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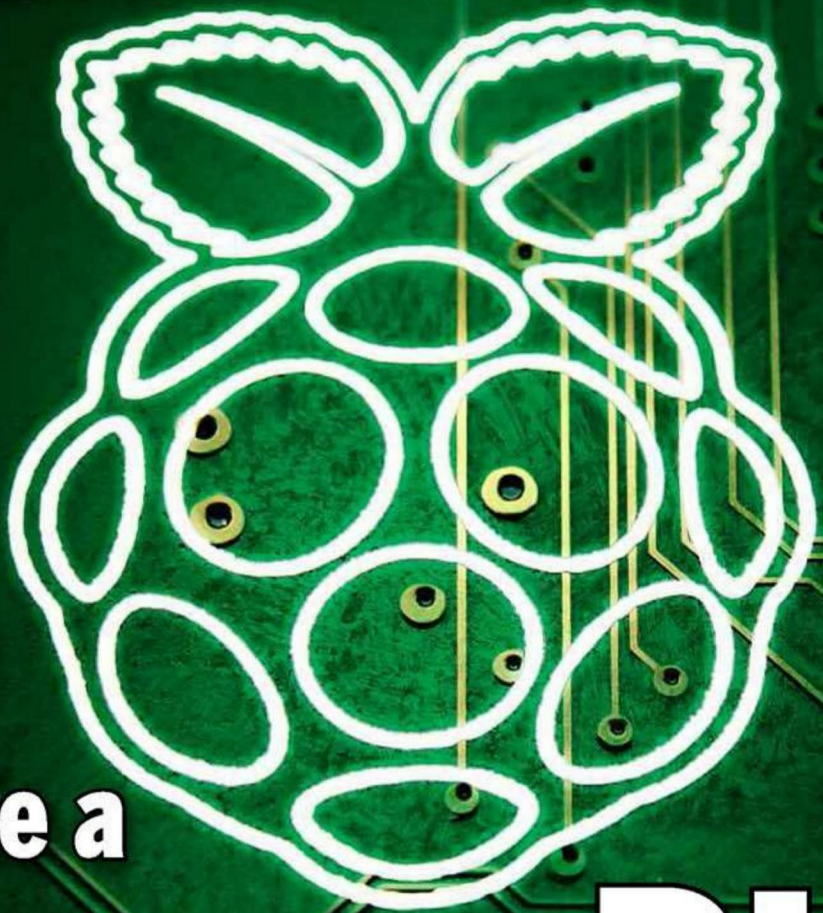

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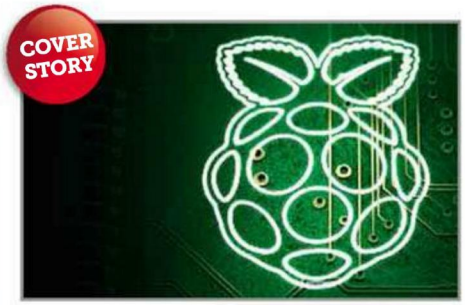

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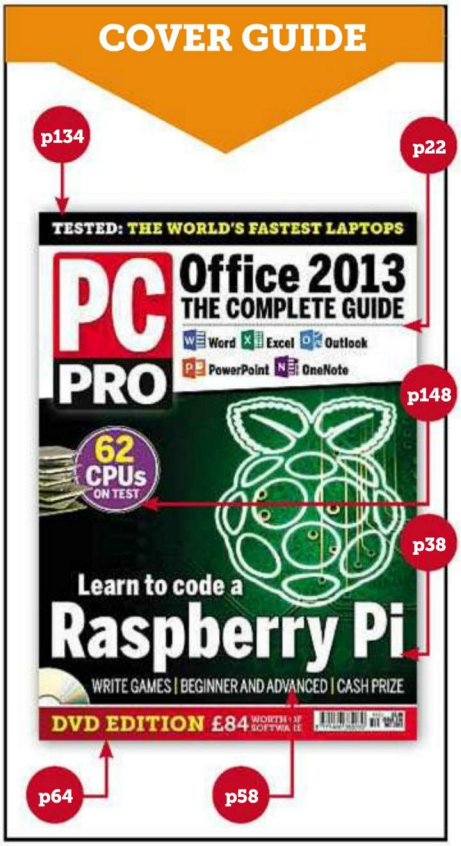

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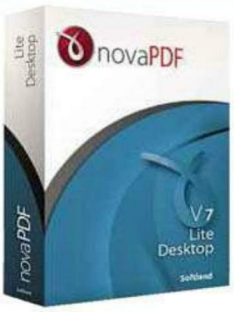

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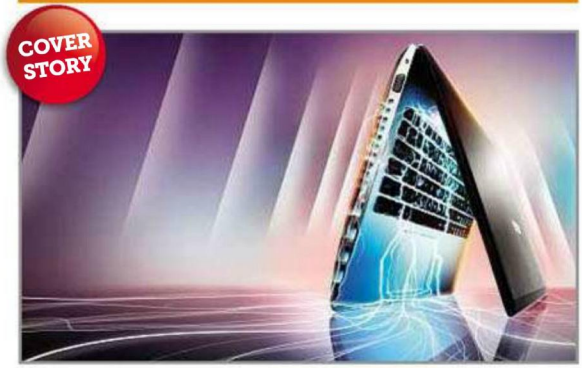
IN THE LABS...



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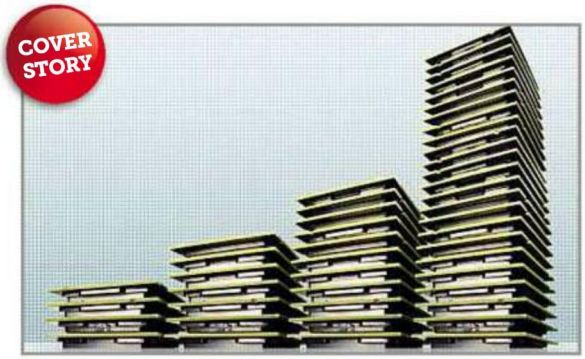

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50 NEW REVIEWS THIS ISSUE

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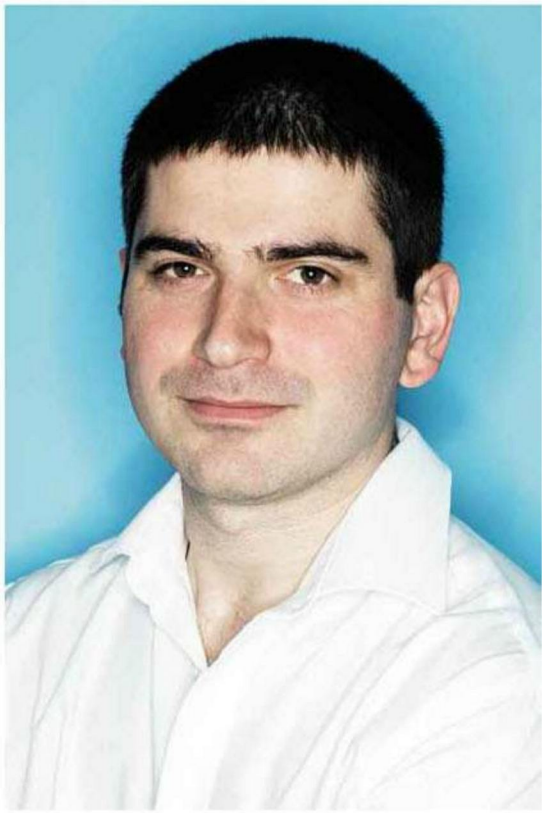
BARRY COLLINS is sick of keeping an eye on his laptop's battery gauge



Want to know the five most depressing words in this month's *PC Pro*? "No decrease in battery life." They're in this month's laptop Labs, as Sasha Muller praises Intel's Ivy Bridge processors for delivering an extra dollop of performance for "no decrease…".

Sasha's quite right to commend Intel for its spectacular engineering efforts. By refining its processor transistor technology down to 22nm – a nanometre is one billionth of a metre, which means a nanometre is to a tennis ball what a tennis ball is to the planet Earth – the company is managing to squeeze more life out of Moore's law than even the great Gordon Moore dared to predict.

But those five words make my heart sink. I don't need more processing power. On the desk in front of me sits an Intel Core 2 Duo laptop of 2009 vintage: it's running Windows 8, Office 2013 (see our guide on p22) and, crucially, Football Manager, without smoke pouring out of the USB ports. But when I take it off the mains, I'm lucky if it lasts 90 minutes before the battery pootles out. The words I really longed to read in that Labs were "a significant boost to battery life, with no decrease in performance".

Under heavy use, none of the laptops on test lasted much more than an hour. Admittedly, our heavy-use test is a worst-case scenario, where all the processing cores are put under more strain than Mel Gibson's image consultant. Yet, even under light use, where the laptop does nothing more than sit with its screen on and scroll through web pages, only one got close to lasting a working day. Most of them would have been dead by lunchtime.

Intel shouldn't shoulder all the blame; it isn't only the processor that's doing damage to the battery life, but also those increasingly high-resolution displays (see David Bayon's excellent feature on p44 for details on how these Retina-grade displays really work). All the same, the sooner we don't have to write In Depth guides to preserving battery life (*see p48*), the better.

I live in a near-constant state of battery paranoia. If I'm not watching the battery bar seep dangerously close to empty midway through a save of my months-old game of Football Manager, I'm carefully monitoring the battery charge of my iPhone, calculating if I've got enough juice left to stream a few songs over Spotify and still call home to get a lift back from the station. I'm petrified to play half the games on my iPhone because the battery will be flat before bedtime.

And talking of bedtime… where some people go through a routine of taking pills and vitamins before they turn in for the night, I'm scrabbling around trying to find a handful of chargers for my devices. On a recent business trip to Amsterdam, I had to set my alarm to wake me at 4am just so that I could switch over the device plugged into my travel adapter and be sure I'd have enough power in my laptop and smartphone for the following day.

There are only two devices that don't literally give me sleepless nights over their battery life: my Kindle and my iPad. The Kindle has to be tethered to the power socket only about once a month thanks to its blissfully efficient E Ink screen. The iPad travels with me everywhere, and goes a working week between charges, in which time it's used for taking notes in meetings, reading newspapers on the train, and watching iPlayer when the kids are hogging the living room TV with Peppa Pig.

In fact, the iPad is increasingly edging out my laptop for work. With a decent keyboard case and the right apps, there isn't much I can't do on it. I took it to a day-long meeting recently in which it was in pretty constant use, and the battery depleted by just over 25%; my laptop would have given up before the coffee break. Not having to worry about the battery running out mid-event is an enormous weight off my mind.

> There are only two devices that don't literally give me sleepless nights over their battery life: my Kindle and my iPad

Alas, the same can't be said for the Windows 8 tablet Microsoft loaned us recently. Yes, it's using a last-generation Sandy Bridge chip – we've yet to see a Windows RT tablet built on the same type of ARM processor that powers the iPad – but battery life is somewhere around the five-hour mark in my experience. I'm told Intel's next-generation Haswell processors, which we suspect will be used inside Microsoft's Surface tablet, will make big gains in battery life.

I certainly hope so, because if I read another laptop Labs with "no decrease in battery life", I might have a little cry.

BARRY COLLINS is the editor of *PC Pro*. He's currently leading a promotion charge with Lewes FC into the football league in Football Manager, of which he's irrationally proud.

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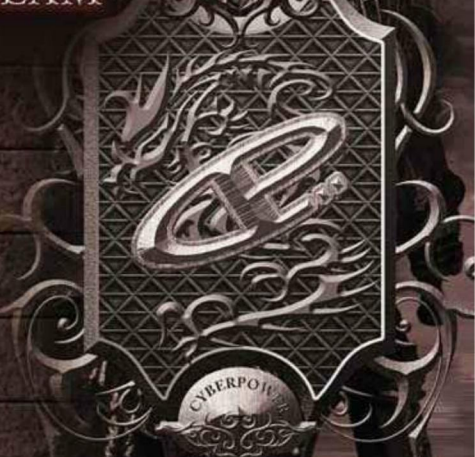

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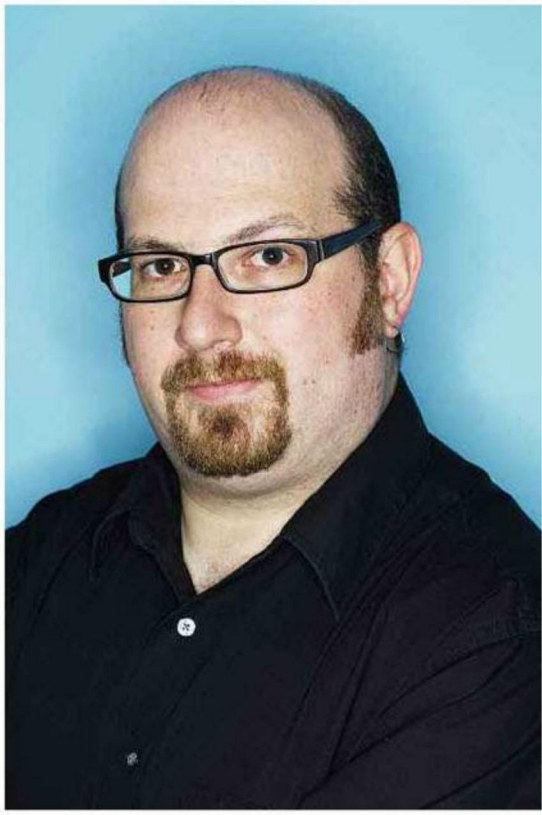
DARIEN GRAHAM-SMITH tries writing for Android – but finds coding isn't what it used to be



I started programming at school. I wasn't exactly a prodigy: most of my early creations merely filled the screen with pretty patterns, or with prime numbers, or with the words "DARIEN IS SKILL" over and over again. But I found something exciting – even addictive – in the creative process, something that inspired me to keep experimenting and building new ideas on top of old ones. And so, over time, my horizons grew, until by the sixth form I was writing educational software to help students learn their French and German verbs, which I ended up selling to the modern languages department.

I don't do so much programming these days, but it doesn't take much to reawaken the urge: after reading Kevin Partner's splendid introduction to writing games in Python for the Raspberry Pi this month (*see p58*), I found myself itching to write a game of my own. I don't own a Raspberry Pi, but I do have a shiny new Nexus 7 tablet, so I decided to take the plunge and write my first Android app. After all, I reasoned, I taught myself programming once: how hard could it be a second time?

In fact, it turns out that creating an Android app is quite a lot more challenging than writing your first two-line program in Sinclair BASIC – or indeed, than writing a Raspberry Pi game in Python. For one, before you can even write a line of code, you must begin by installing and correctly configuring a solid half-gigabyte of Android SDKs, plugins and development tools, from three different publishers. If you're not already au fait with the platform and the Eclipse development environment, it's a daunting process.

When you're finally ready to write your first line of code, you then face the question of where it actually goes. Android apps aren't linear flowcharts, but forests of interconnected Java files, XML sheets, resource libraries and more, working together in systems of contextual "activities" and "intents". I found myself struggling, not merely to create a simple "Hello World" app, but even to understand how such a thing would be implemented.

Now, I do understand that there are good reasons for doing things this way, and I'm sure with a bit of tutelage I'd be able to master it all in time. But to the casual tinkerer or the curious kid it's simply impenetrable. If this, rather than the reassuring flashing K-cursor of a ZX80 BASIC interpreter, had been my first experience of programming, I'd have given up there and then. I'd almost certainly never have ended up at *PC Pro* – and as to the broader impact on my generation, I shudder to think.

Happily, help is on its way – thanks to a project dubbed Scripting Layer for Android (or SL4A for short). It's an Android interpreter that lets you write, edit and run Python, Perl, Ruby, JavaScript and more, directly on your mobile device. It can even be supplemented with an Android port of the Pygame library, making it easy to incorporate sound, graphics, user interaction and sprite handling into your Python scripts.

Unfortunately, it isn't quite time to throw away that SDK. SL4A is currently in alpha, so it isn't guaranteed to work perfectly or consistently. Pygame for Android doesn't support the full feature set of the native package. And, since your creations run within SL4A, there's no direct way to distribute them via Google Play – and hence no direct way to make money from them. For now, Python and other scripting languages on Android remain very much poor cousins to native development.

> Creating an Android app is quite a lot more challenging than writing your first two-line program in Sinclair BASIC

Still, the fact that they're under development is exciting. My experiences with "real" programming have shown me just how valuable the Raspberry Pi project is as an introduction to computing. But I look forward to a day when such starter systems won't be necessary – because initiatives such as SL4A will bring the same accessibility and immediacy to the devices we carry in our pockets and use every day.

I don't think this is an unreasonable dream: as mobile hardware grows in power, so interpreted languages become ever more viable frameworks for sophisticated games and apps. And what better way to support and encourage today's youngsters to take their first steps in programming? Imagine the attraction of not only being able to create your own "DARIEN IS SKILL" app (or whatever adjective you may prefer) but being able, at the tap of a button, to beam it to your friends; upload it to an app store for the world to see; and perhaps even make a bit of pocket money.

DARIEN GRAHAM-SMITH is *PC Pro*'s technical editor, and perhaps the only person in the world with a shortcut to QBASIC pinned to his taskbar.

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FEEDBACK

THE PICK OF YOUR COMMENTS FROM EMAILS, BLOGS OR PCPRO.CO.UK

Recycling: a dirty business

I'm not surprised by the news of Apple choosing to pull its laptops out of the EPEAT green certification plan, even though it has subsequently rejoined the scheme. It raises valid points about the recycling of computers and other hardware – if "proper" recycling is so difficult, will it be tempting for less scrupulous companies to ship old kit to the developing world for cheaper, "manual" recycling?

The methods used by some recycling companies in parts of Asia, Africa and Latin America are well known. The process essentially consists of the salvageable parts of a laptop or PC being manually stripped, often by children. Once stripped, components such as PCBs are dunked in unpleasant chemicals in order to release valuable metals such as copper and gold.

These processes are incredibly unhealthy, with many of the metals and chemicals involved often toxic to some extent. WITTGENFROG

Replace Windows 8 with Ubuntu

I agree with Jon Honeyball's thoughts on Windows 8 (*see issue 215, p170*). I've used MS-DOS, Windows 3, 3.1, 95, 98, XP, Vista and now 7. Of those operating systems, Windows 3.1 and XP have stayed with me in business, with the rest used at home. I can safely say that Windows Vista was the worst, and Windows 7 has been the best.

I've tried the Windows 8 Consumer Preview and I find it unproductive and useless for power users – so much so that I won't be purchasing hardware that has Windows 8 installed. I've been using Ubuntu 12.04 LTS in conjunction with Windows 7, and I'd advise businesses to switch to Ubuntu.

I hope Microsoft comes to its senses and releases something that can be used in a proper desktop environment, and not some pretty thing that's only suitable for touchscreens and mobiles. BRIAN LILLY

A question of upgrades

I recently read your Tablets Labs (*see issue 214, p126*) using Zinio on my Asus Transformer TF101. While initially sceptical, I've found that I use it all the time – and on holiday recently, I was amazed to see so many tourists using tablets in cafés that offered free Wi-Fi.

I'm definitely upgrading my device when I find something significantly better, but a major factor in my buying decision is something that isn't often covered: updates.

My Asus arrived with Android 3 installed, but as soon as I added a microSD card, it downloaded and installed Ice Cream Sandwich – well done to Asus for supporting last year's product. It got better: I've since received three minor firmware updates, which are flagged up, downloaded and installed smoothly – more smoothly, most notably, than my PC's Microsoft updates.

Will hardware manufacturers take shortcuts when recycling kit in the developing world?

Contrast this with the lack of support from many major laptop, PC and smartphone manufacturers. Recall the shambles made of upgrading from Windows Vista to 7, for instance, or remember HTC phones that haven't seen upgrades since Android 2.2. BOB DELAMARE

Strength in numbers... and letters, and characters

I'm a heavy internet user, especially when it comes to e-commerce and banking, and I have a huge number of accounts and logins, all of which require passwords. I keep mine in a secure, encrypted database that can also generate strong passwords.

I've read about how easily passwords can be cracked with modern processors and graphics cards and, consequently, how important strong passwords are. One overlooked aspect of this, however, is the limitations that websites place on passwords: many account creation pages only tell you how many characters you need to use – not which characters are allowed, or whether passwords are case-sensitive.

The strongest passwords are long, random strings of all the characters it's possible to type on a keyboard. However, I often find that websites don't allow for this. I've even gone as far as ringing companies to find out which characters I can use; when I've commented that the selection impacted on the eventual strength of my password, I received only a sniffy reply.

Perhaps the misguided thinking is that people will only use passwords they can easily remember, rather than copy and paste long, complex strings from a database. Password security isn't only a matter of educating users, it's also one of educating those who design insecure websites. PETE HOW

No home for Home Server

I'm saddened by the news that Microsoft has killed Windows Home Server. I have a household of four PCs, and regularly undertake coursework as well as working from home. Having automated backups, simple restoration and backups that I can read from any PC with a USB-to-SATA adapter if hardware fails is enticing for the beginner.

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STAR LETTER

I read with interest Darien Graham-Smith's column on the lack of progress with printers (*see issue 215, p9*) – and I, too, was briefly whisked away by the nostalgia of my Panasonic KX-P1081.

I agree that printers seem much less reliable these days. Two years ago, I purchased an Epson Stylus SX515W so that my family could use it wirelessly. It wasn't used much other than for printing my wife's dissertation, and it wasn't too expensive – £99 in a sale. After a while, it refused to print any black ink – even after changing the cartridge, cleaning the print heads and checking the nozzles.

I ended up talking to Epson's online support, whose advice boiled down to binning the machine and buying a new device. Is this really the answer? I can't help but feel cheated; I have a printer that hasn't even ploughed through two packs of A4 paper, won't print black, and I'm out of pocket for a new ink cartridge.

That Panasonic KX-P1081 served me well for so many years. Some of those old machines must still be in service, since you can still buy ribbons for them – I think that says plenty about their reliability and build quality! CHRIS MILLARD

Technical editor Darien Graham-Smith replies: Several readers wrote in this month to share memories of old-school printers, and to vent their frustration with modern inkjets. Sadly, it's a situation we all perpetuate by continuing to buy disposable printers. If we want things to change, we'll have to get used to investing in business-class hardware – whether that's inkjet, laser, or one of the handful of dot-matrix and daisy-wheel models still on the market.

This month's star letter wins a Corsair 128GB Performance Pro SSD worth £136
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I'm aware you can perform these tasks by using cheaper NAS devices, but in the past, I've struggled to find products that are as reliable and as easy to use as Home Server.

The cost of hard disks makes a Windows Home Server machine potentially expensive to populate but, conversely, each PC hooked up will only need a smaller disk or an SSD, and a reliable network connection.

I know from experience that Windows Home Server hasn't been easy to sell, but it will be missed by its users. In the meantime, I'll search for a NAS device with sensible software that's just as easy to use – after all, my hard disks need to go somewhere. GCANTON

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BLOG BITES

Follow the musings of the *PC Pro* team at www.pcpro.co.uk/blogs

News editor Nicole Kobie spent time testing parental control software and found that – contrary to MP Claire Perry's beliefs – setting up a system to keep your children safe on the net isn't exactly difficult, but the biggest barrier is often a simple lack of knowledge. It's a thorny issue that sparked plenty of debate on the blogs.

"I have the misfortune to have Claire Perry as my MP. She's already proved that she's willing to forego common sense in order to win government posts; her response is typical of crusaders who feel challenged by a reasoned argument – if you don't have the right knowledge, resort to abusing the opposition!" **INCOGNITII**

"It's hardly difficult to set up controls, even from within Windows. First, head to the Control Panel and its User Account & Family Safety option, and then into the Parental Controls area – from here just create an account and follow the instructions. Simple." **DAMIAN**

"Books can be pornographic but we have children's libraries, and adult content on television can be blocked by parental locking. Overall control is by supervising adults opting out of such services – anyway, if the net is an adult-based communication system, should young people be going on it in the first place?" **LENMONTIETH**

"Another issue is children knowing more than their parents about technical things, even if some of us – and I'm 45 – have realised that learning doesn't stop when you leave school. No-one in this larger debate has broached the subject of sexting, either, which is a far greater problem in my opinion." **ANDREW FERGUSON**

"One option is OpenDNS. I've used it before and it's very versatile; it can be applied to individual computers or entire home networks. I can appreciate it's daunting for parents without much technical knowledge, but instructions are available for using it with BT Home Hubs and other popular routers." **RICHARD BAFFOE**

"People forget the impact of such controls on incorrectly blocked sites. Say I'm a banker and my site is blocked – my clients could lose millions. Who should compensate them; who do I sue if I went out of business? I live in a country where my ISP's software blocked an ex-employer's site; it took days to rectify." **EMAD KHADER**

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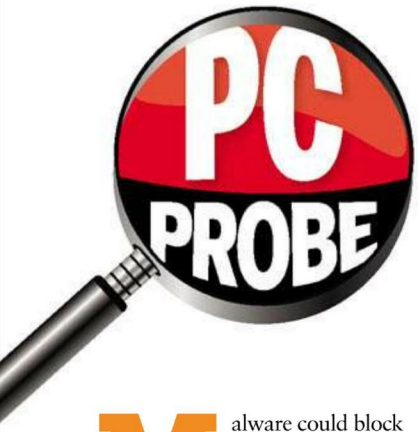
NEWS

IN-DEPTH REPORTS, ANALYSIS AND OPINION

Is it time to quarantine infected PCs?

Nicole Kobie investigates the implications of taking malware-riddled computers offline



Illustrations: BabyCrow, www.babycrow.co.uk

Malware could block your access to the internet – but in some cases by those on the right side of the security fence, who are deploying tactics such as blocked ports, letters in the mail and PCs quarantined from the net to combat the most damaging threats.

Last year, authorities – led by the FBI – arrested the criminals behind the DNSCharger operation, taking over their servers. The malware changed victims' DNS settings, and unplugging the servers would have cut off the four million infected PCs from the web. The FBI won a court order allowing it to keep the servers running long enough to work with ISPs to warn infected customers and clean up machines. The 120-day grace period was extended once, but eventually the plug was pulled in July, with 250,000 machines still infected – 13,000 in the UK alone.

While some described it as an "internet doomsday" (*see p15*), there were few reports of PCs suddenly refusing to find websites. This is partially because ISPs – including Virgin Media – stepped in to handle the DNS re-routing, meaning that some infected PCs are still being propped up.

The case raised questions about how far authorities can – or should – go to tackle the worst malware, and who is responsible if it all goes wrong.

Quarantine

One idea that's been previously mooted is quarantining infected PCs. When malware is detected, that PC would be blocked from openly accessing the internet. Microsoft's vice president of trustworthy computing, Scott Charney, suggested the idea at the RSA security conference in 2010, asking, "Why don't we think about access providers who are doing inspection and quarantine, and cleaning machines prior to access to the internet?" Microsoft has since pulled back, renaming it "internet health" and proposing PCs receive a "health check" before gaining access to networks.

Microsoft isn't the first to consider the idea. A Dutch bank has previously blocked customers with infected PCs from accessing its online services, as it battled a particularly troubling trojan. "That bank made some waves among the population by sending notes and letters to its customers,

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saying we're cutting off your banking," said F-Secure Labs security advisor Sean Sullivan, noting that the European Commission has recently advised banks to assume that all of their customers' PCs are infected with a trojan. "There's a lot of talk suggesting that if you see anything strange in your customer base, block it – block your customers."

ISPs also like the idea of isolating infected PCs, Sullivan said, as PCs spewing spam clog up their networks, with recent research from the Delft University of Technology suggesting that as much as 6% of UK traffic comes from compromised machines. "It's a minority of the overall customer base, but 10% of all machines [globally] exhibiting bot-like behaviour is a huge free resource that can be commoditised for cybercrime," said Sullivan.

"You can't have client-side solutions on such devices, as they're all running different OSes, so they definitely want to invest in building network resources that will isolate machines into these walled repair gardens, and you can do that regardless of the device," said Sullivan. "All these smart devices – you can't have antivirus on your fridge… but you can build network resources; that's where the technology is moving."

"Why don't we think about cleaning machines prior to access to the internet?"

However, there are problems to cutting off customers beyond angering them. "It's tricky," said Kaspersky Lab senior security researcher David Emm. "There's a contract in place between myself and the ISP to provide me with a broadband connection. If it's to sever that, there's a potential problem." He added that ISPs would need to include severance policies in their terms of service, since cleaning up computers without permission from users could be seen as "unauthorised modifications of a computing device" and would therefore be in breach of the Computer Misuse Act.

Whether or not users are cut off, more security work is being done at the network level – which becomes more important as users shift to tablets and smartphones.

Sick notes

There are less severe ways to tackle serious malware outbreaks. Google and Facebook displayed messages to those users they detected as having DNSChanger infections, offering advice on how to tackle the problem; since users are already logged into Google and Facebook, the messages are more likely to be trusted.

Virgin Media takes it a step further, sending letters to customers through the mail. While that may sound old-fashioned, it's clear the message isn't a phishing attack, since it's obvious where it came from – and it's offline. Virgin has sent two tranches of letters, to 1,000 and 1,500 customers each time. While the ISP doesn't keep stats tracking the success of the programme, it believes it's a useful tool for extreme cases of malware. It doesn't look for botnet traffic actively across its own network, instead working with third-party security organisations that alert it to odd patterns and infected machines' IP addresses.

The risk is that such messages will become too common, and will therefore be ignored. "There's always that danger… that people become a bit saturated and blasé about it," said Emm, suggesting the technique should be reserved for the worst malware and remain targeted to only affected users. "It isn't like putting out a circular on a web page… this is targeted, it's more focused, so it isn't dragging in people who aren't impacted."

Blocked ports

Other solutions are more proactive. In F-Secure's home country of Finland, ISPs block specific ports that are rarely used by consumers but frequently targeted by criminals. "It was decided consumer ISP accounts don't need outbound SMTP, as the typical consumer isn't running an email server," said Sullivan. "There's a whole range of ports that malware can take advantage of that consumers typically never use… that the customer would be happy to opt out of and would make their node on the internet pretty useless to malware."

Those who want access must buy a business account or call up the ISP to have it switched on, cutting down the number of open ports, meaning that "infecting a Finnish machine and trying to turn it into a spam bot is impractical," said Sullivan. "It would be the beginning of a solution to cutting off these free resources to the bad guys."

Malware control: what we think

Technical editor Darien Graham-Smith: It's no insult to suggest that the typical user may not realise when their PC is infected with malware. Modern trojans and worms are so good at concealing themselves that even security experts sometimes miss them – a case in point being the recent Flame worm, which circulated for at least two years before its malicious function was discovered. If ISPs can make customers aware of threats that might otherwise fly under the radar, it's hard to argue that they shouldn't.

The idea of suspending infected PCs' internet connections is troubling, however. Yes, it sends an unmissable message to subscribers who might otherwise ignore warnings, and it prevents them from infecting others. But for many people the internet today isn't a luxury but a lifeline, serving as their primary (or only) connection to friends, businesses and even the government. Even brief disconnection, bureaucracy being what it is, is a harsh and disruptive sanction. In five European countries internet access is now recognised as a basic human right, and it's surely only a matter of time before the UK follows. It isn't something to be withheld lightly – and certainly not from those whose only crime is unwittingly clicking on a dodgy link, or naively opening a malicious email attachment.

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TOP STORIES

READERS REACT TO THE MONTH'S TECH NEWS

1 Windows 8 arrives in October for $40 upgrade

Windows 8 will go on sale on 26 October, with upgrades from any version of Windows since XP costing $40, although UK prices have yet to be revealed. Anyone upgrading will be offered Windows Media Center free, and Windows 7 users will be able to carry all settings, apps and files to the new OS, although the transfer will be more complicated for Vista and XP converts.

The company also explained to *PC Pro* its unpopular decision to remove the Start menu, saying its own data showed people had stopped using it in favour of pinning applications to the taskbar.

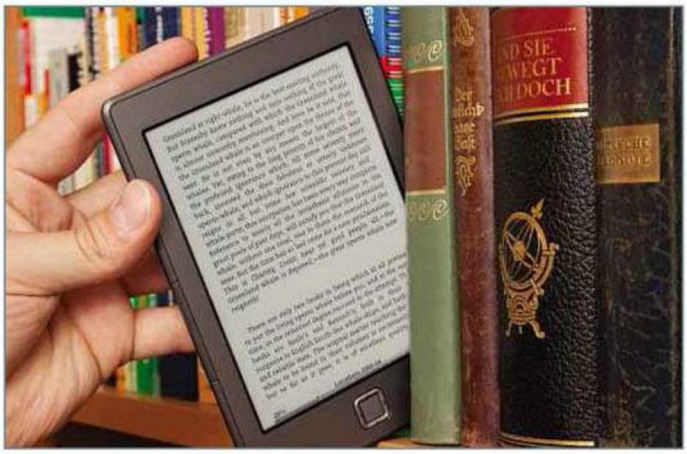
Details of the guts of Windows 8 continued to emerge, including File History, a new backup system. This safety net will provide Time Machine-like copies of multiple versions of documents, saved to external storage for safe-keeping, with backups on mobile devices cached locally if they're disconnected from external storage.

What we said: "The $40 upgrade is an aggressive move on Microsoft's part, not least because it includes every OS back to Windows XP – which basically means anyone who's ever owned a PC," said editor Barry Collins. "I'm still not sure it's aggressive enough, though. A free upgrade would have made it a no-brainer and given Microsoft maximum opportunity to earn commission from app sales. Given that only a slim fraction of its OS licence revenue comes from consumer upgrade sales, would it really have hurt Microsoft to go for broke?"

What you said: Readers mostly liked the price, with ElDiabloJuanCarlos typical in saying: "Only $40 to get off Windows Vista! Suddenly, I'm very interested in a Windows upgrade." Cheysuli, however, wasn't convinced. "It will cost Microsoft more than that... it will need to pay me more than $40 to put up with Metro," he said.

The Start menu explanation was more contentious. "I've always used the Start menu and only pin essential apps on the taskbar," said scottbob9. Mrmiley agreed, saying: "Codswallop. As per usual with Windows 8, Microsoft seems to be ignoring power and professional users. Do I really want to pin the 100+ applications I have installed?"

2 Court gives software resellers the green light



Companies and consumers were given the go-ahead to sell downloaded software when they've finished with it or upgraded to new versions, after a ruling against Oracle in the European courts.

Users of downloaded products could put licences up for sale on web exchanges, the court ruled, provided they stopped using their own copies of the software, dealing a blow to traditional perpetual software licences. Lawyers told *PC Pro* the ruling meant used software was now as much of a commodity as second-hand books, but warned that software companies may counter the ruling with new ways of selling apps, such as software-as-a-service models or drip-feed rolling upgrades.

Although the initial ruling applied to software downloads, a lawyer told us it could be logically extended to take in other digital downloads, including ebooks, music and video.

What we said: "Although a victory for consumers, who may be able to buy cheaper apps and recoup some of their investment by selling on, it's likely that big software vendors and particularly content publishers will change their licences in order to close this option," said contributing editor Stewart Mitchell. "Being able to resell copies of ebooks, for example, would drive a truck through the business model of Amazon, increasing the likelihood of further DRM restrictions."

What you said: Readers welcomed the news, but said the courts should go further to protect consumers against overbearing licences. "It should be made illegal for EULAs to contain clauses that strip consumers of their rights," Anteaus said. "If the clause isn't related to copying or public performance, then it's nothing to do with copyright – in which case it has no place in a EULA."

Martindaler said it made sense for software companies to pass on value to users. "Car manufacturers minimise the depreciation of their products. Why would software manufacturers want their products to do the opposite and depreciate to zero on day one? Surely a manufacturer can charge more for a product that's known to retain its value?"

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3 Microsoft faces EU fine over absent browser ballot

Microsoft is back in hot water with European regulators, accused of violating its agreement to present users with options for browsers other than its own Internet Explorer.

Officials threatened the company with "serious sanctions" after it failed to include the browser ballot in Windows 7 Service Pack 1. The ballot dates back to a 2009 ruling that said Microsoft should give users the choice of alternative browsers on new installations of Windows.

Although IE was the lead browser software at the time of the initial ruling, the situation has since changed, with Google recently claiming Chrome had overtaken Microsoft, with 310 million users. The claim echoed figures from web analytics firm StatCounter, which said that Chrome overtook IE as the most popular browser in May.

What we said: "What an error: forgetting to include the browser ballot in the update could, in theory, cost Microsoft a $7 billion fine," said news editor Nicole Kobie. "That neither Microsoft nor the EU noticed it wasn't being displayed for more than a year highlights how impotent the browser ballot has been. Always a silly idea, the ballot looks even more pointless with Chrome in mind. With 310 million users, it's impossible to ignore the market is more divided now. Whether or not the move will truly help competition is a different issue, since giving Google more sway on the web does little more than solidify its existing dominance."

What you said: Most readers were against the ballot update. "I got this mandatory EU virus on my Windows 7 PC, despite the fact that I had several browsers installed," said fogtax. "The browser ballot software uninstalled IE, making it impossible for me to get to my IE bookmarks. I'd like to uninstall [EC regulator] Neelie Kroes."

However, Manuel said: "Only strong action and harsh penalties will ensure the likes of Microsoft and Google treat users with respect." Mpetrie raised the inevitable Apple comparison. "Why doesn't the iPad have a browser ballot?" he asked. "I'd like to use IE9 on mine."

TECH ATE MY HAMSTER

The mainstream media wrongly hit the panic button over DNSChanger – not helped by disagreement from security experts, finds Nicole Kobie

Predictions of internet doomsday may sound a little last decade, but a combination of fervent security firms and tabloid reporting elevated the DNSChanger switch-off to millennium bug proportions – including the post-event disappointment that catastrophe was avoided.

On 9 July, the FBI switched off a set of servers that were re-routing PCs infected by the DNSChanger malware, potentially knocking as many as 250,000 machines offline. While that's significant, it's hardly carnage – there are more than two billion internet users globally and many more connected devices, plus it's a significant drop from the original four million infected PCs. Even with 13,000 in the UK potentially facing DNS resolution issues, it was an overwhelmingly successful operation.

You wouldn't know that by many of the mainstream press headlines. By far the most hysterical came via the *Daily Mail*: "Malware internet meltdown a bust as feared DNS Changer virus fizzles on 'doomsday'". It's hard to tell if the newspaper is more terrified or disappointed – but thankfully, it calms down enough in its coverage to at least provide sensible tips on how to avoid trouble.

That wasn't helped by contradictory messages from security firms quoted in the same story, with some calmly explaining the potential threats and offering good advice to less tech-savvy users, while others over-egged the problem.

But some credit to the *Mail* for at least offering tips to solve the problem. The *Daily Express* managed to describe it as "D-Day", adding the "total cost could be significant" – but didn't bother to mention the solution, or note that it was in fact simple, easy and free.

Instead of suggesting the malware "fizzled", this was an excellent chance to highlight the success that can be achieved when industry and authorities work together on a threat – because avoiding internet doomsday, no matter how over-egged it is, is always good news.

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EU probe delays new fibre

EU investigating government broadband funding over BT dominance

Concerns that the bidding process for government broadband funding isn't competitive enough have been highlighted by an EU investigation that could delay upgrades.

Broadband Delivery UK (BDUK) is in charge of doling out £530 million in government funds to boost coverage and speeds, but only two bidders remain for more than 30 projects. Of those two, Fujitsu has dropped out of several regions, leaving BT the only firm in the race.

That has drawn the attention of European Commission (EC) regulators, who are concerned that in many areas BT is the only company bidding to win contracts, meaning state aid could be seen as a subsidy. When government money is spent on a commercial project, it needs clearance from Brussels.

North Yorkshire is the first region to be given the green light to start rolling out its network, handing its slice of the funds to BT, but other areas will have to wait for funding while the EC looks into the issue. BDUK says it hopes the probe won't delay projects and that the "majority of councils will meet the timetable to complete procurement by the end of the year" – but whether this is possible remains to be seen.

"I really feel for the guys that are stuck in this state aid approval situation because they're beached and can't do anything," said John Moore, corporate director for finance and central services at North Yorkshire County Council. "Now they're just waiting. They're at the same stage as us, ready to start work, but no-one can do that until the state aid is cleared."

Dark fibre

To boost competition in UK broadband, the EU is calling for large telcos to open up their dark fibre – offering unmanaged access to their networks, rather than managed wholesale services. The EU wants a completely "non-discriminatory" approach to fibre network access, but BT doesn't offer competitors access to dark fibre, which could prove a stumbling block to an early resolution of the state aid regulation.

BT already offers wholesale access to its fibre networks and duct and pole infrastructure, but this may not be enough to appease regulators.

Q&A

How Big Brother works

Julian Richards, of the University of Buckingham's security school, explains how the government will collect and store personal data

The government has unveiled its Data Communications Bill, designed to modernise the security forces' ability to track digital communications. Although it claims that it won't lead to a centralised database of emails and web visits, testimony given to parliament has revealed the system will be searchable, giving police a single source of data. We spoke to Julian Richards, co-director at the University of Buckingham's Centre for Security and Intelligence Studies, after he gave evidence to parliament, to find out how the system could work.

Q The government says this isn't a central database. Is that true?

A My understanding is that data will be harvested and dispersed, a bit like in a cloud computing setup, but the front-end filter that analysts would use allows a federated retrieval of data across the system. To the analysts, it feels like a big database; in practical terms it's a lot more dispersed.

Q So it won't appease fears over "fishing trips" for data?

A No. It wouldn't make any difference with the architecture of the system. More important is how search queries are authorised. The fear that the civil liberties folk have is that you could query searches using broad and complex data, so you could gather quite a lot of detailed information on someone's activities on the web, because you could pull several different types of data into one place.

Q Isn't much of this personal data collected already?

A Communications companies have to keep telephony data, but currently lots of internet traffic isn't stored and therefore isn't available. Use of social networking, for example, isn't available, and people feel that this is more intrusive because people's activity on the internet tells you more about them than just their telephone logs.

> "People's social networking activity tells you more about them than their telephone logs"

Q Is that where the black box traffic filtering comes in?

A That's right. The technical method for gathering that off the network is where this would come in; at the moment it just flows over the network but isn't stored, since there's no business reason to keep it. They don't bill people on the basis of how much time they spend on those services.

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ARM servers put pressure on Intel

Power and cost benefits could help smaller chip rival into new markets

ARM server chips could displace Intel in some markets, with new hardware released for data centres and cloud computing.

The warning to Intel came as Boston, a UK manufacturer, rolled out what it claimed to be the first ARM server to ship globally. Although Dell and HP have announced ARM projects, HP's low-power server options now focus on Intel, while Dell's Copper servers aren't widely available.

"Intel is feeling the heat coming from the ARM-based processors in the server side – it's got low-energy Atom processors for low-energy servers, but there's a lot of interest in ARM," said Nathaniel Martinez, program director for European Systems and Infrastructure Solutions at research company IDC. "It's still early days and there are only a handful of people doing it, but they're in things such as cloud and data centres, and they're growth areas, so that could lead to significant numbers of servers being shipped. ARM could displace Intel."

Intel answer

Intel targets low-power servers with the Atom-based Centerton. Announced in April 2012, one analyst told *PC Pro*: "While it looks good on PowerPoint, there's nothing ready for market yet."

For web-centric operations, there's a perception that x86 servers offer less value, with specifications that are higher than that required for the modern data centre, noted Neil Kalsi, sales manager at Boston. "When there's a new Intel out, I get one, but I'm realising that there isn't always a big performance gain, and a lot of what we do isn't CPU dependent," he added.

Power savings

Citing power consumption of 5W compared to 70W-80W in some entry-level x86 server chips, Kalsi noted that the cost of running ARM servers would appeal for applications where "there isn't always a need for a V8 engine. A lot of people see power as their main issue," he said. "It makes a big difference to cost of ownership."

The migration of Windows to ARM could also help."If Microsoft has already started to make that investment in terms of coding for a non-Intel chip, it would make sense for it to extend that into servers," he said.

Boston's Viridis server uses ARM chips for energy efficiency

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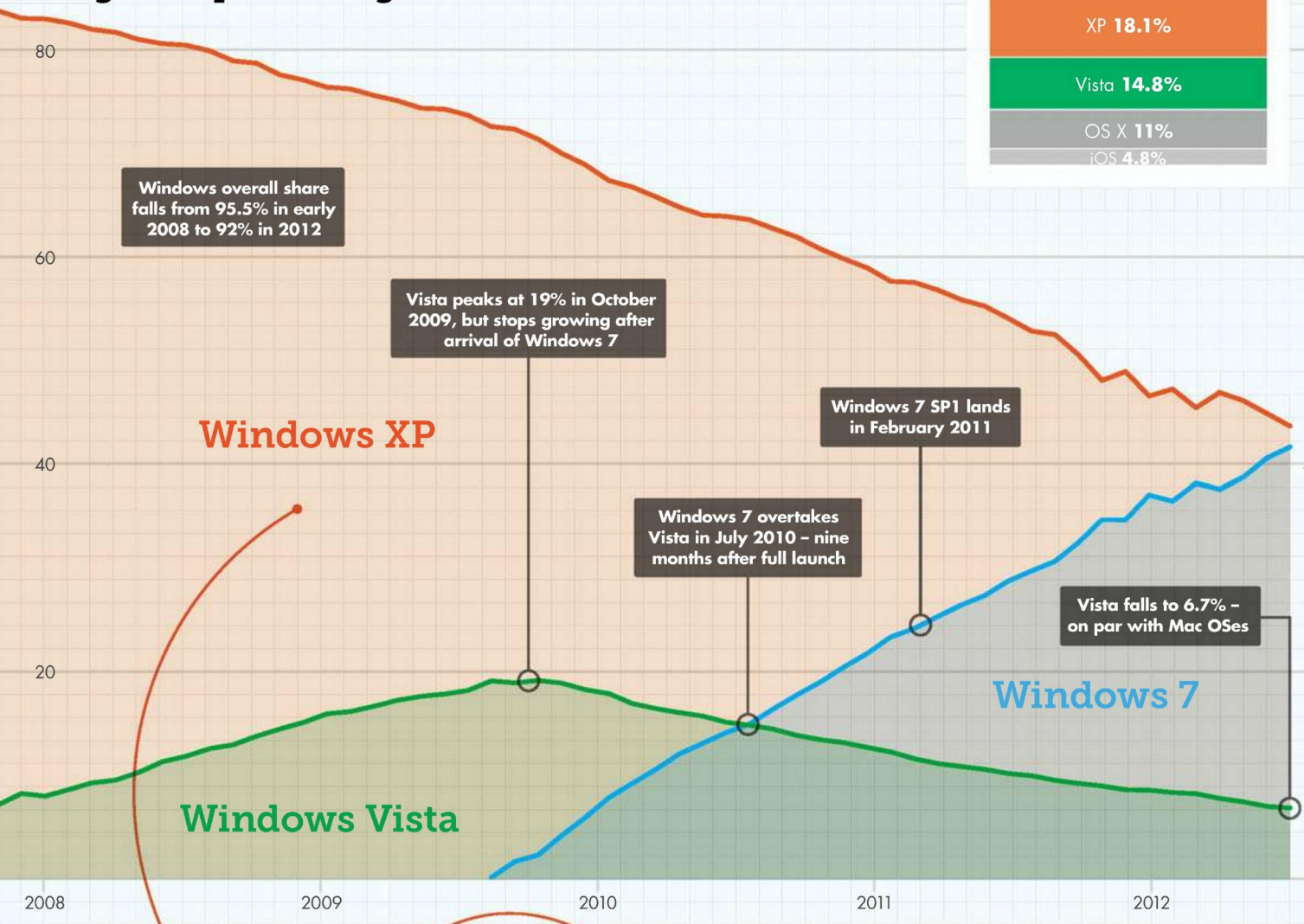
XP: still the popular choice

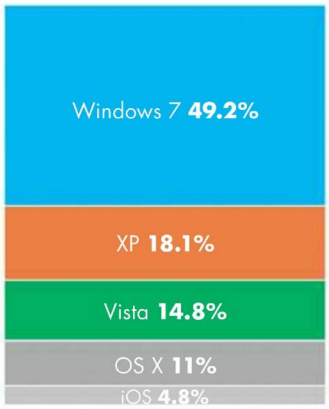
Windows 7 has sold 675 million licences worldwide, but is only now yanking the top spot from XP. Will Windows 8 dent XP's market share, or will it have as little impact as Vista?

Why is the 11-year-old OS so popular? It continues to be the default choice for developing markets such as China and India, but XP holds almost 20% of the UK market, too.

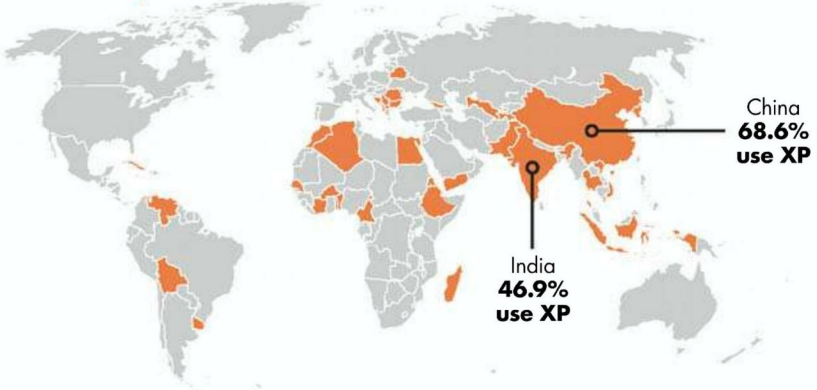
Windows version market share (global percentage)



Top five OSes in the UK



XP leads in **42** out of **233** countries



Global Windows version data via Net Applications Market Share
Map data via StatCounter for April to June 2012

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Can tech ever be eco-friendly, or is it just greenwashing, wonders NICOLE KOBIE

We buy a lot of gadgets, and increasingly they're glued-together tablets and locked-down ultra-thin laptops – bad news given that the greenest tech is the hardware that can be cracked open, stripped down and fitted with new components.

Looking at the sales figures, this isn't foremost in most consumers' minds when buying a new laptop. Who thinks about how green a gadget is when there are specifications, price and how incredibly sexy it looks to focus on? And for those who do have the future of the planet weighing heavily on their mind, there's always a handful of green logos and obscure certification details to assuage their guilt. But do they mean anything – and do customers even care if it's all only greenwash?

The perfect case in point is Apple's MacBook Pro with Retina display. It's a lovely laptop, and while it made our A-List, it fell off another list. Without explanation, Apple yanked its products from EPEAT – the Electronic Product Environmental Assessment Tool, a US registry of green-certified technology, used for government procurement. While Apple's products previously received top marks, EPEAT's CEO, the wonderfully named Robert Frisbee, suggested the MacBook Pro wouldn't have been certified, and that Apple's "design direction" didn't fit its standards – a damning statement about a firm that likes to chirp about its environmental ideals.

> Who thinks about how green a gadget is when there's specifications, price and how incredibly sexy it looks to focus on?

Apple, as usual, went quiet on the issue – but its fans and detractors didn't. The co-founder of repair forum iFixit, Kyle Wiens, claimed the new MacBook Pro is too difficult to recycle, saying his own team was washing "hazardous goo" off their hands after attempting to remove the laptop's battery. Others pointed out that Apple's products aren't meant to be fiddled with – you don't buy a MacBook Pro, the reasoning goes, and attack it with a screwdriver.

Days later, Apple did something unheard of: it publicly changed its mind. "We've recently heard from many loyal Apple customers who were disappointed to learn that we had removed our products from the EPEAT rating system," wrote Bob Mansfield, senior vice president of hardware engineering, in an open letter. "I recognise that this was a mistake."

So, it would seem customers do care! Complaining does work! All it took was a few days of pressure for Apple to back down and go green. Except… this isn't what happened. Nothing has changed with the new MacBook Pro. Apple hasn't altered the battery design or made any other improvements; if you weren't happy with its green credentials before, then there's no new reason to make you alter that opinion now.

That might come as a surprise, as since Apple rejoined EPEAT, its new MacBook Pro landed Gold certification. However, it turns out the registry is self-certified – the laptop scores top marks because Apple says it does.

EPEAT tests such claims with spot-checks – it's placed the MacBook Pro on its "priority" list for one – and says it publicly names and shames firms that fail verification, but it takes some digging to find the data; it's buried in thickly worded reports and jargon-filled charts. In the last round of tests, 52 products from thousands around the world were tested, and 17 were found to not match the companies' claims. If that small sample was representative, just under a third of the products with EPEAT certification aren't as green as they make out.

EPEAT says it doesn't pre-certify because components and sourcing can change in a product's lifetime, meaning "a one-time investigation before a product is released is fundamentally inadequate". Testing after release is hardly an adequate alternative – thousands of laptops may already be in use in a government agency by the time EPEAT has discovered it doesn't meet the criteria.

EPEAT certification is little better than taking a company on its own word; a standard is supposed to take trust out of the equation, handing it to an independent third party.

Explaining EPEAT's own apparent U-turn – allowing the MacBook Pro to take the top ranking despite telling *The Wall Street Journal* that the structure of that laptop made it ineligible for certification – Frisbee said standards must evolve with innovation. That's true: they should get tougher, not weaker. As PC makers push thinner laptops and tablets, they should be forced to innovate in green design, too.

News editor NICOLE KOBIE wished complaining did work, as it's one of her natural talents.

Blog: www.pcpro.co.uk/links/nicolek
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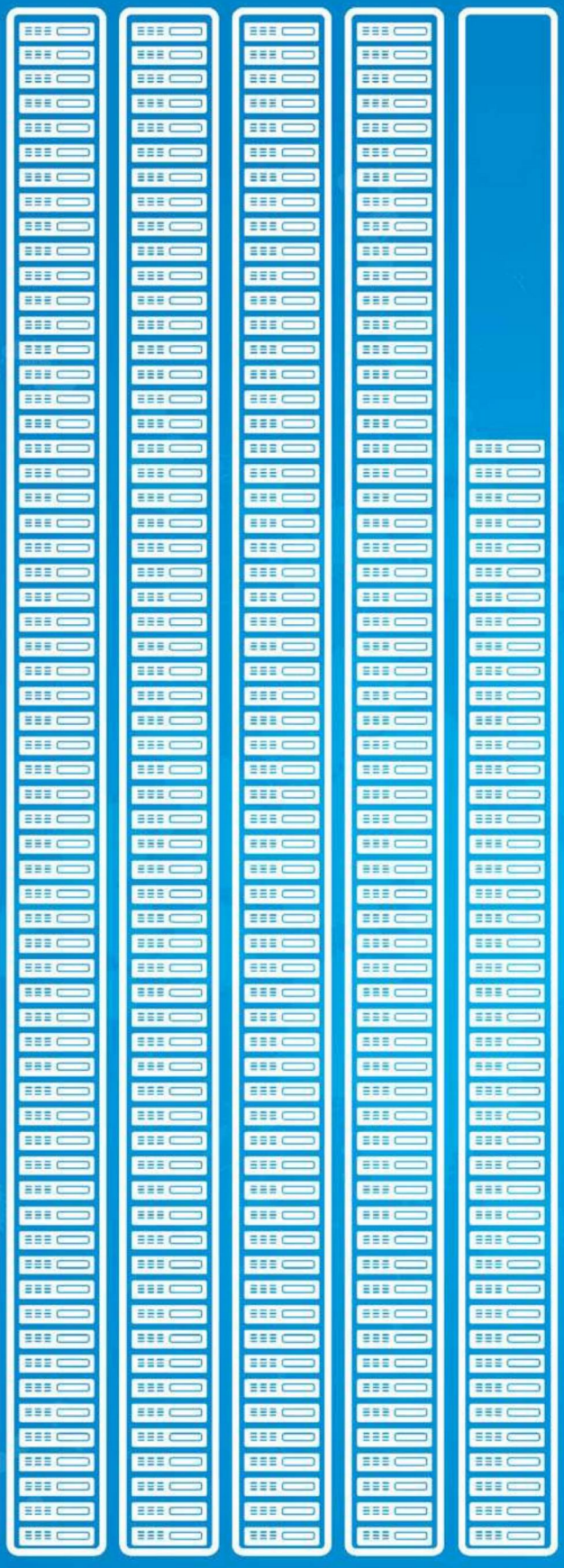

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Office 2013 REVEALED

Not content with unleashing a new operating system on the world, Microsoft has unveiled a new version of Office too. It has a fresh look, dozens of new features and makes a huge shift towards cloud computing. Jonathan Bray, Barry Collins and Tim Danton reveal all you need to know about Office 2013

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Download the Office 2013 Preview for free
www.pcpro.co.uk/links/216Office2013

The consumer beta of Office 2013 arrives in the form of Office 365 Home Premium, which can be installed on up to five PCs

Office 2013: in the cloud

Microsoft CEO Steve Ballmer insists that Office 2013 is the company's first product to be "designed from the get-go to be software as a service", and there's plenty of evidence to support this. From cloud-based subscriptions for consumers, to Office applications "streamed" over the internet, to the full integration of SkyDrive and Skype, Office can no longer be accurately referred to as a desktop suite.

Office 365 for consumers

Business users of Office may already be familiar with Office 365: the online subscription suite that gives you access to both the desktop and web versions of the Office applications for a set monthly fee. That model is now being extended to consumers. In fact, if you sign up for the beta of Office 2013, you'll be enrolled into a (currently free) subscription service called the Office 365 Home Premium Preview.

Office 365 Home Premium Preview allows you to install Word, PowerPoint, Excel, Outlook, OneNote, Access and Publisher on up to five PCs – and you don't even need to wait for the software to finish downloading and installing on your first PC to get going with the new applications. This is down to a new feature called Office on Demand, which is available on both consumer and business subscriptions. It uses virtualisation to provide "streaming" versions of the full Office apps – not the feature-restricted Office Web Apps we've seen before – from the moment you click on the installer. So, you can start tapping out your first Word 2013 document within a minute or two of starting the download, even if the installation doesn't complete for another half an hour or more.

The Office on Demand versions of the apps aren't quite as responsive as a local installation, and we'd be wary of doing any heavy-duty work on them, such as embedding videos in PowerPoint slides or serious number crunching in Excel. Nevertheless, getting access to full-fat Office apps over even a modest broadband connection is impressive, and it isn't only handy during installation.

If you're working away from home without your regular PC or laptop, Office on Demand can be accessed from any Windows 7 or 8 PC, via **https://officepreview.microsoft.com**. Click Create New, select your Office application of choice, and a streaming version of the app is "installed" onto your temporary PC home. It takes a minute or so to download the necessary files, but once this is complete, you get a full version of the app and access to any documents in your SkyDrive folders. We even managed to install an Office on Demand version of Word 2013 on an Atom-powered Windows 7 Starter netbook, and it was perfectly capable of lightweight document editing. Once you've finished your work, there's no trace of the application or your documents on the host machine.

Office Web Apps

Alongside the new Office on Demand service, there are revamped versions of the browser-based Office Web Apps that were launched with Office 2010. These have been redesigned with the spartan, white ribbon interface that's common across all the Office 2013 apps, but appear to be functionally identical to their predecessors. In other words, feature-stripped equivalents of Word, Excel, PowerPoint and OneNote

Office on Demand allows you to run Office 2013 apps without a full installation

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that are usable only for viewing documents and light editing.

We'd much prefer to work in the Office on Demand apps than the Web Apps, but the Web Apps could remain a fallback option for those who want to make a small change to a document, or who can't run Office on Demand because they're using a Windows Vista PC or older. They'll also remain the only cloud-based version of Office apps open to those who buy Office 2013 as a straight software purchase, rather than a subscription.

Skype

When Microsoft paid $8.5 billion for VoIP firm Skype last year, many wondered what on earth could begin to justify that valuation. Integrating Skype into Office 2013 is one of the ways Microsoft will try to claw back some of that enormous investment.

Skype will be blended into Office 2013, although the work hasn't yet been completed for the Customer Preview. Users will see their Skype contacts integrated into Outlook, for example, and be able to place audio and video calls directly from the application. To encourage people to use Skype from within Outlook, Office 365 Home Premium will include 60 minutes of free international calls per month.

SkyDrive

Further evidence of Office 2013's cloud focus comes in the form of SkyDrive, Microsoft's online file synchronisation service. SkyDrive is now the default save location for all the Office 2013 apps, meaning that all your data is saved to Microsoft's cloud service unless you specify otherwise.

A SkyDrive account is created automatically for anyone with a Microsoft account login – which you'll need to download the Office 2013 preview in the first place – and long-term users will have up to 25GB of free storage, which is more generous than the free quotas available from rivals such as Dropbox, Google Drive and Apple iCloud.

SkyDrive – shown here in Windows 8 app form – is now the default save location for Office

Saving all of your documents to SkyDrive has the advantage of creating a seamless backup, not only on Microsoft's cloud but also on any other PC or Mac with SkyDrive installed. It also means that all your files will be available for any Office on Demand sessions when you're away from your regular PC.

For those who don't want their documents beamed up to Microsoft's cloud, there's an option to make the current computer the default save location by clicking File | Options | Save, and checking the relevant box.

How much will all this cost?

The big question for consumers is how much it will cost to buy Office as a cloud subscription service. The answer is, at the time of going to press, we simply don't know. Microsoft steadfastly refused to discuss pricing for any of its Office 2013/Office 365 packages at the unveiling of the suite in San Francisco, and probably won't confirm details until much closer to launch, which we expect to arrive either alongside Windows 8 at the end of October, or shortly afterwards. Microsoft is, again, staying tight-lipped on official timing, but with a version of the Office apps set to be bundled with Windows RT, the core apps must be ready by that date.

We can take a few pointers from Microsoft's current Office 365 prices. The closest equivalent to what's being offered in the Office 365 Home Premium Preview is Microsoft's E3 plan for small businesses, which offers up to five installations of Office Professional Plus 2010, email hosting and voicemail support for $20 per user, per month. Small Business versions start from only $6 per month, but they only include access to the Office Web Apps – not the desktop client software, which must be bought separately.

If we were to take an educated guess, we'd expect Office 365 Home Premium to be priced around $10 (£6.50) per month. Given that a current boxed version of Office Home and Student 2010 – which doesn't include Outlook, Access or Publisher, and can be installed on only three PCs – costs around £85, it's going to give consumers a dilemma. Will the extra software, Office on Demand and rolling upgrades be compelling enough to tempt people to pay the same amount for an annual subscription as they would for a one-off software purchase with no cut-off date? We'll reserve judgement until the pricing is confirmed, but we think Microsoft will have to settle on even less than $10 per month if it wants the majority of home users to switch to the subscription model. Standalone, non-subscription versions of Office 2013 will also be available.

There will be a variety of new Office 365 subscription options for small businesses and enterprises too. Office 365 ProPlus includes Word, PowerPoint, Excel, Outlook, OneNote, Access, Publisher, InfoPath and Lync – and again, can be installed on up to five different PCs and Macs. Small Business Premium is aimed at businesses with up to ten employees, each of whom get a version of ProPlus Preview, which can also be installed on up to five devices. Small Business also includes email, shared documents, and HD videoconferencing hosted by Microsoft.

We'll have a feature on Office 2013 for businesses in a forthcoming issue.

Skype will be integrated into Outlook 2013

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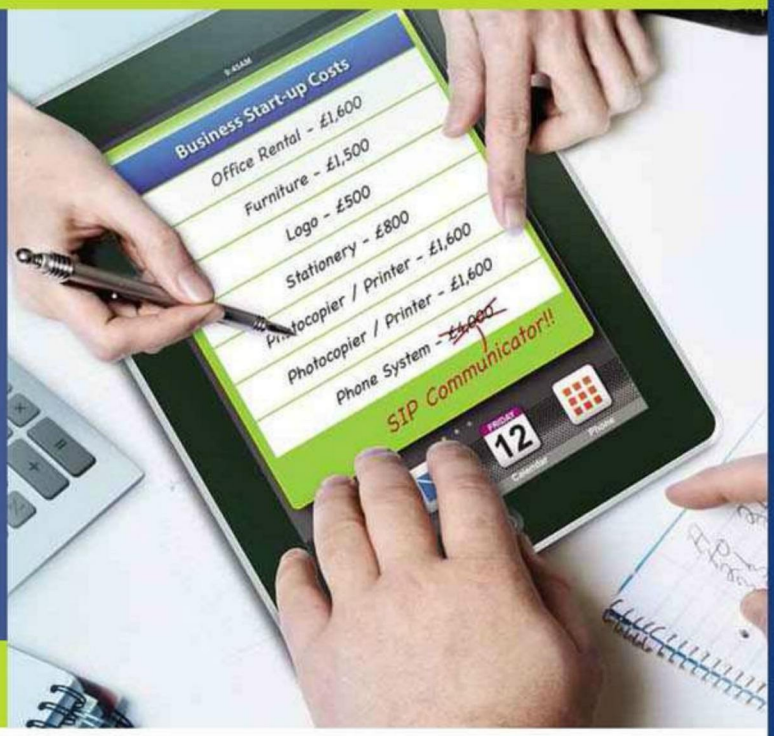

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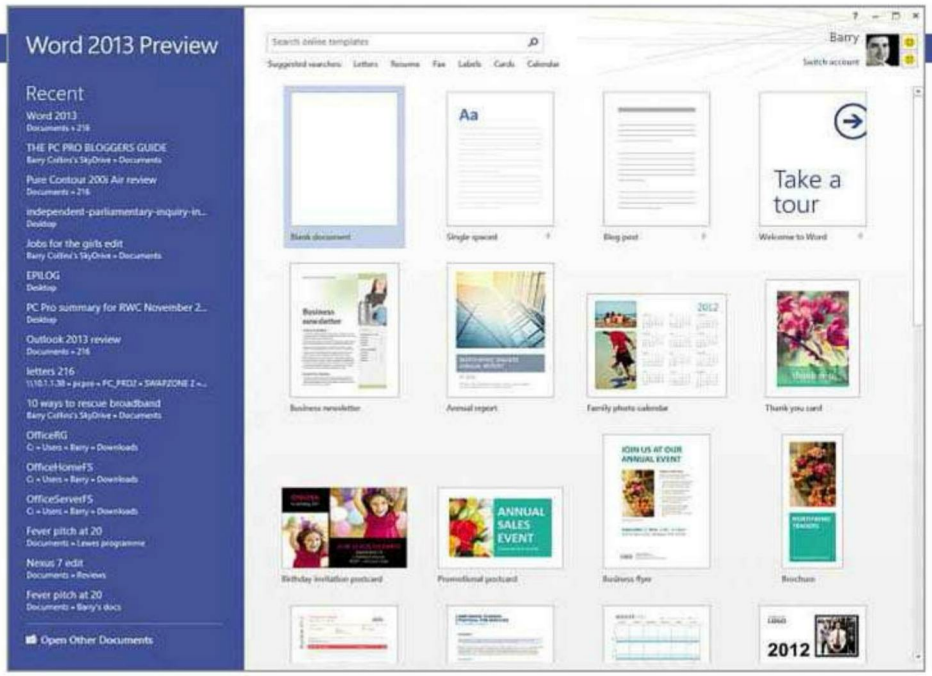


The new Start screen presents recent documents and commonly used templates

Word 2013

Microsoft is making big accommodations for tablet users in Office 2013, and Word is one of the apps that's best optimised for touchscreens.

A new Read Mode, touch-friendly wizards and a ribbon menu that fades out of view when it isn't needed are all signs that Word 2013 is aimed at the Windows 8 crowd. That said, there are notable additions for users of Windows 7 PCs and laptops too.

Read Mode

Read Mode is obviously targeted at tablet owners. The default view when you first open a saved document, it reflows the text into columns appropriate for the width of the screen. So on 16:9 tablets held in landscape mode, you'll get two columns per screen, with all of the editing tools tucked away. You can flick to the next page with a swipe of a finger, or pinch and zoom to alter the size of the text.

For those who frequently plough through reports, Read Mode automatically bookmarks your last position in a document, so that if you come back to the document – or even open it on another PC – you can pick up where you left off.

Read Mode also includes a feature called Object Zoom, which theoretically allows you to hone in on tables, charts or photos embedded in documents at the tap of a finger or mouse click. In tests we found it erratic, especially for tables, where Word seems unsure whether you want to zoom in or edit the table when you click. Hopefully, Microsoft can smooth out the kinks before the full release.

Read Mode is also the default for laptop and desktop users, and here its benefits are less obvious. In fact, we suspect most people will switch it off and opt for normal editing mode.

New template

If you're creating a document from scratch, you'll notice another big change to Word right away: the new Start page. Instead of opening into a blank document (or whatever was saved in your NORMAL.DOT template), Word now presents a list of recently opened documents in the left-hand pane, and a series of predefined templates on the right.

If you can't find anything suitable from the predefined list, you can search Microsoft's online library – it contains thousands of different templates, many of them perfectly presentable. It's also worth noting that one of the default templates is a "single-spaced" blank document, suggesting Microsoft's decision to insert an extra line of space between every paragraph by default since Office 2007 hasn't met with universal approval.

Another new feature you'll notice from the off is the smooth-scrolling cursor. Now, instead of jumping from character to character as you type, the cursor glides smoothly across the page. This seemingly innocuous change has divided the *PC Pro* office: some admire the attention to detail; others regard it as a needless distraction. Either way, there's no option to switch it off.

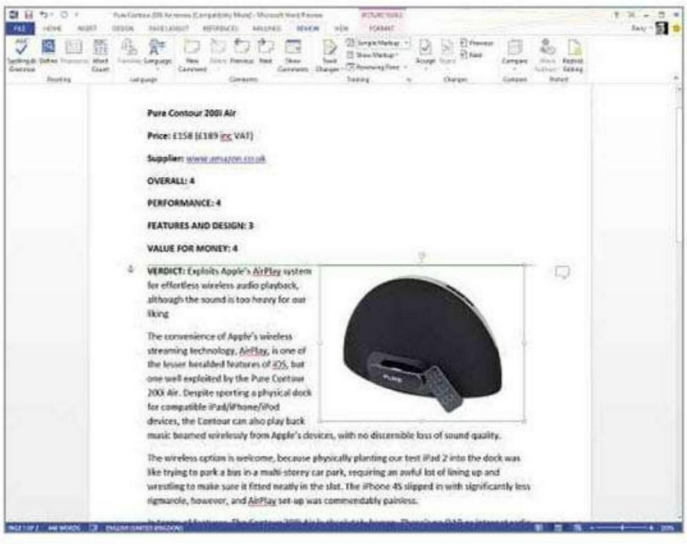
Advanced document layout

Many of the new tools in Word 2013 are aimed at people who plug more than words into their documents. In fact, Word 2013 is drifting more towards a desktop publishing suite than a traditional word processor.

Live Layout sees text reflow automatically when you drag photos and videos around documents. Green guidelines appear as you drag photos, allowing you to line them up with the top of paragraphs or textboxes, helping to keep documents looking tidy and professional.

In the Insert menu, you'll now find two new options to embed online photos and videos into your documents. Images provides the option to search Microsoft's online Clip Art collection, Bing Images, and your SkyDrive and Flickr accounts for relevant photos. The returned Bing search results include (by default) only images released under Creative Commons; although the pop-up menu urges you to review the licence for each photo before pasting it into your documents, it provides no easy way of doing so.

The Insert Online Video pop-up allows you to search Bing or YouTube for videos, and preview clips before dropping them into



Guidelines allow you to line up photos with the top of textboxes, to make documents look more professional

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Word documents can be marked up with handwritten annotations on a tablet

documents. There's also the option to simply insert the embed code provided by sites such as YouTube. Although Word allows you to dynamically resize the video window, clicking the Play button creates a full-width pop-up on top of your document, which slightly defeats the object. Readers of your document will also need to be connected to the net to play back clips.

It's worth noting that we experienced layout glitches when attempting to insert both online photos and videos, but hopefully these will be dealt with before the final release.

Editing and reviewing PDFs

One of the more interesting features – especially for businesses – is the ability to read, mark up and even edit PDFs in Word 2013. Naturally, editing comes with caveats: Word can edit only in the fonts available on your PC, and PDFs with complex layouts are often reformatted badly when opened in Word for editing. However, for a quick way to revise rudimentary PDFs, it's a welcome addition.

For tablet and stylus users, there's also now the options to Start Inking, and jot handwritten notes and annotations over Word documents, in much the same way as you can in OneNote.

Another feature borrowed from the world of PDFs is the new Comments system. It's always been possible to add review comments to Word documents, but now co-workers can reply to comments inline, making it easier to collaborate on documents. Better still, comments can be marked as "done", so if you're responsible for taking in everyone's changes, you can tick them off as you go.

To complement these revamped collaboration features there's a new Simple Markup view for Tracked Changes, which indicates where edits and comments have been made without harming readability. Edits are marked with a red line in the left-hand margin, which you can click to see that specific change in full markup mode. Comments are denoted by a small speech bubble, which displays the comment when clicked.

Such collaboration works best when you're sharing the document on SharePoint or SkyDrive, where more than one person can access and mark up the document at one time. To prevent colleagues inadvertently switching off Tracked Changes, you can now force them to enter a password before they're allowed to edit the document. We did, however, experience issues with reviewing comments and edits in a document hosted in a public SkyDrive folder.

It's also now possible to give an online presentation of your documents. This feature creates a link to send to clients or colleagues – who don't need to have Word installed – and enables you to talk them through a document over the phone, with the page scrolling on their screen as you move the scrollbar up and down. And you thought Death by PowerPoint was bad…

Verdict

Microsoft has clearly put a lot of effort into Word 2013 – and most of the changes are for the better.

Perhaps the biggest problem to overcome is the split between touch control and using Word with a keyboard and mouse. In some cases, the hybrid approach works well: highlight a section and tap it with a finger, and the context menu that appears is horizontal, squeezing neatly between the onscreen keyboard and the top of the screen; right-click the selection with a mouse, and the context menu displays vertically.

In other cases, it can be irritating. Tap the screen while you're typing with a keyboard and up pops the onscreen keyboard, only to disappear once you start typing again. The ribbon icons are also too small to jab with a finger. If you're doing anything more than reading documents on a tablet, you'll still need a keyboard – or a Microsoft Surface tablet.

WALKTHROUGH

Handling comments

1 You've been sent a document for review and you want to add a comment. Highlight the passage of text you wish to comment on and click Insert | New Comment from the ribbon menu. Type your comment into the box that appears next to your photo. Comments from colleagues will appear in the same thread.

2 If you're using a tablet with a stylus, you can make your comments using handwritten notes. Click Review and select Ink Comment; a box with a lined-paper background appears where you can jot your note. Warning: this proved a little temperamental in our tests.

3 If you're taking in other people's comments on a document, you can now tick off comments as you go to show you've made the suggested edit. Simply right-click on the Comment box and select Mark Comment Done.

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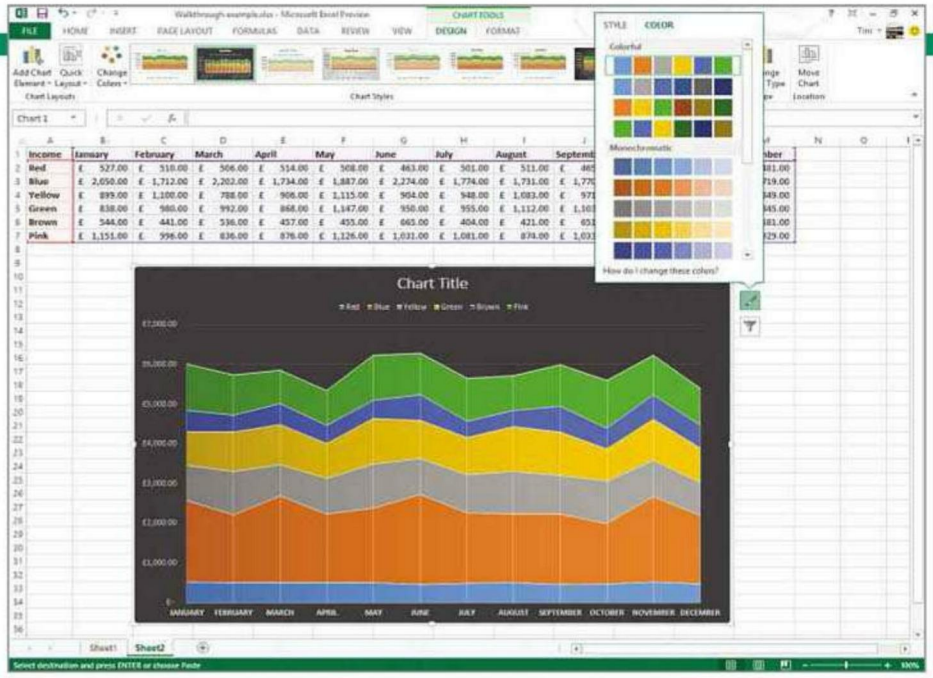


Recommended Charts makes it harder to pick the wrong chart for your data

Excel 2013

It isn't often that you start using a new piece of software and chortle in delight, but that's exactly what happened when we first launched Excel 2013. The reason: lists.

Let's say you run a query on a database that returns the usual mishmash of poorly formatted data. Imagine hundreds of rows, consisting of three columns filled with obscurely worded job functions, email addresses and phone numbers. To make sense of the data in Excel 2013, you type in the first row's values and then start to repeat the job for the second row. Excel then instantly applies the lessons learnt to the rest of the data, with all the columns below filling with the correctly formatted data. It's the sort of problem 100-line macros have been written to solve in the past.

Chart clever

Chart handling is the real star of Excel 2013. Excel 2010 and 2007 both made it much easier to create professional-looking charts than previous versions of Excel (and any of its rivals), but you had to wade through a wizard-style interface to find the style you wanted. It's easy to see how many people would plump for the familiar ones, without giving much thought to what presentation best suited their data.

Excel 2013 is far cleverer. Its main weapon is the Recommended Charts feature (*see Inserting and amending charts, right*). If you have a simple set of figures – say, two rows of six columns – then it will suggest basic charts such as a line bar or a clustered column.

Now imagine you're dealing with more complicated information. Eight rows of data, the bottom of which is automatically summed from the seven above it. This time, Excel will suggest a chart that presents the total figure as a line and plots the figures that make up that total as bar charts beneath it. If you don't like that choice, there are others to pick from.

Let's make amends

Forgive us our obsession with charts, but we're also big fans of how easy it is to make amends once a chart is in place. In our example of the six columns of data, the final one was the sum of all the previous, and this was skewing the relative sizes. Click anywhere on the chart and you'll see three new icons appear to its right; for now, it's the bottom one we're interested in.

Called Chart Filters, it allows you to deselect (or reselect) any data you want to remove from the chart. In our example, getting rid of the Total figures is a matter of a single click. The middle icon (Chart Styles) is all about appearance, allowing you to pick from a selection of predefined styles – 3D graphs rather than 2D, perhaps, or using a black background rather than white.

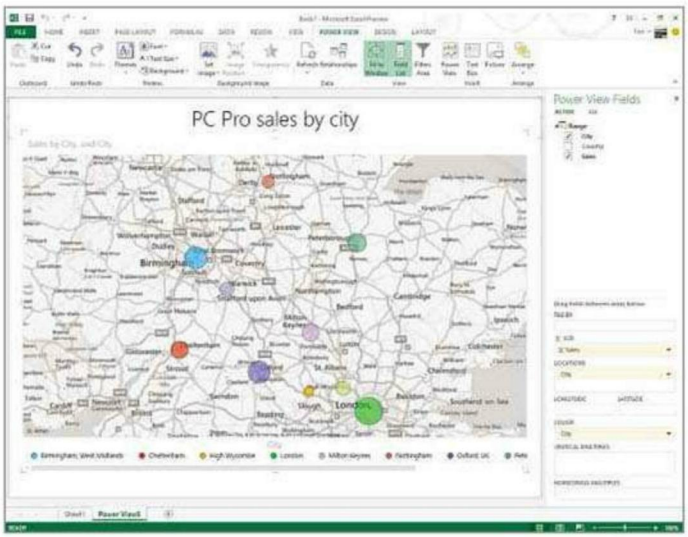
We're disappointed to have only eight styles to choose from, however, and that it isn't possible to replace a default style with our own preference. While you can make dozens of tweaks if you head to the Chart | Design ribbon, we'd like to set a few house styles to apply in an instant. The topmost icon refers to Chart Elements: think axis labels, gridlines and trendlines. So you can switch them off and on, and adjust their position.

If you're trying to make a point in a meeting, you may also find yourself using Excel 2013's animation skills. Want to show the effect of 500 sales versus 200? Change the value in the table and the chart animates, redrawing the axis scales as it goes. It hammers home the point far more than a changing figure ever will.

Quick analysis

One of Excel 2007's best innovations was conditional formatting. Taking a table of data and applying formatting based on the values of the cells, with one obvious example being sales figures: the highest figures would be shaded vibrant green; the worst vibrant red; the rest would gain a shade somewhere in between.

Excel 2010 added extra niceties, such as Sparklines. These analysed the figures from a row of cells and placed a graphic in the cell to their right to give a visual representation of the data. You could choose a line graph, bar charts or a simple win/loss image. While Excel 2013 doesn't add many conditional formatting features, it makes them easier to apply. Select



Want to see how many products you're selling by location? Power View gives you this kind of business intelligence at your fingertips

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your table of data and a Quick Analysis icon appears at the bottom right; click it and you're greeted with a mini options menu that lets you select the most common conditional formatting options (such as the colour scale mentioned above, or selecting the top 10% of results).

You can also use this menu to add charts, tables and Sparklines, but we like the Totals feature. Choose this to instantly sum figures (either at the bottom of columns or to the right of rows), count values and calculate averages.

Making sense of data

PivotTables come to the fore when handling interconnected data: the sales figures for a toy shop chain, for example, where the figures apply across product type, month, unit sales, sales value, sales person, district, promotions running – the list goes on.

They provide a way to view data through whichever lens you choose: you can see at a glance how effective each sales person was compared to others; track the success of your promotions; drill down to one month's figures.

Previously, no-one could call themselves a master of Excel unless they could tap into the power of PivotTables, but Excel 2013 allows even casual users to take advantage. It's similar to Suggested Charts, but you select the data and click on the Suggested PivotTables icon.

The feature that's generated much excitement among those working in business intelligence is Power View. Only available in the Office Professional Plus version, it has the ability to turn a mass of data into meaningful graphics – ideal if you need to present complex information such as sales by location, especially as you can integrate Bing Maps. Coupled with the PowerPivot add-in, it turns Excel into a genuine business intelligence tool, giving even small businesses the means to intelligently analyse their data – and act on it.

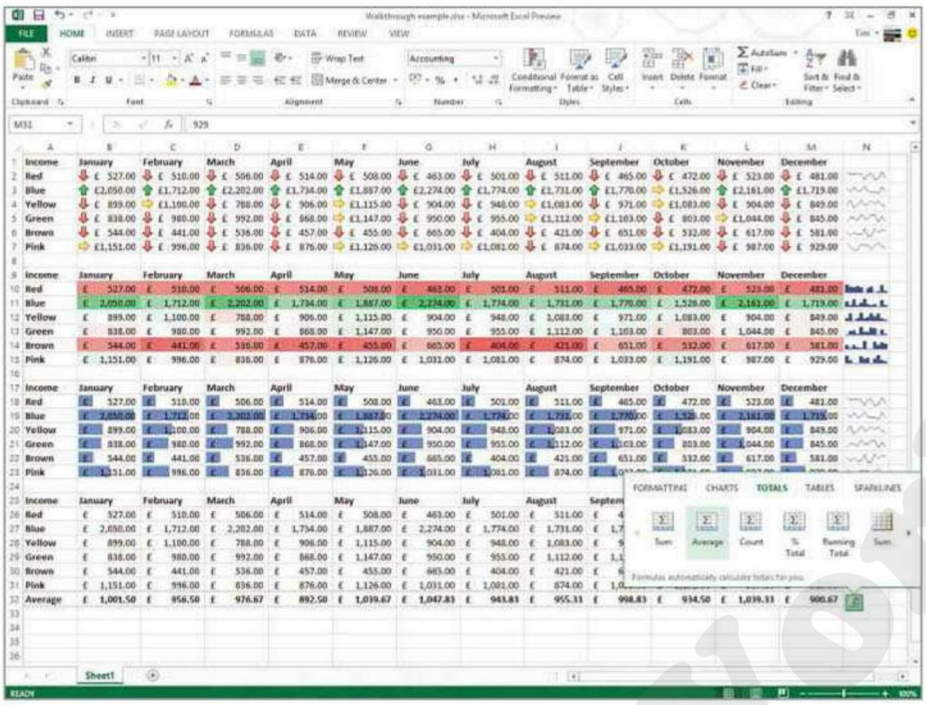
The small things

Anyone who works with multiple worksheets at one time will appreciate that Excel 2013 opens files in different windows, making it easier to have one sheet open on the left-hand screen and another on the right.

But there are irritations, too. We'd love to switch off the swooshing animations Microsoft seems so keen on; they can be a distraction. It's also astounding that two people can't work simultaneously on the same Excel file, given that "collaboration" is as big a buzzword as "cloud". But you can't: the same old "File is locked" warning appears as always.

> "Excel 2013 allows even casual users to tap into the power of PivotTables"

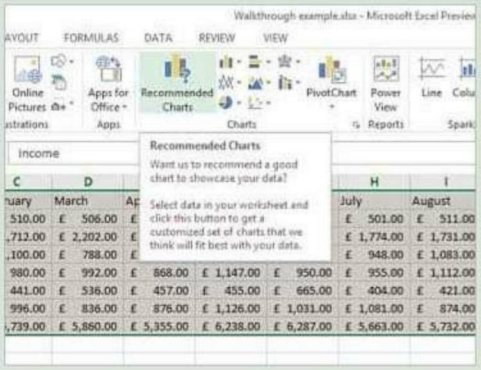
Despite these rumblings of discontent, we can't hide our admiration for Excel 2013. Of all the Office components, its changes are likely to have the biggest effect on people's working lives.



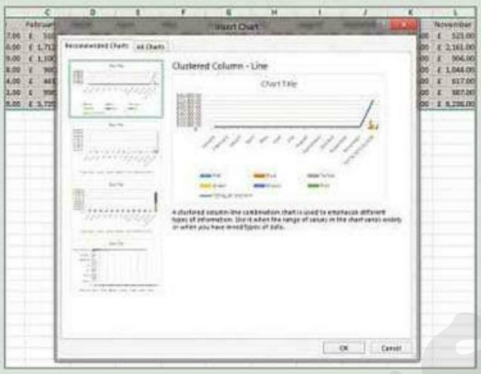
Conditional formatting can help to make sense of tables of data; Sparklines can show trends

WALKTHROUGH

Inserting and amending charts



1 Excel 2007 introduced excellent charting tools, but Excel 2013 makes it easier to use them thanks to Recommended Charts. Select your data, in this case the amount of profit from each colour of toy sold, then head to Insert | Recommended Charts.



2 Since our data includes totals based on the results, Excel has worked out that we'd benefit from a mixed chart: clustered columns to show how each colour of toy sold, and then a line above them to indicate how the total sales vary over time.

3 Our table includes an extra column at the end for the total sales per colour, and this is skewing the results. Click anywhere on the chart and three icons appear: click on Chart Filters at the bottom, deselect Total from the categories, and then hit Apply. It's gone.

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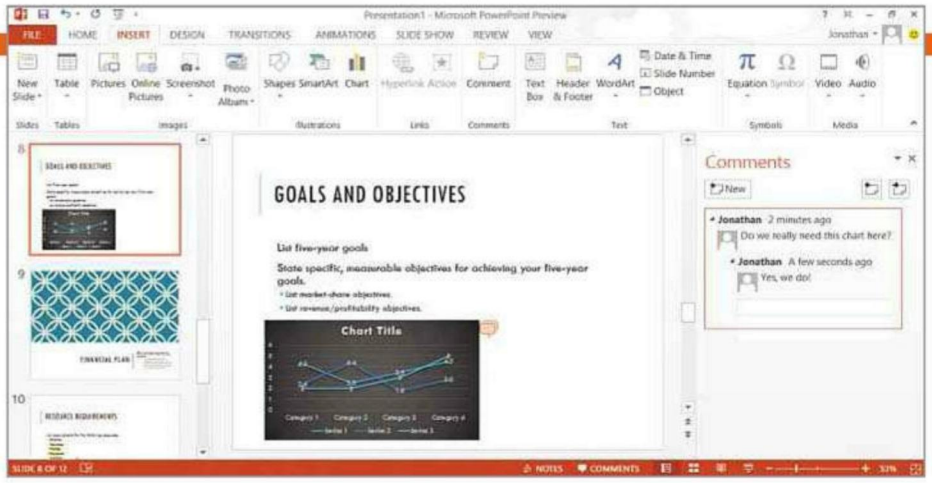


The new PowerPoint offers improved commenting facilities, complete with replies

PowerPoint 2013

Few people actually enjoy having to author, deliver or sit through a PowerPoint presentation, but whatever area of business you're in, it's likely to be an important part of your software toolkit. PowerPoint 2013 is an all-round upgrade, with improvements across the board, aimed at helping users deliver more effective presentations, as well as create attractive slides.

Presenter View

At the launch, the big "new" feature Microsoft chose to focus on was Presenter View. In fact, it isn't new at all – but it's received a major, Metro-style makeover in this release. It's far slicker than what went before, giving presenters a more streamlined, blacked out, cockpit-style view from which to control the progress of their presentations.

For those who aren't familiar with Presenter View, it's aimed at those who deliver presentations on a big screen or projector. Instead of simply mirroring the current slide on each display, it shows a control screen to the presenter, with the current slide in a box on the left, the next slide as a smaller thumbnail in the top right of the screen, and any notes you might have made about the current slide tucked in the bottom right. It's a useful feature that allows presenters to mentally prepare for the next slide before actually getting to it.

It isn't all about forward planning, though. The Presenter View also plays host to a number of other useful controls and tools to help add interest to what may otherwise be flat, lifeless slides, and here further improvements have been made. Click the Pen icon and you'll see a laser pointer mode has been added to the existing highlighter and Pen tools – useful for drawing your audience's attention to specific data on a graph, for example, or highlighting a bullet point in a list.

Tapping the icon next to the pen brings up the Navigation grid – another new feature that gives an overview of all the slides in your presentation. It replaces the old filmstrip view, and should make it a little easier to navigate back and forth between slides. Next is the Slide Zoom, which allows presenters to hone in on a particular area of a slide, either by pinching with a finger or clicking with the mouse. There's a shortcut icon for blanking the screen, and an options menu gives access to, among other things, a Slide Show Help box listing keyboard shortcuts.

UI and touch

The other big change, as with the rest of the Office 2013 applications, is the new, Metro-inspired look and feel, with its flat, sharp-edged windows and touch-enhanced collapsing ribbon.

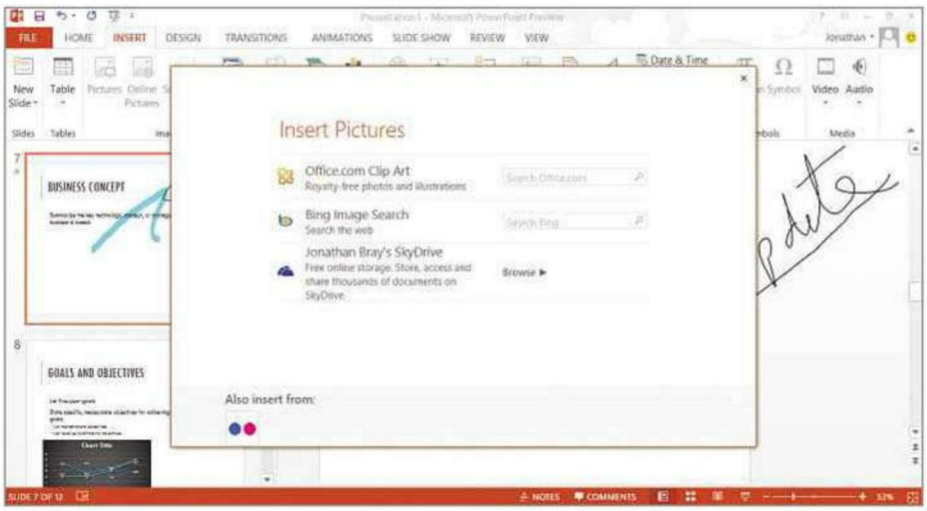
Whether this appeals or not depends largely on personal taste. Far more important are the implications the redesign has for touch. In terms of slide creation, our comments remain the same as for Word, Excel and the rest: Microsoft hasn't done enough. Sure, the ability to zoom in and pan around is nice, but start to edit an existing presentation with only your fingers and you'll quickly become frustrated.

Despite the new touch mode, which enlarges some elements and spaces out buttons on the ribbon, many elements of the UI remain small and fiddly: the windowing controls in the top-right corner; the zoom slider in the bottom right; and, bizarrely, the touch mode switch itself, which is hidden behind the tiniest dropdown imaginable.

In another odd move, many of PowerPoint's dialog boxes have been completely done away with and replaced by a pane that smoothly appears from the right-hand side. We like this approach, but it isn't consistent with the other Office apps, and could cause confusion. Neither Microsoft Word or Excel use this approach.

"The Presenter View is a revelation; the touch enhancements really work"

For presenting, it's a different story. Run your slideshow on a touchscreen tablet and it has the potential to transform your performance. You can swipe to navigate back and forth, and pinch and tap directly on a slide to zoom in, all of which feels far



Inserting pictures from online services such as Flickr, Bing Images and Office.com's Clip Art library can be achieved with a simple click on the ribbon

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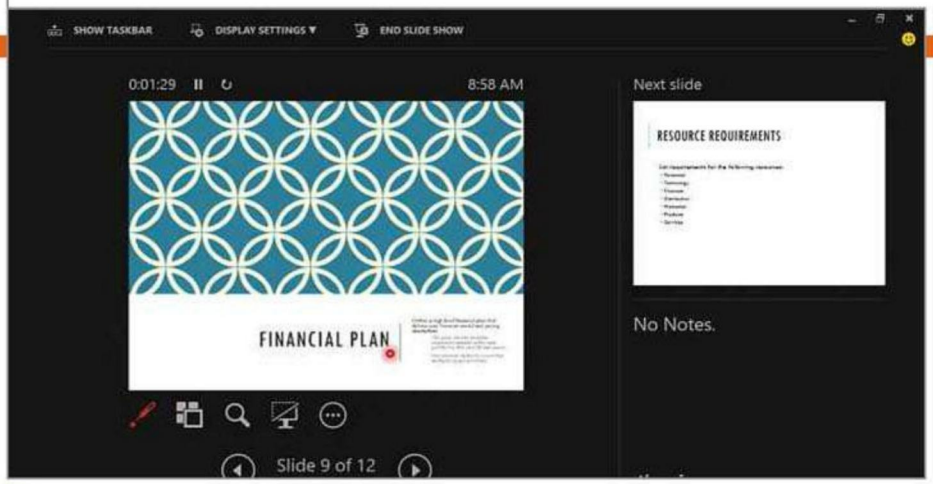


The revamped Presenter View provides a slick Metro-style control hub for presentations

more natural than clicking a mouse, leaving you to focus your attention on the presentation, not the software.

Design and layout

None of this really matters, though, unless you can create compelling slides in the first place, and – although there aren't huge changes here – Microsoft has provided a number of tools to make things easier.

First on the list of improvements is a library of new templates designed specifically for 16:9 format screens – a long overdue introduction that will be welcomed by users of modern laptops and tablets. All the core templates that appear on the new-style welcome splashscreen are compatible with this format, and many existing templates on Office.com, which can be browsed or searched directly from the splashscreen, have been converted too.

Modifying templates is easier as well, thanks to improved layout tools. The first thing you'll notice is PowerPoint's Smart guides, which allow you to dynamically align elements such as pictures, shapes and textboxes by simply dragging them around the slide. As you go, vertical and horizontal dotted lines appear and disappear indicating alignment, allowing you to snap those elements into position. This isn't a new feature, but previously only shapes could be aligned in this way. Master-level guides also aren't new, but they're now more flexible, with the ability to add custom guides to the default centre and grid guides.

Elsewhere, Microsoft has added an eyedropper, making colour-matching between elements easier. Adding visual content is simpler with PowerPoint 2013, with tools for searching for and embedding online video and pictures from the web. As with Word, PowerPoint users can comb through a number of sources, including Bing search, Office.com, Flickr and YouTube (although embedded online videos refused to play when we tested them).

Finally, each core theme provided with the installation is also now available in a series of different "Variants" – effectively, this means you can change the colour of the current theme, with coloured backgrounds, text headings and other elements all changing too.

Sharing and collaboration

PowerPoint 2013 also shares other Office applications' focus on the cloud (*see p24*), which brings improved sharing and collaboration tools to the table.

The commenting system sees an upgrade similar to Word's (*see p28*), with comments indicated by a small speech bubble, inline replies and inking capabilities. Microsoft's Presence system also works in comments, indicating users' availability for chat sessions via the Lync corporate messaging system.

Present Online, a feature that allows you deliver slideshows over the web, has also been enhanced. This is a free service; it's a remarkably powerful tool. Although some advanced features are unavailable – the laser pointer and highlighting tools, for example, and animated transitions are replaced by a simple fade – you can still control presentations using Presenter View, and even edit slides while you go.

Finally, presentations can also be worked on by more than one person at the same time, either using the desktop application connected to SkyDrive, or via the PowerPoint Web App. That's the theory, at least – during testing, we failed to make this work smoothly.

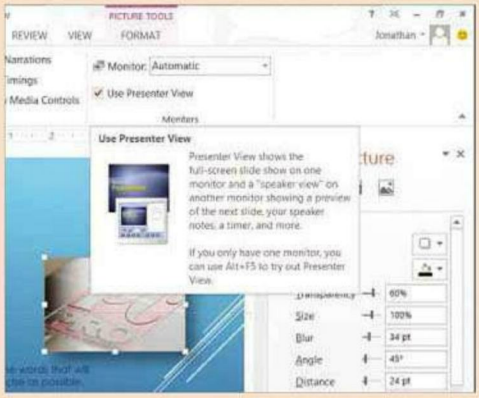
Verdict

This is a major overhaul for PowerPoint, and features plenty of welcome improvements aside from the cosmetic Metro-style changes. The Presenter View is a revelation, and there's a host of smaller, equally effective improvements, from better templates to more efficient layout and editing tools.

And when it comes to delivering those slides in front of an audience, Microsoft's touch enhancements really do work, giving presenters more tools and control than ever before. Don't imagine, though, that when it comes to editing and creating slideshows, you're going to be able to shed your keyboard and mouse just yet.

WALKTHROUGH

Using Presenter View



1 Delivering a presentation using the Presenter View opens up a number of new tools. To activate it you'll need to have a second display connected to your laptop or tablet. Click on the Slide Show ribbon tab and tick the Use Presenter View checkbox on the right-hand side.

2 Start the Slide Show by pressing F5, or clicking/tapping the icon in the Quick Access toolbar, and you'll see the Presenter View displayed on one screen and your first slide on the other. If the Presenter View is on the wrong screen, simply hit the Display Settings menu and swap them.

3 You can now use Presenter View to zoom in with a pinch, point out areas of the screen or navigate to a later or earlier slide. Experiment with the controls found beneath the current slide view on the left-hand side of the screen.

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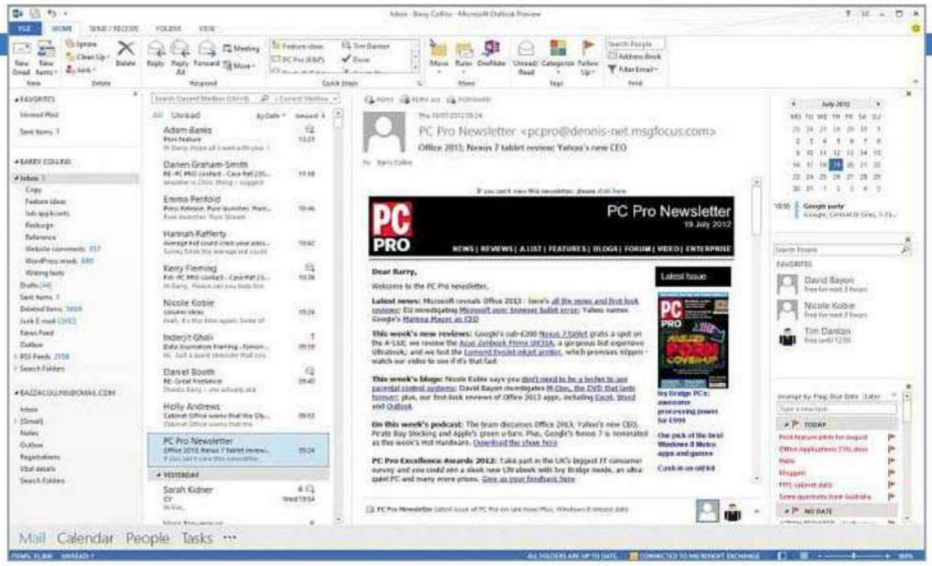


The whitewashed ribbon interface makes it difficult to separate content and functions

Outlook 2013

After being neglected in Office 2007's big "ribbon" shake-up, Microsoft lavished much attention on Outlook in 2010. This time it's back in the shadows, with the changes proving largely cosmetic.

Those changes are apparent as soon as you open Outlook – which for the first time can be installed alongside a previous version of the mail client. Outlook 2013 has been whitewashed, with almost no visual separation between the ribbon menu at the top and the Inbox/Calendar/Contacts below. It gives Outlook an incomplete look and, unlike previous versions, there's no option to alter the colour scheme.

Elsewhere, the Windows 8 Metro influence is apparent. The icons to switch between Mail, Calendar and Contacts modes are replaced by chunky text labels. Contacts has been renamed People, in another echo of the corresponding Windows 8 app. Switching between modes invokes an elegant wipe transition that sees your inbox slide out of view to be replaced by the Calendar, for example.

Email

The Outlook 2013 inbox bears more than a passing resemblance to the Windows 8 Mail app. Unread emails are highlighted with a blue bar, with the currently selected message in grey. Meanwhile, the thin rule that separated email messages in Outlook 2010 has been removed, making it harder to distinguish between different messages.

Email gets one of the few standout features in Outlook 2013: inline replies. This allows you to compose quick replies to emails from within the inbox Reading Pane; there's no need to open the message in a new window as before. A new Delete button that appears when you hover over messages in your inbox also makes it quicker to clear out the cruft. Indeed, if you're merely reading, replying to or forwarding messages, you can happily minimise the ribbon to devote more screen space to messages.

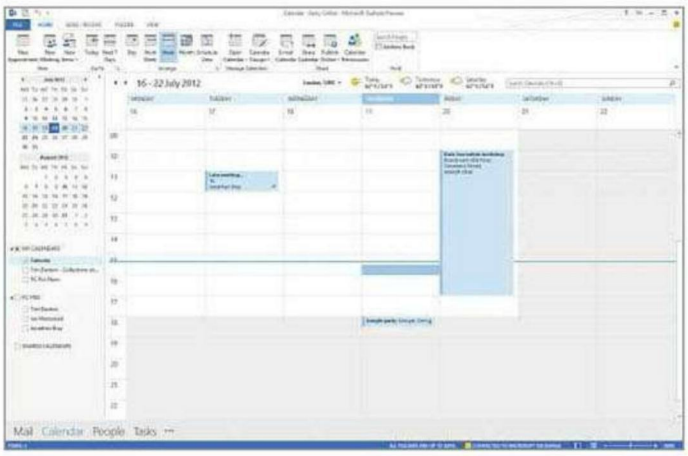
Outlook 2013 also takes advantage of Windows 8's notifications, alerting users to new messages in their inbox with a pop-up in the top-right corner of the screen. Compared to the old system tray alerts, these provide less information, and there's no option to delete messages directly from the notification pop-up.

The new Site Mailboxes feature may appeal to businesses: it's an Exchange-based feature that allows you to create a shared mail folder, calendar and tasks for everyone in a team.

Calendar

You don't have to switch to Calendar mode to glimpse at your diary; it's now possible to hover your mouse over the Calendar icon and take a quick "peek" at forthcoming appointments. You still have the option for a pervasive mini-Calendar running down the right-hand side of the screen, however.

Very little else has changed here. A new bar marks the time of day across the Daily/Weekly view and a mini-weather forecast sits below the ribbon.



Daily and weekly calendar views now show a timeline, and a weather forecast appears beneath the ribbon

People

People is the new name for Contacts, in many ways duplicating the Windows 8 app. It, too, pulls in contact information from LinkedIn and Facebook and, unlike the Windows 8 People app, cleverly merges duplicate contacts into one "People Card". Contacts can be set to automatically update, taking the hassle out of keeping phone numbers and email addresses up to date.

Favorite People can also be added to the To-Do bar running down the right-hand side of the Outlook window, allowing you to see at a glance if/when your team members are next free for a meeting.

Touch

Outlook 2013 includes a touch mode that theoretically makes it easier to use the software on a tablet, although we beg to differ. The fact that the touch mode is initially available only from an impossibly small dropdown menu reveals how little thought Microsoft has put into reformatting Outlook. Even when activated, it merely adds a little more white space around page elements and a series of shortcut buttons to the right-hand side of the screen. There are hidden touch gestures that work quite well – pinch to zoom on the Calendar view, for example, neatly switches between day, week and month views – but referring to Outlook 2013 as a touch-enabled app in its current state is woefully misleading.

With the much more touch-friendly Mail, Calendar and People apps in Windows 8 providing full support for Exchange, it's easier to use the Metro apps when you don't have a keyboard and mouse to hand.

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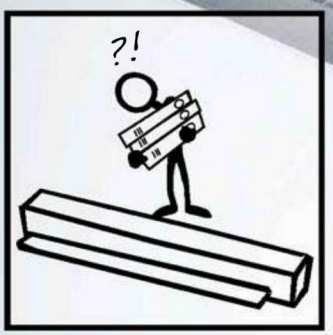
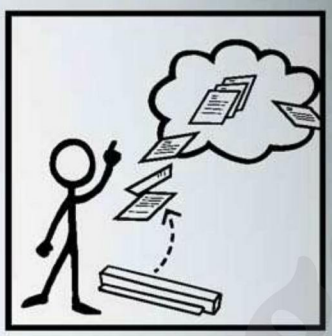


Ah! There's a ScanSnap. It's so small and fast! Let me try...

... how easy! Just press the blue button and scan to… everywhere!



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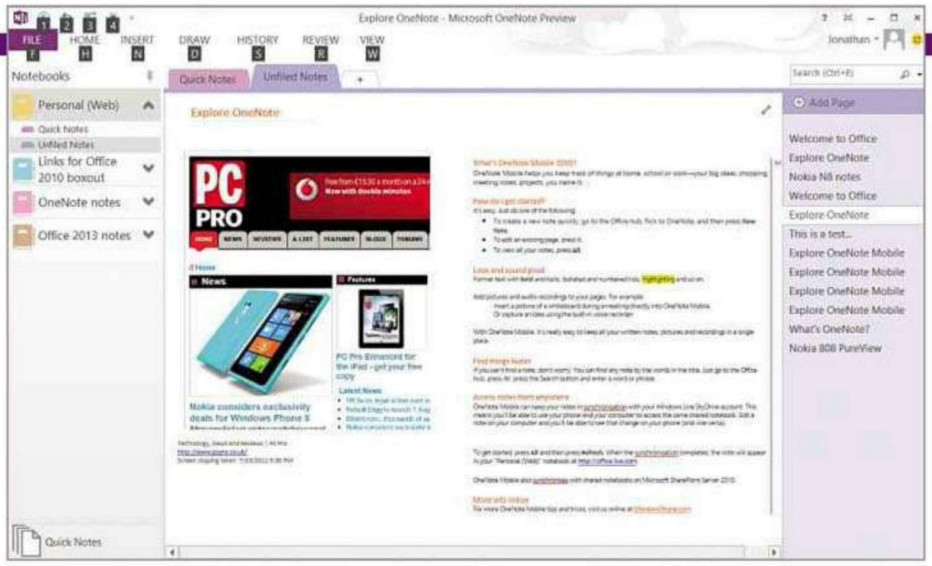

It looks different, but OneNote 2013 isn't blessed with many standout new features

OneNote 2013

It may not be a household name, but OneNote has built up a hard-core following in the years since it was first introduced to Office back in 2003. Its freeform note entry, automatic saving, and the later introduction of linked notes and online collaboration in 2010, endeared it to note-takers from all walks of life.

With online and app-based upstarts such as Evernote increasingly encroaching on its patch, OneNote needs to stage a fight-back. It starts as we've come to expect, with the new Metro-inspired UI seeming to herald a dramatically different piece of software. The reality once you've peered past the new interface, however, is that it's business as usual for OneNote.

Slim pickings

Look closely at the redesigned ribbon toolbar and you'll find it plays host to the same tools as before, although there has been a little reorganisation. The Share menu, for example, has been replaced with the History tab, and some tools moved onto the Home tab. Otherwise, there's little sign that anything has changed.

The user interface is organised in the familiar way, too, with a handful of cosmetic alterations – but again, there's nothing to make you spit out your coffee. Notes take up the majority of the working screen area – the panel for navigating pages within notebooks remains to the right – with a series of section tabs running along the top and page navigation down the right.

The Notebooks navigation panel works a little differently: it used to live in a collapsible panel to the left of the screen, but has now been moved into a dropdown, launched from a small downward-pointing arrow below the current notebook title.

Where there are new features, they're minor. The ability to create Excel tables directly in OneNote is more useful than the old flat table tool. Embedded spreadsheets and Visio diagrams can now be edited, with changes reflected in the notebook automatically: a double-click launches the application in question for editing; saving it updates the item on the page.

And there's extended support for touch. As with the rest of the new Office apps, tapping a small button in the Quick Access Toolbar lets you add the touch mode button, which enlarges some toolbar elements and spaces out icons on the ribbon.

OneNote for Metro

The most significant development with OneNote surrounds not new features, but a new addition to the OneNote family. Alongside Office 2013 for desktop will debut a separate Metro app called OneNote MX, and the most interesting aspect of this app is its radical menu system. Dubbed the radial menu, this is a turbo-charged context menu, with formatting controls such as font type and size arranged in a circle, and accessed via a button that pops up whenever you tap an item or highlight text.

It looks unusual, and gives access to a huge range of controls in a very small space; it's no coincidence that this circular menu fits within the narrower part of a Windows 8 Metro split screen. But for a system aimed at operation by touch, some of the buttons are surprisingly small and fiddly. We hope it's refined further by launch, because there's clearly great potential here.

Aside from the radial menu, OneNote MX features very different navigation and search facilities. Making your way around OneNote's over-complicated organisational structure (notebooks, sections and pages), is performed via a series of panels that can be pulled out from the left-hand side of the screen. These can be hidden away to the point at which only links to pages in the current notebook show when you're working, and they disappear completely when the app is split screened in Windows 8.

As with most Metro apps, searches are performed using the Windows 8 Search Charm, accessed with a swipe of a finger from the right or by shunting the mouse pointer into the top right-hand corner of the screen.

Elsewhere, though, it's disappointing. Functionally, OneNote MX echoes many of the desktop version's features: it links to the cloud via SkyDrive or SharePoint, allowing synchronised access to notes on whatever device you're using; it allows you to type, insert pictures, and scrawl notes with a finger or stylus. But certain key features are missing. It won't recognise and index text in photos when they're inserted, and you can't record audio notes or make quick screen clippings – both key features in the desktop version.

Verdict

We hope there's more to come from OneNote MX when the final version ships with new Windows RT tablets, because elsewhere it's pretty slim pickings. And with the desktop version also gaining few significant features of note, it looks like OneNote enthusiasts are going to be disappointed with what Office 2013 brings.

OneNote MX's radial menu offers a radical take on traditional, flat menu systems

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WRITE YOUR OWN RASPBERRY PI GAME

Follow Stuart Andrews' step-by-step tutorial to writing your own game on the Raspberry Pi and enter our fabulous competition to win £250

The £15 Raspberry Pi is a computing sensation, but it was originally designed with one key intention: to inspire a new generation to look beyond games consoles, smartphones and tablets, and embrace the way of code.

The Raspberry Pi comes with a selection of programming environments pre-baked into its Debian-based Linux distribution, but the easiest way to get started is with Scratch. Created by the Media Lab at MIT, Scratch was designed to teach children the fundamentals of programming, without the need to learn complex syntax.

Scratch allows users to drag and drop characters and objects into a game environment, then program their actions using building blocks, which are grouped into colour-coded categories such as Controls, Motion, Operators and Sensing. By dragging and dropping these into place you can create surprisingly sophisticated interactive stories, animations and games, then share them with a global community of students and developers.

We also want you to share your completed games with us. We've teamed up with the creators of the Raspberry Pi to run our very own Scratch game competition (*see p42*).

First, however, read our tutorial on how to get started.

Getting started with Scratch

In this feature, we're aiming to produce an arcade game – we're calling it Crustacean Storm – while giving you a few pointers on how you may want to take it further. We hope it will encourage budding programmers of all ages to try their hand at coding something bigger and better, leading you on to more complex programming tasks.

If you've never come across Scratch before, it might be worth looking at our previous feature on programming with it (**www.pcpro.co.uk/links/216scratch**), which covers some of the basic functions. However, Scratch is extremely intuitive and easy to pick up; its scripts are comprehensible, and you can learn a lot just by downloading games and finding out what makes them tick. Don't worry if you don't have a Raspberry Pi: Scratch will run happily under Windows, OS X and Linux, and even on the most modest of PCs. You can download it and find plenty of example programs at **http://scratch.mit.edu**.

Scratch is only the start. The Raspberry Pi is also great for working with Greenfoot – another highly visual tool that teaches real Java programming – and Python. This general-purpose, high-level programming language remains reasonably accessible, and with the Pygame modules – also preinstalled on the Raspberry Pi – it's possible to create even more complex and fully featured games. If you're interested in learning more, see our Python tutorial on p58. However, Scratch teaches a good range of basic concepts that you can apply to other languages and development environments that you might come across later on. Think of this as the start of a long journey leading to knowledge, enlightenment and, for some lucky youngsters, a future career.

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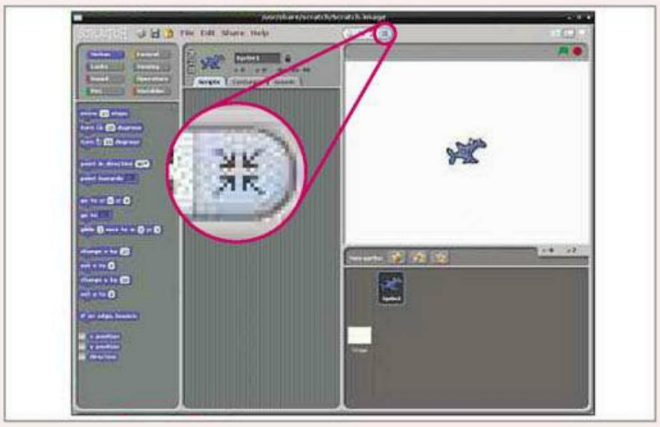
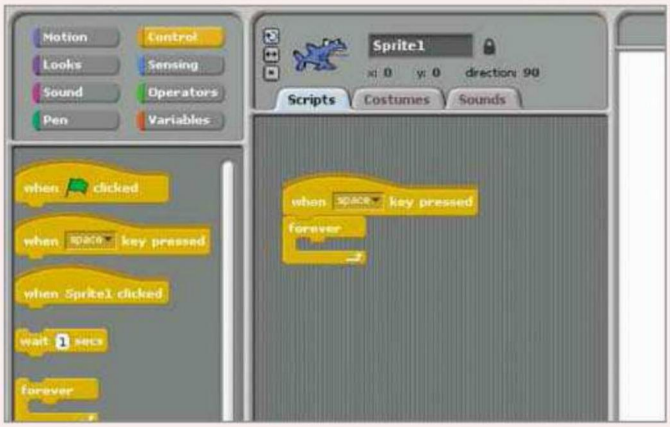
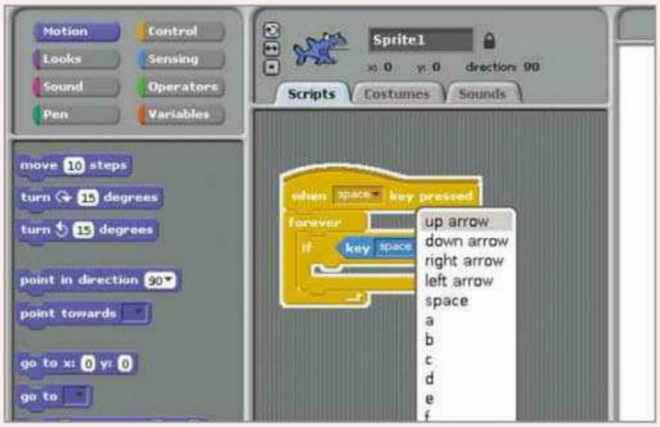
1 First, start up Scratch. Now, you can't have a cat starring in a game called Crustacean Storm. Right-click on the sprite and delete it. Go to the New Sprite bar above the bottom-right-hand window, select the middle button to "Choose new sprite from file", go to the Costumes|Animals folder and select "shark 1-b".



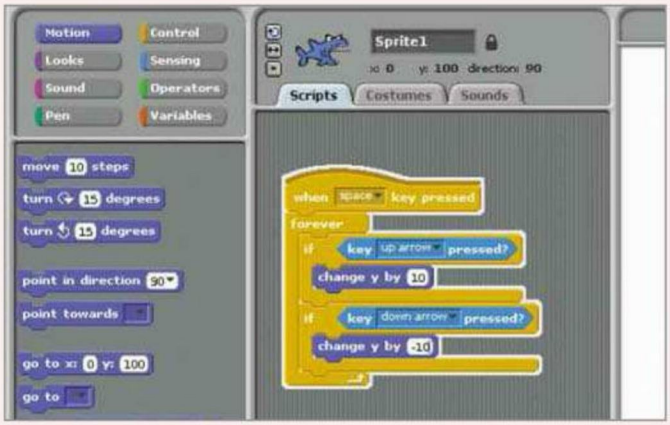
2 As he is, the shark is too big. Let's shrink him. Select the Shrink tool from the toolbar (as shown above) and click about 30 times on the shark until he's roughly the size shown here. Now it's time to name the sprite. Go to the name bar above the central window and type to change its name from "Sprite1" to "Shark".



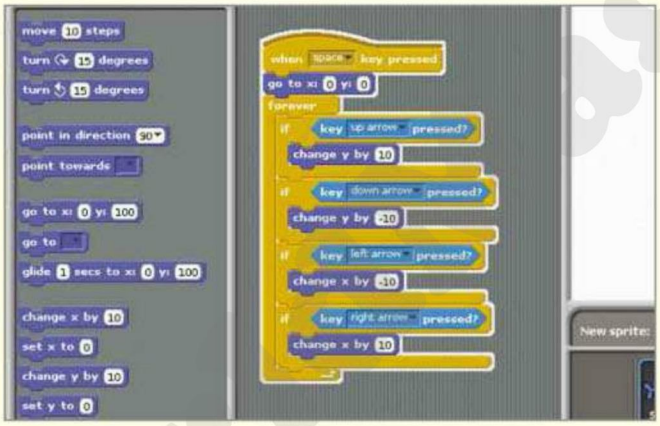
3 It's time to put the player in control. First, select the Control category from the top left of the screen, then drag the blocks "when 'space' key pressed" and "forever" into the shark's script window, as shown here. We'll use the spacebar as the start key for our game.



4 Now drag the "if" block from the Control category into the "forever" block, then go to the Sensing category and drag the "key 'space' pressed" block to the control point on the "if". Use the dropdown menu to change "space" to "up arrow".



5 That tells Scratch to look out for the Up key, but now we need to assign the response. Go to the Motion category and drag the "change y by 10" block into the "if" block. If the spacebar then Up arrow is pressed, our shark now moves. You can now repeat this for the Down arrow, replacing the "change y by" value to -10.



6 To make the left and right arrows work, repeat steps 4 and 5, but replace the "change y by" block with the "change x by" block and set the values -10 and 10 respectively. Finally, our star needs a start position. Grab the "go to x: 0 y: 100" block from Motion and drag it into the place shown. Change both values to 0.

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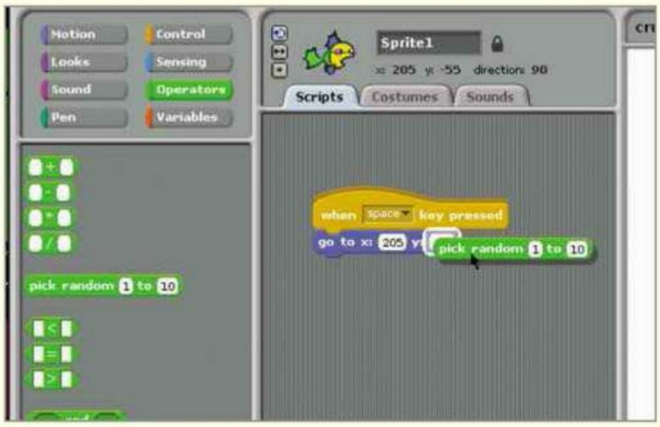
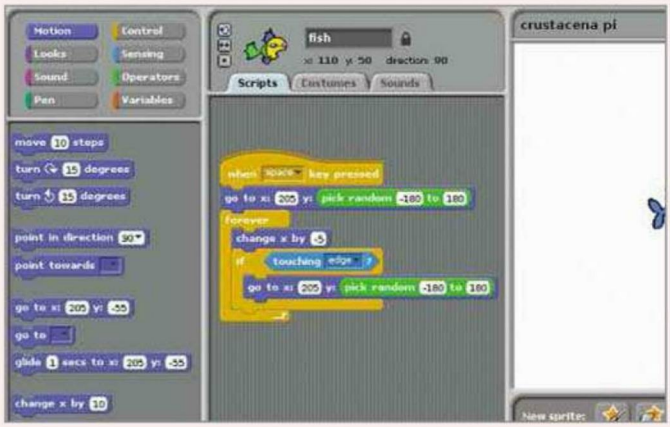
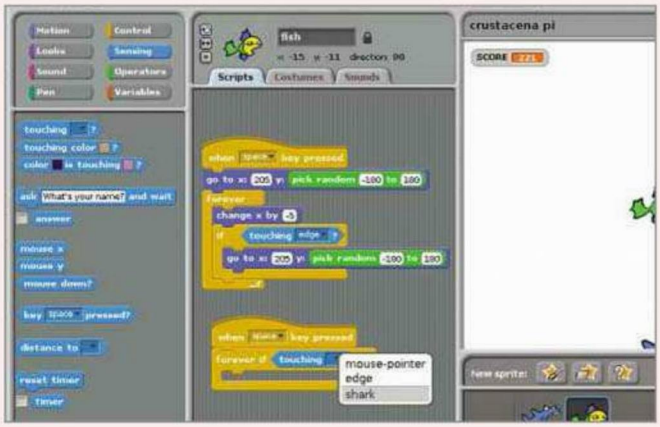
7 Now click again to "Choose new sprite from file" and select a fish, before shrinking it as we did in step 2 and renaming it "Fish". Ensure it's selected, as shown, and drag "when 'space' key pressed" into the central scripts window. Go to Motion and drag the "go to x:0 y:0" block into place below.



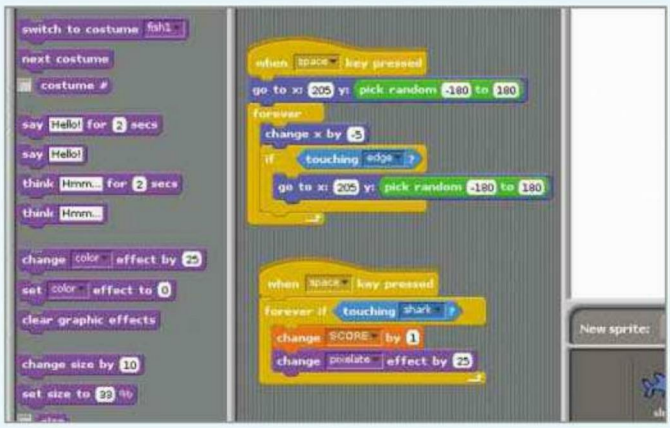
8 Set "x" to 205. To stop the fish always appearing in the same place, go to Operators and drag the "pick random 1 to 10" block into the "y" value. Set values to -180 and 180. Next, go to Control and drag in "forever" to snap in below "go to", then go to Motion and pull the "change x by" block inside it. Change x to -5.



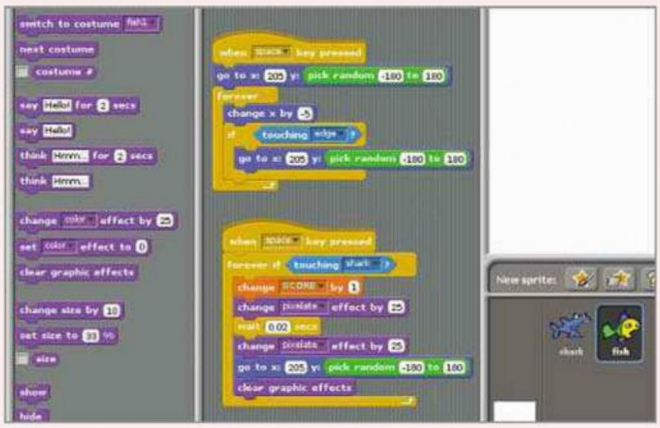
9 We want our fish to reappear if it hits the side of the screen. Drag an "if" block from Control inside the "forever" block, then go to the Sensing category and drag the "touching" block onto the "if". Select "Edge" from the "touching" dropdown. Drag in a "go to x & y" block from Motion and configure it as in step 8.



10 Click on Variables and then the "Make a Variable" button. Call it "Score". The score will now appear in the top-left corner of the game screen. Add a new "when 'space' key pressed" block from Control, clip on a "forever if" block; now go to Sensing and drag in a "touching" block. Choose "shark" from the dropdown.



11 What happens when the fish meets the shark? Our piscine friend gets eaten and the score creeps up. Go to Variables and drag in the "change score by 1" block, then go to Looks and drag in the "change 'color' by 25" block. Change the "color" option to "pixelate".



12 It's a nice effect, but over far too soon. Drag in a "wait '1.00' secs" block from Control and change the wait duration to 0.02. Then drag in another "change 'color'" block and change the "color" to "pixelate". Add the "go to x" block with a random "y" position (as in step 8), and a "clear graphic effects" block from Looks.

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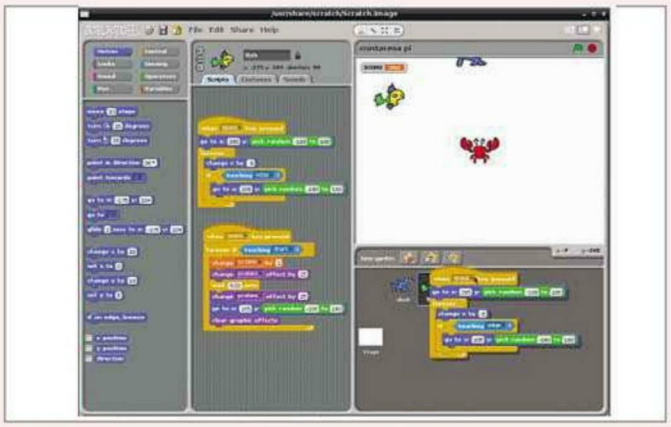
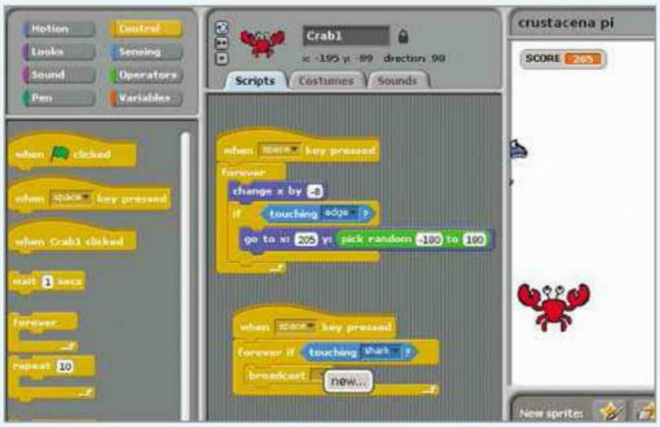
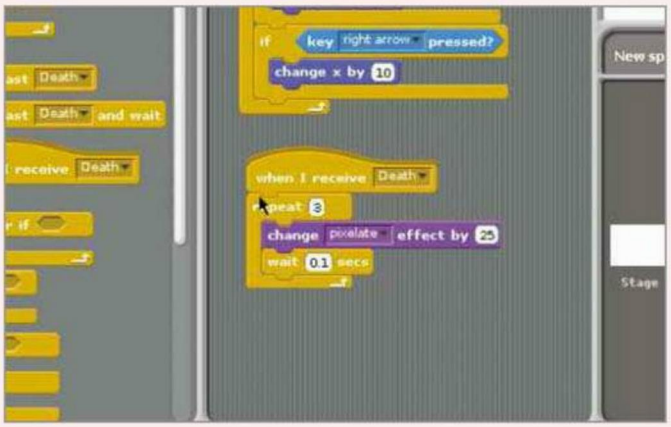
Raspberry Pi – advanced class
Now tackle our In Depth tutorial on p58



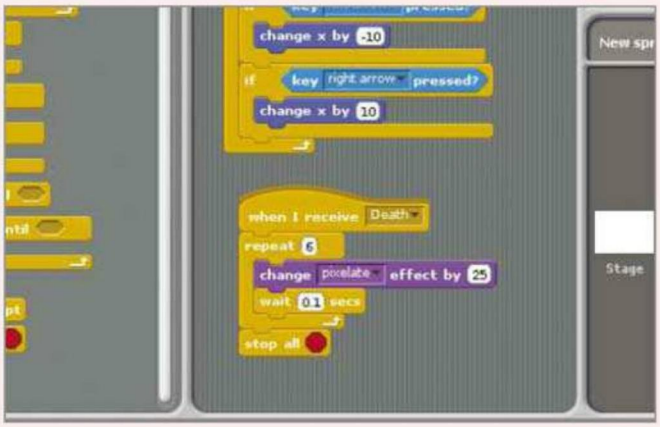
13 It's crab time! Add a new sprite – crab 1-a – and shrink him. We can make the crab move by duplicating the fish script. Click on the Fish sprite, then click the Duplicate icon on the top toolbar, click on the first script for this fish, and drag it over to the crab. Go to the crab's script and amend "change x by" value so it reads -8.



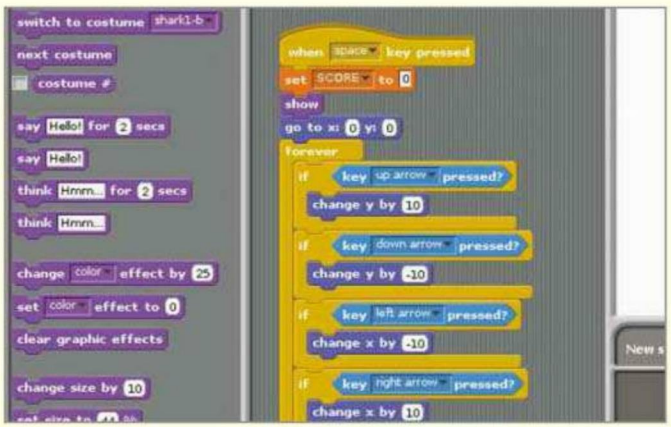
14 The crab moves, but we want him to be deadly. Drag in a new "when 'space' key pressed" block, then add a "forever if" block. Go to Sensing and add a "touching" block; use the dropdown to select the Shark sprite. Go to Control and drag in a "broadcast" block. Select New from the dropdown and call it "Death".



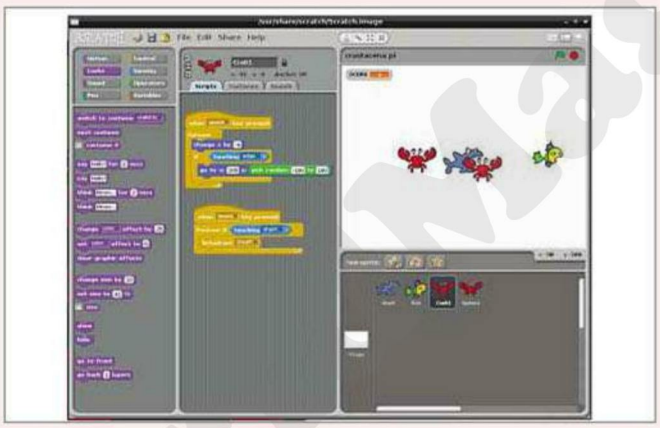
15 Death equals Game Over. Select the Shark sprite, then go to the Control category and add the "when I receive" block. Select "Death" from the dropdown. Now add a "repeat" block from Control, go to Looks and add the same "pixelate" block as in step 12, and then a "wait" block.



16 Let's stretch the shark's demise out a bit. Set the "wait" value to 0.1 seconds, and set the value in the "repeat" block to 6. Add a "stop all" from Control to the end of this script. That will end the game when the shark is hit.



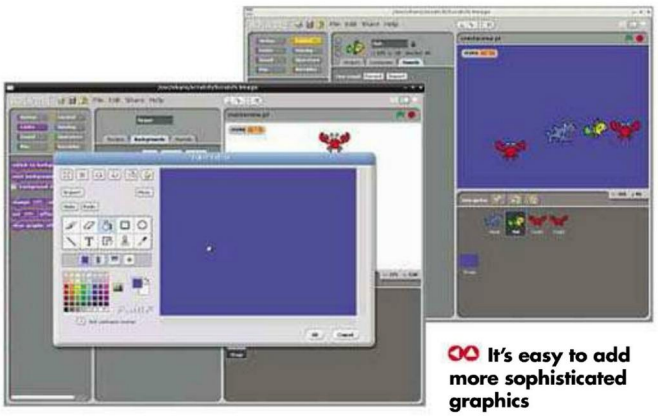
17 We need the score to reset every time the game is started, so drag a "set score to 0" block from Variables and a "show" block from Looks to the first shark script, placing them just below the initial "when 'space' key pressed" block.



18 We have one killer crustacean, but what about a swarm? In Scratch you can easily duplicate crabs. Click the Duplicate tool, then the crab, and make another crab or two. When you're done, click the button in the top right to enter the full-screen presentation mode, press the green flag, then space – and start playing.

What next?

Where do you go from here? Adding a background would be one easy step (here we've simply edited the default background and used the Paintbucket tool to fill it with blue). Another would be to add sound effects, or even simple animation; both the shark and the crab have alternative costumes you can use, and it's simple to do using the "switch to costume" block in the Looks category. By altering values it's also possible to speed up the crabs and fish, while you can duplicate both to make for a busier game. Why not try adding more hostile sea creatures with different movement patterns, or change the theme altogether? Or add titles and a proper Game Over screen. Scratch makes all this and more possible – the rest is up to you.



It's easy to add more sophisticated graphics

COMPETITION

Enter our Raspberry Pi coding competition and you could win our £250 first prize!

We want you to **design your own computer game** – either using the Scratch software from this feature, or the more advanced Python used for our In Depth tutorial on p58. You can create your own shoot-em-up, a brain-taxing puzzler, or even a text adventure game for the 21st century – the choice is yours.

Raspberry Pi founder Eben Upton will help *PC Pro* editor Barry Collins to select the winning entry.

HOW TO ENTER

Simply email your finished game to competitions@pcpro.co.uk

If you're sending a Scratch-based game, simply attach the .rb file to your email. If you're coding your game in Python, send us a zip file containing all the code and other game assets, such as images.

The winner will receive a cheque for £250 and have their game published on the *PC Pro* website.

The closing date for entries is 10 October 2012.

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The science of RETINA DISPLAYS

The Retina display: marketing genius or the future of laptops? David Bayon looks at how it works, what it means for developers, and whether you can expect one on your next laptop

Photography: intro, Danny Bird; repro, Jan Cihak

The march began in 2010 with the iPhone 4, gathered pace in 2012 with the third-generation iPad, and reached its dramatic peak last month with the launch of a new breed of MacBook Pro. As Apple adds its stunning Retina displays to ever-larger devices, resolutions climb higher, and the sharpness continues to appeal to an audience long fed on scraps by manufacturers.

How we've ended up in such a situation is a question many have been asking for some time. Have higher-resolution laptop displays been an insurmountable manufacturing issue, or is it the software that's held us back? Could these sharper screens have been here years ago if manufacturers had only invested as they are – or, at least, Apple is – seemingly doing now?

In this feature, we look at how the field of display technology is taking leaps forward, largely – but not exclusively – driven by a single company. You'll learn how Apple has managed to deliver panels at higher resolutions than its competition, how operating systems are making it all work, and whether the future is one of Retina-quality displays on every device.

The numbers behind Retina

The MacBook Pro's Retina display looks almost paper-like, and that's down to two key design factors. First, it's glossy, but without the usual feel of looking at a reflective pane of glass. This is because it's constructed in a different way to standard LCD panels. As the teardown experts at iFixit explain: "Rather than sandwich an LCD panel between a back case and a front glass, Apple used the aluminium case itself as the frame for the LCD panel and used the LCD as the front glass. The entire display assembly is an LCD panel." That's why the panel is so thin, allowing Apple to trim down the MacBook Pro.

In most laptop displays, that would be the most interesting fact, but few could argue that's the chief selling point of the MacBook Pro: the more important factor is pixel density. If you know the resolution and size of a screen, you can calculate the number of pixels per inch (ppi) it has, where a higher density makes each pixel finer and the overall image sharper.

In Apple's own words, on a Retina display the "pixel density is so high your eyes can't discern individual pixels". If that statement sounds vague, that's because it isn't as simple as having a golden number to aim for. As screens become larger, so too does the distance from which they tend to be viewed; to have the same perceived sharpness, a smartphone in the hand must have a higher pixel density than a laptop on a desk.

During Apple's 2010 unveiling of the first Retina display on the iPhone 4, Steve Jobs announced a loose figure for smartphones. "There's a magic number right around 300ppi," he said, "that when you hold something around 10 to 12in away from your eyes is the limit of the human retina to differentiate the pixels." There was disagreement at the time about the claim, since it falls some way short of the resolve of *perfect* vision – but few people have perfect vision. Instead, 300ppi is safely beyond the 286ppi capability of 20/20 vision from that distance, so for most people Jobs was right: the individual pixels are indiscernible.

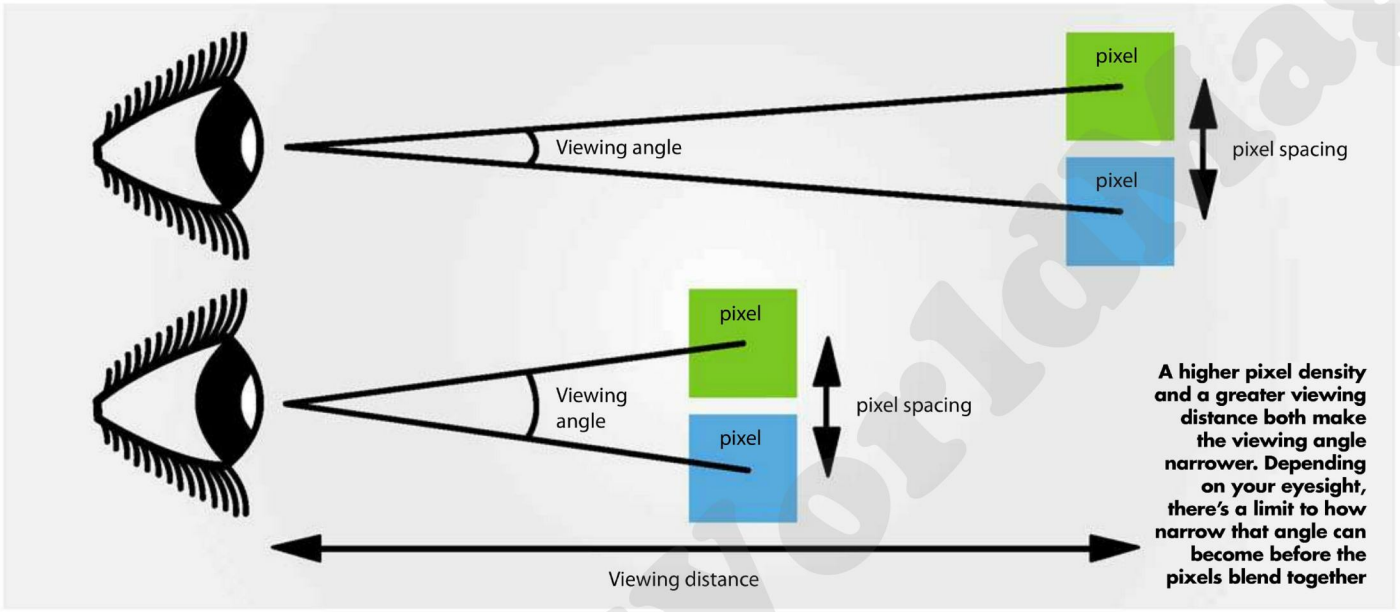
> "On a Retina display, the 'pixel density is so high your eyes can't discern individual pixels'"

In fact, the iPhone 4 and 4S have a 326ppi display, the latest iPad is 264ppi and the new MacBook Pro is 220ppi, all of which – given the variations in viewing distance – meet Jobs' apparent requirement of invisible pixels with 20/20 vision. By contrast, a 15.4in laptop display with today's most common 1,366 x 768 resolution has a density of 102ppi; even at 1,920 x 1,080, it's still only at 143ppi. It's possible to buy a 13.3in laptop at that resolution to give a better 166ppi, but it's a rare option offered by a select few manufacturers.

How it works

A high-resolution display on a screen as small as that of a laptop has its disadvantages: everything on it gets tinier as the pixel density increases. To get around this, Apple uses the HiDPI mode first introduced in OS X Lion and approaches the concept of screen resolutions in a different way. The new MacBook Pro has a 2,880 x 1,800 Retina display, but you can't choose 2,880 x 1,800 as a screen resolution. In fact, you can't technically choose a resolution at all. The display settings pane instead offers five desktop scaling options ranging from "Larger text" to "More space", where the default is the middle "Best" setting.

As long as developers use Apple's text-rendering API, they'll always have text scaled to take advantage of the available pixels; the same applies when using Apple's standard OS X UI elements such as menus and buttons. For everything else, just as with the iPhone and iPad, developers can supply extra high-resolution assets, which OS X automatically swaps in when a Retina display is detected.



A higher pixel density and a greater viewing distance both make the viewing angle narrower. Depending on your eyesight, there's a limit to how narrow that angle can become before the pixels blend together

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The default "Best" setting gives a 2,880 x 1,800 desktop, but with the interface scaled to resemble 1,440 x 900

The 1,680 x 1,050 setting renders the desktop at 3,360 x 2,100, enlarges the UI, then scales the lot to 2,880 x 1,800

The most spacious official setting gives the feel of a 1,920 x 1,200 desktop, but actually lets you fit much more onscreen

There is no 2,880 x 1,800 setting, but simple hacks can be found online. As you can see, it isn't very practical

Once you understand that scaling isn't global, but rather handled on a per-element basis, it's easier to see that the "Best" mode is simply the full 2,880 x 1,800 desktop with the interface size of a non-Retina MacBook Pro at 1,440 x 900. The desktop renders at the full resolution, but via the use of scaling and higher-resolution assets, the entire interface appears to be its normal size and remains pin-sharp. This delivers the best of both worlds.

All of this works with third-party applications, too, although if they don't use Apple's APIs, they'll need to be updated. The Chrome browser doesn't use Apple's text-rendering API, but Google issued an update within a week, and Adobe has announced it's hard at work on adapting its Creative Suite software. For applications without Retina support, the existing lower-resolution assets are simply pixel-doubled; their blurriness is jarring next to Retina elements, particularly text, but it's by no means an unusable workaround in the short term.

Things become complicated if you decide you want more space than the "Best" 1,440 x 900 display setting offers. You can set the UI size to represent a 1,680 x 1,050 or 1,920 x 1,200 resolution, and how OS X handles this is a little strange. In each case, it first renders the desktop at twice the selected resolution – a massive 3,360 x 2,100 or 3,840 x 2,400 – before downscaling the whole thing to 2,880 x 1,800. The result is a gargantuan yet usable desktop environment, with a very small trade-off in crispness due to the scaling factors involved. It's akin to the blurriness you see when changing a Windows PC to a display setting other than the native resolution.

If you're still unsure what all of this means for your productivity, look at Final Cut Pro (*see above right*). It's running in 1,920 x 1,200 mode, yet the editing pane comfortably contains a 1080p video at 100% zoom.

What about Windows?

OS X deliberately omits a native 2,880 x 1,800 resolution from its display settings (although there are easy workarounds) – it may sound enticing but it would be impractical for daily use. We know this because Windows offers such a resolution: with the Boot Camp drivers installed, you can run your desktop in all its Retina glory. It's by no means unusable, but you'll need good eyesight to comfortably last a working day in that manner.

Windows offers its own DPI scaling options that work in a similar fashion to OS X, although anyone who has used a high-resolution Windows laptop before will know it can be hit and miss. The Display settings dialog asks if you want to "change the size of all items", and allows settings of 125%, 150% or – via a Custom menu – right up to 200%, the last of which achieves the same effect as OS X's default setting: the illusion of

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a 1,440 x 900 desktop running at the native 2,880 x 1,800 resolution.

Unlike OS X, you can't make these scaling changes on a live desktop; Windows requires you to close all applications, log off and log back in. While the desktop background is pin-sharp, and Windows interface elements are generally scaled correctly, we found several applications that wouldn't play ball, including Chrome, Adobe Reader and Xara Designer Pro X. Unlike the usable blurriness of OS X, the effect seems more pronounced in Windows, and we counted a few menus and dialogs with incorrect scaling and confused positioning. It's better than it used to be, and less buggy at 200% than at the intermediate settings, but few could argue the Windows desktop is totally ready for these high-density displays.

Things are greatly improved in Windows 8, but – perhaps in the knowledge that the display revolution is working its way from the smallest devices upwards – only when using the Metro interface. Much as Retina iPad apps use assets optimised for a 200% scaling of the 1,024 x 768 screen of the iPad 2, WinRT apps will support automatic scaling at 140% and 180% of the most common 1,366 x 768 resolution, the two percentages at which the interface size appears roughly the same on 1,920 x 1,080 and 2,560 x 1,440 tablet screens respectively.

Developers can choose between an adaptive layout, where a grid or flexible interface sees elements moved or added onscreen as the resolution rises, and a scalable layout in which the interface design is fixed and the whole thing is simply enlarged to fit higher-density displays.

To show how big the desktop gets, the preview pane contains a 1080p video at 100% zoom

> "Apple is taking giant leaps forward; will the rest of the industry catch up soon?"

Similar to OS X, developers supply three sets of assets optimised for 100%, 140% and 180% scaling, and Windows 8 ensures the appropriate set is displayed.

The future

From all this, we can safely assume Microsoft expects high-density displays to play a large part in the first wave of Windows 8 tablets – indeed, the Surface for Windows 8 Pro tablet unveiled last month has a 1,920 x 1,080 resolution on a 10.6in screen, a density of 208ppi. We've also reviewed the Asus Transformer Pad Infinity (*see p106*), which has a 1,920 x 1,200 display and a density of 224ppi.

Until that arrived, the iPad stood alone as the only tablet currently available with a resolution higher than 1,280 x 800 or 1,366 x 768. Other than the new MacBook Pro, we've seen no other laptops with a pixel density that even comes close to 200ppi, let alone tops it. Apple is taking giant leaps forward; will the rest of the industry catch up soon?

The reason only one MacBook model received the upgrade is simple supply and demand: when producing such advanced technology, yields always begin low and gradually increase as methods are refined and production capacity expands. According to analysis by NPD DisplaySearch, mass production of this Retina display started in late May, and only two million units are expected in 2012. Although Apple made sure the MacBook Pro was available to buy at launch, stock ran out within 48 hours, and the Apple Store's estimate was three to four weeks at the time of writing.

Both Apple and its main manufacturing partner Foxconn have invested huge sums in Sharp, the intended supplier of the Retina display for the iPad. Its breakthrough IGZO (indium gallium zinc oxide) screen technology is significantly more efficient than existing TFT technologies, potentially allowing for thinner devices, but manufacturing delays forced Apple to turn to Samsung to get the iPad out on time. The iFixit teardown of the MacBook Pro's Retina display confirms Sharp isn't the sole supplier of that either – LG is at least one supplier – although last month in Tokyo, Sharp demonstrated a remarkable 13.5in 3,840 x 2,160 prototype OLED panel using IGZO transistors. Sharp's president Takashi Okuda reportedly told the crowd its advanced displays will be ready for production this fiscal year.

Whichever company supplies the panels, Apple's huge orders mean capacity is expanding, although the timescales remain unpredictable. NPD DisplaySearch analyst Richard Shim reports that a 13.3in 2,560 x 1,600 panel – which exactly doubles the 1,280 x 800 resolution of the current 13.3in MacBook Pro – will begin production in the third quarter of 2012, for possible launch in Q4, and volume is expected to be roughly twice that of the 15.4in model. From this, we could speculate on 2013 being the year of Retina on the MacBook Air and potentially the iMac, although much will depend on the rate at which yields increase.

All this is more viable for Apple than most, partly due to its huge power in the supply chain, but also because its customers are willing to cover the cost of the new technology. According to Shim, the Retina display in the MacBook Pro is likely to cost about $169 per unit, compared to $68 per unit for a standard panel. With its wide profit margins, Apple can choose to swallow such a cost or simply raise the purchase price, knowing many of its customers will view the advance in quality as a price worth paying.

More mainstream manufacturers will find it tougher to incorporate extra panel costs, but there's evidence supply is increasing at last. Asus has this month upgraded its Zenbook with the same Prime suffix as its Transformer tablets, giving both 11.6in and 13.3in models 1080p IPS displays. You can read a full review on p102, and hopefully its 166ppi display is just the first of many we'll be welcoming into the Labs over the coming months.

We can't confidently say how fast this resolution revolution will move, but it's gathering pace. Smartphones, tablets and laptops; Windows, Mac, iOS and Android: by the end of the year, you'll find high-density screens on them all, initially at a premium but eventually as standard. After years of laptop manufacturers effectively saying "after you" to each other, Apple was the only one willing and able to force the industry to move forward. We'll all reap the benefit of that.

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IN DEPTH

GET MORE OUT OF YOUR PC WITH OUR COMPREHENSIVE ADVICE

How to get the best from your batteries

Looking for all-day performance? Darien Graham-Smith explores how the batteries in mobile devices work, and how to maximise capacity

We're increasingly reliant on mobile devices for computing, whether in the form of laptops, mobile phones or tablets. To that extent, we're reliant on batteries to keep these devices working while we're out and about, and to minimise the time we spend tethered to the wall by a charging cable. On these pages, we'll look at how battery capacity is measured, and what you can do to ensure your devices enjoy the longest possible battery life.

How powerful are modern batteries?

The rechargeable batteries you'll find in laptops and mobile phones are sometimes rated in terms of watt-hours. A rating of one watt-hour (1Wh) means a battery can provide one watt of power for an hour – or, if it's used in a more demanding device, two watts of power for half an hour, and so on. A standard laptop battery might be rated at around 50Wh; a tablet may have around half of that; smartphone batteries are often rated at less than 10Wh.

The watt-hour standard isn't universal: you'll commonly see batteries rated in amp-hours (or, for greater precision, milliamp-hours). Strictly speaking, this represents something different to watt-hours – it's a measure of electrical charge rather than power consumption – but for practical purposes you can think of it as merely an alternative way of measuring a battery's capacity.

All things being equal, more watt-hours or milliamp-hours means longer battery life. If you replace a 4,000mAh laptop battery with a high-capacity 6,000mAh one, you can expect it to last around 50% longer. But if you're comparing two different laptops – or two different phones – you can't necessarily assume the one with the higher battery rating will last longest. Different screens and processors consume different amounts of power.

Even devices with apparently identical technical specifications may gobble up juice at very different rates: for example, one device might use firmware that throttles back the CPU to save energy, while another runs the CPU at full power all the time. Factors such as the brightness of a screen also make a difference. Even the design of the casing can affect battery life: if a system becomes very hot, it may automatically slow itself down to keep things cool, reducing power draw. If the casing of a mobile phone affects its reception, the radio may need to draw more power to hold on to a consistent signal.

For these reasons, battery ratings provide, at best, a rough guide to how long a device will last away from the mains. The only real way to find out how long a battery will last is to test it. Even then, performance will vary depending on whether you're doing something hardware-intensive – such as carrying out big calculations – or something lighter, such as browsing the

"You can help prolong your battery's life by keeping it cool as much as possible"

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web or word-processing. This is why, when *PC Pro* tests laptop batteries, we perform both light-use and heavy-use benchmarks, to give upper and lower bounds for expected battery life.

Expected battery life

There's another reason why capacity ratings can be misleading. Almost all consumer devices use lithium-ion (Li-ion) batteries, as this technology offers comparatively high capacity in a compact form. Some manufacturers describe their batteries as lithium-polymer: this is simply a specific type of Li-ion design that's well suited to modern mobile devices since it needs no metal casing, meaning batteries can be made very light and thin.

Unfortunately, the capacity of any Li-ion battery will inevitably degrade as you use it. A battery that's been used for a few years will have a significantly smaller charge capacity than a brand-new one.

How drastic is the drop off? There's no simple answer to that. Research carried out at Ohio State University in 2010 suggests that if you habitually run a regular Li-ion battery down to zero before recharging, its capacity could drop below 75% of its original level after as few as 300 recharges. Modern laptop manufacturers promise a better lifespan, however: Apple and Samsung both advertise that the batteries in their laptops will take up to 1,000 full charge and discharge cycles before falling to 80% of their original capacity.

At this point it's worth addressing the persistent notion that fully discharging a battery before recharging prevents the "memory effect" and prolongs its lifespan. This was perhaps true for old nickel-cadmium rechargeable batteries (which are in fact now banned in the EU, since cadmium is highly toxic), but with modern Li-ion technology it's actually best to do precisely the opposite. Degradation is minimised if you discharge the battery as little as possible before recharging.

Li-ion battery capacity can also be affected by heat. By some estimates, a battery that's exposed to ambient heat of 25°C for a year will lose 20% of its capacity, with higher temperatures having an even more drastic effect.

Unfortunately, most laptops inevitably heat up when they're in use (especially modern Ultrabook-style designs that have little or no space for internal ventilation), so heat degradation is unavoidable. But you can help prolong your battery's life by keeping it cool as much as possible, and not storing it in a hot environment.

A last tip for prolonging the life of a Li-ion battery is not to leave it empty, or with a very low charge, for a long period. Lithium batteries lose between 5% and 10% of their capacity a month when not in use, and if the charge drops below a certain level it will no longer be possible to recharge it.

> "A tip for prolonging the life of a Li-ion battery is not to leave it empty for a long period"

Note that this advice applies only to Li-ion batteries. Nickel-metal hydride (NiMH) batteries – such as rechargeable AAs – can be fully discharged without suffering any harm, and aren't so sensitive to heat.

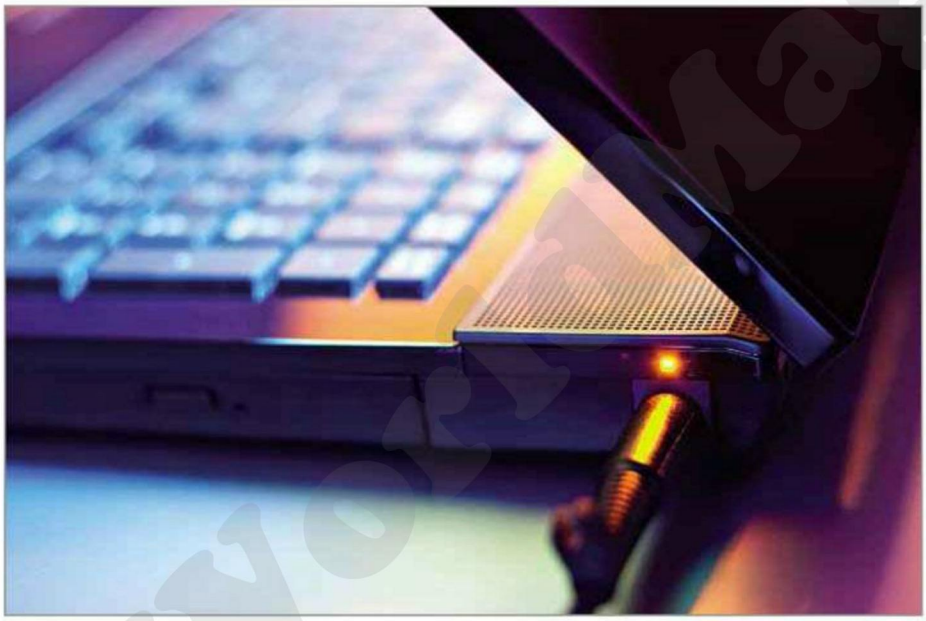
Maximising laptop battery life

It's natural to want the longest possible battery life from your laptop. If you have a modern thin and light model in which the battery is integrated into the body and can't be replaced, you'll want to maximise its lifespan, too, since replacing it means sending it away and probably facing a hefty bill. As we've mentioned above, the best way to do this is to avoid completely emptying the battery between charges – so in all cases what's really wanted is a way to make a charge last as long as possible.

The Power Options in the Windows Control Panel (called Energy Saver in OS X) let you control various settings, such as how long the computer should sit idle before automatically dimming its screen, spinning down its hard disks, going to sleep and so forth. Such measures are helpful if you're using the computer sporadically, but do nothing to prolong battery life for a PC in constant use.

Happily, there are several things you can do to increase the battery life of a PC while you're using it. The most obvious one is to keep the screen at a lower brightness level. This is a great way to save power, as the LCD panel is one of the most energy-hungry components in a laptop, yet it doesn't affect the practical performance of your computer at all.

Many laptops progressively dim the screen automatically as the battery depletes, so as to eke out the remaining charge. You can get a greater benefit by dialling back the brightness of your screen full-time, perhaps turning it up only when bright ambient light makes things hard to read. The effect will vary from system to system, depending on the particulars of the



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hardware. We tested an Asus N55SF laptop (with the battery disconnected) and found the whole system consumed 20W when sitting idle with the screen at full brightness, but only 15W at its dimmest.

Another power-hungry component is the processor. When under heavy load, the CPU is by far the most demanding part of the system – this is when it may approach its maximum Thermal Design Power (TDP) rating. We tried stress-testing our sample laptop, taxing each of its four cores (plus four virtual cores provided by Intel Hyper-Threading) with 100% load: power draw rocketed from an idle rating of 20W to a steep 75W. Since the supplied battery is rated at 56Wh, expected battery life under this type of load would be a mere 45 minutes.

Clearly, it's best to avoid running heavy number-crunching processes on battery power. You may even choose to throttle the maximum CPU speed in Windows' Power Options – and it's worth having an audit of your startup items to disable any unneeded programs that run in the background and keep your CPU churning needlessly. See last month's discussion of tune-up utilities for a guide (*see issue 215, p54*).

If your laptop has switchable graphics, you can save power by ensuring the discrete GPU is disabled and steering clear of 3D applications, as these devour power at a great rate. You can cut a few additional watts by disabling unneeded wireless features such as Wi-Fi and Bluetooth; disconnecting USB peripherals that draw power from your PC; ejecting discs from optical drives, which may otherwise periodically spin up; and even turning off unnecessary lights, such as keyboard backlights. We can't promise any of these measures will give you more than a few minutes of extra battery life, but at least you'll know you're not wasting power.

Finally, if you need to use your laptop intermittently, consider setting the default sleep mode to hibernate instead of sleep. This switches off the computer completely, so it will take a bit longer to resume, but the battery won't be depleted while you're not using it.

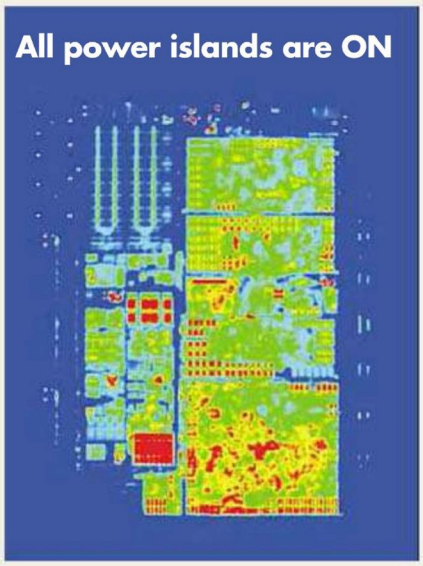
Reducing power consumption

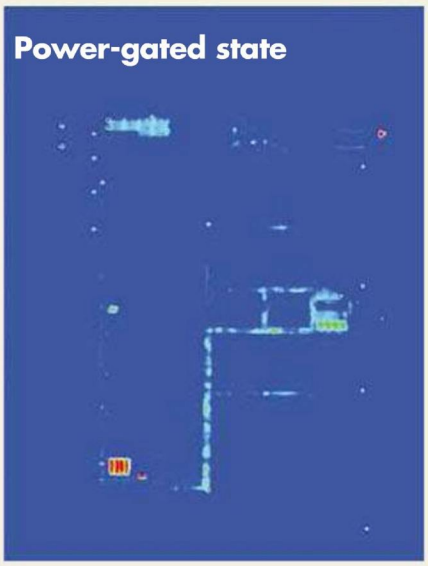
Modern CPUs are designed with a strong focus on cutting power consumption, so as to make the most of each battery charge. It's no exaggeration to say that energy efficiency is a bigger concern for chip-makers than performance: Intel CTO Justin Rattner last year set a goal of cutting PC power requirements by a factor of 300 in a decade.

This will be accomplished through a variety of energy-saving measures. First, the regular "die-shrink" process – wherein existing CPU architectures are physically reduced in size – will continue to reduce the scale of electrical leakage, allowing the same amount of work to be done with less power.

Recently, Intel has also been building extensive power-gating capabilities into its chips. This divides the chip into dozens or hundreds of isolated "power islands", each of which can be turned on individually as needed, and switched off again when its function has been completed. The thermal image below shows how, in its fully gated state, the chip is almost entirely cold, indicating most of it is unpowered. This can reduce the chip's overall power consumption significantly when doing something simple such as writing a word-processing document.

The CPU is, however, only one component of a laptop – so there's a limit to how much power can be saved in this way. Intel is therefore working on more ambitious plans, too. CEO Paul Otellini announced last year that the Haswell micro-architecture, due for release in 2013, would introduce a "system-level power-management framework". Details remain under wraps, but we expect to see motherboard components such as USB ports, audio outputs and network adapters powering down when not in use. Otellini has promised that Haswell's power-saving systems will enable laptops to deliver "all-day usage, and more than ten days of always-connected standby, on a single charge".





Maximising battery life on phones and tablets

It's a frequent complaint that mobile phone batteries don't last as long as they used to. A few years back you could expect a charge to last for three or four days on end, whereas now it's the norm to recharge every night. Indeed, it's a catch-22 situation, since running down the battery in this way inescapably leads to a progressive reduction in capacity over time.

Battery technology hasn't regressed, of course: rather, phones have become much more demanding, with vastly more powerful CPUs, huge screens and dozens of processes running in the background at all times. Effectively, they're little computers – as are tablets. And for both types of device, you can save battery life in most of the same ways: dimming the screen and turning off wireless and Bluetooth connections when they're not needed, as well as the GPS receiver, for example.

On a smartphone, you can also reduce the amount of power used by the radio unit by preventing apps (and system features such as Google Play and Gmail) from automatically polling for updates, or making them do so less frequently.

Android users may choose to install a battery-saving app that will automatically switch various features and services on and off to a schedule – one example being the free JuiceDefender app – so they're available at times when you might want them but not wasting power when you don't. Unfortunately, Apple's developer restrictions mean this isn't possible in iOS.

Android also supports a range of "task-killer" apps, which automatically close programs running in the background, but here the benefit is likely to be minimal: Android apps (unlike Windows applications) are largely suspended when not running in the foreground, so there isn't much to save. Indeed, if you end up repeatedly relaunching closed apps, this can consume more power than leaving them running in the first place.

A final tip: as with laptops, do your best to keep phones and tablets cool – for example, by avoiding leaving them in hot cars. Heat will quickly erode the battery's life – and, in many cases, there's no easy way to replace a rundown battery.

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HANDS ON

Automate your web with ifttt

Overwhelmed by web services? ifttt is a free tool that can take care of many tasks automatically. Darien Graham-Smith shows how it's done

The free online automation service ifttt watches for specified events and carries out predefined actions when they occur (the name is short for "if this then that"). At its simplest, you can use ifttt as a notification tool for your online services: you might set it up to send you an email when a friend publishes a new blog post, or when someone posts an advert on Craigslist that matches particular search terms.

ifttt can do more advanced things, too, thanks to its ability not only to monitor events, but also to interact with online accounts. For example, whenever you publish a new update to your own blog, or upload a new photo to your Flickr account, you can configure ifttt to automatically post the link to Twitter. It's like having a secretary to help keep on top of what's going on in all the various online communities you're a part of. You can sign up for a free account at **http://ifttt.com**. Don't be put off by the huge text and acres of white space – the ifttt website is designed to convey an almost child-like sense of simplicity.

How ifttt works

ifttt is still officially in beta, so it's regularly being improved and updated. Already, though, it can connect to 40 different online services. The modules within ifttt that handle these various services are called "channels", and you can browse a full list of them at **http://ifttt.com/channels**.

Each channel comprises a set of triggers and actions that are specific to a particular service. Triggers are simply events that can be checked for: triggers for the Twitter channel, for example, include "New tweet by you", "New tweet by you with hashtag" and "New follower". Most triggers are checked at 15-minute intervals, although some events will prompt an immediate response.

Actions are, as the name implies, things ifttt can do with an online service (object-oriented types might like to think of them as methods). The Twitter channel's actions include "Post a new tweet" and "Add user to list". These actions are carried out from your Twitter account, so before using the Twitter channel for the first time, you must authorise ifttt by confirming your Twitter password. All channels in ifttt are disabled by default, but it takes only a moment to activate and authorise them as required.

Making ifttt work for you is as easy as connecting an action to a trigger, to produce what's called a recipe. Using just the Twitter channel, for example, you could create a recipe that automatically posts "Hello to my new follower!" every time someone starts to follow your feed. (This might not endear you to your existing followers, but you could do it.) The process is entirely visual and largely mouse-driven: first you specify an "if this" condition, then a "then that" action. See our walkthrough on p54 for a detailed guide.

Once you've created one or more recipes, you can manage them by clicking on the My Recipes tab at the top of the main ifttt page: from here you can delete, deactivate or edit recipes, as well as share them with others – as we'll discuss later.

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Ingredients

If you want to create more advanced behaviours for ifttt, you can do so by making use of specific "ingredients" – that is, data items relating to the trigger. For example, the New Follower trigger within the Twitter channel exposes five ingredients: your new follower's username, real name and profile text, plus URLs for their avatar image and their main profile page.

This data can be used within actions: for example, you can configure the "Post a new tweet" action to include the name of your new follower in your welcoming tweet. Making this happen is easy: simply enter the name of the ingredient in double braces. The text of your automatic tweet might therefore read:

```
A big hello to my new follower
{{FullName}}!
```

When this is posted, the ingredient reference will be automatically replaced with the appropriate data. If you don't know the name of the ingredient you want to access, you can see all the available options from a dropdown menu, and click to insert whichever you want. When you do this, or click out of the text-entry field, valid ingredients will appear in your text as blue blobs, while invalid ones are highlighted in red, making errors impossible to miss.

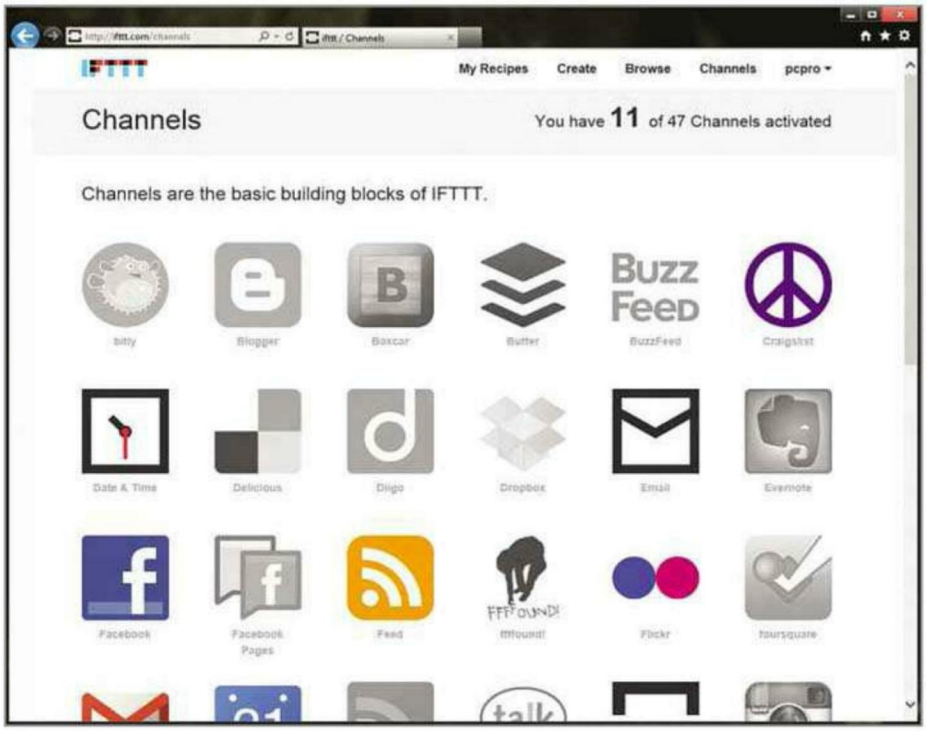
Mix and match

It's cute to have a script that automatically takes care of Twitter niceties without your intervention, but the real power of ifttt lies in its ability to work across services. We suggested above that you could use ifttt to create a Twitter post every time you upload a new Flickr photo, and this provides a fine example of ifttt's versatility. To set it up, first go to the Flickr channel and create a recipe using the "Any new public photo" trigger as the "if this" part.

Next, for the "then that" section, select the Twitter channel, then once again select the "Post a new tweet" action. You'll see that ifttt automatically inserts the title of your new photo and a short link to it: actions can access all the ingredients exposed by triggers, even if they come from a different channel, so you can effortlessly customise your tweet to contain all sorts of details about the new photo, such as the date it was taken and its description on Flickr.

ifttt's ability to connect disparate web services in this way opens up a tremendous range of possibilities. For example, you don't need to use Twitter for your notifications: you might prefer to configure the service to send emails (from your own account) containing information from whichever channel you're monitoring. You can post automatically to a Blogger or WordPress blog, via the appropriate channels, or add notes to an Evernote notebook.

Since many trigger ingredients pass URLs, it's possible to create tasks that share between services. Instagram uploads can be duplicated to Tumblr. Videos you mark as favourites on YouTube, or tracks you love on last.fm, can be shared on Facebook.



When you start using ifttt, its 40+ channels are disabled, but it's quick and easy to activate them and authorise ifttt to access your various services

Extra channels

Most of ifttt's channels access web services directly, but there are a few that work in slightly different ways. The triggers and actions in the Dropbox channel allow you to upload files in your Dropbox folder to online services, or selectively download files based on information received from other channels. The Feed channel lets you monitor the content of any RSS or Atom feed, and act on new posts that match a specified template. This can be used for many purposes, from simple notifications to uploads and downloads based on URLs within posts.

A few of the channels on offer barely involve the internet at all, although that doesn't make them any less useful. The Date and Time channel lets you create recipes that run at set intervals or to a given schedule, while the Google Calendar channel can trigger actions from calendar events. The Weather channel monitors weather reports for a specified location (using data from Yahoo Weather) and can trigger actions based on current or future meteorological conditions, including wind speed and pollen count.

A particularly neat feature is the SMS channel, which can send you text alerts whenever your preset conditions are met, meaning you don't have to be near a computer at all to stay in the loop. You can also send text messages to ifttt to trigger tasks – this takes effect immediately – or as a simple way of posting to a blog or a social network.

Disappointingly, one of ifttt's headline channels – the Phone Call channel – isn't yet available for non-US users. If you do have a US phone number, though, this channel lets you dial up an ifttt phone number and trigger an action by leaving a voicemail message. A URL of the audio of the message is made available as an add-in, as is an automatic text transcription, meaning ifttt can be used as a musician's sketchbook or as a remote voice control for numerous online apps.

US users can even configure ifttt to call them and read out the data contained in any add-in, so you could use the service to alert you to more or less anything that might happen online. Or, as some crafty ifttt users have discovered, you can use it as a way to generate a fake phone call should you need an excuse to exit an awkward situation. Just send an SMS to trigger the recipe and you'll receive a call very shortly afterwards.

Intriguingly, the most recent update to ifttt has added channels for controlling Belkin's

"ifttt's ability to connect disparate web services opens up a range of possibilities"

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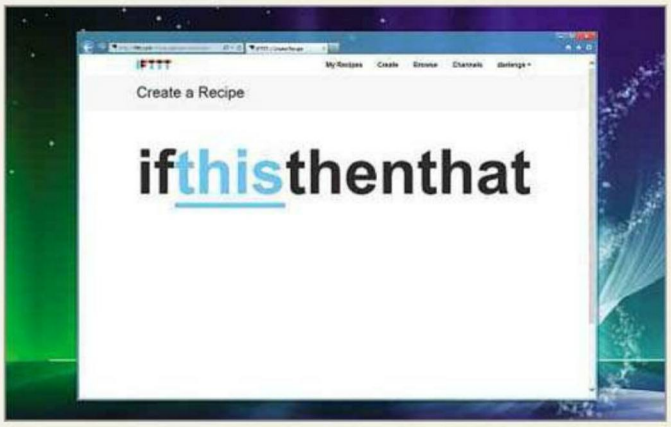
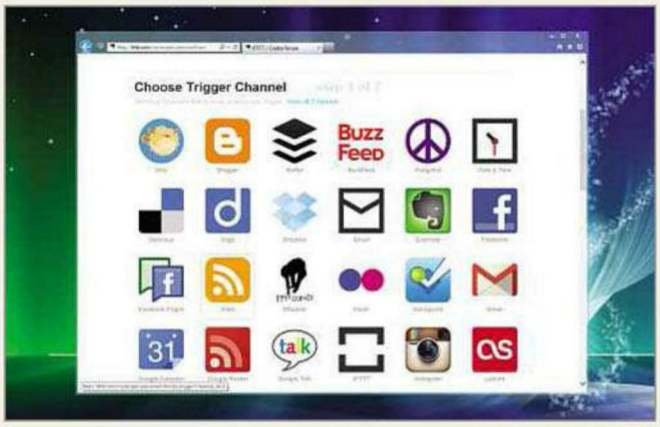
WALKTHROUGH

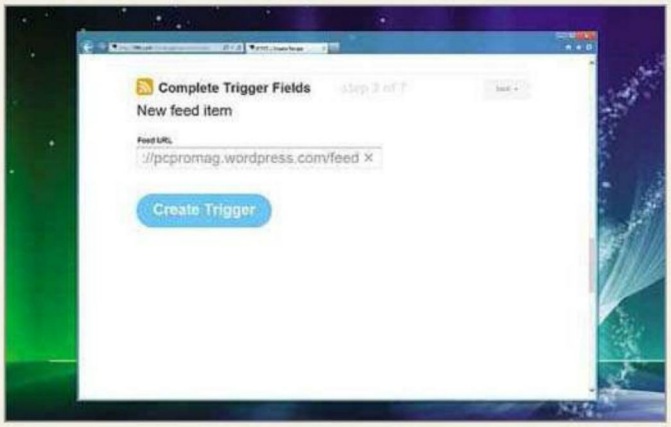
Set up SMS notifications for the *PC Pro* podcast



1 In this walkthrough, we'll create a task that sends you a text message when a new *PC Pro* podcast is published. Start by logging into the service: if you don't have an account, you can create one for free at http://ifttt.com. When you see the welcome screen, click the "Create" link at the top of the window.



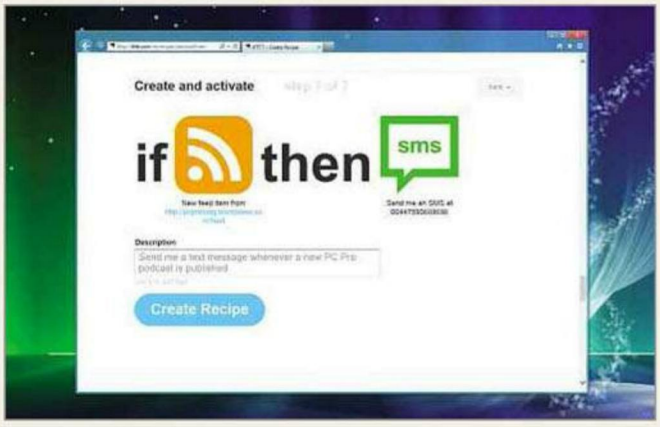
2 Click on this and you'll be invited to start by setting up the "if this" side of your new recipe. A grid of all available channels will appear: we want our recipe to trigger every time a new item is posted to the *PC Pro* podcast RSS feed, so select the Feed channel.



3 The Feed channel offers two triggers: "New feed item" and "New feed item matches". We don't need to worry about matching terms, since this RSS feed is used only for new podcasts, so select "New feed item" and enter the URL of the feed you want to monitor, which in this case is http://pcpromag.wordpress.com/feed.

4 Now we choose the "then that" side of things. For this we want to use the SMS channel: if you haven't used this channel before, you'll be prompted to activate it and provide your mobile phone number for verification. This has to be done only once. Enter your number in international format, starting 0044.

5 Now you can specify the format of the SMS messages you want to receive. ifttt automatically populates the message with the most informative details, so there's no harm in leaving this as it is. If you prefer, though, you can customise it with your own text and different ingredient data. Click "Create action" when you're happy.



6 Finally, you'll be prompted to provide a name for your new recipe. Once this is done, the recipe will appear under My Recipes. It will be active right away, so you don't need to do anything more: the icons to the right let you delete the recipe, temporarily disable it, share it, or view and edit the details.

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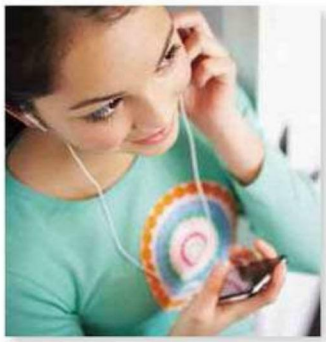

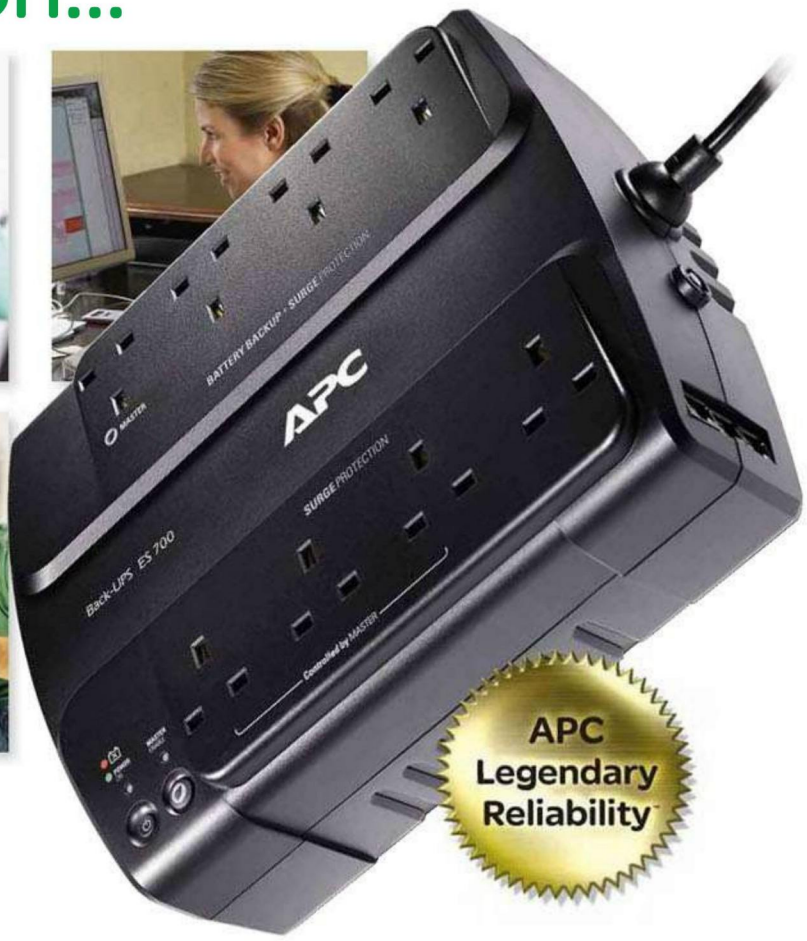

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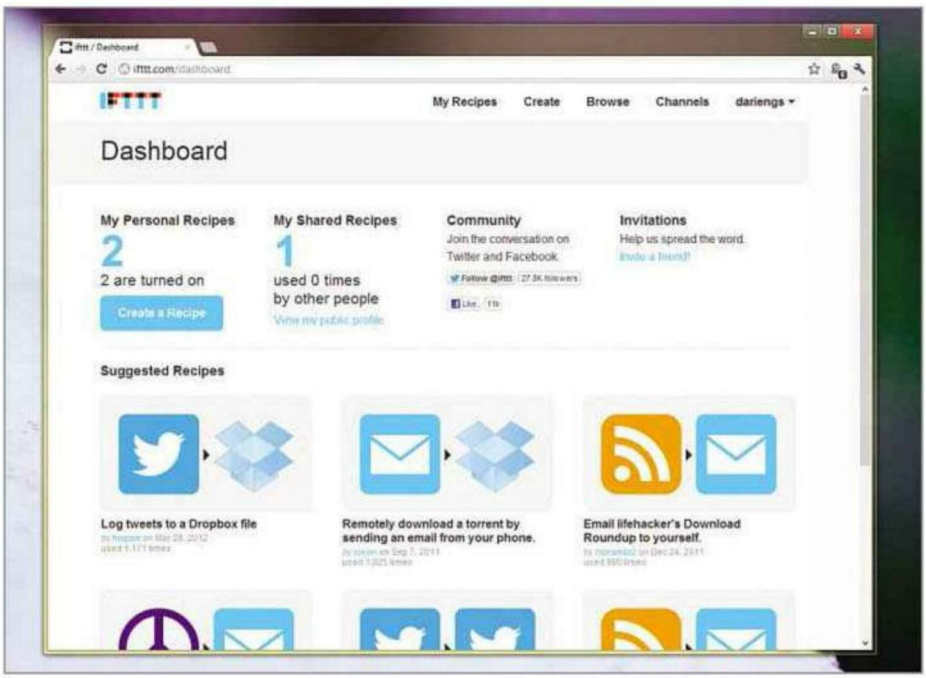

The ifttt dashboard provides a quick overview of your ifttt usage and suggests recipes you might find useful

WeMo home automation devices, making it possible to create recipes that turn electrical appliances on and off in response to online triggers, or which generate an online response when motion is detected in your home.

Shared recipes

Although ifttt is still in beta, the service has already been up and running for more than 18 months, during which time its users have created more than one million recipes. So whatever you want to do, it's very likely that someone will already have created a recipe to do it – and there's normally no need to reinvent the wheel. If an ifttt user has chosen to share a recipe, you can make use of it right away.

To access other people's shared recipes, click on the Browse tab at the top of the ifttt page. When the list of recipes and descriptions appears, you can search descriptions using the box at the top of the page, select the channels that are included with the "Filter" button, and change the sorting using the dropdown menu at the top right. Of course, you can simply browse what's on offer: some creative users may have come up with uses for ifttt that you wouldn't have thought of (*see Ready recipes, below*).

Once you find a promising-looking recipe, press the arrow icon at the right of the page to review it. If it uses channels that you haven't activated, you'll be prompted to activate them before continuing. You can then edit the trigger and action before adding the recipe to your own account. If you want to share one of your own tasks, click on the My Recipes tab, then click on the Share icon.

Limitations of ifttt

ifttt's simplicity makes it tremendously accessible, even if you've never written an automation script in your life. However, power users could find it limiting. For a start, you can't combine conditions: for example, you can't configure an action to trigger only if a new email arrives in your Gmail account between 4pm and 6pm. You can't create new triggers, such as a recipe that executes when a named person posts a new comment on your WordPress blog. And if you were hoping to create new channels to interface with your own favourite web services, you can forget it: ifttt is, for now, a closed system.

Yet it may not stay that way forever. The development team has expressed the hope of developing a public API as the service matures. This would turn ifttt into a fantastically powerful open interconnect between online (and offline) services. If that's something you want to see happen, perhaps the best way is to support your interest in ifttt now, by creating an account and setting up your own recipes.

Ready recipes

There are thousands of ready-to-use recipes available on the ifttt website, showcasing the range of uses to which the tool can be put. Some of these are simple time-savers: for example, there's a recipe that activates when you change your profile picture on Facebook and automatically updates your profile picture on Twitter to match.

Some are more ingenious, such as those that pick up information from RSS feeds. One recipe collects movie release dates and inserts them into a Google calendar for you, so you can see at a glance when films are released. Another uses the RSS feed of the still-popular Dilbert website to send daily cartoons straight to your inbox.

Recipes created by others are available to you, making it easy to set up sophisticated automation tasks

One thing that ifttt can't do is directly control applications that run locally on your PC, but some applications can be indirectly automated. For example, if you're using the Plex media-centre software, it's possible to add videos to your viewing queue by sending an email to a preset address. On the ifttt website you'll find recipes that pick up video URLs from an RSS feed – or from your own actions on sites such as YouTube and Vimeo – and send them to Plex automatically.

You'll also find recipes that work in conjunction with local applications that use watched folders. For example, if you use BitTorrent and want to download new files automatically as they become available, simply set your software to watch a folder within your Dropbox, then activate an ifttt task that monitors an RSS feed and downloads new torrents into this folder. Voilà – a completely automatic download system.

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HANDS ON

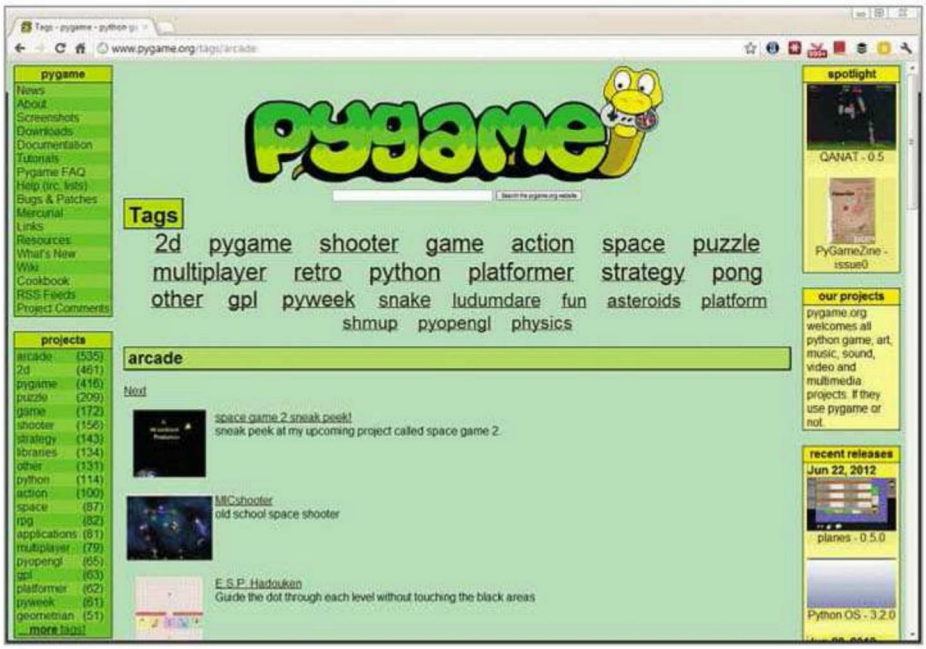
Create a Python game for the Raspberry Pi

Want to code your own action game for the Raspberry Pi? Kevin Partner shows how to create a simple shoot-em-up in Python

If you're the proud owner of a Raspberry Pi, the visual Scratch language is a great way to take your first steps in programming (*see p60*). But to unlock more of the power and potential of the hardware, take a look at Python.

Python is the default educational programming language for the Raspberry Pi. It's used around the world as an introductory language for many platforms, thanks to its uncluttered style and easy-to-understand syntax. It isn't only for beginners, though: according to the TIOBE Programming Community index, Python is the eighth most popular programming language among professional engineers, ahead of Perl, JavaScript and Visual Basic .NET. It's also free, so it's easy to see why so many people choose Python as their first scripting language.

In this feature we'll introduce the key concepts of Python, and show you how to get started with the language by walking you through a sample game written in Python. Then it's over to you to create your own masterpiece, which you can submit to our Raspberry Pi coding competition (*see p42*).



Although the website looks undeniably amateur, Pygame is a hugely powerful Python library that's been used to produce thousands of games

Getting to know Python

There are two major versions of Python in use. Python 3 is the future, but Python 2 enjoys wider compatibility with existing resources, and it's this version that's currently bundled with Raspberry Pi. For this tutorial, we'll use Python 2.7, the final stable release in the 2.x series: this means we can use the majority of online examples and pre-written code unchanged. When the time comes, moving up to version 3 will be straightforward.

The first thing you may notice about Python is how neat it looks. Those used to PHP, JavaScript or other modern languages will also spot the absence of curly braces, as conventionally used to enclose sections of code. This is because Python uses indentation to organise code. This is good practice in most languages, because it makes code more readable: in Python it's mandatory. If you don't get your spacing right, your code won't work.

While this can be a shift for experienced programmers, it becomes natural quickly and leads to clear, intelligible code by default.

Python also makes a good first language because it represents a simple implementation of object-oriented programming – a concept any aspiring coder must understand – and is relaxed about how variables are created and managed. The net result is a particularly productive programming environment.

Python code is usually run through an interpreter rather than being compiled, but despite this, end results are pretty fast. Python applications can run on all major operating systems, so it's possible to create a Python game on a Windows PC and have it run on a Mac or Linux box – or, indeed, a Raspberry Pi.

A final great strength of Python is the availability of a wide range of add-on modules that bring extra functionality. One such module is Pygame (**www.pygame.org**). As its name suggests, Pygame helps you create games using Python: for example, it greatly improves image handling through its Sprite class, makes it easy to control in-game audio, and even allows your game to work with joysticks. Games such as Call of Duty might be beyond its capabilities, but an Angry Birds clone certainly isn't.

Native and cross-platform development

If you're running the recommended Debian Squeeze Linux distribution on your Raspberry Pi, Python and Pygame come preinstalled, so you can start programming right away. You can write Python scripts in a text editor, but we suggest you take advantage of the free Geany integrated development environment (IDE) that's also installed as part of the operating system. This software offers numerous helpful features for programmers, such as automatic syntax colouring, to make your code simpler to read and debug, and a symbol browser to help keep track of all the classes and variables in your code.

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As we've mentioned, however, Python works across many platforms, so you can write your code on a Windows PC and then move it across to the Raspberry Pi when you're finished. To do this, you'll need to install Python 2.7 on your PC: you can get the installer from **www.python.org/download**. Even if you're running 64-bit Windows, choose the regular Windows installer, not the x86-64 one, since the standard Pygame installation is 32-bit only.

"A great strength of Python is the add-on modules that bring extra functionality"

Once you've installed Python (accepting the installation defaults), Pygame for Windows can be downloaded from **www.pcpro.co.uk/links/216id1** – again, accept default settings. If you already have a preferred IDE, it will almost certainly support Python "out of the box"; if not, get Geany for Windows free from **www.pcpro.co.uk/links/216id2**. To configure it for testing and running Python scripts, launch Geany, then go to the Build menu and click Set Build Commands. Find the Execute field and replace the current contents with C:\Python27\python %f (assuming you installed Python to the default directory).

Designing a game

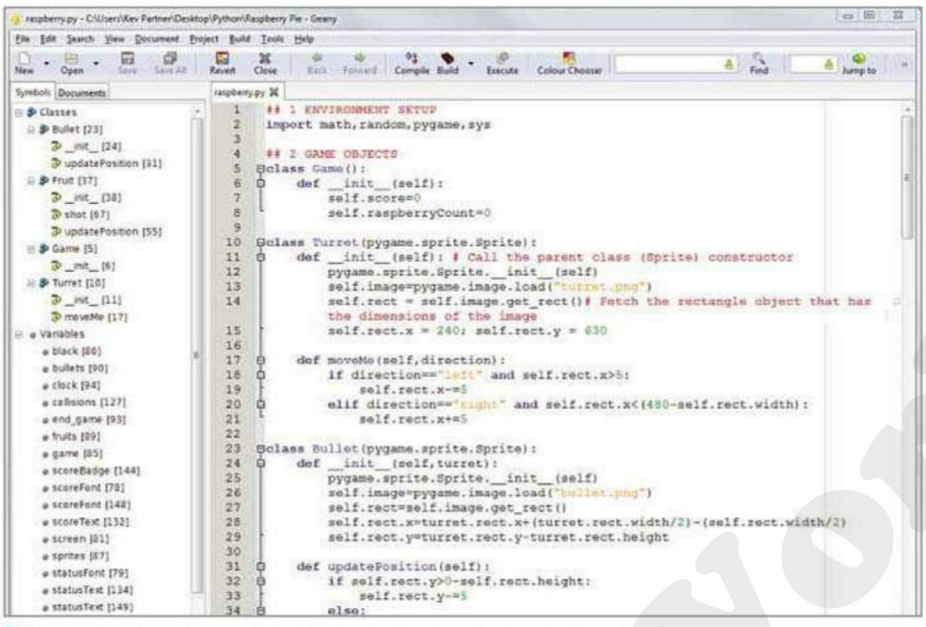
Our first Python project will be a simple shooting game called Raspberry Pie (ahem). In this game, three different types of fruit will fall from the top of the game area, but only the raspberries should reach the bottom and go into the pie. The player controls a movable turret, and wins points by shooting cherries and strawberries: points are deducted if a raspberry is destroyed accidentally, or if one of the other fruits ends up in the pie.

Let's start by collecting together the assets. The Open Clip Art Library (**http://openclipart.org**) is a great place to find free clip-art; we can get our fruit images from here. We'll create our own images for the turret and the bullets. We could collect together sounds for our game, too, but for now we'll keep things simple and silent.

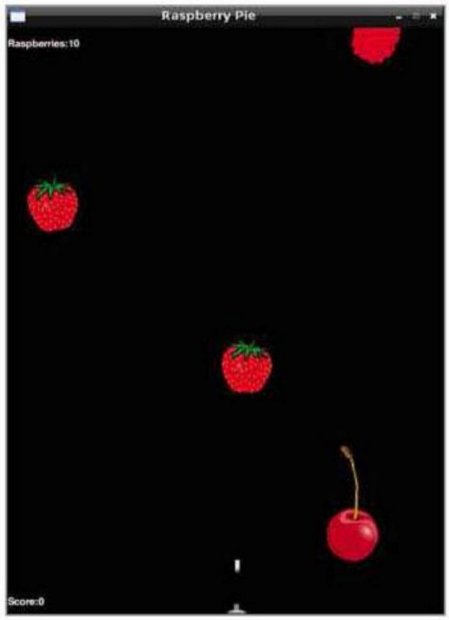
Now let's think about how we're going to structure our program. The basic structure of an arcade game is the same whether you're planning to use Scratch, Python or any other tool. We begin by setting up the execution loop environment, and create the objects that will be used in the game. We then initialise everything – for example, setting the score to zero. Then there's a main loop that handles the gameplay. Once the game ends, the score is displayed.

Objects

Object-oriented programming (OOP) underpins most modern programming languages, and it isn't too difficult to understand. Think about the visible objects in our game: the only aspects that vary from one tumbling fruit to another are their position and genus (that is, whether they're raspberries, strawberries or cherries). We can therefore represent them all very simply by creating a single fruit *class* with *properties* that indicate genus and position. We can then create fruits as independent *instances* of the class (these instances are the "objects" of OOP), each of which contains information about what sort of fruit it is and its location.



Geany is a free, lightweight IDE that's ideally suited to Python development



Our game runs exactly the same way on the Raspberry Pi as it does in Windows

As well as properties, classes can have *methods* – built-in actions that we can invoke whenever we want. In the case of fruit, the major thing each object does is fall. So we might build a method into our class that says "take my current vertical position and move it down by 3 pixels".

Since all the code relating to the fruit sits within the fruit class, bugs are easy to find and, once fixed, apply to all instances across the entire program. You can even base one class on another, giving you a hierarchy of subclasses. For now, however, let's stick to a simple implementation. Remember that, while classes are written as part of the code, objects are created only when the program runs, and don't exist beyond the duration of the game.

Creating the code

On the following pages we'll walk you through the code for Raspberry Pie, so you can see how the program works and type along if you wish. If anything seems unclear, your first stop should be the Python documentation (**http://docs.python.org**) for more information. We'll also be drawing heavily on the methods and properties provided by Pygame – see **www.pygame.org/docs** for more information.

You can also download a copy of the code from **www.pcpro.co.uk/links/216id3**, so you can play the game yourself right away. In addition, you can use this code as a starting point to learn more by modifying and updating it yourself. Can you add a high-score table? Or make different types of fruit move in different ways? Once you've mastered the basics of writing games in Python, you can create your own original game, and send it in for our competition (*see p42*).

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WALKTHROUGH

Creating Raspberry Pie in Python

1
```
## Import libraries
import math,random,pygame,sys
```

2
```
## Set up class for main game variables
class Game():
        def __init__(self):
                self.score=0
                self.raspberryCount=0
```

3
```
## Set up class for the player's turret
class Turret(pygame.sprite.Sprite):
        def __init__(self):
                pygame.sprite.Sprite.__init__(self)
                self.image=pygame.image.load("turret.
png")
                self.rect = self.image.get_rect()
                self.rect.x = 240; self.rect.y = 630
```

4
```
## Set up method to enable the player's turret to move
        def moveMe(self,direction):
                if direction=="left" and self.rect.x>5:
                self.rect.x-=5
                if direction=="right" and self.rect.
x<(480-self.rect.width):
                self.rect.x+=5
```

5
```
## Set up class for bullets
class Bullet(pygame.sprite.Sprite):
        def __init__(self,turret):
                pygame.sprite.Sprite.__init__(self)
                self.image=pygame.image.load("bullet.
png")
                self.rect=self.image.get_rect()
                self.rect.x=turret.rect.x+(turret.rect.
width/2)-(self.rect.width/2)
                self.rect.y=turret.rect.y-turret.rect.
height

## Set up method to move bullets up the screen
        def updatePosition(self):
                if self.rect.y>0-self.rect.height:
                        self.rect.y-=5
                else:
                        self.kill()
```

6
```
## Set up class for fruit
class Fruit(pygame.sprite.Sprite):
        def __init__(self):
                pygame.sprite.Sprite.__init__(self)
                self.genus=random.randint(1,3)
                if self.genus==1: imagefile="raspberry"
                if self.genus==2: imagefile="strawberry"
                if self.genus==3: imagefile="cherry"
                self.image=pygame.imageload(imagefile+".
png")
                self.image=pygame.transform.rotate(self.
image,-15+random.randint(0,20))
                self.rect=self.image.get_rect()
                self.rect.y=-0-self.rect.height
                self.rect.x=(random.randint(2,44)*10)
```

1 Start by opening Geany and saving a blank document as "raspberry.py". The extension tells Geany we're using Python, so it will highlight our syntax accordingly. As another visual aid, go to Geany's Edit menu, select Preferences | Editor | Display and tick "Show white space" – this helps spot indentation errors. Now we're ready for our first line of code. The import statement links external libraries into our program, so we can use the classes, properties and methods they contain. Before going any further, let's test that these libraries can be found. Click the Execute button and a command window should pop up. If there's a problem, this will contain an error message; otherwise, we're good to go.

2 Now we create our first class – a simple one called Game that keeps track of the score. We define this class using the class statement, and give it a name. The colon after the name marks the start of the block of code that describes the properties of instances of Game. No punctuation is needed to mark the end of this block: that's shown by indentation. Define a single method called "__init__". This is a special method (called a constructor) that's automatically run whenever an object of this class is created. In this case, it creates and initialises variables for the score and the raspberry count. As you can see, the same colon and indentation syntax is used, and when we're defining a class we use the placeholder "self" to stand in for whatever the name of the instance might be.

3 Now let's define a class for the player's turret. We'll base this on Pygame's Sprite class, which is full of useful properties and methods. To specify this, we put the name of that class (the "parent class") in brackets after the class name. Now we create a constructor method for the turret. First, we call the parent class constructor to initialise everything. Then we use the Pygame image.load method to import a graphic for our turret and store it in the property "image". The get_rect() method lets us access the position and dimensions of this image, so in the next line we can use the rect property to set the pixel position of the turret. The co-ordinates we've chosen place it halfway along the bottom of the area we're going to use for the game. Using a semicolon lets us put two commands on one line.

4 The turret needs to be able to move, so we'll add a second method called moveMe, to be called when the player presses a cursor key. This will take two arguments: a reference to the turret to be moved and a direction to move in. If the direction argument is "left" – and the left edge of the turret isn't already within five pixels of the edge of the game area – we subtract five pixels from its horizontal co-ordinates using the "-=" subtraction operator. (Note also the "==" operator that's used for checking if two values are equal.) If the direction is "right", we test whether the turret's right edge is too close to the right-hand side: we calculate this using the rect.width property, so our code will work regardless of what size the turret graphic is. Assuming there's space to move, we then add five pixels to the turret's horizontal co-ordinate.

5 Next we create a class for bullets, in much the same way as the turret. However, whereas the turret is always created in the middle of the playing area, each new bullet instance must appear directly above the centre of the turret. To find the correct "x" co-ordinate, we perform a few calculations involving the rect.width properties of both the turret and bullet objects. To place the bullet directly above the turret, we set its "y" co-ordinate to be the same as the "y" co-ordinate of the turret, minus the turret's height (vertical co-ordinates count from the top of the screen to the bottom). The bullet needs a movement method too: updatePosition moves it five pixels up the screen, or deletes it if it has reached the top.

6 All three types of fruit in the game behave in the same way, so we can derive them all from a single class. The type of fruit each instance represents is determined by a random integer between one and three, and stored in a property called genus. We use this property to assemble a filename and load in the right image. To add visual variety, we rotate the image randomly, to an angle between -5° and 15°. All fruits start out above the top of the screen, ready to drop into the playing area, so we set the initial vertical position to zero, minus the height of the image. Finally, we set its horizontal starting position. We don't want fruit to protrude off the edge of the play area, so we use a random number between 20 and 440.

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To find out about our Raspberry Pi competition
Read our feature on p38

```
## Set up method to enable fruit to fall down the screen
        def updatePosition(self,game):
                if self.rect.y<640:
                        self.rect.y+=3
                else:
                        if self.genus==1:
                                game.score+=10
                                game.raspberryCount+=1
                                else:
                                game.score-=50
                        self.kill()
## Set up method to update score and remove fruit when
shot
        def shot(self,game):
                if self.genus==1:
                        game.score-=50
                else:
                        game.score+=10
                self.kill()
```

```
## Initialise the game
pygame.init()
pygame.key.set_repeat(1, 20)
scoreFont=pygame.font.Font(None,17)
statusFont=pygame.font.Font(None,17)
black=(0,0,0)
screen=pygame.display.set_mode([480, 640])
pygame.display.set_caption('Raspberry Pie')
```

```
## Create initial object instances
game=Game()
turret=Turret()
sprites=pygame.sprite.Group()
sprites.add(turret)
fruits=pygame.sprite.Group()
bullets=pygame.sprite.Group()
```

```
## Initialise game over flag and timer
end_game=False
clock=pygame.time.Clock()
tock=0
```

```
## Main loop starts here
while end_game!=True:
        clock.tick(30)
        tock+=1
        screen.fill(black)
```

```
## Process events
        for event in pygame.event.get():
                if event.type==pygame.QUIT:
                        sys.exit
                if event.type==pygame.KEYDOWN:
                        if event.key==pygame.K_LEFT:
                                turret.moveMe("left")
                        if event.key==pygame.K_RIGHT:
                                turret.moveMe("right")
                        if event.key==pygame.K_SPACE:
                                bullet=Bullet(turret)
                                bullets.add(bullet)
```

7 Just as bullets travel upwards, fruit moves down the screen at regular intervals – so we give this class its own updatePosition method. If the fruit's vertical position is less than 640 – that is, if it's still within the play area – it drops by three pixels. Otherwise, the score is updated. If the object's genus property is 1, meaning this fruit is a raspberry, the player gets ten points, and the raspberry counter is incremented. Otherwise, the player loses 50 points. Either way, the fruit object is now deleted. We also create a method called Shot, to be called if the fruit is hit by a bullet. If the fruit is a raspberry, we deduct 50 points from the player's score; otherwise, add 10 points. Again, in either case, the object is then destroyed.

8 With all our classes now created, it's time to initialise the game. First we initialise Pygame itself, to ensure everything is in its default state. Then we use the pygame.key.set_repeat() method to specify that if the user holds down a key, an event will register every 20 milliseconds. The next two lines set up font objects that will display the score and how many raspberries have landed – for more on this, see the Pygame website. We store the value of black in a variable of that name (the three zeros represent red, green, and blue values) – this is just for convenience later on. Next we set up the game's window: Raspberry Pie runs in a portrait-shaped space measuring 480 x 640 pixels, which we'll refer to as "screen". Finally, we set the caption of this window to show the name of the game.

9 We're now ready to start creating objects based on the classes we defined in steps 2-7. First we create a Game object called game, and a Turret object called turret (note the capitalisation convention). For convenience, we then create a group called "sprites", and add the turret to this group. We also create groups for the fruits and bullets (although we can't add members to these groups yet, as we haven't yet created the objects). Combining sprites into groups is a convenient way to organise game elements. If you were creating a platform game, for example, using groups would make it easy to draw all the background tiles at once, then draw the player and enemies on top. Sprite groups also make it easy to use Pygame's collision detection routines: a single line of code can check whether any element of one group has collided with any element of another.

10 Before entering the main loop, we initialise a variable called end_game: so long as this remains False, the main loop will continue cycling. When ten raspberries have hit the ground, we'll set this variable to True and the game will end. Next we initialise an object called clock, based on the Pygame Clock object, to manage how often we poll for events and update the screen – if the game tore along at the maximum speed the Raspberry Pi can handle, it would be unplayable. Finally, we initialise a variable called "tock". This will keep track of how long it is since a fruit last appeared onscreen, so we can introduce a new one every two seconds.

11 Now it's time to start the main game loop. We implement this using a while block – a block of code that executes only while the variable end_game isn't set to True (the != operator means "not equal to"). At the end of the block, this condition will be tested again, and if it's still true then the block will execute again – and so on, round and round, until the value of end_game changes. Inside this loop, we start with a Pygame clock.tick() statement: this introduces a small pause, regulating the speed of execution so that the loop runs no more than 30 times a second (as specified by the number in brackets). Next we increment the value of tock by one, to mark that a bit more time has passed. Finally, we clear the playing area, using the value of black that we defined earlier.

12 Now we check for keypress events, so that the game can respond to the user. Pygame creates and stores an event each time a key is pressed (or multiple events if a key is held down), and we can access them using its event.get() method. Python's for...in syntax allows us to cycle through and deal with each event in turn. For each event received, we first check whether the user has closed the game window – in which case we terminate the game. Then we check whether the user has pressed the left or right cursor key: if so, we call the turret's moveMe method with the appropriate parameter. If the user has pressed space, we create a new bullet – passing it a reference to the turret so it knows where to appear – and add this bullet to our sprite group.

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WALKTHROUGH

13
```
## Move objects
        for bullet in bullets:
                bullet.updatePosition()
        for fruit in fruits:
                fruit.updatePosition(game)
```

14
```
## Add new fruit if 2 seconds has elapsed
        if tock>60:
                if len(fruits)<10:
                        fruit=Fruit()
                        fruits.add(fruit)
                tock=0
```

15
```
## Check for collisions
        collisions=pygame.sprite.groupcollide(fruits,
bullets,False,True)
        if collisions:
                for fruit in collisions:
                        fruit.shot(game)
```

16
```
## Update player score
        scoreText=scoreFont.render('Score:'+str(game.
score),True,(255,255,255),(0,0,0))
        screen.blit(scoreText,(0,620))
        statusText=statusFont.render('Raspberries:'+str
(10-game.raspberryCount),True,(255,210,210),(0,0,0))
        screen.blit(statusText,(0,10))
```

17
```
## Update the screen and check for game over
        sprites.draw(screen); bullets.draw(screen);
fruits.draw(screen)
        pygame.display.flip()
        if game.raspberryCount>=10:
                end_game=True
## Game over: display the player's final score
scoreBadge=pygame.image.load("scoreframe.png")
scoreBadge.convert_alpha()
left=90;top=250
screen.blit(scoreBadge,(left,top))
scoreFont=pygame.font.Font(None,52)
statusText=scoreFont.render('Your Score:'+str(game.score)
,True,(0,0,0),(231,230,33))
screen.blit(statusText,(105,300))
pygame.display.flip()
## Wait for the player to close the game window
while True:
        for event in pygame.event.get():
                if event.type == pygame.QUIT:
                        sys.exit()
```

13 Now we move all bullets up the screen, and all fruits down. As each object contains a method that moves it appropriately, we simply need to call this method for each bullet and fruit in the game. Again, we can do this using the for...in syntax to move each member of the bullets group and each member of the fruits group in turn. We don't need to send any arguments to the bullet's updatePosition method, but for the fruits we must call updatePosition(Game). This is because the updatePosition method in the fruit class includes code that automatically updates the user's score if the fruit reaches the bottom of the play area – so it needs a reference to the object that contains that property.

14 The variable "tock" increments each time the main loop is executed. Since the loop runs 30 times per second, we know two seconds have passed when tock exceeds 60. At this point, we add a new fruit – so long as there are fewer than ten fruits already onscreen. We check this using the len function (the name is short, slightly incongruously, for "length") to count how many members the fruits group has. If it's fewer than ten, we create a new fruit object and add it to our fruits group. As the game runs, "fruit" will always refer to whichever fruit object was created most recently: we could give each fruit instance its own unique reference, but there's no need. Finally, we reset tock to zero, restarting our two-second count.

15 Now let's check whether any of the fruits has been hit by a bullet. Pygame makes this very easy: simply pass references to the two sprite groups to Pygame's groupcollide() method and it will work out the collisions. It can also automatically delete either or both of the colliding objects. In our case, we don't want fruits to be deleted (first we want to check the fruit type and update the score accordingly) – but the bullet can be removed right away. We convey this by passing "False, True" as arguments, referring to the first and second arguments respectively. The groupcollide() method returns a list, which we'll call "collisions": if it has any members, we use yet another for...in loop to run the "shot" method on each fruit that's hit.

16 The game mechanics are now complete, but we still need code to show the current score and how many raspberries have been collected. Earlier on, we set up two Pygame font objects; now we can create text by accessing the render method of this class. This takes four arguments: the first is the text to be rendered, followed by a string (text) representation of the user's score. Then we specify whether or not we want the text to be smoothed, and give RGB values for foreground and background colours. Pygame's screen.blit() method draws the rendered text onto the screen at specified co-ordinates. We repeat this with the raspberry count, the difference being that this number counts down from ten and appears at the top of the screen rather than the bottom.

17 Finally, we update the screen to reflect the new positions of our turret, bullets and fruit. Pygame's draw method lets us render all members of a sprite group in one line of code, but the screen isn't redrawn right away: the display.flip() method updates the whole screen in one go, so that everything moves smoothly and simultaneously. Finally, we check whether the game is over. As the indentation shows, this is the end of the main code block, so execution loops back to the while statement in section 11, and the following lines are executed only after the game ends. These lines load in a frame graphic, using Pygame's convert_alpha method to provide transparency, and render the final score text on top. We use another "while" block to pause the game so that the player can read the text. When they close the game window, Python exits the game.

The very last step is testing. This is especially important if you've been using a different platform for development: by modern standards, the Raspberry Pi is a very slow computer, and it runs a different OS to your PC, so it's vital to ensure that your game works properly and runs at a playable speed before publishing it. If you're working in Windows, and plan to test your creation on native hardware only at the end of the process – for example, if you're coding at home to run on a Raspberry Pi at school – the easiest approach is to transfer the folder containing your game using a USB memory stick and load it up in Geany on the Raspberry Pi. It may take a little while to initialise, but so long as your game doesn't waste memory or try to carry out excessively demanding computations, it should be fine.

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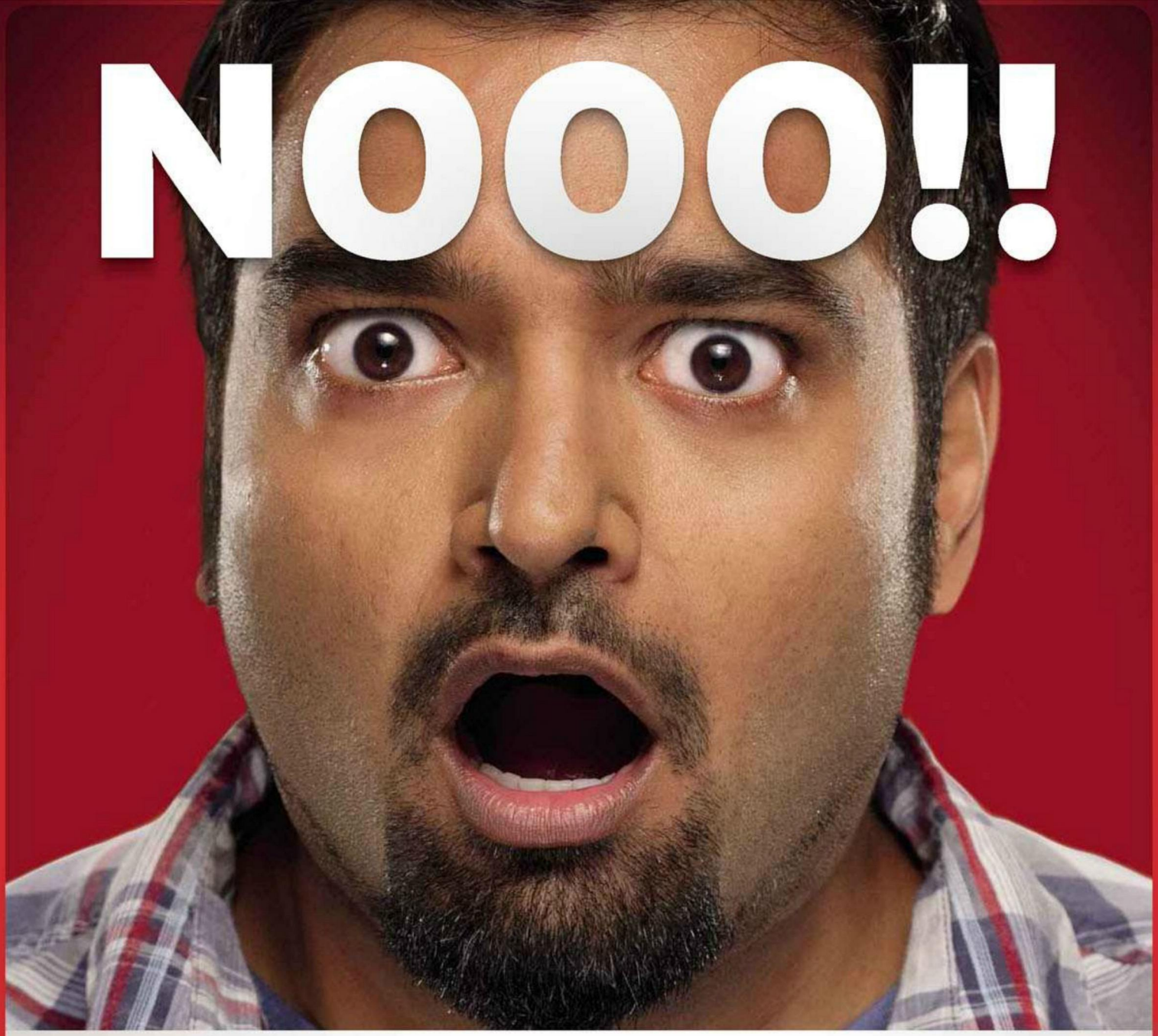

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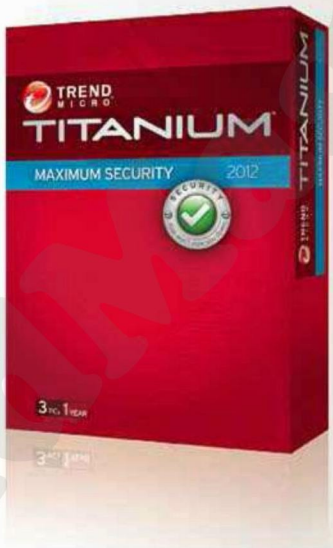

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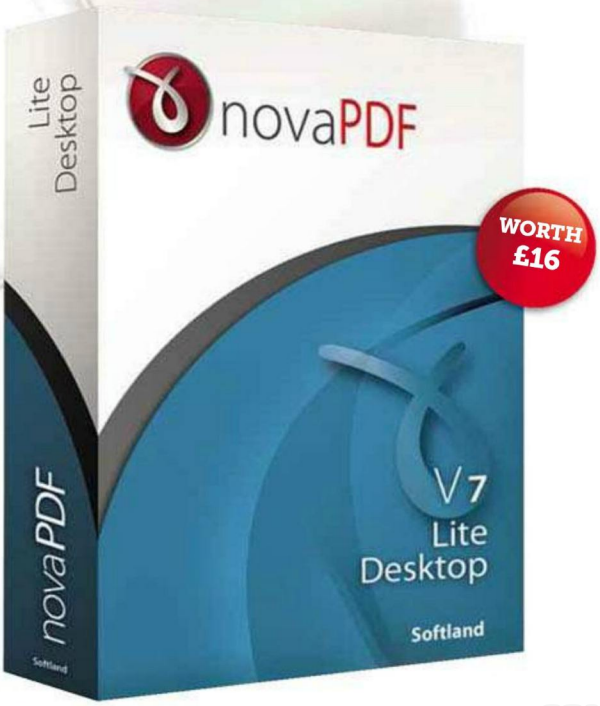

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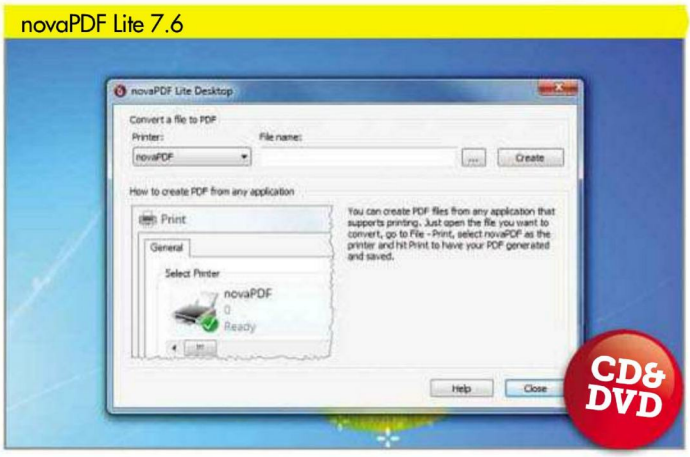

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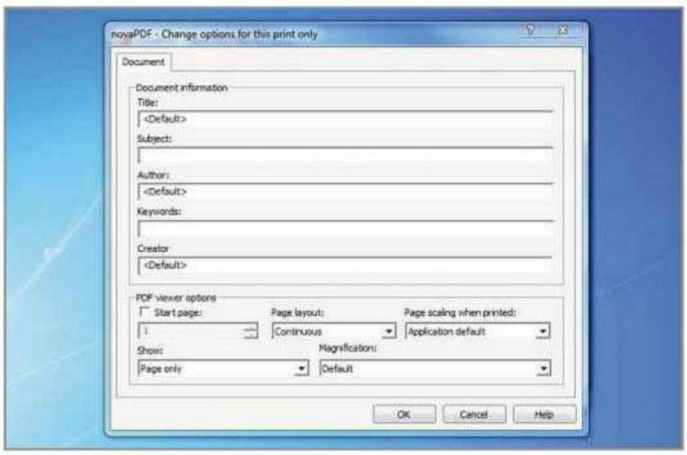

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SpringPublisher Professional 2.5.5

Professional templates make it easy to get started, and the wealth of options included allows for plenty of versatility

SpringPublisher Professional 2.5.5

SpringPublisher's latest software is a fully featured desktop publishing application, with all the power and versatility you need to create professional-looking documents – and it's free on this month's disc.

Getting started is simple thanks to dozens of quality templates, and it's possible to add images, maps or logos with a couple of clicks. It even has the power to generate personalised QR codes thanks to a tool that can embed information and web links to these scannable images. It's then easy to incorporate these codes into your documents.

A variety of effects – from drop shadows to opacity filters – can be applied to your designs, and each element of your image can be fine-tuned with precise positioning options, size tweaks and alignment modifiers.

The interface consists of large, clear icons that should see beginners safely on their way, while more advanced users can access all the functionality they need to create complex layouts. To register, use the code "asd3v-pcpro-noncommercial-sffc1-anbv2" before 6 October 2012.

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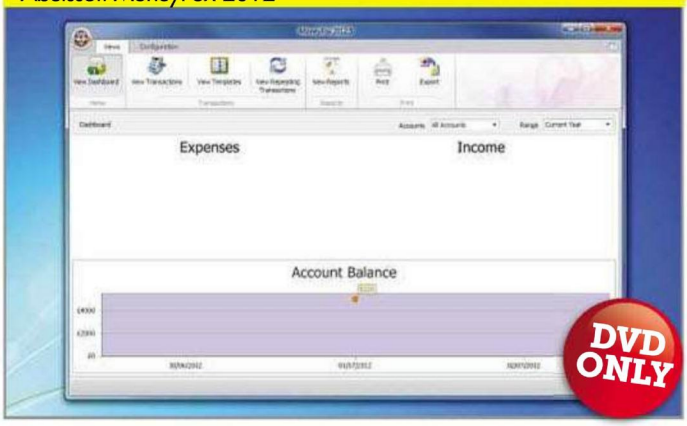
Abelssoft MoneyFox 2012



The Account Balance graph is an easy way to track your finances, with key figures divided into expenses and income columns

ON THE DVD: BONUS FULL PRODUCTS

Abelssoft MoneyFox 2012

Managing your money isn't always easy, especially if you have multiple accounts, credit cards and direct debits to keep track of on a monthly basis. MoneyFox 2012 takes the headache out of your finances.

Getting started is as simple as using MoneyFox's wizard to set up a financial profile. This can be password-protected and customised with a variety of options, from your choice of currency to the type of account, its balance and account number. The main application window is just as intuitive thanks to its handy overview of your financial affairs.

Transactions are summarised in a separate window; repeated transactions can be easily tracked, and reports generated. You can choose specific dates and accounts to tailor the output.

Registration takes seconds: enter your name and email address to unlock the application.

SYSTEM REQUIREMENTS Windows 7/Vista/XP; requires online registration

PowerArchiver 2011 Standard

PowerArchiver brings together a huge range of options, from batch-processing and disc-burning to encryption and error repair

PowerArchiver 2011 Standard

PowerArchiver 2011 Standard, free on this month's cover disc, comes with a wealth of file compression and management options that make it perfect for power users.

It's possible, for instance, to create multiple archives simultaneously – handy if you need to zip numerous files. It can also extract files from multiple archives simultaneously. Files can be encrypted for added security, or turned into self-extracting executable files.

There's built-in FTP support, too, so archived files can be stored safely at network locations, and the backup module can be used to schedule operations. Files and disc images can be burnt to blank discs from within the program, and the app even attempts to repair broken zip files.

It has virtually every option for file compression and archival and, with added tools for backup, protection and more, you're sure to find the right tool for the job. Registration is easy, too: click the link on the cover disc page to obtain your code.

SYSTEM REQUIREMENTS Windows 7/Vista/XP; requires online registration

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RWC REAL WORLD COMPUTING

EXPERT ADVICE FROM OUR PANEL OF IT PROFESSIONALS

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BUSINESS CLINIC

FREE BUSINESS ADVICE FROM PC PRO'S EXPERTS

Do you need help with a business IT problem? *PC Pro*'s Steve Cassidy and Davey Winder will visit your company to deliver free advice on your firm's IT setup. Send details to **businessclinic@pcpro.co.uk** and we could pay you a visit!

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Steve Cassidy on the problems with the perceived threat of electrosmog, and more practical uses for plastic optical fibre.

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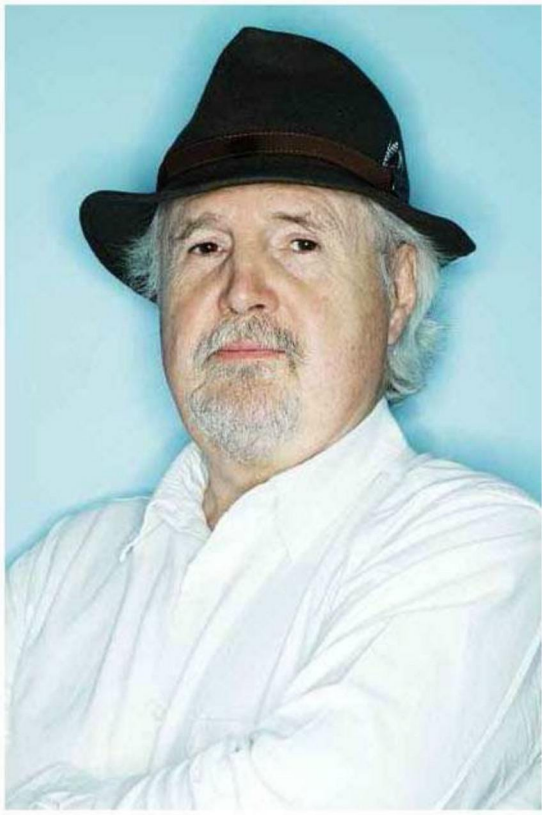
Apple's iCloud helps to lift DICK POUNTAIN's iPad-induced bad mood



I'm writing this at my desk in Italy, on a balmy evening, watching fireflies drift in and out among the vines. (I thought I'd see whether I could type that without smirking, but my reflection says I've failed.) Our existence here is a testament to advances in communications technology over the past few years.

Communication with the rest of the world happens through a Telecom Italia mobile mast on the mountain opposite, via which my laptop and my partner Marion's iPad are connected on pay-as-you-go mobile data plans. These are fast enough to watch live streamed television and listen to music and radio, without recourse to the huge, expensive satellite dishes required only a couple of years ago. My package gives me unlimited data for €19 per month.

Being here has given me the opportunity to get to grips with the iPad, and hence caused me to oscillate wildly between being very impressed indeed and hair-tearingly frustrated. The latter state is almost always induced either by the lack of documentation, or by Apple's smug assumption that everyone buys into its total ecosystem, which I most certainly do not.

A most egregious example of the latter concerned Marion's contacts, which it fell to me to transfer from her netbook into the iPad's Contacts. For historical reasons, these have been kept for many years in Palm Desktop. When the iPad arrived, I realised there wasn't going to be any direct way to export addresses to it since Contacts appears to lack any menu for importing. So I opened a Gmail account for her and exported them all into that via a CSV file, believing job done. Fat chance. The Apple Contacts app lacks any mechanism for importing from the enemy Gmail. After hours of footling, I gave up and suggested she log onto Gmail via Safari to see her contacts.

Months passed and a friend loaned us a book called *iPad 2: The Missing Manual*, which solved many puzzles, such as how to recover when you accidentally lock the screen into portrait. One chapter began with the soothing words "Putting a copy of your contacts file onto your iPad is easy" and suggested using iCloud or iTunes. Like an idiot, I decided iTunes would be easier since it was already installed on the homescreen. More head-scratching followed because iTunes did nothing but offer to sell me David Guetta albums.

I'm embarrassed to divulge how many hours it took me to realise that iTunes has to be installed on a computer (assumed to be a Mac) rather than the iPad for this. I flirted with the idea of polluting my VAIO with the Apple software, but fortunately, first took the precaution of Googling "uninstall iTunes from Windows 7": horror stories about how much junk it leaves behind cured me of that impulse. I Googled more and the scales were removed from my eyes by a crystal-clear blog called "Apple iPad Tablet Help". The answer is: use iCloud, stupid!

It took about ten minutes once that penny dropped. Pull up Gmail on my VAIO; log in as Marion; export her Gmail contacts to a vCard file on the VAIO; go to **www.icloud.com** and log in with Marion's Apple ID; drag the VCF file onto the Contacts icon in iCloud. The iPad remained lying in the other room, and no cables were involved. I fetched the iPad and opened Contacts... where to my disappointment were only three entries I'd added manually months before. However, before I could muster a curse, up popped another, then another and in they all streamed, 1,200+ of them, in less than a minute.

The moral of the story for me is that the cloud just works: feeble documentation, different OSes, squabbles between Apple and Google, smug assumptions that iPad owners have a Mac too, all just melted away in the universality of HTTP and the internet.

> The cloud just works: feeble documentation, different OSes, all just melted away in the universality of HTTP

This was the same month we decided to adopt Dropbox in place of Dennis Publishing's own server to transport RWC copy, and it's proving more convenient and reliable for all concerned. The cloud just works. (Of course, being a paranoiac, I download it all to archive on my machine too.) For extra cloudiness I've also built an archive of all my previous Idealog columns from 1994 in Blogger, where you can read them onscreen in a convenient format (**www.pcpro.co.uk/links/216idealog**).

As I was uploading one from August 1996, its headline, *Wake Me When It All Works*, caught my eye. In it I complained: "Somewhere along the line, everyone seems to have forgotten that simplifying means removing stuff, not just hiding it on the 19th tab of some dialog". Now, 16 years later, I can smell the coffee...

DICK POUNTAIN is the editor of *PC Pro*'s Real World Computing section. Or the Reale Mondo Computing sezione to his Italian friends.

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FEATURE

Crowdfunding: does it work?

Is it really practical to fund a business from hundreds of small donations harvested over the internet? Simon Brew investigates

There's a sporting chance that you've seen the work of Jane Espenson on your television over the past decade or so. She's written scripts for shows such as *Buffy the Vampire Slayer*, *Torchwood* and *Battlestar Galactica*. Naturally, therefore, she's worked with and befriended some people with very deep pockets.

Yet, when it came to raising funds for one of her most recent projects – a small web-based sitcom by the name of *Husbands* (**http://husbandstheseries.com**) – she chose not to turn to her well-heeled contacts. For Espenson is one of a growing number of people who has turned to the idea of crowdfunding: seeking small donations from many supporters over the internet, instead of big contributions from venture capitalists, banks and such like.

> **"A viable, previously relatively untapped source of project funding has appeared"**

Consequently, the budget for *Husbands*' second season has come almost directly from its audience. In all, 956 people have donated a total of $60,000, with the smallest contribution being only $1. Impressively, it raised its budget in less than a month.

Crowdfunding is a fascinating idea, and one that's beginning to find its feet, thanks to the rise of dedicated websites such as Kickstarter (**www.kickstarter.com**). Could it really give the banks – with their continued reluctance to lend to small businesses – some serious competition?

Who needs crowdfunding?

Let's be honest from the outset: for the majority of businesses, crowdfunding simply won't work. Since it requires the interest of a comparatively large number of people to fund a venture, the project itself has to have relatively wide appeal. After all, there's something idyllic and romantic about being able to fund a film, but an educational hobby robot? That had 31% of its target when we visited its appeal page, with only 18 days left to go. Setting up a crowdfunding appeal is clearly no guarantee of success.

"You need to do your homework," Jane Espenson told *PC Pro*. "Look at other projects, both successful and unsuccessful, and figure out what would make *you* back something. Work on the campaign video and the wording of your appeal. Find great incentives for donors and include incentives across the spectrum, from low to high amounts. And publicise the campaign."

Espenson only turned to the crowdfunding model for the second season of *Husbands*, "so we had all of season one to use as a demonstration of what people were funding". And if you don't have a back catalogue of work at hand? "Find another way to demonstrate what makes your project special," she advises.

Many have. In the past year, there's been a substantial rise in the number of crowdfunded projects. These range from small video games costing a few hundred dollars, through to a documentary about US footballer Jay DeMerit, which has banked $223,422. Seemingly out of nowhere – although the roots of this variant of crowdfunding go back a decade in the music industry, at least – a viable, previously relatively untapped source of project funding has appeared.

However, Doug Andrews, the CFO of the Homeworking & Small Business Alliance (HSBA) wonders if the novelty factor is what's attracting investors. "Crowdfunding sounds like something that could work brilliantly for early pioneers, but I suspect that once it becomes mainstream, it will be very difficult to get your idea found among all the other businesses vying for attention. A lot of the excitement and goodwill that's associated with early trends will have been replaced with people asking 'what am I going to get out of this?'". Andrews admits that such questioning is "not necessarily a bad thing in itself", but adds that "as a business owner, I wouldn't want 2,000 investors dipping their oar in and trying to run my business".

Investor influence

Do investors really get much say? The emerging crowdfunding model, through websites such as Kickstarter, Sponsume (**www.sponsume.com**), Indiegogo (**www.indiegogo.com**) and their ilk, encourage project initiators to offer rewards for differing levels of donation, but they tend to be gift-based rather than offering input into the business or a guaranteed return. Some of the rewards are enticing – a part in a film, special versions of the product being funded, the chance to get involved – but they tend to be a substitute for a firm, legally binding share of the profits that a substantive investment would normally attract.

"It's more like a charity investment," says Toby Ricketts, CEO of Margetts Fund

Jane Espenson's series *Husbands* has been largely funded by its audience

Management. "People are investing on trust, or in excitement, in the same way you and I would buy a lottery ticket. There's pleasure at the point of investment". There are, however, far more effective – and tax-efficient – ways to invest in a business, Ricketts argues, adding that he would "invest £20 in a project, but only if I got £20 of enjoyment out of it".

While the burgeoning popularity of crowdfunding websites suggests that people like the idea of small, tangible sponsorship of a project, it's an uphill battle to convince potential investors to part with their credit card details, especially in less glamourous industries. A scan of the most popular crowdfunding websites confirms a skew towards creative projects. At Kickstarter, 943 film and video projects were trying to attract funding when we visited, compared to 90 in technology. More tellingly, in May 2012, only 23 tech projects had hit their funding target. In the film and video category, it was 345.

That isn't to say tech projects can't attract funding. Tammy Erdel, for example, is using Kickstarter to finance AIRbudz in-ear earphones (**www.pcpro.co.uk/links/216cf1**). "I believe that Kickstarter is beginning to promote more products that don't necessarily fall into the creative works arena," she told *PC Pro*. That said, she adds that "it's important that you have another means to promote your product and direct people to Kickstarter".

Theresa Burton, CEO and co-founder of British crowdfunding service Buzzbnk, told us that 58% of projects listed on her site receive full backing, although she adds that "we work hard to set expectations about what does and doesn't work in crowdfunding, and the amount of effort required to actively fundraise". Buzzbnk also offers the option for investors to make a loan, possibly with an interest return.

It's worth noting that if you have a less prominent project that fails to meet its target, you haven't actually lost much. Bernie Thompson, of Plugable (**http://plugable.com**), has successfully raised funding via Kickstarter in the past, and is currently seeking investment for a $50 thin client computer for schools. He isn't sure he'll get to his funding target this time – although "there's often a big jump in backers at the end". But he argues: "We'll have invested a bunch of time, but we won't have risked a big investment in hardware inventory, because we do that purchase only if the Kickstarter succeeds. We'll have learned something very valuable about the size or character of the market for the product, with less risk." And if he doesn't hit his target? He'll scale down his project, and do it anyway.

The crowdfunding sites

A growing number of projects do manage to hit their goals, and the current wave of crowdfunding services seems to have tapped into an appetite among individuals to contribute to projects. That's interesting news for business.

Furthermore, it's a myth to suggest that crowdfunding is all about a few pounds here and a few dollars there. The scaling system of incentives (which you determine when setting up your appeal) is intended to attract the wealthier investor. There's ample evidence already of people being willing to offer large sums, even though the most popular reported donation is around the $25 mark.

With the growing number of people interested and investing in crowdfunding, there's been an inevitable rise in the number of services catering for it. Among the highest profile is Kickstarter. Its model is simple, and not uncommon. If you want to list a project, there are certain criteria you must meet. First, you have to have a tangible end point: to produce a film, make a product or write something, for example. The golden rule is simple – your venture can't be an open-ended proposition. Second, it has to fit within the fairly broad, predetermined categories, which inevitably limits what projects can be listed. And third, there are expected criteria prohibiting certain products. You're not allowed what the site describes as "fund my life" projects either, meaning appeals for tuition fees or expensive holidays are off limits.

Next, you're at a screen where you're entering details of the project, coming up with a target funding goal, and setting a duration of up to 60 days to keep your appeal open (Kickstarter recommends 30 or fewer). There's a small, salient point lying in the small print here: Kickstarter will take 5% of funds raised, and Amazon then skims off a further 3-5% for credit card processing. There's no charge if a project doesn't raise all of its funding, but it's all or nothing: if you miss your target by a penny, you don't get a bean. Once your project page is complete, it goes off to Kickstarter for approval, and it can be live within a matter of days. Already, that's a far quicker process than the traditional model of attracting investment. You don't even need to print a physical prospectus, although investing in a good video makes sense.

"It's a battle to convince potential investors to part with their credit card details"

The cons of crowdfunding

For a small business looking to get a project off the ground, there are obvious advantages to the crowdfunding model, but there are risks too. The obvious one is having to surrender a proportion of capital raised, up to 10%, to the crowdfunding site in the first place.

You also have to be realistic. Crowdfunding might be a catalyst for a business, but that's it. It's quick funding for a single project, and that's different to a long-term investment.

For instance, what happens if your project runs over budget? What happens if things don't go to plan? Partnering with a more traditional investor may leave you open to similar costs, but there's a relationship. It comes back to the all-or-nothing mentality. If you raise funding but fail to complete your project, you're honour-bound with crowdfunding – although not legally obliged – to return people's money.

Anthony Caulfield is trying to raise money for a documentary feature, and he argues that "no-one oversees how you spend the money, and donors have to trust that you're capable. If you've been involved in dodgy campaigns in the past, that reputation will stick, and you're unlikely to be successful."

"If you raise funding but fail to complete your project, you have to return people's money"

Also, you may have to surrender more information about your business than you're comfortable with. You need to put enough details of your idea into the public domain to raise interest, but that in turn exposes what's arguably your primary business asset.

Five tips for crowdfunding success

- **Keep your goal attainable** Most crowdfunding websites won't give you a penny of the cash you raise unless you hit your target, so don't miss out by a few pounds because you over-stretched.
- **One Kickstarter page is never enough** The funding page itself should be only the final part in a broader attempt to drive awareness and interest.
- **Stagger rewards** Come up with interesting rewards for differing levels of funding. You might get an extra £10 out of a donor, just for something as simple as autographing whatever you produce.
- **Keep your investors up to date** That way, when you come to do another project, they'll already know you're trustworthy.
- **And the big one** Deliver on your project, or return the money.

Is it worth it?

The question, then, is does it all work? The answer: sort of. Crowdfunding certainly has its place, and the indisputable fact is that many creative projects that otherwise wouldn't attract money are receiving funding from generally undemanding investors.

Take *From Bedrooms to Billions*, Anthony and Nicola Caulfield's planned documentary about the rise of British video games. Anthony told *PC Pro* that, after pitching the idea for the project to broadcasters, he couldn't believe the lack of interest. He was told that gaming was a "niche hobby", and that broadcasters "wouldn't know where to place" his documentary. BBC Four turned it down, despite having recently commissioned an expensive drama on the rivalry between Sir Clive Sinclair and Chris Curry. "We're not talking about a fad that suddenly appeared then fizzled out," Caulfield argues. "Gaming was something that was born out of enthusiastic interest and not necessarily commercial enterprise, which went on to become the biggest entertainment industry on the planet!"

Caulfield, an experienced documentary maker, therefore turned to crowdfunding and, at the time of writing, has achieved more than 20% of his target total, and stands a real chance of hitting his target.

The immediate future for this iteration of crowdfunding seems bright, with the sheer novelty set to fuel things for a good while yet. The real test, however, will be when it's time to deliver on the many projects that have successfully achieved full funding. In the months and years ahead, it's vital that they're realised, and that the backers are kept in touch with, simply to allow them to keep faith with the initiative.

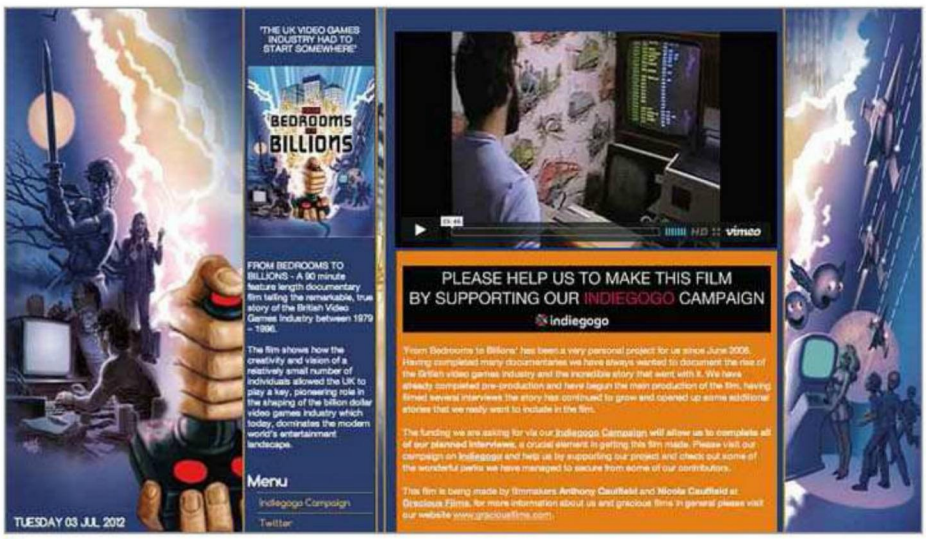
Inevitably, then, the continued future and broadening of crowdfunding hinges on the very people who have raised funds through the assorted services. Or, more to the point, on the people who suddenly have a few hundred bosses they didn't have before. After all, as Jane Espenson acknowledges, a crowd of investors brings with it an unwritten demand of its own. "We're spending their money," she told us, "and I feel a huge responsibility to spend it in smart ways." There's little doubt Espenson will. It needs many more like her to keep crowdfunding viable, well into the future.

Notable hits

The Age of Stupid
A 2009 feature documentary, directed by Franny Armstrong and starring Pete Postlethwaite. The bulk of its £450,000 budget was raised via a crowdfunding model, with 223 investors.

Carmageddon: Reincarnation
A sequel to the ultra-violent video game of yesteryear is now in production, courtesy of a Kickstarter campaign; 11,947 backers donated a total of $456,944.

Amanda Palmer
American musician Palmer chose to raise funding for her new album, tour and art book outside of the record label system. She raised $1,059,129 from 21,963 backers.



Anthony and Nicola Caulfield's documentary could be realised through crowdfunding

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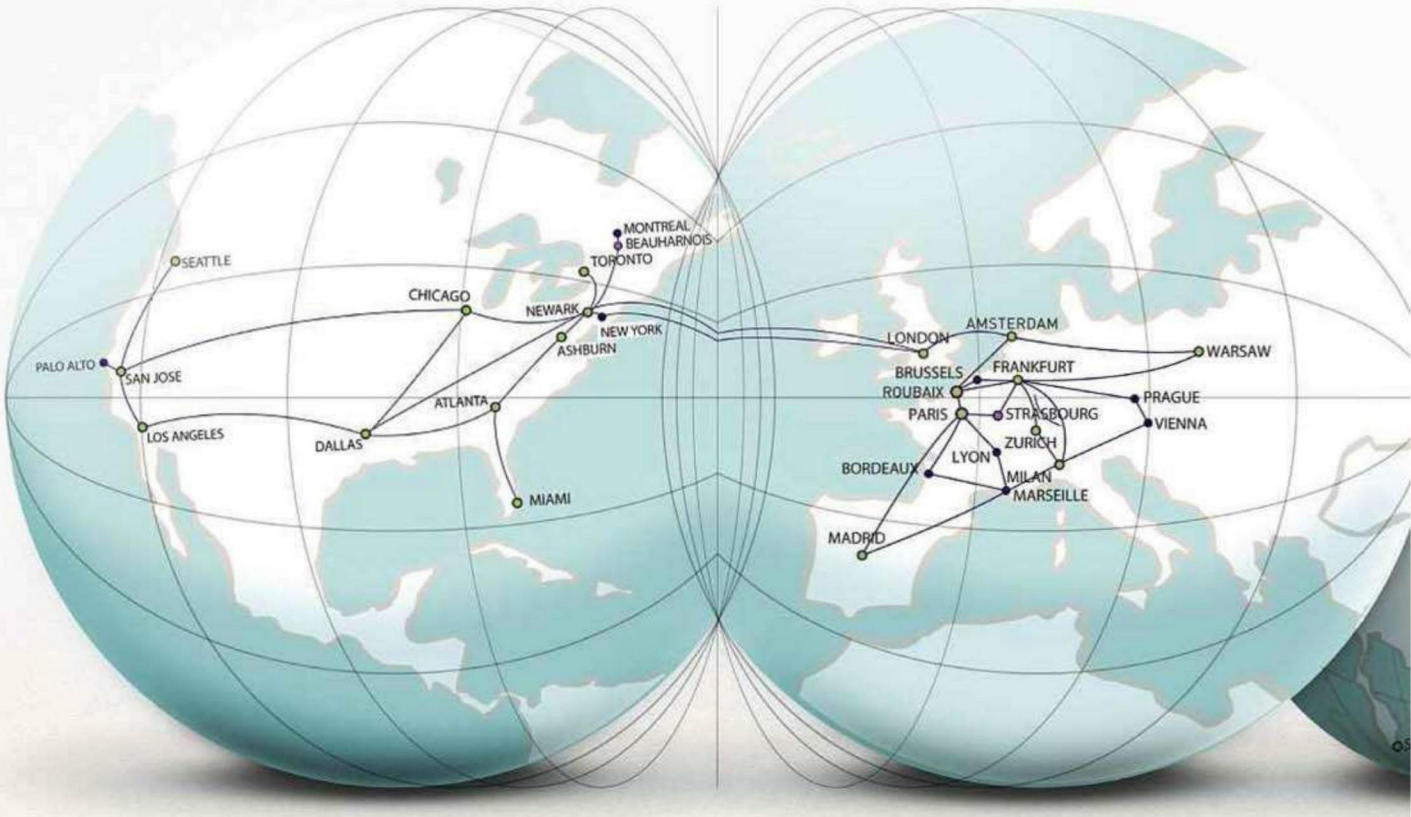

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CAREERS

So you want to be an... IT consultant

Stuart Andrews plots the career path for those looking to make a living from their IT expertise

Becoming an IT consultant might not be an instant path to fortune and glory, but it's certainly one of the most exciting and potentially lucrative jobs in IT. Consultants are the gunslingers of the IT world: they don't play sheriff and look after the infrastructure; they blaze into town, fix what needs fixing, create a solution, and ride off into the sunset.

If it's sometimes hard to pin down exactly what an IT consultant does, it's because it can encompass such a variety of roles, including security, systems architecture, infrastructure, data centres, project management, programming and hardware installation. You might work freelance or for a company, or even in association with vendors or resellers, providing pre-sales advice and planning solutions, or helping deploy new hardware and software after sale.

So what draws all these strands together? That the consultant has knowledge and expertise the client lacks. As consultant Peter Bryant of Corylus Business Systems puts it: "The day-to-day reasoning behind my role is to provide skills that a business – be it a reseller or a company – doesn't have immediately to hand, or has exhausted on current duties, or may not ever want in-house."

Getting started

When companies hire a consultant, they're looking for someone with existing skills and experience, so it isn't a job for recent graduates or hobbyists. In fact, it's the type of job best suited to those already working in IT, but looking to become self-employed or take on a more wide-ranging role. For Bryant, the impetus came through redundancy. "I wasn't looking for it, but some of my (then) suppliers said 'if you're free…'".

If you're looking to go freelance, Bryant suggests some simple steps that can make the move easier. A fighting fund is essential, as you may face several months without income. Relationships with key vendors such as Microsoft or IBM will help, as will relationships with suppliers, IT specialists and other consultants. In this business, much of the work comes through personal referrals, where, in Bryant's words, "the referrer has done all the hard work for you". However, as he notes, "you need a track record they're willing to promote".

Finally, Bryant suggests thinking like a consultant while you're still employed. After all, you can learn something from everyone, even if it's from their mistakes.

Experience is vital; formal qualifications can be useful. "As a strategy consultant, my experience is by far the most important qualification I have," says Chris Cranie, an independent consultant working in the charity sector, "but I pursue qualifications to ensure my knowledge is up to date."

For Bryant, qualifications provide clients with a clear sign that you know what you're talking about. "You rarely go through a door and have a prospect ask 'what certifications have you got'" he notes, "but is there work that, without my certification, I wouldn't have got? Certainly." If you want to work in a VMware environment, for example, it helps to have VMware Certified Professional (VCP) 3 and 4, and the same goes for the relevant Microsoft Certified IT Professional and Architect certifications or the Symantec/Cisco/Oracle equivalents.

Finding your niche

In consultancy, it pays to have a niche. While there's money to be made as a generalist, particularly in the small-business sector, larger companies are looking for more in-depth expertise in areas where in-house staff may struggle. After all, consulting is about solving specific problems or producing specific solutions.

But what should you specialise in? "It's been challenging finding good consultants in three areas," says Cranie. "First, good all-rounders with strong experience in virtualisation and data centres, including private/public cloud; their skills are currently high in demand. Second, mobile security consultants who can advise on integrating mobile devices into corporate networks; clients are increasingly enquiring about mobile, including Bring Your Own Device (BYOD), and it's important that security isn't a secondary consideration."

"Third," Cranie adds, "I also see demand for good managerial and strategy consultants,

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which is the area I work in." Cranie helps companies' IT staff develop strategy and make efficiency savings. He also supports clients that have outsourced their IT to manage those relationships.

The more you specialise, the more important it is to keep on top of the technology and best working practice, and ensure that you're at least one step ahead of the client. As well as reading *PC Pro* (obviously), consultants need to engage with the tech community, attend seminars and events – Microsoft, VMware, Symantec, IBM, Citrix and other conferences and workshops targeting IT professionals – and follow blogs, websites, RSS and Twitter feeds.

Bryant also suggests that consultants run an infrastructure that mirrors that of their typical client. "For not an awful lot of money you can run a virtualised setup with partner licensing and live their experience with your own environment."

Beyond your technical expertise, consulting puts other skills to the test. "A strong depth of experience in your area of expertise is essential," says Cranie. "However, it was a wider set of business skills that really increased my value to clients." As he explains, clients might ask simple questions, but the answers may involve a range of complex issues. "To do well, I've had to draw on a variety of financial, project management and staff management skills. In addition, you'll need good discipline, planning and organisational skills to manage your workload."

Bryant lists some other useful traits, including "putting yourself in the client's shoes, patience, good communication skills and, when you think you have an answer, asking why or how at least a few more times to be sure." Attention to detail is also vital. Yet, in Bryant's opinion, the most important thing is to discover what your client expects, document everything in language they can understand, and then manage and deliver on those expectations.

Freelance or firm?

All consultants must decide whether to work freelance, in a partnership, or as part of a larger consulting firm. There are advantages to the latter, including financial security and having someone else schedule engagements. However, there are also benefits to working for yourself. "The relationship with clients becomes your responsibility, and I found that a high quality of work led to a better quality of relationship," says Cranie. There are also no internal wranglings; you're free to "focus on getting something done as effectively as you can," says Bryant.

Free advice
Do you want free business advice from *PC Pro*'s Real World IT consultant Steve Cassidy? Send details to businessclinic@pcpro.co.uk and he could pay you a visit.

A day in the life of an IT consultant

PROFILE

Name: Philip Fearon
Job title: Director, Qutoric Limited
Experience: Technical architect at Logica, system design authority for UK government, three years in XML tools development

Typically, I get to work at about 7.45am. On this current project, I'm developing code for a single product. The first thing I do is check for feedback, such as bug reports, questions or comments. I check the product's own community site and then Twitter, Google and Stack Overflow. The day's routine is influenced by outside factors: if a bug report has been put in, I'll try to deal with that. Failing any outstanding bugs, I'll get started on code – this could either be Java, JavaScript or XSLT 2.

Each project I work on varies. The current project is close to the ideal: it's relatively small, so I work in the same office as my client – there are few phone calls for me to deal with and very little in the way of email contact. We don't do meetings, either. When we need to talk, we just speak up. My client is very busy so I try not to interrupt him too much. My previous projects were quite large, so there were lots of meetings and many emails.

I'm not very good at taking breaks, so I'll often have lunch at my desk. The afternoon is much the same as the morning, except I keep an eye on the time and finalise significant code changes before the end of the day. This gives me time to do more thorough testing before I compile, check in the code and go home shortly after 6pm.

There's almost always work out of hours, but that's because I like to have my own home projects for research and learning. There's often useful overlap with my day job, as I use the tools I develop at home for work. Most rewarding is producing something that other people find useful and give good feedback on. I like working on projects that might just change things significantly for the good.

"In the afternoon, I keep an eye on the time and finalise significant code changes before the end of the day"

The biggest challenge is balancing your workload. "At first it's difficult to say no for financial reasons," says Cranie, "but as your client portfolio increases, you can exercise more control over your workload and, where appropriate, refer work to other consultants."

One risk of consulting is that projects can go wrong, and it can be the consultant who shoulders the blame. There can be financial implications. Is there anything consultants can do to mitigate the risks? "It's always important to do the best you can, and keep detailed records to justify all the recommendations you've made," says Cranie. "Where there's a new technology I'm not sure about, or where the client wants endorsement of their own idea, I take extra care and have no reservations about saying 'I don't know'."

A contract is a necessity, and should include a clause to limit your liability. Finally, insurance is a must, particularly if you operate as a sole trader. "The day before I started work, I took out professional indemnity and public liability insurance to cover that scenario," says Bryant. "The insurance gives both you and the client comfort – and for some engagements it's a requirement."

Financial gain

There are rewards for all the risks and hard work, not least financial. According to IT Jobs Watch, the average consultant will earn around £55,000 a year, although salary or daily/hourly rates will vary depending on the size of clients, the region and the level of experience, expertise and reputation you bring to the table.

There are personal rewards, too. For Bryant, these include "a sense of achieving your value, a more flexible lifestyle, and seeing clients doing better as a result of your work". For Cranie, consulting has enabled him to adopt a flexible lifestyle abroad, where he can spend time with his family. His one-year-old son is already in training. "I've just hooked up his first screen, keyboard and mouse to a Raspberry Pi, so his career is already on the right track!"

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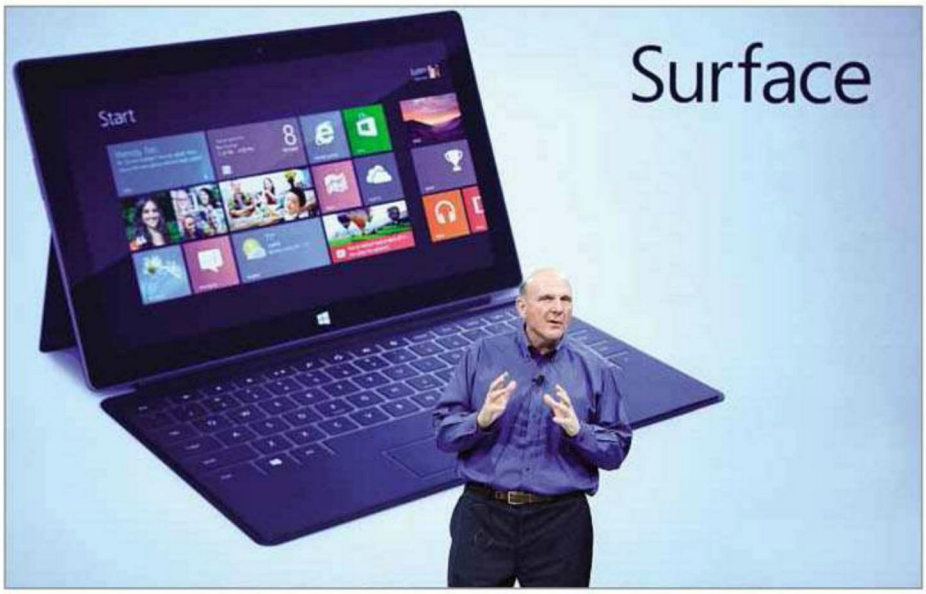
ADVANCED WINDOWS & MAC

Not yet much beneath the Surface

Jon Honeyball is cynical about Microsoft's Surface announcements, and is impressed by the new MacBook Pro's Retina display

JON HONEYBALL

Computer journalist and consultant specialising in both client/server and office automation applications. Email jhoneyball@woodleyside.co.uk



Most companies are ready to ship their tablets straight after the announcement – not Microsoft

We're in what was supposed to be a calm before the storm-surge of the Windows 8 release, but it's nevertheless been extraordinarily busy on the hardware front. Where to start? Well, I don't suppose anyone missed the announcement by Microsoft that it's going to be making its own tablet PCs for Windows 8, under the brand name of Surface? There was much cooing and swooning at this news, mostly because Microsoft isn't known for making hardware – if you're prepared to ignore the mouse and keyboard marketplace, that is. Oh, and let's not forget the custom-built servers it's made for its data centres.

Alright, so no hardware apart from those three. Did I mention the Xbox? And the Kinect controller? Actually, when you look at it closely, PCs and laptops are one of the few areas where Microsoft doesn't currently sell its own hardware. Mobile phones is another, although one might argue that Nokia has become a quasi-dependent subsidiary through its commitment to Windows Phone. But if you leave aside all these areas, it's apparently big news that Microsoft is going to do a tablet.

"PCs and laptops are one of the few areas where Microsoft doesn't sell its own hardware"

Perhaps Microsoft has only itself to blame. As I tweeted at the time: "Apple announces. Apple ships. Google announces. Google ships. Microsoft announces. Can't even tell you the battery life. QED", which, although harsh, is fair. Apple always has products ready to ship, often on the same day as the announcement. Google announced its new tablet PC and is shipping it within a week or two. Microsoft announces Surface, but can only commit to shipping the ARM RT version somewhere around the release date of Windows 8 itself, with the Intel version following around three months later. So that would be October and maybe January then?

The OEM hardware manufacturers have come under intense criticism, too. It's been claimed that Microsoft may have decided to do the Surface tablet because of disappointment with the OEM's offerings. I've heard this from various sources, and while it may be true, it also seems incredibly unfair. You might recall that back in January, I reported from the CES in Las Vegas that there was nothing there for Windows 8 – nothing from Microsoft, and no hardware of significance from any OEM vendors. This was entirely to be expected, because what company would want to unveil designs in January for a product that it couldn't ship until October? Remember that hardware has a shelf life of some six to eight months at best nowadays, so that's a whole generation in hardware terms.

Roll forward to Computex in Taipei and a few vendors showed hardware, but mostly in a tentative way, and the commentators still blasted them for not showing more despite the shipping date for Windows 8 remaining a great unknown. Worse still, Intel had only just started shipping the Ivy Bridge chipset, which is arguably a necessary piece of the puzzle required for Intel-based touchscreen devices to achieve half-decent battery life. And now here we are, months before the official Microsoft release date, when vendors finally have the tools to build devices for an October release.

But no, Microsoft isn't happy with that timescale – that would be far too easy. It has decided to go with what's effectively an early-2013 hardware ship date for its Intel product. Why would it want to do that? Well, there's a rumour doing the rounds that Intel's

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next-generation chipset will be ready by then and that this will significantly improve battery life – which, as I've just said, is a major problem area for Intel-based tablets and Ultrabooks. That's why Microsoft won't give us battery life figures today for Surface – because if it did, they'd be based on Ivy Bridge (at best) and it wants to quote next-generation hardware lives if at all possible.

Never mind those poor OEMs that have signed up to have hardware ready for the Windows 8 launch this autumn. The ones that now can't wait to see whatever Intel has up its sleeve next. Worse still, they know that businesses, which are the prime target for the Intel version of the Surface product, will probably hang on to see what Microsoft itself will deliver. After all, a Microsoft operating system running on a Microsoft device leaves no wriggle room for Microsoft – it will be judged ruthlessly on what it ships. I do hope Microsoft has pulled the best people together at Pegatron, which is rumoured to be the ODM (original design and manufacture) partner.

Who'd want to be an OEM hardware vendor in the middle of this perfect storm? According to some reports, the heads of certain OEMs weren't told by Microsoft about its plans until minutes before the announcement. I can imagine how well that news was received.

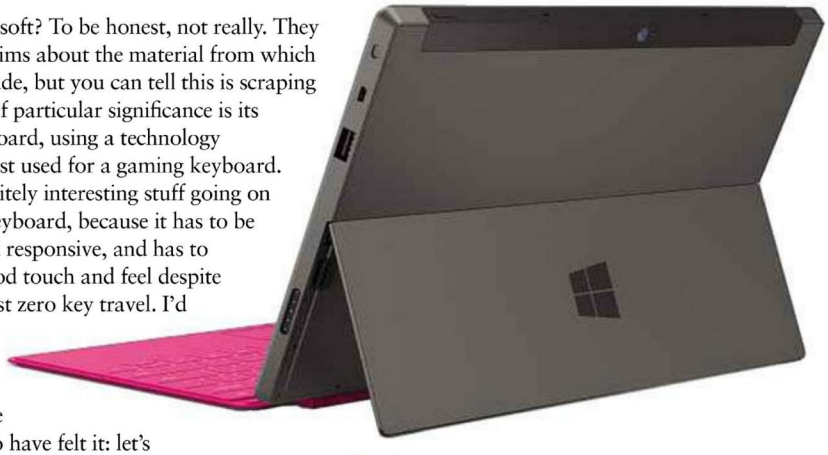
Surface tension

Now let's consider the whirlwind of spin that surrounds the name "Surface". You might recall this term was originally used for a large interactive table-top display, where the whole table surface was the working area. Designed for multi-user input, or for large areas such as hotel check-ins, this concept has gone through several generations of hardware realisation, with Samsung creating a large, custom TFT panel that can "see" upwards at pixel level to detect what objects have been placed on it.

"It's almost as if Microsoft can't decide what it wants Windows 8 to be"

This whole project has now been unceremoniously kicked out of the pram by Microsoft, its name taken away – presumably being considered too valuable and interesting – and plonked down as branding for the Windows 8 project. The older project has been renamed "PixelSense" and parked under its own domain name of **www.pixelsense.com**. You know something is coming to an end when it's no longer part of the Microsoft website, although I hasten to add that the domain name owner for this site is Microsoft itself.

Is there anything particularly interesting in the design of the Surface devices as shown so far by Microsoft? To be honest, not really. They make big claims about the material from which its case is made, but you can tell this is scraping the barrel. Of particular significance is its clip-on keyboard, using a technology Microsoft first used for a gaming keyboard. There's definitely interesting stuff going on inside this keyboard, because it has to be very fast and responsive, and has to present a good touch and feel despite having almost zero key travel. I'd discount comments made so far by people who claim to have felt it: let's wait to see what actually ships from the factory in production form.



The Surface's clip-on keyboard features some interesting technology inside

But it's the whole need to have a keyboard attached at all that I find quite fascinating. The reality is that Windows 8 running on a touchscreen device is actually quite a horrible typing experience, far worse than an iPad. Why is this? Well, because iPad applications have all been designed from scratch to work with a defined size and layout of system keyboard, whereas Windows applications haven't, as we know to our cost from that nasty floaty thing you get on a Windows 7 desktop. With Windows 8 things are better, but not by much. On the classic desktop, the old problems still occur despite efforts to cater for various alternative designs of keyboard, including one that's designed for landscape mode using both thumbs. The problem is still present on RT applications on the Metro desktop.

In truth, I find operating my Microsoft Build conference Samsung tablet awkward, even using the latest builds of Windows 8, because of this keyboard. Hence my interest in seeing that Microsoft appears to have recognised this and decided to build a keyboard into the Surface's cover. It's almost as if, yet again, Microsoft can't decide what it wants Windows 8 to be, and rather than focus on doing one thing well has decided to try to satisfy everybody, all of the time. This runs a significant risk of ending up with a camel when you were aiming for a racehorse, as the old saying goes; Microsoft's Surface announcements should be viewed with cynicism.

Microsoft itself, and its online apologists, cheerfully claim that all of this has been underway for years, that nothing about Surface was a panicked reaction to a sudden and crippling fear that the initial launch success of Windows 8 might be stymied by OEMs that would actually prefer to keep going with Windows 7 on laptops and Ultrabooks. Talking of which, I hear that the Windows 8 demonstrations at TechEd Europe run on Ultrabooks had some problems with the multifinger gestures. Here's how it was reported by our very own editor, Barry Collins, on the *PC Pro* website:

"Demonstrations during the day had seen two Microsoft presenters struggle to make gesture controls work on laptop trackpads, with the Start screen intermittently failing to scroll when the presenters swiped two fingers across the trackpad, for instance. [Chaitanya] Sareen insisted that the touchpad drivers were still 'very, very early' and were 'still being refined'." Read more at "Why Microsoft killed the Windows Start button" (**www.pcpro.co.uk/links/216awm**).

"Very, very early"? In the final preview version of a product that's about to go gold in a few weeks' time? No sir, that excuse will not do. Trackpad support in Windows 8 appears to have been mostly forgotten about, being left as an exercise for the third-party OEMs. No wonder the experience I had with the final beta on my Toshiba Ultrabook was so awful.

Yet more hardware

In contrast to Microsoft's announcement without shipping, Apple decided to launch a significant refresh of many parts of its desktop and laptop hardware ranges during its WWDC (Worldwide Developers Conference) event in June. The highlight wasn't really this refresh of various bits and pieces, though, but the arrival of the MacBook Pro with Retina display. Sporting an Air-like thinness but with the tank-like horsepower we've come to expect from the MacBook Pro, its marvellous screen is the component that's stolen centre stage.

Naturally I ordered one on the spot and have now spent several weeks playing with it. Be in no doubt that a 2,880 x 1,800 pixel display on a 15in laptop is utterly staggering. In the same way that the iPad 3's high-resolution screen has made all other tablets look foggy, low resolution and second-rate, the new screen on the MacBook Pro makes all other laptop screens seem lit by gas. It isn't only that it's

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Retina displays
For the science behind hi-res screens, see our feature on p44

sharp, it's the incredible clarity and crispness of every item on screen that's utterly compelling. Once you've seen it you really won't want to go back to a conventional display.

To make this happen, Apple pushed the capabilities of graphics chipsets and GPUs to the very edge of what's possible. Indeed, it can now be seen that much of the work Intel has been doing on graphics chipsets and GPUs has been driven by the requirements of its close friend and partner Apple.

But this isn't all that's new in this laptop. Apple has made a brave but correct move by increasing the baseline RAM complement to 8GB, with a 16GB option. There are no spinning disks either, and you can only choose from various sizes of SSD. The reason for this follows on directly from the work done on the MacBook Air: by repackaging the RAM and SSD chips as motherboard-level components, a great deal of space can be saved, which can be then be filled either with more battery or spent in shaving millimetres off the case dimensions, depending on your priorities.

This approach has its critics. A number of people have complained that it means you're fully locked into Apple's choices, with no real room for any third-party device options. That would become an issue if the prices charged by Apple were old-school rapacious, but that simply isn't the case. Charging only £160 to upgrade core memory from 8GB of DDR3L 1,600MHz RAM to 16GB isn't exactly harsh. Some might argue that £240 to go from 2.6GHz Core i7 to 2.7GHz Core i7 is rather steep, but we simply don't know how much Intel is charging for the faster product. And £400 for an upgrade of the SSD storage from 512GB to 768GB might sound a lot, but just how many 768GB SSDs are actually shipping from anyone at the moment?

I went with the faster 2.7GHz processor speed and the 16GB of RAM, but stayed with the 512GB of SSD. It's a true powerhouse of a laptop and the new screen will really require the forthcoming Mountain Lion OS X 10.8 to make best use of its capabilities. It's a free upgrade, so I'm not particularly worried.

One final item that caught my eye on the Retina MacBook Pro is the provision of not one but two Thunderbolt ports, a most unexpected and welcome development. My experiments with the previous-generation MacBook Pro driving two 27in Thunderbolt displays and two 12TB Promise arrays has clearly shown that even with the amazing throughput of Thunderbolt, it's possible to run out of bandwidth quite easily. Providing a second Thunderbolt port will enable power users to spread the load between two buses – maybe one 12TB array on one bus for primary workload and a Thunderbolt display, and a second 12TB array on the second port for display and backup, or some such arrangement. I've rejigged my desktop now to be based around my current 27in iMac, fitted with 16GB of RAM and 256GB of SSD. To this I attach a second Thunderbolt monitor and the two 12TB arrays. It's more stable than the old MacBook Pro when the workloads become extreme.

The Retina display makes other laptop screens seem lit by gas

The new Retina MacBook Pro has one other feature that must be considered – it has no Ethernet port. As you might expect, most of the connectivity of these laptops is done now over 802.11n, especially at the vastly superior 5GHz spectrum slot. Plugging in a Gigabit Ethernet cable is worth doing, but I suspect not many people do this. The 27in Thunderbolt displays have Ethernet on them of course, which connects to the host computer over the Thunderbolt bus. But it was nice to see Apple producing a short Thunderbolt-to-Ethernet adapter cable.

Hooray!
Can I save a final cheer for the MacBook Pro with the much-awaited inclusion of USB 3 on an Apple product? Apple has been tardy in adopting this standard, but with the availability of the Ivy Bridge chipset from Intel, there were no credible excuses left any more.

Thunderbolt adapters

Take a look at Belkin's just-announced Thunderbolt Express Dock. This is a slim device that hooks onto the Thunderbolt bus and gives you a range of interface capabilities. You get Ethernet, eSATA, FireWire 800, headphone and microphone jacks, and three USB 3 ports. It's just what you need to plug a MacBook Air into to give it more I/O capabilities, especially useful as a desktop breakout-box that you leave at home. Belkin says it will ship in September, and although no price has been mentioned, rumours put it at $399. It can't be much more than this; otherwise, it will start to look expensive compared to the 27in Thunderbolt display, which has all these ports as well as a big screen.

Matrox doesn't want to be left out of the party either, and is bringing to market a small Thunderbolt docking station for a rumoured $249. This will offer a DVI output connector, which seems curiously retro in these days of HDMI. There will be a Gigabit Ethernet port, one USB 3 and two USB 2 ports, and audio in and out. Again, it's expected to be ready to ship in September.

Finally, I've received my LaCie Thunderbolt eSATA adapters, which I first spied back in January at CES. Each box has Thunderbolt in and out ports and two eSATA sockets. Plug in an eSATA array or disk and it magically appears on your desktop as a mounted device. This is a very useful way of bringing forward older eSATA devices onto Thunderbolt connectivity. The price isn't high and the performance appears to be excellent. I'll be using one to migrate my two-year-old LaCie Big 8TB array onto Thunderbolt.

Belkin's Thunderbolt Express Dock is perfect for giving a MacBook Air more I/O capabilities

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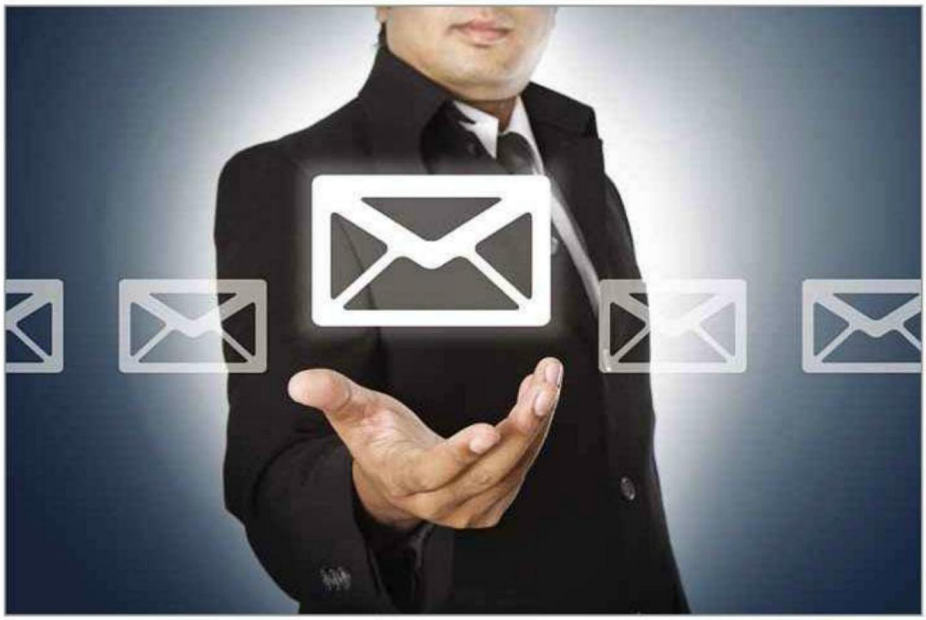
MOBILE & WIRELESS

Email everywhere

Paul Ockenden ponders the best way to sync email across devices, looks at mobile OS upgrades, and tracks down earbuds designed for mobile

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



How many email-capable devices do you own? And how many do you use on a regular basis? For me it's a desktop in the office, a chunky powerhouse Windows laptop that I use at home and a more portable one that I carry on trips, a Mac, three tablets (travel, bedside and coffee table), and maybe four different phones that I'm testing at any one time. Now I realise I'm not a typical user, especially since three of the phones and one of the tablets are on loan, but I don't think it's unusual for someone to have a work PC, a home PC, a laptop, a phone and possibly a tablet, all needing access to the same email account. Or more likely, multiple accounts.

There are problems, however, and they arise not so much from sending or receiving email – most devices these days come with brilliant clients for doing that. No, what bugs people is keeping their email properly synced across multiple computers and handhelds. If you're still working with POP3 (and many people are forced to), a particular incoming email might have been downloaded on one device and deleted from the server; then, if you want to reply to it from your phone or tablet, you'll find it isn't there. Likewise, if you replied to an email a couple of weeks ago and want to refer back to it in your Sent Items folder – again, with a traditional POP3 setup – you'll need to be on the same machine to do this. It's very messy.

"What bugs people is keeping email synced across multiple computers and handhelds"

There are a number of solutions, and I'll run through several here – my list won't be comprehensive, and I'm sure some of you will have other (probably better) ideas, so keep an eye on the *PC Pro* website and feel free to add a comment once this part of the column appears.

Let's start with the basics. By default, most email clients will delete an email from a POP3 server as soon as it's been downloaded: you'll usually find an option buried somewhere in the settings or options, to "leave email on the server for xx days". Set that to something like 30 days, or whatever suits your working environment, and at least you'll receive all of your email on all of your devices. You'll need to adjust the time period to the longest that any single device can sit on the desk without you using it. Oh, and what's vitally important is that you need to make this configuration change on all of your POP3 clients – leave only one on the default setting and it will kill the setup completely.

What about sent emails? How do you get those on all of your devices? Well, it's a bit clumsy perhaps, but the simplest way is to CC (or preferably BCC) all your emails back to yourself. In fact, you'll be able to set many email clients to do that automatically. With others, Outlook being an example, you can create a rule to automatically forward all sent emails to another address, and this can be your own address, thus looping the mails back to your own account. Unfortunately, with Outlook 2010 you can only CC, not BCC such emails, which isn't a massive problem, but can look odd when others see that you're CCing yourself on all of your emails. There's a way around this using custom VB code, and perhaps that's something I'll return to in the future.

Another option, and it's one that I see many people recommend, is to set up a Gmail or Hotmail account and use it as an email archive, forwarding both your inbound and outbound messages there. It works well, but I don't really find it particularly convenient – if you're looking for an email from a year ago, for example, but have only a vague notion of the name of the person you were communicating with, you end up doing several searches in two different places.

You might ask, "why not use Gmail as your main email provider?" This is an option, especially if you use the Apps version that enables you to use your domain name (I believe our esteemed RWC editor Dick Pountain does this). Problems arise if you have to access and act upon emails from multiple sources – for example, I have a mail server that looks after

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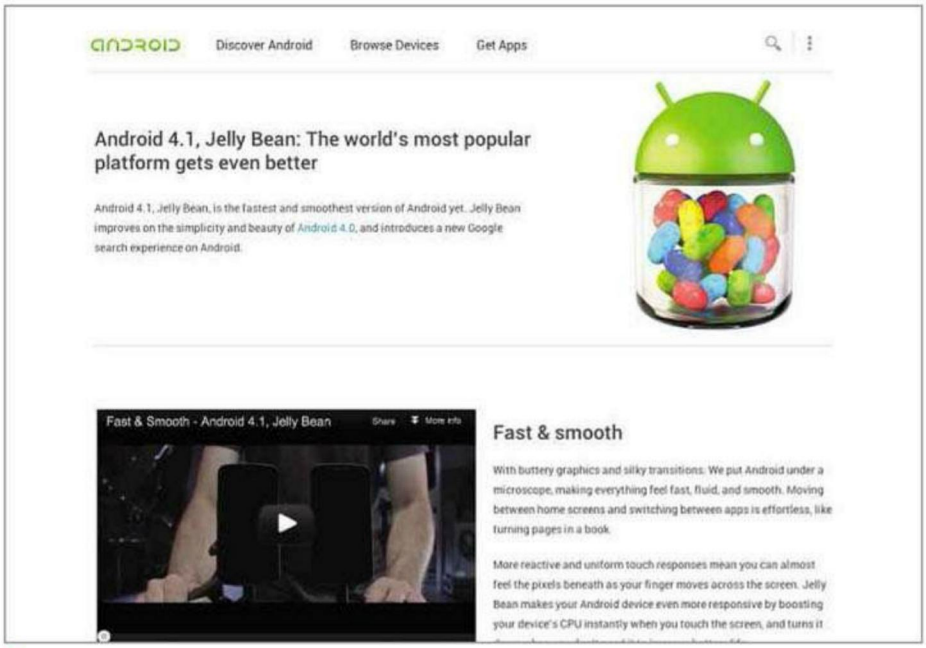
personal and *PC Pro* emails, then cst-group.com for my web agency, demographix.com for the online survey company I help out with, plus a few more. Most people can't force their employer or ISP to use Gmail!

There's also a potential problem over snooping, since many people simply don't want Google to have access to all of their emails and target them with ads and services based on the content. Sure, you can opt out of this in the Gmail settings, but I've never seen a clear statement from Google about whether this actually turns off the email scanning or merely doesn't display targeted ads. For all of these reasons Gmail and Hotmail simply won't be viable options for many people, either as main providers or as email archives.

What about IMAP then? Surely it was designed to address these issues? This is certainly true – with POP3 your mail client grabs the messages and runs the mailbox locally, whereas IMAP works by keeping your mailbox on the server, and the client software (Outlook, Thunderbird, or whatever) simply provides a window onto that mailbox. It means all computers see the same view, and even share the Sent Items folder. Perfect, eh? In an ideal world it would be, but there are still a few problems. First, despite IMAP being 26 years old this year, not every email system supports it. Well, actually, most email systems support it, but not all mail server managers open it up: many old-school network admins still think IMAP is a horrible new invention.

If you look at the most popular UK ISPs, for example, you'll find the majority support POP3 only for email collection – and it isn't too difficult to understand why since IMAP keeping all of the email on their servers massively increases the disk space consumed. This isn't much of a problem on a mail server in a small company with few employees, but ramp it up to a large ISP and the costs of disk space go up considerably compared to a POP3-based setup.

One of the most common email environments in Enterprise Land is Microsoft Exchange Server, and not only does ActiveSync ensure you'll see the same view on your mobile devices as you do in Outlook (including message read status and flags), it's also great for keeping multiple devices in sync because, as with IMAP, the main mailbox is stored on the server. Yes, this uses up lots of disk space, but in an Exchange environment that's expected. There are usually size limits on an Exchange mailbox, which will be site-dependent, but figures in the range of 200MB to 750MB are fairly typical. Unfortunately, if you're the kind of person who likes to – or maybe needs to – keep old emails then even 750MB won't last long. My own email archive, for example, takes up little over 10GB. This is fairly easy to manage in an Exchange/Outlook environment, though, since you'll move older emails off the server to locally held PST files on one of the connected PCs.



One of the first things you'll notice with Android 4.1 is how smoothly it runs

In fact, Outlook includes a very nice auto-archive facility that can be set to sweep ancient emails from your Exchange mailbox on a regular basis. What this does of course is take us right back to square one. Much as with the old POP3 email problem, these ancient emails will be available only from the machine that holds the PST file, so if you're out on the road or sitting at home, and want to refer back to an email you sent this time last year (maybe for a service or contract renewal), you probably won't have access to that PST file. Even if you do have file-level access to it, it will be a huge file that might take hours to copy.

There are several different solutions to this, but one of the best I've found is a fairly cheap bit of software called SynchPST for Outlook, from a company called Wisco: you simply point the application at two PST files and it neatly synchronises their contents. You can either sync the whole PST file, or maybe just a single folder or two. The first time you run it, it will take a while, especially if you're syncing over a slow link between home and office, but from then onwards it will run much quicker since it only syncs changed or updated emails. Incidentally, it will sync all Outlook data, including calendar entries and contacts. I can heartily recommend it as a way to keep your PST files in shape.

"I can heartily recommend SynchPST for Outlook as a way to keep your PST files in shape"

SynchPST is a useful tool for keeping your email in sync across multiple PCs

The software comes in two flavours, a Home version that probably does most of what most people need and costs $40, and a Pro version for $30 more that can sync between Exchange servers and PST files, work with password-protected PST files and also enables you to schedule regular synchronisation. I use the Pro version, but for simple PST file syncing I think you'll be fine with the Home edition.

One thing you might notice when you start to sync PST files between different computers is

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that you end up with several copies of the same email, especially if you've moved certain emails into folders on one machine but not on another – sync the two and you'll find copies in both the inbox and the folder. Again, Wisco comes to the rescue with its product NoMoreDupes, which does pretty much what it says on the tin: scanning your mailbox for multiple copies of the same email (or contact, appointment and so on), even if they're in different folders, and allowing you to cull the duplicates.

Smartphone users will appreciate NoMoreDupes too, since you often find that when you change phones you can end up with two or more copies of your contacts and calendar entries – I experience this all the time when testing new handsets. NoMoreDupes clears this up nicely, and is a snip at $30.

OS upgrades

I received lots of feedback following my write-up about mobile OS upgrades in issue 213 (web ID: 375505). Of course, since I wrote this we've seen Google release Android 4.1, otherwise known as Jelly Bean; Apple announce iOS 6 (scheduled for autumn); and Microsoft announcing Windows Phone 8 (scheduled for autumn). Google pulled a bit of an Apple with 4.1, by making it available only an hour or two after the keynote announcement. At the time of writing, there were no proper "vendor" versions, but developers have already provided cooked ROMs for a couple of popular devices, and from my brief hands-on I'd say Google has done a great job. The OS now feels faster even though it isn't, because Google has really concentrated on eliminating lag – tap an icon or swipe a screen and reaction seems to be instant. It's almost disconcerting at first!

It's too soon to write much about iOS 6 or Windows Phone 8, except to say that I can't believe that Microsoft isn't providing an upgrade path from Windows Phone 7 devices. I reckon this will leave a really bad taste in many owners' mouths, especially among corporate buyers. When the company released Windows Phone 7 it effectively stranded owners of Windows Mobile 6.5 devices, and now only 18 months later, it's doing exactly the same again. I think this is going to be a massive test of brand loyalty. Will any large corporations now invest in Windows Phone 8, or will they be frightened that Microsoft will pull the same stunt again in a year or two? And will anyone buy into Windows Phone 7 now? I doubt it.

Ear we go

For a while now I've been trying to find a good solution for making laptop calls via Skype or Lync. There's a whole slew of options, from the high-end and eye-wateringly expensive Plantronics kit through to simple options such as just plugging a set of iPhone earbuds into your laptop via an adapter to split the earphone and mic functions. The latter trick actually works, but the in-cord controls probably won't, so you'll have to mess around with onscreen controls. In fact, even with some of the high-end earbuds you'll probably find that the in-cord controls don't work in Lync, so when you press Mute, for example, it will mute the whole laptop rather than only the Lync client.

Recently I've been playing with a set of Logitech's BH320 earbuds, which plug into the USB socket rather than the usual headphone and mic socket and so can pass commands properly to Lync, Skype or whatever.

I've found these BH320s to be excellent for making voice calls. In fact, I reckon that most times they're better than using a wired telephone (and the person at the other end often remarks that my voice is extremely clear, too). I did try using them for music, which works, but I wouldn't recommend it for serious listening because the bass, in particular, is almost non-existent. But I don't think these earbuds are supposed to be about listening to music – they're optimised for voice calling and perform that function exceptionally well.

I was a little surprised to find a company such as Logitech making kit such as this, since most of its products are very much in the consumer space: internet radios, Squeezebox streamers, big flashy remote controls, keyboards and mice. I wasn't even aware the company was active within the B2B space; based on my real-world test of the BH320s, however, I think Logitech is onto a winner here.

Logitech's BH320s are specifically designed for voice communications via Lync or Skype, and work much better than generic ear buds

The most attractive thing about Google's Nexus 7 tablet is its price

A kick in the price point!

The day before I wrote this, Google announced the Nexus 7 tablet. It's too soon to make any real-world comments about the device, but it's interesting to see that the big boys' tablet market has essentially split into two, with Apple and Microsoft going after the high-end while Google goes after more cost-conscious buyers with the Nexus 7. I can't help feeling, during a recession, Google has made the right call on this one.

BlackBerry snooze

Whenever a calendar reminder pops up on a BlackBerry, you'll receive a default snooze timer: you can control the length of this default timer globally, from one to 30 minutes, but can't set it for individual reminders. That is, until my friends at CrackBerry.com discovered that if you go into the calendar settings and type acsz, you'll see a popup that says "Now allowing user to change snooze from dialog". You'll find that when your next reminder pops up, you'll be able to scroll through times from a minute up to an hour. It's a shame the upper limit is an hour – in Outlook, a reminder can be postponed for several days – but any adjustment is welcome.

Can anyone think of a good reason why RIM buried such a useful option in this fashion? It's been in its mobile OS for some time, going back at least to OS 5, and I'm struggling to think of any good reason why this facility wasn't enabled by default.

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ONLINE BUSINESS

Shopping around for an online shop

Kevin Partner takes a fresh look at the market for hosted e-commerce software, with mixed results

KEVIN PARTNER

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My first experience of e-commerce came ten years ago, when I set up an online children's bookshop called TwoToucans.co.uk. Amazon's dominance is now so complete that such an idea today is unthinkable; back then there was still a gap in the market. The launch of *Harry Potter and The Order Of The Phoenix* created excitement: embargoes, secret deliveries, don't open until the day before release! Demand was such that we needed 12 staff to lug our pre-orders to the post office. It was highly profitable until we moved on to more profitable projects, and I learned plenty about e-commerce.

Back then you built online shops on your desktop PC before uploading the resulting HTML and JavaScript onto a server, since neither the software nor the bandwidth to build them online existed. Two main authoring tools ruled this market: the ShopFactory series and Actinic's range. I did investigate Actinic Catalog, which I'd seen used by many existing online shops, and installed a trial version, but didn't take to it. It felt too complicated: it was a simple bookshop, after all, and the fact that ShopFactory was considerably cheaper clinched it – we based our bookshop and several later ones on that. However, building shops offline and having to, in effect, overwrite them every time you made a stock change has always felt wrong. So when I came to set up my most recent venture I researched online shop-building tools, and after a false start with ekmPowershop, I settled for BigCommerce.

> **"For most small businesses, hosted e-commerce platforms are the most convenient"**

In the meantime Actinic developed its own, somewhat basic, online tool called Actinic Express, but last year abandoned this by partnering with Oxatis, and forming a new business called Actinic Online using the new partner's existing software. To add a further twist, this partnership recently broke up and Oxatis walked away with the Actinic brand name, the original desktop tools now being sold under the name SellerDeck.

For most small businesses, especially during their start-up phase, hosted e-commerce platforms such as those offered by Volusion (**www.volusion.co.uk**) and BigCommerce (**www.bigcommerce.com**) are more convenient and easier to set up. Proponents of desktop tools may point out that a hosted platform exposes your shop to the risk of the provider going out of business, so it makes sense to pick one of the major players to minimise this risk. As your enterprise grows, you could choose to set up your own server (although that merely shifts the risk to your server provider staying afloat). Nevertheless, whether your shop lives on your own server or one owned by an e-commerce provider, it remains more efficient to build the actual shop online.

It's a couple of years since I last looked for a hosted e-commerce platform, and the product I chose then, BigCommerce, has since become far more polished and better featured. However, I've learned the hard way to check periodically that the choice I made back then remains sensible, and here's what I uncovered. I won't go into a Labs-style feature comparison, but simply outline the main competitors, having signed up for trial accounts and spent long enough with each to decide whether they're worth abandoning my current provider for. As with changing bank accounts, business addresses or accountants, the sheer bother creates an inertia that any potential new provider must offer significant improvements to overcome.

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Read Kevin's How To Set Up An Online Business
Buy from www.magbooks.com

ekmPowershop (**www.ekmpowershop.co.uk**) and I go back to the mid-2000s and my first online hosted shop. At that time I was sufficiently impressed to recommend it, based largely on the benefits of moving away from desktop tools: it enabled me to update my shop contents from anywhere, to add special offers on the fly, and to manage the orders entirely online. Hence when I came to build a pilot for what became my main online retail business back in 2009, I naturally returned to it. Sadly, I discovered that while online shopping had changed over those intervening years, ekm had not. We ran it for long enough to finish the pilot and then moved to BigCommerce. With that move I experienced the sort of freedom I'd enjoyed when moving my bookkeeping from Sage to FreeAgent – and frankly, I haven't looked back since.

However, I was keen to see whether ekm has now moved with the times, especially since it's a British company and I prefer to use UK suppliers wherever possible. One area it's certainly addressed is the quality of its built-in shop designs. Back in 2009, its shops relied on table-based layouts that should have been consigned to a design museum; in 2012, these have been replaced by usable CSS-based ones. In fact, ekm is now the only provider considered here that allows you to edit its product from within the live page.

"Time wasted through inefficient workflow means money thrown away"

This is where the good news ends, I'm afraid. While the website customers will see can be made to function reasonably, its administration interface remains awful. For example, if I wanted to create a coupon code to allow customers to receive 10% off an item, it can be achieved in one screen in BigCommerce. In ekmPowershop it's a ten-step process, which must be repeated in full for every single promotion. This isn't the worst of it.

After signing up for a trial shop, I went to Settings | Account Settings | Your Details, only to find it pre-populated with someone else's details: the person concerned had also signed up for a trial and was a little shocked to receive an email from a complete stranger (she should consider herself lucky, because I also had her mobile phone number courtesy of ekm). The company's response was unhelpful: "It could just have been that you were logged in to the same demo shop as someone else." If banks worked in the same way, when I logged into online banking I may "just" get access to someone else's money. As I write this column, it's been a week since I brought this gaffe to ekm's attention, but despite chasing emails I've yet to hear any more.

This lax security alone would have been enough to put me off the product, let alone its poor admin interface, but to add insult to injury its website displays cavalier use of the greengrocers' apostrophe throughout, which may sound trivial but "just" suggests lack of attention to detail and amateurishness.

Actinic Online (**www.actinic.co.uk**) is a rebranding of Oxatis' long-established e-commerce platform. Once again, I've seen shops created using Actinic that are presentable, but I shudder to imagine the torture their owners went through to achieve that. Remember those early web apps, created by programmers who spent 90% of their time on the back-end functions and then bolted on a crude UI amounting to little more than a database field editor? That's how Actinic feels.

For example, there are two buttons on the Site Designs page called Modify and Customise. One of these allows you to edit the existing design, while the other completely replaces it with a new template – but could you guess which is which? Once you're in the SmartSkins Editor (no sniggering), how do you think you'd insert your own logo to replace the placeholder? Click on Logo perhaps? Nope, all that does is move the placeholder around; you have to exit the editor and hunt around in the control panel for the "Headers and Logos" option, then expressly ignore its recommendation about dimensions because these contradict the requirements of the placeholder.

It doesn't get much easier when you come to add products, which have both "attributes" and "properties", a dead giveaway that programmers designed this interface. Uploading photos is easy enough, except that Actinic Online is the only e-commerce package I've ever encountered that doesn't resize them to fit the space: uploading a 2,500 x 2,500 product shot will blast your layout to smithereens. You're warned when you upload a large photo, but you're not told what size you should be using, so it's a matter of guesswork.

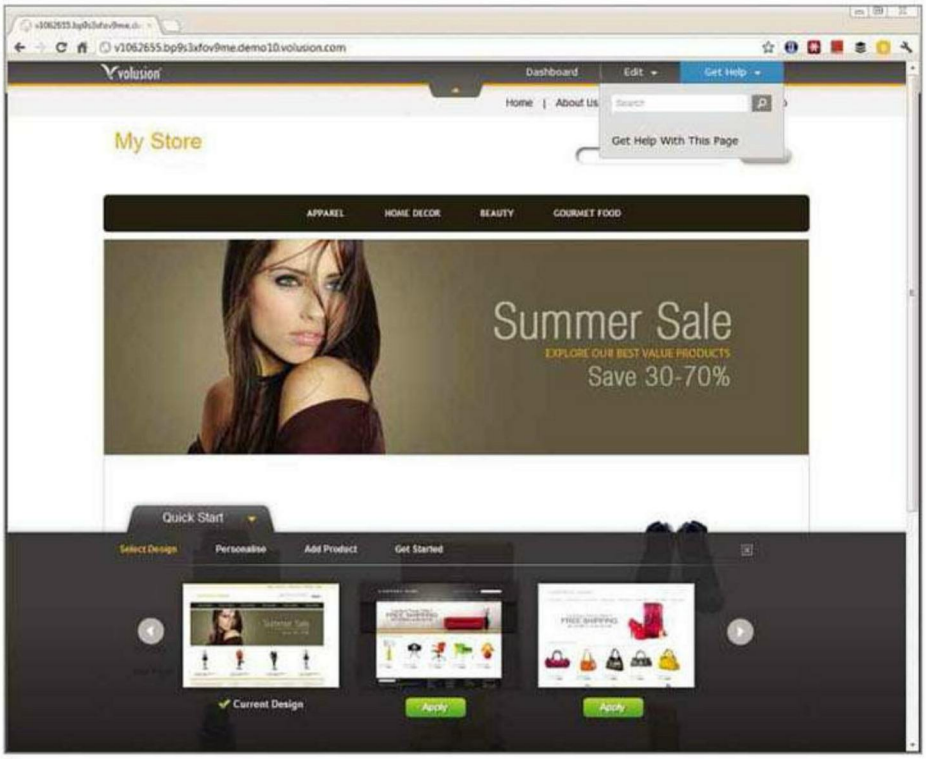
There's little evidence this interface was designed with the needs of online retailers in mind, for whom a smooth and efficient back-end is essential. When you have a hundred orders to process, time wasted through inefficient workflow means missed dispatch deadlines and money thrown away. Despite hints of power lurking beneath this hideous user interface, Actinic Online offers no significant advantage over BigCommerce to compensate for the migraines that using it would induce.

Volusion If you want an amusing peep into the minds of marketeers, Google "volusion vs bigcommerce" and look at the comparison tables created by each. Both are either deliberately (surely not) or accidentally misleading – for example, each claiming that the other doesn't include a Facebook shop plugin; in fact, both do.

In use, however, Volusion is a breath of fresh air compared to ekmPowershop and Actinic Online. Its interface is modern, well thought through, and comes with around 150 free design templates – although many are merely colour variations, so the number of distinct designs is far fewer. That said, the layouts are of good quality and can be customised via HTML/CSS. However, there's no way I can find to visually edit layouts, so even the simplest change requires specialist knowledge, which Volusion is happy to provide for a price. The only problem I encountered was that if I included a colon in my product name, the system threw back an unfriendly ASP error message – and it took some working out that the colon was the culprit.

That aside, Volusion offers a similar range of features to BigCommerce, and if I were setting up my store from scratch today I'd trial them both extensively before choosing – I suspect the easier design customisation features of BigCommerce might still win the day, but it would be a close thing. However, I can't make a case for undergoing the tremendous upheaval

While capable of good end results, Actinic Online is let down by a poor and inefficient back-end interface



Volusion is slick and easy to use, a worthy alternative to BigCommerce

of switching and losing two and a half years of experience with BigCommerce. The two platforms differ mainly in the details, and you may find that a particular feature tips the balance for your business.

Promoting Facebook

Following its recent flotation, Facebook has been relentlessly tinkering with the way ads are created, targeted and delivered. This is no great surprise, since outside of advertising it's hard to see how Facebook can generate money. Indeed, until it finds an effective way to incorporate ads into mobile apps, even this source of revenue is questionable. This search for an approach to mobile that satisfies the needs of advertisers without cheesing off users may have the side effect of clearing the path to a curated app store on Facebook, at least for the Android platform. If it could pull that off, it could charge 30% on each sale and reduce its reliance on ads.

The Promoted Post is the first step towards this cross-platform transition. Traditionally, Facebook ads have appeared in the right-hand column of the News Feed, and most other views, but this causes a problem in mobile clients, which have restricted horizontal space. Promoted Posts are exactly what their name suggests: page-owners pay for their status updates to be promoted onto the pages of their followers. The post itself looks exactly like a standard status update, except for an almost invisible "sponsored" label in the bottom-left corner. So cheekily, Facebook is asking its customers (that is, advertisers) to pay to overcome one of its own chief problems.

The average Facebook user has so many friends and has Liked so many pages that their News Feed is beginning to resemble a Twitter stream, which means that if I post a status update from my page, unless I time it carefully, chances are it will get swept away down their News Feed before they can even read it. This would be bad enough if – as on Twitter – items appeared in strict chronological order, but Facebook prefers a ranking algorithm that estimates which updates the user is most likely to want to see, based largely on whether they habitually Like your posts.

Facebook would have us believe nothing will change for posts that aren't promoted, but this has to be a zero-sum game where every promoted post pushes non-sponsored posts one place downstream. Given that money will almost certainly take precedence over every other ranking attribute, the first posts you see could no longer be those you're most interested in, but those that have been best paid for. Facebook needs to be careful to avoid users' News Feeds being kidnapped by those prepared to pay the most, which may trigger wholesale abandonment of the platform.

At present only pages with 400+ Likes are allowed to promote posts, which excludes brand-new pages and hence most obvious spammers. Beyond that the limits are that only status updates less than four days old can be promoted, and the budget is capped at a low amount. My initial experiments suggest this might become a useful promotional tool – for now at least. It's a blunt tool, since your updates are seen by all users regardless of nationality, location, age and so on, but the clickthrough rate for my first promoted post was an order of magnitude better than for a standard ad.

This route is only worthwhile if you have a way to convert Facebook Likes into paying customers, so it's essential to work out that aspect before investing in any form of promotion: spend too much on cheap Likes and you'll end up with an audience that strokes your ego while you haemorrhage profits.

Emotional blackmail

What's the most effective way of getting people to Like your page? The current fashion seems to be for emotional statements such as the "Click Like if you love your mum" approach used by P&G in its latest ad campaign. The problem is that while this will generate plenty of Likes for your page (thus, presumably, fulfilling the vanity metric targets of your marketing department), most people clicking the ad have no engagement with P&G itself or even with the specific campaign. After all, most of us would agree with that sentiment, but it doesn't make us prime leads. Remember that each click must be paid for, so it's essential it leads to an engaged audience, if not a direct sale. And yet when P&G announced a competition, only 0.3% of its audience Liked it, and a pathetic 0.04% commented.

Personally, I find the current trend for emotional blackmail on Facebook nauseating. In this case it's using the tinge of guilt some people might feel if they don't click Like having seen the question – but again, this hardly makes them prime prospects. In my view, they've made a fundamental tactical mistake, as the campaign is clearly aimed at mothers (fathers being notably absent from the campaign videos) and yet I saw the ad and I'm no-one's mum.

One way in which Facebook Advertising trumps Google AdWords is in the precision of targeting its offers, so if I'd been running that campaign I'd have targeted women over 30 living in the UK and changed the text to read "Click Like if you love your kids". This way, you'd end up with a higher proportion of the people the campaign is aimed at. But as it happens I wouldn't use such a tactic at all, not only because I regard it as manipulative, but because it's still far less targeted than some alternatives. A plain "Click Like if you support our campaign" would have been honest and would have garnered a 100% engaged audience.

Woolly and costly

Smaller online businesses simply can't afford to indulge in woolly, emotional marketing. Each campaign must pay its way, and you can ensure that only by knowing how much each customer is worth to your business – if your marketing costs more than that per head, stop it now before you're forced to.

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SECURITY & SOCIAL NETWORKING

Generation I (for insecure)?

Davey Winder explores the Pinterest security problem and reveals how to check if you've been Pwned

DAVEY WINDER

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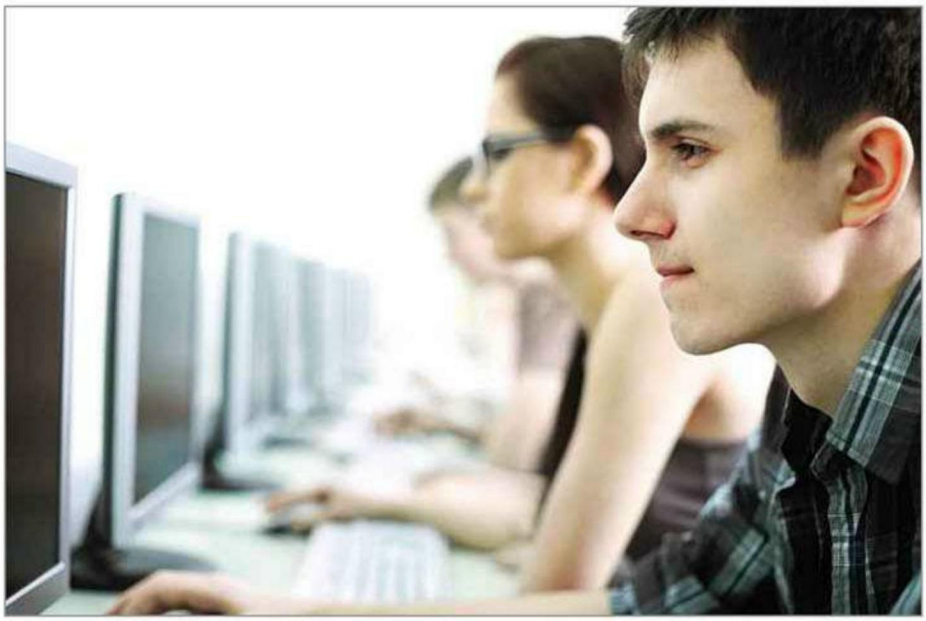

Check Point, the firm behind ZoneAlarm, published a report revealing interesting variations in how security is perceived and applied by different age groups. This "generation gap in computer security" report (**www.pcpro.co.uk/links/216sec**) looked at attitudes of "Generation Y" (18 to 25-year-olds) versus "baby boomers" (56 to 65-year-olds) and its results were surprising. Generation Y users were surer of themselves concerning IT security than baby boomers, but had experienced more security problems over the past couple of years than the latter. In fact, the research suggests 78% of younger users don't follow best practices when it comes to computer security, while baby boomers are twice as likely to install and use security software. This could prove more problematic for the UK than the other regions covered, since it was here that reported security breaches over the past two years peaked at 67%, compared to 57% in Australia and 50% in Canada, Germany and the USA.

> **"Research suggests 78% of younger users don't follow best practices for security"**

Perhaps the problems for Generation Y users are due to poor prioritisation, since they value entertainment and community above security – only 31% of them placed security at the top of their list compared to 58% of 56 to 65-year-olds. Combine this with overconfidence when it comes to their perception of risk, and you're asking for trouble, especially if you throw in cost. Some 45% of Generation Y users think security software is too expensive, and are far less likely to use antivirus and third-party firewalls, for example.

Of course, there are free security suites available that perform very well in a domestic setting, and would almost certainly lead to a lowering of those infection rates were these people to use them. Assuming a Windows 7 platform – more specifically Windows 7 64-bit, which is pretty well the norm in both the domestic and small-business circles I frequent nowadays – it's easy enough to ward off malware and phishing attacks by installing Microsoft Security Essentials and Windows Defender, together with keeping everything you use properly patched and updated. That goes a long way towards mitigating most threats, for most people, and it costs nothing. Using Gmail as a spam filter helps keep most of the archived malware attachments off your PC as well.

It's even possible to defend against oft-used DNS redirects that send your browser off to a drive-by exploit site, should something nasty sneak past your initial defences. Both OpenDNS (**www.opendns.com**) and Google Public DNS (**www.pcpro.co.uk/links/216sec1**) are free DNS services that can bolster your security. For example, OpenDNS offers a phishing filter and domain blocking with typo correction. This kind of secured DNS, with free options that are perfectly adequate for most users, simply requires you to type the relevant DNS server addresses (208.67.222.222 and 8.8.8.8 respectively) into the DHCP server settings dialog of your router and let it deal with everything connected to the network.

Have you been Pwned?

I'm writing this column at the tail end of June 2012, and what a month for database breaches this has been, with membership database leaks confirmed by LinkedIn, eHarmony and TechRadar to name but three. Usually,

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individual members know about the potential risk they've been exposed to only once the news story breaks, or they receive an email telling them to change their passwords due to a security problem. The latter will often be ignored because people are wary of any email that asks them to "click here to change your password", which nowadays is perceived as potentially phishy. If you're among the masses that still reuse the same password across multiple sites, despite constant warnings to the contrary from myself and others within the IT security industry, this can be a major issue.

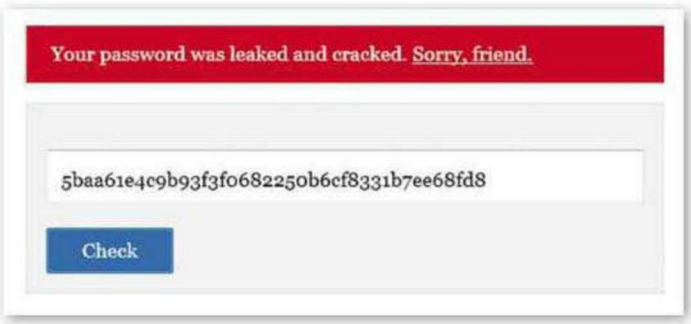
The bad guys know the value of trying a cracked password against webmail accounts in order to scrape useful personal data and perpetrate further scams, but they have to do this before the victim has a chance to change the password in question. Luckily for them – and unluckily for you – all too often this is easily achieved, since official notifications go unnoticed and media stories unread. In the case of the LinkedIn compromise, it was easy to check whether your password was among those affected by the breach, since a list of six-and-a-half million or so unsalted SHA-1 password hashes had been posted online in a bid to get help from other hackers in decrypting them. One web developer, who was on the list of leaked passwords made an app that compared your password – using a SHA-1 hash generator – to the published list and reported whether it had been compromised or not.

Of course, the professional advice is never to give your password to anyone, so an app such as this could all too easily have been a scam designed to collect yet more passwords. As it turns out, this wasn't the case, and LeakedIn (great name) employs JavaScript to hash your password so that the password itself never need leave the confines of your computer. Whether or not your password was on the list, however, my advice would still be to change it, having used LeakedIn or any other such resource just as a matter of common sense.

The best advice when it comes to passwords is to not reuse them – it's really asking for trouble. Invest in a password management solution such as LastPass or 1Password, which not only generates truly "strong" passwords, but also stores them safely in an encrypted format on your home computer, external drive, USB memory stick or smartphone. This way, you only have to remember one super-strong password in order to access all the others, and memorising a single complex string isn't beyond the ability of most folk. With a product such as this in place, it becomes easy to establish a rotation routine where you change all your passwords on a regular basis, adding to the security layers already in place.

PwnedList and LeakedIn (see below) identify at-risk accounts, but a secure password strategy is the best protection

I'd seriously recommend doing this if you're one of our hobbyist or small-business readers. Take the opportunity to change all your passwords: you may as well get off to the best start, and it will be a worthwhile investment of your time. In the meantime, you may want to make use of a neat tool called PwnedList (**https://pwnedlist.com**), which will check whether your email address has appeared in any of the hacker dumps from corporate data breaches that appear online. If it has, then you're at an increased risk of falling victim to fraud, and should set a password-changing strategy in motion immediately.



PwnedList started when security researchers wondered how many compromised accounts could be harvested automatically by a scraping routine – the answer was 30,000 within two hours, complete with logins and passwords attached. They decided to create a one-click service to allow people to check if their email was in any of these account dumps, and to do so for free. At the time of writing, the number of "pwned" emails harvested and compiled in this way is almost 15 million. It should be noted that PwnedList only scrapes the emails, and the accompanying password and login data is discarded. The emails are put through a one-way hash and the cleartext is then destroyed, and when you enter your email address in the checker it isn't stored in any form.

Forget BYOD, what about BYOB?

While Bring Your Own Device (BYOD) continues to soak up headlines and hyperbole in equal measure, I'm willing to gamble that you probably haven't yet heard about BYOB. Bring Your Own Browser is the name applied to a security threat that enables a potential hacker to make the leap from a compromised home PC to a work PC, in much the same way that BYOD opens up a consumer-to-workplace threat channel, but without any physical device being involved. The key, according to the Imperva Application Defense Center researchers who uncovered the threat, is the tab-syncing feature introduced in recent versions of the Google Chrome browser. It looks like a great feature, syncing your browser tabs across multiple computers so whatever pages were open when you left your office will still be open when you fire up Chrome at home, and vice versa.

Where's the risk in this? According to Rob Rachwald, director of security at Imperva, it's a pretty straightforward one: sign in to your sync account at home and work to enable the tab synchronisation to be utilised; if the home PC is compromised by a malware infection then the data you sync from your work PC is also compromised. Now you might still think that this is no big deal, that even if a hacker were able to see what internal corporate URLs you've been accessing, this information alone isn't necessarily going to lead to a breach. But it isn't only data about which tabs are open that's synced to Chrome when you sign in. In fact, to enable a "personal Chrome experience" across all devices, pretty well all browser settings are synced, including apps installed, bookmarks, extensions and browsing history, for example.

Now the threat surface has just expanded considerably, and all of a sudden the value of that kind of information to a potential hacker is far greater, especially when you consider that

"Invest in a password management solution such as LastPass or 1Password"

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the Chrome default for syncing is to include everything. Remember, unlike BYOD scenarios, where there's the opportunity to implement security measures to manage what data can flow between devices when you connect your home laptop or smartphone to the company network, managing what you do with your home web browser or the one that lives in your pocket is impossible for enterprise IT bods.

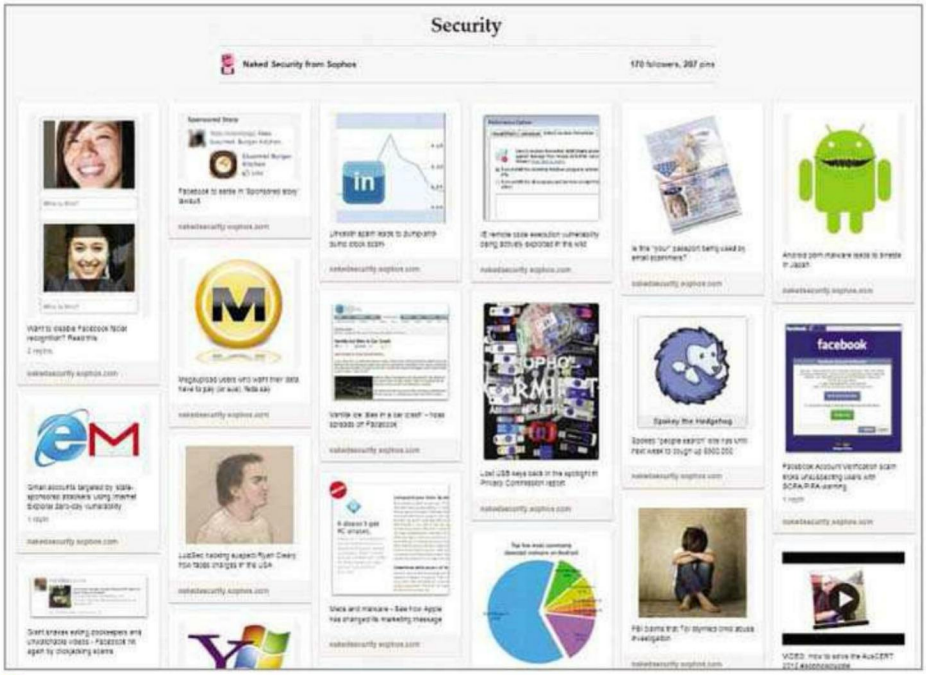
Malware detection in the workplace will spot and stop most infections, but "most" isn't good enough. What if a home PC, by virtue of the corporate acceptable use policy not stretching into the domestic environment, became infected by malware that does the drive-by thing and redirects an open URL to an infected page distributing a zero-day exploit? If the same settings are synced to the work computer, then that browser is at risk from the same infection as soon as it's opened – and this being a zero-day means the chances are high that the company network will be compromised even if there are heuristic and other methods in place to mitigate the zero-day risk.

How so? Because the home PC will remain infected even though the corporate one has detected the exploit and disinfected itself, leaving the bad guys (should they be of the advanced, persistent threat variety) to tweak and morph the malware that would get a fresh chance at antivirus avoidance every day. Then there's the small matter of apps and extensions, which are also synced between devices by default. I'm sure you don't need me to remind you of the dangers of rogue extensions, especially in terms of JavaScript injection attacks. Now think back to the no AUP at home dilemma, and while an AUP may guard against the installation of non-trusted apps and extensions in the workplace, it can't reach into the home, where defences are likely to be lower and users more relaxed when it comes to the nature of the extensions they install, and the provenance of the developers who create them.

Scammers' interest in Pinterest

Pinterest is the latest in a long line of social sites that have captured the imagination of the public. Think of it, as its name suggests, as a pinboard to which you can post images and videos, along with captions, to create themed collections of similar items. Since posts are collated in a thematic way, there's a natural contextual relationship between the posts and the people posting them. Being able to search by boards, pins and people emphasises the social media roots of Pinterest, as does the ability to "Like" and post comments and share via Facebook and Twitter.

The last I heard its official number of users is more than 18 million, although not all of these will be members yet, since it's invitation-only so far as being able to post your own stuff is concerned. Perhaps not too surprisingly, among those invited members are a fair number



Not all Pinterest posts are as innocent as they look

of scammers, peddling everything from spam through to images containing malicious links, or even embedded malware. There have already been reports of scammers impersonating brands by setting up fake boards as phishing and malware bait, and spammers posting images with links that redirect the viewer to scam sites. There are even Pinterest spam botnet kits for sale that boost traffic to a spammers' board and inflate its popularity in order to attract more victims with automated legitimacy.

Perhaps the biggest security problem Pinterest faces at the moment is that it's new territory for its users, so the bad guys will look to exploit the lack of understanding of what a Pinterest spam or scam post looks like.

RAT in the machine

The world of infosecurity is riddled with jargon, some unnecessary, but much of it needed to differentiate between threat types. All jargon has the effect of confusing people, so I thought it a good idea to introduce a jargon-busting spot to each month's column.

Google security: by numbers

According to its latest Security Team report, Google is now shielding 600 million users through built-in protection within the Chrome, Firefox and Safari browsers, and displaying "several million" malware and phishing warnings every day. For Google search itself, as many as 14 million queries a day trigger similar warnings, and 9,500 new websites are added to the malicious sites list. Chrome users also enjoy a download protection service that's currently flagging 300,000 downloads per day as problematic.

Let's start with the commonly used RAT, which is a prime example of confusingly ambiguous jargon. Googling it will offer you Ram Air Turbine, Routing Analysis Tool, Reliability Assessment Test, Remote Administration Tool and Remote Access Trojan among 50 or so other possibilities. The last two are actually both relevant in a security context, as a RAT means a trojan that uses a Remote Administration Tool to gain access to and control a target computer.

The first RAT to achieve notoriety was a rootkit developed by the Cult of the Dead Cow collective to expose security holes in Windows, which went by the rather clever name of Back Orifice. Since then RATs have become very sophisticated, scraping personal and financial data from target machines while adding that computer to a botnet. Another reason for their popularity is that they're difficult to detect, since they mimic tasks performed by legitimate applications, quietly in the background without impacting noticeably upon system resources.

The RAT has become so commonplace that much of the malware distributed nowadays includes a Remote Admin Tool, and this aspect is often monetised by those who develop malware attack kits: while the kit itself is often distributed for free, user/attackers who want to access the value-added RAT components such as remote screen capture, keylogging and command execution have to pay a fee to activate these functions. Some RAT operations are pretty sophisticated, with subscription-based access to web portals from where the trojans can be personalised and the infected victims managed. Such services have promoted script-kiddies (hackers with no real technical knowledge, just access to prefabricated hacking kits) to a new level of virulence as all the tools they need to distribute and launch an attack are provided, along with hosted command and control servers that include usage tutorials.

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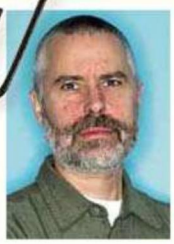
Office 2013
Read more on Microsoft's latest release, p22

OFFICE APPLICATIONS

Office on the Surface

Simon Jones is kept waiting for Office 2013, bids farewell to Office Starter edition, and looks at the controversy over software in schools



SIMON JONES

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In all the hoo-hah over the surprising (to some) announcement that Microsoft is launching its own range of tablet PCs, you may have failed to notice that the company slipped in details about Office. We'd already been told that Office would be "included" in Windows RT – the version of Windows 8 designed to run on ARM processors – and the launch of Surface gave us a name for this included edition of Office: Office Home and Student 2013 RT Preview edition.

Home and Student edition encompasses Word, Excel, PowerPoint and OneNote, so there's no Outlook, Publisher, Access, InfoPath or SharePoint Workspace included as part of the bundle. These products are all reserved for the larger, more expensive editions. This isn't particularly surprising, nor is it much of a revelation: it was only to be expected because of the sort of people Microsoft expects to purchase ARM-powered tablets. So did you spot the revealing bit? It's "Office Home and Student 2013 RT *Preview*". This is Microsoft fessing up, very quietly indeed, to the fact that when Surface for Windows RT ships in October of this year, the full version of Office 2013 won't actually be ready.

At a guess, if you buy a Surface for Windows RT – hereafter referred to for brevity's sake as Surface RT (ye gods, who names Microsoft products) – you'll probably find this unfinished beta productivity suite installed alongside the Mail, Calendar, People app, and you'll be expected to work with it as best you can until a final version is delivered, probably via the Microsoft Store in January or February 2013. We won't know how buggy this Preview version of Office RT is going to be until it actually ships, but we're not expecting to see it until September or later, when Microsoft finally hands Surface PCs to reviewers.

If you want to instead buy a full-fat Surface for Windows 8 Pro – hereafter referred to as Surface Pro – with its Intel processor and concomitant ability to run just about any desktop software, not only will you have to wait until January or February 2013, but you won't be getting a copy of Office with it at all. This is one crafty way to reduce the headline price of the Surface Pro, and it's also another nod towards what Microsoft considers the target audience for that machine. You see, if you're a sensible person who buys your copies of Office via a volume licence through Software Assurance (SA), you'll not only get the upgrade to Office 2013 as part of your SA agreement, but you can also install Office twice for each licence you own – once on a desktop and once on a portable computer such as Surface Pro – provided they're both for use by the same person and aren't generally going to be run concurrently.

Microsoft may well announce a Technology Guarantee programme for Office to ensure that retail customers can buy Office 2010 and get Office 2013 when it ships, but to judge from past performance, that usually only kicks in during the last few months before a new version ships. You might conclude from this that it's more about keeping sales of Office alive in the retail channel than it is about being fair to customers.

If you bought your current copy of Office through retail or OEM channels – that is, if it came with a new PC or you bought a cheap Product Key Card (PKC) or an OEM copy from a retailer – then you won't have any right to a new version. And, what's more, you can't legally transfer PKC or OEM licences to the new hardware (not even if you've scrapped your old machine or uninstalled the software from it). So if you have an old laptop that came with Office already installed on it, and you want to replace it with a Surface Pro next year, you'd do well to factor in to your calculations the price of another copy of Office.

> **"This move is more about keeping sales of Office alive in the retail channel"**

Of course, whether you are a business or home user, Microsoft would like you to sign up for an Office 365 subscription, which it's heavily pushing with the recent release of the Office 2013 Customer Preview. Subscriptions give Microsoft a direct, constant revenue stream and give you a constantly up-to-date copy of Office – but only as long as you continue to pay.

The ad-supported Office Starter edition is no more

Baby Office Starter edition goes bye-bye

We hardly knew it at all but the baby-faced Office Starter edition, a mere two years old, is no more. Shipped only with new PCs from the launch of Office 2010, Office Starter edition consisted of cut-down, advertising-supported versions of Word and Excel, and was intended to replace Works and Works Suite as a cheap productivity suite that PC makers could bundle with new machines. Users who wanted more functionality could buy a PKC to unlock the rest of the Office suite, upgrading it to any edition they wanted, but still firmly and legally locked to that one PC.

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Surface RT will ship with a preview version of Office Home and Student 2013

Microsoft has now notified its OEM partners that they'll no longer be able to obtain new licences for Office 2010 Starter edition, and they must include a new Office 2010 Transition OEM Preinstallation Kit (OPK) with their new PCs. The Office 2010 Transition OPK includes links to Microsoft's website to try or buy different editions of Office, but Starter edition won't be on the menu.

If you're currently using Office Starter 2010 edition, don't worry, it isn't about to stop working – it's good for the life of your PC. If you want to upgrade the PC's operating system to Windows 8 when it becomes available you'll be able to, provided you install a patch for Office Starter 2010 edition first. Microsoft seems intent on pushing users either up to Office Home and Student edition or down to the free Office Web Apps, both of which are expected to get an overhaul for Office 2013 when it finally sees the light of day.

Visual Studio LightSwitch unveils HTML Client

At TechEd North America, which took place in Orlando, Florida, back in June, Microsoft unveiled plans to extend Visual Studio LightSwitch with a new HTML front-end. This will complement rather than replace the current Silverlight front-end, and will be designed for use particularly on mobile devices such as smartphones and tablets. Developers will be able to add an HTML front-end to any pre-existing Silverlight front-end, and the two sets of screen designs (or views) will share the same back-end and data model. The HTML Client screens are optimised for lightweight display devices and small screen sizes, and they're focused mostly on delivering read-only data, with optional access to edit the data if the user requires that. As with the Silverlight client, most of the development work consists of running wizards and setting properties of objects, but any front-end code will be written in JavaScript and based on the jQuery mobile framework rather than Silverlight using VB.NET or C#.

Finger-friendly for touch-driven tablets and smartphones, the HTML Client screens will take advantage of whatever extensions are available on the hardware. For instance, if you mark a field as containing an email address – and if the browser supports it – the user will see a special soft keyboard containing buttons for ".com" and ".co.uk" whenever they go to edit the field. Developers will be able to add community libraries and extensions to their LightSwitch HTML Client projects using NuGet, and the HTML that's output by the tool is as clean and semantically correct as possible.

Since they're built using HTML5 and JavaScript, these screens will run on just about any device with a browser, whether that's Windows, Android, iOS or BlackBerry. The screens will automatically adjust themselves for smaller or larger display sizes, although obviously you should test the usability of the screen designs yourself on the real target devices. More up-to-date browsers and devices may show a slightly better user experience, but any HTML Client applications should still be usable with older devices.

"HTML Client screens will run on just about any device with a browser"

As you can build HTML clients on top of existing LightSwitch data models, you can save a lot of time in developing these systems compared to writing a new mobile system from scratch. LightSwitch is already a very fast way to produce Silverlight client applications for desktop- or browser-based use, and adding a way to write HTML/JavaScript apps for mobile devices makes it an even more compelling platform.

Everything isn't finished yet, and it still isn't feature complete, but it's hoped that this extension will ship soon after Visual Studio

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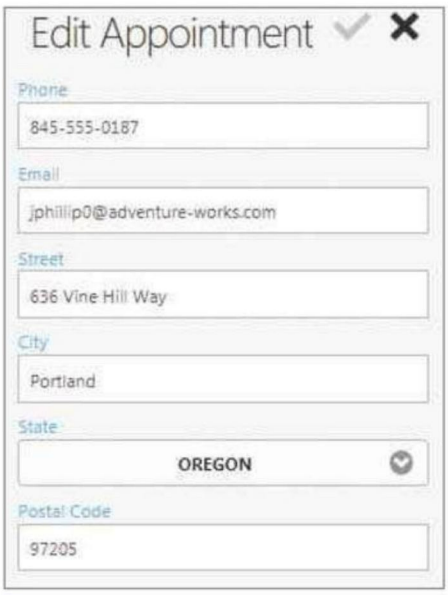
2013 itself. A community technology preview (CTP) of the HTML Client engine has just become available as a VHD (virtual hard disk image for virtual PC) containing everything you need to try it out. A more complete beta that you can add to your own copy of Visual Studio 2012 should follow, but in the meantime you can see videos of it in action on Channel 9 (**www.pcpro.co.uk/links/216oa1** and **www.pcpro.co.uk/links/216oa2**).

Office 365 goes to school

Microsoft's version of Office in the cloud celebrated its first birthday in June and launched its education plans, which are aimed to take over from the existing Live@edu service. Plans A2, A3 and A4 are similar to the enterprise plans E2, E3 and E4, but seem to be missing the SharePoint component – although this can be added at extra cost.

Plan A2, based around Office Web Apps, Outlook Web App, Exchange Online and Lync Online, couldn't be any cheaper since it's free for all pupils and staff at any educational establishment. The A3 plan adds rental of Office Professional Plus, unlimited email storage, archiving and hosted voicemail, and it costs £1.98 per student per month and £3.50 per staff member per month. To add enterprise voice capability, integrating with an on-premise Lync Server, you need the A4 plan, which costs £2.38 per student per month and £4.75 per staff member per month. You can mix and match these plans of course: for instance, by putting junior pupils on plan A2 and senior pupils and staff on A3, for optimum economy.

Many schools, colleges and universities are starting to move over to Office 365, and indeed the Scottish government announced in April that it would be updating its "Glow" project, the "Scottish schools digital network", to use



LightSwitch HTML Client makes it easy to create database front-ends for mobile devices

Glow, the Scottish schools network, will move to Office 365 soon

Office 365. This was a controversial choice, and a significant number of people would have preferred to use Google Apps, but Google pulled out of the procurement process. Microsoft won the contract by promising to provide the service and support free of charge, including a full-time member of staff, until December 2014. Transition to the new platform could take some time, with existing contracts with RM Education being extended until December 2013 to ensure that schools have enough time to identify and transfer all the content they want to keep. Some lucky schools, however, could be up and running on Office 365 from September 2012.

I know that some people wanted to go with Google rather than Microsoft for a variety of reasons: some see Microsoft as too expensive or too corporate; others think that Google's tools are more "innovative"; others believe that since Microsoft's Office suite is effectively the "business standard", why should children be forced to learn something different at school and then have to change when they start work? I take a different stance. Google is basically an advertising sales company, where you're the product: it's out to learn as much about you as possible so it can sell you to its clients. If it can identify you while you're at school, and build up a history of your likes and interests, it will be able to serve up even more highly targeted ads, which means that it can make more money out of you. The company's Terms of Service for Google Apps allows it to use the "information you supply" – that is, your emails and documents – to target adverts at you.

To show where this process can lead, consider Channel One, a US TV channel specifically for schools. The firm leases TV equipment to schools for free, in return for the schools showing its *Channel One News* programme in their classrooms every day. Forty per cent of US middle and high schools have signed up. The schools can use the equipment any way they want, but all their pupils have to sit through the 12-minute news programme, including two minutes of ads, every day.

A study by Michigan State University reported that while students didn't remember much about the news content of *Channel One News*, they did remember the adverts, and that "regular watching of Channel One reinforces materialistic attitudes".

From 1994 until 2007, Channel One was owned by Primedia, part of Kohlberg Kravis Roberts (KKR), which owned RJR Nabisco, makers of Camel cigarettes.

While there's no suggestion Channel One ran cigarette adverts, from 1990 to 1999 Primedia also owned *Weekly Reader*, an educational magazine for children distributed through US schools. Research by Professor Stanton Glantz of the University of California in 1995 accused the *Weekly Reader* of downplaying the health effects of smoking and most often ending with the view of the tobacco industry. The *Weekly Reader* even ran promotions including pictures of Joe Camel, the Camel cigarettes cartoon mascot. In 2007, Channel One was sold to Alloy Media + Marketing, which describes its industry sector as "Marketing and Advertising".

"Google is basically an advertising sales company, where you are the product"

I'm not suggesting Google would go that far, and indeed the company says that its default position is not to serve adverts to users of Google Apps for Education, although it does include "sponsored links" in its Gmail service. What are sponsored links if not adverts? The school's administrator can turn off the sponsored links, but if the school has accounts for "Alumni" then Google insists that all adverts, not only sponsored links, are turned on for those accounts.

I think both Google and Microsoft's reason for providing free services to schools is to accustom young users to its products early on. In Google's case this is about knowing more about its users and making them more valuable to advertisers. In Microsoft's case it's so employers can buy those products with the confidence that the employees it hires in future will already know how to use them, helping it to sell more software.

If we think about the goals of the companies that seek to provide such services, and follow the money, we should be able to make a reasoned judgement about which offering is best for staff and pupils.

No ads

Microsoft doesn't put any adverts into Office 365 – even its free, advertising-supported Windows Live accounts won't serve adverts to children under 13.

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WEB APPS & DESIGN

A new lick of CSS for old websites

Mark Newton finds converting an old Dreamweaver site to a CSS design time-consuming, and feels nostalgic about old development tools

MARK NEWTON

MD of the internet company ECats Ltd (Electronic CATalogueS), specialising in internet-based solutions. Email mnew@ecats.co.uk

I've recently been involved with two major projects at opposing ends of the web developer's spectrum: the first involved converting an old site, whose table-based layout dated from many years ago, to a new CSS design; the other is an information source whose identity I can't reveal for commercial reasons, and the object is to make it accessible via web and mobile devices. This second project gives me the opportunity to revisit web services, and in particular the new easy development tools promised in Visual Studio 11. I was quite unprepared for the struggle that ensued...

First, the saga of updating that old site. It was written and maintained in Dreamweaver, using Templates and Library items, so template changes could be made to a single file that then updated all pages based on it – this made some basic changes simple to apply, but it was still necessary to go through each individual page and correct old code. Search and replace can help in this process if applied carefully (and thank goodness for backups!), but in the end, it needed someone to carefully go through all the relevant pages, edit the HTML and test them in various browsers. This particular site worked via dynamic pages written in ASP, so there were fewer to edit than might appear from browsing the site, but still more than 400, which took time and was a chore that required the assistance of headphones and good music. It was curiously satisfying to remove lots of redundant tags and watch tidier, more readable code emerge, though.

When performing such a tidy-up, there will remain places where using a table is still perfectly sensible – for instance, to display a grid of results – and it's important to test such pages in various browsers (which, thankfully, behave similarly nowadays). Regrettably, the exception to this may still be Microsoft's Internet Explorer – and I say "may" because IE9 is now pretty standards-compliant in many areas. There is, however, one major gotcha that you should be aware of: its "quirks" mode. In this mode, IE9 will behave like a non-standards-compliant older version, so that older websites can still be made to render correctly in modern browsers. Switching between modes can be performed manually by the user or automatically by the browser, but the most common way to force IE not to use "quirks" mode is to make sure that the first line of your page code says:

```
<!DOCTYPE = HTML >
```

With IE, you can easily check what mode the browser thinks it's using for a particular page by opening Developer Tools, where at the end of the top line of the menu you'll be told what the current document mode is. By clicking on this you can change the mode, so you can see how differently a page renders in the various modes. You can also tell IE9 to render as IE7 or IE8 using this option, should you need to test for those; personally, I prefer to use a virtual machine with those actual browser versions installed to make sure all works as it should.

The other change we made to this website was to the usage of Dreamweaver library objects. These are user-defined reusable pieces of HTML that you can select and insert into a web page, the idea being that you need change the code only in the library object itself and

"With IE, you can easily check what mode the browser thinks it's using for a particular page"

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Dreamweaver will update all pages that use this object with the revised code. The drawback to this is that any change to a commonly used library object may result in several hundred web pages getting changed and needing to be re-uploaded to the live site. To ease the updating of library objects, which we use for code on this site that might be changed often (such as submenus), we switched them to use server-side "include files", text files containing HTML code that's inserted into the web page at runtime using the tag:

```
<!--#include virtual="/my_include_file.
    shtml" -->
```

The reason for the shtml extension is to distinguish the include file from a normal HTML file – an include file, while containing HTML code, isn't a properly formed HTML page file with <head> and <body> tags. To use such include files you also need to tell the web server you wish to do so, and in IIS this is a simple checkbox in the Home Directory | Configuration area, while in Apache you need to add the following line to your HTTPD.CONF or .HTACCESS file:

```
Options +Includes
```

You then need to tell it what files to treat as include files:

```
AddType text/html .shtml
AddOutputFilter INCLUDES .shtml
```

The advantage of using includes is that, should you make a change to the code in one of these files – say, for example, to alter a link in a menu – all you need do is upload the new file and the hundreds of pages that use it will update immediately, rather than having to upload these pages again with their updated library item. There's a small server overhead since it has to process each file to see whether it includes this code, but even for very busy sites this isn't often an issue.

As good as a REST

With all these changes made and tested, it was time to attack a new project – whose exact purpose I can't currently reveal, but the principles involved in its design and development are relevant for similar tasks. It involves a database of commercial information sitting on a server out on the web, which is to be made available via web services so it can be viewed via a variety of mobile devices as well as web apps viewable in a browser.

My favourite development tool is Microsoft's Visual Studio, which can be used for a variety of languages including JavaScript and jQuery, and also offers basic HTML design tools – most importantly, though, it gives me IntelliSense help with code syntax, plus full debugging features. This said, I have to agree with Jon Honeyball's column on the subject (*see issue 214, p72*) in which he bemoaned the lack of any great HTML5 tools that would make development as easy as it once was in Visual Basic 3.

Remembering those days, I think the coolest thing about VB development was that you could drag and drop all your components onto a form and then "wire them up", often simply through dropdown list selections – and, finally, for the clever tweaks you could delve into the code and hack away. While this process often didn't result in a nicely crafted product, it did mean that programs could be written and made to work fairly quickly, and it allowed a lot of people to experience the thrill of doing this.

I remember at that time, a very skilled C++ programmer friend decided that he should start to look at writing code for this "new-fangled Windows thing". After two weeks' work he'd managed a simple application that opened and closed windows: I achieved a similar effect with VB in about five minutes – so while I admired his efforts, the way Windows coding was going for the majority of us seemed quite obvious to me. It's too easy to don rose-tinted spectacles about the programs we wrote back then, and many of them would struggle to serve more than a dozen concurrent users, whereas now we think nothing of building web apps that can serve thousands. We've certainly moved on in that respect, but alas many of the development tools have reverted to being little more than fancy text editors with some code prompting: that casual dragging and dropping of objects and setting of events and methods to get them working seems to have disappeared.

> **"Many development tools have reverted to being little more than fancy text editors"**

Even where it is still offered, you'll find that the only way to get certain functions to work is by adding more code to the object involved; if you're not aware what this code has to be, it can leave you floundering for days. For a good example, take a look at data binding in Silverlight, where you have to manually enter {Binding} tags into the XAML code that defines your page objects. Why can't I simply navigate from the list control on the phone app I'm developing to my data source (which the project knows all about), then select the fields I want displayed, click OK and have that boring code written for me? Sure, Visual Studio does write a lot of code for you – for instance, when adding web services – but why not take it that simple step further? Is it because the code required is so easy that a child could write it? I don't think so.

Looking through the reams of forum posts about the best way to achieve such tasks, (and not helped by the fact these techniques change with every release of any of the underlying technologies), it seems to me the examples posted by obviously very clever people at Microsoft are often unnecessarily complicated. One gets the impression that each contributor is putting in more effort to impress their peers than they are to illustrate a technique in the clearest possible way. Is it just me who feels this way? Anyway, back to the project...

There are rare occasions when the opposite is true. If I say that creating a RESTful web service using Data Entity Framework should take less than five minutes, you might at first wonder why anyone would want to do that anyway. Bear with me. Web services come in two main flavours that define the way they communicate between application and the service. These flavours are called SOAP and REST, and while SOAP is perhaps better for big financial institutions thanks to its superior security, RESTful services scale better – and it can be argued they're better suited to web applications, as they can exploit the web server's caching mechanism to improve performance. More to the point, in this case a Windows Phone Silverlight application can consume only REST web services, so REST it has to be.

With the stopwatch running, let's step through the process of creating one. The easiest way if you're using Microsoft products is to first create a website in Visual Studio, then add to this project an item and select "ADO .NET data entity". A wizard will ask you to select your database or to create an empty model. The reason for that second option is that it lets you then design your data entity structure, from which a database will be automatically created – clever stuff. If you instead choose to create your entities from an existing database, it will ask you to connect to a data source that your project knows about and what items you wish to include. Normally you'll just select the tables you need your web service to access, and once this is done a graphical representation of the database structure is generated; if necessary, you can tweak things from within the UI.

The next step is to create the web service that looks at this data entity, so add another item to your project, this time a WCF service. It's here that the handholding stops: up to this point Visual Studio's UI has been helping you along, but now you have to roll up your sleeves and start manual code editing. There are some code hints to help you. Open up the code file for your web service – if your

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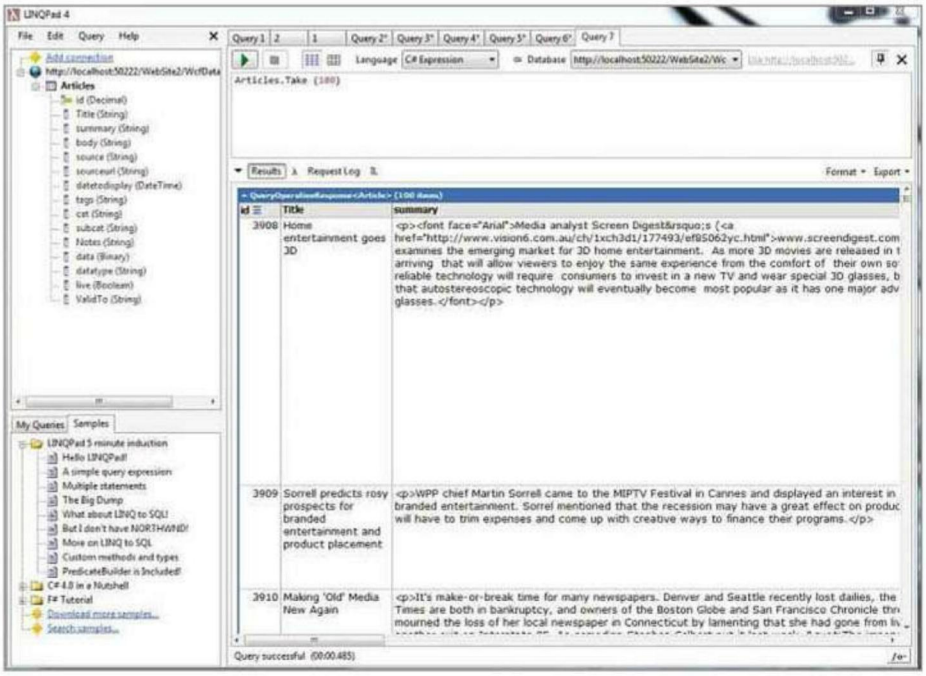

The free LINQPad not only allows you to test LINQ to XML queries, as here, but will also run C# and VB code for testing

web service were called mywebsvc and your selected C# as the programming language, this file would be MYWEBSVC.CS; it will be MYWEBSVC.VB if you choose Visual Basic as your language. In this file you'll need to edit the first line in the Public Class to tell it what data entity to look at. This was the name shown in the wizard when you were adding the database to the data entity, and in this example it's called MTEntities so your altered code line will look like this:

```
Inherits DataService(Of MTEntities)
```

You also need to set the access level to your entities: here you can define read or write levels of access – but for now let's just allow all areas to have read-only access, using the command line:

```
config.SetEntitySetAccessRule("*",
   EntitySetRights.AllRead)
```

It would have been a nice touch if this code could have been auto-generated by the wizard when creating this web service, because the next stage is nothing short of magical. Run your website from within Visual Studio and once the browser has loaded with the default screen, add the name of your web service to the end of the URL so it looks something like this:

```
http://localhost:50222/WebSite2/
   mywebsvc.svc
```

You'll get back a basic structure of your service as an XML feed that should look like this:

```
<?xml version="1.0" encoding="UTF-8"
   standalone="true"?>
<service xmlns="http://www.w3.org/2007/
   app" xmlns:app="http://www.w3.
   org/2007/app" xmlns:atom="http://www.
   w3.org/2005/Atom" xml:base="http://
   localhost:50222/WebSite2/
   WcfDataService.svc/">
      <workspace>
         <atom:title>Default</
         atom:title>
            <collection href="Articles">
               <atom:title>Articles</
               atom:title>
            </collection>
      </workspace>
</service>
```

Nothing particularly impressive there, but it's now that things become interesting. The important part here is the collection "Articles", which tells you the name of the dataset that you can query – and here comes the magic. You now have a dataset that you can query in a multitude of ways without writing any more code. The syntax for doing this follows the OData standard, which you'll find at (**www.pcpro.co.uk/links/216wa1**).

For a simple example, let's assume that your dataset is small so that you're quite happy to return all its records – simply type the following into the URL:

```
http://localhost:50222
WebSite2/
   mywebsvc.svc/Articles
```

Note here that all the extra bits that you add to this URL will be case-sensitive, so "articles" wouldn't work. If, as in the real world, we want to return a subset of our data then the URL would look something like this:

```
http://localhost:50222/WebSite2/
   mywebsvc.svc/Articles?$filter=Amount
   gt 100
```

Entering this would return all the records where the Amount field is greater than 100, or if you want only a few fields returned you could type the following:

```
http://localhost:50222/WebSite2/
   wcfdataservice.svc/Articles?$select=T
   itle,datetodisplay
```

You'll have noticed that the output is in XML, which is fine, but what if you wanted the output from your web service to be in the more compact JSON form? While OData supports the adding of a command to the end of the URL to change the output format, WCF Data Services doesn't support this and you'll need to jump through some hoops by modifying the HTTP headers in your web service code. Full support for the OData specification is promised, but no deadline has been given.

The query language is quite extensive, and I'm sure you can see from this little illustration that building a fully queryable web service from a database is now a simple task, which saves you having to write code in your web service for all the various types of query that your or others' applications might need.

LINQPad

When fumbling my way around code, I often find myself creating several projects in Visual Studio just to test them out, and I always start their names with "test" so I know to delete them later. The other day, I came across a useful free tool that lets you run code written in C#, VB and F# as well as LINQ, (along with code hinting in the paid-for version) and see the results immediately. LINQPad (**www.linqpad.com**) enables you to test code and queries and check their output before committing them to your project – you can connect to a web service, then build and test a LINQ query and view its output in the results window. Numerous samples are provided, and right-clicking on your data connection in LINQPad will offer several query types based on this data, which you can then edit further to get you started. LINQPad is one of those useful utilities such as Notepad++ that makes solving coding problems so much quicker.

SQL too

LINQPad isn't only for testing LINQ queries, as it can do much more than that – you use it to test SQL queries against a database, or write code in any one of its supported languages. I think it's worth paying $39 to get the version with code auto-completion.

NETWORKS

Snake-oil solutions for electrosmog

Steve Cassidy on the problems with the perceived threat of electrosmog, and more practical uses for plastic optical fibre

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

If only Robert Heinlein had known about electrosmog. His early short story *Waldo* (see **www.pcpro.co.uk/links/216net1**) mixed together a number of themes based around human credulity, incomprehension and action at a distance, as an amusing warning about the way snake-oil salesmen baffle people who should know better. It depicted a society only too keen to grab the advertised present benefits of a heedless march into the future. *Waldo* paints a society in which nuclear power hasn't only been harnessed but can be broadcast wirelessly into home or car – that is, until something starts to interfere with the transmissions and threatens the whole economy.

In our own world, the issue of excessive electromagnetic radiation has become fodder for a large movement of folk who, to be charitable, are easily confused by the difference between the philosophical and the actual. Whenever someone discusses "the impact on our lives of the advance of technology", these folk think not in terms of rarefied intellectual abstractions, but instead begin to fret about shortened life spans, weird illnesses and picking up radio shows via the fillings in their teeth.

In his day, Heinlein had a great talent for looking forward to completely different futures, but *Waldo* doesn't look as improbable as it did back then. Unfortunately, current speculative fiction seems to have been captured by moralists who value being right above the truths via which they support their opinions. In place of well-crafted allegories about heroes, nowadays we get semi-psychotic blogs, penned by terrified ingénues who are unsure whether their perpetual malaise is caused by their toaster, phone, games console, or aliens from Venus – although it never seems to inhibit their ability to type…

"In place of well-crafted allegories about heroes, now we get semi-psychotic blogs"

The particular creative mix-up of fiction, fear, futurism and faith that caused me to boggle earlier this summer was, as in *Waldo*, a mixture of real technological developments with imagined threats and advantages. I'm talking about the application of plastic optical fibre as an antidote to the perceived threat of electrosmog in the home (and my problem is that I burst into a fit of the giggles every time I write or think that sentence).

In fact, it was an electrician who drew my attention to a German retailer (which I shan't be naming for legal reasons) with a proposed solution to such electrosmog for a client high up in the Alps. I've yet to translate all the site's nooks and crannies to my own satisfaction, because asking Swiss friends to help risks them being incapacitated by giggles too (and *at* me rather than *with* me). I believe its message crosses the language barrier clearly enough: installing a plastic optical fibre distribution system (POF from here on) is a good cure for the ills created by electrosmog, and it's available from all good electrical outlets today!

Sometimes, ironically sneering in the face of hucksterism risks leaving behind exactly those people who should listen, so if all you smart-aleck hipsters excuse me, I'll get more literal – there's no actual law of physics that states websites containing pictures of happy people with up-stuck thumbs has to be selling products that will make you happy. It may just be that the vendors genuinely believe they have a happy-maker on their hands, if only the

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world could shut up and listen. But after that interlude of sincerity, I'm duty bound to act as party pooper by taking their claims to pieces.

So leaving aside all its smiley slogans, what this German company is selling is a household LAN distribution network built from multifunction powered wall plates, the aforementioned POF cabling and a central POF-capable network switch. These wall plates are mostly depicted sitting in a multiservice outlet beside a mains socket, and they deliver three standard RJ-45 connector network points, plus an optional small Wi-Fi base station, all controlled by a master power switch and a Wi-Fi signal strength selector. The cabling infrastructure proposed is the aforementioned POF.

If you make an online investigation of the general topic of using plastic instead of glass for optical fibre networks, you'll encounter a lot of pretty decent, learned discussions. The basic problem is that, while fibre has had a lot going for it for a very long time, it simply hasn't gained the kind of traction that it should (see my discussion of why this might be in *Why hasn't fibre taken off?*, below). But messing about with bendy plastic rods strikes us hardened fibre gurus as comical: we're used to stuff that can whack those photonic solitons down a 70km waveguide! Even our jargon sounds cool! Herein lies the gap within which all this electrosmog nonsense is incubated.

"While fibre has had a lot going for it for a long time, it hasn't gained the traction it should"

Since old-school fibre is hard to work with and confusing to specify, while copper cable remains manifestly and obviously electrical, there's a temptation for those who are phobic about electromagnetic stuff to accept the basic idea that plastic cable equates to no electrosmog. Let's run with that proposal for a second: having a power switch right on the wall plate is, no question about it, going to let you take control of the EMF emissions in your room. Turning it off should mean zero electromagnetic emissions, a victory for those misguided, neurotic but empathic mums who worry about frazzling their offsprings' brains in the nursery, or about what's happening to their houseplants in the living room overnight. I made the first one up, but the second came from an article on electrosmog in *The Independent* in 2006…

There's nothing special that would require POF to be employed to achieve the effect of turning off at the wall socket. It would be trivial to do the same thing with copper wire, and with exactly the same effect. Also consider – with either copper or POF – what it is you're doing when you hit that button. These little room-resident boxes contain a power supply that piggybacks off something, most likely the nearest mains socket. This means they're connected to a 220V AC circuit, that they probably shrink those

volts (most likely down to 12V) by way of some kind of transformer, and that there's no immediate way to tell whether the switch you flip is positioned on the 220V side or the low-voltage side.

The worst case from an electrosmog viewpoint is actually safer for any device that emerges into a domestic room – let's assume the 220V transformer stays running in an unloaded state all the time those lights on the front of the box are off. So here's a thought experiment for any reader who either believes or wants to understand the electrosmog credo: is the alleged electromagnetic pollution of said domestic room *decreased* because tiny, intertwined and mutually cancelling lines of EMF from copper CAT5 cable inside the wall have been eliminated by the use of POF, or is it *increased* because an open 220-to-12V transformer without any matching load is merrily radiating EMF from it's teeny-weeny windings hidden

Why hasn't fibre taken off?

I really enjoy persuading people to employ optic fibre in their LANs even when they don't strictly need its unique attributes, such as its medium to long range, or its immunity to outside risks such as water or lightning. My preference arises because there's a deplorable tendency to build ordinary copper networking devices down to a price, whereas fibre gear is still built up to a performance level. A good-quality fibre Ethernet add-on card in a server can sling bits at 100% loading 24 hours a day, where its copper equivalent runs out of buffers, kicks up a fuss about auto-negotiation, fails to report packet drop rates, mucks about with the system CPU because nobody bothered to tick the Offload option in the driver...

So why hasn't fibre spread far more widely? The first reason is painfully obvious, and that is because you can't just cut fibre and expect it to work. Squaring off the ends of cut fibres is something that normally needs to occur in the back of a very clean van, or within the confines of a super-neat toolkit, using all manner of weird gritty pastes to render the super-thin cut ends of the fibres optically smooth. Personally, I'm one of those wretches who can't even cut a copper Ethernet cable and expect it to work either, but chopping that stuff up can in principle be done by anyone with access to tools from Maplin. A copper crimper for making cable ends costs about £20, whereas a fibre-polishing kit costs 500 times that.

The second reason is that speeds in fibre networks can't jump up smoothly by way of auto-negotiated connections. In fact, if you need a faster fibre, the right way to do it is to take out all your fibre cables, cards and switches and replace them with a complete matched set of quicker ones. There are exceptions, but they're not at all predictable. This may be acceptable for mega-corporations (although, actually, I know a few with so much old fibre that it's very far from acceptable), but it certainly isn't for smaller business or home users.

The third reason is that there are rather too many connectors and standards in play when you're buying the kit of parts. Of course, their names sound pretty simple: LX is long haul, SX is short haul, LC and SC are large and small connectors, and then there are GBICs and mini-GBICs, but all their permutations are far more challenging than with copper. That's especially true given that a mismatch between the ends may produce not merely a slight slowdown, but no link at all.

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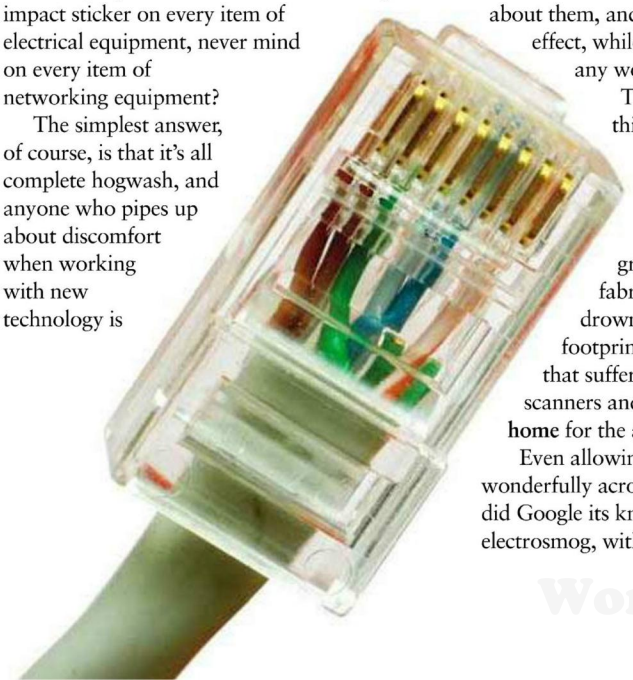
away behind that wall plate? Please, oh faithful, enlighten me, because I'm not convinced that you're not all entirely barking mad.

What I see is a form of diagnosis and presentation that delivers a plausible bottle of snake oil, a rationale for making safety decisions built around the actual design of this completely incomprehensible bit of kit. I don't claim, incidentally, to be a fully qualified electrical engineer. I'm well versed in basics such as watts = amps x volts (way ahead of many of my clients, which still have trouble figuring out why their server room is hot, or why that extension lead has melted). I'm also deeply intrigued by the way such basic electronics can lead you straight into the more dizzying aspects of quantum trickery without warning – the problem of the charge of the whole universe when viewed from the perspective of a single, freely moving electron was knotty enough to lead an undergraduate Richard Feynman to glory. But, even based on my strictly empirical understanding of electricity, it appears foolish to focus one's fears of electrosmog onto copper LAN cabling.

LAN cabling is more properly called UTP, for unshielded twisted pair, and what that means is that each LAN cable contains four pairs of wires, with each pair entwined around one another like the strands of DNA. The whole point of this is that the signals running down those wires are so weedy that they could be completely wiped out by interference from all manner of nearby devices, but once they're entwined then what's bad for one half of the pair is evened out by a balancing effect on the other half. That's why a LAN can run on as little as a single volt (at slower speeds) potential difference to pump data the best part of 100m. Contrast this with the tongue-tingling 50V employed by old-fashioned analogue telephones. So which is the nastier baddy when it comes to electrosmog? Come to think of it, if this whole idea were as important as it's made out, why is there no rational point of reference, say an EU-standard electrosmog impact sticker on every item of electrical equipment, never mind on every item of networking equipment?

The simplest answer, of course, is that it's all complete hogwash, and anyone who pipes up about discomfort when working with new technology is a prize chump, to be ridiculed and ignored. I have to say that I find that position almost as absurd as the superstition-driven electrosmog dogma. I'm pretty clear that EMFs are real and present, but I'm equally clear that far more significant and more manageable physical effects attend computing equipment, and that it's possible to do something about them without completely rewiring your house (see *Home remedies*, above, for a positive list of simple fixes: a set of things you can try around people who complain about odd health effects while using computers. In my experience, such measures create an impression of caring a bit about them, and hence perhaps a real placebo effect, while not actually making matters any worse).



The most annoying aspect of this hogwash about electrosmog is that it may contaminate the rational research into POF itself. This technology has the potential to be that holy grail of an easier, faster network fabric for home users who are drowning in clashing Wi-Fi footprints, or for medical installations that suffer really powerful EMFs from scanners and the like (see **www.pofto.org/home** for the actual news).

Even allowing for the sterling efforts of the wonderfully acronymed POFTO – and yes, I did Google its knowledge base for mentions of electrosmog, with nothing doing – I'm not done yet with the foolishness of the POF-in-a-wall plate concept. At higher data speeds, it's a bad idea to sprinkle these kinds of multiple hops and repeaters all around your network, especially such small, cheap, low-powered ones. Devices that unite POF cabling with copper ought to work seamlessly, flipping bits on one side the instant bits flip on the other, but all too often they won't. Either they fail to cope as traffic increases, or else they fib about what they're doing and are actually storing and forwarding (waiting for a whole packet to arrive before passing it on). These kinds of problems become worse and more apparent as absolute speeds rise, so tricks that were invisible at 10Mbits/sec Ethernet become mildly irritating at 100Mbits/sec – and showstopping at Gigabit speed.

Home remedies

Humidity Computers and dry air don't mix, which is a shame because high-powered ones actually lower the relative humidity of a room. Both computers and people operate rather better with water vapour around: dust clumps together better and falls out of the circulating air sooner; static electricity can't build up so easily; heat is conducted away more rapidly from surfaces and components because water absorbs much more heat per gram than plain old air. Almost any humidifier will work, from a damp towel over a radiator to the poshest, reactive, ultrasonic mineral-water tank dispenser.

Noise Not just quashing the white noise of fans, but a host of other odd sources such as buzzy old TFT backlights, the sharp whine of that SCSI drive you daren't turn off, even the clattery racket of a power-managed laser printer. Such background psychological irritations add up, and get misdiagnosed as electrosmog while getting tantalisingly close to the real problem. My printer lives three floors away, but then I have a real network and a real networked printer.

Light show Beware the excessive contrast of bright screen against darkened wall. Philips TVs have the option of a neat little tube on the back that lights up the wall behind the set to reduce eyestrain from prolonged watching. This is an easy trick to emulate provided you don't thereby fall prey to the other big subconscious irritant, flicker. I don't mean the photo-sharing service, but that insidious, edge-of-perception stutter that arises not from the simple 60 cycles of mains AC, but interference of several fluctuating light sources (your computer screen, certain energy-saving lamps, the TV set) running in the same room together. The fix is rather hard work, especially since incandescent light bulbs become ever rarer, but a general rule seems to be to avoid electronic dimmers and compact fluorescent tubes, and go for bang-up-to-date flicker-free LEDs.

Different strokes

Different humans have very different reactions to strobing light sources, from migraine headaches to full-blown epileptic fits. None of which has anything to do with electrosmog, but they can bring one person to their knees while the next person, presumably with a different internal clock rate, is completely unaffected.

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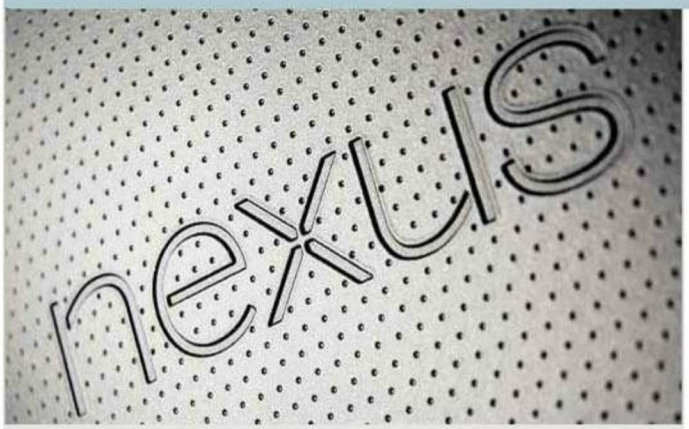
REVIEWS | LABS

REVIEWS HIGHLIGHTS

FOR A FULL INDEX, SEE PAGE 5



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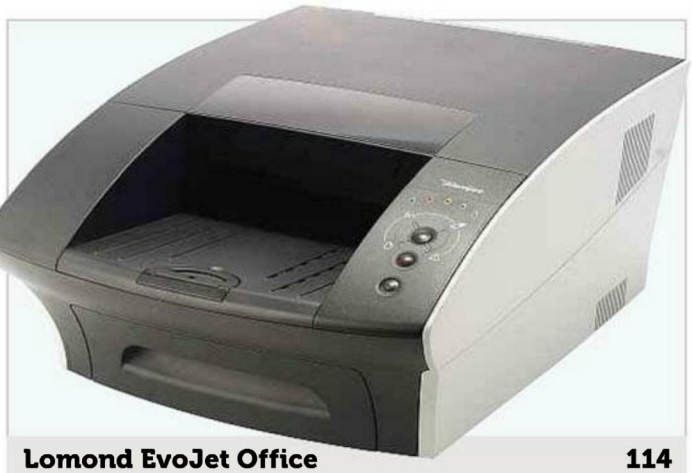
Google and Asus team up to produce the best Android tablet yet.

Nokia 808 PureView 108

A smartphone with a truly astonishing 41-megapixel camera.



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This inkjet prints in colour at an amazing 60ppm.

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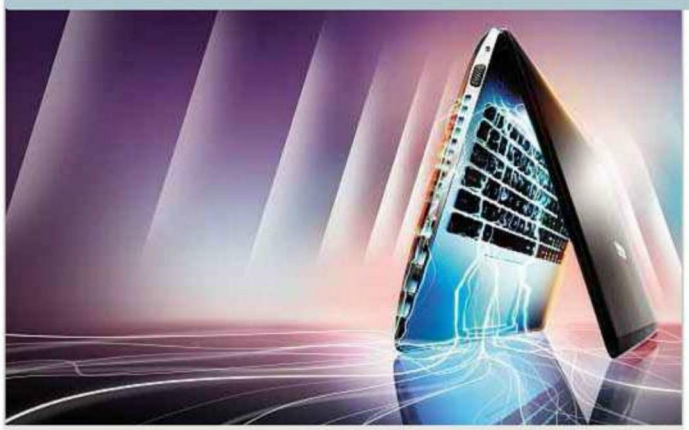
OS X takes another bold step towards iOS territory.

IN THE LABS



Ivy Bridge laptops 134

Intel's latest mobile chips bring unprecedented performance with no hit on battery life. We test a dozen of the latest laptops.

Processors 148

We test every current family from Intel and AMD to see which CPU you should build your next PC around.

WorldMags.net

Will Android soon find itself the odd one out, wonders DAVID BAYON?

There's no argument: the Nexus 7 (*see p102*) is the most exciting Android tablet we've yet seen. It's powerful, it's built to a very high standard, it runs the latest version of Google's OS before any other device, and it costs only £199 – or even less for the 8GB version. Not surprisingly, it's proving rather popular with reviewers and consumers alike.

We saw Microsoft's Surface tablets last month, and now Google has opted for a similar approach, partly out of frustration at manufacturers' slow progress, and partly in response to the threat from the Amazon Kindle Fire in the US. It's taken matters into its own hands with a combination of hardware and software that it feels does justice to both. The Nexus 7 is made by Asus with the full backing of Google, and if the two have to sell it near cost price to make it so appealing – which looks likely – then so be it. Android needs a poster child and this is it.

Microsoft's approach goes even further into uncharted DIY territory. Surface was designed entirely in-house to ensure the best possible blend of hardware and software. Microsoft quickly moved to reassure its partners that there's plenty of room for all of them – Surface will apparently make up only "a few million" of the 375 million Windows PCs sold in the next year – but there's no doubt it's a bold move to increase its control over its products in a fast-growing market.

What's the inspiration for these moves in-house? Apple, a company with full control over every aspect of its tablets and smartphones. It controls the quality and the price of the hardware, and it controls what apps make it into the App Store. It's powerful enough to tempt Google and Microsoft into taking increasing risks.

But if there's one area where Google can't compete with Microsoft and Apple, it's the desktop. With Windows 8, Microsoft is moving to a shared core for apps to function (or at least communicate) across smartphones, tablets and the desktop. With Mountain Lion (*see p118*), Apple's more disparate approach takes its latest step in the same direction, with a unified notifications system, sharing between desktop and mobile apps, and iCloud allowing synchronisation between iOS and OS X devices.

You could argue that the desktop will become less important as time goes on, but with both Microsoft and Apple, there's an increasingly persuasive argument for buying one company's products from top to bottom, from pocket to desk. Once you're in, it all works together; each additional device is easier to assimilate than the last.

That puts Google at a disadvantage. We saw a few attempts to bring Android to laptops in the early days with little success – or should that be little desire from consumers – and Google's Chrome OS is nothing like Android in its feel, function or codebase. Android simply doesn't have that cross-platform history, the powerful desktop applications that make a true all-rounder.

This isn't to say you can't throw yourself fully into Google's world. The Asus Transformer Pad Infinity (*see p106*) gives you the strengths of a high-resolution tablet with the keyboard and trackpad of a laptop. The Asus PadFone, if it ever arrives on these shores, will let you plug your phone directly into a netbook-style device for a similar experience. If you want to do work in Android, you can – but few could argue this is the same as using the full desktop Office suite on a Windows device, or switching from your iPad to your MacBook when the time comes to get down to business.

> There's an increasingly persuasive argument for buying one company's products from pocket to desk

Does this matter? To many people it won't. Android has a huge number of fans with a wide range of devices, and its market share is healthy. Google Drive makes it easy to share documents with Windows systems, and there are all sorts of other apps such as Dropbox that do likewise. Plus, while Microsoft's big picture may look more attractive, it has to start from scratch and persuade app developers Metro is a horse worth backing. That won't be an easy task, as demonstrated by the slow growth of Windows Phone 7.

But with more and more cross-platform features, it isn't difficult to see that if I like Windows 8 on my PC, I'm more likely to play with a Surface tablet in Dixons. If I'm happy with my iPhone, I'm more likely to buy a Mac. But what if I love my Nexus 7? It has no bearing at all on my next choice of laptop. That's a branding hole Google can't fill.

DAVID BAYON is *PC Pro*'s deputy reviews editor. He's still waiting for this top-to-bottom approach to include watches you speak into.

Blog: www.pcpro.co.uk/links/davidb
Email: davidb@pcpro.co.uk

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Nexus 7

Powerful, well built and sporting a better screen than you'd expect for its modest price. The Nexus 7 sets the new gold standard for budget tablets

PC PRO A-LIST

» **PRICE** 8GB, £133 (£159 inc VAT); 16GB, £166 (£199 inc VAT)
» **SUPPLIER** www.dixons.co.uk

After several years of watching manufacturers achieve mixed results with Android tablets, Google has finally had enough. Much like Microsoft's forthcoming Surface tablets, the Nexus 7 is an attempt to marry the company's popular OS with the quality of hardware it deserves – and at the right price.

It isn't technically a Google tablet. In fact, you won't find the company's name on the device at all. Instead, Google has adopted an Asus tablet first seen at CES in January, reworked the exterior and came up with something it was happy with – although only Asus has its name on the device.

Whoever takes the credit, the Nexus 7 has attracted plenty of attention with its mouth-watering sub-£200 price tag. For that money, you get a narrow device with a 7in widescreen display, a first look at Android's 4.1 Jelly Bean update, and even a £15 Google Play voucher.

Little wonder

It's immediately obvious that the Nexus 7 is a cut above most budget tablets. It's just the right size and weight (340g) to fit in the hand, and its mottled rear panel feels soft on the palm. A speaker grille sits just below the Asus logo, with power and volume controls on the right edge, and headphone and micro-USB sockets on the bottom edge. It's sparse, but its gentle curves mean that it feels far from cheap.

The screen is a 1,280 x 800 IPS panel, making for a pixel density of 216ppi – not up there with the iPad, but higher than any smaller tablet we've seen. It's pretty sharp and readable, and the wide aspect makes movie-watching a treat. We measured the maximum brightness at 330cd/m² and the contrast at 1,100:1. Our only complaint is that colours lack punch, with a washed-out look that's noticeable next to more expensive tablet

KEY SPECS

Quad-core 1.3GHz Nvidia Tegra 3 • 1GB RAM • 8/16GB storage • 7in 1,280 x 800 IPS display • 802.11n Wi-Fi • Bluetooth • NFC • 1.2mp front camera • 4,325mAh Li-ion battery • Android 4.1 • 120 x 199 x 10.5mm (WDH) • 340g

Photography: intro, Danny Bird; cutouts, Julian Velasquez; repro, Jon Cihak

WorldMags.net

screens. The speaker on the rear delivers acceptable sound but isn't particularly loud or full-sounding, so you'll want to keep your headphones to hand.

Inside, Asus has installed a quad-core 1.3GHz Tegra 3 chip and 1GB of RAM, so this is a blisteringly fast device. It scored 3,687 in the Quadrant benchmark and took 1,799ms to complete the SunSpider JavaScript test – both scores are as fast as tablets at twice the price. It effortlessly ran every app we threw at it, including the intensive Shadowgun and the oddly demanding Angry Birds Space, and everything about the OS feels smooth and responsive in a way that Android just hasn't managed until now – Jelly Bean's Project Butter advancements have clearly smoothed out many aspects. It did get slightly hot after prolonged gaming, but never dangerously so; we measured the back at 42°C.

With all that power crammed into such a small device, battery life is hugely important. Asus has squeezed in a non-removable 4,325mAh battery, and the Nexus 7 ran dry after 8hrs 48mins of running a video on loop at half brightness with Wi-Fi disabled. This result isn't anywhere near the best in its field, but it's perfectly acceptable for a travelling device.

There are only three areas in which the budget obviously shows. First, there's no camera on the rear, leaving you with an average 1.2-megapixel front-facing camera (see 1). Second, although it's advanced enough to include NFC, there's no 3G option.

Finally, there's the issue of storage: the Nexus 7 is available in 8GB (£159) and 16GB (£199) flavours, with no card slots to add to that. Even with its modest price, we'd be reluctant to buy the cheaper model – with the focus on content consumption, you'd fill that 8GB in no time at all.

Magic Jelly Bean

You unlock the Nexus 7 by swiping in any direction on the lockscreen (except upwards, which we'll come to later), and instead of the kind of reskins we've come to expect from HTC and Samsung, this is as clean as Android gets. That's a good thing, as a pared-down Jelly Bean is wonderfully accessible. In a nod to the direction Google is taking with the Play store, there's a main homepage for media content, with tiles for books, albums and movies. Everything can be moved and resized at will; if you don't like the full-width recommendation tiles, just drag on them to make them smaller.

As with Ice Cream Sandwich, there are three main controls at the bottom of every screen – back, home and recent apps – and an iOS-style row of favourite apps above that. The excellent Google Chrome browser is loaded as standard – although manufacturers can stick to the old Android browser if they wish – and alongside quick shortcuts for various types of media, there's now also a useful expandable folder for your favourite apps.

One major new feature added to Jelly Bean is Google Now, which you access by swiping up to unlock – or, indeed, by swiping up from the Home button on any screen. It brings up a nicely contrasting white screen made up of cards (see 2). Initially, you'll have the local weather, but Google Now can add flight details near an airport, train times near a tube station, information about nearby museums and restaurants, meeting appointments, and so on.

Better still, its voice search works quickly and accurately in our experience. It's like a cross between Siri and one of the many location-aware activity apps, with one key failing: with no 3G, it's largely useless if you want to use it while you're out and about.

The rest of the Nexus 7 experience is provided largely via Google Play, as this is very much a content consumption device in the mould of the Kindle Fire. As we've already said, watching rented movies is enjoyable with a good set of headphones, and games run fine – it almost feels like a portable games console given its dimensions. We're slightly less enamoured with the reading experience, but perhaps that's just by comparison with the sharpness of the new iPad. Books sport large text and a nice page-turn animation, and they're perfectly readable, so for all but the longest journeys, we'd consider leaving the Kindle at home.

The verdict

The Nexus 7 isn't a budget tablet in anything but price. It's fast, has a perfectly good screen, and it's built to a quality that we've rarely seen with such an inexpensive device. Android's Jelly Bean update brings its own advancements, and for the first time, we can look at an Android tablet as a whole package and confidently say it all works. The fact that we can say that about a £199 device is remarkable.

The Nexus 7 is the perfect size to comfortably hold in one hand

For the sofa, there's no doubt that an iPad remains a far more comfortable size, with a screen that's better suited to web browsing and reading text. However, Google's little beauty easily has the edge as a travelling companion. It's the perfect size to hold in one hand, and Google Play's books and movies make it great for flights and hotel rooms.

Despite a few minor flaws, the Nexus 7 redefines what we should expect from a budget tablet. If this is the outcome then Google should take matters into its own hands more often. DAVID BAYON

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
FEATURES & DESIGN	★★★★★½
VALUE FOR MONEY	★★★★★★

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Asus Zenbook Prime UX31A

Asus upgrades its Zenbook with a luxurious Full HD display and a scorching Ivy Bridge processor, but is that enough to make it the best Ultrabook yet?

PRICE £1,272 (£1,526 inc VAT)
SUPPLIER www.morecomputers.com

Asus' Zenbook UX31E (web ID: 370723) almost nailed the Ultrabook formula at the first attempt. It buzzed with potential: it had the looks, the power, the stamina and, crucially, the price.

Now Asus has answered the criticisms levelled at its original Zenbook and rung the changes for its new model, the Zenbook Prime UX31A. With the addition of a gorgeous 13.3in Full HD screen, Intel's latest Ivy Bridge technology and a backlit keyboard, it's gunning for the money-no-object Ultrabook crown.

The Zenbook is as eye-catching as before. A dark swirl of metal spins across the lid, softening into a lighter brushed metal across the base, and the sharp, crisp lines of the UX31A's body are undeniably attractive. When it comes to weight, the UX31A remains firmly in the featherweight camp at 1.4kg – light enough that you could forget it's in your bag. We're fans of the compact wall-wart power supply, too – it adds a mere 200g to the overall weight.

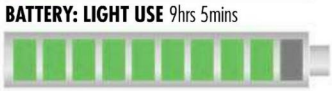
Thanks to the presence of an Intel Ivy Bridge CPU, however, the UX31A's stamina is unlikely to leave you rushing to a mains socket on a particularly frequent basis. Dim the screen and turn off the wireless radio, and the UX31A will keep going for 9hrs 5mins.

Pile on the pressure, and the Core i7-3517U processor, 4GB of RAM and 256GB SSD relish the challenge. A result of 0.68 in our Real World Benchmarks places the Asus just ahead of the Sandy Bridge Core i7 in the previous model, which scored 0.62.

Gaming performance isn't going to harm Xbox sales, but the UX31A's Intel HD Graphics 4000 GPU is far more capable than the previous generation. The 37fps average in our Low detail Crysis test dropped to 19fps at 1,600 x 900 and Medium detail settings – but this is an impressive level of performance for such a dainty machine. Keep the resolution and detail settings to modest levels, and this slender portable will gladly deliver a basic level of gaming performance.

BATTERY: HEAVY USE 1hr 37mins

BATTERY: LIGHT USE 9hrs 5mins



Prime pixels

While the performance increases might be subtle, the display is impossible to ignore. The

KEY SPECS

1.9GHz Intel Core i7-3517U • 4GB RAM • 256GB SSD • Intel HD Graphics 4000 • 13.3in 1,920 x 1,080 IPS LCD • 2 x USB 3 • micro-HDMI • dual-band 802.11n Wi-Fi • Bluetooth 4 • 327 x 226 x 21mm (WDH) • 1.4kg (1.6kg with charger)

Photography: intro, Danny Bird; cutouts, Julian Velasquez; repro, Jon Cihak

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Zenbook Prime's Full HD display humbles its predecessor, with an IPS panel delivering wide viewing angles and rich, saturated colours. Both brightness and contrast are far superior to that of previous Zenbooks, and while the 166ppi can't match the 220ppi Retina display of Apple's MacBook Pro, it still makes for crisp images.

Put to the test with our X-Rite colorimeter, the Full HD display delivers: the 1,032:1 contrast ratio and a maximum brightness of 424cd/m² are as good as laptop displays get, and the average Delta E of 3.1 indicates outstanding colour reproduction. If we have a moan, it's minor: the panel's 6,185K colour temperature is some way off the 6,500K ideal, and lends images a warm, rosy tint.

Improved feel

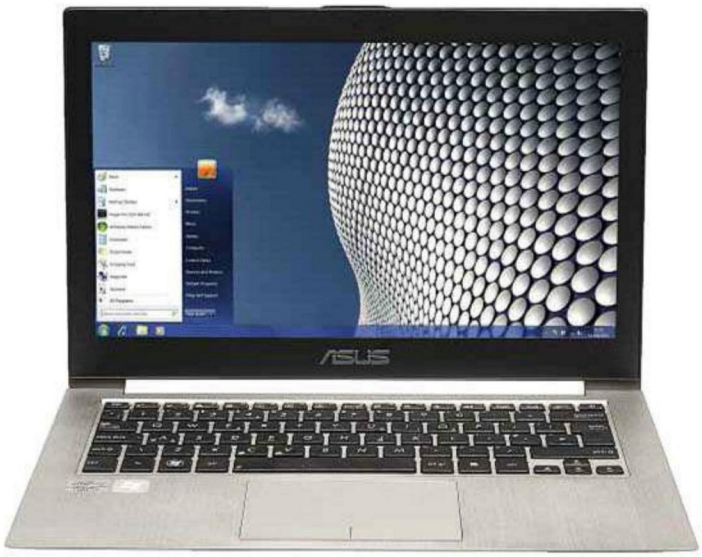
Stop gawping at the pixel-packed display, and you'll note one of the other improvements Asus has brought to the Zenbook Prime: a backlit keyboard. It's certainly a handy feature, but we're more pleased to find that the UX31A's keyboard has improved on its predecessor in more essential ways. Each key gives welcome resistance at the beginning of the stroke, and softens into a cushioned halt as you press home. It isn't the best we've used, but it's spacious and comfortable enough to not cause any problems in everyday use.

The touchpad was a huge stumbling block with the original design, and it seems as though Asus has ironed out the worst of the issues. Multitouch gestures work more reliably, and the overall experience is less infuriating than before.

It isn't perfect, however – we occasionally had trouble when clicking and dragging items across the screen, and we aren't too keen on the pad placement either. Our palms regularly grabbed the cursor and nudged it down the page while we were typing, leaving us reaching for the keyboard shortcut to disable the touchpad.

Connectivity is another of the UX31A's weaknesses. The slim, wedge design doesn't leave much room for ports and connectors. Asus has squeezed in one USB 3 port on each edge, micro-HDMI, an SD card reader and a headphone output.

If you want Gigabit Ethernet or D-SUB connections on the Zenbook Prime, you'll have to make sure you don't forget the supplied dongles. Still, the dual-band 802.11n wireless makes amends, and there's Bluetooth 4 as well.

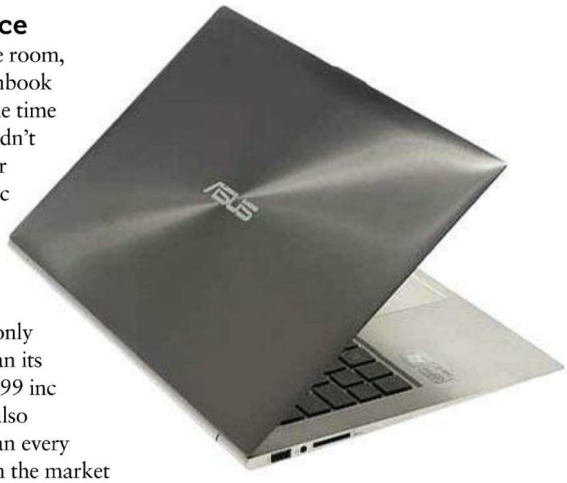


The IPS panel delivers glorious image quality and great contrast

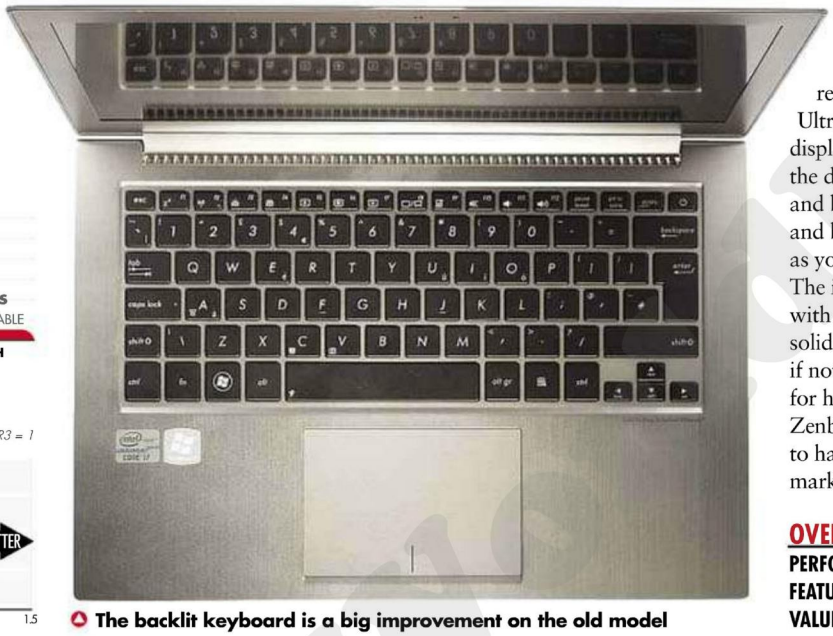
Premium price

The elephant in the room, however, is the Zenbook Prime's price. At the time of writing, we couldn't find the UX31A for less than £1,526 inc VAT, and some high-street retailers were asking as much as £1,849. This isn't only more expensive than its predecessor, the £999 inc VAT UX31E, but also more expensive than every other Ultrabook on the market – as well as both of Apple's MacBook Airs.

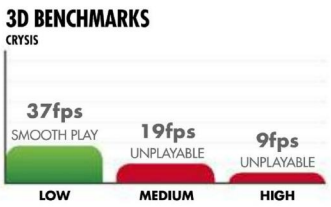
The burning question is whether the larger SSD, Full HD display and backlit keyboard are sufficient to justify the additional expense – and we aren't convinced that they are. For this money, we don't expect improvements; we expect a practically perfect product, and the Asus Zenbook Prime UX31A is some way from achieving that.

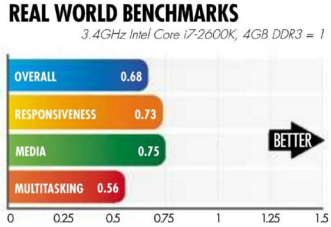


However, the UX31A remains a great all-round Ultrabook. The Full HD display is a welcome upgrade, the design is simply gorgeous, and both the performance and battery life are as strong as you'll find on an Ultrabook. The issue is with the competition: with rival models also delivering solid all-round performance – if not the pixel-perfect display – for hundreds of pounds less, the Zenbook Prime UX31A seems to have priced itself out of the market. SASHA MULLER



The backlit keyboard is a big improvement on the old model





OVERALL	★★★★½
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★½

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Asus Transformer Pad Infinity 700

Asus gives its hybrid a stunning screen and a turbo-charged processor, but it's expensive

PC PRO RECOMMENDED

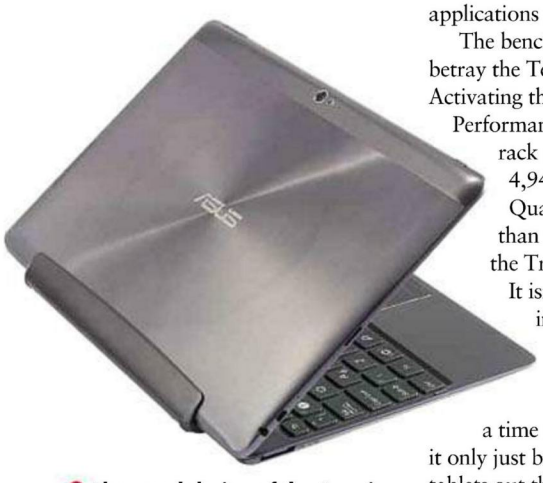
The stunning high-resolution screen is brighter than the iPad's

PRICE £499 (£599 inc VAT)
SUPPLIER http://uk.asus.com

Part tablet, part laptop, Asus' split-personality Transformer devices deliver welcome innovation in a sea of copycat tablets. They've never been cheap, but the latest Transformer Pad Infinity 700 ventures even further into premium territory by adding a glorious Full HD display and the latest Nvidia Tegra 3 processor.

Physically, the Infinity looks familiar. Brushed grey metal pools across the back, while a thick, glossy black bezel surrounds the display. Build quality is as solid as ever, with the metal chassis feeling stiff, sturdy and even reasonably light at 606g; the keyboard dock remains well built, the tablet slotting home with a cushioned click.

Switch on the Infinity and the new display leaps out immediately. With a 1,920 x 1,200 resolution across a 10.1in IPS panel, it effortlessly climbs to the top of the Android pile, making tablets with 1,280 x 800 displays look fuzzy by comparison. Text is pin-sharp and colours stunningly vibrant. It isn't quite the match of the iPad's 264ppi Retina display, but at 224ppi it isn't far off.



The novel design of the Asus is both stylish and practical

In some ways, the Infinity comes out on top. With the IPS panel at full brightness, we measured the Asus at 423cd/m² with a contrast ratio of 940:1, only a smidgen better than the iPad. But with the Super IPS+ mode enabled, it rises to a searing maximum brightness of 650cd/m². Although that drops the contrast to 823:1, the payoff is legibility: even under direct sunlight, the Asus delivers a punchy, detailed picture.

The one weak point is backlight leakage – in the black bars above and below a widescreen video, we saw little pools of light straying in from the LEDs along the panel's edges. It's a minor disappointment on an otherwise exemplary display.

The screen is the headline upgrade, but there are other, more subtle changes. A 1.6GHz Tegra 3 T33 processor replaces the 1.4GHz T30 of the Transformer Prime, but the added graphical demands of the pixel-packed display mean you won't notice the boost in everyday use. Nevertheless, this tablet shows Ice Cream Sandwich in its best light: the crisp front-end flicks back and forth with liquid smoothness, and jumping between applications is nippy.

The benchmark results betray the Tegra 3's power. Activating the Infinity's High Performance mode saw it rack up a stellar 4,941 points in the Quadrant test, more than 1,200 ahead of the Transformer Prime. It isn't as far clear in the SunSpider JavaScript test, but it's still fast by any standards: a time of 1,871ms puts it only just behind the fastest tablets out there.

Thankfully, the Infinity has two batteries to cope with the brutish power and bright display, and Tegra 3 has a secret weapon: a fifth low-power core (dubbed the "companion core") that does all the work at less demanding times. It's an ingenious idea that saw the Infinity's tablet part rack up 10hrs 7mins in our looping video test. After docking it in the base it went much higher, finally expiring after 16hrs 25mins.

In other areas, little has changed. The dock has the same netbook-style keyboard and multitouch touchpad. The dock's battery sends its juice to the tablet when connected, and you get a single USB 2 port for external storage and an SD card reader for good measure. On the tablet itself, there's a microSD slot and a micro-HDMI port for viewing videos and photos on the big screen. The 8-megapixel rear camera produces crisp and detailed snaps, and the front camera has been bumped up to 2 megapixels. Bluetooth 3 is welcome, but the single-band 802.11n radio seems a touch stingy.

It's a superb all-round package, but our appreciation is tempered somewhat by the price. As with previous Transformers, there's no option to buy the tablet without the dock, and Asus has no plans right now to release the 32GB model in the UK – so your only option is this 64GB model for £599. Apple's 64GB iPad costs £550, and the 64GB Transformer Prime around £20 more, so you're certainly paying a premium for the Infinity's screen.

Yet, just as the iPad's Retina display eclipsed the previous generation, the Infinity delivers a tantalising taste of Android's potential. Where budget Android tablets often cheapen Google's OS, the Infinity is at the other end of the scale, its glorious display and fast internals making for a slick, premium tablet experience. It's never going to rival the Nexus 7 in the value stakes, but for those seeking the ultimate do-it-all Android tablet, at any price, the Infinity is the new benchmark. SASHA MULLER

KEY SPECS

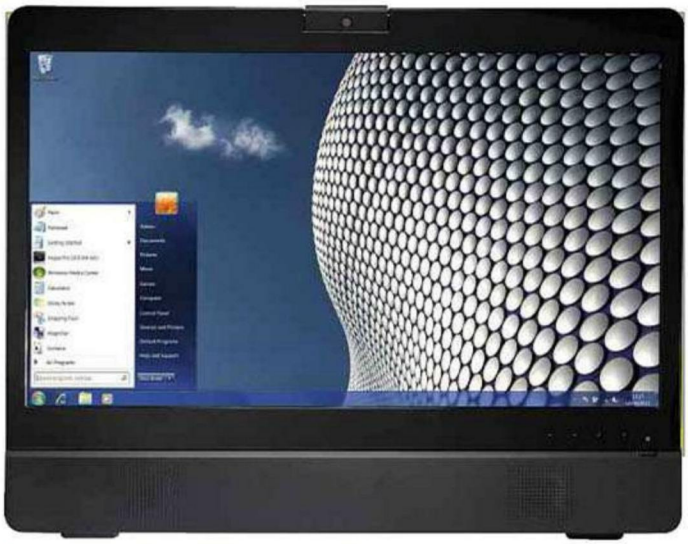
1.6GHz Nvidia Tegra 3 T33 CPU • 1GB RAM • 10.1in 1,920 x 1,200 Super IPS+ display • single-band 802.11n Wi-Fi • Bluetooth 3 • 8mp rear and 1.2mp front cameras • microSD slot • Android 4.0.3 • 1yr RTB warranty • 263 x 8.5 (19) x 180mm (WDH) • 606g (1.14kg)

OVERALL	★★★★½
PERFORMANCE	★★★★★
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★½☆

WorldMags.net

PC Specialist PowerGlide Extreme

An all-in-one with the rare power to handle games – and the touchscreen gives it longer-term appeal



Thanks to the Ivy Bridge core, this all-in-one is surprisingly powerful

PRICE £1,158 (£1,390 inc VAT)
SUPPLIER www.pcspecialist.co.uk

The all-in-one PC market is dominated by Apple's iMac and, to a lesser extent, Sony and HP's machines, so we didn't expect PC Specialist to offer serious competition. But the firm has done just that, albeit by rebranding an OEM system made by Gigabyte.

The PowerGlide Extreme has an Ivy Bridge Core i5-3570K whose four cores, 3.4GHz stock speed and 3.8GHz Turbo Boost delivered a healthy benchmark score of 0.93. That compares well with other all-in-ones: the expensive Intel Xeon-powered HP Z1 (web ID: 375100) scored 1.02, and the 27in iMac (web ID: 367360) scored 0.83 with an older Sandy Bridge processor.

Graphics power comes from Nvidia's GeForce GTX 670, which is by far the most powerful GPU we've seen in an all-in-one. Its 64fps average in Crysis at Very High settings is stratospheric compared to rivals: the iMac only managed 26fps at High settings and the Sony VAIO L21 (web ID: 365413) scored 33fps at Medium settings thanks to its mobile graphics chip. The PC Specialist is a gaming expert.

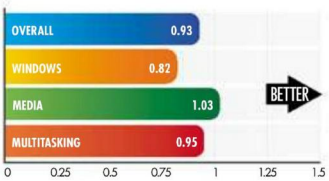
That performance comes with reasonable thermal figures, too.

3D BENCHMARKS

CRYSIS

REAL WORLD BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



The processor's idle and peak temperatures of 32°C and 73°C are fine, and the graphics card's peak of 86°C is warm, but not dangerously high. There's a high-pitched noise from the graphics card when stressed, but we've heard far worse from many desktops. The PowerGlide Extreme's peak power draw of 264W is what we'd expect, although bear in mind the need for wall sockets: due to the lack of space, it requires three separate external power supplies.

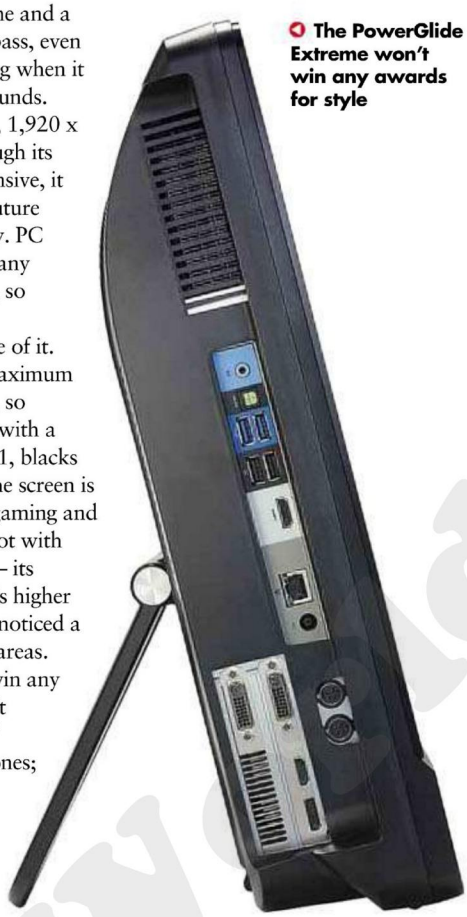
It has 8GB of RAM, a 120GB Kingston HyperX 3K SSD hosting Windows 7 Home Premium 64-bit, and another 1TB of storage in the form of a 2.5in Western Digital Scorpio Blue hard disk in a hot-swappable dock at the top. There's 802.11n wireless, a Blu-ray reader, and speakers that provide plenty of volume and a reasonable amount of bass, even if the audio kit is lacking when it comes to clear treble sounds.

The screen is a 24in, 1,920 x 1,080 panel and, although its touch function is responsive, it feels like a nod to the future rather than useful today. PC Specialist hasn't added any touch-specific software, so you'll have to wait for Windows 8 to make use of it.

We measured the maximum brightness at 234cd/m², so colours are bright and, with a contrast ratio of 1,016:1, blacks are reasonably deep. The screen is perfectly adequate for gaming and movies, but it isn't so hot with proper graphical work – its average Delta E of 5.3 is higher than we'd like, and we noticed a green tint across white areas.

This system won't win any awards for style. It can't match the sleek lines of Apple and Sony all-in-ones; its serviceable, glossy plastic gives it a bland look. Build quality is good, though, and the PC Specialist impresses in other ways. It has more in common with the business-like HP than its stylish rivals: the approach is less elegant than the Z1, but you can get inside this system to upgrade and replace every component – tinkering is covered by PC Specialist's three-year warranty.

The rear panel can be removed via screws and a tug. The graphics card sits in a daughterboard, so it's perpendicular to the motherboard, and they're both hidden beneath metal shrouds. A further pair of daughterboards, again hidden, sits on the opposite side to add additional I/O ports.



The PowerGlide Extreme won't win any awards for style

One area where the PC Specialist falls short is upgrade room. The 2.5in SSD occupies the single 3.5in hard disk bay, with the hard disk relegated to the SATA dock at the top of the machine; there's a single mini-PCI Express x1 slot free; both SO-DIMM sockets are full, and you can't upgrade the memory since 8GB is this machine's limit.

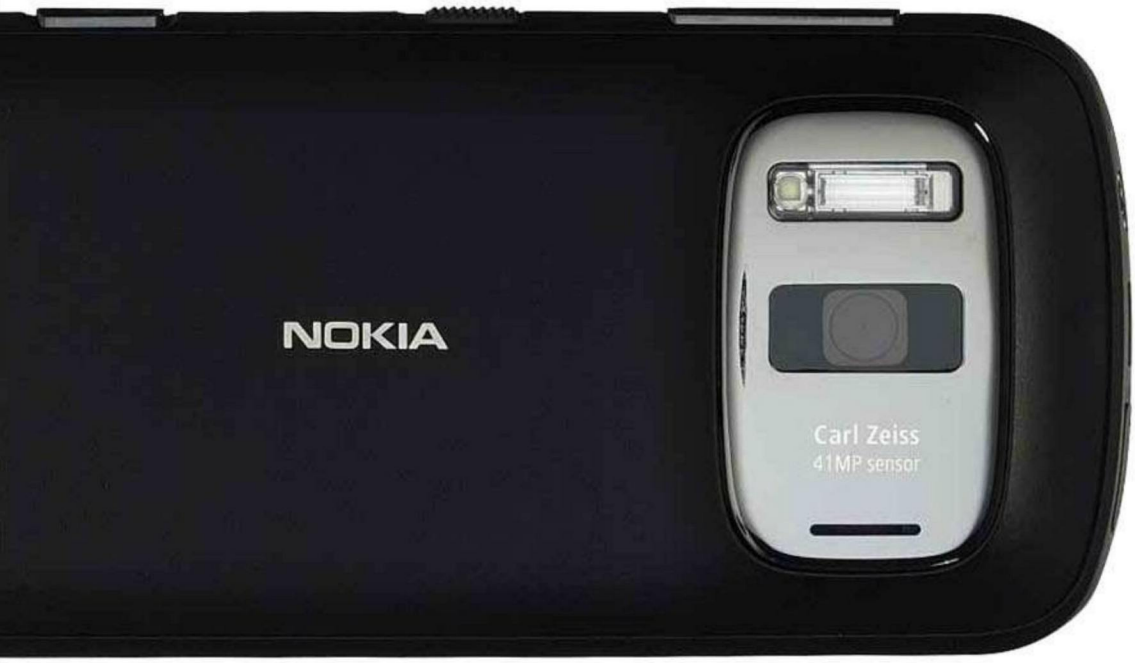
You're largely stuck with what you pay for, then, but that's no bad thing since this is the most powerful all-in-one we've seen. For around £200 less than its £1,390 price you can get the A-Listed Chillblast Fusion Flash (web ID: 369781) – similarly powerful but with a better IPS monitor – but if you've decided an all-in-one is the way to go, you won't find one faster. And the touchscreen may give it new life when Windows 8 arrives. MIKE JENNINGS

KEY SPECS

3.4GHz Intel Core i5-3570K • 8GB 1,600MHz DDR3 RAM • 120GB Kingston HyperX 3K SSD • 1TB WD Scorpio Blue hard disk • Blu-ray reader • Nvidia GeForce GTX 670 • 1,920 x 1,080 24in touchscreen TFT • 1.3mp webcam • 2 x USB 3 • 5 x USB 2 • 802.11n Wi-Fi • Gigabit Ethernet • Windows 7 Home Premium 64-bit • 3yr RTB warranty • 593 x 96 x 453mm (WDH) • Power: 66W idle; 264W peak

OVERALL	★★★★★☆
PERFORMANCE	★★★★★☆
FEATURES & DESIGN	★★★★☆☆
VALUE FOR MONEY	★★★★★☆

WorldMags.net



Nokia 808 PureView

Truly staggering camera technology, capable of capturing sumptuous images and video. It's a shame Nokia chose to debut it on such an underwhelming phone

PRICE SIM-free, £433 (£520 inc VAT); contract prices TBC
SUPPLIER www.amazon.co.uk

When the 808 PureView was first unveiled at the Mobile World Congress show in February, there were audible gasps from journalists as details of its camera emerged. In squeezing a 41-megapixel sensor into a phone, Nokia had pulled off a staggering achievement: not only was this the highest resolution camera available in a smartphone, but it also has a higher resolution than many professional DSLRs.

Now, let's get one thing straight: the 808 PureView is in no way comparable to dedicated SLRs in terms of the quality of pictures it produces. It doesn't have the power, flexibility or lens quality to come anywhere close. The size of its sensor is one limiting factor: it measures 1/1.2in across, and is smaller than the APS-C sensors in most consumer SLRs, let alone the FX format 35mm equivalent sensors of more expensive cameras.

Still, compared to any other smartphone (and consumer compacts), it's a big sensor. And once you start loading pictures from it into your photo editor of choice, you'll quickly find any worries about noise or quality start fading away. In Full Resolution mode (which produces 38- or 34-megapixel images depending on aspect ratio) and in good light, the pictures produced by the 808 PureView are nothing short of astonishing. Despite the small lens – and photosites that are crammed onto the sensor like mackerel in a trawler hold – pictures are crisp and bursting with detail.

You might be tempted to stick with full resolution for the sheer hell of it, but the size of the images it produces will soon start to jam up the PureView's 16GB of integrated storage. At the full 38 megapixels, the test JPEGs we shot ranged from 10MB to 16MB each.

Practically, such huge images aren't really necessary, unless you plan on producing wall-sized enlargements on a regular basis, or like showing off on Flickr. That's why there's another mode: PureView. Here there are three settings to play with, producing 8-, 5- and 3-megapixel images. In these modes a technique called pixel oversampling is used, which pulls together groups of pixels in a bid to eradicate the grain and colour noise that afflicts most small-sensor smartphones and cameras.

It works, too: we snapped a few low-light pictures and were very impressed with the results. The lack of grain and colour speckles is something to behold, and you can adjust the ISO speed up to 1600 if you find your shots are too blurry. Shooting at lower resolution also enables the PureView's other party trick – lossless digital zoom, controlled via the volume rocker. In 8-megapixel mode, this gives a 3x zoom with no loss in quality.

Take a step back and it's clear that detail isn't the PureView's only strong suit. The phone captures vibrant colours, especially in PureView mode, and a wide aperture of f/2.4 and a focal length of 8.02mm produces shots that have a surprisingly shallow depth of field. Don't expect the smooth blurred background of a proper SLR, but it's still better than any smartphone around.

We'd be remiss in not mentioning the video quality. The 808 PureView produces smooth, sumptuous footage, with a continuous autofocus mode and the ability to zoom in 4x using lossless digital zoom in Full HD, and 6x in 720p.

Only a couple of things give us cause for criticism: the autofocus isn't always 100% reliable – we found we often had to use the touch focus to get things sharp; and there's noticeable optical distortion apparent in full-resolution shots with lots of straight lines.

The PureView is very thick for a modern smartphone

The phone

Despite that, the 808 PureView's camera is, quite simply, the best smartphone camera there is. The big disappointment is the phone in which Nokia has chosen to debut its staggering new technology. For starters, the 808 PureView is no looker. It's chunky, measuring 18.4mm at its thickest point by the bulbous lens housing, and 14.7mm thick at the bottom end where you hold it. It weighs 172g, and although that doesn't sound like much, it puts a noticeable sag in your pocket.

Hardware-wise, there isn't much to shout about either. The

KEY SPECS

1.3GHz ARM 11 processor • 512MB RAM • 16GB storage • 4in 360 x 640 TFT • Bluetooth • 802.11n Wi-Fi • 41mp sensor • 1080p video • NFC • 1,400mAh Li-ion battery • 2yr RTB warranty • 60 x 18.4 x 124mm (WDH) • 172g

WorldMags.net

Download this sample image and more
Go to www.pcpro.co.uk/links/216Nokia

These pictures show how much detail the camera can capture: the full frame is on the left, and on the right is a close-up crop of the same frame

processor is a 1.3GHz single-core ARM unit, there's 512MB of RAM and it comes with 16GB of internal storage, with a microSD slot for adding a further 32GB. The 4in display is topped with scratch-resistant Gorilla Glass, and it's bright at 337cd/m². But the screen resolution is unthinkably low at 360 x 640, an astonishing decision given this phone's main purpose is to snap and view high-resolution photos.

We could live with that if the 808 PureView was a pleasure to use, but it runs Nokia Belle (the operating system formerly known as Symbian), which its parent company has publicly condemned to the scrap heap. Technically speaking, Nokia Belle is powerful, and a big improvement on what went before it, with multiple Android-style desktops and widgets, and a simple, flat app launcher. We also like that Nokia has preloaded the handset with Microsoft Office Mobile, complete with a PowerPoint app that can view or edit files, and versions of Word and Excel that allow documents to be created as well as viewed and edited.

Symbian continues to be the very epitome of efficiency – after our 24-hour battery test, the 808 PureView had 80% left on the battery gauge, which is nothing short of remarkable. Keep away from demanding apps and this phone is capable of lasting longer than two days. Add your Twitter and Facebook accounts, take a few shots and videos, and the gauge drops more quickly; on average, we were able to get more than a day and half of use.

Nokia Belle is a big improvement for Symbian

It's easy to see why Nokia made the jump to Windows Phone, though, because this OS is far from slick. The default keyboard, for one, is the worst we've used in quite some time. It's possible to replace it with Swype, but even this has its problems on the PureView, getting in the way of how search fields autocomplete.

The OS is littered with annoying little inconsistencies. The Gallery app lets you upload photos to Facebook or Flickr, for instance. But if you want to upload to Twitter, you have to do so via the separate Nokia Social app, which aggregates your Facebook and Twitter feeds.

If you want to read your full Twitter feed from the widget, you have to tap a tweet or status update, then hit the Menu button and select the All Activity option. Adding a Gmail account in the standard way will synchronise only your mail – not your contacts or calendar – and doesn't offer the option to have email delivered as it arrives. The shortest interval for updates is five minutes.

General performance, meanwhile, is distinctly below par. Running the SunSpider JavaScript test resulted in a score of 4,211ms, far slower than your average flagship Android handset. Panning around media-rich web pages felt sluggish and slow, and of the handful of games we downloaded from the understocked Nokia Store, only Angry Birds felt smooth and polished to play.

Verdict

The final problems concern price and availability. At the time of writing, no UK network had taken on the 808 PureView – and the SIM-free price is a hefty £520, which puts it in an awkward position. In smartphone terms, we'd hesitate to spend this much on a handset with such a low-resolution screen and a second-tier OS. If it's a great camera you're after, you're better off spending your money on an SLR, notwithstanding the innovative features and stunning quality.

In many ways we love the Nokia 808 PureView: we have great respect for the way Nokia has splashed out on the technology and made it work so spectacularly well. But it's so good it can't be long before Nokia puts it in a "proper" smartphone – perhaps one of the first Windows Phone 8 handsets slated to appear at the end of this year – and when that happens, it won't be such a tough sell. JONATHAN BRAY

OVERALL	★★★★☆
PERFORMANCE	★★★★☆
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★☆☆

WorldMags.net

Disgo 9104

A good budget tablet, but not without its problems; the arrival of the Nexus 7 makes it look ordinary

PRICE £150 (£180 inc VAT)
SUPPLIER www.dixons.co.uk

Disgo claims the 9104 uses the same 9.7in IPS panel as the iPad 2

Ice Cream Sandwich (also known as Android 4) has breathed new life into the budget tablet market. Devices that before felt horribly sluggish are now passable with the new OS, and the Disgo 9104 was one of the first to take advantage of this.

Processing power is supplied by a 1.2GHz boxchip processor based on the ARM Cortex-A8 design. Graphics are provided by a Mali 400 CPU, and there's 1GB of RAM. This allows the tablet to hit a price well below £200, while remaining usable.

Android homescreens flick by with alacrity, as do menus and the app launcher screen. Loading a web page reveals some sluggishness, exposed as a slight lag between moving your finger on the screen and the content catching up, but this isn't a disaster. Most of the games we tried to play ran fine, although perhaps not with a 100% smooth frame rate.

Disgo has made an effort with the hardware. The matte silver chassis is 9.8mm thin and weighs 620g. Connectivity is decent, with mini-HDMI, 3.5mm headphone jack and a microSD slot for memory expansion. There's 16GB of internal storage, although the rear 2-megapixel and front VGA cameras seem like an afterthought.

The 9.7in display is the star: Disgo claims it's the same IPS panel as used in the iPad 2, with a resolution of 1,024 x 768. When we measured it with a colorimeter,

iStorage diskAshur DT

PRICE 3TB, £242 (£291 inc VAT)
SUPPLIER www.lambda-tek.com
OVERALL ✪✪✪✪○○

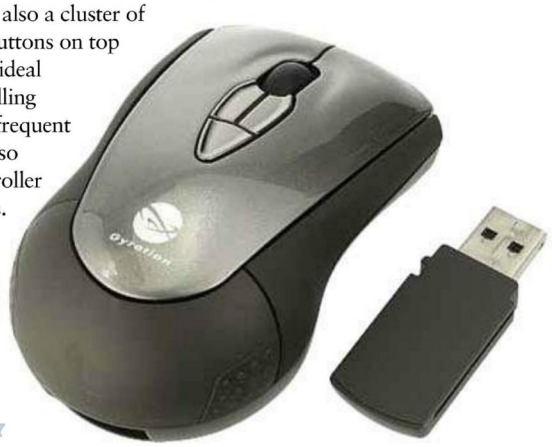
The 3TB diskAshur DT is an external hard disk with a number pad on the front that's used to lock the drive with its own personalised PIN number. That PIN is protected by 256-bit AES encryption and – although it's easy to use once it's all set up – it initially requires a complex, seven-step process. The DT protects against brute-force attacks, data is automatically encrypted, and administrators can use master accounts to create up to ten individual PIN numbers.

Large-file write and read speeds of 140.9MB/sec and 320MB/sec are faster than all of the drives in our last external hard disk Labs. It's less adept with small files, however: its write and read speeds of 38.6MB/sec and 36.7MB/sec are at the bottom of the pile. At £291, it's expensive by hard disk standards, too, but if data protection is paramount then you'll find few devices that can match the diskAshur DT. MIKE JENNINGS

Gyration Air Mouse Mobile

PRICE £48 (£57 inc VAT)
SUPPLIER www.morecomputers.com
OVERALL ✪✪✪✪○○

We've looked at Gyration's gyroscopic mice before, and found the combination of standard operation and mid-air wrist twisting to be a flexible combination. The Air Mouse Mobile takes that idea and shrinks it down to a package small enough to sling in your briefcase. Placed on a desk it's a comfortable, wireless mini-mouse; pick it up, hold down the trigger underneath, and its gyroscopes kick into action, allowing you to rotate your wrist in mid-air to control the mouse pointer. It's remarkably accurate, and installing the accompanying software opens up all sorts of powerful options, from highlighting an onscreen pointer to motion gestures for opening up applications. There's also a cluster of three customisable buttons on top of the mouse. It's an ideal companion for travelling professionals giving frequent presentations, and also serves well as a controller for media-centre PCs. The only problem is the price – we can't see many people willing to spend £57 on a mouse, no matter how good it is. JONATHAN BRAY



WorldMags.net

we found it didn't quite match up, with a lower maximum brightness of 295cd/m² and a contrast ratio of 720:1. Subjectively, the colours don't look as vibrant either, but it's a good display for the price.

All this indicates a progression from the nastiness of many previous budget Android tablets, but performance issues cropped up with increasing regularity. Our main bugbear was keyboard lag; even replacing the stock keyboard with SwiftKey failed to resolve the issue.

Out of the box, the tablet lacks the core Google Apps. There's no Gmail, no Maps and, critically, no Play store. Instead, Disgo provides links to some popular apps on its website, and the third-party app store SlideME for adding more. Fortunately, it's reasonably easy to find the Play install file on the web and drop it on yourself.

However, the Disgo's chief selling point – the price – is undermined by the arrival of the Nexus 7 (*see p102*) You can get it for as little as £159, and it has a more powerful processor and a higher-resolution screen. Full access to the Play store and the complete set of core Google Apps are provided as well.

The Disgo 9104 has its plus points – a good screen, 16GB of internal storage and Android 4 – but the launch of the Nexus 7 and a host of rough edges put paid to this otherwise promising tablet's chances. JONATHAN BRAY

KEY SPECS

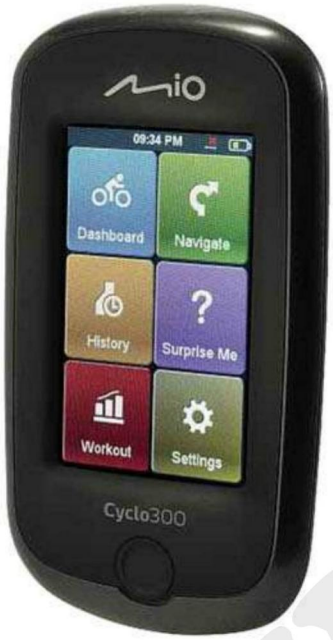
1.2GHz boxchip Cortex-A8 CPU • 1GB RAM • 16GB storage • 9.7in 1,024 x 768 display • Bluetooth • 802.11bgn Wi-Fi • 2mp camera • Android 4 • 7,000mAh lithium-polymer battery • 1yr RTB warranty • 241 x 9.8 x 185mm (WDH) • 620g

OVERALL	★★★☆☆
PERFORMANCE	★★★☆☆
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★☆☆

Mio Cyclo 300

» PRICE £195 (£234 inc VAT)
» SUPPLIER www.merlincycles.com
» OVERALL ★★★★½

Mio's Cyclo 300 brings its GPS know-how to the pedal-powered market. This is the entry-level model in the range and it's a chunky, smartphone-sized device. It sports a crisp 3in, 240 x 400 resistive touchscreen, and has both European TeleAtlas and OpenStreetMap data preinstalled. The display is large and bright, if not stunningly so, and while the resistive touchscreen technology needs a firm jab of your finger, it does work with gloves. A clear, bold interface keeps things simple and the turn-by-turn navigation is easy to follow at a glance. The "Surprise Me" feature is a neat addition, too, providing alternative routes to spice up a regular commute or countryside jaunt. In use, the handlebar mount feels sturdy, and the twist-lock operation is quick and reassuringly solid; an optional car mount is also available. Keen cyclists should look at Garmin's Edge 800 – its compact design and ANT+ compatibility are major boons – but Mio's Cyclo 300 is a solid, versatile device for a sensible price. SASHA MULLER



The Contour 200i Air sports Apple's wireless streaming technology

Pure Contour 200i Air

Effortless AirPlay audio playback, but the sound is too heavy for our liking

» PRICE £136 (£163 inc VAT)
» SUPPLIER www.amazon.co.uk

The convenience of Apple's wireless streaming technology, AirPlay, is one of the less heralded features of iOS, but one that's well exploited by the Pure Contour 200i Air. As well as sporting a physical dock for compatible iPad, iPhone and iPod devices, the Contour can also play back music beamed wirelessly from Apple's devices, with no discernible loss of sound quality.

The wireless option is welcome; planting our test iPad 2 into the dock was like trying to park a bus in a multi-storey car park, requiring an awful lot of lining up and wrestling to fit neatly in the slot. The iPhone 4S slipped in with far less bother, however, and AirPlay setup was hassle-free.

In terms of features, the Contour 200i Air is barren. There's no DAB or internet radio as you might expect from Pure – there isn't even an LCD panel present on its semi-circular dome. That isn't a criticism, however. Instead, Pure is relying on iOS apps – both third-party and its own Pure Lounge – to provide access to music, podcasts and digital radio streams.

The Pure Lounge app provides free access to most of these, as well as the £5-per-month Pure Music service, a Spotify rival that allows you to stream "millions" of tracks to any of your Pure apps and devices. However, the music catalogue isn't as comprehensive as that of Spotify, and the iOS app is poorly designed, complicating music searches and playlist creation. There's no option to control the bit rate of streams either. We'd prefer the AirPlay option within Spotify, even if a subscription costs twice as much.

The 36W speakers deliver a convincing wallop of volume with impressive clarity, but the bass is overbearing and booming. Even the most nasal of newsreaders is made to sound like Brian Blessed trapped down a well. With no EQ settings on the Contour itself, we found ourselves resorting to the Treble Booster setting on the iPhone to redress the balance.

If you can live with the cavernous sound, though, the Contour 200i Air is a convenient way to listen to music for iOS devotees, and the price isn't too punishing either. BARRY COLLINS

KEY SPECS

2 x 18W drivers • iPod, iPhone and iPad (check full compatibility list at www.pure.com) • infrared remote • 1yr RTB warranty • 371 x 175 x 229mm (WDH)

OVERALL	★★★★☆
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★☆☆
VALUE FOR MONEY	★★★★☆

WorldMags.net

TonidoPlug2

Convenient, flexible and cheap, this mini-NAS drive makes setting up connected storage easy

PC PRO RECOMMENDED

The TonidoPlug2 offers full NAS capabilities in a tiny package

PRICE £83 (£99 inc VAT)
SUPPLIER www.tonidoplug.com

Many NAS drives offer personal "cloud" content sharing, but in our experience setting it up can be a frustrating experience. The diminutive TonidoPlug2 is an exception, and among the easiest we've come across with regard to setting up remote access.

After creating an account online, you'll be able to access the device from within your home LAN via Gigabit Ethernet, and also externally via a personalised URL – and all this without having to faff about with port forwarding or dynamic DNS.

The hardware is beautifully efficient, too. The TonidoPlug2 is very small, almost pocket-sized, with a single external USB 2 port for networking external drives. There's embedded 802.11n Wi-Fi and, despite its tiny size, space for an internal 2.5in SATA drive (not included) as well.

What's perhaps most impressive of all is the TonidoPlug2's software, accessed via a browser. It isn't quite up to Synology levels of sophistication, but it's attractive, responsive and easy to use, offering everything from simple file browsing to music and video streaming and photo browsing. A range of extra features is available via a series of free, downloadable "apps" installed on the device itself. Among these are a media server, torrent client and file sync tool. There are also native apps for most major mobile OSes for file browsing and streaming.

But there are annoyances. On occasion, the onboard apps go into "suspend" mode and stop working when you connect new drives or reset. Also, music formats other than MP3 are transcoded to a noticeably low bit rate. Despite this, we still like the TonidoPlug2. It's a doddle to set up and use, is highly capable and compact, yet it isn't horribly expensive. A nice idea that's been well implemented. JONATHAN BRAY

KEY SPECS

800MHz Marvell ARM Feroceon 88FR131 CPU • 512MB RAM • 512MB NAND flash • 1 x 2.5in SATA II drive bay • 1 x USB 2 • Gigabit Ethernet • 802.11n Wi-Fi • 1yr RTB warranty • 79 x 139 x 33mm (WDH)

OVERALL	★★★★★☆
PERFORMANCE	★★★★★☆
FEATURES & DESIGN	★★★★★☆
VALUE FOR MONEY	★★★★★☆

Samsung SyncMaster S24B750V

Partners striking looks with smartphone-friendly features, but the price is far too high

MHL technology lets users see smartphone content on the big screen

PRICE £208 (£250 inc VAT)
SUPPLIER www.johnlewis.com

There's no denying Samsung's new 24in Full HD monitor looks fantastic, but its space-age appearance isn't its only unusual feature. It has smartphone-friendly technology built in, allowing it to display images and videos from a range of compatible handsets.

The technology behind this is Mobile High-Definition Link, or MHL, which makes it possible to connect a range of smartphones with a cable to view the phone's display on the big screen.

Alas, the S24B750V isn't particularly practical. The stand, for one, tilts back and forth only a little, with no height adjustment. Ease of use is below par, with the combination of touch-sensitive buttons and a feature-packed onscreen display making it fiddly to adjust even basic settings. Connectivity is rudimentary, with a single D-SUB input, twin HDMI inputs and two 3.5mm audio jacks.

Critically, where most monitors at this price now use IPS panels, Samsung has stuck with inferior TN and it shows. We measured the brightness at 258cd/m², which is fine, but with a disappointing contrast level of 696:1, blacks are slightly grey. The high 6,940K colour temperature adds a bluish tint, and with an average Delta E of 3.4, there's plenty of room for improvement.

The Samsung S24B750V may be novel, but at this price we'd demand much better image quality, and with the 23in AOC i2352Vh (web ID: 373606) delivering IPS at half the price, this Samsung looks distinctly over-priced. SASHA MULLER

KEY SPECS

24in 1,920 x 1,080 TN LCD • 250cd/m² brightness • 1,000:1 quoted contrast • D-SUB • 2 x HDMI • 3.5mm audio input • 3.5mm audio output • 1yr RTB

OVERALL	★★★☆☆☆
IMAGE QUALITY	★★★★☆☆
FEATURES & DESIGN	★★★★☆☆
VALUE FOR MONEY	★★☆☆☆☆

WorldMags.net

Nokia Lumia 610

A budget phone that's mostly a pleasure to use; ideal for the first-time smartphone owner

The curvy Lumia 610 sits nicely in the hand

PRICE SIM-free, £137 (£164 inc VAT); from free on a £16/mth, 24mth contract
SUPPLIER www.amazon.co.uk

In the light of Microsoft's recent announcements, power users might want to hold off until Windows Phone 8 arrives, but there are still some decent WP7 handsets out there. The latest is the Lumia 610, the cheapest in Nokia's range.

It's available on contract from only £16, and for £164 SIM-free, yet it doesn't feel cheap. It's nicely made, with a soft-touch plastic rear, chrome-effect trim and a curvy profile that sits nicely in the hand.

The same holds true for the screen. With flagship phones now hitting HD resolutions, the Lumia 610 doesn't leap out, but with 480 x 800 squeezed into 3.7in, it's perfectly fine. Quality isn't bad either, with a maximum brightness of 349cd/m², a contrast ratio of 873:1 and decent viewing angles.

And at this price, WP7 makes a lot of sense. None of the Android competition is as fluid and responsive as the Lumia 610, and there's also free turn-by-turn satnav with offline maps, courtesy of Nokia Drive.

Even the 5-megapixel camera isn't bad, with a dedicated shutter button and an LED flash for shots taken indoors. This is fine for casual snaps, but video resolution is limited to 640 x 480. Battery life from the 1,300mAh power pack, meanwhile, is respectable, with 50% remaining on the gauge after our 24-hour test.

It's all good so far, but there are problems. There's no microSD slot, meaning you're limited to the phone's integrated 8GB. The 800MHz CPU and 256MB of RAM (lower than we're used to seeing on WP7 handsets) mean some apps won't run, a problem that particularly afflicts games. At the time of writing, neither Angry Birds nor PES 2012 was available for download. The 800MHz processor doesn't give great browsing performance either, taking a huge 11,319ms in SunSpider.

So it isn't the sexiest phone on the block, nor the most cutting-edge. As a starter device, however, we'd happily recommend the Nokia Lumia 610: it's fluid and easy to use, and has a wide selection of features. JONATHAN BRAY

KEY SPECS

Single-core 800MHz CPU • 256MB RAM • 8GB storage • 3.7in 480 x 800 LCD • Bluetooth • 802.11bgn Wi-Fi • 5mp camera • GPS • 1,300mAh Li-ion battery • 1yr RTB warranty • 62 x 13 x 119mm (WDH) • 132g

OVERALL	★★★★½
PERFORMANCE	★★★½☆
FEATURES & DESIGN	★★★½☆
VALUE FOR MONEY	★★★★★

Sony Xperia P

A capable mid-range handset with few flaws, but the competition is strong at this price

The Xperia's 4in screen is sharp and bright

PRICE SIM-free, £229 (£275 inc VAT); from free on a £20/mth, 24mth contract
SUPPLIER www.amazon.co.uk

Sony dropped the Ericsson brand for the Xperia S (web ID: 374293), and its next release is the Xperia P. They're similar, with the same clear bar for the back, home and menu symbols, only this time they're actual buttons. Build quality is good; our only design criticisms are the inability to replace the battery and upgrade storage.

The 4in, 540 x 960 screen is sharp – the 275ppi means pixels are visible only if you look closely. The 911cd/m² brightness is high and the contrast ratio of 746:1 is good, but black levels could be darker.

To keep the Xperia P affordable, Sony has made compromises. This phone has a slower 1GHz ARM Cortex A9 processor than the Xperia S, and instead of Nvidia's Tegra 3 it boasts the Mali-400MP, the same graphics hardware as the Samsung Galaxy S III (web ID: 374950).

A Quadrant score of 1,716 isn't the fastest, and a SunSpider time of 3,008ms is twice as long as the top handsets. Reckless Racing II played flawlessly, but Shadowgun juddered during intensive scenes. Battery life was average, with 50% of the power pack left after 24 hours.

Sony's own software is capable, and most crapware has been removed, but it isn't as clean as the HTC Sense or as innovative as Samsung's TouchWiz. Many widgets just point to online stores.

Pictures from the 8-megapixel camera were sharp, if lacking warmth. Close-ups exhibited a some noise, and the lens struggled to retain clarity in bright settings. Still, these won't stop most from taking good pictures.

The Sony Xperia P is a fine mid-range handset, but HTC's One S (web ID: 375343) costs around the same but is faster, with better software, camera and screen. It remains our mid-range choice. MIKE JENNINGS

KEY SPECS

Dual-core 1GHz ARM CPU • 1GB RAM • 16GB storage • 4in 540 x 960 LCD • Bluetooth 2.1 • 802.11n Wi-Fi • 8mp stills • 1080p video • 1,305mAh Li-ion battery • Android 2.3 • 1yr RTB warranty • 60 x 122 x 11mm (WDH) • 120g

OVERALL	★★★½☆
PERFORMANCE	★★★½☆
FEATURES & DESIGN	★★★½☆
VALUE FOR MONEY	★★★½☆

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Cisco Linksys EA4500

Easy to set up and manage remotely – but clearly still a work in progress

Cisco's EA4500 can be managed via third-party apps

PRICE £102 (£122 inc VAT)
SUPPLIER www.dabs.com

Other than gradual speed advancements, there's rarely any radical re-imagining in the world of wireless routers. Despite more and more people relying on that blinking box in the corner, most routers remain tricky for inexperienced users to troubleshoot and maintain.

Cisco's latest cloud-connected, app-enabled router, the Linksys EA4500, is designed to lay that ghost to rest – and to a large extent it succeeds. On paper, the specification doesn't look unusual. It's a top-of-the-range, dual-band cable router (for connecting to services such as Virgin Media), capable of maintaining concurrent triple-stream networks over both 2.4GHz and 5GHz. The claimed top speed in both bands is 450Mbits/sec, and there are four Gigabit LAN ports on the rear, along with a single USB 2 port for shared storage, a power switch and a button for activating WPS setup.

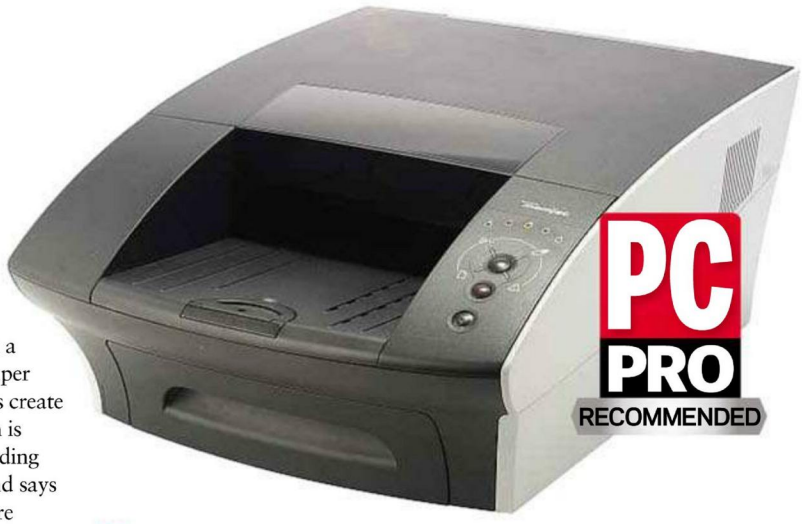
The really interesting stuff happens when you switch it on. The wizard on the CD takes you through setting up the wireless security and connection to your ISP, and also through online registration, which links the router with Cisco's Connect Cloud service. The idea behind this is to enable router management from anywhere without the need for a static IP address or a separate dynamic DNS account. With apps available for iOS and Android, this makes it a doddle to run diagnostics, speed tests and even initiate WPS pairing remotely.

The interesting aspect of the system, though, is that Cisco is throwing it open to third parties. This will allow smartphone developers to build other apps that tap into your router. Block the Bad Stuff (69p) uses Connect Cloud to link the Norton ConnectSafe DNS service with your router for rudimentary parental control over web browsing. The free HipPlay app provides access to music, photos, videos and documents on shared storage.

The second thrust of Cisco's new system is a complete redesign of the UI. Gone are the flat, intimidating table-based HTML pages to be replaced by a modern, altogether friendlier affair with slick graphics and animated menus. Most sections are now explained in plain English.

Lomond EvoJet Office

Even at truly amazing speeds, this inkjet produces great results with low running costs



The EvoJet Office produces colour prints at an amazing 60ppm

PRICE £549 (£659 inc VAT)
SUPPLIER www.alfatec.co.uk

The world of printers isn't particularly fast-moving, but every so often there's a genuine leap forward. We've recently seen several inkjets trying to provide the strengths of lasers with mixed results, but the Lomond EvoJet Office pulls it off spectacularly: it's an inkjet that its maker claims will print colour documents at 60ppm.

With standard inkjets, the print head scythes left and right across the page, dropping rows of ink as the paper is fed through. The EvoJet uses Memjet technology, where a single massive print head – 223mm wide and with 70,000 print nozzles – remains static, laying down a "waterfall" of ink as the paper passes through. The nozzles create 1 picolitre ink drops, which is the same tiny size as the leading Canon Pixmas, and Lomond says the fixed head makes it more durable than a standard inkjet with more moving parts.

We were sceptical of such heady claims as we setup the device. It has a low, long shape, with the four ink tanks dropped in from a flap on the top and the paper loaded into a 250-sheet tray in the base. There's a single-sheet feed at the back, and the only controls are a few buttons on the right of the sloping top.

We connected via USB, loaded the ISO standard 5% colour document we use to test all of our inkjets, and first printed multiple copies of a single mono page. Sure enough, after around ten seconds of preparation, the pages began hurtling out – spitting may be a better word – at an amazing 60ppm. We tried again with the full colour document and the speed didn't drop at all. It may be slightly noisy as it does its job, but the speed claims are right on the money.

There's no draft mode – as if you'd need prints any quicker than that – but there is a Best mode. With that engaged the speed was halved: bang on 30ppm with every

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See the EvoJet Office in action
at www.youtube.com/pcpro

On the main homepage, the interface features a dashboard populated with, confusingly, more "apps". These apps aren't related to the smartphone apps, they're widgets that can be hosted on the homepage of the web-based front-end. We're not sure the app analogy works here, but the redesign certainly makes it a friendly router to manage.

Performance is rapid. Copying a series of files over Wi-Fi using a laptop equipped with an Intel WiFi Link 5300 adapter, we recorded an average transfer rate of 12.3MB/sec over 2.4GHz at 2.5m, and 14.35Mbits/sec over 5GHz. At long range that fell to 5.2MB/sec over 2.4GHz and 1.6MB/sec over 5GHz. It's a performance that would have placed it just in front of our favourite cable router from the last routers group test – the Asus RT-N56U – and it's quicker than its predecessor, the E4200.

There are shortcomings, however. Read speed from shared USB storage is slow: we recorded an average rate of only 184KB/sec from an NTFS-formatted stick and 693KB/sec when that stick was formatted to FAT32. Write speed was far quicker, giving an average of 19.53MB/sec. Elsewhere, when the router is disconnected from the Cloud Connect service, the widgets disappear, which robs you of the ability to manage USB storage.

The EA4500 is a mixed bag, then. It's easy to set up and use and quick over wireless, but slow USB read speeds and a questionable reliance on apps undermine all that good work. It's encouraging to see routers getting simpler, but the Linksys EA4500 isn't quite there. JONATHAN BRAY

KEY SPECS
802.11abgn router • dual-band concurrent triple-stream 2.4GHz and 5GHz radios • 4 x Gigabit Ethernet • 1 x WAN • USB 2 for shared storage • 1yr RTB warranty • 226 x 158 x 26mm (WDH)

OVERALL	★★★★☆
PERFORMANCE	★★★★★
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★★☆

document we tried. Apart from a slightly more solid look to blocks of colour, we really couldn't see much difference between the two quality modes, so even if you stick with the normal setting you'll get clear text and accurate colours. It isn't perfect: blacks are quite pale and prints lack the boldness of the best inkjets, but to all but the most discerning eye they're absolutely fine.

Better still, the EvoJet can also print photos, albeit only on A4 paper. We loaded a few glossy sheets and opened our usual test photomontage in Photoshop CS5. Again, we didn't expect much from such an office-focused device, but the photo came rocketing out at the same speed as a normal print. There were faint lines visible in places and the detail wasn't quite there, but with remarkably accurate colours, we'd put it a single rung below the best from Canon and HP.

There's a major downside to all this: a hefty £659 purchase price. It's offset to some extent by print costs of only 1.1p for a mono page and 3.1p for colour, although you'll need to shell out £230 to replace the all-important print head after 50,000 pages. The EvoJet also lacks a few important office features, such as a duplex mode and the ability to add extra paper trays, so it won't suit all office environments.

But despite that, what you get for your money is an inkjet with unique abilities. The combination of amazing speed and good-quality prints, along with running costs lower than most colour lasers, makes the Lomond EvoJet Office hugely appealing for workgroups. It's a genuine advance for inkjet printing. DAVID BAYON

KEY SPECS
4-colour A4 inkjet • 1,600 x 1,600dpi • 60ppm • 250-sheet input tray • USB 2 • Ethernet • 420 x 550 x 225mm (WDH) • 12kg

OVERALL	★★★★★☆
PERFORMANCE	★★★★★★
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★★☆

With its 6in screen, the Start 60 is the biggest satnav we've seen

TomTom Start 60 Europe

Outstanding navigation and a lovely screen, but it's a little on the expensive side

Satnav apps on smartphones may be on the rise, but standalone devices are still TomTom's bread and butter. The Start 60 sits at the top of the firm's "basics" range, and is notable for its huge screen. At 6in across, with a resolution of 800 x 480, it's the biggest satnav we've tested. It certainly makes for a better driving experience, but it does require more care as far as positioning is concerned: it's 165mm wide, which can eat into your view of the road.

Otherwise, TomTom has done a good job of keeping things shaved back physically: it's light and slim, and features a hinged, integrated mounting system that folds flat when not in use.

As it's a budget device, the Start 60 lacks a SIM card and GPRS modem, which means no TomTom HD Traffic. It is possible to add an FM-based TMC receiver, but this isn't as comprehensive or accurate. Critically, however, it does have both TomTom's IQ Routes and Map Share features, with full mapping of 45 European countries onboard.

PRICE £130 (£160 inc VAT)
SUPPLIER www.amazon.co.uk

On the road, the Start 60 performed impeccably. We tested it around London for a couple of weeks, and couldn't find fault with the accuracy. Voice instructions were timed to perfection, the volume loud enough to make out over a radio, and the routes chosen were on the money every time.

It isn't flawless. In central London, among the tall buildings along Upper Thames Street, the device lost GPS contact a couple of times. No GPRS means no Google search, so there's no fall back if your destination isn't in the POI database. As a result, it failed to locate by name some of the places on our test route. You need to make sure you have the postcode and full address details for your destination or you might be stuck.

Perhaps more significantly, the price is on the high side. With the 5in TomTom Start 25 costing around £120, you'd have to really want that extra inch to spend another £40. JONATHAN BRAY

KEY SPECS
6in 800 x 480 resistive touchscreen • maps of Europe (45 countries) • microSD slot • 1yr RTB warranty • 165 x 105 x 24mm (WDH) • 236g

OVERALL	★★★★☆
PERFORMANCE	★★★★☆
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★☆☆

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Thunderbolt external drives

Hard disks using the superfast Thunderbolt interface are starting to appear – but do the performance benefits justify the price? We put four quite different drives to the test

	Buffalo MiniStation Thunderbolt	Elgato Thunderbolt SSD	LaCie Little Big Disk Thunderbolt SSD	Seagate GoFlex Thunderbolt Adaptor
Overall	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪
Capacity	500GB, 1TB	120GB, 240GB	240GB	N/A
Drive type	Mechanical	SSD	2 x SSD	N/A
Price inc VAT	TBC	£330, £550	£520	£100
Supplier	TBC	www.apple.com	www.dabs.com	www.apple.com

Thunderbolt ports have been appearing on Apple hardware for more than a year now, and they're slowly starting to show up on high-end Ultrabooks and motherboards too. There's been a lot of buzz surrounding this high-speed, multipurpose interface, but as yet few consumer peripherals have made use of it. Now, however, we're starting to see Thunderbolt emerge as a connector for external hard disks.

The appeal of Thunderbolt for connecting drives is obvious: it offers a huge 10Gbits/sec of bandwidth. This doesn't mean a Thunderbolt drive will transfer data at that rate, since hard disk technology simply isn't capable of that sort of performance. But it means there's headroom for the disk to perform at its maximum speed, whatever that may be. This is a big advantage over older USB 2 drives, in which the 480Mbits/sec connection speed keeps transfer rates low. Even USB 3 drives, with 5Gbits/sec of bandwidth, could bottleneck today's fastest SSDs – especially if they're combined into a striped RAID array.

Another benefit of Thunderbolt is support for daisy-chaining, allowing you to string together drives neatly, rather than each one requiring its own port on your PC. You can even attach a monitor to the chain, since Thunderbolt carries DisplayPort data alongside other protocols. Monitors consume a lot of bandwidth, though, so be warned that this may reduce the performance of other peripherals attached to the same host port.

"The appeal of Thunderbolt is obvious: it offers a huge 10Gbits/sec of bandwidth"

There are downsides to Thunderbolt, however, and the first is the price. Thunderbolt is currently a small market of high-performance parts, and the prices reflect that. Even a cable will currently set you back around £30 inc VAT.

The second issue to be aware of is power consumption. Thunderbolt is a more electrically complex system than USB, and drives connected via Thunderbolt draw more power than USB 3 ones. In our tests, we found USB 3 disks typically added around 4W to total system load when spinning idle, while Thunderbolt disks added around 10W. If you're powering a portable drive from a laptop, that difference could have a significant impact on battery life.

To test our Thunderbolt drives, we used a Windows 7 test rig comprising a Gigabyte Z77X-UP5 TH motherboard, an Intel Core i3-2100 CPU and 4GB of RAM.

1 Elgato Thunderbolt SSD

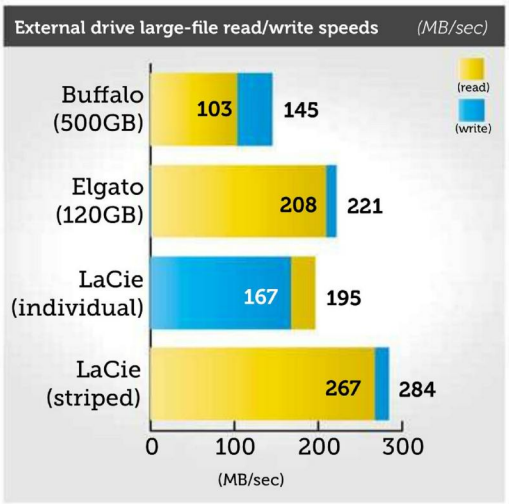
If you want to see the greatest benefit from a high-speed Thunderbolt connection, you'll want to look at SSD-based models. Elgato's drive sets either a 120GB SSD or 240GB model in a low-profile case with a single Thunderbolt socket, promising speeds much higher than a typical mechanical drive. And so it delivered in our large-file tests, where the 120GB model achieved read and write speeds of 208MB/sec and 221MB/sec. Performance was less exceptional in the small-file tests, where the Elgato Thunderbolt SSD achieved 30MB/sec and 66MB/sec respectively – not much better than a USB 3 mechanical disk.

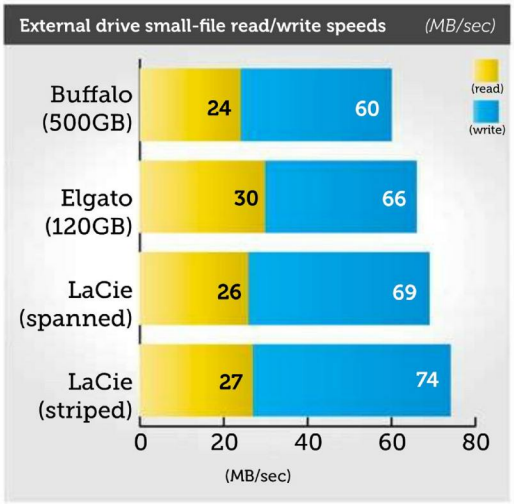
The real question mark over the Elgato Thunderbolt SSD, however, is the price. We understand SSDs are expensive, but the Apple Store price of £330 inc VAT for the 120GB model is hard to swallow – especially since it doesn't even include a cable. The £550 240GB model is better value, but a comparatively steep 10W idle power draw is a turn-off.

2 Buffalo MiniStation Thunderbolt

Buffalo's MiniStation Thunderbolt contains a 2.5in mechanical drive, of either 500GB or 1TB capacity. It serves as a convenient illustration of the difference between USB 3 and Thunderbolt – since it offers both interfaces, and thoughtfully comes with both cables.

We tested the 500GB model, first over USB 3. When reading and writing large 1.5GB files to and from a RAM disk, it averaged transfer speeds of 103MB/sec. In our taxing small-file test, which creates and copies 15,000 files of 100KB each, it averaged read and write speeds of 23MB/sec and 50MB/sec respectively.





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We then switched to Thunderbolt and repeated the tests. In both large-file and small-file read tests, scores were effectively identical across the two interfaces: this was as we expected, since the bottleneck here is the performance capability of the drive. Using Thunderbolt did improve write speeds: large-file results gained a boost, up to 145MB/sec, and small-file results was lifted to 60MB/sec. Overall, though, performance trailed some way behind the Elgato.

Although UK prices for the MiniStation Thunderbolt are yet to be confirmed, a US price of $210 suggests we'll be paying at least £150 – around three times the price of a USB-only unit. Although the performance benefit is undeniable, that makes it hard to recommend, unless perhaps you're using a 2011 Mac that lacks USB 3.

It's worth noting, too, that the MiniStation has only a single Thunderbolt port, limiting your ability to take advantage of Thunderbolt's daisy-chaining capabilities. Moreover, when connected by Thunderbolt, the drive drew 8W when spinning idle, compared to a draw of only 3W when connected via USB.

3 Seagate GoFlex Thunderbolt Adaptor

Seagate's modular GoFlex system takes a slightly different tack to its rivals. The idea is simple: if you have an existing 2.5in Seagate GoFlex drive, you can turn it into a Thunderbolt disk by simply slotting it into the appropriate caddy. This approach makes it impossible to make promises about performance, since this will depend on which disk you use. We installed a 1TB drive from 2011 (originally sold with a USB 3 caddy) and saw identical speeds to those delivered by the Buffalo MiniStation. In principle the Thunderbolt caddy should support much faster drives, but at present Seagate doesn't offer any SSD-based GoFlex models.

As it stands, therefore, the GoFlex Thunderbolt Adaptor is – like Buffalo's MiniStation – probably only worth considering if you have a Mac that supports Thunderbolt but lacks USB 3. Otherwise it makes more sense to pay £30 for a USB 3 cable – or not much more for an entire new drive – than to splash out £100 for this.

4 LaCie Little Big Disk Thunderbolt SSD

LaCie's SSD-based Thunderbolt drive looks chunkier than most, but that's because it contains two 120GB disks, which you may choose to use in separate, spanned, striped or mirrored configuration. Individually, these solid-state models outshone Buffalo's mechanical drive in our tests, but couldn't match the large-file transfer rates of Elgato's drive (*see graph, opposite*).

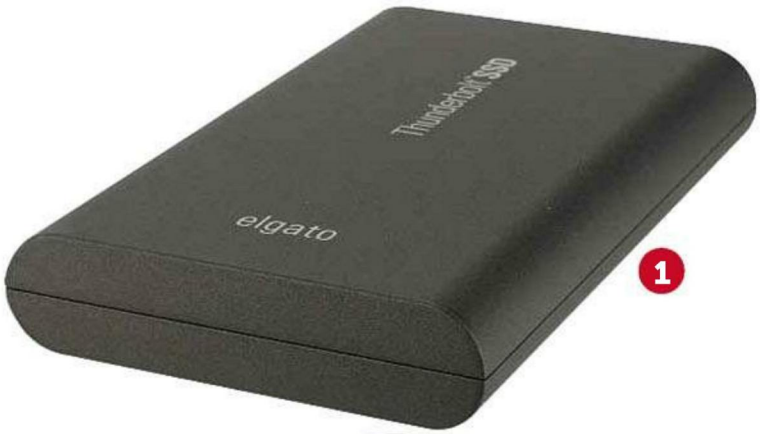
Combine the two disks into a RAID0 array, though, and performance rockets: we saw large-file read and write speeds jump to 267MB/sec and 284MB/sec. Even small-file operations were slightly accelerated, with write speeds hitting 74MB/sec.

However, you may baulk at using RAID0 for storing important files, since it doubles the likelihood of a hardware failure leading to irrecoverable data loss. SSDs are less prone to this than mechanical drives, since they have no moving parts, but if you plan to use the Little Big Disk in this mode, you should make sure you have a good backup system in place.

At £520 inc VAT for this model, LaCie's twin-disk Thunderbolt drive isn't a bargain, but it's cheaper and more versatile than Elgato's 240GB drive. It also offers a second Thunderbolt port, and a bundle of complimentary backup software. Our final caveat is that it uses an external 12V power supply, making it less suited than most to a mobile lifestyle.

Verdict

Clearly, Thunderbolt drives are fast – but they're also expensive, and for everyday use there's much to be said for sticking with USB 3. For professionals, however, who are willing to pay for top-speed storage, Thunderbolt is exciting – and as the market grows, prices will surely fall. We look forward to seeing what Thunderbolt brings in the coming months and years. DARIEN GRAHAM-SMITH



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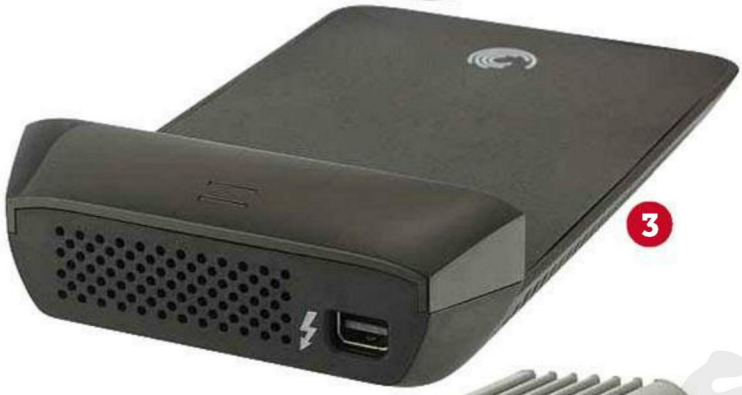
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PC PRO RECOMMENDED

Apple OS X 10.8 Mountain Lion

Apple's latest upgrade sees OS X evolve into an online social hub that blends the desktop and mobile experience together – and it works surprisingly well

PRICE £14 inc VAT
SUPPLIER Via the Mac App Store

Mountain Lion – or OS X 10.8, to give it its more prosaic designation – is the latest big cat to stalk onto the Mac. It will run on most Macs released since 2008, so long as they have at least 2GB of RAM and are currently running Snow Leopard or Lion, and the cost remains very low: a single £14 purchase from the Mac App Store allows you to upgrade all your authorised Macs (which in practice means up to five machines).

Yet although the price suggests Mountain Lion is a minor upgrade, it represents a significant shift in focus for OS X. Or, rather, it brings to fruition a shift that began last year, when Lion started importing iOS features such as full-screen applications, multitouch gestures and the Launchpad view to the desktop. Mountain Lion builds on this, tying the Mac in more closely to online content and services – and to iOS devices.

New online features

The most visible new feature is the iOS-style Notification Center. Calendar appointments, emails and software updates are heralded by tasteful notification balloons at the top right of the screen, which optionally either fade out or remain until snoozed or dismissed.

As in Lion, you can sign in to various external email services, including Gmail, Yahoo and Microsoft Exchange – and you can now also connect directly with Twitter, Vimeo and Flickr. Facebook integration is promised for this autumn. If you miss a notification, simply swipe to the left or click the new icon at the far right of the menu bar to see your notification history (*pictured above*).

More subtle is the appearance of discreet Share buttons dotted around the various applications. In Safari, you can now share URLs and send images to email, Twitter or the Messages application directly from the toolbar. In iPhoto, Photo Booth and Preview, you can click to post an image directly to Flickr – or set it as your avatar on online services. Even the Finder now sports a share button to send a file to a friend.

The Messages application now supports iMessages, so you can chat seamlessly with people using both OS X and iOS clients. More excitingly, there's also now a Mac version of the iOS Game Center for playing games directly against mobile users – we couldn't try this as it wasn't yet live.

Living in the cloud

Mountain Lion isn't only about socialising. iCloud integration has been beefed up to help you manage multiple devices. In Lion,

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Notifications work with your own reminders as well as third-party services, while Time Machine at last supports multiple backup destinations

this service synchronised mail, calendars and some types of document between your Mac and mobile devices: now it can also synchronise Safari web tabs – so you can put down an iPad and continue on the Mac – and share photo streams with other iCloud users.

You can share memos created in the new cloud-aware Notes application, too: update a document and it will sync across your Mac, iPhone and iPad. The Reminders application works similarly, but lets you attach a date and time to an alert, which will then pop up on all of your Apple devices. Reminders can be assigned to locations too, popping up when you arrive at a particular place.

New desktop features

If you're not interested in Mountain Lion's online features, there's good stuff here for standalone use too. Lion's Auto Save feature receives welcome tweaks, so documents can be more easily renamed, reverted or saved under a new name. Time Machine at last supports multiple backup destinations, providing redundancy at home or extra security if you use your MacBook both at home and in the office.

Safari gets a single "omnibox", into which either URLs or search terms can be entered. Software Update has been merged into the Mac App Store, tidying up the niggling inconsistency whereby application updates and OS updates arrived through different channels. And the Launchpad view now lets you type to search, just like Spotlight – turning it into a usable, albeit limited, launcher.

Mountain Lion makes no extravagant demands on your system – on our 2008 iMac with an upgraded 3GB of RAM, it felt every bit as snappy as its predecessors – but it does include a few hardware-specific features. Trackpad users will appreciate a few new gestures, including a three-finger tap for Quick Look and a pinch overview of all open tabs in Safari. If you're using a recent MacBook Air (or a MacBook Pro with Retina display) you can also take advantage of Mountain Lion's Power Nap feature, where OS X continues to do useful things while in power-saving standby mode, including downloading updates, processing Time Machine backups, and even periodically updating its location with the Find My Mac service. Apple TV owners can use AirPlay mirroring – previously only supported by iOS devices – to display Mac content on a TV.

One of Mountain Lion's quirkier new features is voice recognition. Impressively, this works everywhere in the OS – so long as you have an internet connection, as the actual interpretation is done online, presumably using a spin-off of the Siri back-end. But we found accuracy was poor unless we spoke loudly and clearly, so don't plan to use it in Starbucks. The online processing model also means nothing appears on the screen until you tap a key or click to indicate that you've finished speaking, so you don't see your words appear as you go.

Security

Mountain Lion is purportedly the most secure version of OS X yet, thanks to the new Gatekeeper feature, which optionally prohibits downloads from developers who aren't registered with Apple. In practice, we doubt this will make much difference: it's easy to turn off, and frankly there's very little stopping registered developers from publishing malware – there's no vetting for the software itself.

There's no great cause for alarm, though. The OS remains robust, thanks to its Unix-like permissions model and automatic sandboxing in Safari and Mail.

The Launchpad now lets you type to search for applications

Worth the upgrade?

The dozens of improvements in Mountain Lion affect almost every corner of the operating system, so even if you never use the internet and don't own a single iOS device, there's enough here to tempt an upgrade from Lion – after all, the cost is almost negligible.

However, the principal goal of OS X 10.8 is evidently to make the Mac a more connected companion to its iOS brethren – and here it really impresses. Last year, when Lion seemed to hint at a straightforward convergence between OS X and iOS, we feared OS X would be dumbed down or even axed. Instead, it's gone on to embrace online services and mobile devices without compromising its own identity.

For sure, the range of services supported is limited, especially while we're waiting for Facebook. We'd have liked to see a properly open framework for notifications and two-way communications, to help services such as reddit, Myspace, LiveJournal and Google+ join in the fun.

Overall, though, even in its current closed and inchoate form, Mountain Lion is a bold advance – and a persuasive alternative to the one-interface-fits-all approach of Windows 8. If you're an existing Mac user we've no doubt you'll upgrade. But even if you've never considered the platform before, we recommend you take a look at Mountain Lion before buying your next laptop – or, as it might be, your next tablet. DARIEN GRAHAM-SMITH

OVERALL	★★★★★
EASE OF USE	★★★★★
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★★

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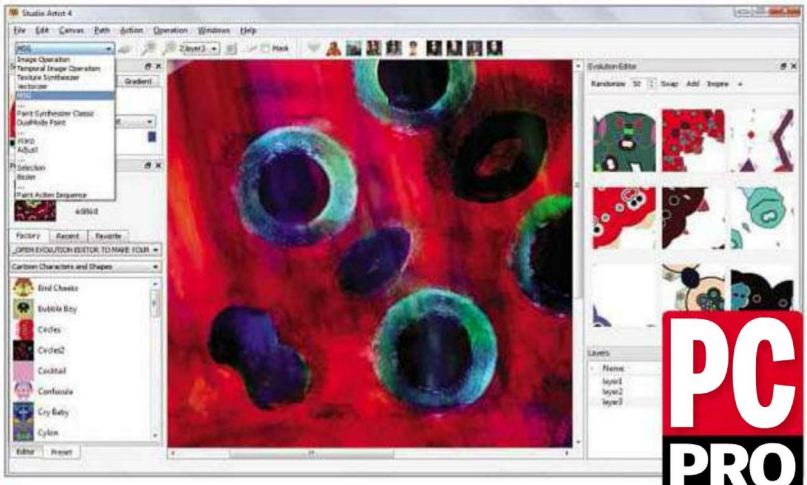
Studio Artist 4

From artistic painting to video rotoscoping, Studio Artist offers superb creative power



Studio Artist provides numerous operational modes, each of which opens up major new creative options

PC PRO RECOMMENDED

PRICE $399 (£256, VAT N/A)
SUPPLIER www.synthetik.com

For the past 20 years, professional art on the PC has largely been defined by one application: Corel Painter. Now some serious competition has finally arrived, as Synthetik has at last ported Studio Artist from Mac to PC.

Rather than a traditional paint program, Studio Artist calls itself a "graphics synthesizer" for reasons that will become clear. However, as with any art program, the software's success ultimately depends on the range of brushes provided. Studio Artist has thousands of options ranging from acrylics to watercolours, and plenty of eye-catching special effects. Each brush is accessed from a central Presets control panel, with an Editor tab for fine-tuning how you save your own brushes.

Using Studio Artist's brushes, images can be painted from scratch, but the program really comes into its own once you've loaded a source image – usually a photo – for conversion. Studio Artist automatically analyses the bitmap, breaking it down into colours, regions, outlines and so on, and can then use this information to repaint the image. Simply hit the Action command and the source photo is recreated before your eyes in the currently selected style. As the image is being built up stroke by stroke, the results are excellent and far superior to most art filters.

It isn't only the end results that are creative and rewarding; the entire process of producing images is absorbing, too. It's possible to switch brush presets while the image is being painted; Studio Artist won't even pause. This allows you to quickly explore creative options and makes it possible to produce extraordinary and unique mixed effects. Even better, using Assisted mode, you can take advantage of Studio Artist's automatic painting for your own creations.

If this were all Studio Artist offered, it would be impressive enough, but this central Paint Synthesizer mode is just one of many effects. Switching to Image Operations mode opens up access to hundreds of customisable filter options, while changing to Warp or Adjust modes offers a whole range of distortion and colour-correction effects. DualMode Paint applies dynamic effects to the image as you paint.

Using Texture Synthesis mode, abstract textures can be produced that are procedurally generated and therefore independent of the resolution. Meanwhile, Studio Artist's MSG mode – which stands for "modular synthesizer graphics" – allows the generation of abstract geometric patterns and, using the dedicated Evolution Editor palette, allows variations to the current theme to be quickly generated.

More power is available in the form of Studio Artist's vector capabilities. Using Vectorizer mode, source images can be converted to a wide range of shape- and line-based artistic interpretations, which can be saved to resolution-independent EPS or SVG formats, allowing images to be resized without loss of quality. Switch to Bézier mode and the generated paths can be fine-tuned, and new ones drawn from scratch. Incredibly, you can even switch back to Paint Synthesizer mode once you're happy with the results, and add a stroke path with the current brush. If you don't like the effect, simply undo it and choose another preset.

Compositing capabilities, add Photoshop-style layering facilities. At any point you can switch to Selection mode to create a mask to limit where brushstrokes and effects are applied, and for maximum control and creativity you can create layered compositions, and manage opacity and blending modes.

Studio Artist 4 is just as happy creating the frames of a video as it is producing standalone bitmaps. Simply open a video or image stream and the current canvas can be repeatedly written out to build up a freehand animation. Batch-processing can be used to output whatever appears on the Studio Artist canvas. Existing video can be manipulated by loading the frames of a QuickTime video to a movie layer that can be edited by hand.

Alternatively, you can record all the actions applied to the current frame as a paint action sequence that can then be batch-applied to the video as a whole. In this way, entire videos can be rotoscoped in any number of hand-painted styles. Combine paint action sequences with Vectorizer mode and you can even resize your rotoscoped footage to full cinema resolution.

Synthetik Studio Artist 4 is a staggering piece of software, and its creative power is extraordinary. For professional art on the PC, Corel Painter has been blown out of the water. TOM ARAH

Using Studio Artist, source images can be artistically and intelligently interpreted in many different styles

OVERALL	★★★★★
EASE OF USE	★★★★☆
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★☆

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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

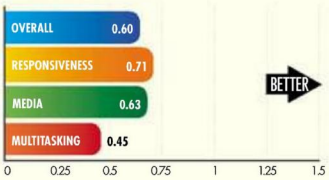
We test 3D performance using pre-recorded sequences in Crysis. We use the game's Low, Medium and High quality settings in the resolutions of 1,366 x 768, 1,600 x 900 and 1,920 x 1,080 respectively. For really fast systems we replace the Low test with one at 1,920 x 1,080 and Very High quality. A system's 3D graphs (*see left*) will be coloured red, amber or green to indicate how smooth on average gameplay will be.

3D BENCHMARKS

CRYSIS

REAL WORLD BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



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.

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.

Hard disks

We time how quickly internal and external drives can read and write files within Windows. We do this first using a single, 1.5GB data file, then with a folder containing 15,000, 100KB data files, to tax the drive controller and file system. We give the results in MB/sec and also compare costs in terms of price per gigabyte.

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iiyama ProLite G2773HS

The 27" ProLite G2773HS is a real game changer. The use of a high quality 120Hz panel with a blistering 1ms Response Time offers you an amazing gaming experience. The screen offers crystal clear, smooth and judder free graphics during fast paced games and beautiful quality HD video. Hardcore gamers will really appreciate the few milliseconds advantage this screen gives you, allowing split second game changing decisions. The screen comes equipped with stereo speakers and a headphone socket as well as HDMI, VGA and Dual Link DVI connections and boasts a 1920 x 1080 Resolution.

iiyama ProLite E2273HDS 22"

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- 2ms response time
- 5 000 000:1 ACR
- DVI-D, VGA (D-Sub), HDMI

iiyama ProLite E2473HDS 24"

Features include:

- 24" LED-backlit
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 2ms response time
- 5 000 000:1 ACR
- DVI-D, VGA (D-Sub), HDMI x 2

iiyama ProLite E2773HDS 27"

Features include:

- 27" LED-backlit
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- 1ms response time
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EXCLUSIVE

HP ProLiant DL380p Gen8

HP's eighth-generation ProLiant flagship is a superbly designed 2U rack server that's clever enough to look after itself

PC PRO A-LIST

» PRICE £6,193 exc VAT
» SUPPLIER www.hp.co.uk

HP's new generation of ProLiant servers offer much more processing power than their predecessors

HP claims its eighth-generation ProLiant servers are so intelligent they manage themselves. Along with giving administrators more free time, they offer improved I/O, flexible configuration options and, with Intel's E5-2600 Xeons in the driving seat, much more processing power.

In this exclusive review, we bring you the first look at HP's flagship ProLiant DL380p Gen8. This 2U rack server introduces the new iLO4 embedded controller, which comes with HP's Agentless Management, Active Health System (AHS) and Embedded Remote Support features.

These provide enhanced health monitoring, plus power and thermal controls and a smartphone app for remote management. The iLO4 web interface sees a minor redesign, with more information on major components such as storage and RAID.

AHS monitors more than 1,600 system parameters and stores up to 1GB of diagnostics data, which can be securely downloaded by HP support for faster problem resolution. It links up with HP's new SmartMemory and SmartDrive devices; if it identifies a problem, it arranges for replacement memory and hard drives to be ordered in advance.

HP's Intelligent Provisioning means you no longer need to boot the server with a SmartStart DVD to load an OS – it's been a long time coming; Dell had a similar feature more than three years ago.

Storage capacity is the same as the DL380 G7 (web ID: 360274), with the server supporting up to 16 SFF or eight LLF drives. Our sample came with eight SFF drives, but if you add the second expansion cage you'll also need an extra RAID PCI Express card.

Alternatively, DL380e models focus more on capacity, with 12 LFF or 25 SFF drive bays. Other differences from the DL380p include their 12 DIMM sockets and support for E5-2400 Xeons.

The embedded Smart Array P420i in the DL380p links up with the motherboard's pair of SAS 2 ports, and offers a good choice of cache memory. We had the full 2GB FBWC (flash-backed write cache) module, which comes with a fast charging capacitor.

HP's SmartDrive carriers are clever, packed with status LEDs so you know exactly what the drive is up to. A locate LED on each carrier glows blue while the drive is being identified by the host, and flashes when it's being updated.

The circular button has a rotating green disk-activity ring, while its multicolour centre LED shows the drive status and warns of impending failures. An LED on the carrier-release button glows white to warn that it must not be removed where, for example, another drive in the same RAID5 array has already failed.

The HP has a tool-free design, and the two PCI risers can be removed with a flick of the wrist. The Smart Socket guide reduces the chances of CPU pin damage during upgrades or maintenance.

The review system came with dual 2GHz E5-2650 Xeons, which have eight cores and a 20MB L3 cache. Dual-CPU systems have six hot-swap fans (see 1), and we found the review system to be extremely quiet during testing. It came with two 750W power supplies, but HP also offers 460W or 1,200W options, and they all share a common form factor.

The E5-2650 Xeons have a low TDP of 95W, which helped deliver impressive results in our power tests. With Windows Server 2008 R2 in idle we measured a draw of 109W; under maximum load from the SiSoft Sandra benchmarking app, this peaked at 250W. As a comparison, the Dell PowerEdge R720 (web ID: 374416) had dual 2.7GHz E5-2680 Xeons with a 130W TDP: it drew 120W in idle and 358W under load.

For virtualisation, the server has both internal USB and SD memory card slots. However, Dell comes out top for hypervisor redundancy, as its R720 supports dual internal SD card slots. Network options are improved, as HP's FlexLOM cards slot in at the back of the server. We had the quad-Gigabit version, but HP also offers a dual-10GbE card or a 10/40Gbits/sec FlexFabric module.

HP has taken much longer than Dell to unveil its E5-2600 Xeon servers, but the wait was worthwhile. Combining excellent design and versatility with the smartest server management features on the market, the ProLiant DL380p Gen8 takes a well-deserved place on the A-List. DAVE MITCHELL

KEY SPECS

2U rack chassis • 2 x 2GHz Intel Xeon E5-2650 • 32GB 1,600MHz RDIMM DDR3 memory expandable to 384GB (768GB with LRDIMMs) • Smart Array P420i SAS 2 with 2GB FBWC cache • supports RAID0, 1, 5, 6, 10, 50, 60 • 2 x 600GB HP 10k SAS hot-swap hard disks (max 16) • SD slot • 6 x PCI-E • 4 x Gigabit FlexLOM • 2 x 750W hotplug supplies • HP iLO4 Standard • HP Insight Control software • 3yr on-site NBD warranty • Power: 109W idle; 250W peak

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
FEATURES & DESIGN	★★★★★★
VALUE FOR MONEY	★★★★★½

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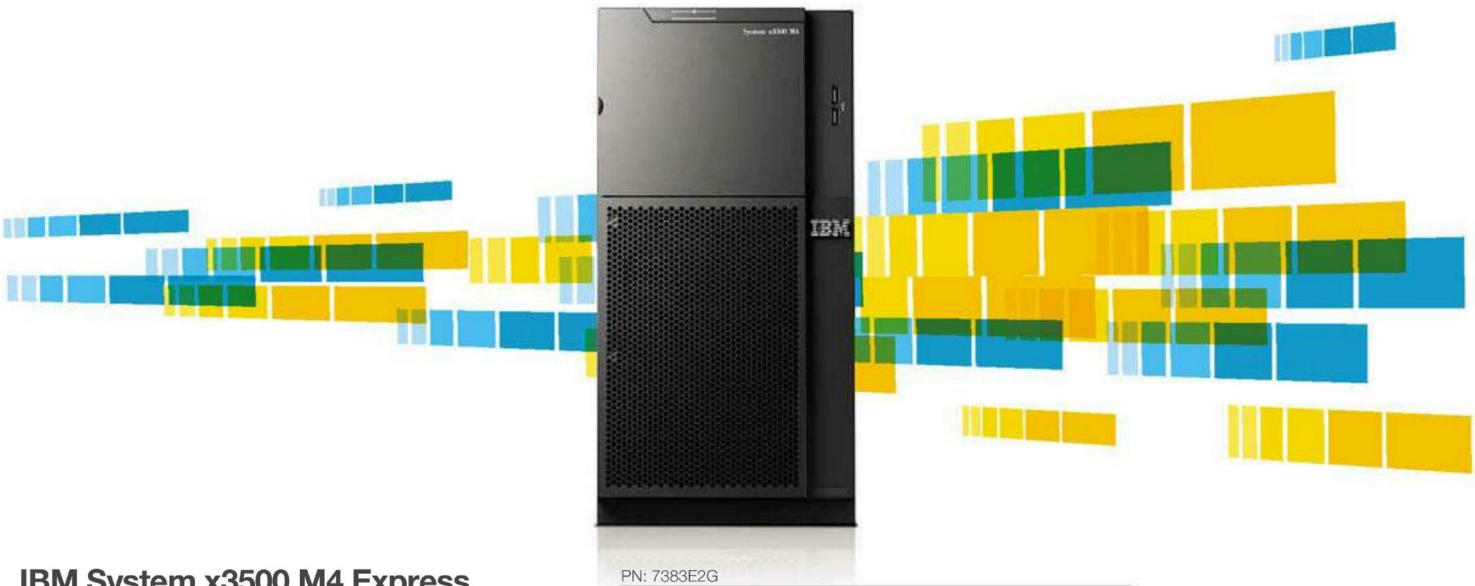

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intel inside Xeon

[1] TBR Report – "IBM System x® x86 servers: Meeting the demands of today's enterprises by combining value and support," January 2012.
[2] Source: Intel® Performance comparison using SPECfp*_rate_base2006 benchmark. Baseline score of 267 on prior generation 2S Intel® Xeon® processor X5690 (3.46GHz, 6-core, 12MB L3, 6.4 GT/s, 130W) based platform published at www.spec.org as of 6 Sept 2011. Estimated new score of 486 on 2S Intel® Xeon® processor E5-2690 (2.90GHz, 8-core, 20MB L3, 8.0 GT/s, 135W) is based on Intel® internal measured estimates as of 6 Sept 2011 using two Intel® Xeon® processor E5-2690, Turbo Enabled, EIST Enabled, Hyper-Threading Enabled, 64GB memory (8x8GB DDR3-1600), Red Hat® Enterprise Linux Server 6.1 beta for x86_6, Intel® Compiler 12.1.
[3] x3500 M4 supports up to 768GB of memory using 32GB LRDIMMs in its 24 memory slots. Previous generation x3500 M3 supports up to 192GB of memory.
[4] Ships with 4 1Gb Ethernet ports standard and supports integrated slot-less 10Gb Ethernet with Virtual Fabric. Previous generation server includes two 1Gb Ethernet slots and requires use of a PCI Express slot to support 10Gb Ethernet.
[5] x3500 M4 supports up to 32 internal 2.5" HDD. Previous generation x3500 M3 supports up to twenty four 2.5" HDD.
[6] Quarterly price quoted is based on IBM's 0% System x Solution Finance offering (FMV lease). Terms & Conditions Apply: Offering availability subject to credit approval; for more details and full Terms and Conditions please visit: http://www.ibm.com/financing/uk/lifecycle/acquire/xsolutionfinancing.html.
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EXCLUSIVE

IBM System x3650 M4

Not perfect, but a good choice for SMBs that want an affordable 2U rack server that can grow with them

PC PRO RECOMMENDED

» PRICE £3,339 exc VAT
» SUPPLIER www.ibm.co.uk

The IBM System x3650 M4 is highly upgradeable and virtualisation-ready

The System x3650 has always been IBM's workhorse rack server, and in this exclusive review we test the new M4 model. Along with support for Intel's E5-2600 Xeons, IBM has designed this server to allow businesses to start small and pay as they grow.

You can choose from a wide range of storage and RAID options. Our review sample came with eight hot-swap SFF SAS/SATA drive bays, and you can upgrade to 16 bays (see 1). Usefully, the 8 Pac upgrade has a SAS expander card on its backplane. Unlike HP's DL380p Gen8 (*see p124*), you don't need a second RAID card and so won't lose a PCI Express slot.

Those with deep pockets can order the server with up to 32 of IBM's 1.8in SSDs. If capacity is more important, you can have six hot-swap LFF hard disk bays, and then there's the configure to order (CTO) model that cuts costs by using six cold-swap SATA bays.

IBM has improved its RAID options, as the base ServeRAID M5110e controller is embedded on the motherboard. This supports 6Gbits/sec SAS and SATA drives, but if you want more than stripes and mirrors, one upgrade gives RAID5 and 50, and a second takes that to RAID6 and 60.

Cache starts at 512MB with a battery pack, or you can go for 512MB or 1GB of flash-backed cache. As RAID is based on LSI's SAS2208 chip, you have the option to activate its CacheCade feature to optimise read activity from an SSD-based cache.

The x3650 M4 showcases IBM's new IMM2 embedded management controller. The basic version is of limited use since it doesn't support web browser management or KVM over IP remote control. Our system included the IMM2 Advanced upgrade, which activates the Gigabit port at the back. The browser interface sees a substantial redesign over the older IMM and provides more information about critical components.

However, it comes up short of Dell's iDRAC7 for features and is beaten soundly by HP's new iLO4. On a more positive note, IBM's Systems Director utility is easier to use than Dell's Management Console and HP's Insight Control.

Designed to manage network devices, Systems Director provides discovery, software deployment, inventory, file transfer and VNC-based remote control tools. The Active Energy Manager plugin talks to the IMM2 and provides power capping, plus trend graphs of power consumption and system temperatures.

IBM is lagging behind in deployment, since you still have to boot with the ServerGuide DVD to get an OS. Dell did away with this three years ago, and HP's Gen8 servers now have the new Intelligent Provisioning feature.

The IBM is virtualisation-ready since its internal USB port uses a key to boot into VMware ESXi or vSphere 5. HP's DL380p Gen8 provides internal USB and SD card slots, but Dell goes one step beyond as its R720 has dual internal SD card slots for hypervisor redundancy.

Memory options are extensive, and the x3650 M4 is the first of IBM's servers to be offered with HyperCloud DIMMs (HCDIMMs). These are expensive but support up to 384GB running at 1,333MHz with three DIMMs per channel, and claim a 25% performance boost over standard RDIMMs.

Network connections are also more flexible: the IBM has four embedded Gigabit ports plus a dedicated connector for an Emulex dual-port 10GbE mezzanine card. The HP has one connector that supports either quad Gigabit or dual 10GbE cards.

The quoted price includes a pair of 750W hotplug supplies, which will cover most workloads, but you can opt for 550W or 900W modules. With Windows Server 2008 R2 Enterprise idling, we recorded a draw of 98W, and with SiSoft Sandra putting the processors under maximum load this peaked at only 222W.

Internal cooling is handled by a bank of four hotplug fans in front of the processors (see 2). With the HP sitting next to the x3650 M4, noise levels were low with nothing between the two.

SMBs looking for a general-purpose 2U rack server or something on which to run their critical apps will find IBM's x3650 M4 worthy. It isn't as sophisticated as the HP, but it's good on features and value, and will be easy to upgrade. DAVE MITCHELL

KEY SPECS

2U rack chassis • 2 x 2.3GHz Xeon E5-2630 • 16GB 1.35V DDR3 RDIMM memory expandable to 256GB (768GB with LRDIMMs) • IBM ServeRAID M5110e with 512MB cache and BBU • supports RAID0, 1, 10 • 2 x 300GB IBM 10k SAS 2 hot-swap hard disks (max 16) • 6 x PCI-E 3 • 4 x Gigabit Ethernet • 2 x 750W hotplug supplies • IMM2 Advanced • IBM Systems Director 6.3 software • 3yr on-site NBD warranty • Power: 98W idle; 222W peak

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
FEATURES & DESIGN	★★★★★½
VALUE FOR MONEY	★★★★★½

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THE LITTLEST BIG COLOUR PRINTER THAT DOES IT ALL

Inkjet or laser? A3 or A4? When you're choosing a printer, you'll need to weigh up paper size, desk space, colour quality and running costs. But there's an alternative that could change your calculations: OKI's A3 colour LED

WIN an OKI C822 A3 colour LED printer worth £830! (See below)

The first thing you notice about the C822 is its size. It's only a little bigger than A4 colour lasers offering comparable speeds – but it takes A3 paper. In fact, OKI reckons it's the world's smallest laser-class A3 colour printer, meaning you can find room for it even if you thought A3 would take up too much office space. With modern styling to boot, it's likely to improve the looks of your office too.

Replacing lasers with LEDs is the trick. Printers powered by this technology, long associated with OKI, can be more compact, and the C822's neat styling complements its small footprint. Yet it's still big on the inside. The main paper tray holds up to 300 sheets, and a 100-sheet multipurpose tray (MPT) is also included – so you can swap between A3 and A4, for example, without having to reload. The MPT can even handle banner paper up to 1.32m in length.

Maybe smaller rather than larger is your thing? The C822 handles sizes down to postcard (A6) too.

If you frequently use both A4 and A3 paper in larger volumes, it may be worth adding a second paper tray with capacity for 530 sheets. This simply sits underneath the main body of the printer, and takes the online paper capacity up to 930 pages.

Installation art

Installation is straightforward. All the consumables are pre-installed and simply require you to remove various bits of paper, tape and plastic. Once this has been done and paper loaded, the unit can be switched on ready for use. The supplied software DVD includes both Mac and Windows drivers (also available for download), and once the appropriate driver has been selected the device is automatically linked to it.

In use, the C822 quickly sets about printing the first page, with a quoted warm-up time of only 32 seconds. Print speed is rated at a speedy 23ppm – and that applies to both mono and colour, with the first page out in as little as 14 seconds.

Having set up the C822 and printed a few pages, you'll begin to notice how quiet it is. OKI has worked hard to minimise noise when the device is in use and, just as importantly, when it's idle. This is great for smaller offices where the device may be installed close to workers.

Flexible friend

Duplex (printing both sides) is standard on the C822dn, saving paper as well as time. In fact, the driver defaults to duplex to support paper-saving initiatives. The main tray can feed up to 220gsm paper, and folding out the MPT at the front and the bypass door at the rear gives you a completely flat path. This means it's easy to feed a wide range of types and weights of media, right up to 256gsm stock.

On ordinary office copy paper, OKI's LED technology promises high-quality text and rich, vibrant images (it's this technology that earned the OKI C821n a *PC Pro* Recommended award). The printer uses OKI's ProQ multilevel technology to achieve the equivalent of a 2,400 x 600dpi resolution.

Economy boost

The C822 should also prove economic to run. Measured on the ISO standard, costs per page are low, and high-yield toners, drums and other long-life components all contribute to ensuring that's true in real-world use. The supplied starter toners have a life of up to 2,500 pages, and they're simple to replace with after-market toners ISO-rated at 7,000 pages for black and 7,300 pages for colour.

It's obvious OKI takes power consumption seriously, too. About one minute after each operation, the C822 switches to standby. Then, after 15 minutes without further activity the device switches to "deep sleep" mode, consuming less than 1W but ready to wake quickly for the next job.

Compact, quick, economical and flexible, OKI is confident the C822 is the colour printer you've been waiting for. Find out more from OKI at **www.cleverprinters.co.uk**, and don't miss the chance to win one too.

Words and image: Oki

HOW TO WIN

For a chance to win an OKI C822 printer worth £830, answer this question: What is the capacity of the starter toners supplied with the C822? Tweet "PC Pro" plus your answer to @OKIUK or post the same thing at www.facebook.com/OKIUK. Winners will be notified by the same medium. Closes 30 September 2012. UK only.

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EXCLUSIVE

Boston Value Series 120 G8

A basic feature set, but Boston's compact Xeon E3-1200v2 rack server offers good value with an impressively low power draw

» PRICE £1,539 exc VAT
» SUPPLIER www.boston.co.uk

This Boston's 1U chassis is only 22in deep, making it suitable for most rack- and wall-mounted cabinets

Along with the burgeoning microserver market, Intel's Xeon E3 processors are aimed at the single-socket, entry-level server sector. The latest E3-1200v2 series is built on the Ivy Bridge architecture, and in this exclusive review we look at the first production server to use these new CPUs.

The Boston Value Series 120 G8 is an all-Supermicro affair, designed to handle basic IT services such as web and email serving, network gateway security and dedicated hosting. Its low-profile 1U chassis is only 22in deep, so it will fit neatly into most rack- and wall-mounted cabinets.

The review system came with a 3.4GHz Xeon E3-1240v2 – one of a family of 11 new models. The biggest change to the new CPUs is a die shrink to 22nm, which should bring a noticeable reduction in power consumption. Speeds range from 2.3GHz up to 3.7GHz, and all support Intel's Turbo Boost 2, with the E3-1290v2 capable of hitting 4.1GHz. All but one model have four cores and 8MB of L3 cache; the dual-core E3-1220Lv2 is the odd one out, with a smaller 3MB L3 cache and a tiny TDP of 17W.

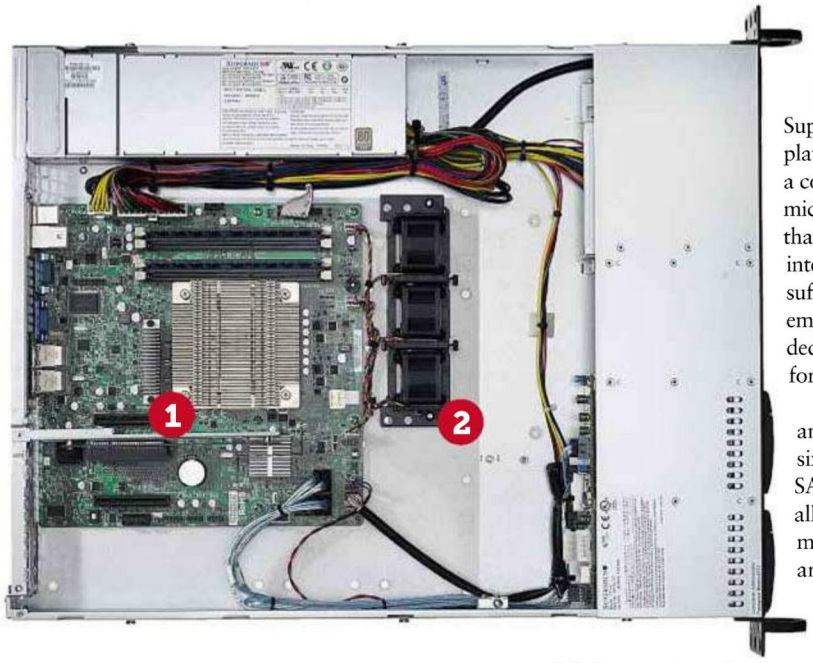
Powering the Boston is a fixed 330W supply, and this CPU's 69W TDP had a small but significant impact on overall power usage. With Windows Server 2008 R2 in idle, we measured a draw of only 33W; with SiSoft Sandra hammering all eight logical cores, this peaked at a mere 80W.

The differences in consumption between the E3-1200v2 and v1 versions are apparent only under full load. We measured a Broadberry CyberServe XE3-R130 (web ID: 368131) equipped with a 3.1GHz E3-1220, and with its 80W TDP it drew 33W in idle and 91W under load.

The processor has a large passive heatsink (see 1), and all cooling is handled by a row of three 40mm fans in front (see 2). Each module has two fans that rotate in opposite directions for improved airflow and reduced vibration. They work well: we found the server exceptionally quiet during testing, which makes it suitable for a small office. The system also has mounting points and power connectors for two more fan modules if you require extra cooling for the drive bays.

The new E3-1200v2 CPUs support DDR3 memory speeds of up to 1,600MHz and the price includes a pair of 4GB modules. Up to 32GB of ECC memory can be fitted, but only the unbuffered variety as registered memory isn't supported.

Storage options are basic. The chassis has a hot-swap bay for up to four SFF hard disks, and the price includes a triplet of 500GB Seagate Constellation SATA II drives. You can't add any more bays: the air grille in the middle of the front panel is fixed, and there's only an extra bay on the other side for an optical drive.



Based on Supermicro's SuperServer 1017C-TF platform, the server uses a compact X9SCL-F microATX motherboard that doesn't take up much internal space. The "F" suffix indicates it has an embedded RMM and dedicated network port for remote management.

The motherboard has an Intel C202 chipset with six embedded 3Gbits/sec SATA ports. The chipset allows you to create mirrors, stripes or RAID5 arrays, the last of which is supported only in Windows since it's managed using Intel's Rapid Storage Technology app.

The server can be managed from a web browser, and its simple interface provides access to sensor readouts so you can keep a close eye on critical components. Each sensor has links to thresholds; if anything goes awry, it will issue SNMP traps and email alerts.

The RMM looks short on features when stacked up against Dell's iDRAC7 and HP's new iLO4. However, if you need only basic monitoring, it does the job nicely – and it has the added bonus of providing KVM over IP remote control and virtual media services as standard, rather than as optional upgrades.

Expansion is limited to a single riser card with a PCI Express x8 slot. Two Gigabit network ports are provided at the rear, and these can be bonded together into fault-tolerant or load-balanced teams using Intel's driver settings.

The Value Series 120 G8 offers SMBs a useful entry rack platform for running general IT services. Storage options are basic, but it's quiet enough for a small office, offers good value and won't cost much to run. DAVE MITCHELL

KEY SPECS

1U rack chassis • Supermicro X9SCL-F motherboard • Intel C202 chipset • 3.4GHz Intel Xeon E3-1240v2 • 8GB UDIMM 1,600MHz ECC DDR3 RAM expandable to 32GB • embedded Intel SATA controller • 6 x SATA II ports • supports RAID0, 1, 5, 10 (Windows only) • 3 x 500GB Seagate Constellation SATA II hot-swap hard disks (max 4) • PCI-E 3 x8 slot • 2 x Gigabit Ethernet • embedded RMM with 10/100 port • Supermicro SuperDoctor III software • 3yr on-site NBD warranty • Power: 33W idle; 80W peak

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
FEATURES & DESIGN	★★★★½☆
VALUE FOR MONEY	★★★★★½

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AOC

ULTIMATE MONITOR

for iPod®/iPhone® fans

The AOC e2343Fi is an intelligent display providing the Apple® fan community with the ability to listen to music or view their pictures, videos and YouTube content from numerous iPhone and iPod devices on a stylish 23" (58.5 cm) monitor, with or without the need for a PC. Connect it to a PC to synchronise music, downloads and office applications or simply work on your PC applications and listen to great music through the powerful 5 W inbuilt speakers. A complete multimedia solution for Apple users.

Easy accessible menu/buttons

Stylish design with 1.29 cm profile

Dock your iPhone / iPod directly into the socket

Monitor specifications: 23" LED backlight monitor, 50,000,000:1 contrast ratio, 5 ms response time. Connections: VGA, HDMI connection, audio input, audio output, USB 2.0, iPhone/iPod docking station

www.aoc-europe.com

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EXCLUSIVE

Imation DataGuard T5R

Imation's new NAS appliance delivers good speeds and includes an integrated RDX drive for off-site backups

PRICE Diskless, £965 exc VAT
SUPPLIER www.coolspirit.co.uk

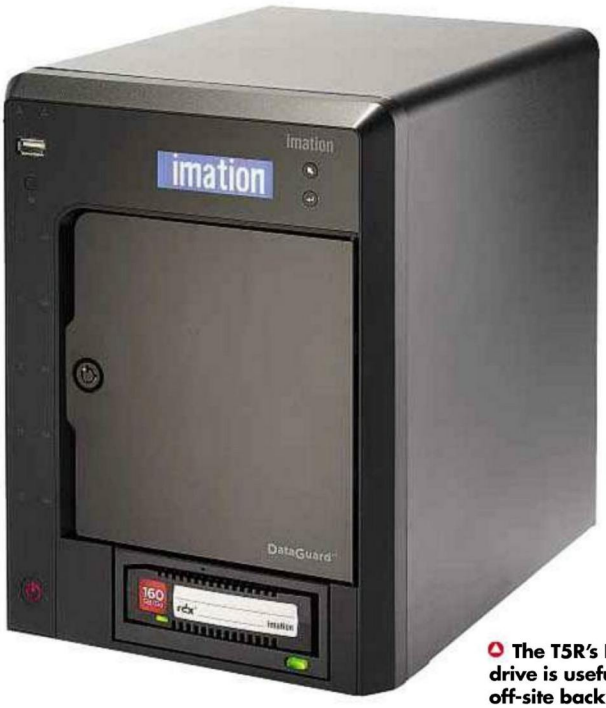
Imation is moving in a new direction with its DataGuard NAS appliances, as it responds to the global slowdown in tape and optical media sales. In this exclusive review we examine the entry-level desktop DataGuard T5R, which the company claims is the world's first appliance with an integrated RDX cartridge hard disk backup drive.

Backup is a priority: along with the RDX drive, the T5R supports local backup, replication and a range of cloud storage providers. Amazon's S3 and Dropbox are supported and it can also back up shares to OpenStack providers.

The appliance is well built, and contains a 2.13GHz Intel Atom D2700 and 2GB of RAM. Along with a pair of Gigabit ports, there are two USB 3, three USB 2 and one eSATA port.

The price here is for a diskless unit, and for testing we loaded up five 1TB Western Digital Enterprise SATA II drives. The web interface offers a one-click setup routine, but if you want to create iSCSI targets then it's best not to use this.

The wizard groups all drives into a single storage pool and creates one RAID5 logical drive for NAS use only. If you want NAS shares and iSCSI targets, logical drives must be created manually; you then choose a RAID array plus a size, and select either NAS or IP SAN operations.



The T5R's RDX drive is useful for off-site backups

Snapshots are supported on NAS shares and you must ensure that space is left for them when creating your logical drive. Snapshots can be run manually or to a regular daily and weekly schedule, and recovery is a simple two-click operation.

Workstation backup software isn't included, but the T5R offers plenty of other backup options. You can create jobs that secure

Ricoh Aficio SG 3110DNw

Low colour print costs, but that's the only redeeming feature of this disappointing, slow gel printer

PRICE £146 exc VAT
SUPPLIER www.printerbase.co.uk

Ricoh's Aficio gel printers are designed to offer a low-cost, environmentally friendly alternative to small-business colour lasers. As part of a complete range refresh, the new SG 3110DNw takes over from three older GX models and adds wireless to the mix. The desktop footprint has been reduced by 30%, and Ricoh's GelSprinter technology is now called Geljet.

The printer uses a pigment-based gel that dries more quickly on the page than ink, allowing Ricoh to claim a laser-beating print speed of 29ppm. The gel cartridges are loaded into a small panel at the front, and are keyed so they can't be placed in the wrong slot. On power-up the printer has to charge its tanks, which takes close to ten minutes.

We recommend the high-yield 2,500-page black and 2,200-page colour cartridges, since they return low running costs of 1.2p for a mono page and 4.4p for colour. Ricoh also offers 600-page low-yield cartridges, but these push costs through the roof: mono and colour pages cost 3.8p and 14.4p respectively.

A status window can be loaded on each client system to provide updates on gel levels.

The Aficio SG 3110DNw's colour printing costs are low

The printer also offers a simple web management interface that can be used to keep an eye on consumables, create email alerts, configure the wireless network and apply IP address-based access security.

In our tests, we found that the claimed top speed was all but unachievable. Printing a 30-page Word document on the High Speed setting took 1min 23secs for an average of 22ppm. This is essentially a draft mode that's of no general use, since the quality is so poor that small fonts are almost unreadable. Stepping up to the Quality Priority setting produced much sharper text, but speed plummeted to only 6ppm.

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selected shares to external USB or eSATA devices, and replicate them to another DataGuard appliance.

The T5R delivered impressive speeds in our real-world tests. Copying a 2.52GB video clip between the appliance and a Dell PowerEdge R515 system running Windows Server 2008 R2 saw high read and write speeds of 98MB/sec and 93MB/sec. FTP speeds were in the same ballpark at 106GB/sec and 90MB/sec. General backup operations are fast as well: a 22.4GB folder with 10,500 small files was copied to a share at a rate of 59MB/sec.

For IP SANs, the T5R presents one portal, so all targets will be shown to any logged-in initiator. The T5R kept up the pace, with Iometer reporting top read and write rates for a 100GB target of 112MB/sec and 91MB/sec.

For the RDX drive, you create special backup jobs that copy all selected shares to it. Performance isn't great: backing up a 20.5GB folder with 10,000 files returned only 15MB/sec. Restore speeds were quicker, returning the folder to the NAS share at an average of 32MB/sec.

You can also restore to a new folder, overwrite an existing folder of the same name, or synchronise the two. Since the RDX drive is NTFS-formatted, if you have an RDX dock in another system you can pop in the cartridge and drag and drop to restore data.

With Qnap's TS-559 Pro II appliance costing around £560, the DataGuard T5R looks pricey. However, it holds its own for performance, and the integrated RDX drive leaves no excuses for not using off-site backups. DAVE MITCHELL

KEY SPECS

Desktop chassis • 2.13GHz Intel Atom D2700 • 2GB DDR3 RAM • 5 x hot-swap SATA II drive bays • supports RAID0, 1, 1E, 3, 5, 6, 10 • internal SATA RDX drive • 2 x USB 3 • 3 x USB 2 • eSATA • 2 x Gigabit Ethernet • internal power supply • 1yr RTB warranty

OVERALL	★★★★½
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★½

Bring a good book if you're planning on using the High Quality driver setting. We tested this with a 24-page DTP-style document, and its challenging mix of colour graphics and photographs took the printer 34 minutes to complete at a shocking average of only 0.7ppm.

We found that cheap copier paper remained slightly soggy for up to a minute after printing, and the output quality didn't even justify the long printing time. Our colour performance chart revealed smooth gradients across colour fades, but the printer couldn't reproduce the 0.1pt and 0.2pt gaps between solid blocks of colour. Grey shades using a mix of C, M and Y gels also showed a slight magenta cast. Many of these problems disappeared when we used higher-quality 100gsm paper, but this will obviously push up running costs.

One thing the Aficio SG 3110DNw can do that laser printers can't is print on glossy photo paper. However, even here we felt let down: test prints showed an unpleasant yellow tinge. The printer also had an annoying habit of stopping halfway through a photo, ejecting it and restarting the whole process from the beginning.

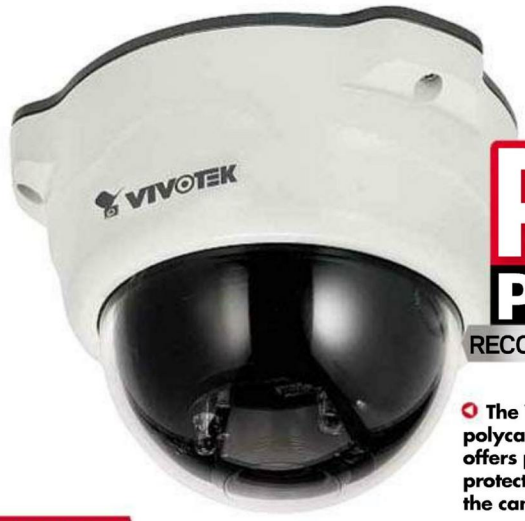
The low price of £146 exc VAT could tempt small businesses away from colour lasers, but they may regret it in the long run.

Although the Aficio SG 3110DNw's colour printing costs are low, output quality simply isn't good enough for business use, and print speeds on anything but the draft setting will hit productivity hard. DAVE MITCHELL

KEY SPECS

3,600 x 1,200dpi A4 gel printer • 128MB RAM • quoted 29ppm colour/mono • USB 2 • 10/100 Ethernet • 802.11bgn Wi-Fi • 250-sheet input tray • duplex • 1yr on-site warranty • Options: 250-sheet lower tray, £160 exc VAT

OVERALL	★★½
PERFORMANCE	★½
FEATURES & DESIGN	★★★½
VALUE FOR MONEY	★★★½



PC PRO RECOMMENDED

The Vivotek's polycarbonate shell offers plenty of protection for the camera

EXCLUSIVE

Vivotek FD8134V

An IP66/IK10-rated IP camera with reasonable image quality and a tempting price tag

Vivotek's FD8134V raises the bar for affordable external surveillance: its weather-proof IP66-rated unit costs only £224 exc VAT. Its metal shell and polycarbonate dome have the highest impact-protection rating of IK10, meaning that they can handle a 20-joule impact – equivalent to dropping 5kg from 400mm.

The camera uses a 1/4in RGB CMOS sensor, and its eight IR emitters mean it's ready for 24-hour operation. The shell is fixed to the camera body with three Torx screws, which you'll need to remove, as the lens body must be positioned manually.

The Ethernet, power and I/O cables are protected in a 300mm sheath, so it's ready to go straight outside. Finally, the camera is 802.3af PoE compliant; we had no problems powering it from a standard injector and the lab's HP ProCurve 2424M-PWR switch.

Installation is wizard-assisted, and it displays URLs for accessing the cameras locally, over the internet and from a mobile, where it will use a lower resolution of 176 x 144 pixels. The homepage opens with the live view, and we found image quality to be good.

Focus is too soft for fine details, but colour balance in natural and artificial light is clean, and movement is conveyed smoothly. A 4x digital zoom is available, but quality breaks down, so it won't be of use when surveillance of distant objects is required.

We tested by monitoring the local car park: at maximum zoom, distant car number plates couldn't be read and facial recognition was impossible. However, the claimed 10m range for the IR emitters is acceptable – when the lights go out, the level of detail was quite high within this perimeter.

Motion detection is configured in different windows with their own sensitivity settings. It can be active during the day or night, and triggers used to send images to email, FTP and web servers, or the camera's SD card slot.

Vivotek's FD8134V offers plenty of useful features, and its compact body is as hard as nails. DAVE MITCHELL

» PRICE £224 exc VAT
» SUPPLIER www.networkwebcams.co.uk

KEY SPECS

1/4in RGB CMOS • 1,280 x 800 • 8 x IR emitters • 30fps • H.264/MPEG4/M-JPEG • 10/100 Ethernet • 802.3af PoE • motion detection • microSD/SDHC card slot • external power supply (optional) • web browser management • installation wizard and ST7501 recording software • 1yr RTB warranty

OVERALL	★★★★½
PERFORMANCE	★★★★½
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★★½

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Thecus N4800

A fast, low-cost four-bay NAS appliance with plenty of features and a very handy battery backup pack

PRICE Diskless, £399 exc VAT
SUPPLIER www.span.com

Thecus' N4800 four-bay NAS appliance stands out thanks to its mini-UPS battery backup unit (BBU). Slotting in the back, this small lithium-ion slab keeps RAID arrays, outstanding disk writes and firmware upgrades intact in the event of a blackout.

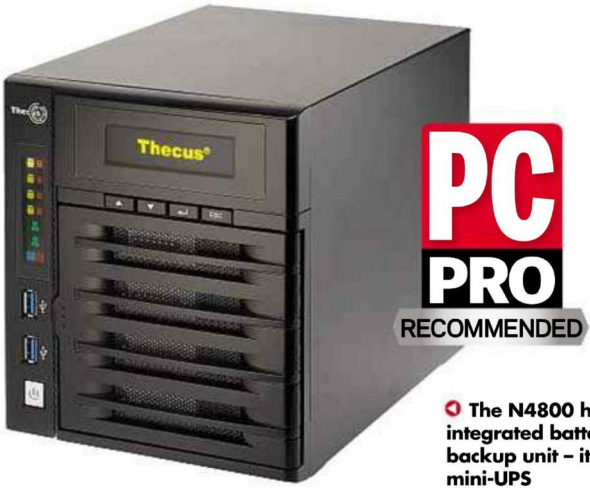
The BBU charge status is shown in the OLED panel, and to test it we pulled the power on the appliance, at which point it sounded a warning beeper and after 70 seconds powered itself down. We then restored power, rebooted and it worked fine.

Aside from that handy feature, the N4800 sports a 2.13GHz Intel Atom D2700, 2GB of DDR3 RAM, and pairs of USB 3 and USB 2 ports. A VGA port provides direct console access to the Linux OS, and the HDMI port is for a TV connection to view videos, although Thecus has yet to release a firmware update to enable this.

New cloud features include free modules for Dropbox and ElephantDrive, but there's nothing yet to match Synology's ezCloud and Cloud Station, or Qnap's MyCloudNAS. It has a McAfee VirusScan module, and others are available for a mail server, web server and MySQL.

KEY SPECS

Desktop chassis • 2.13GHz Intel Atom D2700 • 2GB DDR3 RAM • 4 x hot-swap SATA II drive bays • supports RAID 0, 1, 5, 6, 10 • 1GB SATA DOM • Li-ion BBU • 2 x USB 3 • 2 x USB 2 • eSATA • HDMI • VGA • 2 x Gigabit Ethernet • external power supply • setup wizard and Acronis True Image Personal software • 2yr RTB warranty



The N4800 has an integrated battery backup unit – its own mini-UPS

We created a RAID5 array with four 1TB WD GreenPower SATA II drives, and added some thinly provisioned iSCSI targets. Drag-and-drop copies of a large video clip over Gigabit returned read and write speeds of 96MB/sec and 91MB/sec. FTP was faster, with the FileZilla client reporting 108MB/sec and 103MB/sec.

General backup tasks won't take long: our 22.4GB test folder with 10,500 small files was copied at a rate of 62MB/sec. IP SANs were also nippy, with Iometer reporting a 98MB/sec raw read rate for a 100GB target.

The N4800 delivers good performance, and it offers near-silent running. At less than £400 for a diskless model, it's also good value, and its BBU could be a lifesaver. DAVE MITCHELL

OVERALL	★★★★★
PERFORMANCE	★★★★★
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★★

EXCLUSIVE

WatchGuard XTM 25-W

A complex setup, but this affordable wireless UTM appliance packs sophisticated security measures

PRICE Appliance with 1yr security bundle, £595 exc VAT
SUPPLIER www.watchguard.com

WatchGuard's desktop XTM 25-W offers all the network security features available in the higher-end XTM appliances. The price gets you a one-year subscription to anti-spam, antivirus, URL filtering, IPS, application controls, HTTPS inspection and WatchGuard's reputation-enabled defence. If demand outstrips supply, the box can even be upgraded in situ. Adding a new licence turns it into an XTM 26-W by increasing firewall throughput from 110Mbits/sec to 350Mbits/sec.

WatchGuard uses proxies, so you need to create firewall rules for each service. Proxy choices include HTTP, HTTPS, FTP, SIP, H.323, POP3 and SMTP.

Anti-spam is handled by Commtouch's hosted service, and suspect messages can be tagged or quarantined to a separate server. The A-Listed XTM 330 (web ID: 375079) also uses Commtouch, and detected 98.9% of spam in our live tests.

KEY SPECS

Desktop chassis • 5 x Gigabit Ethernet • 2.4GHz 802.11bgn or 5GHz 802.11an wireless • 110Mbits/sec firewall • UTM throughput 20Mbits/sec • WatchGuard and Firebox System Managers plus WebBlocker, Report, Log and Quarantine server software • 1yr advanced hardware replacement

This desktop box offers all the features of high-end XTM appliances

The appliance supports either 2.4GHz 802.11bgn or 5GHz 802.11an – but not both together – and presents up to three SSIDs. A close-range 5GHz connection with a Windows 7 system returned a modest 12MB/sec.

The XTM 25-W's application awareness stands out, since it can be used to fine-tune control of sites such as Facebook, and combined with WatchGuard's AD authentication support.

Small businesses may find the XTM 25-W complex, but this is because it offers so much more. It's worth persevering, as you won't find a tougher UTM solution at this price. DAVE MITCHELL

OVERALL	★★★★★
PERFORMANCE	★★★★★
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★★

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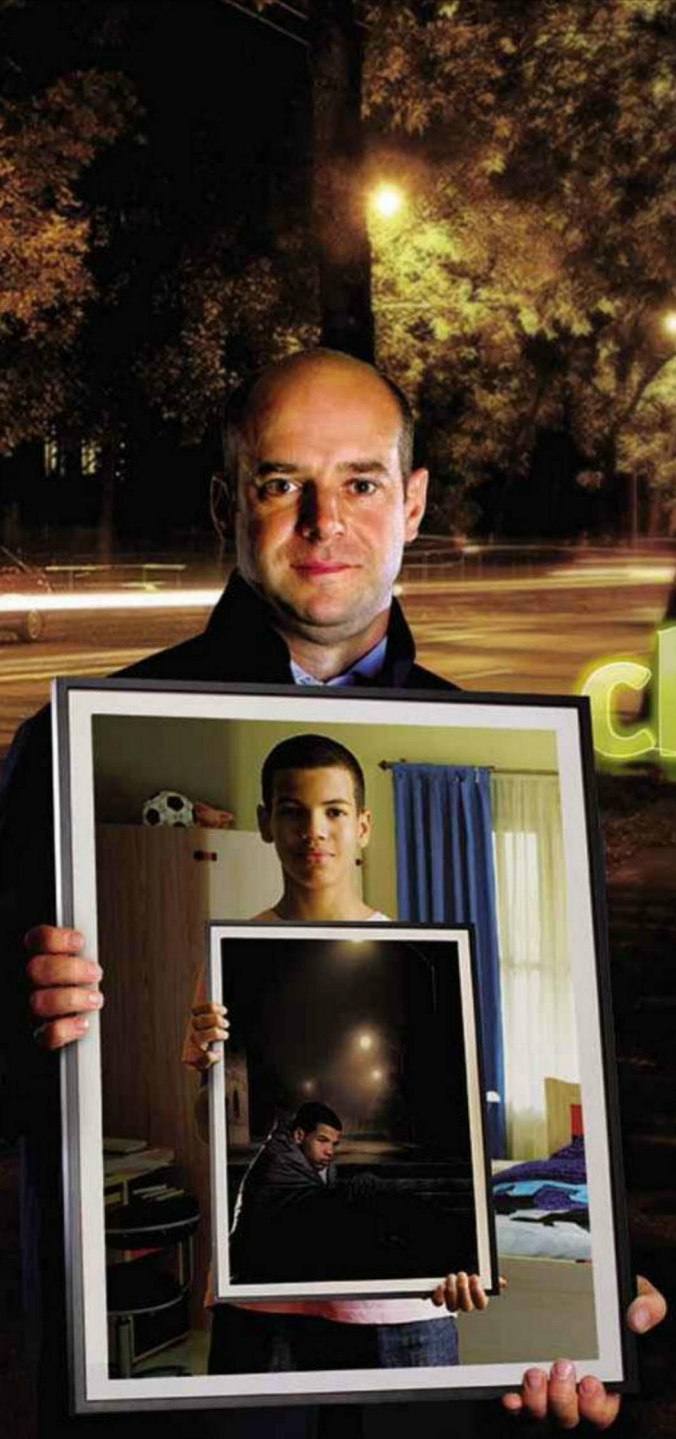
byte night 2012

action for children

changing lives



Mark Heath
VP Engineering, XenServer
Byte Night Sleeper

15 years on, Byte Night is more vital than ever.

Homelessness amongst young people has many root causes. You can help Action for Children to tackle them by joining the IT and business community for Byte Night 2012. Sleep out or chip in and you will help change the lives of some of the most vulnerable children and young people across the UK.

With only a sleeping bag between you and the elements, you'll join celebrities, CIOs, systems developers, business managers, marketers and more. It's our fifteenth year and we're aiming to reach a total of £5m in fundraising. With your sponsorship, donations, fundraising and of course, one memorable night - we can do it!

Got a QR code reader?
Scan over this QR code now to visit the website

Byte Night: 5 October 2012

Belfast Cambridge London Scotland Thames Valley

For more information, visit: www.bytenight.org.uk

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Photography: main intro, Danny Bird; mini-intros and cutouts, Julian Velasquez; repro, Jon Chhak

Ivy Bridge laptops

With the promise of improved performance and battery life, this month's Labs features laptops powered by Intel's cutting-edge Ivy Bridge processors. From only £700, here are 12 of the fastest laptops we've ever seen...

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HDMI

Buyer's guide

If you've postponed a laptop purchase in readiness for the arrival of Intel's Ivy Bridge, this month's 12-strong group of laptops are ample proof that it's been well worth the wait.

While the technological advances are impressive, not least the move to a 22nm manufacturing process and Intel's Tri-Gate 3D transistor technology, those refinements deliver a palpable, real-world improvement. With an Ivy Bridge processor in your laptop, you can expect a boost to application performance, better graphics performance and, best of all, no decrease in battery life.

The first Ivy Bridge laptops through the door employ the mid- and high-end Core i5 and Core i7 CPUs. With the Core i3 processors destined for the budget ranges, it means this month's Labs focuses on the costlier end of the market, with prices starting at £700 and going right up to £1,800.

Whether you're after a portable 13.3in laptop, such as Sony's VAIO S Series or Apple's MacBook Pro, a mid-range 15.6in model that can do it all, or a gaming beast, we have 12 models covering every possible eventuality.

In terms of their specifications, this month's group has a fair amount in common. The 15.6in and 17.3in laptops here use Intel's quad-core Core i7 processors, with only the smaller models from Sony and Apple using dual-core CPUs. In everyday use you probably won't notice the difference, but the quad-core models pull ahead in multithreaded applications.

Intel's improved HD Graphics 4000 chipset is also worth noting. It still isn't fast enough to handle serious gaming, but it's a big improvement on the previous generation, delivering significantly smoother frame rates in our Crysis tests. With most of this month's group partnering Intel's new GPU with dedicated graphics from Nvidia and AMD, however, gaming is firmly on the agenda.

Those with Nvidia's new GT 600 Series chipsets all manage playable frame rates in our Medium detail Crysis test. For those who crave the ultimate in graphics performance, Alienware's M17x touts AMD's top-end mobile GPU, the Radeon HD 7970M – it comes at a premium, but it's the only GPU here that coped with Crysis' Very High setting.

And talking of Full HD, it's good to see that several of this month's laptops have high-definition displays as standard. It's easy to forgive the smaller 13in laptops for having 1,366 x 768 displays, but when it comes to larger models, we really wouldn't recommend settling for anything less than 1,600 x 900.

HOW WE TEST

Every laptop is put through our intensive suite of Real World Benchmarks, which uses everyday applications such as Microsoft Office, Photoshop and iTunes to give an indication of all-round computing performance. We also run through three iterations of our Crysis gaming tests, at progressively tougher settings, to evaluate each laptop's ability to play demanding games.

Battery life

To give accurate battery-life figures, we run two tests. In the light-use test, we optimise the system settings for the greatest power efficiency – Windows' power profile is set to Power Saver mode, and screen brightness is set as close to 75cd/m² as possible using an X-Rite i1Display 2 colorimeter. We then disconnect the mains and run a script that scrolls through a variety of web pages until the system shuts down.

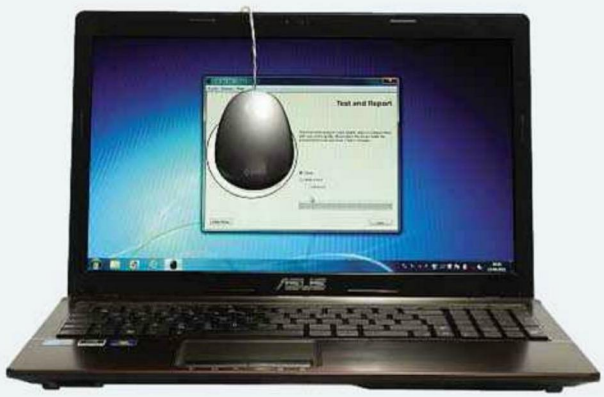
For the heavy-use test, we change Windows' power profile to High Performance and set the display brightness to maximum. We then disconnect the mains, setting Cinebench's 3D renderer looping constantly until the battery is completely drained. With Cinebench 11.5 pushing every CPU core to 100%, this test provides a worst-case figure.

Hands-on testing

Each laptop is evaluated for the quality of its features, build quality and design. The range of connectivity is taken into account, including network capabilities and hard disk capacity, as well as features such as fingerprint readers and physical switches to disable the touchpad while typing.

We test the quality of each laptop's display with our colorimeter, measuring the brightness, contrast ratio and colour accuracy, and use a selection of test images and videos to look for issues such as poor viewing angles or slow response times.

For items that can't be measured objectively, such as the build quality, speakers and keyboard, two members of *PC Pro* team award points, and the results are averaged.



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	Acer Aspire V3-571G	Alienware M17x	Apple MacBook Pro 13in	LABS WINNER Asus N56VM	RECOMMENDED Dell Inspiron 15R Special Edition	Dell Inspiron 17R Special Edition
Overall	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪
Performance	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪
Battery Life	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪
Features & Design	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪
Value for Money	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪	✪✪✪✪✪✪
Purchase Information						
Part code	NX.RZNEK.001	M17x-R4	MD102B/A	N56VM-S3113V	N/A	N/A
Price (inc VAT)	£583 (£700)	£1,533 (£1,840)	£1,041 (£1,249)	£679 (£815)	£733 (£879)	£799 (£959)
Delivery (inc VAT) [1]	£8 (£10)	Free	Free	£4 (£5)	Free	Free
Supplier	www.saveonlaptops.co.uk	www.alienware.co.uk	www.apple.co.uk	http://uk.insight.com	www.dell.co.uk	www.dell.co.uk
Dimensions (WDH, including feet)	382 x 253 x 34mm	410 x 304 x 45mm	325 x 227 x 25mm	380 x 255 x 28mm	378 x 252 x 35mm	417 x 276 x 38mm
Weight (with PSU)	2.57kg (3.12kg)	4.37kg (5.4kg)	2.06kg (2.42kg)	2.75kg (3.53kg)	2.91kg (3.39kg)	3.34kg (3.83kg)
Service & support						
Warranty [2]	1yr C&R	1yr On-site	1yr RTB	2yr RTB	1yr On-site	1yr On-site
Manufacturer reliability/ support [3]	83%/73%	N/A	91%/85%	84%/75%	73%/75%	73%/75%
Core components						
Processor	2.3GHz Intel Core i7-3610QM	2.3GHz Intel Core i7-3610QM	2.9Ghz Intel Core i7-3520M	2.3GHz Intel Core i7-3610QM	2.1GHz Intel Core i7-3612QM	2.3GHz Intel Core i7-3610QM
Motherboard chipset	Intel HM76	Intel HM77	Intel HM77	Intel HM76	Intel HM77	Intel HM77
RAM fitted	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Display						
Display size & finish	15.6in glossy	17.3in glossy	13.3in glossy	15.6in matte	15.6in matte	17.3in matte
Resolution	1,366 x 768	1,920 x 1,080	1,280 x 800	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080
Graphics chipset	Intel HD Graphics 4000/ Nvidia GeForce GT 640M	Intel HD Graphics 4000/ AMD Radeon HD 7970M	Intel HD Graphics 4000	Intel HD Graphics 4000/ Nvidia GeForce GT 630M	Intel HD Graphics 4000/ AMD Radeon HD 7730M	Intel HD Graphics 4000/ Nvidia GeForce GT 650M
Video outputs	D-SUB, HDMI	D-SUB, HDMI, Mini-DisplayPort	Thunderbolt/Mini-DisplayPort	D-SUB, HDMI	D-SUB, HDMI	D-SUB, HDMI
Drives						
Hard disk capacity	500GB	256GB SSD + 1TB	750GB	750GB	1TB	1TB
Spindle speed	5,400rpm	SSD + 7,200rpm	7,200rpm	7,200rpm	5,400rpm	5,400rpm
Optical drive	DVD writer	Blu-ray reader	DVD writer	Blu-ray reader	Blu-ray reader	DVD writer
Battery						
Battery capacity	48Wh, 4,400mAh	90Wh, 7,860mAh	64Wh, 5,500mAh	56Wh, 5,200mAh	48Wh, 4,200mAh	48Wh, 4,000mAh
Ports & connections						
Wi-Fi	Dual-band 802.11n	Single-band 802.11n	Dual-band 802.11n	Single-band 802.11n	Single-band 802.11n	Single-band 802.11n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit	10/100
Bluetooth	4	4	4	4	4	4
Memory card reader	SD, MS/Pro, MMC, xD	SD, MS/Pro, MMC	SD	SD, MS/Pro, MMC	SD, MS/Pro, MMC	SD, MS/Pro, MMC
Ports	2 x USB 2, USB 3, headphone, mic	4 x USB 3, USB 2/eSata, headphone, mic, headset, optical S/PDIF out, HDMI input	2 x USB 3, FireWire 800, Thunderbolt, headphone/ mic combo jack	4 x USB 3, headphone, mic, optical digital out	4 x USB 3, headphone, mic	4 x USB 3, headphone, mic
Other features						
Webcam	1.3mp	2.1mp	1mp	1mp	1mp	1mp
Fingerprint reader	×	×	×	×	×	×
Touchpad on/off switch	Keyboard shortcut	Keyboard shortcut	×	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut
Volume control	Keyboard shortcut	Dedicated buttons	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut
Software supplied						
Operating system	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit	OS X Lion (free upgrade to Mountain Lion on release)	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit
Recovery method	Recovery partition, burn own recovery discs	Recovery partition	Recovery partition	Burn own recovery discs	Recovery partition	Recovery partition

Key: 1. Mainland UK only. 2. Parts and labour, UK mainland, unless otherwise stated. 3. Laptop reliability/support rating in reader-voted PC Pro Excellence Awards 2011. Where N/A, companies didn't receive enough feedback to be rated. See www.pcpro.co.uk/links/awards2011.

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	Lenovo IdeaPad Z580	Samsung Series 5 NP550P7C	Sony VAIO E Series 17	Sony VAIO S Series 13	Toshiba Satellite P855	Toshiba Satellite P875
	✪✪✪✪✪	✪✪✪✪✪	✪✪✪✪✪	✪✪✪✪✪	✪✪✪✪✪	✪✪✪✪✪
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	M81D2UK	NP550P7C-S02UK	SVE1711X1E	SVS1311F3EW	PSPKBE-042008EN	PSPLBE-01T00FEN
	£625 (£750)	£706 (£847)	£749 (£899)	£625 (£750)	£750 (£900)	£917 (£1,100)
	£8 (£10)	£8 (£10)	Free	£6 (£8)	Free	Free
	www.saveonlaptops.co.uk	www.saveonlaptops.co.uk	www.sony.co.uk	www.saveonlaptops.co.uk	www.currys.co.uk	www.currys.co.uk
	377 x 245 x 35mm	409 x 270 x 32mm	409 x 278 x 38mm	331 x 225 x 24mm	385 x 253 x 32mm	419 x 273 x 34mm
	2.42kg (2.9kg)	2.93kg (3.42kg)	2.96kg (3.37kg)	1.72kg (2.14kg)	2.53kg (3.2kg)	2.91kg (3.77kg)
	1yr RTB	1yr C&R	2yr C&R	2yr C&R	1yr C&R	1yr C&R
	76%/78%	86%/73%	83%/72%	83%/72%	80%/76%	80%/76%
	2.1GHz Intel Core i7-3612QM	2.3GHz Intel Core i7-3610QM	2.1GHz Intel Core i7-3612QM	2.5GHz Intel Core i5-3210M	2.3GHz Intel Core i7-3610QM	2.3GHz Intel Core i7-3610QM
	Intel HM77	Intel HM76	Intel HM76	Intel HM76	Intel HM76	Intel HM76
	8GB DDR3	6GB DDR3	8GB DDR3	4GB DDR3L (low voltage)	8GB DDR3	16GB DDR3
	15.6in glossy	17.3in matte	17.3in semi-gloss	13.3in semi-gloss	15.6in glossy	17.3in glossy
	1,366 x 768	1,600 x 900	1,920 x 1,080	1,366 x 768	1,366 x 768	1,600 x 900
	Intel HD Graphics 4000/ Nvidia GeForce GT 630M	Intel HD Graphics 4000/ Nvidia GeForce GT 650M	Intel HD Graphics 4000/ AMD Radeon HD 7650M	Intel HD Graphics 4000	Intel HD Graphics 4000/ Nvidia GeForce GT 630M	Intel HD Graphics 4000/ Nvidia GeForce GT 630M
	D-SUB, HDMI	D-SUB, HDMI	D-SUB, HDMI	D-SUB, HDMI	D-SUB, HDMI	D-SUB, HDMI
	1TB	1TB	750GB	500GB	1TB	750GB
	5,400rpm	5,400rpm	5,400rpm	5,400rpm	5,400rpm	7,200rpm hybrid
	Blu-ray reader	Blu-ray reader	Blu-ray reader	DVD writer	Blu-ray reader	Blu-ray reader
	48Wh, 4,100mAh	57Wh, 5,200mAh	59Wh, 5,300mAh	49Wh, 4,400mAh	48Wh, 4,200mAh	48Wh, 4,200mAh
	Single-band 802.11n	Dual-band 802.11n	Single-band 802.11n	Dual-band 802.11n	Single-band 802.11n	Single-band 802.11n
	10/100	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
	4	4	4	4	4	4
	SD, MS/Pro, MMC, xD	SD, MMC	SD, MS/Pro	SD, MMC	SD, MMC	SD, MMC
	2 x USB 2, 2 x USB 3, headphone, mic	2 x USB 2, 2 x USB 3, headphone, mic	3 x USB 2, 1 x USB 3, headphone, mic	1 x USB 2, 2 x USB 3, headphone/mic combo jack	2 x USB 2, 2 x USB 3, headphone, mic	2 x USB 2, 2 x USB 3, headphone, mic
	1mp	1.3mp	1.3mp	1.3mp	1mp	1mp
	×	×	×	×	×	×
	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut	Dedicated button	Dedicated button
	Dedicated buttons	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut	Keyboard shortcut
	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit
	Recovery partition, burn own recovery discs	Recovery partition	Recovery partition	Recovery partition	Recovery partition	Recovery partition

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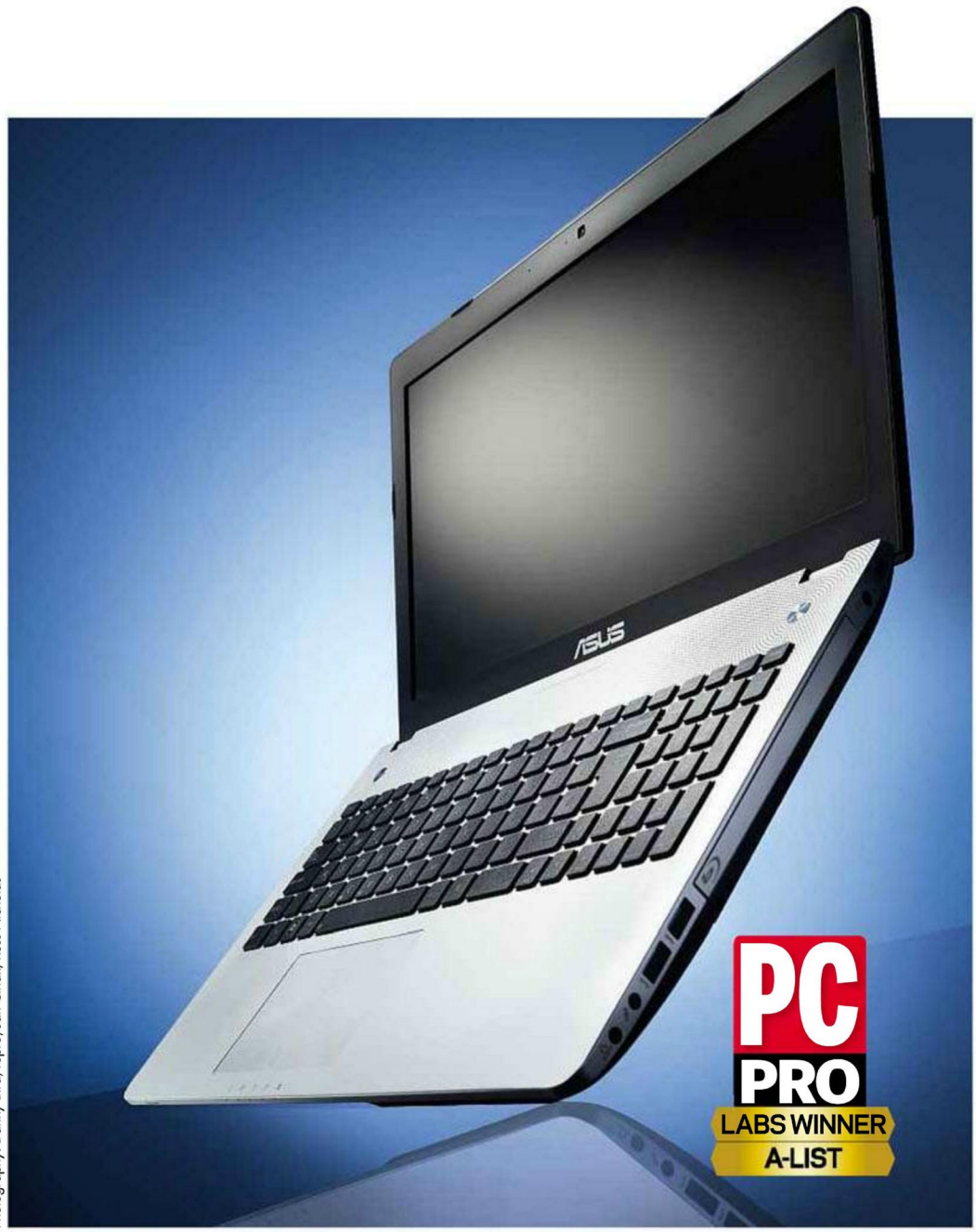

Photography: Danny Bird; repro, Jan Cihak, Russ Nicholas

Asus N56VM

Great build quality, good performance and refined design push Asus' gorgeous N56VM right to the top of the Ivy Bridge heap

PRICE £679 (£815 inc VAT)
SUPPLIER http://uk.insight.com

BENCHMARK SCORE 0.95
CRYSIS (HIGH) 18fps
LIGHT-USE BATTERY 5hrs 24mins

With an Asus logo glowing in the centre of a dark brushed-metal lid, and a chassis that feels more solid than any of its plastic peers, this 15.6in laptop feels as if it's worth every penny of its asking price.

At 2.75kg, it isn't the lightest 15.6in model here, but the payoff comes in the form of bombproof build. The dark metal lid feels robust, and as the keyboard surround is hewn from metal, too, the chassis is second only to the MacBook Pro for sturdiness. It's even reasonably pretty: concentric circles of dots emanating from the keyboard's corners add a little pizzazz, and co-ordinate nicely with the plain, elegant design.

Peer above the excellent keyboard, and you'll notice that Asus has proudly emblazoned the N56VM with Bang & Olufsen ICEpower branding. At default settings, the speakers sound plummy and muffled, but delve into the audio control panel and the Waves MaxxAudio enhancements allow for an amazing improvement, adding treble and bass seemingly from nowhere. As a further novelty, Asus includes a small subwoofer in the box that's around the size of a fizzy drinks can. Plug this in, and the extra bass provides a warmer, rounder sound. From an audio perspective, the N56VM is surprisingly well endowed.

The display is a visual treat, too. It's a 15.6in Full HD panel with impressively wide viewing angles, and the matte finish fends off distracting reflections. Image quality isn't quite on a par with the Sony VAIO E Series, but it's only a whisker behind the Dell Inspirons. It's far brighter than its rivals at a measured 357cd/m², and the 566:1 contrast ratio complements the solid colour reproduction to make for bold, attractive images.

With the quad-core processor driving the N56VM to a result of 0.95 in our benchmarks, there's no shortage of power on tap, but graphical performance isn't quite up with the best. Its GeForce GT 630M GPU achieved an average frame rate of 18fps in our most demanding Crysis test, slower than both Inspirons and the Samsung Series 5.

The keyboard is spacious and, with the Scrabble-tile keys resting on the stiff, metal surround, there isn't a hint of flex or wallow. Asus has also done a good job with the touchpad. Two-fingered right-clicks, pinching and zooming motions all feel natural, and the pad itself depresses with a taut, reassuring click.

There's little to criticise elsewhere. The Blu-ray reader is welcome at this price, the four USB 3 ports are a boon, and the rare sight of an optical audio output will please those wanting to get bit-perfect sound to an external DAC or amplifier. Considering the power and screen, even battery life is decent, at 5hrs 24mins in light use.

It's rare that a laptop manages to strike a perfect balance, but Asus' N56VM comes close. With pitch-perfect sound, a great display and a healthy turn of speed, this month's Labs Winner is an astonishing all-rounder.

OVERALL	★★★★★½
PERFORMANCE	★★★★★½
BATTERY LIFE	★★★½☆☆
FEATURES & DESIGN	★★★★★½
VALUE FOR MONEY	★★★★★½

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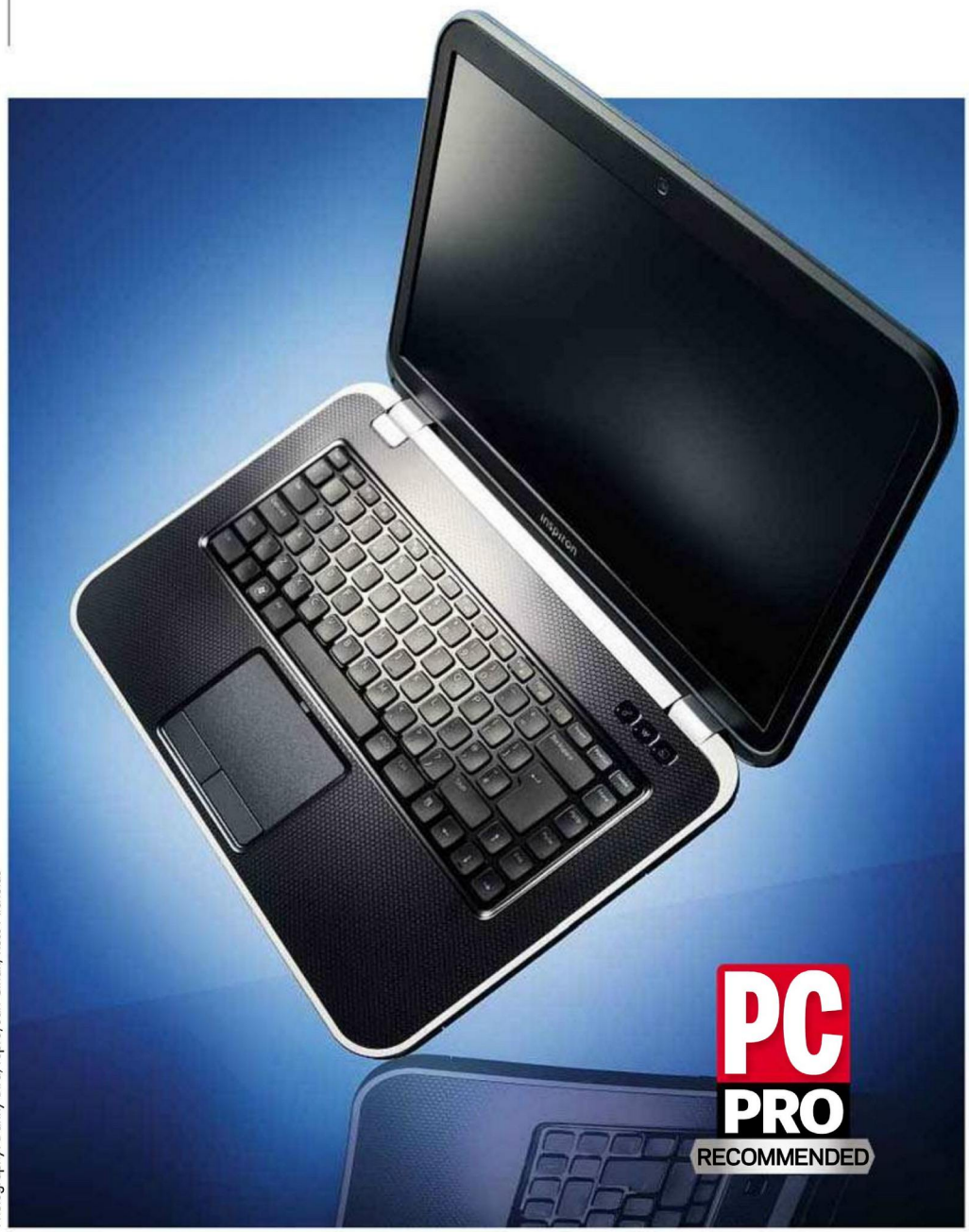


Photography: Danny Bird; repro, Jan Cihak, Russ Nicholas

Dell Inspiron 15R Special Edition

Doesn't look "special", but a luscious display and top-notch specification mean this laptop is only a whisker behind the top-of-the-class Asus

PRICE £733 (£879 inc VAT)
SUPPLIER www.dell.co.uk

When you're spending almost £900 on a laptop, it wouldn't be unreasonable to expect a little luxury. Yet despite the Special Edition tag, this Inspiron doesn't look luxurious. It's clad in thick, dowdy plastic, and finished in a rather naff honeycomb texture that would be more at home on a sub-£500 machine.

Its looks aren't the only disappointment. Part of the appeal of the SE is supposedly its interchangeable lid panels (blue, pink, red and white are also available), but the black unit backing our review laptop had an unsightly 0.5mm gap running along its top edge – perfect for catching dust and crumbs.

To be fair to this 15in laptop, however, there isn't an awful lot wrong with the rest of it. The specification list leaves no stone unturned: 1TB of storage, four USB 3 sockets, HDMI and D-SUB outputs, Gigabit Ethernet and a Blu-ray player. The warranty, as with the 17R, offers a year of on-site cover, which is better than most.

We like the layout of the keyboard: it lacks a number pad, but there are no compromises on any other front, with a large Enter key, sizeable cursor keys, and a sensibly organised navigation cluster. The action is on the woolly side and the keys rattle, but there's no flex in the base, and the multitouch touchpad with its separate buttons is flawless.

BENCHMARK SCORE 0.91
CRYSIS (HIGH) 22fps
LIGHT-USE BATTERY 5hrs 27mins

Above the keyboard sits an excellent display. It's Full HD, bright (321cd/m²) and has good contrast (655:1) – although it can't match the Sony VAIO E's display for sheer punch. It's an ideal display for anything from movie watching to photo editing, with a semi-matte finish that successfully keeps distracting reflections at bay.

Although it looks and feels cheap, the plastics are tough, affording plenty of protection for the display and the components hidden away in the base. And when it comes to those core elements, again, there's little room for criticism. The Inspiron 15R is equipped with a quad-core 2.1GHz Intel Core i7-3612QM, which scored 0.91 in the *PC Pro* application benchmarks – not the fastest this month, but not far off the mark. This is a laptop that will shrug off the most challenging multitasking, and it's a competent gamer, too. Where many of its rivals have opted for Nvidia's GeForce graphics chipsets, Dell has equipped the Inspiron 15R with AMD's Radeon HD 7730M. While not quite up with the best Nvidia GPUs, it remains potent, delivering 22fps in the High quality Crysis test and 46fps at Medium quality.

Aside from the looks, the battery life is the only area of concern, and even then 5hrs 27mins in our light-use test isn't a complete disaster. This adds up to a laptop that, while not pretty, will certainly get the job done, especially considering it's a touch cheaper than its main rival. However, for a little more elegance and better all-round build quality, the Asus N56VM gets the nod this month.

OVERALL	★★★★½
PERFORMANCE	★★★★½
BATTERY LIFE	★★★☆☆
FEATURES & DESIGN	★★★☆☆
VALUE FOR MONEY	★★★★½

WorldMags.net

Apple MacBook Pro 13in

Superb design, fine performance and excellent battery life – well worth shelling out for

» PRICE £1,041 (£1,249 inc VAT)
» SUPPLIER www.apple.co.uk

While all eyes were on the Retina display of the 15in MacBook Pro (web ID: 375337), Apple quietly wheeled out an updated 13in model. There's no Retina display, but this little laptop retains its pint-sized appeal.

At 2.06kg, it's relatively light, and the build quality is superb; the taut metal chassis makes most laptops feel cheap by comparison.

Two ports on the left see USB 3 make its Mac debut alongside FireWire 800, Thunderbolt, Gigabit Ethernet and an SD card reader. Meanwhile, the optical drive and the LED battery meter are a welcome sight – both have since disappeared from the larger Pro models.

This is the better specified of the two 13in models and has a dual-core Core i7 processor, 8GB of RAM and a 750GB hard disk. It can't keep pace with the quad-core models here, but a result of 0.81 in our benchmarks is impressive. The huge battery does its job, too, lasting only 5hrs 23mins in our light-use test in Windows, but surviving a much more impressive 9hrs 20mins with a similar test in OS X.

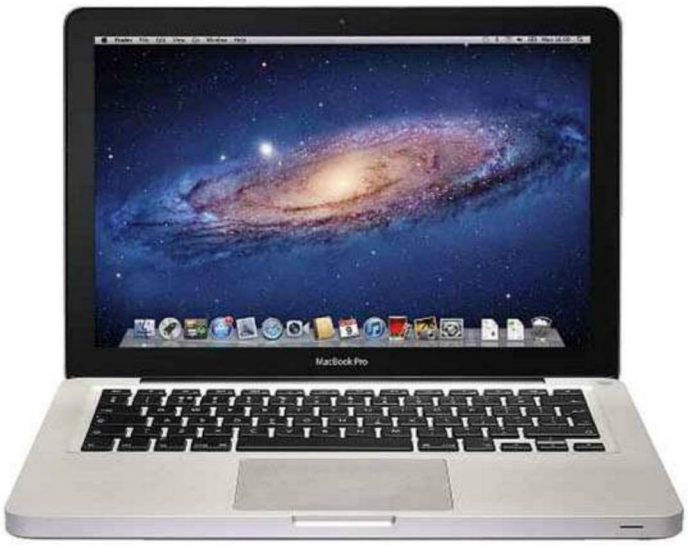
With no dedicated graphics chip, you're stuck with Intel's integrated HD Graphics 4000 chipset. Still, an average frame rate of 24fps in our Medium quality Crysis tests proves there's enough power for basic gaming.

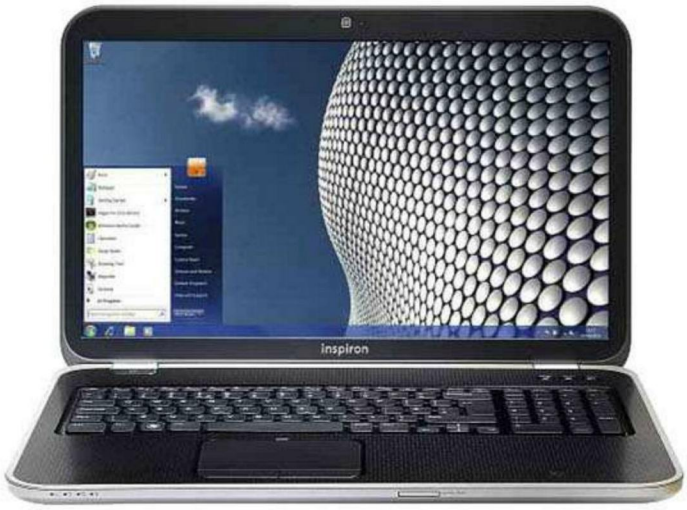
Using the Pro is a delight. The large touchpad makes light work of pinching, flicking and gesturing your way through OS X, and the keyboard is great. Every key bounces back with a crisp, lively feel, and the layout is perfect.

If there's a disappointment, it's that the 13in display has a low 1,280 x 800 resolution. Image quality is great, however, with the high 362cd/m² brightness combining with a 593:1 contrast ratio and the most accurate colour reproduction in the group.

The MacBook Pro 13in is superb. Those who want more power should look to its 15in stablemates, but this 13in machine is a long-lasting laptop that's well worth the money.

OVERALL	★★★★½
PERFORMANCE	★★★☆☆
BATTERY LIFE	★★★★½
FEATURES & DESIGN	★★★★½
VALUE FOR MONEY	★★★½☆





Dell Inspiron 17R Special Edition

Dell's desktop replacement delivers high performance and a sterling screen, but the build quality disappoints

» PRICE £799 (£959 inc VAT)
» SUPPLIER www.dell.co.uk

With a huge 17.3in Full HD display, a powerful quad-core processor and speedy Nvidia graphics, Dell's Inspiron 17R Special Edition is an affordable powerhouse.

It might look smart in the photo above, but the 3.34kg Inspiron is entirely constructed from plastic. Get up close, and the budget heritage is plain to see: the hollow-feeling body and patterned plastic both feel cheap, and tapping away at the keyboard or the touchpad's rattly buttons leaves no doubt as to where Dell has spent its budget.

All the money has been put towards the components inside. The quad-core Intel processor gives the laptop a fine turn of speed – it achieved a result of 0.94 in our benchmarks – and the GeForce GT 650M GPU powered through our Crysis tests.

With an average of 28fps with Crysis running at High detail settings in Full HD, the Dell is a capable gamer.

The Dell's screen is superb and makes the most of Crysis' lush jungle scenes. The 17.3in panel is a Full HD unit, and while colour reproduction is a touch cold, it's bright and the contrast ratio is superb at 664:1.

Despite the plasticky chassis, there are redeeming factors. Tap away on the keyboard and the Scrabble-tile keys fall nicely under your fingers. The touchpad is effective, with discrete physical buttons that work more reliably than the integrated buttons on other laptops in this Labs.

The Dell's tiny 4,000mAh battery is a disappointment, surviving only 3hrs 48mins in our light-use test. We were also frustrated to find that Dell had skimped on the Inspiron's networking capabilities – 10/100 Ethernet and single-band 802.11n wireless are stingy at this price.

The cheap feel is our biggest bugbear with Dell's super-sized laptop. The single year of on-site warranty might be enough for many people, but with Asus' N56VM trading all-out speed for better build and more assured ergonomics, we'd think long and hard before splashing out.

OVERALL	★★★½☆
PERFORMANCE	★★★★½
BATTERY LIFE	★★☆☆☆
FEATURES & DESIGN	★★★½☆
VALUE FOR MONEY	★★★½☆

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Samsung Series 5 NP550P7C

A good all-rounder with one key weakness: a very low-contrast screen

» **PRICE** £706 (£847 inc VAT)
» **SUPPLIER** www.saveonlaptops.co.uk

It isn't often a laptop can be described as handsome, but the patterned silver chassis of the Samsung certainly falls into that category.

Another unusual feature is the Series 5's matte screen. Several other manufacturers in this Labs use a glossy coating, all of which create distracting reflections to a greater or lesser degree.

Its appeal isn't purely cosmetic: it's seriously quick, too. The laptop's 2.3GHz Intel Core i7-3610QM raced through our application benchmarks at a blistering rate, achieving a score of 0.96.

Meanwhile, the Nvidia GeForce 650M discrete graphics chip provides enough juice for games, with only the far pricier Alienware M17x proving faster in our Crysis tests. In the High quality test, an average of 25fps places it among the front-runners.

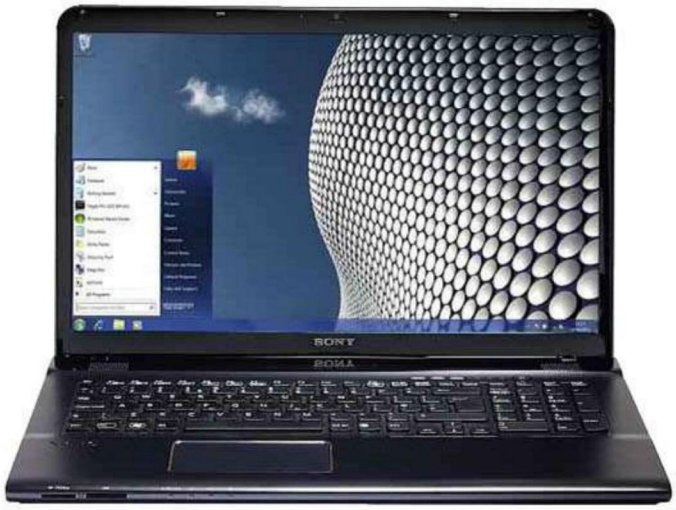
The standout test result for the Samsung is its battery life. A time of 7hrs 12mins is nothing short of astounding for a machine of this size, and although we can't see it being carted outside the home very much due to its bulk, its stamina means that you won't have to worry about looking for a mains socket all the time.

With a good-quality keyboard, a sensitive touchpad with separate buttons, a good range of connections, a Blu-ray drive and 1TB of storage, you might have thought the Samsung Series 5 would earn an award. However, there's one critical weakness to the laptop: the 1,600 x 900 screen resolution is ample, but the image quality simply isn't what we'd hope for on a machine of this price.

The contrast ratio is the main problem: at 154:1, images look flat and lack punch, and blacks look like dark grey. Watching movies on this screen, particularly during dark scenes, can be frustrating, since important details are completely lost.

For only £50 more, the Sony VAIO E offers far superior screen quality with a Full HD resolution, and that nudges it ahead of this laptop. As an all-rounder, though, the Series 5 is a strong offering.

OVERALL	★★★★½
PERFORMANCE	★★★★½
BATTERY LIFE	★★★★½
FEATURES & DESIGN	★★★½☆
VALUE FOR MONEY	★★★½☆



Sony VAIO E Series 17

Hardly pretty, and the ergonomics are suspect, but the screen more than makes amends

» **PRICE** £749 (£899 inc VAT)
» **SUPPLIER** www.sony.co.uk

At first glance, the VAIO E looks like any other 17in Sony. Open it up and switch it on, however, and this is no ordinary desktop replacement.

It's the display that sets this machine apart, with its pixels beaming out like a beacon in a fog of mediocrity. Its Full HD resolution lets you take advantage of the Blu-ray drive, and the colours and contrast level are stunning.

With a 1,000:1 contrast ratio, movie scenes and photographs have a punch and vibrancy that no other laptop in this Labs can match. Colours are accurate, and only brightness disappoints, with a maximum of 268cd/m². The Sony's main rivals this month – the Dell Inspiron 17R and the Asus N56VM – both have significantly brighter displays.

The laptop's display alone is almost enough to warrant a recommendation, especially given the keen pricing. Alas, there are weaknesses, and these prevent us from handing the Sony an award. First, it's no looker; it's solidly built, with good protection for the screen, but the all-round combination of matte- and gloss-black plastics lend it a slightly cheap feel. The keyboard is too squishy, and the touchpad – with its integrated buttons – has a horribly indistinct, mushy action.

There's nothing wrong with application performance. A score of 0.93 from its quad-core 2.1GHz Intel Core i7-3612QM in the *PC Pro* benchmarks places it among the class leaders. There's more than enough storage, too, courtesy of the 750GB hard disk.

The AMD Radeon HD 7650 hobbles its gaming performance, though, with a mere 16fps in the High quality Crysis test. Since Sony hasn't implemented the processor's integrated graphics, this laptop isn't ideal for life on the road. It lasted only 3hrs 38mins in our light-use test.

Still, the margins in this Labs are narrow, and the Sony VAIO E Series 17 falls behind the Labs winners only by a very small margin. Had the keyboard and touchpad been better, it might have been in with a chance.

OVERALL	★★★½☆
PERFORMANCE	★★★½☆
BATTERY LIFE	★★☆☆☆
FEATURES & DESIGN	★★★½☆
VALUE FOR MONEY	★★★½☆

WorldMags.net

Acer Aspire V3-571G

PRICE £583 (£700 inc VAT)
SUPPLIER www.saveonlaptops.co.uk

For a 15in laptop, the battery life of this Acer is nothing short of incredible. It lasted for 6hrs 2mins in our light-use test.

Other aspects we like about this machine are dual-band Wi-Fi – still a rarity among laptops – the price, and performance. The Aspire V3-571G has a 2.3GHz Intel Core i7-3610QM CPU and a discrete Nvidia GeForce 640M GPU. In the application benchmarks it scored a joint-top score of 0.97, and in the High quality Crysis test, an average of 23fps is highly respectable.

There are problems, however. The screen lacks punch, with a low contrast ratio of 251:1. The design is uninspired, too, with a glossy plastic lid and wristrest that are a magnet for fingerprints and dust.

The ergonomics are a disaster. Although the keys have a comfortable click to them, the backslash key butts up against the left Shift key, and the hash key does the same with Enter, resulting in frequent typos. It's also far too easy to brush the touchpad by accident.

The single USB 3 socket and a small 500GB hard disk drive put paid to the Acer's aspirations. Performance and battery life on their own simply aren't enough.

OVERALL	★★★★☆☆
PERFORMANCE	★★★★★☆
BATTERY LIFE	★★★★☆☆
FEATURES & DESIGN	★★★☆☆☆
VALUE FOR MONEY	★★★★☆☆

Lenovo IdeaPad Z580

PRICE £625 (£750 inc VAT)
SUPPLIER www.saveonlaptops.co.uk

There are a few areas in which Lenovo laptops have been typically strong over the years. Ergonomics is one, and it's good to see that the Z580 keeps up the tradition. Its shaped keys have a good amount of travel, are well spaced, and Lenovo has also squeezed in a number pad. Even the large trackpad isn't too annoying in use, although the integrated buttons are far from trouble-free.

There's 1TB of storage, and although the CPU isn't the fastest in the group, in reality, the quad-core Core i7-3612QM will be fast enough for most people.

There's also a Blu-ray reader, and the price is reasonable, but there are several reasons why this laptop doesn't trouble the leaders this month. The 15.6in screen isn't the best, with a maximum brightness of 232cd/m² and contrast ratio of 272:1 (although it's a tad better than the Acer's display). We'd like a few more pixels to play with than the 1,366 x 768 resolution offers too.

Battery life is mediocre, and if you're after a decent gaming machine, this isn't the best choice. Spend an extra £100 or so, and you'll get a far superior screen and better performance.

OVERALL	★★★☆☆☆
PERFORMANCE	★★★★☆☆
BATTERY LIFE	★★★☆☆☆
FEATURES & DESIGN	★★★☆☆☆
VALUE FOR MONEY	★★★☆☆☆

Alienware M17x

PRICE £1,533 (£1,840 inc VAT)
SUPPLIER www.alienware.co.uk

Alienware's hulking M17x is a sight to behold. With a physique illuminated by the multi-coloured AlienFX LED light array, this laptop is a beast.

Weighing in at 4.37kg, and a portly 5.4kg with the brick-sized charger, lugging the Alienware M17x to and fro is a real workout. Bear in mind that you'll need to carry that charger everywhere, too, since the large 7,860mAh battery runs dry in just over three hours.

Fire up a game and this giant is in its element. The quad-core processor and top-end AMD Radeon HD 7970M GPU scythed through our Crysis tests, even at Full HD resolution and maximum detail, and the large exhaust fans at the rear help the M17x to keep cool under duress.

Gaming on the Alienware is an audiovisual treat. The display's glossy finish is highly reflective, but the Full HD panel delivers ample brightness, superb contrast and vibrant colour reproduction. Meanwhile, the Klipsch speakers are unusually refined, delivering loud, crisp audio.

The top-end performance and bulletproof build come at a hefty price, but fear not – dump luxuries such as the SSD and it's possible to buy an M17x for much less cash.

OVERALL	★★★★★☆
PERFORMANCE	★★★★★★
BATTERY LIFE	★★☆☆☆☆
FEATURES & DESIGN	★★★★★★
VALUE FOR MONEY	★★★★☆☆

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Sony VAIO S Series 13

PRICE £625 (£750 inc VAT)
SUPPLIER www.saveonlaptops.co.uk

If there was a prize for the best-looking laptop on test, Sony's S Series would emerge victorious. This delicately proportioned 13.3in laptop is slim, lightweight and very attractive.

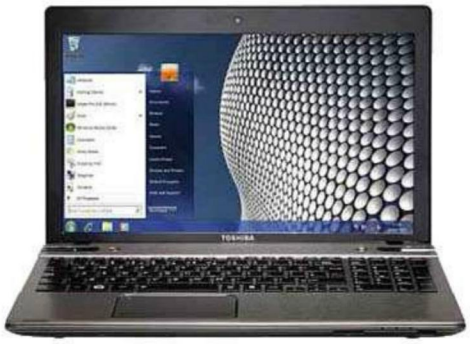
The recent crop of Ultrabooks might make the VAIO S13 look a little flabby, but at 1.72kg, it's still highly portable. Sony has also found room to accommodate a slot-loading DVD writer, two USB 3 ports, Gigabit Ethernet, and both D-SUB and HDMI video outputs.

The all-white chassis houses an Intel dual-core Core i5 CPU allied with 4GB of low-voltage DDR3 RAM. Performance lags behind the quad-core machines elsewhere in this group, but the overall result of 0.72 sees the Sony punching well above its weight. Stamina is a high point, too, with the result of 8hrs 43mins in our light-use battery test topping the table.

It isn't all rosy for Sony's little one, however. The build quality feels lightweight, with more flex than we'd like, and the display is another low point. Brightness reaches a modest 204cd/m² and the vertical viewing angles are quite narrow.

It looks great, but this petite portable laptop needs a better display for us to recommend it.

OVERALL	★★★★☆
PERFORMANCE	★★★☆☆
BATTERY LIFE	★★★★★
FEATURES & DESIGN	★★★☆☆
VALUE FOR MONEY	★★★★☆



Toshiba Satellite P855

PRICE £750 (£900 inc VAT)
SUPPLIER www.currys.co.uk

Toshiba's Satellite P855 is a seriously smart-looking laptop.

One of Intel's quad-core CPUs partners with 8GB of RAM, a hybrid 750GB hard drive provides ample storage, and a Blu-ray reader makes the cut too. It's a combination that places the Toshiba among the front-runners for performance, scoring 0.96 in our Real World Benchmarks.

The modest GeForce GT 630M graphics chipset drags it down the gaming rankings, however, and the display delivers another blow. The 1,366 x 768 resolution is stingy compared to the Full HD competition, and the panel's image quality squanders the Blu-ray drive's potential: a mediocre 165:1 contrast ratio delivers weak, washed-out images.

Ergonomics seal the Toshiba's fate. The keyboard is fine, but the Satellite P855's touchpad severely dents its appeal. The whole pad clicks downwards noisily and feels clunky. The combination of an over-sensitive touch surface and the occasional tendency for the cursor to bounce out of position prove aggravating.

At this price, we expect better. With its rivals trading metal-clad looks for much better displays and graphics performance, the Satellite P855 needs a rethink.

OVERALL	★★★☆☆
PERFORMANCE	★★★★☆
BATTERY LIFE	★★★☆☆
FEATURES & DESIGN	★★★☆☆
VALUE FOR MONEY	★★★☆☆

Toshiba Satellite P875

PRICE £917 (£1,100 inc VAT)
SUPPLIER www.currys.co.uk

There are a few outstanding aspects to Toshiba's 17in desktop replacement. First, the patterned grey finish is the height of fashion compared to many of its rivals.

Second, its Harmon Kardon-branded speakers are excellent. They kick out full-bodied sound at high volume. It's also the only laptop on test with 16GB of RAM.

In almost every other department, however, this Toshiba is mediocre. Performance from the 2.3GHz Core i7-3610QM processor is great, but the Nvidia GeForce GT 630M graphics lag behind with a frame rate of 15fps in the High quality Crysis test.

Ergonomically, the P875 isn't up to scratch. The keyboard feels light and rattly to type on, and the large multitouch trackpad has irksome integrated buttons that make clicking and dragging a chore. The 1,600 x 900 screen is average – the maximum brightness of 251cd/m² and contrast ratio of 295:1 are unexciting.

With a price that tops every machine bar the MacBook Pro and Alienware's M17x, the Satellite P875 simply doesn't do enough to earn an award this month.

OVERALL	★★★★☆
PERFORMANCE	★★★★☆
BATTERY LIFE	★★★☆☆
FEATURES & DESIGN	★★★★☆
VALUE FOR MONEY	★★★★☆

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Results

The graphs below testify to the improvements brought about by Intel's Ivy Bridge processors. All but two of this month's laptops use Intel's high-end quad-core processors, and the overall results make this the fastest group of laptops that *PC Pro*'s Labs has ever seen.

With even the slowest of the quad-core pack, Dell's Inspiron 15R Special Edition, scoring 0.91 in our benchmark tests, there's nothing that these laptops can't handle. With performance that's only a whisker away from the 3.4GHz Core i7-2600K Sandy Bridge processor in our reference PC, these laptops eat video encoding and serious multitasking for breakfast. Even the dual-core Ivy Bridge CPUs in Sony and Apple's 13in models are quick, too.

Thanks to the arrival of Nvidia's GeForce GT 600 Series and AMD's Radeon HD 7000 Series GPUs, most of these laptops are potent gaming machines. Indeed, where we normally quote the results from our easiest Crysis benchmark tests, this month's group performs so well that we've quoted the results from our Full HD, high-detail tests. If a laptop manages to reach double figures here, it's doing well. If it manages to exceed 40fps, such as the Radeon HD 7970M in Alienware's M17x, it's the ultimate in laptop gaming performance.

For all this power, battery life hasn't really suffered. More than half of this month's group manage more than five hours away from the mains. For those seeking a high-performing laptop with acceptable battery life, Intel's Ivy Bridge seems to have done the trick.

VIEW FROM THE LABS

It's easy to become blasé about the onwards march of technology, but it pays to stop and take a long look at all the improvements. Think about it: for a laptop to achieve a score of 1 in our benchmarks, it needs to be as fast as a top-end PC of 18 months ago.

With most models in this month's group scoring around 0.9 or higher, what was once considered top-flight performance for a desktop PC is now within reach of a £750 laptop. And what's more, this is serious desktop PC power in something small enough to chuck in a bag and carry anywhere. It's amazing, really.

"Both winners here boast matte Full HD screens"

While Intel's engineers and Ivy Bridge deserve all the plaudits coming their way, we find ourselves heartened by other developments in this month's group – namely, the improvement in both display quality and resolution. Laptop users have for far too long suffered at the hands of manufacturers keen to slash prices by using low-quality displays; this month shows a shift in the right direction. More than half of the models here have 1,600 x 900-pixel resolutions or better.

Better still, the preponderance of glossy, reflective displays might just be coming to an end. We've often moaned about the aggravation of glossy displays – try using a laptop with one in a sunny garden or sun-drenched office, and you'll soon see why – so it's great to see many manufacturers bucking the trend. Samsung led the charge by promising to dump glossy displays across its laptop range, and now companies such as Asus, Dell and Sony are following suit.

If you're an enemy of the glossy display, then you have plenty to be cheerful about. And with both this month's Labs winners boasting matte, reflection-free Full HD screens, as well as stunning performance, now is a great time to buy one.

SASHA MULLER
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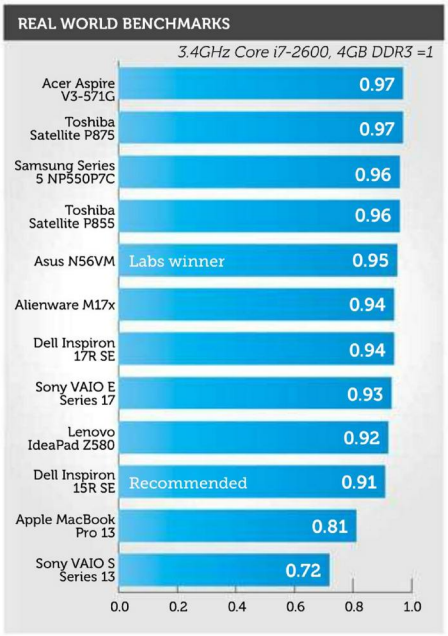

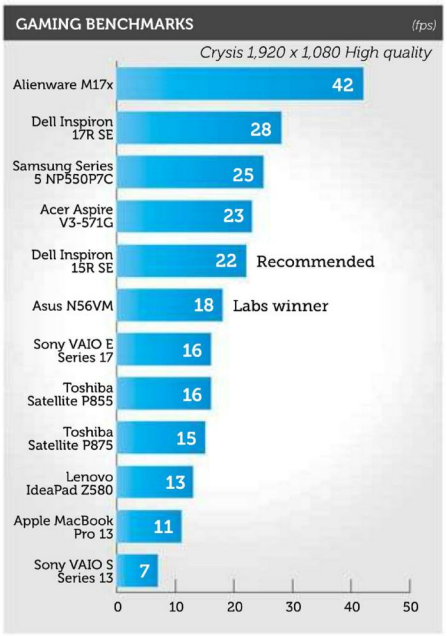

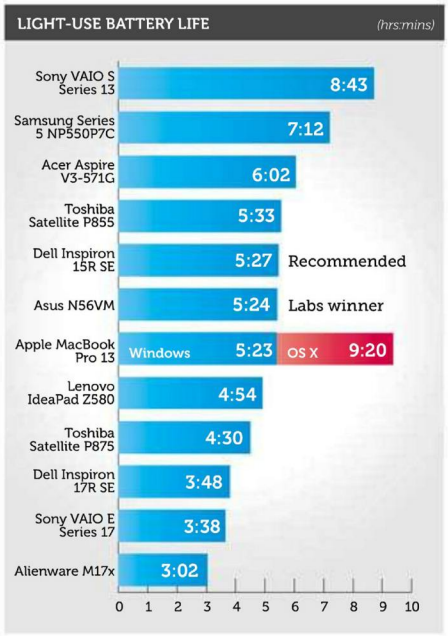

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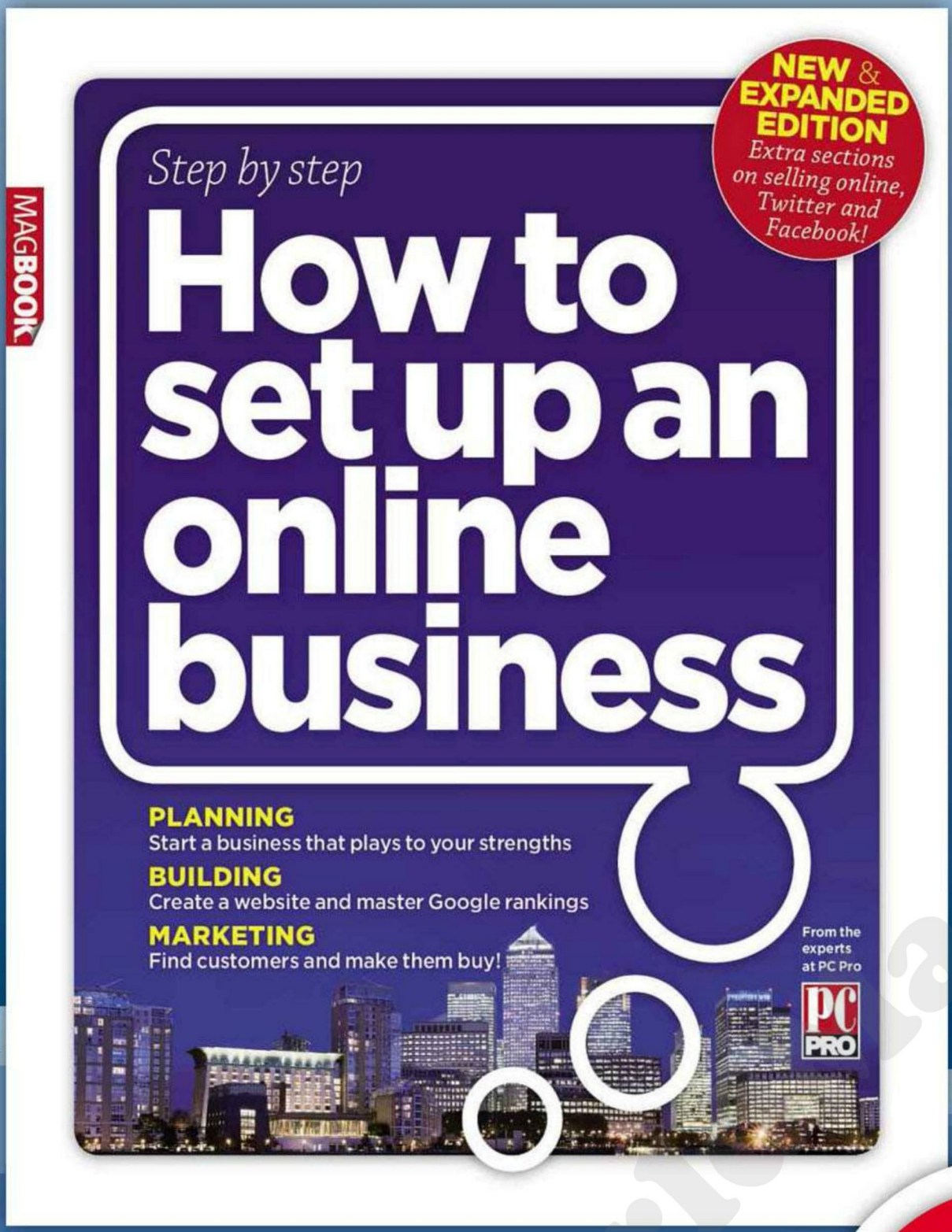

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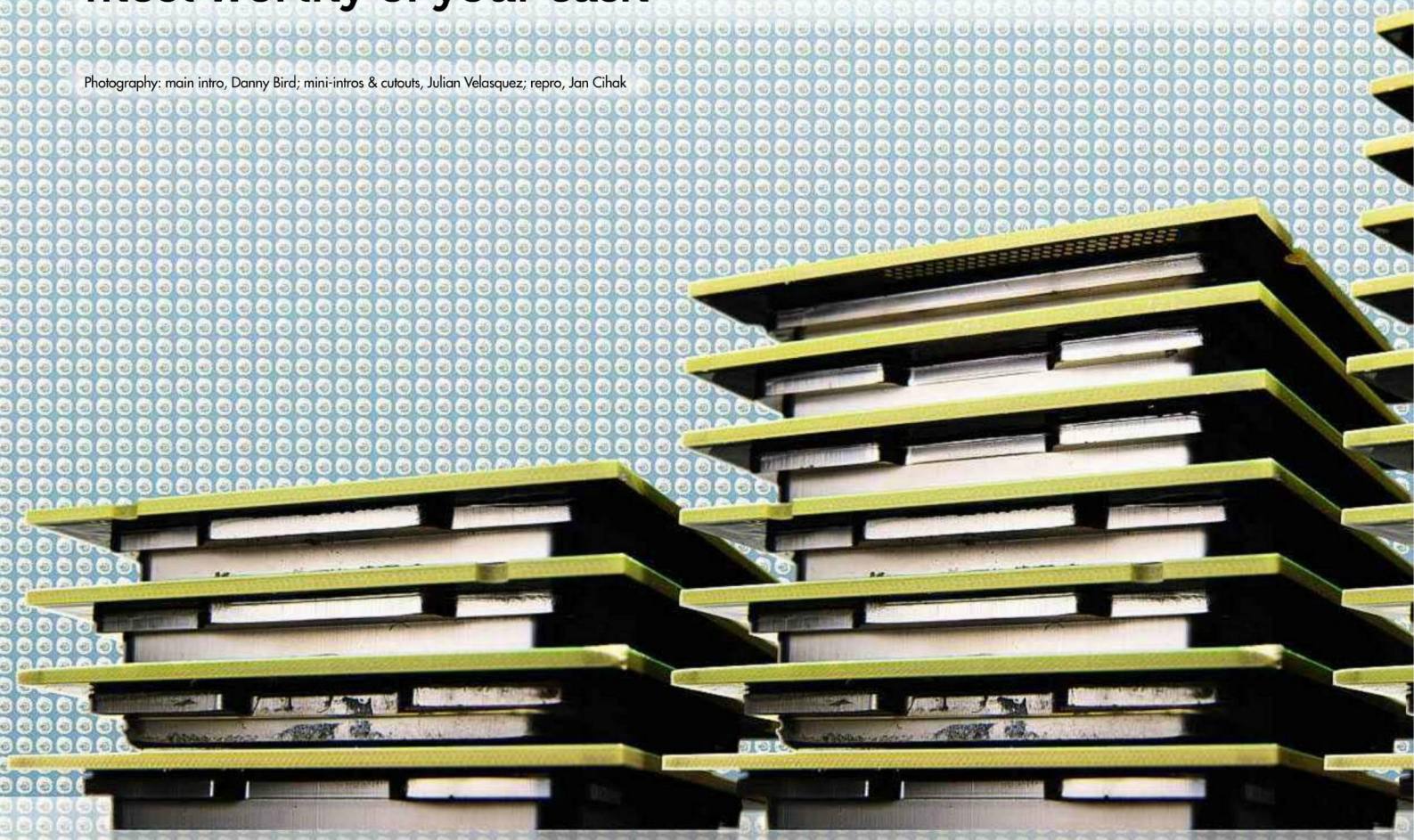
Processors

Intel and AMD have long battled to empty consumers' wallets by offering the fastest processors. With this new selection on the market, the choice is harder than ever. We put 62 top chips on test to find out which is most worthy of your cash

Photography: main intro, Danny Bird; mini-intros & cutouts, Julian Velasquez; repro, Jan Cihak



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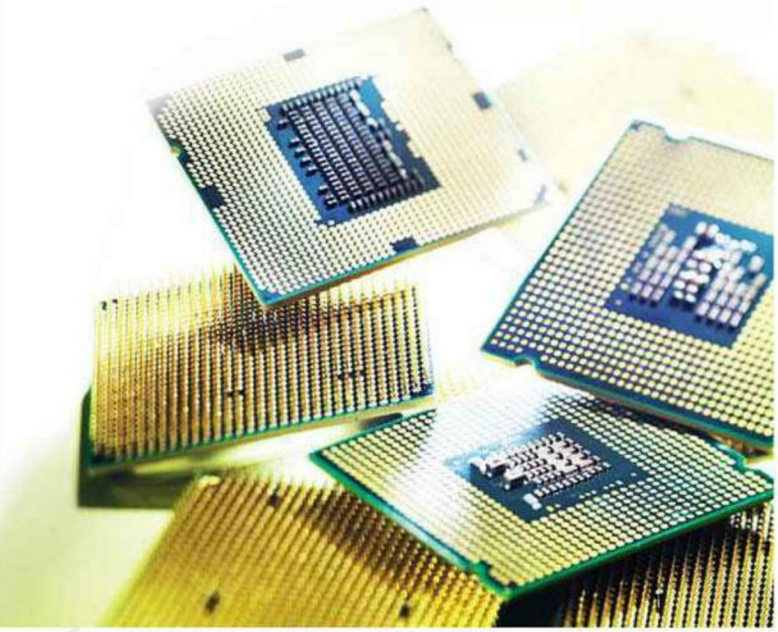
Buyer's guide



Upgrading your PC with a new processor isn't always a case of just ordering one and locking it into your motherboard. There are important factors to take into account, and they become more numerous as your PC gets older.

The main consideration is the motherboard. Every generation or so, a new range of processors will make a move to a new socket, designed to take full advantage of their capabilities. This means you can't usually put a new processor in a motherboard that's more than two years old and expect it to fit.

The feature table opposite shows that the current generation of CPUs is based on only a handful of sockets, so it isn't as complicated as it has been in the past; however, it pays to be sure you have a compatible motherboard before making a purchase.

The second consideration is graphics. The majority of processors available today include an integrated GPU, so as long as your motherboard has video outputs, you won't need a discrete graphics card as well. Some boards – mostly at the low end – don't, however, so again be sure to check the feature table before buying, otherwise you could find yourself needing to shell out for a card just to get your monitor connected. We further explore integrated graphics on p156.

The final consideration is cooling, although you could simply use the cooler that's included with your processor. This will be fine in normal use with many of the latest processors, and it's also fine for mild overclocking – most have plenty of headroom. If you want to perform serious overclocking, however, it can pay to invest in a proper third-party cooler, as temperatures can become pretty toasty as you push up the frequency ever higher.

The latest Ivy Bridge Core i7 chips approached 100°C when we ran stress tests with the stock cooler. Overclocked systems regularly arrive in the Labs, and these clearly demonstrate the extra heat generated: Core i5 and Core i7 chips running at 4.6GHz and upwards push even the best third-party coolers to their limits.

If you've thought about all of these aspects and know what you're after, turn the page and start reading our breakdown of each processor family. Then flip to p158 to see where they sit in the price-performance graph. There's a perfect chip for all budgets.

HOW WE TEST

Performance is divided into three categories. The Media test uses Adobe Photoshop CS5, Sony Vegas Pro 10 and Apple iTunes to edit and encode images, audio and video into a variety of formats. The Multitasking test runs a selection of applications designed to evaluate the multicore and multithreaded processors in this month's test. The third test – Responsiveness – opens, moves and closes multiple applications and windows to simulate everyday Windows usage; the better the score, the livelier your system will feel.

We also load up our Crysis, Just Cause 2 and DiRT 3 benchmarks at a variety of resolutions and quality settings to test the gaming potential of the various graphics cores included in both Intel and AMD processors. Our thermal tests evaluate the idle and peak temperature of each processor, and the power requirements of our test rig with different chips installed.

Value for Money

The Value for Money score is based on the benchmark results of each chip – we take this data, factor in how much each processor costs, and deliver a bang-per-buck result. We've combined much of this data in the graph on p158, so you can see exactly which processors represent the best and worst value for money.

Overall

The Overall rating is an average of the Performance and Value for Money scores, although due to rounding the figure may be higher or lower than you'd expect.

Test rigs

This month has seen several different test rigs built in the *PC Pro* labs, with LGA 1155, LGA 2011, Socket FM1 and Socket FM3 machines assembled in order to test all the processors on the market. We standardised equipment as much as possible across all of our test systems: each uses 8GB of DDR3 RAM, a top-end SSD for storage, and a discrete AMD Radeon HD 6500 Series graphics card. We used discrete cards to achieve consistent results across processors with and without integrated graphics – for an in-depth look at the processors' graphical capabilities, see *Integrated graphics: put to the test*, p156.

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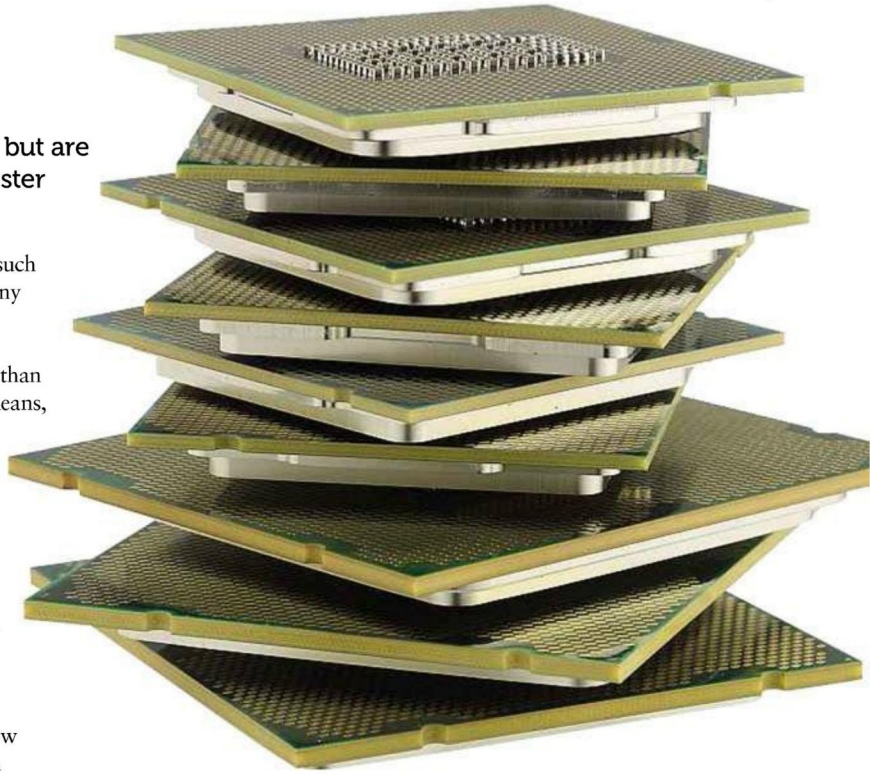
	Socket	Frequency	Turbo Boost [1]	Unlocked	Cores	Hyper-Threading [1]	L2 cache (per core)	L3 cache (shared)	Integrated GPU	GPU frequency	Die size	TDP
AMD Athlon II X4 631	FM1	2.6GHz	×	×	4	×	1MB	×	×	×	32nm	100W
AMD Athlon II X4 641	FM1	2.8GHz	×	×	4	×	1MB	×	×	×	32nm	100W
AMD Athlon II X4 651	FM1	3GHz	×	×	4	×	1MB	×	×	×	32nm	100W
AMD Athlon II X4 651K	FM1	3GHz	×	✓	4	×	1MB	×	×	×	32nm	100W
AMD A4-3300	FM1	2.5GHz	×	×	2	×	512KB	×	HD 6410D	443MHz	32nm	65W
AMD A4-3400	FM1	2.7GHz	×	×	2	×	512KB	×	HD 6410D	600MHz	32nm	65W
AMD A6-3500	FM1	2.1GHz	2.4GHz	×	3	×	1MB	×	HD 6530D	443MHz	32nm	65W
AMD A6-3650	FM1	2.6GHz	×	×	4	×	1MB	×	HD 6530D	443MHz	32nm	100W
AMD A6-3670K	FM1	2.7GHz	×	✓	4	×	1MB	×	HD 6530D	443MHz	32nm	100W
AMD A8-3800	FM1	2.4GHz	2.7GHz	×	4	×	1MB	×	HD 6550D	600MHz	32nm	65W
AMD A8-3850	FM1	2.9GHz	×	×	4	×	1MB	×	HD 6550D	600MHz	32nm	100W
AMD A8-3870K	FM1	3GHz	×	×	4	×	1MB	×	HD 6550D	600MHz	32nm	100W
AMD FX-4100	AM3+	3.6GHz	3.7GHz	✓	2	✓	2MB	8MB	×	×	32nm	95W
AMD FX-4170	AM3+	4.2GHz	4.3GHz	✓	2	✓	2MB	8MB	×	×	32nm	125W
AMD FX-6100	AM3+	3.3GHz	3.6GHz	✓	3	✓	2MB	8MB	×	×	32nm	95W
AMD FX-6200	AM3+	3.8GHz	4GHz	✓	3	✓	2MB	8MB	×	×	32nm	125W
AMD FX-8120	AM3+	3.1GHz	3.4GHz	✓	4	✓	2MB	8MB	×	×	32nm	95W
AMD FX-8150	AM3+	3.6GHz	3.9GHz	✓	4	✓	2MB	8MB	×	×	32nm	125W
Intel Celeron G440	LGA 1155	1.6GHz	×	×	1	×	256KB	1MB	HD Graphics	650-1,000MHz	32nm	35W
Intel Celeron G460	LGA 1155	1.8GHz	×	×	1	✓	256KB	1.5MB	HD Graphics	650-1,000MHz	32nm	35W
Intel Celeron G530T	LGA 1155	2GHz	×	×	2	×	256KB	2MB	HD Graphics	650-1,000MHz	32nm	35W
Intel Celeron G530	LGA 1155	2.4GHz	×	×	2	×	256KB	2MB	HD Graphics	850-1,000MHz	32nm	65W
Intel Celeron G540	LGA 1155	2.5GHz	×	×	2	×	256KB	2MB	HD Graphics	850-1,000MHz	32nm	65W
Intel Pentium G620T	LGA 1155	2.2GHz	×	×	2	×	256KB	3MB	HD Graphics	650-1,100MHz	32nm	35W
Intel Pentium G630T	LGA 1155	2.3GHz	×	×	2	×	256KB	3MB	HD Graphics	650-1,100MHz	32nm	35W
Intel Pentium G620	LGA 1155	2.6GHz	×	×	2	×	256KB	3MB	HD Graphics	850-1,100MHz	32nm	65W
Intel Pentium G630	LGA 1155	2.7GHz	×	×	2	×	256KB	3MB	HD Graphics	850-1,100MHz	32nm	65W
Intel Pentium G840	LGA 1155	2.8GHz	×	×	2	×	256KB	3MB	HD Graphics	850-1,100MHz	32nm	65W
Intel Pentium G850	LGA 1155	2.9GHz	×	×	2	×	256KB	3MB	HD Graphics	850-1,100MHz	32nm	65W
Intel Pentium G860	LGA 1155	3GHz	×	×	2	×	256KB	3MB	HD Graphics	850-1,100MHz	32nm	65W
Intel Pentium G870	LGA 1155	3.1GHz	×	×	2	×	256KB	3MB	HD Graphics	850-1,100MHz	32nm	65W
Intel Core i3-2100T	LGA 1155	2.5GHz	×	×	2	✓	256KB	3MB	HD Graphics 2000	650-1,100MHz	32nm	35W
Intel Core i3-2100	LGA 1155	3.1GHz	×	×	2	✓	256KB	3MB	HD Graphics 2000	850-1,100MHz	32nm	65W
Intel Core i3-2105	LGA 1155	3.1GHz	×	×	2	✓	256KB	3MB	HD Graphics 3000	850-1,100MHz	32nm	65W
Intel Core i3-2120	LGA 1155	3.3GHz	×	×	2	✓	256KB	3MB	HD Graphics 2000	850-1,100MHz	32nm	65W
Intel Core i3-2125	LGA 1155	3.3GHz	×	×	2	✓	256KB	3MB	HD Graphics 3000	850-1,100MHz	32nm	65W
Intel Core i3-2130	LGA 1155	3.4GHz	×	×	2	✓	256KB	3MB	HD Graphics 2000	850-1,100MHz	32nm	65W
Intel Core i5-2400S	LGA 1155	2.5GHz	3.3GHz	×	4	×	256KB	6MB	HD Graphics 2000	850-1,100MHz	32nm	65W
Intel Core i5-2405S	LGA 1155	2.5GHz	3.3GHz	×	4	×	256KB	6MB	HD Graphics 3000	850-1,100MHz	32nm	65W
Intel Core i5-2300	LGA 1155	2.8GHz	3.1GHz	×	4	×	256KB	6MB	HD Graphics 2000	850-1,100MHz	32nm	95W
Intel Core i5-2310	LGA 1155	2.9GHz	3.2GHz	×	4	×	256KB	6MB	HD Graphics 2000	850-1,100MHz	32nm	95W
Intel Core i5-2320	LGA 1155	3GHz	3.3GHz	×	4	×	256KB	6MB	HD Graphics 2000	850-1,100MHz	32nm	95W
Intel Core i5-2380P	LGA 1155	3.1GHz	3.4GHz	×	4	×	256KB	6MB	×	×	32nm	95W
Intel Core i5-2400	LGA 1155	3.1GHz	3.4GHz	×	4	×	256KB	6MB	HD Graphics 2000	850-1,100MHz	32nm	95W
Intel Core i5-2450P	LGA 1155	3.2GHz	3.5GHz	×	4	×	256KB	6MB	×	×	32nm	95W
Intel Core i5-2500	LGA 1155	3.3GHz	3.7GHz	×	4	×	256KB	6MB	HD Graphics 2000	850-1,100MHz	32nm	95W
Intel Core i5-2500K	LGA 1155	3.3GHz	3.7GHz	✓	4	×	256KB	6MB	HD Graphics 3000	850-1,100MHz	32nm	95W
Intel Core i5-2550K	LGA 1155	3.4GHz	3.8GHz	✓	4	×	256KB	6MB	×	×	32nm	95W
Intel Core i5-3450S	LGA 1155	2.8GHz	3.5GHz	×	4	×	256KB	6MB	HD Graphics 2500	650-1,100MHz	22nm	65W
Intel Core i5-3450	LGA 1155	3.1GHz	3.5GHz	Turbo	4	×	256KB	6MB	HD Graphics 2500	650-1,100MHz	22nm	77W
Intel Core i5-3470	LGA 1155	3.2GHz	3.6GHz	Turbo	4	×	256KB	6MB	HD Graphics 2500	650-1,100MHz	22nm	77W
Intel Core i5-3550	LGA 1155	3.3GHz	3.7GHz	Turbo	4	×	256KB	6MB	HD Graphics 2500	650-1,150MHz	22nm	77W
Intel Core i5-3570	LGA 1155	3.4GHz	3.8GHz	Turbo	4	×	256KB	6MB	HD Graphics 2500	650-1,150MHz	22nm	77W
Intel Core i5-3570K	LGA 1155	3.4GHz	3.8GHz	✓	4	×	256KB	6MB	HD Graphics 4000	650-1,150MHz	22nm	77W
Intel Core i7-2600K	LGA 1155	3.4GHz	3.8GHz	✓	4	✓	256KB	8MB	HD Graphics 3000	850-1,350MHz	32nm	95W
Intel Core i7-2700K	LGA 1155	3.5GHz	3.9GHz	✓	4	✓	256KB	8MB	HD Graphics 3000	850-1,350MHz	32nm	95W
Intel Core i7-3820	LGA 2011	3.6GHz	3.8GHz	×	4	✓	256KB	10MB	×	×	32nm	130W
Intel Core i7-3930K	LGA 2011	3.2GHz	3.8GHz	✓	6	✓	256KB	12MB	×	×	32nm	130W
Intel Core i7-3960X	LGA 2011	3.3GHz	3.9GHz	✓	6	✓	256KB	15MB	×	×	32nm	130W
Intel Core i7-3770S	LGA 1155	3.1GHz	3.9GHz	Turbo	4	✓	256KB	8MB	HD Graphics 4000	650-1150MHz	22nm	65W
Intel Core i7-3770	LGA 1155	3.4GHz	3.9GHz	Turbo	4	✓	256KB	8MB	HD Graphics 4000	650-1150MHz	22nm	77W
Intel Core i7-3770K	LGA 1155	3.5GHz	3.9GHz	✓	4	✓	256KB	8MB	HD Graphics 4000	650-1150MHz	22nm	77W

Key: 1. Or AMD equivalent

Intel Core i7

Intel's top-end chips remain unchallenged by AMD, but are beginning to look niche as Core i5s become ever faster



When the Core i7 first arrived in 2008, it was the daddy of desktop CPUs – the processing pinnacle that only an enthusiast would even consider buying. It still is to a certain extent, but since we passed the point at which a Core i5 was powerful enough for most applications long ago, does the i7 offer anything that makes it worth the extra cost?

All i7 processors have at least four cores, with the top i7-3900 series boasting six. Unlike the Core i5 range, however, these cores are enhanced by Hyper-Threading so they can handle eight or 12 concurrent threads. This is of limited use in most applications, but there are a few that take full advantage of multithreaded optimisation: video-editing and 3D rendering tools are the obvious examples. A Core i7 excels if you use demanding applications such as Adobe Premiere Pro or Sony Vegas Pro every day.

Core i7 processors Turbo Boost to higher clock speeds than their Core i5 siblings. This means, while the Core i5-2400 and Core i7-3770S both run at 3.1GHz, their maximum Turbo Boosts differ: 3.4GHz for the Core i5; 3.9GHz for the Core i7. The gap is smaller at higher speeds, but is usually present.

Performance

A Sandy Bridge Core i7 is now lagging when compared with newer, high-end chips. The i7-2600K scored 1.05 in our benchmarks, barely faster than the 1.04 of a Core i5-3570K. It also has a much higher power draw and costs £50 more, which makes it uncompetitive. The same applies to the Core i7-2700K – its 1.08 score is beaten by the new low-voltage i7-3770S, which is almost the same price. The former's unlocked multiplier, ripe for overclocking, is its only significant advantage.

Full-fat Ivy Bridge chips are much better. The i7-3770 and i7-3770K scored an impressive 1.14 and 1.18 in our benchmarks – the former for a £228 price that's similar to those Sandy Bridge chips, and the latter for £251 with the bonus of easy overclocking thanks to its unlocked multiplier, denoted by the "K" suffix.

If you have an LGA 2011 motherboard, be warned that the current trio of Sandy Bridge-E chips is lost in this company: they're either slower than similarly priced LGA 1155 chips, or faster but prohibitively expensive.

The only reason to consider buying them is their multithreaded performance. The £760 Core i7-3960X scored 1.14 overall, but its 12 logical cores delivered a massive 1.65 and 1.47 in the video and 3D rendering benchmark segments.

The verdict

Our favourites are the i7-3770 and i7-3770K: the former is faster than its rivals for no extra cash, and the latter is faster still with huge overclocking potential. The i7-3770S is a worthwhile, energy-efficient alternative. Meanwhile, the top-end LGA 2011 parts are ludicrously priced for their admittedly impressive performance, with no premium placed on Ivy Bridge technology compared to the prices you'll have to pay for Sandy Bridge silicon.

The problem is that these chips are overshadowed by increasingly impressive Core i5s. Stock performance is ample for most people and, with some healthy overclocking, the i5-3570K will match most of these Core i7s for less cash, albeit with fewer cores. That reaffirms our belief that Core i7 processors are great for power users but overkill for everyone else.

Know your sockets

Every Intel processor in this Labs uses the same LGA 1155 socket except for three Sandy Bridge-E models. The Core i7-3960X, i7-3930K and i7-3820 are only compatible with LGA 2011 – and despite using the Ivy Bridge i7-3000 naming convention, they're actually Sandy Bridge parts.

The LGA 2011 socket was Intel's high-end branch created exclusively for Sandy Bridge-E processors, although it's likely that there will be Ivy Bridge-E models arriving towards the end of this year. So while it's by no means the wrong platform on which to base your PC, be aware that LGA 2011 will effectively limit your future upgrade choices to a small group of Intel's most expensive enthusiast processors. For the vast majority of users, LGA 1155 is the more sensible choice.

Model	Speed	Responsiveness	Media	Multitasking	Overall	Price (inc VAT)	Rating
i7-2600K	3.4GHz	0.99	1.11	1.06	1.05	£183 (£220)	✪✪✪✪✪✪
i7-2700K	3.5GHz	1.01	1.14	1.09	1.08	£192 (£231)	✪✪✪✪✪✪
i7-3820	3.6GHz	0.93	1.08	1.02	1.01	£188 (£226)	✪✪✪✪✪✪
i7-3930K	3.2GHz	0.92	1.23	1.24	1.13	£340 (£409)	✪✪✪✪✪✪
i7-3960X	3.3GHz	0.92	1.26	1.26	1.14	£633 (£760)	✪✪✪✪✪✪
i7-3770S	3.1GHz	0.98	1.17	1.11	1.09	£191 (£230)	✪✪✪✪✪✪
i7-3770	3.4GHz	1.03	1.22	1.17	1.14	£190 (£228)	✪✪✪✪✪✪
i7-3770K	3.5GHz	1.05	1.27	1.21	1.18	£209 (£251)	✪✪✪✪✪✪

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Intel Core i5

The mid-range straddles Sandy and Ivy Bridge, with bargains throughout

The Core i5 range is the largest group in this Labs for two reasons: it's Intel's mid-range processor family and, unlike Core i3 and i7, contains plenty of Ivy Bridge parts.

One unusual omission is Hyper-Threading, which is included on Core i3 and Core i7 processors, but not the quad-core i5s. And unlike Core i3 chips, mid-range silicon also includes Turbo Boost, so cores will be overclocked when extra grunt is required.

Ivy Bridge i5s improve on the Turbo Boost offered by their predecessors, with the ability to reach maximum boost levels across two cores simultaneously rather than one.

The multiple variants of Core i5 are denoted by a selection of suffixes. As usual, "K"-branded chips have unlocked multipliers for easier overclocking, and low-voltage chips end in "S", with a TDP of 65W. All of these have integrated graphics, with a mix of HD Graphics 2000 and 3000 across the Sandy Bridge parts, and HD Graphics 2500 and 4000 across Ivy Bridge. There's one final suffix, which is "P" – this is reserved for two chips that are sold with no integrated graphics core.

The Core i5 range is a broad church, and prices vary widely. The cheapest i5-2310 costs £135, only £25 more than the priciest Core i3. The most expensive is the Ivy Bridge Core i5-3570K, which will set you back £170 – significantly more than any of this month's AMD processors.

Performance

Core i5 chips bring a wide variety of performance levels to the table. At the bottom end are two low-voltage Sandy Bridge chips and one low-voltage Ivy Bridge chip.

The Sandy Bridge Core i5-2400S and i5-2405S both scored 0.86 in our tests – not far ahead of the best Core i3 has to offer – but the Ivy Bridge i5-3450S scored 0.99, making it the best low-voltage Core i5 part by some distance – and not far off Core i7 levels of performance. It's also way ahead of the AMD FX-8150, which scored 0.89.

The low-voltage chips also did very well in our thermal tests. The Core i5-2405S's peak test rig power draw of 110W is far below standard Sandy Bridge Core i5s – the Core i5-2500K, for example drew 165W – but the Ivy Bridge i5-3450S trumps them all, with a 105W peak being the lowest of all the Core i5s on test. The Ivy Bridge i5-3450S is also the cheapest low-power chip at £145.

Intel's standard Core i5 processors kick off with a selection of Sandy Bridge-based parts that are looking dated. The £137 Core i5-2300 and the £136 i5-2320 return scores of 0.92 and 0.95, and are still worth buying over their AMD counterparts. However, further up the range, it's tough to argue for a Sandy Bridge part, since they're comparatively slower and not much cheaper than their Ivy Bridge replacements.

We'd spend more on the £170 i5-3750K; its 1.04 benchmark score is virtually as quick as last generation's Core i7 processors. That said, there's still plenty to like about the i5-2500K, which is quick at its stock speeds and can be overclocked considerably.

Model	Speed	Responsiveness	Media	Multitasking	Overall	Price (inc VAT)	Rating
i5-2400S	2.5GHz	0.89	0.88	0.8	0.86	£125 (£150)	✪✪✪✪✪
i5-2405S	2.5GHz	0.88	0.9	0.8	0.86	£133 (£160)	✪✪✪✪✪
i5-2300	2.8GHz	0.97	0.93	0.86	0.92	£114 (£137)	✪✪✪✪✪
i5-2310	2.9GHz	0.98	0.95	0.87	0.93	£112 (£135)	✪✪✪✪✪
i5-2320	3GHz	0.99	0.97	0.9	0.95	£113 (£136)	✪✪✪✪✪
i5-2380P	3.1GHz	0.94	1	0.93	0.96	£117 (£141)	✪✪✪✪✪
i5-2400	3.1GHz	0.94	1	0.93	0.96	£120 (£144)	✪✪✪✪✪
i5-2450P	3.2GHz	0.95	1.01	0.94	0.96	£127 (£153)	✪✪✪✪✪
i5-2500	3.3GHz	0.96	1.01	0.95	0.97	£129 (£155)	✪✪✪✪✪
i5-2500K	3.3GHz	0.98	1.03	0.98	0.96	£126 (£151)	✪✪✪✪✪
i5-2550K	3.4GHz	0.99	1.05	0.98	1.01	£130 (£156)	✪✪✪✪✪
i5-3450S	2.8GHz	0.98	1.02	0.98	0.99	£121 (£145)	✪✪✪✪✪
i5-3450	3.1GHz	0.96	1.04	0.98	0.99	£121 (£145)	✪✪✪✪✪
i5-3470	3.2GHz	0.96	1.05	0.99	1	£127 (£152)	✪✪✪✪✪
i5-3550	3.3GHz	0.96	1.1	1.02	1.02	£132 (£159)	✪✪✪✪✪
i5-3570	3.4GHz	0.98	1.11	1.04	1.04	£141 (£170)	✪✪✪✪✪
i5-3570K	3.4GHz	0.98	1.11	1.04	1.04	£141 (£170)	✪✪✪✪✪

The verdict

The i5-3570K is our mid-range chip of choice thanks to its combination of stellar performance and reasonable price. If you'd like to spend a little less cash, the cheaper Ivy Bridge chips and the low-power i5-3450S are both fine, future-proof choices, with the latter a frugal option. For those on a tight budget, a more affordable unlocked part that's ripe for overclocking is the venerable i5-2500K.

Intel Core i3

Intel's budget range hasn't yet been bolstered by Ivy Bridge, but do last year's chips still compete?

The Core i3 is Intel's range of mainstream, affordable processors, and it arrived on the scene back in January 2010. They're Sandy Bridge parts that sit in the same LGA 1155 processor socket as most of the more expensive models, but compromises have been made.

There's no sign of quad-core chips yet, with dual Hyper-Threaded cores throughout. They also have the last-generation HD Graphics 2000 and 3000 cores, rather than the HD 2500 and HD 4000 GPUs that furnish more modern processors.

Clock speeds range from 3.1GHz to 3.4GHz, which is a little lower than you'll find on high-end chips from the Core i5 and Core i7 ranges, and there's no Turbo Boost – so cores won't automatically overclock when under duress.

There's also one low-power chip available – the i3-2100T, which runs at 2.5GHz and has a 35W TDP. The rest of these parts have a 65W TDP, which is still fairly low.

These aren't Intel's cheapest chips – that honour is reserved for Celeron and Pentium CPUs – but they're still relatively affordable. The top-end Core i3-2130 costs £110 – £25 less than the cheapest Core i5 part – while the bottom-end i3-2100 costs only £88, which is more expensive than all but one of AMD's FX processors.

Performance

The low-end Core i3 models compete with AMD. The cheapest, the i3-2100, scored 0.77 in our tests – this is the same level as AMD's top FX-4000-series chip and the FX-6000 series. There isn't much difference in the pricing, either, with the i3-2100 costing £88 compared to the FX-4170's £100 and FX-6100's £91.

The decision depends either on your existing motherboard, if you're upgrading, or our thermal tests if not, and here Intel streaks ahead. The i3-2100's peak temperature of 63°C is fine, and the rig's peak power draw of 92W is way below the 189W and 196W of the two AMDs. Intel is the clear winner when it comes to efficiency.

There's little difference in performance as we move up the Core i3 range. The i3-2125 and i3-2130 cost £100 and £101 respectively, and both scored 0.79 in our benchmarks. However, we prefer the former for its superior HD Graphics 3000 core – the i3-2130 makes do with HD Graphics 2000.

Once again, AMD's FX series isn't far behind but, for several reasons, it can't fully compete. The mid-range parts offer reasonable competition in our application benchmarks, but the Core i3 chips on test have integrated graphics, keener prices and better thermal results. The AMD A-Series has better graphics, but it's slower in our application benchmarks – a trade-off some will be happy with.

The low-voltage Core i3-2100T scored 0.7, but its £96 price is a tad high when its peak power draw of 82W isn't far behind the 93W average of the rest. Here, the FX-6100 is faster and cheaper, and the FX-4100 costs only £73 for a very similar 0.71 score.

The verdict

We await the first Ivy Bridge Core i3 processors, but these Sandy Bridge parts hold their own for those on a budget. Performance is on a par with the best AMD FX cores, they have integrated graphics, and thermal performance is better than any of their rivals.

With little benchmark difference across the range, we'd select a couple of chips in particular. The i3-2100 is the cheapest and still performs well, and the i3-2125 offers similar performance with an HD 3000 graphics core.

AMD's A-Series, meanwhile, offers strong competition if you're happy to lose a little application performance in exchange for a better integrated graphics chip.

The low-power i3-2100T is the only Core i3 to truly disappoint. In the context of a whole PC at this level, its TDP savings make little difference, so unless every watt is vital, we prefer AMD's A8-3870K, which is as quick, costs less and includes a better GPU as well.

Model	Speed	Responsiveness	Media	Multitasking	Overall	Price (inc VAT)	Rating
i3-2100T	2.5GHz	0.91	0.67	0.53	0.7	£80 (£96)	✪✪✪✪✪
i3-2100	3.1GHz	0.94	0.77	0.62	0.77	£73 (£88)	✪✪✪✪✪
i3-2105	3.1GHz	0.94	0.77	0.62	0.77	£83 (£100)	✪✪✪✪✪
i3-2120	3.3GHz	0.94	0.77	0.62	0.78	£75 (£90)	✪✪✪✪✪
i3-2125	3.3GHz	0.94	0.79	0.65	0.79	£83 (£100)	✪✪✪✪✪
i3-2130	3.4GHz	0.96	0.78	0.64	0.79	£91 (£110)	✪✪✪✪✪

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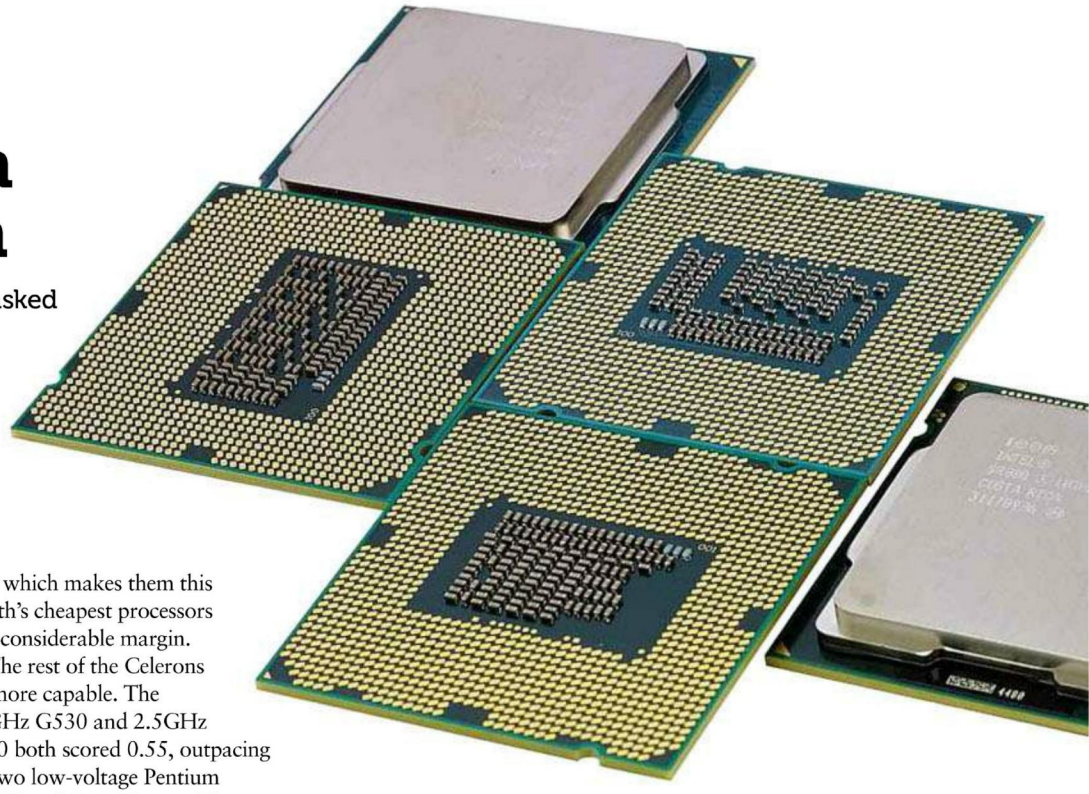
Intel Celeron and Pentium

These are Sandy Bridge chips masked in old brands, with mixed results



The venerable Celeron and Pentium brands are still with us, but these days they're just rebranded low-end Sandy Bridge processors.

Five Celerons are widely available, with clock speeds ranging from 1.6GHz to 2.5GHz across single- and dual-core chips – figures that are much lower than many of Intel's Core-branded parts. Only one, the low-power G460, offers Hyper-Threading, there's no Turbo Boost, and old, tweaked HD Graphics 2000 cores are used throughout.

The eight Pentiums are all dual core and run between 2.2GHz and 3.1GHz, but there's still no sign of Hyper-Threading or Turbo Boost. They have 3MB of L3 cache, and their HD Graphics 2000 cores are clocked 100MHz higher than the Celerons – not that the slight speed bump will make the weak graphics chip produce smooth results in games.

Performance

The two single-core Celerons aren't much faster than Atom-based netbooks, with the 1.8GHz G460 scoring a paltry 0.29 in our benchmarks. Their saving grace is their price: they cost only £27 and £29, which makes them this month's cheapest processors by a considerable margin.

The rest of the Celerons are more capable. The 2.4GHz G530 and 2.5GHz G540 both scored 0.55, outpacing the two low-voltage Pentium G620T and G630T parts. These Celerons are cheaper, too – £31 and £35 compared to the £43 and £54 Pentiums.

The remaining six Pentiums range from the 2.6GHz G620 to the 3.1GHz G870, and return benchmark scores between 0.57 and 0.65. That isn't far behind low-end Core i3 chips, and the Pentium parts are much cheaper – the G620 costs only £44, and the more powerful G860 scored 0.64 for only £61. The cheapest Core i3, meanwhile, weighs in at £88.

The verdict

The cheapest chip we'd choose from this particular group is the Celeron G530. Its benchmark score of 0.55 means that it isn't far behind Pentium performance, but its £31 price is £12 less than any Pentium. Buy any of the even cheaper Celerons and the few quid you save will quickly be forgotten in your annoyance at your PC's sluggish performance; the lowest-end chips offer barely half the application performance.

Value for money varies when it comes to the eight Pentiums on test. The G840 scored a mediocre 0.59 but costs £54, for example, which looks poor next to the similarly quick and cheaper G630. The top-of-the-range G870 costs £74 for a score of 0.65, but the G860 costs £61 and scored 0.64. That's barely slower at all, and it makes the decision a no-brainer.

Model	Speed	Responsiveness	Media	Multitasking	Overall	Price (inc VAT)	Rating
Celeron G440	1.6GHz	0.53	0.27	0.03	0.27	£22 (£27)	●●○○○○
Celeron G460	1.8GHz	0.54	0.3	0.03	0.29	£24 (£29)	●●○○○○
Celeron G530T	2GHz	0.73	0.43	0.27	0.47	£30 (£37)	●●●○○○
Celeron G530	2.4GHz	0.76	0.51	0.34	0.55	£25 (£31)	●●●●○○
Celeron G540	2.5GHz	0.8	0.52	0.35	0.55	£29 (£35)	●●●○○○
Pentium G620T	2.2GHz	0.76	0.46	0.31	0.51	£35 (£43)	●●●○○○
Pentium G630T	2.3GHz	0.76	0.47	0.34	0.52	£45 (£54)	●●○○○○
Pentium G620	2.6GHz	0.79	0.55	0.39	0.57	£36 (£44)	●●●●○○
Pentium G630	2.7GHz	0.79	0.57	0.38	0.58	£37 (£45)	●●●●○○
Pentium G840	2.8GHz	0.79	0.61	0.39	0.59	£45 (£54)	●●●○○○
Pentium G850	2.9GHz	0.82	0.64	0.42	0.63	£53 (£64)	●●●●○○
Pentium G860	3GHz	0.86	0.63	0.42	0.64	£50 (£61)	●●●●○○
Pentium G870	3.1GHz	0.86	0.65	0.44	0.65	£61 (£74)	●●●○○○

What's in a name?

Pentiums weren't always low-end. Following its release in 1993, the Pentium 60 was Intel's top CPU and its success led to the Pentium II, III and 4 – and the Pentium D range, which contained Intel's first dual-core processors.

Pentium lost its top spot in 2006 to Core 2, but in 2007, Pentium returned as a low-cost brand favoured by overclockers and budget builders. Releases since then have encompassed the Penryn, Westmere and Sandy Bridge architectures.

Celerons have always been budget chips, but in 1999 they were designed to compete with Cyrix and IDT's WinChips as well as AMD – with great success.

Since then, the Celeron brand has consistently been used for the lowest-speed chips, even appearing in netbooks. Today's models may be based on the Sandy Bridge architecture, with single- and dual-core models available, but they aren't good for much more than basic everyday applications.

AMD FX series

Reasonable prices, but for performance, AMD remains some way behind the Intel juggernaut

AMD has virtually handed the high-end CPU market to Intel. Although the Bulldozer architecture in the FX chips was designed from scratch, performance is on a par with the Core i5 – AMD lacks any chips that can match Core i7 speeds.

FX chips are similar to Intel's Sandy and Ivy Bridge parts, with each Bulldozer module showing as two logical cores in a similar fashion to Hyper-Threading. Turbo Core is like Turbo Boost, overclocking two cores at a time.

A top-end FX-8150 will set you back £141, less than a Core i5-2500K. Parts such as the £73 FX-4100 compete well with the Core i3 chips, most of which cost around £100.

Performance

The £73 FX-4100 and the £100 FX-4170 scored 0.71 and 0.78 respectively in our benchmarks. That's reasonable power for little cost – the same performance from a Core i3 costs at least £88.

However, AMD's own A-Series is almost as quick, often costs less and has Radeon graphics.

The £91 FX-6100 scored 0.75, so it doesn't stand out from a host of other FX and Core i3 parts. The FX-6200 was better – with 0.82 – but at £119, it's more expensive than every Core i3, without Intel's power efficiency or graphics.

The best FX chips were left behind by both Sandy Bridge and Ivy Bridge Core i5s. The £115 FX-8120 scored 0.86, and the £141 FX-8150 scored 0.89.

All but the low-voltage Core i5 chips trounced FX in benchmarks and at the checkout: every full-power Core i5 scored between 0.92 and 1.04.

Model	Speed	Responsiveness	Media	Multitasking	Overall	Price (inc VAT)	Rating
FX-4100	3.6GHz	0.86	0.69	0.57	0.71	£60 (£73)	✪✪✪✪✪
FX-4170	4.2GHz	0.92	0.76	0.65	0.78	£83 (£100)	✪✪✪✪✪
FX-6100	3.3GHz	0.83	0.75	0.68	0.75	£75 (£91)	✪✪✪✪✪
FX-6200	3.8GHz	0.89	0.82	0.75	0.82	£99 (£119)	✪✪✪✪✪
FX-8120	3.1GHz	0.87	0.88	0.84	0.86	£95 (£115)	✪✪✪✪✪
FX-8150	3.6GHz	0.9	0.91	0.87	0.89	£117 (£141)	✪✪✪✪✪

The verdict

AMD hasn't placed much emphasis on FX, and we can see why. Top-end chips are nowhere near Intel's flagships, and low-end chips are less attractive than Core i3s and AMD's own APUs. If you have an AMD motherboard there may be some appeal, but we wouldn't recommend these chips.

Integrated graphics: put to the test

The graphics chips in processors used to be the butt of jokes, but these days they're serious business, with the power to run games and graphical applications instead of barely being able to handle an average Windows desktop. We've tested every integrated core in this Labs in its fastest processor to see what's worth buying. All three games are tested at Low quality settings and a resolution of 1,366 x 768.

Unlike the CPU market, AMD leads the charge in this area, with a variety of Radeon graphics cores transplanted into its A-Series APUs. Intel has improved recently, though, replacing its ageing HD Graphics 2000 and 3000 cores with new HD Graphics 2500 and 4000 in the latest Ivy Bridge Core i5 and Core i7 chips.

The HD Graphics 2000 isn't cut out for gaming: its Low quality Crysis result of 32fps is the worst here, followed up by scores of 16fps and 30fps in Just Cause 2 and DiRT 3. The newer HD 2500 core is a step forward, with 45fps, 22fps and 37fps in those same benchmarks, but it's still too slow to be considered a useful gaming chip.

The HD Graphics 3000 core was always more capable, with scores of 49fps and 43fps in the Crysis and DiRT 3 runs, but the HD Graphics 4000 really steps up a gear. Its 53fps Crysis result is good, while its 61fps DiRT score is this month's joint best. Its 37fps result in Just Cause 2 makes it the only Intel chip that managed playable results in all three games.

AMD's HD 6410D is on a par with only the Intel HD Graphics 3000 core, but the mid-range Radeon HD 6530D is strong. Its 63fps Crysis score and 38fps Just Cause 2 average outpace Intel's best, although it lags behind in DiRT 3.

At the top of the pile is the HD 6550D: it's the fastest in Crysis and Just Cause 2, averaging 68fps and 45fps, and its 61fps score is on a par with the HD Graphics 4000.

Although gamers should still buy a discrete card for the best experience, those on a budget can enjoy themselves too. After all, the top integrated cores here are just as quick as, and sometimes quicker than, low-end discrete cards.

Intel has closed the gap with Ivy Bridge – and we've been told to expect a huge leap forward with next year's Haswell – but for now, AMD has the edge. After all, its HD 6550D resides in APUs that cost £79, while the HD Graphics 4000 isn't included in anything cheaper than £170.

WorldMags.net

AMD A-Series

AMD's APUs mix decent application performance with powerful graphics, but can they compete with Intel?

With its A-Series chips, AMD switched its focus. They're known as APUs, or accelerated processing units, since they include both a processor core and a relatively powerful Radeon graphics core in the same package.

All of the 32nm Radeons inside A-Series APUs share architecture with last year's Radeon HD 6000 Series. Three appear across the range: the HD 6410D in the A4 APUs; the HD 6530D in A6-branded parts; and the high-end HD 6550D in A8 chips.

The bottom-end HD 6410D boasts the same 600MHz clock speed as that of the top-end HD 6550D, but has only 160 stream processors compared to the latter's 400.

The mid-range HD 6530D is clocked at a lower 443MHz, but has 320 stream processors. All three use a 128-bit memory bus, and although they lack the power to run current games across multiple monitors, they support three-screen Eyefinity. The performance of these chips, as well as Intel's integrated cores, is evaluated on p156.

Elsewhere, the A-Series architecture isn't far removed from AMD's other desktop chips. Some of the APUs feature Turbo Core, which dynamically boosts clock speeds by up to 300MHz, and there are varying levels of cache. A4-Series chips have a total of 1MB, A6 chips 3MB or 4MB, and A8 cores have 4MB.

The A6 and A8-Series have improved memory support, too, and are capable of handling 1,866MHz DDR3 RAM; the A4 chips work with only 1,600MHz memory.

Finally, we're also including a quartet of Athlon II X4 processors in this roundup. The name may be an old one, but these are new chips based on the same architecture as the A-Series, albeit without the integrated graphics core. They're quad-core chips with frequencies ranging from 2.6GHz to 3GHz – higher than several A-Series processors, but without the Turbo Core feature.

Performance

The A-Series will win few awards for application performance. The A4-3300 and A4-3400 scored 0.49 and 0.51 in our benchmarks, behind the slowest of Intel's Core i3 chips and more in line with the cheaper Pentiums. They're priced similarly, but the AMD chips caused our test rig to draw more than twice the power of the Intel chips at peak performance levels.

AMD's mid-range APUs put on a better show. The A6-3500 scored 0.64, and both the A6-3650 and A6-3670K scored 0.67. Only the two most expensive Pentiums can compete with that speed – and here, the combination of speed and graphical power makes the AMD chips the more tempting option.

The pinnacle of the A-Series is a trio of A8-branded parts, but there's no significant performance increase over the mid-range A6-branded chips.

In fact, unless you regularly use multithreaded software to take advantage of the extra cores, they're barely any faster at all, with scores of 0.66, 0.69 and 0.7 in our benchmarks.

The verdict

The AMD A-Series is a mixed bag. At the bottom of the pile, application performance is nothing special and the weaker graphics cores are no quicker than those of Intel. They're inefficient, too, when it comes to power draw.

The mid-range is better. The A6-3650 is the standout chip, with identical performance in applications for less cash than the overclockable A6-3670K, and better performance than the equivalent Pentiums. The addition of a good graphics chip makes it ideal for a low-end entertainment system, which is something Intel can't boast at this price point.

At the top end, the A8-3850 and A8-3870K outpace the best Pentiums, and come close to the low-end Core i3s; they also have much better graphics. As you move up the scale, the question of graphics rears its head, though: if you intend to use a separate graphics card, the major strength of these APUs is diminished.

The Athlon II X4 chips are reasonable for those on a tight budget. There's no Radeon core, but performance sits between the Pentium and Core i3 ranges, and prices are a little lower than you'll pay for the best Pentiums. They aren't particularly frugal, but we'd choose the Athlon II X4 651K, as it's unlocked for overclocking.

Model	Speed	Responsiveness	Media	Multitasking	Overall	Price (inc VAT)	Rating
Athlon II X4 631	2.6GHz	0.82	0.62	0.56	0.67	£41 (£50)	✪✪✪✪✪✪
Athlon II X4 641	2.8GHz	0.84	0.65	0.59	0.69	£49 (£59)	✪✪✪✪✪✪
Athlon II X4 651	3GHz	0.87	0.68	0.63	0.73	£54 (£65)	✪✪✪✪✪✪
Athlon II X4 651K	3GHz	0.87	0.68	0.63	0.73	£55 (£67)	✪✪✪✪✪✪
A4-3300	2.5GHz	0.71	0.45	0.3	0.49	£31 (£38)	✪✪✪✪✪✪
A4-3400	2.7GHz	0.74	0.47	0.31	0.51	£38 (£46)	✪✪✪✪✪✪
A6-3500	2.1GHz	0.8	0.59	0.53	0.64	£45 (£54)	✪✪✪✪✪✪
A6-3650	2.6GHz	0.82	0.62	0.56	0.67	£55 (£67)	✪✪✪✪✪✪
A6-3670K	2.7GHz	0.83	0.63	0.56	0.67	£62 (£75)	✪✪✪✪✪✪
A8-3800	2.4GHz	0.8	0.62	0.56	0.66	£93 (£112)	✪✪✪✪✪✪
A8-3850	2.9GHz	0.83	0.64	0.6	0.69	£65 (£79)	✪✪✪✪✪✪
A8-3870K	3GHz	0.83	0.66	0.61	0.7	£70 (£84)	✪✪✪✪✪✪

Analysis

PRICE vs PERFORMANCE

The graph on this page plots the best online price of each processor against its overall score in our benchmarks. As in previous processor Labs, the further towards the bottom right-hand corner of the graph, the better the bang per buck.

Last year Intel dominated, and little has changed since then. Intel's Core i5 and i7 ranges to the right of the graph largely stand unchallenged for performance, and the arrival of Ivy Bridge can be seen extending the lines further to the right.

Only a handful of the slowest Core i5s are threatened by AMD's fastest FX processor, and the Core i3s are pretty comfortable too. We see those Core i3s in the majority of cheap PCs, and there's clear graph space between them and AMD's A-Series APUs. The Intel chips are more expensive, but they're quicker in our benchmarks, and much more efficient.

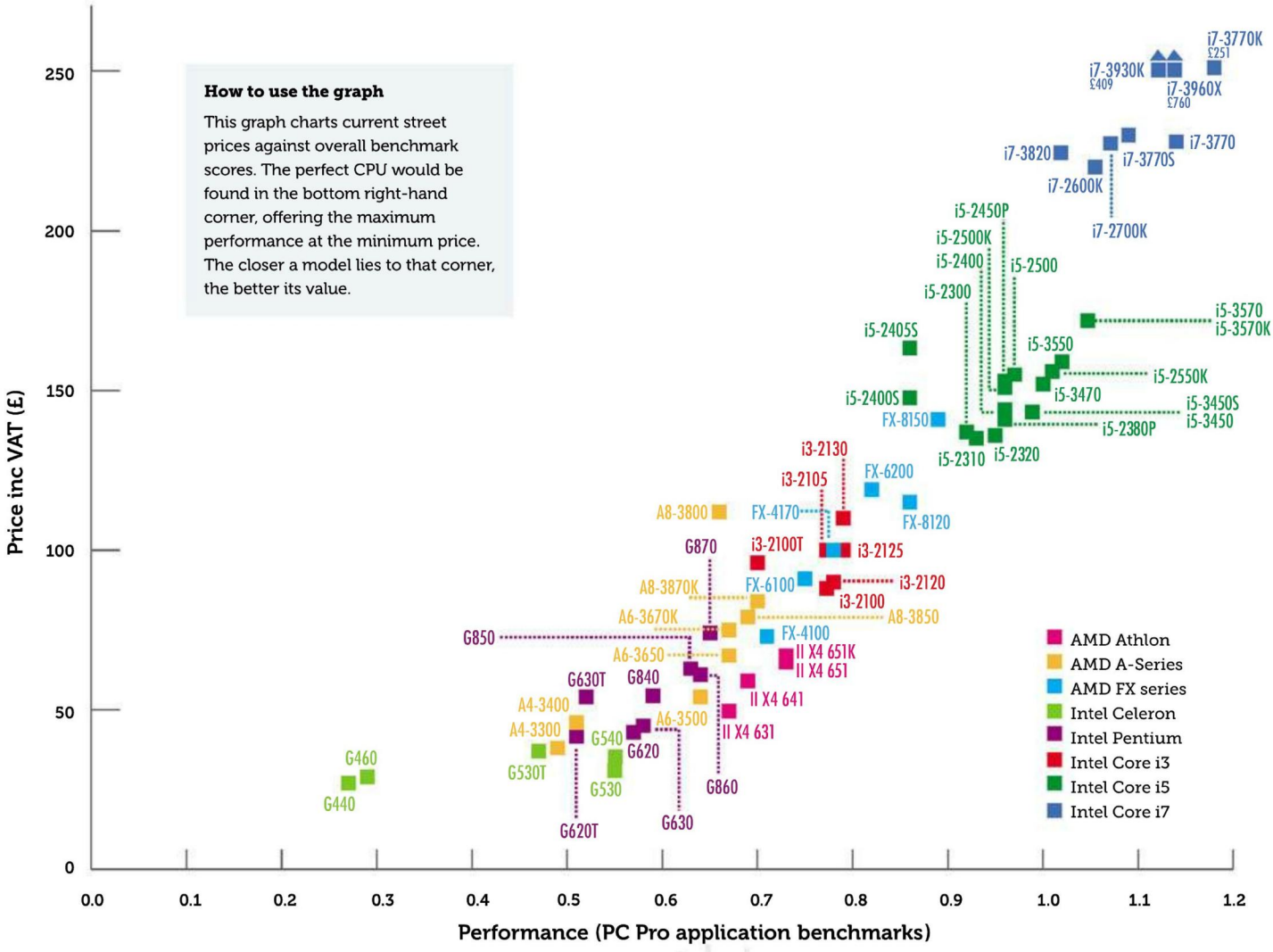
When it comes to pure processing power, AMD's APUs are left to trade blows with Intel's cheaper Pentiums and Celerons; its top-end A-Series chip scored 0.7 in the benchmarks, which is around 10% slower than most Core i3s. This isn't a great position for AMD, which once prided itself on beating Intel in the high-volume, low-price processor market.

However, these APUs illustrate the partial story this graph is telling. While it's a fine resource to quickly see which chips offer the best value when it comes to price and processing power, the A-Series chips have Radeon graphics cores that are better than the weak, integrated cores that lurk in cheaper Intel Sandy Bridge processors.

That makes AMD superb value for those looking to balance application and graphical performance – something that this chart alone won't tell you, and a factor that could appeal to those who want to build a PC without having to shell out for a discrete graphics card.

It's also worth noting – and often avoiding – some of this month's outlying chips. They're immediately obvious on the graph: the Core i7-3960X, for example, is so expensive that it's literally off the scale and simply not worth buying when top-end Ivy Bridge chips are faster in some of our benchmarks.

There are two expensive CPUs at the left of the Core i5 line, which neatly illustrate the premium that sometimes has to be paid for low-power "S"-branded parts. The vagaries of closely bunched ranges can also be seen in the disorganised zigzag of the Core i3 line. The lack



of price differentiation among Celeron chips is also evident – while performance almost doubles across this small range, the price of these low-end chips barely changes.

Our picks

We may have tested more chips than ever this month, but a handful of processors stand out from the crowd at the budget, mid-range and enthusiast ends of the spectrum.

Our choice for a cheap chip is **AMD's A8-3870K**. This is the only category this month in which Intel doesn't come out on top, and the innovative APU takes the crown thanks to one key advantage – its graphics core. The A8-3870K features the Radeon HD 6550D, and it outpaced Intel's new HD 4000 core in our Crysis and Just Cause 2 benchmarks. That makes it capable of playing modern games, albeit at lower quality levels – a claim that an Intel Core i3 processor can't make.

The A8-based chip is a little slower than the Core i3-2125, with its benchmark score of 0.7 falling behind the 0.79 of the Intel chip, but it also costs only £84 compared to the Core i3's £100 price. Plus, the AMD chip is unlocked for easy overclocking, and any tweaks made will pave the way for improving application and gaming performance.

Intel gains ground in the mid-range arena, however, where there's a clear winner. Ivy Bridge makes its impact felt in the **Core i5-3570K**. This 22nm chip is almost as quick as last year's Core i7 chips, it's more frugal than any of its rivals, and its £170 price is reasonable – higher than any other Core i5, but still far less than the cost of a Core i7. It's one of the few Core i5 chips to boast an unlocked multiplier, too, so it's overclockable for improved performance. AMD, meanwhile, has nothing to offer – its fastest chip, the FX-8150, scored 0.89 in our benchmarks.

Intel dominates at the high end, too, and Ivy Bridge continues to lead the way. The i7-3770 and **i7-3770K** chips are both impressive, but we prefer the latter; as well as being overclockable thanks to its unlocked multiplier, its Base Clock is 100MHz faster than the standard chip, and that helps it to score 1.18 in our benchmarks. That's even faster than the i7-3960X, which has six cores and costs £760, but the i7-3770K is considerably cheaper at £251.

If you're an enthusiast or power user who needs the ultimate in processor power for work or play, then this is the chip to buy.

VIEW FROM THE LABS

We haven't given AMD an easy ride this month. Its FX processors are difficult to recommend when up against Intel's Core i3 and Core i5 chips, and its APUs, while impressive in many ways, are mid-range parts that won't satisfy power users.

One thing we can praise AMD for, though, is clarity. Neither family is crammed full of parts, with only six FX chips and eight A-Series APUs available, and for the most part, they're sensibly ordered from top to bottom with a logical progression of clock speeds, benchmark scores and prices.

We're hardly able to say the same about Intel – as the graph shows, its many families are all over the place, with the Core i3 and Core i5 ranges proving to be bewilderingly complex. With its annual refreshes and packed CPU line-up, there's a danger that Intel quite simply has too many chips.

With both Sandy Bridge and Ivy Bridge options, there are now a whopping 17 Core i5 chips available, and that's without including OEM-only chips that aren't available at retail. Across the entirety of this month's Labs, we've tested 44 Intel chips compared to AMD's 18 chips.

It's a bloated line-up, and from a consumer point of view, it just isn't necessary. A glance at our benchmark tables shows just how superfluous many of them are: several pairs of Core i5 chips return exactly the same benchmark scores – four of them score 0.96, and three other pairs share identical scores – and those 17 chips have prices that cover only £35 from top to bottom.

"For most people, any Intel Core i3 or i5 chip will meet their computing needs"

It isn't only the Core i5s, either. Five full-fat Core i3 processors boast near-identical benchmark scores at prices ranging from £88 to £110, four of the eight Core i7 chips have prices within touching distance of £230, and five Celeron chips are separated by only £8 despite the benchmark scores ranging widely between the chips on offer.

This is the downside of Intel's prolific output, and confusing for all but the most dedicated of enthusiasts. At least Intel is so far ahead that, for most people, any Core i3 or i5 chip will meet their computing needs, which makes the lottery less of a problem.

We've been saying for a long time that, when it comes to processor design and architecture, AMD could do worse than take several leaves from Intel's book.

When it comes to clarity, however, Intel could learn a thing or two from AMD. This sharing of knowledge might make our job a little easier and, most importantly, the consumer would benefit as well.

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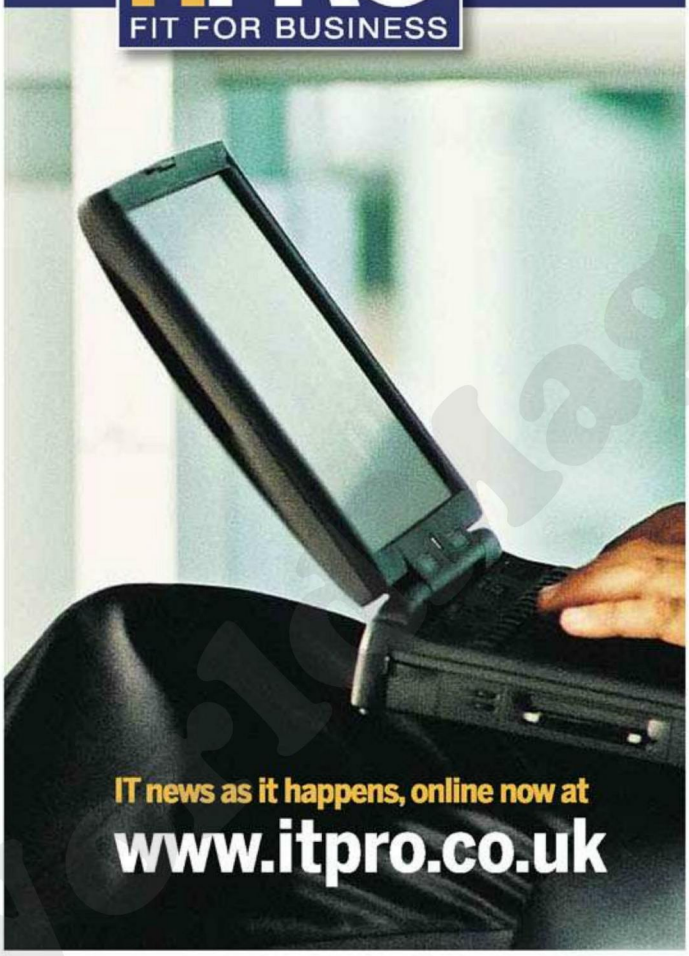

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THE A-LIST

LAPTOPS, PCs & TABLETS

COMPACT TABLET

Nexus 7

8GB, £133 (£159); 16GB, £166 (£199)
www.dixons.co.uk
WEB ID 375886 ISSUE 216

Powerful, well built and with a better screen than you'd expect for the price, the Nexus 7 sets the new gold standard for budget tablets.

KEY SPECS 7in 800 x 1,280 IPS TFT; quad-core 1.3GHz Nvidia Tegra 3; 1GB RAM; 8/16GB storage; 802.11n Wi-Fi; Bluetooth; NFC; 1.2mp front camera; Android 4.1; 120 x 199 x 10.5mm; 340g

ALTERNATIVE

Motorola Xoom 2 Media Edition

Small and light, with a good screen and attractive design. You don't quite get the battery life or power of a larger device, but its portability more than compensates.

£254 (£305); www.morecomputers.com WEB ID 372142

FULL-SIZE TABLET

Apple iPad (3rd gen)

32GB Wi-Fi, £399 (£479)
www.apple.com/uk
WEB ID 373648 ISSUE 212

Faster graphics and a better camera, but the groundbreaking high-resolution screen is the reason to splash out – it's a genuine leap forward. We'd opt for the 32GB version.

KEY SPECS 9.7in 1,536 x 2,048 TFT; iOS 5.1; 1GHz dual-core Apple A5X; 1GB RAM; 32GB storage; dual-band 802.11n Wi-Fi; Bluetooth 4; 5mp rear/0.2mp front camera; 186 x 241 x 9.7mm (WDH); 652g

ALTERNATIVE

Asus Transformer Pad Infinity 700

The successor to the Transformer Prime, Asus' hybrid tablet boasts a Full HD display and improved performance. The price is daunting, but this premium tablet delivers the ultimate Android experience.

£499 (£599); http://uk.asus.com WEB ID 376000

BUDGET LAPTOP

Acer Aspire 5750G

£367 (£440)
www.saveonlaptops.co.uk
WEB ID 375496 ISSUE 212

Now with an updated specification, the Acer delivers nippy application performance and the Nvidia GPU is enough for basic gaming. With solid ergonomics at a good price, it's a top budget all-rounder.

KEY SPECS 2.1GHz Intel Core i5-2450M; 6GB RAM; 500GB HDD; DVD-RW; Nvidia GeForce GT 610M; 15.6in 1,366 x 768; Windows 7 Home Premium; 382 x 253 x 35mm; 2.52kg. Part code: LX.RXL02.060

ALTERNATIVE

Sony VAIO T13

It's technically an Ultrabook, but this pretty, portable laptop is unusually affordable. With its Core i3 CPU lasting for over seven hours of light use, the dim screen and average build are easy to forgive.

£566 (£670); www.sony.co.uk WEB ID 375187

HIGH-END LAPTOP

Asus N56VM

£679 (£815)
http://uk.insight.com
WEB ID N/A 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 XPS 15z

Powerful and well built, the XPS 15z has an excellent 15.6in Full HD screen and offers a very respectable six hours of light use away from the mains. A near-perfect all-rounder.

£999 (£1,199); www.dell.co.uk WEB ID 368896

ULTRABOOK

Apple MacBook Air 13in

£833 (£999)
www.apple.com/uk
WEB ID N/A ISSUE 215

Not strictly an Ultrabook, but the laptop that so obviously inspired them now has an Ivy Bridge processor and a sorely 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

Asus Zenbook UX31E

Core i7 power, gorgeous design and a high-resolution display make this one of the best Ultrabooks yet, at least until Ivy Bridge models arrive.

£833 (£999); www.pcworld.co.uk WEB ID 370723

NETBOOK

Toshiba NB510

£183 (£220)
www.johnlewis.com
WEB ID 374857 ISSUE 214

The arrival of the Cedar Trail update to the Atom processor finally brings Intel netbooks into the media age, with the muscle to process Full HD video. The rest of this device is very nice too.

KEY SPECS 1.6GHz Intel Atom N2600; 1GB RAM; 320GB HDD; Intel GMA 3600 graphics; 10.1in 1,024 x 600 TFT; Windows 7 Starter; 262 x 187 x 35mm; 1.18kg. Part code: PLL72E-01W019EN

ALTERNATIVE

Toshiba NB520

A luxurious alternative that's well built, and which now combines a new Cedar Trail CPU with proper laptop speakers. The luxury bumps up the price considerably, however.

£261 (£313); www.morecomputers.com WEB ID 372907

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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

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.

£1,533 (£1,840); www.dell.co.uk WEB ID 374749

ALL-IN-ONE PC

HP Z1

£2,540 (£3,048)
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

Apple iMac 27in

As we wait for the iMac to receive an Ivy Bridge update, rivals are beginning to get closer to matching its all-round appeal.

£1,166 (£1,399); www.apple.com/uk WEB ID 367360

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 AOC 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 VAT) www.chillblast.com WEB ID 372364

HIGH-END PC

Chillblast Fusion Thunderbird

£832 (£999)
www.chillblast.com
WEB ID N/A ISSUE 215

A bold, some would say garish chassis, but inside is an Ivy Bridge PC with power, gaming performance, plenty of storage and surprisingly low noise. A fine all-rounder.

KEY SPECS 3.4GHz Intel Core i5-3570K @ 4.8GHz; 8GB RAM; Asus P8Z77-V motherboard; 240GB Mushkin Chronos SSD; 2TB HDD; Blu-ray; Nvidia GeForce GTX 670 graphics; Windows 7 Home Premium; 2yr C&R warranty

ALTERNATIVE

Chillblast Fusion Immortal

A pair of AMD Radeon HD 7970 cards provides stunning gaming performance in a quiet, well-built PC with few faults.

£1,749 (£2,098); www.chillblast.com WEB ID 373126

BUSINESS/EXECUTIVE LAPTOP

Sony VAIO Z Series

£833 (£1,000)
www.amazon.co.uk
WEB ID 368422 ISSUE 205

Sony totally revamped its tiny portable late last year, lifting out the optical drive and GPU into an external media dock. Expensive, but brilliant.

KEY SPECS 2.3GHz Intel Core i5-2410M; 4GB RAM; 128GB SSD; Intel HD Graphics (media dock optional); 13.1in 1,600 x 900 TFT; 3G; Windows 7 home Premium; 330 x 210 x 17mm; 1.5kg. Part code: VPCZ21M9E

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.

£791 (£950); www.saveonlaptops.co.uk WEB ID 371551

BUSINESS PC

Dell OptiPlex 790

£617 (£741)
www.dell.co.uk
WEB ID 369544 ISSUE 205

Dell's latest PC comes in a tiny yet versatile chassis. It has the raw performance to handle business tasks yet consumes very little power, and it's customisable too.

KEY SPECS 2.5GHz Intel Core i5-2400; 4GB RAM; 500GB HDD; DVD-RW; Intel HD Graphics 2000; Windows 7 Professional; 3yr NBD on-site warranty

ALTERNATIVE

Lenovo ThinkCentre M91p

It's expensive, but thanks to superb chassis design and strong performance – now with Sandy Bridge – it's well worth the cash for demanding business users.

From £533 (£640); www.lenovo.co.uk WEB ID N/A

WorldMags.net

MOBILE

SMARTPHONE

Samsung Galaxy S III

Free, £26pm, 24mths
www.buymobiles.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 4S

Faster, with a better camera and the novelty that is Siri. Not the full revamp many were expecting, though.

Free, £31pm, 24mths; www.vodafone.co.uk WEB ID 370735

SATNAV

TomTom

£33 (£40)
Apple App Store
WEB ID 375418 ISSUE 213

If you own a smartphone or tablet, apps are now a very cheap way to benefit from quality navigation, and the TomTom app for iPhone and iPad is undoubtedly the best of the bunch.

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

£74 (£89)
www.amazon.co.uk
WEB ID 371917 ISSUE 207

The newer Touch model doesn't significantly improve on this superb device. If all you want to do is read books, its simple design, rip-snorting performance and low price make it perfect.

KEY SPECS 6in 600 x 800 E Ink screen; 16 greyscale levels; 2GB storage; 1yr RTB warranty; 114 x 8.7 x 166mm; 170g

ALTERNATIVE

Sony Reader Wi-Fi

The store works well; it offers free library loans; it's readable, quick and handles PDFs well; and it has a great touchscreen.

£108 (£129); www.sony.co.uk WEB ID 371920

MONITORS

BUDGET TFT

ViewSonic VX2336s-LED

£101 (£121)
www.dabs.com
WEB ID 375424 ISSUE 214

Superior IPS panels are now entering the mainstream, allowing ViewSonic to go back to basics and build a monitor that delivers good image quality at a far lower price than we'd expect.

KEY SPECS 24in 1,920 x 1,080 IPS matte TFT; DVI, D-SUB; 250cd/m² brightness; 548 x 201 x 426mm

ALTERNATIVE

Dell UltraSharp U2312HM

A bit dearer than the ViewSonic, but it offers superb image quality, excellent build and a great warranty.

£137 (£164); www.ilgs.co.uk WEB ID 375427

PREMIUM TFT

Dell UltraSharp U2412M

£189 (£227)
www.amazon.co.uk
WEB ID 375430 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

Samsung SyncMaster S27A850D

Samsung's PLS panel technology makes a fine debut, mixing good image quality with a USB 3 hub and adjustable stand.

£445 (£534); www.oyyy.co.uk WEB ID 370729

SPECIALIST TFT

Eizo ColorEdge CG275W

£1,370 (£1,644)
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

HP ZR30W

With a 10-bit IPS panel and a huge 2,560 x 1,600 resolution, HP's flagship 30in monitor delivers sublime image quality.

£835 (£1,002); www.dabs.com WEB ID 361456

CAMERAS

DIGITAL COMPACT/BRIDGE

Nikon Coolpix S9100

£125 (£150)
www.digitalrev.com
WEB ID 372181 ISSUE 208

Great performance and image quality, a huge zoom and an intuitive interface make this the king of point-and-shoot compacts – especially given the reasonable price tag.

KEY SPECS 12mp CCD; 18x optical zoom; 3in LCD; shutter speed 1/2,000-1sec; 160-3200 ISO; 103 x 34 x 62mm; 214g

ALTERNATIVE

Panasonic Lumix DMC-FZ150

SLR fans may scoff at the thought, but this bridge camera does everything – and does it brilliantly.

£296 (£355); www.amazon.co.uk WEB ID 371305

DIGITAL SLR/SLD

Pentax K-r

£358 (£430)
www.simplyelectronics.net
WEB ID 371119 ISSUE 206

A Canon or Nikon DSLR might feel like a safer bet, but the K-r's competitive image quality, excellent controls, abundant features and outstanding performance make it our favourite.

KEY SPECS 12mp CCD; 27-82.5mm zoom; 3x optical zoom; 3in LCD; shutter 1/6,000-30secs; ISO 100-25600; 125 x 143 x 98mm; 798g

ALTERNATIVE

Sony NEX-C3

Looks like a point-and-shoot, but with a superb 16-megapixel sensor. A true hybrid of SLR and compact camera technology.

£275 (£330); www.purelygadgets.co.uk WEB ID 371128

DIGITAL VIDEO CAMERA

Panasonic HC-X800

£483 (£580)
www.currys.co.uk
WEB ID 372862 ISSUE N/A

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.

£54 (£65); www.ebuyer.com WEB ID 367357

WorldMags.net

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www.pcpro.co.uk/reviews

PRINTERS

CONSUMER ALL-IN-ONE

Canon Pixma MG6250

£112 (£134)
www.amazon.co.uk
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.

£49 (£59); www.tesco.co.uk WEB ID 372337

OFFICE ALL-IN-ONE

HP Officejet Pro 8600 Plus

£155 (£186)
www.amazon.co.uk
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.

£123 (£148); www.amazon.co.uk WEB ID 375118

PERSONAL LASER

Lexmark C540n

£88 (£106)
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.

£72 (£86); www.laptopsdirect.co.uk WEB ID 362242

SOFTWARE

INTERNET SECURITY

Trend Micro Titanium Internet Security 2012

£20 (£24), 1 PC, 1yr
www.amazon.co.uk
WEB ID 374038 ISSUE 211

Offers a compelling combination of usability and effectiveness that you won't find in any of the free packages.

ALTERNATIVE

AVG Anti-Virus Free 2012

It's riddled with ads, but offers great malware detection and web protection.

Free; http://free.avg.com
WEB ID 374035

BACKUP/STORAGE

Livedrive

Unlimited, £5/mth, 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.

£19 (£23); www.amazon.co.uk
WEB ID 370153

ACCOUNTING

FreeAgent

£15 (£18)
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.

£61 (£79); www.amazon.co.uk
WEB ID 375481

PRODUCTIVITY

Microsoft Office 2010

From £68 (£81)
www.amazon.co.uk
WEB ID 358660 ISSUE 190

PowerPoint and Outlook see the biggest changes, but usability boosts make this a worthy 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.

£302 (£362); www.adobe.co.uk
WEB ID 374221

GRAPHICS/DESIGN

Adobe CS6 Design Standard

£860 (£1,032)
www.adobe.co.uk
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.

£32 (£40); www.amazon.co.uk
WEB ID 368470

PHOTO EDITING

Adobe Photoshop Lightroom 4

£75 (£90)
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.

£543 (£609); www.amazon.co.uk
WEB ID 373714

VIDEO EDITING

Adobe Premiere Pro CS6

£675 (£810)
www.adobe.co.uk
WEB ID 374092 ISSUE 213

A new interface and improved engine make this powerful professional editor more tempting than ever.

ALTERNATIVE

Sony Vegas Movie Studio HD Platinum 11

For amateurs, this is an incredibly powerful tool that costs a pittance.

£21 (£25); www.currys.co.uk
WEB ID 367906

AUDIO PRODUCTION

Steinberg Cubase 6

£373 (£448)
www.musicmatter.co.uk
WEB ID 366139 ISSUE 200

An ambitious update, with improvements for editing live recordings and boosting the quality of MIDI performances.

ALTERNATIVE

Ableton Live 8

The best version of Live yet, with a well-rounded feature set.

£249 (£299); www.play.com
WEB ID 257713

WorldMags.net

NETWORKING

EXTERNAL HARD DISK

Verbatim Store 'n' Go USB 3.0

500GB, £48 (£57)
www.amazon.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 exotic 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

Iomega Prestige Desktop

Avoid the overpriced 3TB model, but otherwise this USB 3 desktop drive offers plenty for the money.

1TB, £102 (£122); www.oyyy.co.uk WEB ID 370366

NETWORK STORAGE

Synology DiskStation DS212j

Diskless, £133 (£160)
www.amazon.co.uk
WEB ID 374536 ISSUE 212

Fast, feature-packed and blessed with the best interface of any NAS around. And with an imminent DSM4 update promising a host of new cloud storage features, it's only going to get better.

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, £208 (£249); www.amazon.co.uk WEB ID 374695

WIRELESS ROUTER

Netgear DGND3700 N600

£86 (£103)
www.scan.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; 2 x USB; 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.

£71 (£85); www.scan.co.uk WEB ID 371296

COMPONENTS

PROCESSOR

Intel Core i5-3570K

£146 (£175)
www.amazon.co.uk
WEB ID 374158 ISSUE 213

It's a whisker behind the Core i7s, but Intel's i5-3570K is our mid-range chip of choice, thanks to its combination of stellar performance and a reasonable price.

KEY SPECS 3.4GHz (3.8GHz Turbo Mode); LGA 1155 quad-core CPU; Intel HD Graphics 4000; 6MB L3 cache; 77W TDP; 22nm

ALTERNATIVE

NEW

AMD A8-3870K

Outpaces the best Pentiums, and comes close to the low-end Core i3s, but the integrated GPU is a real cut above.

£61 (£74); www.cclonline.com WEB ID N/A

MOTHERBOARD

Asus P8Z77-V Pro

£124 (£149)
www.amazon.co.uk
WEB ID N/A 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 (£70); www.aria.co.uk WEB ID N/A

SOLID-STATE DISK

Corsair Performance Pro

256GB, £199 (£239)
www.scan.co.uk
WEB ID 375460 ISSUE 213

If you want the best, you have to pay for it – but this drive is reasonably priced for its 256GB, and it's blisteringly fast too. The enthusiast's choice.

KEY SPECS 2.5in SATA 6Gbits/sec solid-state disk; Marvell 88SS9174 controller. Part code: CSSD-P256GBP-BK

ALTERNATIVE

Corsair Force GT

For tighter budgets, this drive is a little slower, but it comes in six capacities and doesn't cost the earth.

240GB, £140 (£168); www.scan.co.uk WEB ID 375463

MAINSTREAM GRAPHICS CARD

AMD Radeon HD 6850

Typically, £130
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

This is fine for playing HD video on an old PC without modern integrated graphics.

Typically, £30 WEB ID N/A

ENTHUSIAST GRAPHICS CARD

Nvidia GeForce GTX 680

Typically, £400
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 more efficient, too.

KEY SPECS 1,536 stream processors, 1,006MHz core, 2GB GDDR5 RAM, 28nm, 2 x 6-pin connectors, 257mm long

ALTERNATIVE

Nvidia GeForce GTX 560 Ti 448

The power to handle the latest games on a single screen and, at half the price of the leaders, it's a more realistic alternative.

Typically, £180 WEB ID 364639

HARD DISK

Hitachi Deskstar 7K1000.D

1TB, £54 (£65)
www.ebuyer.co.uk
WEB ID 375466 ISSUE 213

The fastest drive 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, £60 (£73); www.scan.co.uk WEB ID 375469

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ENTERPRISE

RACK SERVER

HP ProLiant DL380p Gen8

NEW ENTRY

£6,193 exc VAT
www.hp.co.uk
WEB ID N/A ISSUE 216

HP's eighth-generation ProLiant flagship harnesses Intel's E5-2600 Xeon processors in a superbly designed 2U rack server with top-flight management features.

KEY SPECS 2U rack chassis; 2 x 2GHz Intel Xeon E5-2650; 32GB DDR3; 2 x 600GB SAS HDD; SD slot; 6 x PCI-E; 4 x Gigabit FlexLOM; 2 x 750W PSU

ALTERNATIVE

Dell PowerEdge R620

Dell sets new standards for server design, with great features and remarkable expansion potential. It's excellent value, too.

£6,083 exc VAT; www.dell.co.uk WEB ID 373312

PEDESTAL SERVER

HP ProLiant ML110 G7

£935 exc VAT
www.hp.co.uk
WEB ID 370198 ISSUE 206

Small but big on features, with an unusual choice of storage options for an entry-level server. Compact, affordable, well-specified and with classy remote management.

KEY SPECS 3.3GHz Intel Xeon E3-1240; 4GB DDR3; 2 x 160GB HDD; cold-swap RAID0, 1, 10; 2 x Gigabit; iLO 3

ALTERNATIVE

Dell PowerEdge T110 II

Well built, efficient, plenty of expansion room and a wide range of options to juggle the price. A fine entry-level server.

£1,123 exc VAT; Dell 0844 444 4155 WEB ID 369607

SECURITY APPLIANCE

WatchGuard XTM 330

1yr Security Bundle,
£867 exc VAT; www.broadbandbuyer.co.uk
WEB ID 375079 ISSUE 214

Not as easy to configure as, say, Netgear's UTM 150 appliance, but much smarter. It packs in a lot of security features and is more versatile than any other appliance at this price point.

KEY SPECS 1U rack chassis; 7 x Gigabit; 850Mbits/sec firewall; WatchGuard and Firebox System Manager software

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, £633 exc VAT
www.dabs.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 absolutely drowning in features, including superb cloud backup services.

Diskless, £1,369 exc VAT; www.lambda-tek.com WEB ID 371404

BACKUP DEVICE

HP StorageWorks Ultrium 3000 SAS

£2,365 exc VAT
HP 0845 270 4000
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.

£1,266 exc VAT; Span 020 8288 8555 WEB ID 213831

BUSINESS LASER

HP LaserJet Pro 400 MFP M475dw

£450 exc VAT
www.printerland.co.uk
WEB ID 374509 ISSUE 213

A lot of features in a compact, affordable device. It delivers on its speed promises and offers excellent output quality, and wireless mobile- and web-printing services.

KEY SPECS A4 colour laser MFD; 20ppm; 2 x USB 2; 2 x RJ-11; 10/100 Ethernet; 802.11n; fax; 250-sheet input tray; 50-sheet ADF; duplex

ALTERNATIVE

Dell 5230dn

Good speeds, acceptable quality, low running costs and huge expansion potential make this mono laser good for workgroups.

£317 exc VAT; www.dell.co.uk WEB ID 370231

UPS DEVICE

APC Smart-UPS 1500 LCD

£382 exc VAT
www.apc.com/gb
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.

£215 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

Unbeatable data protection features, and CA's new licensing schemes make it more affordable for SMBs and enterprises.

From £317 exc VAT; www.span.com WEB ID 373744

NETWORK MONITORING

Paessler PRTG Network Monitor 9

500 sensors, £770 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, £1,994 exc VAT; www.ipswitch.com WEB ID 370246

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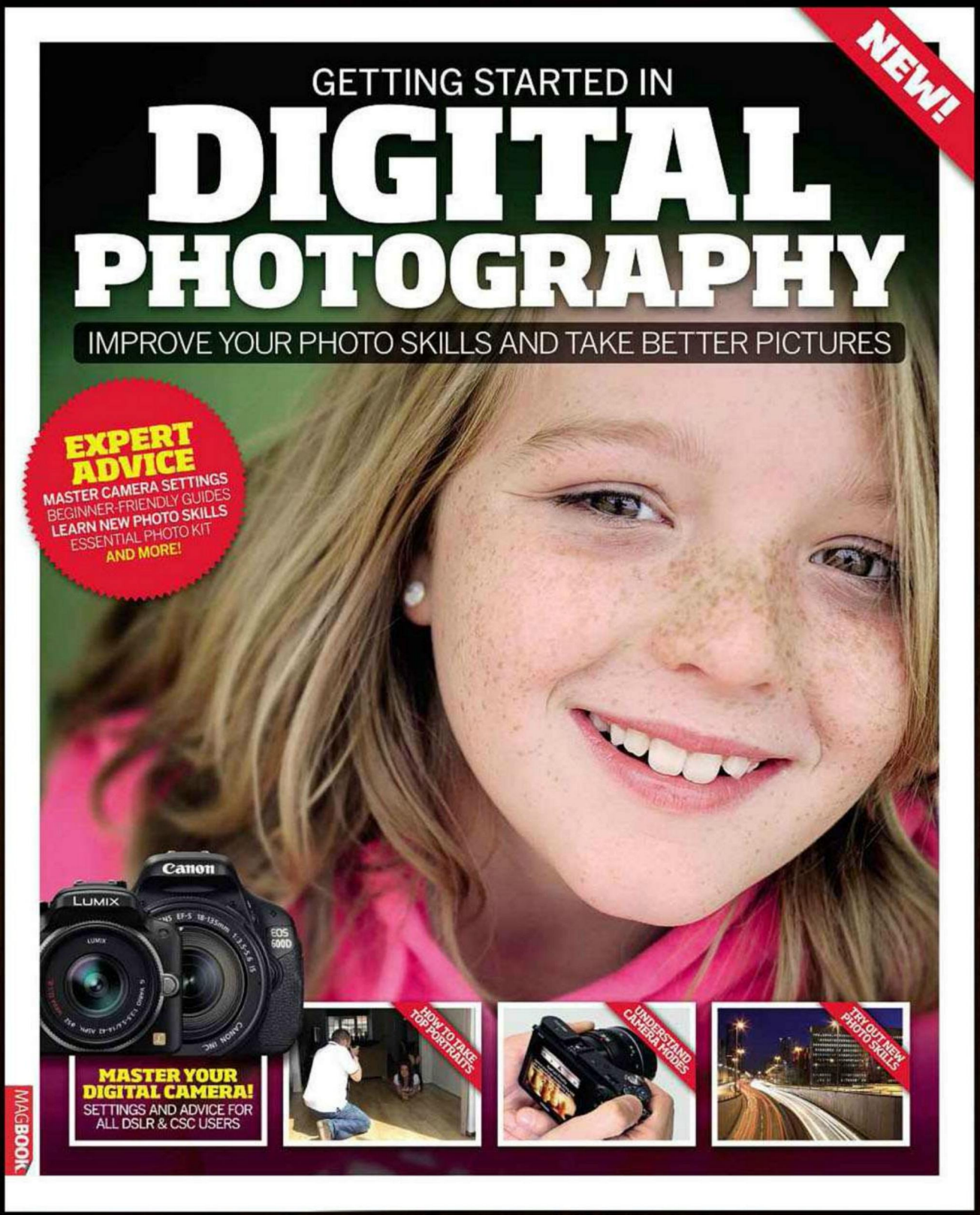

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The slumping price of Windows is bad news for PC makers, warns JON HONEYBALL

Something struck me about the price of Windows 8. To all intents and purposes, Microsoft is giving away its new operating system. Oh, I know it will cost a few tens of pounds, but in the historical context, it's all but free. All you need to qualify for an update is a licence key to a version of Windows going all the way back to XP. So that's the best part of a decade of Windows sales.

Why is this significant? Well, Microsoft recognises, and has clearly stated at its recent partner conference, that it needs to get everyone to move off XP onto something later, with the "something later" preferably being Windows 8. Or at least Windows 7, if you're a business user with a conventional laptop or desktop.

The reality is that there's still a great deal of XP and Vista out there (see *Infographic, p18*), and Microsoft has had considerably less success at moving customers forward compared to Apple with OS X, where there's a much greater uptake of the most recent version of the OS. There are various reasons for this. Apple customers are more likely to do as Apple tells them, and Apple hasn't charged much money for OS X upgrades. The upgrade isn't a significant financial consideration, unless you happen to be on old hardware that isn't supported in the newest release.

> It's possible that the end result will be that many users decide to upgrade their OS but keep their existing hardware

Steep upgrade costs cause people to say: "oh, to hell with it, I'll wait – there's something better coming along soon anyway". If the price is too high, customers simply won't bother, even if they wish to make the change.

Therefore, Windows 8 will be the cheapest version of Windows ever. And you'll be able to upgrade to the full professional version for a few tens of pounds too. And put back in the Media Center capabilities, again for free. Of course, Microsoft is saying this is a limited-time offer and, indeed, I understand that the pricing might well go back up in 2013. However, what if it doesn't?

Look at Microsoft Office. Back in December 1989, I paid £450 for a single licence of Word for Windows 1. WordPerfect, Lotus 1-2-3, and other serious business applications were all around the £300-£400 bracket, and that's ignoring 20 years of inflation.

Today, you can find a Home and Student edition of Office for around £80, and that's for all the main components of Office. It's a three-machine licence, too. I accept that you're not licensed for business use, but the slide in price is inevitable. The only thing propping up the revenue stream are business customers that continue to pay the rolling licence fees that Microsoft charges.

With the move to cloud services, the pricing pressure becomes ever more intense. I have a subscription to Office 365, which is an excellent package with surprisingly few rough edges. As part of my $20-per-month E3 package, I receive all the back-end services I need in a full-fat, full-feature version of Exchange Server. I get a desktop licence for Office Professional Plus 2010, too, licensed for up to five devices per use. For an extra two bucks per month, I could add in the PBX functionality of Lync.

If I wanted to be a small-business user, the cost collapses to $6 per month, but I don't receive some higher-powered Exchange capabilities, nor the Office licence. I could go to Google and buy a broadly similar range of capabilities for a broadly similar cost.

What's interesting is that much of this is delivered through a modern web browser. There's no intention of keeping data locally, especially if I've signed up to a SkyDrive or Dropbox equivalent. This makes the local PC ever less relevant, and ever more a box that you just walk up to and use as a springboard platform into a cloud-based world.

Where does this take the revenue stream for a vendor such as Microsoft? Looking at its accounts, it's still the case that most of its money comes from OS sales and from licences of Office. With the almost predatory pricing of Windows 8 for the upgrade market, it's possible that the end result will be that many users decide to upgrade their OS but keep their existing hardware. That would damage sales of new PCs considerably – but would Microsoft care? Providing its revenue stream held up, why would it matter to Redmond?

After all, it's shown that it has little regard for the OEM ecosystem with its announcement of Surface. I foresee interesting times ahead, and that prices will only continue to fall.

JON HONEYBALL has contributed to *PC Pro* since issue 1, when Amstrad was still knocking out PCs for £1,400 a pop.

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