty for same-day, four-hour response, or Platinum cover, which gives you full 24/7 protection.

Storage options seem plentiful. There's room up front for eight SFF hot-swap hard disks, with our fixed configuration including a single 300GB Toshiba SAS 2 hard disk. The server's unusual dual-controller arrangement presents limitations, however.

A peek under the lid reveals an LSI SAS9211-4i PCI Express RAID card, which supports up to four hard disks in mirrors or stripes, cabled to the four left-hand drive bays. The motherboard itself has a real mess of SATA ports. It offers two SATA III, four SATA II and a separate SATA II/SCU quad-port connector linked via an iPass fan-out cable to the remaining four drive bays.

The SATA ports are handled by the embedded Intel C602 chipset, which offers mirrors, stripes and RAID5 arrays across them all. What this effectively boils down to is the RZ-1280i supports 6Gbits/sec SAS drives as JBODs, mirrors and stripes in the left-hand four bays and SATA drives with RAID5 in the four other bays.

The server's horsepower comes in the shape of a 1.8GHz E5-2603 Xeon (see 1), which is the slowest of Intel's basic Xeon E5 family. It has four cores, 10MB of L3 cache, a 6.4GT/sec QPI, but it doesn't support either Turbo Boost or Hyper-Threading.

Upgradability is reasonable. The motherboard has 16 DIMM slots, although only eight are active here – you'll need to add a second processor to enable them all, a feature common to all Xeon E5-2600 servers. Two 4GB DDR3 modules are included, and it's worth noting the E5-2603 Xeon supports only 1,066MHz memory speeds. With the RAID card in residence, there's room for one more full-height, half-length PCI Express card (see 2). Two embedded Gigabit ports are provided and a useful new feature is their support for IP SAN boot.

Cooling is handled by five dual-rotor cold-swap fans and airflow is aided by a clear plastic cover over the motherboard. Power redundancy is provided by a pair of hefty 700W hotplug supplies (see 3), and overall consumption isn't bad for a 1U rack server. However, we found the PSU fans were noisy.

With one supply inserted we measured a power draw of 60W in idle, and 79W with the SiSoft Sandra benchmark app running. With both supplies fitted, the idle draw went up to 88W; under load it hit 99W.

Remote management comes as standard, with an embedded RMM chip and dedicated network port. Although nothing radical, Supermicro has finally seen fit to redesign the web interface to make it more informative. There's now a table of sensor readings for critical components, along with a thumbnail view of the server's screen and a pie chart of the event log. KVM-over-IP remote control is a standard feature and can be accessed directly from the homepage with a single click. This also provides virtual media services, so you can present a device on the guest PC to the server and use it to boot from. Another new feature allows the remote control screen to be recorded for a number of seconds.

For storage and RAID management, the server takes a two-pronged approach. The MegaRAID Storage Manager web application takes care of the LSI raid card, while Intel's Rapid Storage Technology Enterprise utility manages the embedded SATA ports. The latter provides tools for creating RAID arrays and sending email alerts if drive problems are detected.

You usually pay a premium for next-day delivery, but the RTG RZ-1280i provides decent value for money, providing a comprehensive selection of hardware components for the price. However, the mismatched array of storage ports and dual RAID controllers, plus the unpleasant noise levels, reduce its appeal. DAVE MITCHELL

KEY SPECS

1U rack chassis • Supermicro X9DRW-iF motherboard • 1.8GHz Xeon E5-2603 (max 2) • 2 x 4GB 1,066MHz RDIMM DDR3 (max 512GB) • 300GB Toshiba 10K SFF SAS 2 hot-swap hard disk (max 4 SAS, 4 SATA) • Intel C602 and LSI SAS9211-4i RAID controllers • supports RAID0, 1, 5, 10 (Intel); RAID0, 1, 10 (LSI) • 2 x PCI-E Gen3 slots • 2 x Gigabit Ethernet • 2 x 700W hotplug PSUs • Supermicro RMM with 10/100 Ethernet • 3yr on-site NBD warranty • Power: 88W idle; 99W peak

For a rack server available for next-day delivery, the RTG RZ-1280i represents decent value for money

OVERALL	★★★★☆☆
PERFORMANCE	★★★★☆☆
FEATURES & DESIGN	★★★☆☆☆
VALUE FOR MONEY	★★★★★☆

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- 3m SAS cable '39R6531' (4 qty)

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EXCLUSIVE

IBM System x3550 M4

IBM's x3550 M4 isn't great value, but this well-designed 1U rack server offers plenty of features and is easy to upgrade, too

PRICE £5,059 exc VAT
SUPPLIER www.ibm.co.uk

The x3550 M4 ships with four SFF SAS/SATA hot-swap bays and can be upgraded to eight

Servers in the 1U dual-socket rack unit space have their work cut out toppling our A-List incumbent. HP's ProLiant DL360p Gen8 (web ID: 377143) offers a killer combination of top design, excellent upgradability and great value for money, and it will take a great product to dislodge it.

IBM's x3550 M4 is the latest to take on the challenge, and along with support for Intel's E5-2600 Xeons, it continues IBM's pay-as-you-grow philosophy, allowing businesses to start small and expand only when demand dictates. The standard models all ship with four SFF SAS/SATA hot-swap bays, which can be upgraded to eight bays.

This is achieved with a kit comprising a backplane for the four extra bays, to which you must add an IBM ServeRAID M1115 or M5110 controller for the four extra SAS ports. The latter goes into the dedicated PCI Express slot behind the DIMM sockets (see 1). Other drive options include three hot-swap LFF drives and a cheaper cold-swap LFF version available as a configure-to-order (CTO) model.

RAID cache options are extensive, with IBM offering standard battery backed-up memory and a choice of 512MB or 1GB flash-backed write cache modules. The review system includes the 512MB module, which brings support for RAID5 as well as mirrors and stripes.

Cooling is handled by six fans between the drive backplanes and motherboard (see 2). These are hot-swappable, but we found the protruding power connector tab on each one made them a little tricky to remove and replace. However, the server is very quiet: IBM uses a similar method to Fujitsu's Cool Safe where round holes in the chassis are replaced by a honeycomb. This allows the holes to be more densely packed, thereby reducing turbulence and noise.

The price of the review system includes a pair of 2.5GHz E5-2640 Xeon CPUs, the fastest of Intel's standard Xeon E5 family. They're six-core modules with a 15MB L3 cache, a 7.2GT/sec QPI, and offer Hyper-Threading and Turbo Boost. The server supports 1,333MHz memory in the shape of either 64MB of UDIMMs, 384GB of RDIMMs or 768GB of LR-DIMMs. There are 24 DIMM slots flanking the two CPU sockets.

IBM provided the review system with a single 550W hotplug supply (see 3), to which a second can be added for around £160. For higher power systems you can opt for meatier 750W supplies, although this isn't as impressive as HP's upgrade options; its DL360p Gen8 supports up to 1,200W power supplies. For the review system, power consumption is in line with similar rack systems with an idle draw of 95W and a peak of 228W.

For virtualisation duties, Dell's PowerEdge R620 (web ID: 373312) is our top choice since it has dual internal SD card slots for hypervisor redundancy. IBM provides only an internal USB socket and lags behind the competition in terms of server deployment, too. You still have to boot its servers with the ServerGuide DVD before installing an OS onto them – a process rivals did away with some time ago.

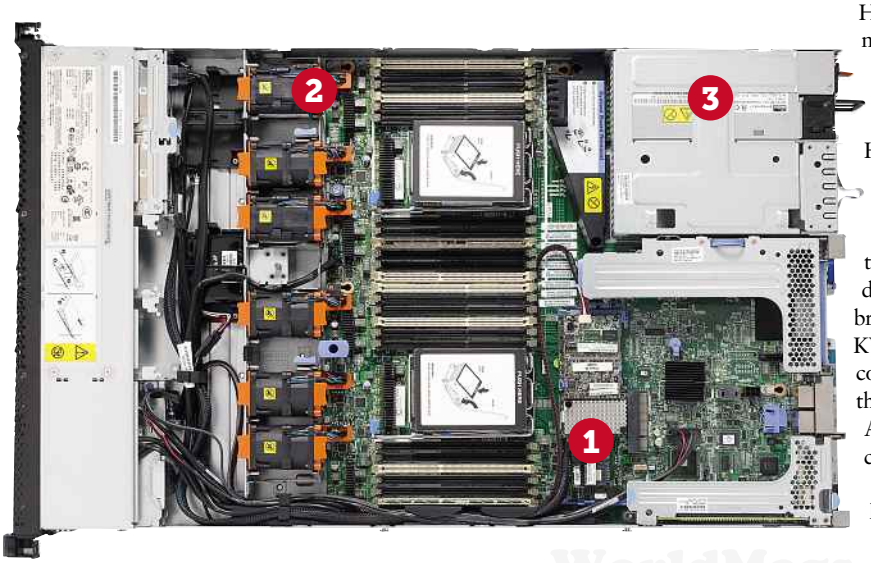
When it comes to remote management, it's another win for HP. Although IBM's new IMM2 sees big improvements, it isn't as sophisticated as HP's class-leading iLO4. The IMM2 Basic module supplied with the review system doesn't support web browser access or KVM-over-IP remote control, and to get these requires the Advanced upgrade costing £180.

IMM2 doesn't have integral power metering, either, but it can pass this information on to the Active Energy Manager plugin. This allows IT managers to apply power capping and view trend graphs of consumption and system temperatures.

IBM's Systems Director provides general systems management, and it's easier to deploy than HP's Insight Control software. It can manage all SNMP-capable devices and offers plenty of tools including network discovery, software deployment, inventory and file transfer.

There's a wide range of network options. The x3550 M4 has four embedded Gigabit ports and an extra one for an Emulex dual-port 10GbE mezzanine card, which is better than the HP DL360p Gen8's single connector that supports HP's FlexLOM quad-Gigabit or dual-10GbE cards.

The x3550 M4 will appeal to businesses that want a compact and powerful rack server that has room to grow. It's well designed and built, but HP's ProLiant DL360p Gen8 offers superior remote management and storage features at a lower price, which keeps it on top of our A-List. DAVE MITCHELL



KEY SPECS

1U rack chassis • 2 x 2.5GHz Xeon E5-2640 • 16GB DDR3 RDIMM (max 768GB with LR-DIMMs) • IBM ServeRAID M5110 with 512MB FBWC • supports RAID0, 1, 5, 10 • 2 x 300GB IBM 15k SAS 2 hot-swap hard disks (max 8) • 2 x PCI-E Gen3 • 4 x Gigabit Ethernet • 550W hotplug supply (max 2) • IMM2 Basic • IBM Systems Director 6.3 software • 3yr on-site NBD warranty • Power: 95W idle; 228W peak

OVERALL	★★★★☆☆
PERFORMANCE	★★★★★☆
FEATURES & DESIGN	★★★★☆☆
VALUE FOR MONEY	★★★★☆☆

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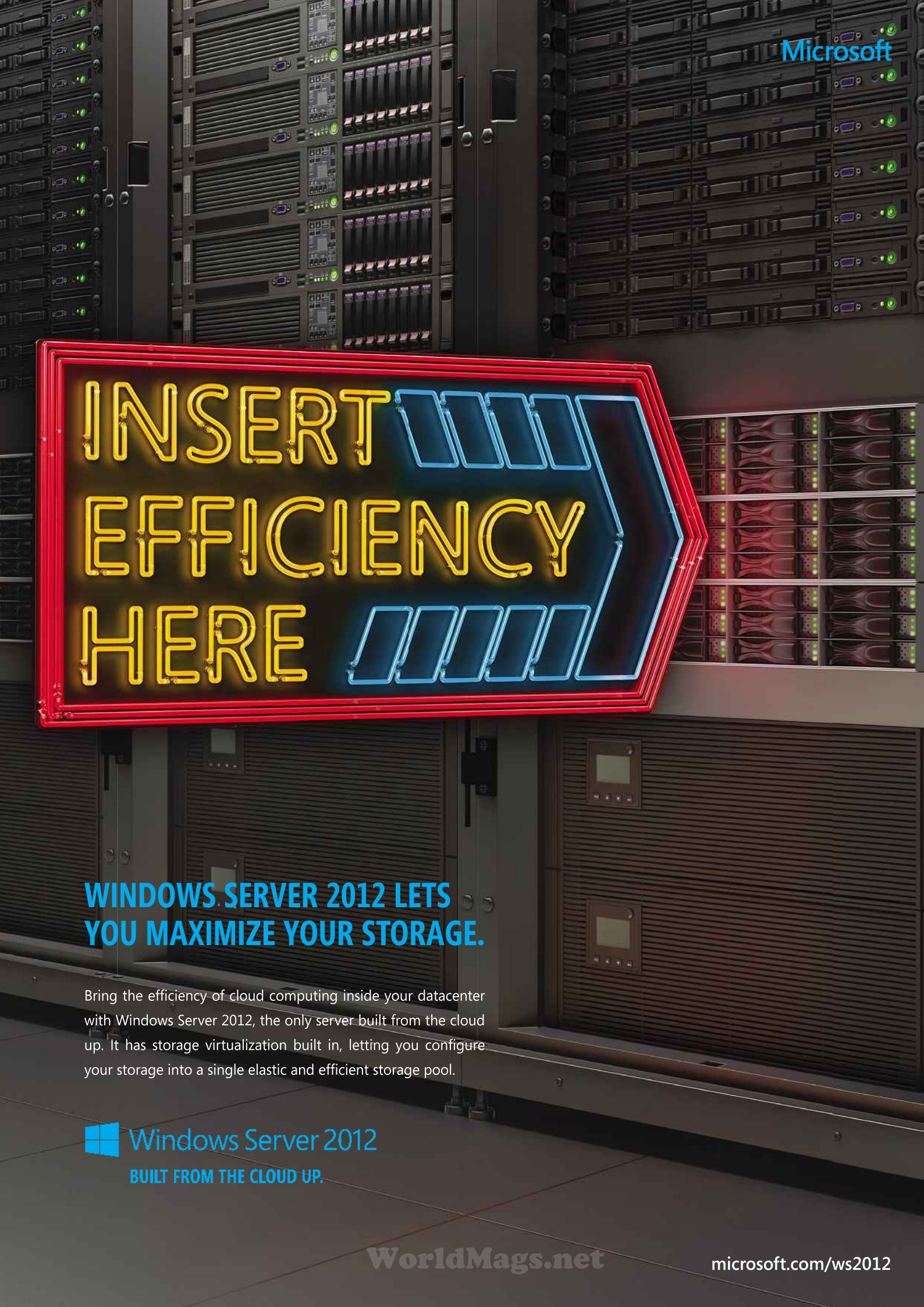

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Netgear ReadyDATA 5200

Delivers top performance and extensive data protection features, but its low deduplication ratio limits storage savings

The 2U Supermicro chassis offers 12 hot-swap SAS/SATA drive bays

PRICE Diskless, £5,499 exc VAT
SUPPLIER www.netgear.co.uk

Netgear's ReadyNAS appliances are popular network storage choices for SMBs, but their limited features and multimedia baggage makes them less appealing to larger businesses. With the ReadyDATA 5200, Netgear aims to remedy these shortcomings, giving the old RAIDiator software the push in favour of a new Solaris-based operating system.

With the ZFS file system on board, the ReadyDATA provides NAS and IP SAN operations, unlimited snapshots and thin provisioning. There's also built-in deduplication, compression, fast copy-on-write snapshots and SSD caching.

Block-level replication for volumes and snapshots is also included. This uses the hosted service and management portal as used in Netgear's ReadyNAS systems, and snapshots can be taken regularly, with only the available storage limiting the number and size of snapshots you can take. For each share and LUN, you can select the continuous protection option box and go for hourly, daily or weekly snapshots. The one major restriction is that it's only possible to replicate with other ReadyDATA appliances.

As with its ReadyNAS 3200 (web ID: 354130) and 4200 (web ID: 360919), the hardware is made by Supermicro. The result is a solid partnership of a 2U 12-bay chassis and X8SI6-F motherboard. It's rather noisy, though.

The drive backplane supports 6Gbits/sec drive speeds and there are two Gigabit ports plus a dual-port 10GbE PCI Express card. Storage expansion is now possible, with two external SAS ports supporting Netgear's EDA2000 and EDA4000 expansion chassis.

The main web interface is nicely designed and laid out. For volume creation, choose drives from the front-panel graphic and pick a RAID type; deduplication and compression can be enabled or disabled for each share and iSCSI LUN; and volume expansion allows new drives in the extra shelves to be added to existing RAID arrays. One smart feature is the ability to add extra drives to an array as read or write caches to improve performance.

The review system was supplied with six SATA and four SAS hard disks, plus Intel and STEC SSDs. We created separate RAID5 arrays on the SAS and SATA drives, and found IP SANs easy to create: choose a target name, a size, and thick or thin provisioning, and the ReadyDATA does the rest. LUNs can be expanded into available volume space and migrated online to another volume.

For performance testing, we used the lab's Dell PowerEdge R820 with its quartet of 2.2GHz E5-4607 Xeons and 96GB of DDR3 memory. This was running Windows Server 2008 R2 Enterprise and was equipped with an Emulex 10GbE adapter.

IP SAN testing over a single 10GbE link saw Iometer report sequential read and write speeds of 656MB/sec and 540MB/sec for a 200GB target on the SAS array. Running the same test on the SATA array saw lower speeds of 620MB/sec and 510MB/sec.

We then added the STEC SSD to the SATA array as a write cache and the Intel SSD as a read cache to see what difference it would make. We saw a significant speed boost, with Iometer reporting similar speeds to the SAS array.

Using an Iometer database load comprising 16KB random reads and writes saw 480MB/sec on the SAS array. The SATA array returned 455MB/sec, and enabling SSD caching again saw this boosted in line with SAS speeds.

Deduplication is carried out at the appliance so it's transparent to all host systems. To test it we used our deduplication test suite and CA's ARCserve r16 (web ID: 373744), set to use a mapped share as a disk-based backup. Using 4GB of 1,000 files, we ran a standard backup strategy consisting of daily incrementals and full weekly backups. After the first full backup had run, 2% of data was modified in 40% of files prior to each subsequent backup. After a four-week simulation, we saw a reduction ratio of 3.04:1. This is very low, but on par for ZFS-based systems. Infortrend's EonNAS Pro 500 (web ID: 375949), another ZFS appliance, returned 3.2:1 in the same test.

The ReadyDATA 5200 is a better bet for business storage than the ReadyNAS boxes since it has superior features and data protection options. Performance is better as well, although the low data reduction ratios mean it won't save as much storage as most other appliances boasting deduplication. DAVE MITCHELL

A plentiful array of connections includes two Gigabit, two 10GbE and a pair of SAS expansion ports

KEY SPECS

2U rack chassis • Supermicro X8SI6-F motherboard • 2.66GHz Intel Xeon X3450 • 16GB 1,333MHz DDR3 RAM (max 32GB) • 12 x hot-swap SAS/SATA drive bays • supports RAID0, 1, 5, 6, 10, 50, 60, hot-spare, JBOD • 2 x Gigabit Ethernet • 2 x 10GbE • 2 x SAS expansion ports • 2 x 700W hotplug PSUs • web browser management

OVERALL	★★★★☆
PERFORMANCE	★★★★★
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★★☆

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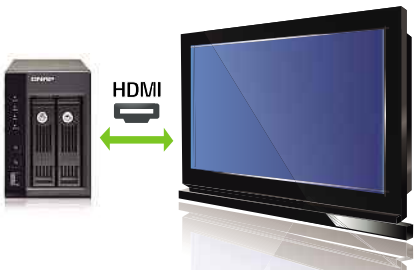

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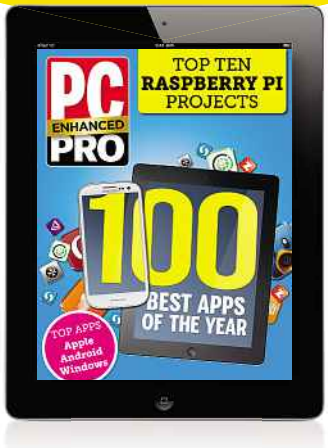

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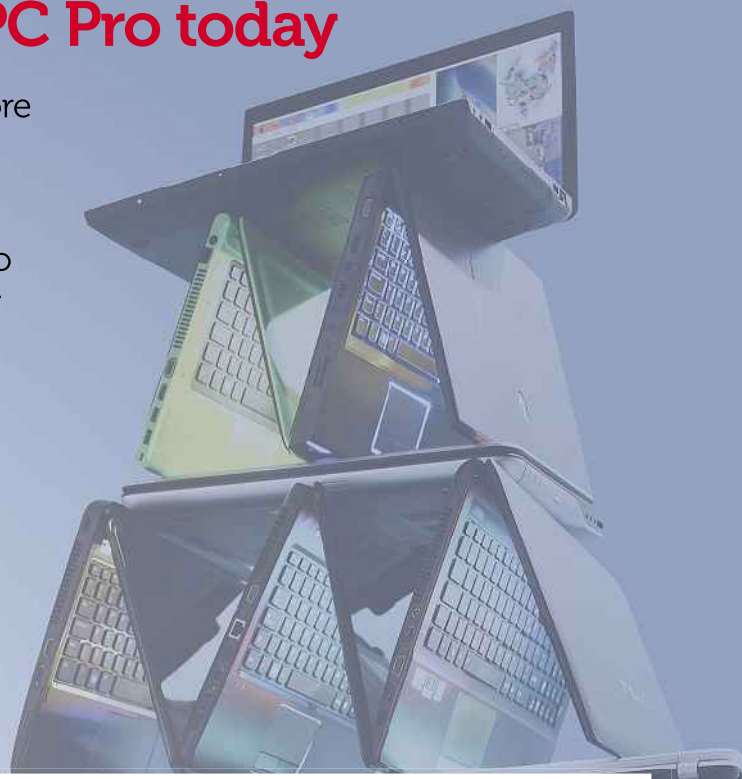

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Fujitsu ScanSnap S1300i

No big improvements over its predecessor, but it remains a good choice for businesses

PC PRO RECOMMENDED

PRICE £171 exc VAT
SUPPLIER www.lambda-tek.com

The ScanSnap S1300i is a solid upgrade to an already versatile and affordable portable scanner

Fujitsu is usually at the forefront of portable scanner development, so it's a surprise it's taken more than two years to update its popular ScanSnap S1300 (web ID: 359428). The S1300i doesn't offer any radical improvements, however, upping scan speed from 8ppm to a mere 12ppm.

Its chassis is identical to the older S1300, too. It has a flip-up ten-sheet ADF tray, with no output tray, and all scans are initiated by pressing a blue backlit button on the right-hand side.

The scanner can be powered via the mains or a USB port, with the latter cutting down the top quoted speed to 4ppm. Build quality is solid enough for deskbound duties or mobile use, but it doesn't come with a case.

Installation on a Windows 7 host is swift, and all operations are managed via the bundled ScanSnap Manager software. This runs in the background and pops up whenever you hit the Scan button, giving you the option to save scans to various formats, print them, send them as email attachments, or load them into a variety of applications.

From ScanSnap Manager you can set up profiles for specific apps, assigning various parameters as you go. These range from simple settings such as resolution, to more advanced options such as whether to scan originals single- or double-sided, in colour or mono.

Scanning to Google Docs is a cinch: after linking the software to our account, we could scan test pages and have them sent directly across as PDFs.

Scan speeds depend entirely on the resolution selected; the top speed is only possible at the lowest colour setting of 150dpi. Using the external power supply, we confirmed this with a ten-page test

EXCLUSIVE

WatchGuard XTM 515

Combines a heady blend of gateway security measures with excellent performance and a reasonable price

PC PRO A-LIST

PRICE Appliance with 1yr Security Bundle, £1,011 exc VAT
SUPPLIER www.lambda-tek.com

WatchGuard's latest XTM 5 Series of security appliances aims to deliver enterprise-level performance at SMB prices. In this exclusive review, we look at the XTM 515, which has a high quoted throughput of 850Mbits/sec.

The appliance delivered the goods in our performance tests. Hooking up the 515 to the lab's Ixia XM2 chassis and Xcellon-Ultra NP load modules, we created a test that simulated web clients on two Gigabit ports accessing web servers on two other Gigabit ports.

The IxLoad tool reported a top throughput of 860Mbits/sec, with all universal threat management (UTM) features switched on in the firewall policies. The appliance can be upgraded with a feature key to an XTM 525, which increases throughput to 1Gbit/sec.

The XTM 515 isn't short of features either, and the price shown above is for the one-year Security Bundle. This includes WatchGuard's LiveSecurity support plus IPS, web-content filtering, anti-spam, gateway antivirus, application controls, HTTPS inspection and WatchGuard's "reputation enabled" defence. The latter uses an online server to flag up URLs with good reputations, so the box doesn't have to scan every item of traffic.

Mixed-mode routing is the most flexible deployment method since it allows all the ports to be defined as separate interfaces. We opted for this and had the appliance up and running in minutes thanks to a wizard-based setup routine. It becomes trickier from here on in, however, as you need to configure application proxies for each of the security services. Even so, there's a fine choice, and it includes HTTP, HTTPS, FTP, SIP, H.323, POP3 and SMTP.

After proxy configuration, actions are assigned. These include functions such as exceptions, alarms and logging requests. Firewall rules are then used to apply each proxy and its associated actions to selected network interfaces.

WatchGuard's application awareness makes the XTM appliances stand out, since it allows admins to control Facebook and other social networking sites. It can be linked with Active Directory

WatchGuard's security appliance is supplied with a one-year security bundle

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document, which scanned in at almost 13ppm.

The "Better" 200dpi mode returned 9.5ppm; "Best" 300dpi dropped the speed to 7ppm; and the top 600dpi "Excellent" setting saw speed fall to 1.5ppm. With the scanner under USB power, we saw scan speeds drop to 5ppm, 4ppm, 2.5ppm and 1.5ppm for the four tests respectively.

Scanning plastic-embossed cards will jam the mechanism, but business cards were handled well, provided only two or three were loaded in the ADF at a time. The supplied CardMinder software failed to impress, though, with distinctly average OCR abilities and an inability to deal with anything other than bog-standard originals. Cards with coloured backgrounds flummoxed it completely.

ABBYY FineReader, on the other hand, does a fine job for general OCR, and produced searchable PDFs from our test documents with few errors. We also found the anti-skew function worked well, straightening out every one of our test receipts.

Finally, Fujitsu's Scan to Mobile feature will prove useful for smartphone and iPad users. Download the Connect app onto your device, configure access security in ScanSnap Manager and you can send scanned documents to it from the host PC.

With admirable scan output quality and a decent selection of software, the SnapScan S1300i is good value. There isn't enough here to entice existing S1300 users to upgrade, but businesses looking for an affordable and versatile portable scanner will find that the S1300i does the job well. DAVE MITCHELL

KEY SPECS

600dpi optical resolution • 12ppm colour duplex scan speed at 150dpi • 10-sheet ADF • ScanSnap Manager 5.1 • ScanSnap Organiser 4.1 • CardMinder 4.1 • Scan to SharePoint • ABBYY FineReader for ScanSnap software • 2yr product replacement warranty • 284 x 99 x 77mm (WDH) • 1.4kg

OVERALL	★★★★½
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★½☆
VALUE FOR MONEY	★★★★½

authentication, so you can fine-tune access on a per-user basis and decide who can log in, edit their profile, access webmail, view video, transfer files, play games or chat.

Web-content filtering requires a separate Windows system to host the WebBlocker URL category database, although we found a basic Windows 7 PC can run this happily. The same system will be needed to run the logging and reporting servers as well, but these also have a light footprint.

With WebBlocker there are 56 categories of URL that can be blocked, and we found very little sneaked past it. The Commtouch hosted anti-spam service is no lightweight, either: when tested previously, it delivered a detection score of 99% in our live tests.

Along with a performance boost over the older Series 5 XTM appliances, the latest WatchGuard Fireware 11.6.1 firmware adds new features. WebBlocker database updates are now fully automated, the web interface offers a handy policy checker service, and the appliance supports even more VPNs than before.

Larger businesses with branch offices can use WatchGuard's System Manager tools for remotely managing multiple appliances. These now allow you to schedule feature key synchronisations, reboots and OS upgrades across groups of appliances.

High UTM performance usually comes with an equally high price, but the XTM 515 bucks the trend. It's far better value than most competing products and offers a superb range of security measures. DAVE MITCHELL

KEY SPECS

1U rack chassis • 2.6GHz E3400 Celeron • 2GB RAM • 1GB CompactFlash card • 10/100 Ethernet • 6 x Gigabit Ethernet • RJ-45 serial • 2 x USB • WatchGuard and Firebox System Managers plus WebBlocker, Report, Log and Quarantine server software • 3yr on-site NBD warranty • Options: Appliance and 3yr Security Bundle, £1,608 exc VAT

OVERALL	★★★★★★
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★★★★
VALUE FOR MONEY	★★★★★★

The TS-469U-RP includes dual power supplies

Qnap TS-469U-RP

A feature-packed, four-bay rack NAS appliance with top-notch performance

» **PRICE** Diskless, £833 exc VAT
» **SUPPLIER** www.lambda-tek.com

Intel may have put its Atom D2700 out to grass, but the TS-469U-RP from Qnap shows there's life in the old dog yet. Our tests show this four-bay rack NAS appliance and its dual-core CPU have a good turn of speed, but do its features justify the high price?

It certainly starts well, with dual-hotplug 250W power supplies included as standard. Basic memory is 1GB and it can easily be upgraded to 3GB by whipping off the lid and dropping an extra SO-DIMM into the spare socket. There's a host of cloud backup options, including support for Amazon S3, ElephantDrive and Symform. And you also get Qnap's free MyCloudNAS service, which impressed when we looked at it in our review of its TS-459 Pro II (web ID: 369625).

That's a pretty long list already, but it's also possible to add more services. We tested the latest Google Drive add-on, and after logging on with our Google account, we could synchronise our files with a folder on the appliance and run scheduled and manual bi-directional synchronisation.

Elsewhere, the bundled NetBack Replicator receives an update with support for snapshots and replication. Qnap's DSM 3.7 firmware adds extra features including management via smartphone.

The Connect Windows app allows you to quickly create a secure Windows PPTP VPN connection to the appliance.

For testing, we loaded a quartet of WD 3TB Red SATA drives and created a RAID5 array from Qnap's slick web interface. Performance over Gigabit was impressive, with copies of a 2.52GB video clip between the appliance and a Windows Server 2012 system returning read and write speeds of 94MB/sec and 91MB/sec. The FileZilla utility reported slightly faster FTP speeds of 104MB/sec and 102MB/sec.

The appliance handled backups of large data sets well: our 22.4GB test folder and its 10,500 small files copied to a share at a rate of 71MB/sec. Qnap's IP SAN performance is excellent as well, with Iometer reporting an impressive raw read rate of 96MB/sec for a 100GB target.

The TS-469U-RP won't be beaten for features, and overall performance is superb, but for a four-bay rack NAS appliance it's expensive. We recommend you consider Synology's RackStation RS812 (web ID: 372370) instead – although it has only a single power supply and is slower, it comes in around £400 cheaper, a saving that's hard to ignore. DAVE MITCHELL

KEY SPECS

1U rack chassis • 2.13GHz D2700 Atom • 1GB DDR3 (max 3GB) RAM • 512MB DOM • 4 x hot-swap 3.5in/2.5in SATA drive bays • RAID0, 1, 5, 5 + hotspare, 6, JBOD • 2 x Gigabit Ethernet • 2 x USB 3 • 5 x USB 2 • 2 x eSATA • 2 x 250W hotplug PSUs • Power: 56W idle; 70W peak (4 x 3TB drives)

OVERALL	★★★½☆☆
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★☆☆☆

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EXCLUSIVE

Xerox Phaser 7100N

An affordable A3 colour laser with nippy speeds, reasonable running costs and exceptional colour quality

PC PRO RECOMMENDED

» PRICE £749 exc VAT
» SUPPLIER www.printerbase.co.uk

When it comes to low-cost A3 laser printing, Oki is king of the hill – but now Xerox wants a piece of the action. The latest Phaser 7100N delivers high-resolution, large-format colour printing for less than £800.

It beats Oki's C822n (web ID: 377407) for speed with a faster 30ppm for colour and mono A4 prints. Xerox doesn't quote A3 speeds, but we clocked it in the labs at 18ppm – that's 5ppm faster than the C822n.

Printing costs are similar, with A4 colour and mono pages costing 8.1p and 1.8p – but check out the PagePack contracts, which offer fixed quarterly charges based on your estimated usage and cover consumables and maintenance too.

We like the new toner cartridges: they're compact, less messy than Oki's combo units, and much easier to fit. As for capacity, there's a 250-sheet tray to start with, which can expand with up to three more 550-sheet trays (£254 exc VAT each).

The 7100N performed well in our speed tests, although you have to be careful which way the paper is stacked. With the long side facing the paper path, a 30-page Word document returned 30ppm; turning the paper through 90 degrees saw this drop to 24ppm.

Our 24-page DTP-style document was produced in Standard mode at 30ppm. Changing the PostScript driver to Photo mode didn't harm speed; the time to first page for all tests was rarely more than ten seconds. Output quality won't disappoint, either. Text was pin sharp across a wide range of font sizes; mono photos delivered high levels of detail; and colour quality was exceptional, with smooth gradients across complex colour fades and no banding in photos.

The 7100N costs £65 more than Oki's C822n, but this gets you faster print speeds and superior colour quality. With very similar running costs, we have no hesitation in recommending the 7100N as our new favourite A3 colour laser. DAVE MITCHELL

The 7100N performed well in tests, and print quality is good

KEY SPECS

1,200 x 1,200dpi A3 colour printer • 30ppm colour/mono A4 speed • 667MHz CPU • 1GB RAM (max 2GB) • USB 2 • 10/100 Ethernet • 250-sheet input tray • 150-sheet MPT • 60-216gsm paper • 1yr on-site warranty • 500 x 538 x 406 (WDH) • Options: duplex, £132; 550-sheet tray, £254; productivity kit, £400 (all exc VAT)

OVERALL	★★★★★
PERFORMANCE	★★★★★
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★½

HP LaserJet Pro 200 Colour MFP M276n

A fine choice for small businesses that want a good-quality, low-cost colour laser MFP

PC PRO A-LIST

» PRICE £215 exc VAT
» SUPPLIER www.printerland.co.uk

HP's M276n colour laser MFP is a multitalented beast. Not only does it offer fast colour printing, but it combines this with fax, scan and copy functions and a wide range of cloud printing options.

At this price you might think quality would suffer, but this is no bargain-basement printer. It's thoroughly modern, with a slick, touchscreen for accessing options and settings, and installing HP's print apps. These include a range of predefined sample forms and even the ability to print out your Google calendar.

Cloud printing features don't get any better. It supports HP's ePrintCenter, so remote workers can email documents directly to the printer for output. Google's Cloud Print works just as well, and both are simple to set up. ePrintCenter also provides plenty of useful admin controls, such as controlling which users can print in colour, and which can't.

Documents can be scanned directly to email and network shares. You can scan to and from a USB stick, and the printer's web interface makes light work of creating fax phone books or speed-dial lists.

At this price, output quality can't be faulted, with sharp text and high-quality colour output. Colour photos are vibrant, with no noticeable banding. Scan quality is fast enough for general business use, although copy speeds are only 6ppm. Print speeds are on the money, however, with all our tests delivered at 14ppm.

The M276n is ideal for small businesses wanting a cheap and versatile colour laser MFP. Output quality belies its low price, running costs are on a par with other MFPs, and HP's excellent web printing features set it apart from the rest. DAVE MITCHELL

This is a fast printer, and cloud support is excellent

KEY SPECS

600dpi A4 colour laser • 1,200pi colour scanner • 750MHz CPU • 256MB RAM • 14ppm colour/mono • 2 x USB 2 • 2 x RJ-11 • 10/100 Ethernet • 33.6Kbits/sec fax/modem • 150-sheet input tray • 30-sheet ADF • 1yr on-site warranty

OVERALL	★★★★★
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★★

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Internet security suites

Are you relying on Windows' free antivirus suite to protect your PC? If so, the results of our latest test of security suites may shock you. Find out why Microsoft Security Essentials is failing to protect from threats, and which of its free and paid-for rivals you should install instead. We have 16 of the biggest names on test

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Illustration: Simon Brader (www.simonbrader.co.uk)

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Buyer's guide

Choosing a security suite has never been easy: there are many options, and a bamboozling array of features to compare. The first question, though, has to be how effective each package is at the basic job of detecting malware. Our results graphs on p152 and the performance scores on each review offer guidance. Opposite, we explain how these are reached.

There are secondary features to consider, too. Commercial security suites often include their own firewall, to protect you from external intrusions. We haven't seen any evidence that these give significantly better protection than the built-in Windows Firewall, but some offer a more configurable interface – appealing to advanced users – while others may be friendlier for novices.

Another feature you may want is web protection, where a security package integrates with your browser to block sites known to distribute malware, or to flag them in search results to warn you not to click on them in the first place.

Some features won't be useful to everybody. Email scanning can protect you from phishing attempts, email-borne malware and spam; if you use a webmail service for your personal email this won't help, however, since your messages are stored on a remote server that's beyond the reach of your security software.

Many suites include parental controls, which can be used to keep children away from unsavoury websites, or to restrict and monitor their online activity. It's worth having a look at Microsoft's free Family Safety service first, though, to see if it covers your needs.

Other niceties include personal data protection, which warns you whenever sensitive information such as credit card details are transmitted from your computer, and a "game mode" that suppresses alerts and interruptions while you're running a full-screen application such as a game or video player. In a few cases you'll get an integrated backup client, with a small amount of online storage for personal use.

If you don't need all of these features then a free package may seem your best bet, but most commercial security suites are also offered in cheaper antivirus-only versions (as well as premium editions with additional system tools and backup capabilities), so to an extent you can pick and choose the features you want within your preferred package.

One possible downside to a feature-packed suite is its impact on your system's startup time, memory usage and general responsiveness. In practice, however, it doesn't always go as you might expect: some of the most comprehensive suites are among the most nimble, while seemingly simple software can place a major burden on your system resources. Again, see our graphs and How We Test, opposite, for details.

	RECOMMENDED			LABS WINNER			
	Avast Free Antivirus	**AVG AntiVirus Free 2013**	**Avira Free Antivirus 13**	**Bitdefender Internet Security 2013**	**BullGuard Internet Security 2013**	**Eset Smart Security 5**	**F-Secure Internet Security 2013**
Overall	★★★★★½	★★★★½	★★★★½	★★★★★	★★★★½	★★★★★½	★★★★★½
Performance	★★★★★½	★★★★½	★★★½	★★★★★	★★★★½	★★★½	★★★★★
Features	★★★★½	★★★½	★★★½	★★★★★	★★★★★	★★★★★½	★★★★½
Ease of Use	★★★★★½	★★★½	★★★★★½	★★★★★½	★★★★½	★★★★★	★★★★½
Value for Money	★★★★★★	★★★★★★	★★★★★★	★★★★★★	★★★★½	★★★★★½	★★★★½
Pricing							
Price (inc VAT)[1]	Free	Free	Free	£15 (£19)	£16 (£20)	£37 (£44)	£28 (£33)
Supplier	www.avast.com	http://free.avg.com	www.avira.com	www.amazon.co.uk	www.amazon.co.uk	www.amazon.co.uk	www.more computers.com
Developer	www.avast.com	http://free.avg.com	www.avira.com	www.bitdefender.co.uk	www.bullguard.com	www.eset.co.uk	www.f-secure.com
Free trial period	N/A	N/A	N/A	30 days	60 days	30 days	30 days
OS support	Windows 8/7/Vista/XP/2000	Windows 8/7/Vista/XP	Windows 7/Vista/XP	Windows 8/7/Vista/XP	Windows 8/7/Vista/XP	Windows 8/7/Vista/XP/2000	Windows 8/7/Vista/XP
Features							
Firewall	✗	✗	✗	✓	✓	✓	✗
Email scanning	✓	✓	✗	✓	✓	✓	✓
Web protection	✓	✓	Via optional toolbar	✓	✓	✓	✓
Anti-spam	✗	✗	✗	✓	✓	✓	✓
Online backup (standard)	✗	✗	✗	2GB via separate free app	5GB	✗	✗
Parental controls	✗	✗	Limited	✓	✓	✓	✓
Game mode	✓	✓	✗	✓	✓	✓	✓
Personal data protection	✗	✗	✗	✓	✓	✗	✗
Other major features	AutoSandbox, remote assistance	✗	✗	Safepay, social networking protection, vulnerability scanner	PC Tune Up, vulnerability scanner	✗	Launchpad gadget
Technical support	Email, forum	Forum, phone	Forum, phone (non-UK, premium rate)	Email, forum	Forum, online chat	Phone (0845 rate)	Email, forum, online chat, phone (0870 rate)

1. Price for a retail boxed edition from the stated supplier with three-PC, one-year licence.

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HOW WE TEST

We award each package a score out of six stars across four categories – Performance, Features, Ease of Use and Value for Money. Our Performance score reflects the ability of each suite to detect real-world malware under real-world conditions. In this Labs, we've based this score on the combined results of the latest malware detection and repair tests carried out by AV-Test, an independent consultancy. For more details on these tests, and a breakdown of the scores awarded, visit **www.pcpro.co.uk/221labs**. The results themselves are shown on p152.

The Features score reflects the range of features offered by each package, taking into account how useful and relevant they are: tune-up utilities that duplicate native Windows functions will score less than practical anti-malware features such as sandboxes and vulnerability scanners.

Our Ease of Use score represents, in part, each package's impact on your system's responsiveness and resources. To quantify this, we time how many seconds installing each package adds to the startup time of a typical mainstream laptop (specifically, an Acer Aspire 5750G) running Windows 7.

We also measure the system's overall memory footprint two minutes after the desktop appears. Both measurements are taken after four reboots to ensure installation and optimisation is complete.

Finally, we measure how long it takes to complete a "quick" scan of a clean PC. We also consider the accessibility of each package's user interface, and how clear its alerts and responses are when a security issue is detected, to arrive at an overall score for Ease of Use.

Finally, our Value for Money score indicates whether the price you'll pay at a major online retailer for each package represents good value for the features and performance on offer. From these scores we derive the Overall score.

	G Data Internet Security 2013	GFI Vipre Internet Security 2013	Kaspersky Internet Security 2013	McAfee Internet Security 2013	Microsoft Security Essentials	Norton Internet Security 2013	Panda Internet Security 2013	PC Tools Internet Security	Trend Micro Titanium Internet Security 2013
	★★★★½	★★★★½	★★★★★½	★★★½☆☆	★★½☆☆☆	★★★★★½	★★★★½	★★★★½	★★★★★★
	★★★★★½	★★★★½	★★★★★★	★★★½☆☆	½☆☆☆☆☆	★★★★★½	★★★½☆☆	★★★½☆☆	★★★★★★
	★★★★½	★★★★★½	★★★★★★	★★★★★½	★½☆☆☆☆	★★★★★½	★★★★★★	★★★★★½	★★★★★½
	★★★★½	★★★★★½	★★★★★½	★★★½☆☆	★★★★★½	★★★★½	★★★★½	★★★★½	★★★★★★
	★★★★½	★★★★½	★★★★½	★★★½☆☆	★★★★★★	★★★★★½	★★★★½	★★★★½	★★★★★★
	£25 (£30)	Up to ten PCs, £33 (£40)	£29 (£35)	£20 (£24)	Free	£19 (£23)	£22 (£26)	£21 (£25)	£19 (£23)
	www.ebuyer.com	www.vipre antivirus.com	www.amazon.co.uk	www.amazon.co.uk	www.microsoft.com	www.box.co.uk	www.cclonline.com	www.cclonline.com	www.play.com
	www.gdata software.co.uk	www.vipre antivirus.com	www.kaspersky.co.uk	www.mcafee.com	www.microsoft.com	http://uk.norton.com	www.panda security.co.uk	www.pctools.com	www.trend micro.co.uk
	30 days	30 days	30 days	30 days	N/A	30 days	30 days	✘	30 days
	Windows 8/7/ Vista/XP	Windows 7/Vista/XP	Windows 8/7/ Vista/XP	Windows 8/7/ Vista/XP	Windows 7/Vista	Windows 8/7/ Vista/XP	Windows 8/7/ Vista/XP	Windows 8/7/ Vista/XP	Windows 8/7/ Vista/XP
	✓	✓	✓	✓	✘	✓	✓	✓	✘
	✓	✓	✓	✓	✘	✓	✓	✓	✓
	✓	✓	✓	✓	✘	✓	✓	✓	✓
	✓	✓	✓	✓	✘	✓	✓	✓	✓
	✘	✘	✘	1GB	✘	✘	2GB (via Mozy)	✘	✘
	Optional module	✘	✓	✓	✘	Via Online Family service	✓	✓	✓
	✘	✘	✓	✓	✘	✓	✓	✓	✘
	✘	✘	✓	✘	✘	✘	✓	✘	✓
	Shredder	Shredder, update checker	Safe Money, virtual Keyboard	Shredder, QuickClean, vulnerability scanner	✘	Facebook wall scanner, Identity Safe, network management	Network management, safe browser	Scam alerts	Facebook privacy scanner, shredder, system tuner
	Email, phone (0800 rate)	Email, online chat, phone (01784 rate)	Email, forum, phone (0871 rate)	Email, online chat, phone (0800 rate)	Email, forum	Forum, online chat, phone (020 rate)	Email, forum, phone (0800 rate)	Email, forum, phone (0800 rate)	Email, forum, phone (premium rate)

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PC PRO RECOMMENDED

PERFORMANCE AT A GLANCE

Avast Free Antivirus

The cream of the crop of free antivirus tools, with great protection, plenty of features and an exceedingly light touch

1. **The Avast front-end is clear and easy to navigate**
2. **Threats are handled clearly and with a minimum of fuss**
3. **Although free, Avast is a highly configurable package**

PRICE Free
SUPPLIER www.avast.com

In our view, the Avast Free Antivirus front-end is one of the most attractive around. It's easy to navigate, too, with a tabbed interface offering direct access to primary settings and information panes, and it's illustrated with surprisingly tasteful graphics.

Since it's free, some advertising is inevitable. The front page of the interface displays a big advert for Avast's paid-for Internet Security suite, and an ever-present "upgrade" button sits in the top-right corner of the window. A section of the interface is dedicated to promoting other Avast products and services, both paid-for and free, including data backup and protection for Android devices.

In everyday use, however, this isn't too intrusive. Turn off the grating voice notifications and Avast is attractively inconspicuous. You'll mostly only notice it via the WebRep browser extension, which adds safety ratings to search results and shows trustworthiness ratings for sites you visit. It installs by default in Chrome, Firefox, Internet Explorer and Opera – but it doesn't meddle with homepage or search settings.

This softly-softly approach is matched with an unobtrusive RAM footprint of 82MB, and a 13-second impact on the startup time of our test laptop. That may sound steep, but remember that this is a low-end system. A desktop with a faster hard disk or a laptop with an SSD will see a much less noticeable impact on boot time.

In fact, our only speed-related complaint is with the Quick Scan feature: on our test system this took more than 15 minutes to complete. You can create a custom scan, however, specifying which file types to inspect, which drives to include and so forth.

In addition to real-time and scheduled scanning features, Avast Free Antivirus also includes an AutoSandbox feature that runs suspicious software in a virtualised environment. It's configurable, so you can decide for yourself how paranoid you want the software to be. Peer-to-peer downloads and IM attachments can be monitored, too, as well as scripts in browsers and PDF readers.

A distinctive feature is the Remote Assistance tool, which can be used to access someone else's desktop (with their permission, of course). This partly duplicates Windows' Remote Desktop capabilities, but no configuration is required, making it an appealing option if you're one of those lucky souls who provides technical support to friends and family.

All this would be moot if Avast Free Antivirus weren't competent at the basic business of detecting malware, but here too it's a strong performer. Across two months of tests, Avast successfully protected against 98% of recent malware, including so-called zero-day malware attacks that hadn't previously been seen. That's a better performance than any other free antivirus tool – and outshines several paid-for suites. Avast also completely cleared up 79% of malware infections: that places it fifth in our field of 16 packages, with none of the contenders achieving a perfect score.

In the past we've picked AVG as the best free security package; this time Avast has showed itself to be a lighter, friendlier and more capable option. It isn't as powerful or as feature-filled as Bitdefender's commercial suite, but if you want a free tool to keep you safe, this is the one to choose.

OVERALL	★★★★½
PERFORMANCE	★★★★½
FEATURES	★★★½☆
EASE OF USE	★★★★½
VALUE FOR MONEY	★★★★★

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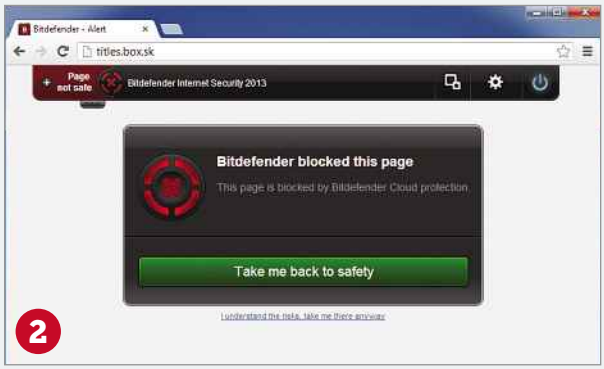

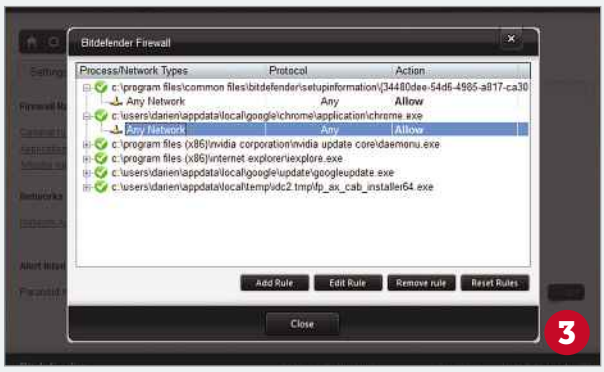

PC PRO LABS WINNER A-LIST

PERFORMANCE AT A GLANCE

Bitdefender Internet Security 2013

A comprehensive set of features, coupled with exceptional malware detection

1 The main Bitdefender interface can be slightly daunting
2 Web protection is unobtrusive – until you visit a dodgy site
3 For technical users, there are plenty of configuration options

» **PRICE** £15 (£19 inc VAT)
» **SUPPLIER** www.amazon.co.uk

The Bitdefender website quotes £35 for a three-PC licence for this software, but shop around and you can get it at close to half price. That's a bargain considering what you get.

To start with, Bitdefender Internet Security 2013 achieved an exceptional 100% score across all of AV-Test's zero-day malware tests. That's a perfect protection record against never-before-seen threats – a feat equalled this month only by F-Secure and Trend Micro. Bitdefender fared spectacularly well against older malware, too, with a 99% protection rate.

The installer sets up a Linux-based rescue environment on your hard disk, so you can scan for malware from outside of Windows, without messing around with boot CDs. In tests, the software restored compromised systems to their pre-infection state with a 94% success rate.

Bitdefender ticks every feature box, from anti-spam to parental controls. Its firewall lets you create custom rules by application or type of connection, and the intrusion-detection system flags attempts to install rogue drivers, tamper with Windows, or change system settings. A vulnerability scanner checks for missing updates to your operating system and applications, and warns if accounts have weak passwords.

Browser integration is low-key, with no visible toolbar or buttons, but try to visit an untrusted website and an interstitial page appears, giving you the option of turning back or opening a sandboxed browser. On sensitive sites, such as banks and online retailers, you'll be prompted to use the new Safepay feature – a specially secured browser designed to lock transactions away from keyloggers, screen scrapers and man-in-the-middle attacks.

Bitdefender also places reputation indicators next to search results in Bing, Google and Yahoo, and you can have your Facebook wall and Twitter stream scanned for dangerous apps and links to keep you safe from social networking scams.

With so many features at hand, the interface is slightly convoluted. You have to scroll left and right to access all of the controls, or to access the new Overview panel and drill down into a particular area of the program. Some features, including parental controls and the Safebox backup feature (which provides 2GB of free space), must be accessed via a separate web-based dashboard.

Yet this doesn't wreck the experience. Bitdefender defaults to its trademark Autopilot mode, which silently protects your privacy and safety with as little user interaction as possible. Novices who don't want to go hunting for settings and options can enjoy full protection without getting their hands dirty.

Resource efficiency isn't Bitdefender's strong suit. On our test laptop it added 16 seconds to boot time, with an undistinguished memory footprint of 172MB. Ultimately, though, we feel that's a reasonable compromise when you're receiving excellent malware protection, and a comprehensive feature set, at a price that shames Bitdefender's paid-for rivals.

OVERALL	★★★★★
PERFORMANCE	★★★★★
FEATURES	★★★★★
EASE OF USE	★★★★½
VALUE FOR MONEY	★★★★★

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BullGuard Internet Security 2013

Lots of features, but this package is resource-hungry and protection is average

PRICE £16 (£20 inc VAT)
SUPPLIER www.amazon.co.uk

BullGuard was one of the first security suites to offer online backup as standard, and it still leads the pack in this regard; the 5GB you get is more than twice the storage of its rivals. Tucked away in the interface you'll also find a configurable two-way firewall, an email scanner with spam filter, and a game mode to suspend interruptions when you're running full-screen applications.

There's a vulnerability scanner for finding unpatched applications, and a tune-up wizard that removes unneeded files from your hard disk, disables unnecessary startup applications and services, and optimises the Registry. As well as categorising search results in Bing, Google and Yahoo, the web protection module scans links on Facebook and warns you of dodgy content.

Accessing and configuring these features isn't easy. The interface is poorly organised: rather than guiding you through BullGuard's features, the too-simple three-button homescreen obscures them. Still, like Bitdefender, BullGuard does come with an "as quiet as possible" mode, so you can enjoy its protection without having to configure anything. We tested this by deliberately downloading a dangerous file and we saw the malware silently vaporise before our eyes, without any sort of notification from BullGuard.

When it comes to detecting malware, AV-Test found BullGuard to be an above-average performer, but not a winner. Its 95% protection rate against zero-day threats puts it ahead of most free antivirus packages, but behind Bitdefender, G Data and Kaspersky. Its scores against known viruses and pre-infected systems were merely average.

A final disappointment came in our resource-usage tests. BullGuard's 17-second startup time was this month's slowest, and its 202MB memory footprint is above average. A 21-second quick scan was creditable, but not enough to win us over.

On paper, BullGuard's extensive feature list is attractive, especially at this price, but the package is too compromised overall for us to recommend. If you want a security suite that's packed with features, Bitdefender will give you better malware protection at a similar price.

OVERALL	★★★★☆
PERFORMANCE	★★★★☆
FEATURES	★★★★★
EASE OF USE	★★★★☆
VALUE FOR MONEY	★★★★☆

Kaspersky Internet Security 2013

High levels of configurability make this a sound choice – if an expensive one – for techies

PRICE £29 (£35 inc VAT)
SUPPLIER www.amazon.co.uk

The big new feature in this year's Kaspersky is Safe Money, which double-checks the authenticity and security credentials of the page you're visiting, then optionally switches your session to a special sandboxed browser to ensure browser-hijacking malware can't interfere with your transaction.

For added protection, you can use the onscreen Secure Keyboard to enter sensitive information in a way that isn't as vulnerable to keyloggers. We suspect this will appeal mostly to those using touchscreens, however: typing with a mouse is hardly convenient.

There's little else new here, but Kaspersky was already a well-equipped package, with both local and cloud-based features designed to watch over your files, emails, web pages, IMs, applications, network connections and more. These features are all customisable, too, making Kaspersky Internet Security particularly appealing to hands-on techies.

Accessing the various settings is a bit of a pain, however. A confusing set of arrows, links and buttons make navigating the 2013 interface for the first time an irritating exercise in trial and error.

Historically, when it comes to malware tests, Kaspersky software tends to place near the top of the table, and this latest iteration is no exception. AV-Test saw Kaspersky achieve a strong malware protection score of 99% across both established malware and brand-new exploits, and in 96% of cases it was able to fully clean up an infected system. We found Kaspersky fast, too, intercepting a dodgy download in a fraction of a second, and completing a quick system scan in half a minute.

Kaspersky's suite added only 11 seconds to the startup time of our test PC, but it occupied a lumbering 303MB of system memory, which could have a noticeable impact on an older PC. There's a literal price to pay, too: on a one-year, three-PC basis, Kaspersky is the most expensive security suite here.

If you're not someone who yearns for maximum features and configurability, this isn't an irresistible deal, especially since there's no beginner-friendly set-and-forget mode, as found in Bitdefender and BullGuard. However, for the more technically engaged, Kaspersky's suite remains an excellent choice.

OVERALL	★★★★★
PERFORMANCE	★★★★★
FEATURES	★★★★★
EASE OF USE	★★★★☆
VALUE FOR MONEY	★★★★☆

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Panda Internet Security 2013

A well-equipped package, but performance is so-so and the interface is ugly

PRICE £22 (£26 inc VAT)
SUPPLIER www.cclonline.com

It's quite possible that some people will find the colourful interface of Panda Internet Security 2013 attractive and tasteful. They'll probably be in the minority, however: we think it's a mess, with too many buttons, too many colours and too much generic clip-art dotted about. It's like having your security provided by a bad PowerPoint presentation.

To be fair, the proliferation of buttons reflects the wide range of security components on offer. From the main interface you can access firewall settings, parental control reports, tech support and more. Click on Backup Copies and you can set up local backup or online archiving, thanks to a free 2GB Mozy deal.

You can launch a virtual keyboard – helpful for entering sensitive information if you suspect malware is monitoring your physical keys – or download a secure browser. You can also immunise connected USB devices against infection with one click, replacing AutoPlay information with a read-only placeholder that can't easily be overwritten by USB-borne malware.

Alas, although well stocked with features, Panda turned in a mixed performance in AV-Test's malware protection tests. Against established threats it produced a perfect 100% protection score, but when it came to brand-new exploits Panda protected against only 82% of attacks, a score worse than any other paid-for suite. A 67% success rate at repairing infected PCs doesn't fill us with confidence either; here, only PC Tools did worse.

The suite isn't exactly lightweight, adding 273MB to our system footprint, and slowed down startup time by 12 seconds. However, scanning is fast; a quick system scan completed in six seconds. When we tried downloading a dangerous file, an unobtrusive notification instantly faded in at the bottom of the screen confirming it had been blocked, with no further action needed on our part.

Shop around and you can get Panda Internet Security 2013 for £26. On the face of it, this doesn't look bad for a three-PC licence for such a feature-packed suite. Malware detection isn't top-notch, however, and, if you ask us, this eyesore isn't worth it.

OVERALL	★★★★☆
PERFORMANCE	★★★☆☆
FEATURES	★★★★★
EASE OF USE	★★★★☆
VALUE FOR MONEY	★★★★☆

Trend Micro Titanium Internet Security 2013

A powerful and lightweight suite that deserves serious consideration

PRICE £19 (£23 inc VAT)
SUPPLIER www.play.com

Trend Micro's 2012 internet security suite was our Labs winner last year, and it remains a persuasive contender. This year, against both brand-new and older malware, it delivered flawless protection – a feat unequalled by any other package. It excelled in AV-Test's repair tests, too, with a 90% success rate bettered only by Bitdefender.

In terms of features there isn't much new, but you do get tools to help keep you safe on social networks. Links on Facebook, Twitter, Google+, LinkedIn and various other services are now scanned and flagged if they lead to a dodgy destination. There's also a new Check My Privacy button that pops up within Facebook. Click it and Trend Micro scans your settings and warns if you're sharing more than you may intend to.

All of last year's features remain, too, including a rescue-disc builder, a secure file deletion tool, a parental control system, a simple set of system tune-up tools and a graphical reports module. The interface, however, has been overhauled. A tabbed front-end – in bold black and white – replaces the red and grey design of previous editions. We think it's an improvement, both in terms of aesthetics and accessibility.

As before, there's no firewall. Trend Micro evidently considers the built-in Windows one to be adequate, and we've no reason to disagree. This parsimonious approach appears to help keep system load low. Trend Micro Titanium Internet Security was one of the quickest suites to start up, adding a mere nine seconds to boot time, and its memory footprint of 84MB is one of the lightest here. When we tested the suite's reflexes by accessing a malicious file from the web, Trend Micro severed the network connection before the file had even finished downloading.

This year we've chosen Bitdefender as our overall Labs winner, because it has a small edge over Trend Micro on features, and is, at the time of writing, available at a lower price. But Trend Micro Titanium Internet Security is still an excellent piece of security software that deserves a place on your shortlist.

OVERALL	★★★★★
PERFORMANCE	★★★★★
FEATURES	★★★★½
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★★

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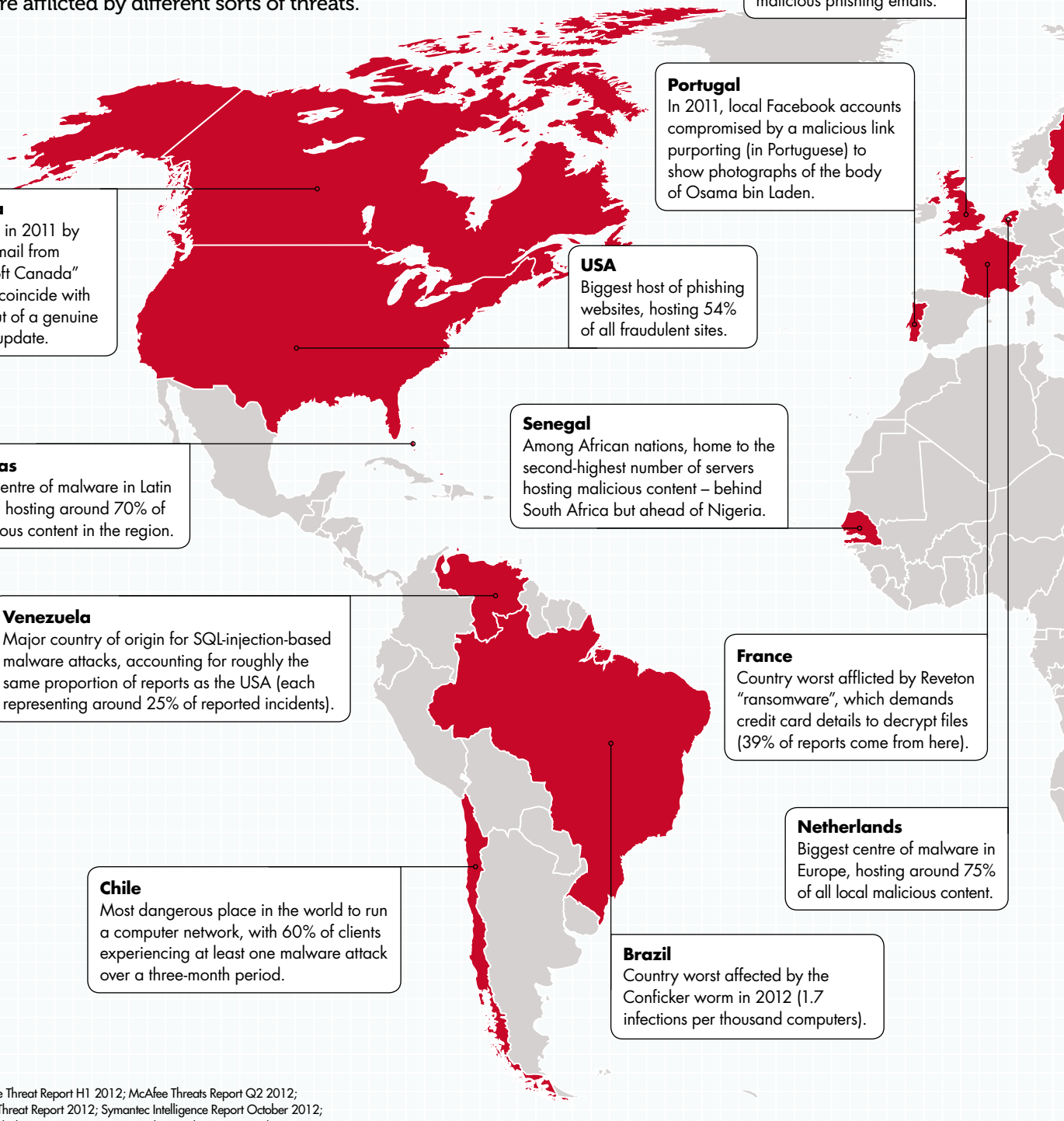
Where malware hits hardest

Malware may seem to arrive out of the blue, but it all comes from somewhere. In fact, it's a highly regional phenomenon. Some countries host many more malware creators and malicious websites than others, and different parts of the world are afflicted by different sorts of threats.



UK
Biggest worldwide source of malicious phishing emails.

Portugal
In 2011, local Facebook accounts compromised by a malicious link purporting (in Portuguese) to show photographs of the body of Osama bin Laden.

Canada
Attacked in 2011 by a fake email from "Microsoft Canada" timed to coincide with the rollout of a genuine security update.

USA
Biggest host of phishing websites, hosting 54% of all fraudulent sites.

Senegal
Among African nations, home to the second-highest number of servers hosting malicious content – behind South Africa but ahead of Nigeria.

Bahamas
Biggest centre of malware in Latin America, hosting around 70% of all malicious content in the region.

Venezuela
Major country of origin for SQL-injection-based malware attacks, accounting for roughly the same proportion of reports as the USA (each representing around 25% of reported incidents).

France
Country worst afflicted by Reveton "ransomware", which demands credit card details to decrypt files (39% of reports come from here).

Netherlands
Biggest centre of malware in Europe, hosting around 75% of all local malicious content.

Chile
Most dangerous place in the world to run a computer network, with 60% of clients experiencing at least one malware attack over a three-month period.

Brazil
Country worst affected by the Conficker worm in 2012 (1.7 infections per thousand computers).

Sources: F-Secure Threat Report H1 2012; McAfee Threats Report Q2 2012; Sophos Security Threat Report 2012; Symantec Intelligence Report October 2012; Trend Micro TrendLabs 2Q 2012 Security Roundup; Websense 2012 Threat Report

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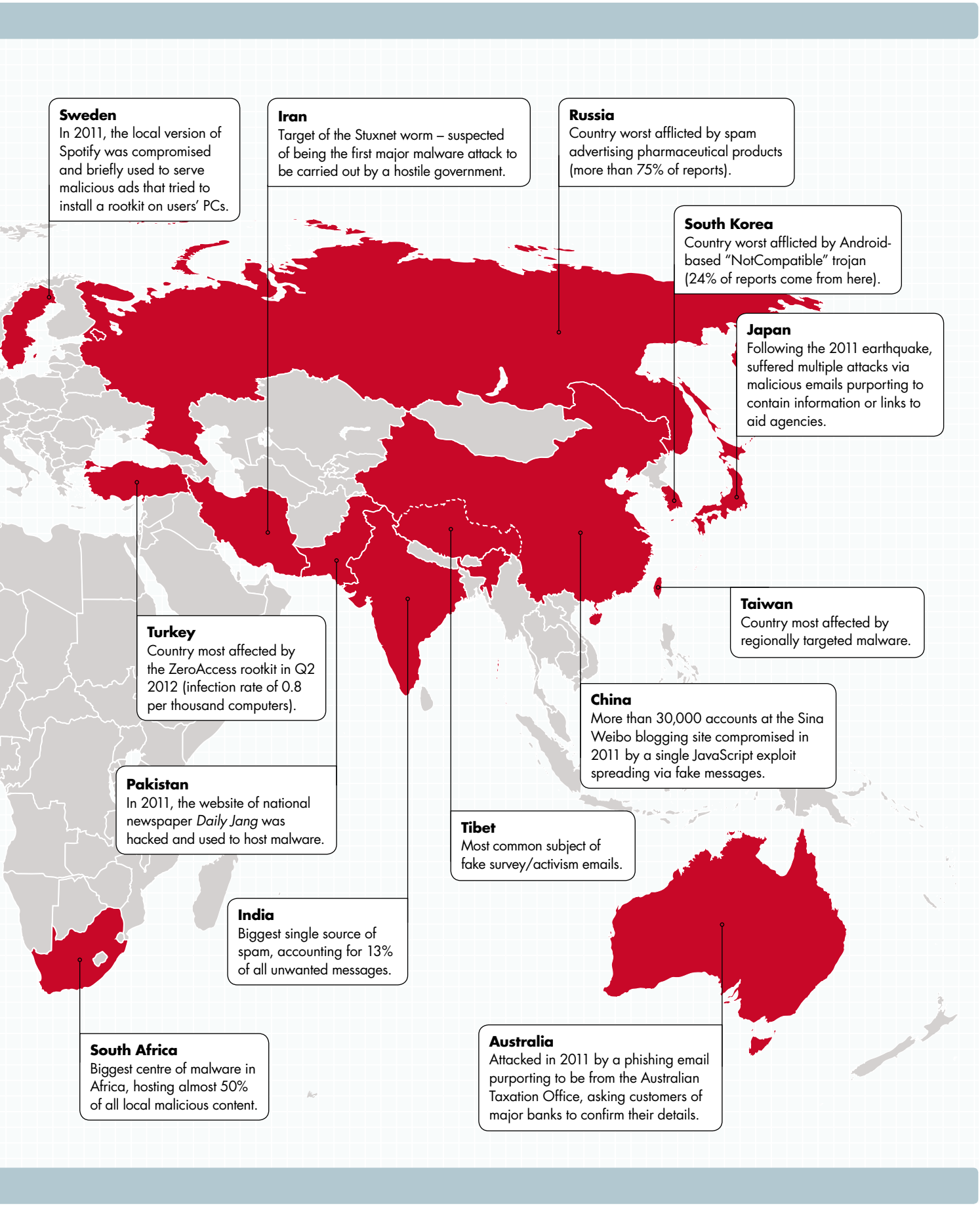

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AVG AntiVirus Free 2013

PRICE Free
SUPPLIER http://free.avg.com

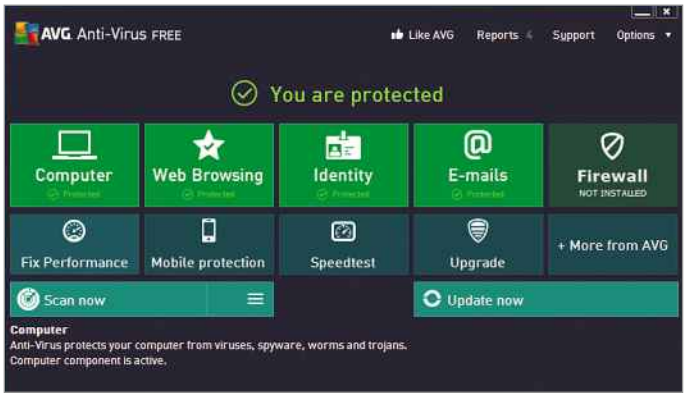
In the past few years, we've seen AVG consistently achieve better protection than its free rivals. This year, however, a mediocre 91% protection rate against zero-day threats puts it some way behind Avast's 98%.

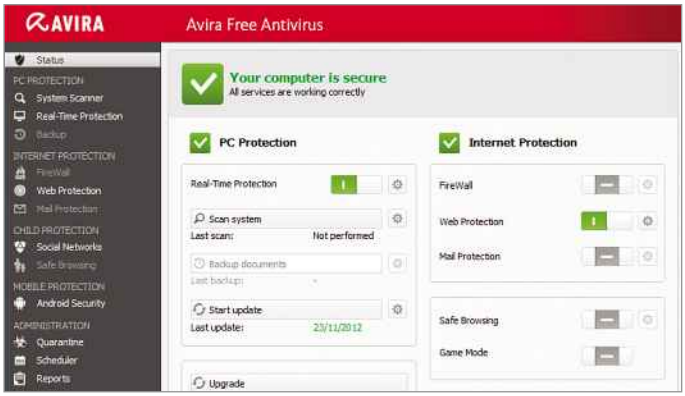
That might be excusable if AVG AntiVirus Free were otherwise a friendly and well-featured package – but sadly, the opposite is true. Although this latest version of the software sports a new Windows 8-inspired interface, it's still frustratingly unclear which buttons lead to genuine features of the software, and which are merely there to steer you towards AVG's paid-for products.

In fact, the core features consist of only a virus scanner, an email scanner and a browser plugin. In other words, not only is AVG less effective than Avast, it's also shorter on features; its 272MB memory footprint is more than three times as heavy.

We'd like to think that stiffening competition will prompt AVG to come back next year with a streamlined package that's capable of retaking the crown. For now, though, we'd steer clear.

OVERALL	★★★★☆
PERFORMANCE	★★★★☆
FEATURES	★★★☆☆
EASE OF USE	★★★☆☆
VALUE FOR MONEY	★★★★★





Avira Free Antivirus 13

PRICE Free
SUPPLIER www.avira.com

Avira's latest interface is straightforward and usable – but in this free version, most of the features don't actually work and are there only to tempt you to upgrade to the paid-for suite.

The package also ties its web protection into an Ask.com toolbar that's installed by default for Chrome, Firefox and Internet Explorer. Still, the suite no longer pops up a big advertisement when it updates, so overall it's less intrusive than previous versions.

It's nimble, too, adding a creditably low nine seconds to boot time and completing a quick system scan in 14 seconds. When we tried downloading a malicious file, the software warned us immediately – although, as well as removal options, the notification included a shameless link to paid-for support, which clearly wasn't needed in this case.

Ultimately, though, it isn't the advertising that lets Avira down, but the test results. AV-Test saw Avira achieve a low 84% detection rate against brand-new threats, and a similar overall repair rate of 85%. That puts its protection some way behind Avast and AVG, making it an unattractive choice.

OVERALL	★★★★☆
PERFORMANCE	★★★☆☆
FEATURES	★★★☆☆
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★★

Eset Smart Security 5

PRICE £37 (£44 inc VAT)
SUPPLIER www.amazon.co.uk

Version 6 of Eset Smart Security is in the pipeline, but for now last year's version 5 remains current. It doesn't feel outdated, though: the front-end is clear and airy, and the software makes modest demands on your system, adding only eight seconds to our test system's boot time and a light 111MB to our system's memory footprint. That's impressive, considering the package includes a customisable firewall, parental controls and automatic monitoring of web and email traffic.

If you want to configure these features, you'll find simple on/off switches in the main UI. Disable a feature and, optionally, it will be automatically re-enabled after a specified time – a nice way to ensure you're not accidentally left unprotected. Click on the unobtrusive "advanced setup" link and you'll find a bevy of technical options to satisfy expert users.

We liked the way Smart Security responded when we tried to download a dangerous file: the web connection was automatically severed, and a tasteful notification appeared at the bottom of the screen. We didn't like the "smart scan", which took almost 40 minutes to run on our test system: if you want to check quickly that your PC is clean, you'll have to set up a custom scan.

However, our serious concern is Eset's performance in AV-Test's latest malware detection tests. In the past Smart Security has often scored highly, but this month it achieved only an 86.5% success rate against zero-day threats, and a similar repair rate for infected systems. Those are disappointingly mediocre scores – so while Smart Security 5 has its strengths, we can't recommend it right now.

OVERALL	★★★★½
PERFORMANCE	★★★☆☆
FEATURES	★★★★½
EASE OF USE	★★★★★
VALUE FOR MONEY	★★★★½

WorldMags.net

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F-Secure Internet Security 2013

» **PRICE** £28 (£33 inc VAT)
» **SUPPLIER** www.more computers.com

F-Secure's features are split across two interfaces: Computer Security and Online Safety. This division doesn't help you find your way around, and while the interfaces are attractively designed, they aren't perfectly intuitive: headings such as Tools and Tasks are too vague for our liking.

Such complaints are somewhat mitigated by the package's excellent malware detection abilities. AV-Test found F-Secure stopped 100% of zero-day attacks, and managed to completely clean up malware-inflicted damage on 85% of infected systems.

When we tried to download a dodgy file, F-Secure blocked the network connection so quickly the malware never touched our hard disk. As a cherry on top, the software also completed a quick system scan in only three seconds.

The software's impact on system resources is average, with 15 seconds added to boot time and a memory footprint of 179MB. That's disappointing, especially as the suite doesn't include its own firewall. Gripes aside, though, F-Secure Internet Security 2013 is a clean and effective suite.

OVERALL	★★★★½
PERFORMANCE	★★★★★
FEATURES	★★★½
EASE OF USE	★★★½
VALUE FOR MONEY	★★★★½

G Data Internet Security 2013

» **PRICE** £25 (£30 inc VAT)
» **SUPPLIER** www.ebuyer.com

G Data uses two security engines in parallel, and this helps it do an excellent job of detecting malware: AV-Test found it stopped 99% of zero-day threats, and achieved a perfect score with older viruses.

Naturally, two engines weigh more heavily than one. G Data's 362MB footprint is the largest this month, and scanning is slow too. A "quick" scan took more than four minutes, and when we downloaded a dangerous file G Data warned us only five seconds later. This delay makes the suite feel unresponsive.

Still, the UI is easy to configure, and protection extends not only into your browser, but also various IM applications. Optionally, you can also install parental controls and a secure file deletion tool. If you have a badly infected system, you can create a boot CD for offline repair, too.

Be warned, however, that AV-Test found the software was able to completely undo malware infections in only 73% of test cases; there's no backup, no data protection and, oddly, no game mode either. Although G Data offers respectable protection, you can do better overall.

OVERALL	★★★½
PERFORMANCE	★★★★½
FEATURES	★★★½
EASE OF USE	★★★½
VALUE FOR MONEY	★★★½

GFI Vipre Internet Security 2013

» **PRICE** Up to ten PCs, £33 (£40 inc VAT)
» **SUPPLIER** www.vipre antivirus.com

GFI is primarily known for business security, and the standard ten-PC Vipre licence is clearly intended to cover a small office. The feature list is businesslike too, offering no parental controls and no game mode. Most other mainstream features are here, though, including a firewall that provides plenty of options and statistics those who like to keep an eye on their connections. The interface looks rather cold and severe, but it's clear and simple to get around.

One distinctive feature of GFI Vipre is Easy Update, which checks for updates to all the various bits of software on your PC to ensure vulnerabilities are patched. That's a good idea, as these days it's often web browsers and plugins that are targeted by exploits, rather than the operating system itself. The PC Explorer utility provides a rundown of your system processes, startup applications and the like.

The software is fast and lightweight – in a field of 16 suites, it came sixth in RAM usage and fourth for boot speed. A quick scan was completed in a nippy seven seconds, and downloading malware prompted an instant response: the file was blocked, and at the click of a button we saw extensive information about the threat and how it was detected.

Sadly, Vipre's malware detection scores were below average, with 15% of zero-day malware missed. If you don't have ten PCs to protect, it's relatively expensive too: a single-PC licence costs £30 inc VAT, which is more than most vendors will charge you for a three-PC bundle.

OVERALL	★★★½
PERFORMANCE	★★★½
FEATURES	★★★★½
EASE OF USE	★★★★½
VALUE FOR MONEY	★★★½

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McAfee Internet Security 2013

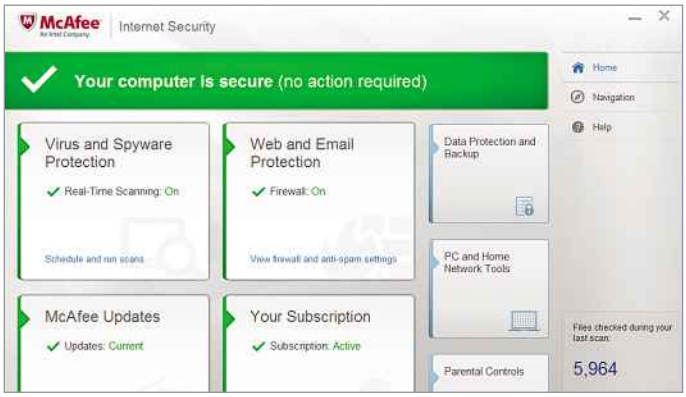
PRICE £20 (£24 inc VAT)
SUPPLIER www.amazon.co.uk

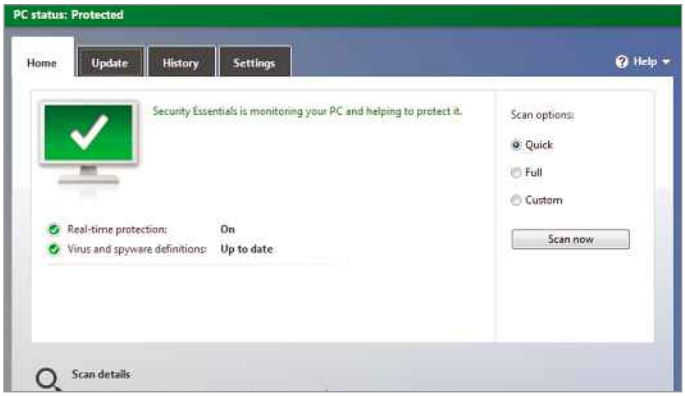
McAfee's 2013 suite brings a new, tiled front-end that echoes the Windows 8 style, while still looking at home on Windows 7. This makes it easy to access all program settings and features, which include McAfee's renowned SiteAdvisor web protection system, plus a vulnerability scanner and secure file deletion. Unusually, there's also online backup, with 1GB of included space – something most suites offer only in expensive, premium editions.

Unfortunately, this promising feature set is let down by sub par malware detection and repair abilities. AV-Test found the package protected against only 83% of zero-day threats, and was unable to fully repair a third of infections. We found it slow, too: a quick scan took almost seven minutes, and when we tried downloading a dangerous file the only immediate warning was a browser error, with a notification appearing ten seconds later.

In addition, McAfee's impact on system performance was on the wrong side of average, adding 15 seconds to boot time and 175MB to our RAM footprint. It adds up to a package that's best avoided.

OVERALL	★★★☆☆☆
PERFORMANCE	★★★☆☆☆
FEATURES	★★★★★☆
EASE OF USE	★★★☆☆☆
VALUE FOR MONEY	★★★☆☆☆





Microsoft Security Essentials

PRICE Free
SUPPLIER www.microsoft.com

True to its name, Security Essentials covers only the bare basics of malware protection. You might think that means less bloat slowing down your system, but in fact Security Essentials added 13 seconds to boot time and 125MB to our system's RAM usage, making it heavier than some fully featured suites.

The package's simplicity does make it easy to use. There's pretty much nothing to configure: when malware is discovered, a pop-up gives a warning and deals with it automatically. You can check the details and unblock detected items from the main program interface.

Security Essentials gets its database updates via Windows Update, so it receives new signatures infrequently compared to other suites. This may partly explain why it stopped only a shocking 67% of zero-day threats in AV-Test's detection tests, and even missed 10% of more established threats. This isn't what we'd call peace of mind.

If you're looking for free protection, consider Avast Free Antivirus instead: it's a more lightweight program and provides much better protection.

OVERALL	★★★☆☆☆
PERFORMANCE	★☆☆☆☆☆
FEATURES	★★☆☆☆☆
EASE OF USE	★★★★★☆
VALUE FOR MONEY	★★★★★★

Norton Internet Security 2013

PRICE £19 (£23 inc VAT)
SUPPLIER www.box.co.uk

Norton's 2013 suite brings a new front-end that, with its big borderless tiles, has clearly been inspired by Windows 8. It's more accessible than last year's model, but still not perfectly clear: several prominent links (such as Mobile, Online Family and Backup) don't actually refer to built-in features, but steer you off to separate Symantec services. You're left uncertain whether you've signed up for one product or several.

Features that are integrated into the suite include a Facebook wall scanner and Symantec's Identity Safe password manager: these can be accessed via a (rather ugly) browser toolbar that's automatically installed in Chrome, Firefox and Internet Explorer. With dozens of customisable settings, you can configure most aspects of Norton's behaviour to suit your preferences, although this may overwhelm beginners.

As if to head off any suspicion of bloat, Norton's performance monitor remains in prime position, showing key system events and resource usage. The System Insight tool also digs into your processes and startup items to identify those that might gobble up CPU power – as well as those that aren't trusted by the Norton community. We found Norton itself added 13 seconds to our test system's boot time, which is merely average; but the software's overall 51MB RAM footprint was commendably low.

AV-Test found Norton Internet Security 2013 stopped 96% of zero-day threats and fully repaired a decent 84% of infected systems: these aren't scores that place it among the winners, but they're respectable enough. Overall, Norton Internet Security remains a decent package at a decent price.

OVERALL	★★★★★☆
PERFORMANCE	★★★★★☆
FEATURES	★★★★★☆
EASE OF USE	★★★★☆☆
VALUE FOR MONEY	★★★★★☆

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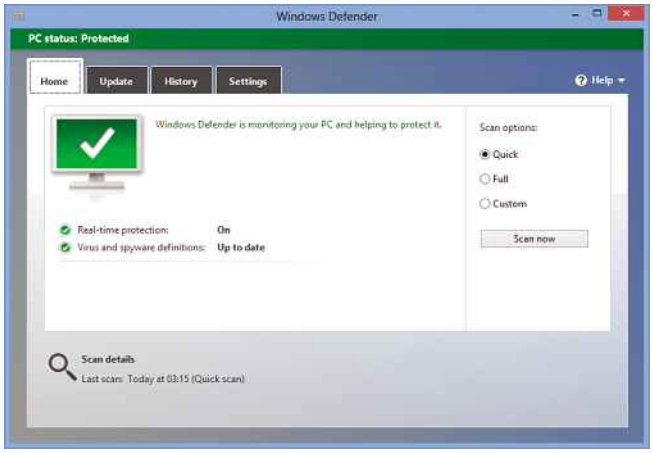
Windows 8 security

If you've upgraded to Windows 8, you might be wondering whether your PC is still vulnerable to the same malware as Windows 7, and to what extent our advice in this Labs applies to you. The short answer is that Windows 8 is safer than its predecessor – but that doesn't necessarily mean you can forget about security software.

One big security advantage of Windows 8 is a system called Secure Boot, which ensures Windows 8 systems will start up only from a signed Windows bootloader. This shuts out rootkits – infections that evade detection by taking hold of your PC before the operating system loads. If you want to install Linux or a different version of Windows, you can authorise additional bootloaders within the UEFI BIOS or disable Secure Boot altogether.

Another enhancement is a feature called SmartScreen, which warns if you download a file that's known to be malicious, or one that comes from an untrusted source. Originally a feature of Internet Explorer, SmartScreen now works at the operating system level, so you'll receive its warnings no matter which browser you use.

These new features may not keep Windows 8 users 100% safe, however. Secure Boot needs support within the UEFI BIOS, so if you've upgraded an older Windows 7 system you won't gain any benefit. And virus writers have a habit of finding creative ways to get around protections such as SmartScreen. In other words, you still need antivirus software.



Don't be confused: the Windows 8 version of Windows Defender is really a renamed version of Security Essentials

Happily, Windows 8 improves on its forebears here, too, by coming with security software preinstalled. The tool is called Windows Defender, just like the anti-spyware software that's included with Vista and Windows 7, but in Windows 8 it detects spyware and malware of all types. Effectively, it's a rebadged version of Security Essentials.

This means that, if you so wish, you can forget about security completely and still enjoy some protection from malware. To be sure, if you do this you're in a much safer position under Windows 8 than you would be on any other version of Windows.

All the same, Microsoft's anti-malware engine managed to protect AV-Test's systems against only 67% of zero-day malware in this month's tests – a much lower score than any other package, including its free rivals. Third-party security suites also offer features that aren't included in Windows 8, such as browser integration, personal data protection and password management.

"Secure Boot needs support within the UEFI BIOS"

So, yes: the need for third-party security software is less urgent for Windows 8 than it is for previous versions of Windows. But it's still well worth looking into third-party options. Almost all the suites on test this month are certified as compatible with Windows 8, and a few developers have even gone so far as to remodel their interfaces to fit the Windows Store look, to ensure their software is right at home on the new OS.

PC Tools Internet Security

PRICE £21 (£25 inc VAT)
SUPPLIER www.cdonline.com

PC Tools' suite hasn't visibly changed in the past year. Its jolly blue and green interface is still one of the friendliest-looking front-ends around, with big switches on the main page that make it easy to turn different types of protection on and off, and to launch scans.

Beyond this very basic level of control, however, tweaking settings is fiddly, thanks to the way the software's functions are split up across nine "guards". Novices may also be put off by the need to make decisions about firewall and malware alerts, as there's no silent protection mode here of the sort offered by Bitdefender and BullGuard. There isn't even much useful guidance from the program: during our testing, PC Tools Internet Security raised the alarm over an "infection" that, on closer inspection, turned out to be merely a cookie. Yes, online tracking is a nuisance, but there's no need to alarm the user unduly.

PC Tools doesn't offer a free trial of the full suite – only a cut-down demo version – so it's only after shelling out that you discover the complete product eats up a hefty 333MB of RAM. Installing it on our test PC also added a sluggish 14 seconds to boot time. In AV-Test's malware tests, PC Tools' software successfully blocked 94% of zero-day malware, putting it slightly below the middle of the pack, and in the virus repair test it ranked last, fully repairing only 64% of systems.

PC Tools Internet Security isn't a disaster, but it isn't the highly capable, beginner-friendly suite it may first appear. Several of its rivals are more efficacious and easier to get along with.

OVERALL	★★★★☆☆
PERFORMANCE	★★★☆☆☆
FEATURES	★★★★★☆
EASE OF USE	★★★★☆☆
VALUE FOR MONEY	★★★★☆☆

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Results

As our graphs below show, there's no real correlation between the demands each suite places on your system and the range of features it includes. Microsoft Security Essentials, for example, is a basic package, yet its resource usage proved decidedly middle-of-the-road this month.

Microsoft's protection rate was nothing to write home about either, especially when we look at protection against zero-day threats – that is, brand-new, never-before-seen attacks. To deal with dangers such as these, a package must be smart enough to recognise an attack in itself, without relying blindly on a database of known bad file signatures.

Admirable performances from Avast, Bitdefender, F-Secure, G Data, Kaspersky and Trend Micro give us confidence these packages can protect us from the unknown. With the rest, there's a concern that newly developed attacks could sneak under the software's defences before security researchers have a chance to analyse the threat and rollout a signature update.

The AV-Test data on which our performance scores are based includes test results for several additional security packages that couldn't be included in this Labs, and breaks down performance across two months of testing, featuring older malware and repair tests where the software was installed on an infected computer. To see these results in full, visit **www.pcpro.co.uk/links/221labs**.

VIEW FROM THE LABS

When Microsoft released Security Essentials back in 2009, many commentators (myself included) wondered whether it might spell the end of commercial security software. Clearly, that hasn't come to pass. Paid-for suites have managed to justify their continued existence with additional features such as password managers and vulnerability scans – and, as this month's results show, they've also developed far more effective techniques for detecting previously unseen malware. When you consider that this month's Labs winner costs only £19, you might start to wonder whether it's actually the free packages whose days are numbered.

"Commercial publishers must be feeling squeezed"

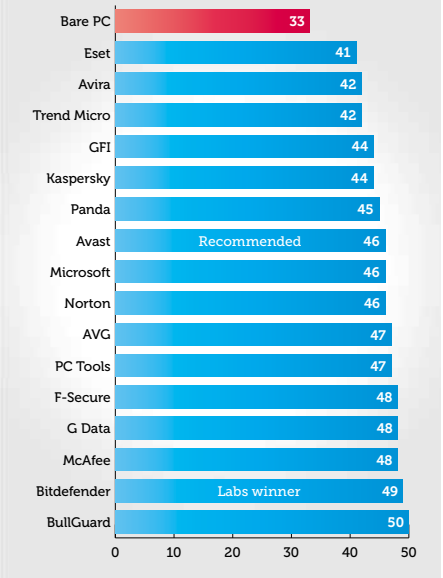
Of course, to get Bitdefender so cheaply you have to shop around. Buy direct from the company's website and you'll be charged more than double that price. Not that this particular publisher deserves to be singled out: almost every security software vendor does the same thing. Presumably people who come actively looking for a particular brand name aren't as price-averse as more casual shoppers.

Publishers' own prices are also typically higher when it comes to renewing subscriptions. If a convenient in-product renewal form pops up, we suggest you ignore it: you'll almost invariably get a better deal if you junk the product and buy a whole new copy of the latest version, again from a third-party retailer.

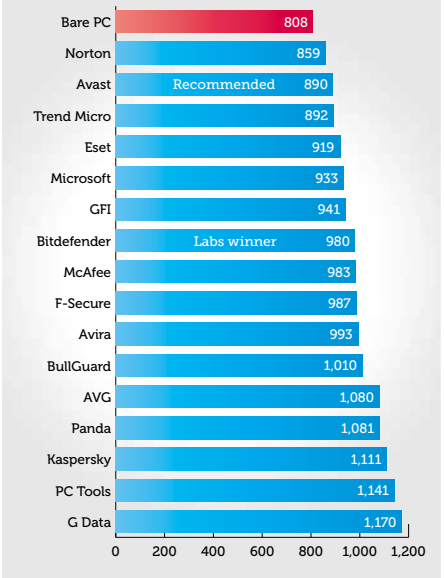
Such finagling leaves a slightly bad taste in the mouth, as if the security vendors are trying to trick us into paying more than is necessary for their software. But can we blame them? Free packages may not be killing off paid-for ones, but when a three-PC licence for a top-grade suite can be bought for less than £20, commercial publishers must be feeling squeezed.

DARIEN GRAHAM-SMITH
darien@pcpro.co.uk

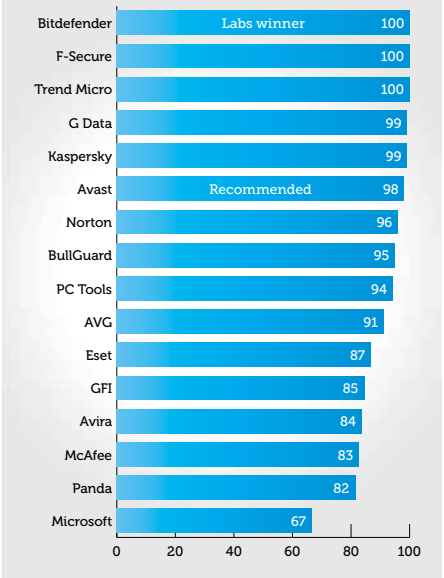
BOOT TO DESKTOP *seconds*



MEMORY FOOTPRINT *MB*



ZERO-DAY MALWARE PROTECTION *% of threats detected*



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- No need for new hardware, IT support or training

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THE A-LIST

LAPTOPS, PCs & TABLETS

COMPACT TABLET

Apple iPad mini

16GB, £269 (3G, £369); 32GB, £349 (3G, £449)
www.apple.com/uk
WEB ID 378061 ISSUE 220

The iPad mini is light, beautifully designed and blessed with excellent battery life. The price is high, but this is the yardstick by which compact tablets should be judged.

KEY SPECS 7.9in 1,024 x 768 IPS display; iOS 6; 1GHz dual-core A5 CPU; 512MB RAM; 16GB/32GB/64GB storage; dual-band 802.11n Wi-Fi; Bluetooth 4; 5mp rear/1.2mp front camera; 135 x 75 x 200mm; 308g

ALTERNATIVE

Nexus 7

Powerful, well built and with a better screen than you'd expect for the price, the Nexus 7 sets the gold standard for budget Android tablets.
16GB, £133 (£159); 32GB, £166 (£199); http://play.google.com WEB ID 375886

FULL-SIZE TABLET

Apple iPad (4th gen)

32GB, £479 (3G, £579)
www.apple.com/uk
WEB ID 378337 ISSUE 220

The Retina display is as stunning as ever, but Apple pushes the iPad to new heights of excellence thanks to an upgraded ARM processor. We'd still opt for the 32GB version, though.

KEY SPECS 9.7in 1,536 x 2,048 TFT; iOS 6; 1.2GHz dual-core Apple A6X; 1GB RAM; 32GB storage; dual-band 802.11n Wi-Fi; Bluetooth 4; 5mp rear/1.2mp front camera; 186 x 241 x 9.7mm; 662g

ALTERNATIVE

Nexus 10

The Nexus 10 harnesses Samsung's tablet expertise to create the finest Android slate money can buy. A stunning 2,560 x 1,600 display is matched by nippy performance, and it's affordable, too.
16GB Wi-Fi, £266 (£319); http://play.google.com WEB ID 378280

BUDGET LAPTOP

Dell Inspiron 15R

£424 (£509 inc VAT)
www.dell.co.uk
WEB ID 378250 ISSUE 219

With good looks and great all-round performance for a whisker over £500, Dell's Inspiron 15R is as good as budget laptops get.

KEY SPECS 2.4GHz Intel Core i3-2370M; 6GB DDR3 RAM; 1TB hard disk; DVD-RW; AMD Radeon HD 7670M; 15.6in 1,366 x 768; Windows 7 Home Premium; 347 x 240 x 21mm; 2.79kg

ALTERNATIVE

Asus VivoBook S200E

Asus delivers a delectable 11.6in touchscreen Windows 8 laptop for an unbelievably low price. Only the dim screen dampens our enthusiasm.
£375 (£450); www.pcworld.co.uk WEB ID 378034

HIGH-END LAPTOP

Asus N56VM

£583 (£700)
www.saveonlaptops.co.uk
WEB ID 376558 ISSUE 216

Asus' N56VM packs in a 15.6in Full HD display, a quad-core Ivy Bridge CPU and competent gaming graphics from Nvidia. With great build quality and crisp audio, it's a superb all-rounder.

KEY SPECS 2.3GHz Intel Core i7-3610QM; 8GB RAM; 750GB HDD; Blu-ray reader; Nvidia GeForce GT 630M; 15.6in 1,920 x 1,080; Windows 7 Home Premium; 380 x 255 x 28mm; 2.75kg. Part code: N56VM-S4034V

ALTERNATIVE

Dell Inspiron 15R Special Edition

Plasticky build and plain looks mask a luscious display and top-notch specification – the Dell is a superb all-rounder.
£733 (£879); www.dell.co.uk WEB ID 376579

ULTRABOOK

Apple MacBook Air 13in

£833 (£999)
www.apple.com/uk
WEB ID 375160 ISSUE 215

Not strictly an Ultrabook, but the laptop that so obviously inspired them now has an Ivy Bridge processor and a tempting sub-£1,000 price tag. That's tough to beat.

KEY SPECS 1.8GHz Intel Core i5-3427U; 4GB RAM; 128GB SSD; Intel HD Graphics 4000; 13.3in 1,440 x 900 TFT; OS X 10.7; 325 x 227 x 17mm; 1.35kg

ALTERNATIVE

Dell XPS 13

Classy, understated and brimming with potential, Dell's XPS 13 conjures a stunning all-round performance for less than £1,000.
£816 (£979); www.dell.co.uk WEB ID 373960

ENTHUSIAST LAPTOP

Apple MacBook Pro with Retina display

£1,499 (£1,799)
www.apple.com/uk
WEB ID 375337 ISSUE 215

It's ditched the DVD drive and slimmed down, but the headline is the incredible 2,880 x 1,800 screen, which is forcing developers to update software. A glimpse at the future of laptop displays.

KEY SPECS 2.3GHz Intel Core i7-3615QM; 8GB RAM; 256GB SSD; Intel HD Graphics 4000; Nvidia GeForce GT 650M; 15.4in 2,880 x 1,800 TFT; OS X; 1yr C&R warranty; 359 x 247 x 18mm; 2.02kg

ALTERNATIVE

Alienware M17x R4

A quad-core Ivy Bridge CPU and AMD's top-end Radeon HD 7970M graphics combine to make the M17x R4 a gaming force to be reckoned with.
£1,349 (£1,618); www.dell.co.uk WEB ID 374749

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Our hand-picked selection of 102 best buys, chosen from the dozens of products tested each month in the PC Pro labs

MEDIA PC

Tranquil PC MMC-12

£649 (£779)
www.tranquilpcshop.co.uk
WEB ID 372430 ISSUE 210

It isn't cheap, and it has no TV tuner as standard, but this beautiful and silent media system is a stylish addition to any living room.

KEY SPECS 2.5GHz Intel Core i3-2100T; 4GB RAM; 80GB SSD; DVD writer; 2 x USB 3; 2 x USB 2; eSATA; Windows 7 Home Premium; 3yr RTB warranty; 395 x 225 x 40mm

ALTERNATIVE

Chillblast Fusion Vacuum Mini

A silent and well-specified living room PC that delivers dual TV tuners and promising performance, but it doesn't come cheap.

£832 (£999 inc VAT); www.chillblast.com WEB ID 376774

ALL-IN-ONE PC

HP Z1

£2,400 (£2,880)
www.laptopsdirect.co.uk
WEB ID 375100 ISSUE 215

The first all-in-one we've seen in ages to challenge the iMac, and it does so by opening up like a briefcase for easy upgrading of pretty much every component. An expensive technical marvel.

KEY SPECS 3.6GHz Intel Xeon E3-1280; 8GB RAM; 1TB HDD; DVD-RW; Nvidia Quadro 3000M; 27in 2,560 x 1,440 IPS TFT; Windows 7 Professional; 3yr RTB warranty; 660 x 419 x 584mm; 21kg

ALTERNATIVE

Toshiba LX830

Toshiba's first Windows 8 all-in-one PC isn't perfect, but the superb image quality, compact design and keen price make amends.

£665 (£799); www.pcworld.co.uk WEB ID 378235

BUDGET PC

Palicomp Phoenix i5 Destiny

£582 (£699)
www.palicomp.co.uk
WEB ID 366679 ISSUE 201

A Blu-ray drive, a solid 22in Full HD monitor, and now with an updated graphics card and new Ivy Bridge, overclocked processor. At this price, it's a great low-end deal.

KEY SPECS 3.4GHz Intel Core i5-3570K @ 4.5GHz; 4GB RAM; Gigabyte 277-D3H motherboard; 1TB HDD; Blu-ray; ATI Radeon HD 6670; 22in Acer TFT; 2.1 Logitech speakers; Windows 7 Home Premium

ALTERNATIVE

Chillblast Fusion Elixir

A basic but solid base unit that's deceptively fast thanks to a huge CPU overclock. It's quiet in use, and well put together.

£499 (£599); www.chillblast.com WEB ID 372364

HIGH-END PC

PC Specialist Vortex Destroyer

£1,457 (£1,749)
www.pcspecialist.co.uk
WEB ID 376309 ISSUE N/A

Stellar performance is matched with a high-quality 27in monitor, a decent 5.1 speaker set and top-notch accessories. It isn't cheap, but it's a sterling combination.

KEY SPECS 3.6GHz Intel Core i7-3820 @ 4.6GHz; 16GB RAM; Asus P9X79 motherboard; 120GB SSD; 2TB HDD; Blu-ray; Nvidia GeForce GTX 680 graphics; Windows 7 Home Premium; 3yr RTB warranty

ALTERNATIVE

Chillblast Fusion Thunderbird

A bold, some would say, garish chassis – but inside is an Ivy Bridge PC with power, gaming performance, plenty of storage and surprisingly little noise. A fine all-rounder.

£832 (£999); www.chillblast.com WEB ID 376405

BUSINESS/EXECUTIVE LAPTOP

Lenovo ThinkPad X1 Carbon

£1,134 (£1,361)
www.lenovo.co.uk
WEB ID 377827 ISSUE 220

Lenovo revisits its X1 and produces the business-class Ultrabook we've been waiting for. Great all-round performance is paired with excellent ergonomics.

KEY SPECS 1.8GHz Intel Core i5-3427U; 8GB RAM; 256GB SSD; 14in 1,600 x 900 TFT; dual-band 802.11n; Bluetooth 4; 3G; 3yr RTB warranty; 331 x 226 x 19mm; 1.36kg

ALTERNATIVE

Toshiba Portégé Z830

The first Ultrabook to focus on business has its niggles, but it's light, thin, has long battery life and is packed with features. Part code: Z830-104.

£782 (£939); www.saveonlaptops.co.uk WEB ID 371551

BUSINESS PC

Lenovo ThinkStation E31

£725 (£871)
www.lenovo.co.uk
WEB ID 376852 ISSUE 376852

This small-form-factor workstation is tiny, but it still includes an Intel Xeon processor and Nvidia Quadro graphics for a reasonable price.

KEY SPECS 3.3GHz Intel Xeon E3-1230 v2; 4GB RAM; 1TB HDD; DVD-RW; Nvidia Quadro 600 graphics; Windows 7 Professional; 3yr RTB warranty

ALTERNATIVE

Fujitsu Esprimo Q510

Fujitsu's compact PC base unit takes up barely any space on a desk, delivers plenty of power and has ample connectivity.

From £432 (£518); www.ballicom.co.uk WEB ID 378769

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MOBILE

SMARTPHONE

Samsung Galaxy S III

Free, £26/mth, 24mths
www.buymobilephones.net
WEB ID 374950 ISSUE 215

Slightly iffy design, but with a superb 4.8in screen and 8-megapixel camera, a quad-core processor and a host of software extras, it's the best smartphone out there.

KEY SPECS 1.4GHz CPU; 1GB RAM; 16GB storage; 4.8in 720 x 1,280 TFT; 802.11n Wi-Fi; 8mp camera; Android 4; 70 x 8.9 x 136mm; 132g

ALTERNATIVE

Apple iPhone 5

Slimmer, lighter and more desirable than ever, but the refined design and 4in Retina display command a hefty premium.

£175, £31/mth, 24mths, www.phones4u.co.uk WEB ID 377185

SATNAV

TomTom

From £27 (£32)
Apple App Store
WEB ID 375418 ISSUE 213

The TomTom app for iPhone and iPad is undoubtedly the best of the bunch, but its Android brethren is inferior and works with only certain screen resolutions. Opt for CoPilot instead.

KEY SPECS Requires iPhone/iPad (or iPod Touch with GPS add-on); UK/ROI maps; HD Traffic, £27/yr or £4/mth; speed cameras, £27/yr or £4/mth

ALTERNATIVE

TomTom Go Live 825

Performs superbly and at a very reasonable price. If it's too much, the Go Live 820 is the same but with a 4in screen.

£153 (£184); www.handtec.co.uk WEB ID 368701

EBOOK READER

Amazon Kindle Paperwhite

Wi-Fi, £91 (£109);
Wi-Fi and 3G, £141 (£169)
www.amazon.co.uk
WEB ID 377665 ISSUE 219

Amazon adds a front light and a capacitive touchscreen to its already excellent Kindle, and the result is by far the best ebook reader money can buy.

KEY SPECS 6in 758 x 1,024 Pearl E Ink screen; 2GB storage; 1yr RTB warranty; 117 x 9 x 169mm; 213g

ALTERNATIVE

Kobo Glo

Kobo's answer to the Kindle Paperwhite partners front lighting with an optical touchscreen.

£80 (£96); www.cclonline.com WEB ID 377821

MONITORS

BUDGET TFT

Dell UltraSharp U2312HM

£129 (£155)
www.amazon.co.uk
WEB ID 375760 ISSUE 214

With falling prices placing it among the cheapest monitors on the market, Dell's UltraSharp U2312HM delivers an unusually refined, high-end performance for sensible money.

KEY SPECS 23in 1,920 x 1,080 IPS matte TFT; DVI; D-SUB; DisplayPort; 300cd/m² brightness; 547 x 186 x 493mm

ALTERNATIVE

AOC i2352Vh

Sluggish response times let it down, but good colour accuracy and eye-popping image quality save the day. A great budget monitor.

£103 (£123); www.dabs.com WEB ID 373606

PREMIUM TFT

Dell UltraSharp U2412M

£170 (£204)
www.aria.co.uk
WEB ID 375823 ISSUE 214

Not the cheapest 24in monitor, but it offers an old-school 1,920 x 1,200 resolution on a superb IPS panel, with great build quality and a fully adjustable stand.

KEY SPECS 24in 1,920 x 1,200 IPS matte TFT; DisplayPort, DVI, D-SUB; 4 x USB 2; 300cd/m² brightness; 556 x 180 x 514mm

ALTERNATIVE

ViewSonic VP2770-LED

The ViewSonic's 27in, 2,560 x 1,440 IPS panel delivers ample brightness and fantastic colour accuracy straight out of the box.

£480 (£576); www.scan.co.uk WEB ID 377770

SPECIALIST TFT

Eizo ColorEdge CG275W

£1,365 (£1,638)
www.nativedigital.com
WEB ID 368146 ISSUE N/A

The Eizo ColorEdge CG275W is one of the finest TFTs ever made. Image quality is superb, and the ingenious integrated colorimeter takes the hassle out of regular colour calibration.

KEY SPECS 27in 2,560 x 1,440 IPS TFT; 270cd/m²; 850:1 contrast; DisplayPort; mini-DisplayPort; DVI; 646 x 282 x 425mm; 13.6kg

ALTERNATIVE

Eizo ColorEdge CX240

Hugely expensive for a 24in monitor, but image quality is amazing thanks to RGB LED backlighting.

£857 (£1,028); www.nativedigital.com WEB ID 377272

CAMERAS

DIGITAL COMPACT/CSC

Sony Alpha NEX-6

£683 (£819)
www.jessops.com
WEB ID 378553 ISSUE 221

With a small, sharp kit lens, fast autofocus, intuitive controls and integrated flash, the NEX-6 is the first compromise-free CSC: a delight to use, and with first-class image quality.

KEY SPECS 16mp APS-C sensor; 16-50mm f/3.5-5.6 kit lens; 10fps burst mode; SDXC/MS Pro Duo slot; 1yr RTB warranty; 120 x 43 x 67mm; 470g

ALTERNATIVE

Canon PowerShot S110

With top-quality stills and video, and a comprehensive set of features, Canon's S110 is the ultimate pocket-sized compact.

£293 (£351); www.morecomputers.com WEB ID 378604

DSLR

Nikon D600

£1,217 (£1,460)
www.jessops.com
WEB ID 378103 ISSUE 220

Nikon makes a full-frame DSLR affordable. With high-end features and sublime image quality, the D600 should be the choice of amateur enthusiasts and semi-professionals alike.

KEY SPECS 24.3mp full-frame sensor; 39-point autofocus (9 cross-type); 5.5fps burst mode; dual SDXC slots; 141 x 82 x 113mm; 850g

ALTERNATIVE

Canon EOS 650D

Touchscreen controls and a vastly improved autofocus make the 650D the best all-round consumer DSLR on the market.

£468 (£562); www.argos.co.uk WEB ID 377503

DIGITAL VIDEO CAMERA

Panasonic HC-X800

£387 (£464)
www.amazon.co.uk
WEB ID 372862 ISSUE 211

Now that the HDC-TM900 has disappeared from stores, this is the video camera to buy. It shoots fantastic footage in all conditions and the image stabilisation system is superb.

KEY SPECS 1080/50p AVCHD; 3 x 1/4.1in CMOS sensors; 12x optical zoom; 9.15mp; 3in LCD; 63 x 68 x 134mm; 345g

ALTERNATIVE

Sony Bloggie MHS-TS20K

A neat update to the pocket camera, with one ace new feature: a 360-degree lens adapter that makes for hours of fisheye fun.

£52 (£62); www.amazon.co.uk WEB ID 367357

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PRINTERS

CONSUMER ALL-IN-ONE

Canon Pixma MG6250

£99 (£119)
www.pixmania.com
WEB ID 372037 ISSUE 208

Extra photo black and grey inks make this the finest A4 all-in-one for photo enthusiasts, but it's also very good for documents. You pay a bit extra for the quality, but it's worth it.

KEY SPECS 7-ink engine; 3in screen and touch panel; 2 x 150-sheet input trays; duplex; CD tray; USB; 802.11n Wi-Fi; 470 x 367 x 173mm

ALTERNATIVE

HP Photosmart 5510

If you don't print as often, this HP is cheap to buy, not too dear to run, and produces high-quality prints and excellent scans.

£59 (£71); www.printerland.co.uk **WEB ID** 372337

OFFICE ALL-IN-ONE

HP Officejet Pro 8600 Plus

£153 (£184)
www.dabs.com
WEB ID 375367 ISSUE 215

HP's A-Lister gets a curvy, bold redesign for its annual update, and underneath is an office all-in-one that still produces superb documents and scans with very low running costs.

KEY SPECS 4-ink engine; 4.3in touchscreen; 250-sheet input tray; fax; duplex; 50-sheet ADF; USB; Ethernet; 802.11n Wi-Fi; 493 x 460 x 315mm

ALTERNATIVE

Canon Pixma MX895

Dearer to run than the HP, but it has a strength its rival can't match: fantastic, fast photo prints.

£117 (£140); www.printerbase.co.uk **WEB ID** 375118

PERSONAL LASER

Lexmark C540n

£119 (£143)
www.printerbase.co.uk
WEB ID 353659 ISSUE 199

A well-built, network-capable colour laser with reasonable running costs, a huge 250-sheet paper tray and fast, top-quality document and image output – all at a competitive price.

KEY SPECS A4 colour laser; 21ppm speed; USB; Ethernet; 250-sheet input tray; 100-sheet output tray; 595 x 495 x 402mm

ALTERNATIVE

Brother HL-2270DW

A mono laser with all the features a home office needs, plus good print speed and quality as well.

£125 (£150); www.printerbase.co.uk **WEB ID** 362242

SOFTWARE

INTERNET SECURITY

Bitdefender Internet Security 2013

NEW ENTRY

£15 (£19), 3 PCs, 1yr
www.amazon.co.uk
WEB ID N/A ISSUE 221

Bitdefender partners a comprehensive set of features with exceptional malware detection, and for a bargain price.

ALTERNATIVE

Avast Free Antivirus

NEW

The best free antivirus, with great protection and oodles of features.

Free; www.avast.com
WEB ID N/A

BACKUP/STORAGE

Livedrive

£5/mth (unlimited GB), 1 PC
www.livedrive.com
WEB ID 373558 ISSUE 210

Easy to use, cheap and packed with features, Livedrive is the best all-in cloud storage service.

ALTERNATIVE

Acronis True Image Home 2012

Still a very good backup package, now with live folder syncing.

£28 (£33); www.shop.bt.com
WEB ID 370153

ACCOUNTING

FreeAgent

£18/mth, unlimited users
www.freeagentcentral.com
WEB ID 367126 ISSUE 201

Small-business owners, freelancers and traders lacking accounting experience will love the online FreeAgent.

ALTERNATIVE

Sage Instant Accounts 2012

Support is limited, but otherwise this is a fine package at a good price.

£78 (£93); www.amazon.co.uk
WEB ID 375481

PRODUCTIVITY

Microsoft Office 2013

From $140
www.microsoft.com/uk
WEB ID N/A ISSUE 220

Office remains the ultimate office suite, but despite new touch-friendly features, existing users needn't rush to upgrade.

ALTERNATIVE

Scrivener for Windows

The ultimate document creation and organisation tool for serious writers.

£23 (£27); www.literatureandlatte.com
WEB ID 371680

WEB DEVELOPMENT

Drupal 7

Free
www.drupal.org
WEB ID 364549 ISSUE 198

It isn't a simple turn-key CMS, but the combination with its add-on modules puts it a step ahead of the competition.

ALTERNATIVE

Adobe Dreamweaver CS6

Improved for mobiles, although no longer the dominant web standard it once was.

£287 (£344); www.amazon.co.uk
WEB ID 374221

GRAPHICS/DESIGN

Adobe CS6 Design Standard

£959 (£1,151)
www.morecomputers.com
WEB ID 374218 ISSUE 213

Photoshop, InDesign and Illustrator all benefit from interface overhauls and much deeper improvements.

ALTERNATIVE

Xara Photo & Graphic Designer 7

Graphic design, photo editing and much more in one bargain package.

£38 (£46); www.amazon.co.uk
WEB ID 368470

PHOTO EDITING

Adobe Photoshop Lightroom 4

£76 (£91)
www.amazon.co.uk
WEB ID 372220 ISSUE 215

As much an organiser as an editor, it offers the tools that most photography enthusiasts will need.

ALTERNATIVE

Adobe Photoshop CS6

Hugely expensive, but for professionals nothing comes close.

£526 (£631); www.amazon.co.uk
WEB ID 373714

VIDEO EDITING

Adobe Premiere Pro CS6

£620 (£744)
www.amazon.co.uk
WEB ID 374092 ISSUE 213

A new interface and improved engine make this powerful, professional editor more tempting than ever.

ALTERNATIVE

Sony Movie Studio Platinum 12

64-bit support and powerful editing tools unite in an affordable package.

£29 (£35); www.amazon.co.uk
WEB ID 376474

AUDIO PRODUCTION

Steinberg Cubase 7

NEW ENTRY

£363 (£435)
www.dv247.com
WEB ID 378724 ISSUE 221

An overhaul of a heavyweight package, Cubase provides experienced users with the most precise and flexible tools yet.

ALTERNATIVE

Ableton Live 8

The best version of Live yet, with a well-rounded feature set.

£249 (£299); www.studiospares.com
WEB ID 257713

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NETWORKING

EXTERNAL HARD DISK

Verbatim Store 'n' Go USB 3.0

500GB, £40 (£48)
www.laptopsdirect.co.uk
WEB ID 370369 ISSUE 204

A portable drive that placed among the top USB 3 performers in our tests, comes in a variety of colours, and has a very reasonable price per gigabyte.

KEY SPECS 500GB HDD; USB 3; Nero BackItUp & Burn software; 2yr RTB warranty; 80 x 121 x 15mm; 150g

ALTERNATIVE

LaCie 2big USB 3

A little pricey, but it's reasonably quick, has good security options and is stylish too.

2TB, £205 (£246); http://uk.insight.com WEB ID 362206

NETWORK STORAGE

Synology DiskStation DS212j

Diskless, £129 (£155)
www.lambda-tek.com
WEB ID 374536 ISSUE 212

Fast, feature-packed and blessed with the best interface of any NAS around. The updated DiskStation Manager 4 adds a host of new cloud storage features too.

KEY SPECS Consumer NAS; 2 x 3.5in drive bays; RAID0, 1, JBOD; 2 x USB 2; 2yr RTB warranty; 100 x 226 x 165mm

ALTERNATIVE

Qnap TS-412 Turbo NAS

This four-bay NAS device doesn't major on speed, but good design and a range of features make it the high-end choice.

Diskless, £205 (£246); www.scan.co.uk WEB ID 374695

WIRELESS ROUTER

Netgear DGND3700 N600

£85 (£102)
www.amazon.co.uk
WEB ID 371293 ISSUE 206

A pricey, but very quick router across both 2.4GHz and 5GHz that works with cable or ADSL connections. It's unreliable on older ADSL 1 lines, though.

KEY SPECS Dual-band 802.11n cable/ADSL router; 4 x Gigabit Ethernet; 2 x USB 3; UPnP; 76 x 160 x 233mm

ALTERNATIVE

Asus RT-N56U

A low-price cable router with sterling performance, simple operation and a design that won't stick out in a living room.

£66 (£80); www.dabs.com WEB ID 371296

COMPONENTS

PROCESSOR

Intel Core i5-3570K

£139 (£167)
www.ebuyer.com
WEB ID 374158 ISSUE 213

It's a little slower than the Core i7s, but Intel's i5-3570K is our chip of choice thanks to its combination of excellent performance and a reasonable price.

KEY SPECS 3.4GHz (3.8GHz Turbo Boost); LGA 1155 quad-core CPU; Intel HD Graphics 4000; 6MB L3 cache; 77W TDP; 22nm

ALTERNATIVE

AMD A10-5800K

AMD's Trinity APU almost keeps pace with the Core i3s, and its graphics performance is streets ahead of Intel's.

£75 (£90); www.aria.co.uk WEB ID 378481

MOTHERBOARD

Asus P8Z77-V Pro

£124 (£149)
www.amazon.co.uk
WEB ID 376573 ISSUE 215

The latest Asus includes 802.11n Wi-Fi as well as almost every feature a PC builder needs, with plenty of sockets, ports and a UEFI BIOS. It's an ideal partner for Ivy Bridge.

KEY SPECS Socket LGA 1155; Intel Z77 chipset; 3 x PCI-E x16; 2 x PCI-E x1; 2 x PCI; 4 x USB 3; 4 x DDR3 DIMM sockets; 802.11n Wi-Fi

ALTERNATIVE

MSI Z77A-G43

MSI's board offers a rich, rounded specification, Intel's Z77 chipset and Ivy Bridge support for a reasonable price.

£58 (£69); www.pixmania.co.uk WEB ID 376576

SOLID-STATE DISK

Samsung SSD 830

256GB, £121 (£145)
www.dabs.com
WEB ID 378652 ISSUE 213

With NAND prices dropping steadily since its release, the Samsung SSD 830 has gone from being a pricey, top-notch performer to becoming a veritable solid-state bargain.

KEY SPECS 2.5in SATA 6Gbits/sec solid-state drive; Samsung MCX controller. Part code: MZ-7PC256D

ALTERNATIVE

Corsair Force GT

Pricier than Samsung's SSD 830, but the Corsair's Sandforce controller is only a whisker behind in performance terms.

240GB, £140 (£168); www.amazon.co.uk WEB ID 375463

MAINSTREAM GRAPHICS CARD

AMD Radeon HD 6850

Typically, £120
Depends on brand
WEB ID 362152 ISSUE 211

For most people, a card that will play the latest games at high settings on a 1080p screen is the goal, and this one will do exactly that.

KEY SPECS 960 stream processors; 900MHz core; 1GB GDDR5 RAM; 40nm; 2 x 6-pin connectors; 230mm long

ALTERNATIVE

AMD Radeon HD 6450

The HD 6450 is fine for playing HD video on an old PC without modern integrated graphics.

Typically, £50 WEB ID N/A

ENTHUSIAST GRAPHICS CARD

Nvidia GeForce GTX 680

Typically, £370
Depends on brand
WEB ID 373696 ISSUE 212

If you have enough cash, Nvidia's 28nm debut blows AMD away: quicker in practically every test, with impressive new features – and it's more efficient, too.

KEY SPECS 1,536 stream processors; 1,006MHz core; 2GB/4GB GDDR5 RAM; 28nm; 2 x 6-pin connectors; 257mm long

ALTERNATIVE

Nvidia GeForce GTX 660 Ti

For single-screen gaming, the GeForce GTX 660 Ti provides a serious amount of bang for your buck.

Typically, £230 WEB ID 376438

HARD DISK

Hitachi Deskstar 7K1000.D

1TB, £51 (£62)
www.scan.co.uk
WEB ID 375973 ISSUE 213

The fastest hard disk in our Labs, yet the price for a terabyte – while not exactly dirt-cheap – isn't nearly as high as you'd expect. A great blend of value and performance.

KEY SPECS 3.5in SATA 6Gbits/sec HDD; 7,200rpm spindle speed; 32MB cache; 3yr RTB warranty. Part code: HDS721010DLE630

ALTERNATIVE

Seagate Barracuda Green

It won't win any speed awards, but this is a very efficient drive at a good price.

2TB, £70 (£84); www.stuff-uk.net WEB ID N/A

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ENTERPRISE

RACK SERVER

Broadberry CyberServe XE5-R224

£3,795 exc VAT
www.broadberry.co.uk
WEB ID 378319 **ISSUE** 219

With storage space galore, plenty of room for expansion and low power consumption, the CyberServe XE5-R224 only loses out a little on the features front. At this price, it's superb value.

KEY SPECS 2U rack chassis; 2.4GHz Xeon E5-2665; 32GB DDR3 RAM; 2 x 300GB SAS HDD; 4 x Gigabit Ethernet; 2 x 750W PSU; 3yr on-site NBD

ALTERNATIVE

HP ProLiant DL360p Gen8

An extremely well-designed server that squeezes lots into its 1U rack chassis, and presents plenty of room to grow.

£5,159 exc VAT; www.hp.co.uk **WEB ID** 377143

PEDESTAL SERVER

Fujitsu Primergy TX100 S3p

£416 exc VAT
www.ebuyer.com
WEB ID 377572 **ISSUE** 218

The Primergy TX100 S3p combines all-round quality with an unbeatable price, making it a top choice as a small-business server.

KEY SPECS 3.1GHz Xeon E3-1220V2; 8GB DDR3; 2 x 500GB HDD; 4 x PCI-E Gen3; 9 x USB 2; 2 x Gigabit Ethernet; 1yr on-site warranty

ALTERNATIVE

HP ProLiant ML350p Gen8

A whisper-quiet pedestal server that combines good value, huge expansion potential and class-leading remote management.

£4,633 exc VAT; www.hp.co.uk **WEB ID** 377701

SECURITY APPLIANCE

WatchGuard XTM 515

NEW ENTRY

1yr security bundle,
£895 exc VAT; www.lambda-tek.com
WEB ID N/A **ISSUE** 221

High UTM performance usually comes with an equally high price, but the XTM 515 bucks the trend by delivering a wide range of gateway security measures for a sensible price.

KEY SPECS 1U rack chassis; 1 x 10/100 Ethernet; 6 x Gigabit Ethernet; RJ-45 serial; 2 x USB; 3yr on-site NBD warranty

ALTERNATIVE

Fortinet FortiGate-111C

It has every security angle covered; the centralised management options make it suited to SMBs and remote branch deployments.

From £2,442 exc VAT; www.fortinet.com **WEB ID** 372340

STORAGE APPLIANCE

Synology DiskStation DS1812+

Diskless, £612 exc VAT
www.lambda-tek.com
WEB ID 375013 **ISSUE** 214

A top NAS appliance for small businesses that's affordable, fast – thanks to its dual-core Atom processor – and absolutely brimming over with new features.

KEY SPECS 2.13GHz Intel Atom D2700; 1GB DDR3; 8 x SATA II hot-swap bays; RAID0, 1, 5, 6, Hybrid, hot-spare and JBODs; 2 x Gigabit Ethernet

ALTERNATIVE

Qnap TS-879 Pro Turbo NAS

Impressively fast over Gigabit and 10GbE, and drowning in features, including superb cloud backup services.

Diskless, £1,325 exc VAT; www.kikatek.com **WEB ID** 371404

BACKUP DEVICE

HP StorageWorks Ultrium 3000 SAS

£1,362 exc VAT
www.ballicom.co.uk
WEB ID 357982 **ISSUE** 190

Many pundits said tape was dead. They also said that LTO was at the end of its roadmap. HP's 3000 SAS proves them wrong on both counts.

KEY SPECS LTO-5 tape drive; 1.5TB; transfer rate 140MB/sec; 256MB buffer; 6GB/SEC SAS

ALTERNATIVE

Quantum LTO-4 HH

A compact LTO-4 SAS tape drive kit for businesses with big backup requirements and a need for speed.

£871 exc VAT; www.misco.co.uk **WEB ID** 213831

BUSINESS LASER

HP LaserJet Pro 200 Colour MFP M276n

NEW ENTRY

£215 exc VAT
www.printerland.co.uk
WEB ID N/A **ISSUE** 221

A fine choice for small businesses that want a versatile, low-cost colour laser MFP. Output quality belies the low price, and HP's web printing features are a cut above.

KEY SPECS 600dpi A4 colour laser, 14ppm colour/mono; 1,200dpi colour scanner; 150-sheet input tray; 30-sheet ADF; 1yr on-site warranty

ALTERNATIVE

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Xerox Phaser 7100N

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£749 exc VAT; www.printerbase.co.uk **WEB ID** N/A

UPS DEVICE

APC Smart-UPS 1500 LCD

£329 exc VAT
www.amazon.co.uk
WEB ID 374788 **ISSUE** 213

You pay a premium for an APC UPS, but it's worth it. It offers unbeatable management features, and its battery runtime is the only one we've seen to come close to a manufacturer's claims.

KEY SPECS 1,500VA/980W line-interactive UPS; 8 x C13 battery protected outputs; RJ-45 serial and USB ports

ALTERNATIVE

CyberPower CP1500EAVRLCD-UK

A low-cost UPS with a big battery, making it a fine choice for protecting a small-business server.

£206 exc VAT; www.systo.co.uk **WEB ID** 373693

NETWORK BACKUP

Symantec Backup Exec 2012

From £608 exc VAT
www.symantec.co.uk
WEB ID 374467 **ISSUE** 213

BE 2012 is a very different beast to BE 2010, and we'd recommend existing users familiarise themselves with it before upgrading, but it simplifies backup and recovery processes immensely. There's also an all-you-can-eat licence, priced on the data to be secured prior to any deduplication or compression.

ALTERNATIVE

CA ARCserve Backup r16

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From £314 exc VAT; www.misco.co.uk **WEB ID** 373744

NETWORK MONITORING

Paessler PRTG Network Monitor 9

500 sensors, £797 exc VAT
www.paessler.com
WEB ID 371584 **ISSUE** 208

Licensed by the number of sensors, and with a proprietary database included, PRTG offers great value with no hidden costs. It provides an impressive range of network monitoring tools and combines them with quality reporting and alerting facilities, making it our favourite network monitoring tool.

ALTERNATIVE

Ipswitch WhatsUp Gold 15 Premium

The redesigned web console is a step up, the existing monitoring tools are present, and the price makes it affordable for SMBs.

100 devices, £1,930 exc VAT; www.ipswitch.com **WEB ID** 370246

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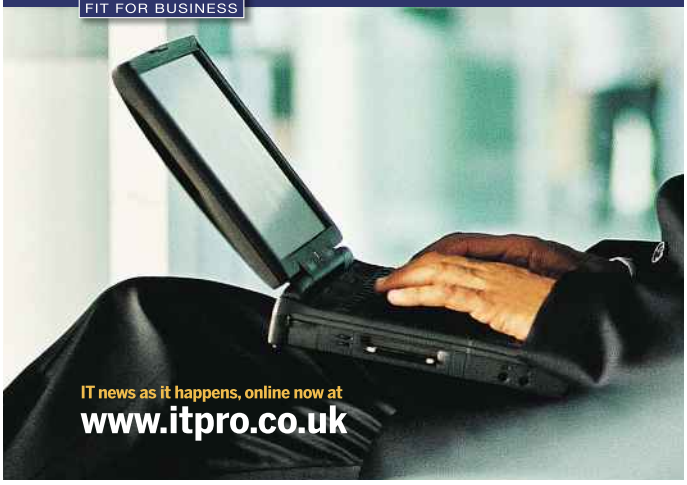

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What if?

What if Apple had gone bust in the 1990s? What if the internet had remained a military-only network? There are huge moments in the history of technology that have helped to shape the present, but they didn't have to go the way they did. We imagine alternative histories of computing and explore what might have been.

How fibre broadband transformed Cornwall

A resistor manufacturing firm in Truro has the fastest fibre connection in the UK – so fast, in fact, that the internet can't keep up. This amazing trial is part of BT's £50 million Superfast Cornwall programme, which aims to put 80-90% of the county on fibre and is revolutionising many local businesses. As the visiting Barry Collins finds out, however, not everyone is feeling the benefit.

The world's most powerful computers

Where once the developments made in the world of supercomputers trickled down to our desktop PCs, now the tables have turned. We explore the evolution of the world's most powerful computers, from Cray and Ferranti through to the Opteron-powered Titan of today; we find out what scientific breakthroughs they're making possible; and we look to the future, where the humble graphics card is already changing everything.

IN LABS

Windows 8 special

Tablets, hybrid devices, touchscreen laptops, flexible all-in-one PCs – Windows 8 comes in all flavours. In this extended Labs, we gather the best of the new hardware in all form factors and pick out the deserving winners. We also take each type of device into the real world to find out which one is best for which type of user.

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JON HONEYBALL is staggered by the tech on sale... in his local pub

One of the advantages of living in a small, rural community is that you have a village pub. I've made a wide range of friends through my local, The Royal Oak in Warboys, since I moved to the area three years ago. There are some real characters: Jimmy, 72, is a wily little chap – he knows everyone, and everyone knows him. Karen, Karen and Kelly, the three barmaids, are a delight. But it was another regular (unnamed for reasons that will soon become clear) who sent my jaw plummeting towards the floor last night, and not because he'd ordered a large single malt on my tab.

This regular came into the pub waving a shiny Apple iPhone 4S box at me. "It was cheap, bought it from a mate in Peterborough just now," he proudly boasted.

I'm somewhat notorious for having the latest phone toys with me at the bar, and he thought he'd impress me, having been rather taken aback when I came in last week toting an iPhone 5, a Samsung Galaxy S III, a Nokia Lumia 920 and an HTC Windows Phone 8X all at once.

> The glassware, screen, edges and switches all looked just like a real iPhone, except for a slight lack of precision in the machining

I opened the box and peered inside. It was, indeed, a white iPhone 4S. Turning it on presented no problems – it booted with the correct Apple logos, and the homescreen looked fine. Something, however, wasn't right. The display stuttered and juddered in a most un-Apple-like fashion. Swiping left to right through the apps was slow. And what was this? An icon for Java? On an iPhone 4S? To misquote Pooh Bear, the more I looked the more it was obvious that something was amiss.

The case was almost spot on. The glassware, screen, edges and switches all looked just like the real thing, except for a slight lack of precision in the machining. The interface was almost identical too: the apps jiggled when you held down an icon, and the Settings menu looked largely accurate. However, the wording on a few of the icons was wrong and the About menu threw up some surprises – the wrong version of the OS, and screen furniture that just wasn't right.

Then it hit me. This was a Chinese third-party clone, nothing to do with Apple. But the more I looked, the more amazed I was with the quality of this forgery. It's one thing to sell a hooky copy of Windows, complete with logos and security features – it's real Windows on the disc, but all the materials are fake. It's entirely another to make a fake phone, complete with OS and apps. It's forgery at a mind-boggling level.

My friend wasn't too happy when I told him that it was a fake. I actually showed my real iPhone 4S, and then the differences were obvious when you looked closely. He made a call back to the "supplier", who claimed it was "legit", but when told we were comparing it to a real 4S, he quickly offered a refund. My friend decided this wasn't really a good idea. It transpired the vendor had a somewhat shady reputation, and the deal had been done on the street. So I decided to lessen his pain, and offered him a cash figure somewhat smaller than he'd paid for it. My friend is a good guy at heart, and wouldn't have wanted to sell on something that he knew to be dodgy. At least this way, he recouped some of his investment.

The next morning, in the lab, we started to look closely at the phoney 4S. Inserting a SIM worked, and when we plugged it in with an Apple USB cable, the device offered to mount itself as USB storage. This gave us access to the file system, and after some poking around and detective work, it was clear that this was a very clever reskinning of a base OS. I initially thought it might be Android or Linux, but it didn't look right. Obviously, iTunes wouldn't sync with the device, so installing apps was out of the question. A deeper dive showed that many of the apps were broken, or nothing more than shells. I couldn't get the browser to work at all.

Overall, I'm not surprised my friend was taken in. At first glance, even I thought it was the real deal. I'm left with a fascinating sample to gather dust on the shelves, but it's been a real jolt to the system. Fake Nokia phone batteries, fake Microsoft software, fake SD memory cards: all of these are well known and comprehensible. Going the whole hog to create a fake phone, OS, box and so forth is another level of effort. The rewards must be huge. Buyers beware.

JON HONEYBALL has contributed to *PC Pro* since issue 1. If you need a cheap phone, he knows a fella who knows a fella.

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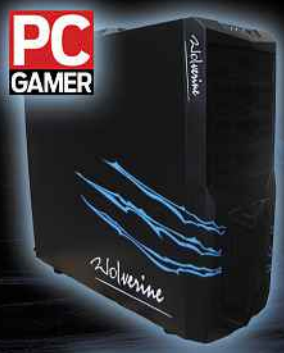

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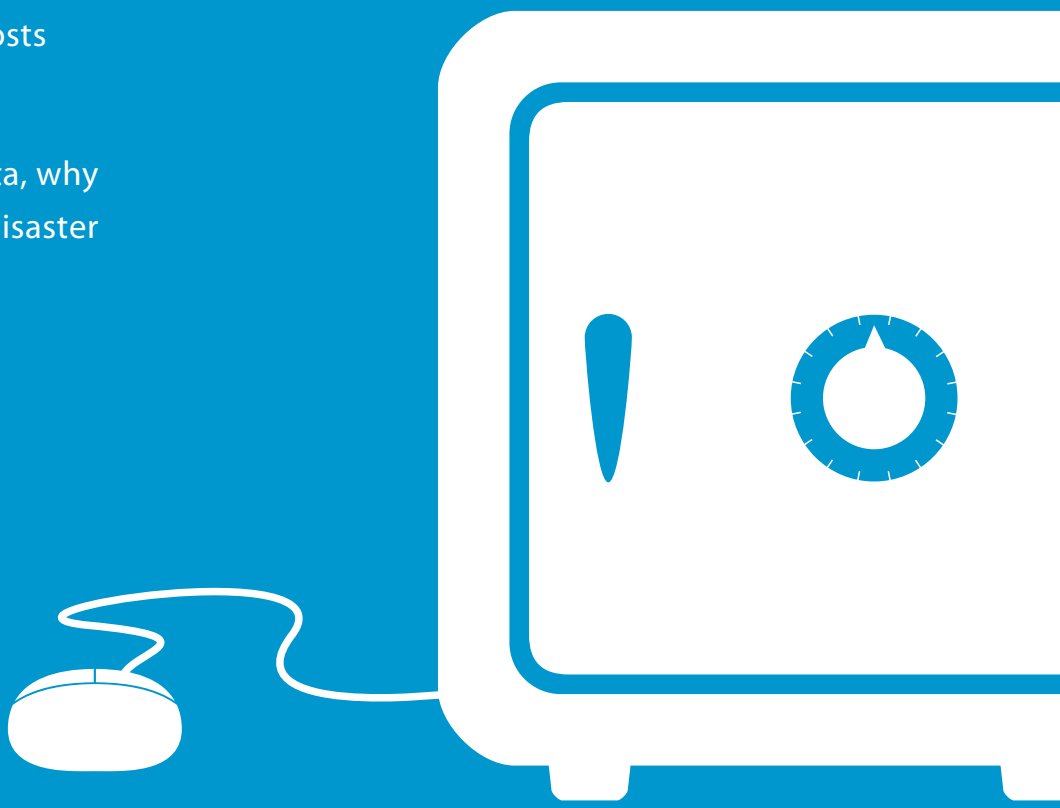

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