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ISSUE 208 NOV 2012

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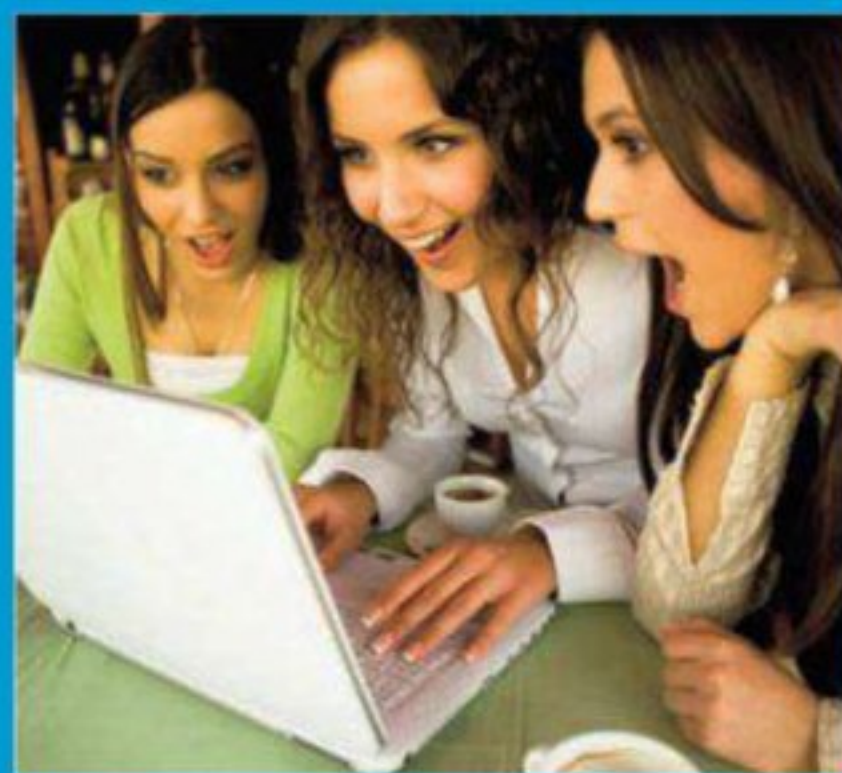
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# More screens please

We used to talk about the PC being your home's 'second screen', but these days we all have multiple screens - and the TV may not be the most important

London 2012 will be remembered for many things, but the Big British Sports Day had a few world-class British winners: Jess Ennis, Mo Farah and the BBC among them.

Auntie Beeb went big on the Olympics, utilising multiple TV channels and streaming online every minute of every sport. And people responded: according to the BBC's own stats, over a 24-hour period on the busiest days Olympic traffic to bbc.co.uk exceeded that for the corporation's entire coverage of the 2010 World Cup. On some days the BBC delivered 2.8 petabytes of data, and while Bradley Wiggins was winning his gold medal data was streamed at 700Gbps.

A huge chunk of this was live video streaming - more than 800,000 people watched Andy Murray win gold in the tennis, and that was live on free-to-air BBC TV, at the weekend when people could watch it on telly.

Online media streaming has arrived. During the Beijing games four years ago you knew if a few people in the *PC Advisor* office watched the online coverage because our connection ground to a halt. During our own Games, literally every workstation

“ **Online media streaming has arrived** ” was streaming the action. It's not that PCA staffers are any more lazy than they were (that's not possible), but the technology has improved as online streaming has grown more popular. At home, lots of people watched one sport on their TV, and another on tablet, laptop or smartphone.

Tech-industry insiders have often talked about the putative 'second screen', the device that will supplement your TV as a display offering a window into connected information and entertainment. In such a scenario the living room sofa points toward the TV, and the second screen PC lurks in the background. But the popularity of laptops, tablets and smartphones means that we all have multiple screens, and the TV is not necessarily the most important.

My satellite dish stopped working for two weeks earlier this year. I had no TV signal, but I was kept entertained by Netflix and LoveFilm on my games console, iPlayer, 4oD and the rest of the catch-up TV gang on my PC, and Sky Go on my mobile. And that's without considering paid-for media downloads to my tablet.

In the post-terrestrial era you don't need an aerial or satellite dish to access TV. You don't even need a TV tuner. And in the post-PC world we have an increasing number of screens dotted around the house via which to watch televisual entertainment. It's something that worries the makers of expensive smart TVs - very few people use apps on their TVs, and you can access 3D content on much cheaper laptops and PCs, as we explain on [page 90](#).

A big display will always be the best tool for watching films, sport and high-class drama, but that display could be one of the all-in-one PCs we review on [page 72](#). These are full-spec PCs, capable of all the productivity and media tasks you'd expect. Meanwhile, the tablets and smartphones in our Top 5 charts ([page 138](#)) make great portable screens for viewing TV and movies. Even an inexpensive laptop such as those reviewed on [page 58](#) make for a perfect workstation and media centre if you are on a budget. I'm talking to you, students.

You'll need a good broadband connection, of course, so check out our guide to getting faster Wi-Fi in your home ([page 100](#)), and our tests of homeplug adaptors and 802.11ac wireless routers ([32](#) & [66](#)). ☒



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## Reader comments



Whether it's with useful tips, pithy observations, or a good old moan, we're always happy to hear from PC Advisor readers. For your chance to appear here, keep in touch via email, our forums, comments on our news stories, and via Facebook, Google+, Twitter and LinkedIn

letters@pcadvisor.co.uk

### Flight grounded

A down side to Microsoft's recent product line overhaul is that Flight, introduced six months ago, has ceased. This is particularly annoying for those who bought the Alaska add-on, only to discover there will be no further challenges. It's a slap in the face for fans who have accepted this variation on their traditional flight-sim platform. **David Richardson**

### Where's your microSD slot?

Does it ever cross the minds of Apple owners to listen to what they're saying? Your article *Analysts cool on Google Nexus 7* in the October issue included downbeat assessments by a couple of iPad owners, who were dubious about the Nexus 7 because, among other things, it doesn't have a microSD slot. Could you please ask one of them to submit a picture showing the location of the microSD slot on the iPad. **James Gourley**

pcadvisor.co.uk

### Get the 'Classic' Windows 8

*jack ladd* gave some hope to readers of our Windows 8 review ([tinyurl.com/65jxpzL](http://tinyurl.com/65jxpzL)) who were worried about losing certain features of the Classic Windows desktop. "Classic Shell gives you back the Start button and conventional interface, along with some neat tweaks that create a 'normal' and less intrusive desktop," he recommended. You can download Classic Shell free from [classicshell.sourceforge.net](http://classicshell.sourceforge.net).

### All about the apps

Windows 8 is all about the apps, writes Jim Martin on [page 146](#), but is that a good thing? "Microsoft is obsessed with trying to compete with the iPad. There is no way that serious video-editing or business software will lend itself to Windows 8. Microsoft made a boob with Vista by not listening to its customers, and it is about to do so again. This is one release I definitely won't be buying," wrote *Anthony Steele728*.

### Faster 4G, but what about me?

Ofcom has given the go-ahead to Everything Everywhere to roll out fast 4G mobile broadband later this year, as we reported



at [tinyurl.com/c4sfc5t](http://tinyurl.com/c4sfc5t). "That's wonderful news," sniped *Unclesaminlondon*. "We will get faster mobile broadband, but BT still can't bring 8Mbps to its slow spots. I can't even get 2.5Mbps!"

### Assault on Assange

WikiLeaks founder Julian Assange has called on governments for an end to the persecution of whistleblowers (read more at [tinyurl.com/d4a8vmh](http://tinyurl.com/d4a8vmh)). "Assange is trying to do good, but he has gone about it in the wrong way, with the result that everyone is talking about him, and no-one is talking about anything he has uncovered that might actually be important," suggested *Mike*.

## Flagged: Star letter

### Microsoft to interrupt Apple's plans for world domination

While no-one can doubt that Apple has done an amazing job in selling its iDevices to the bored masses, world domination is by no means complete. In the case of the iPad, there is still a significant number of professional users (including myself) who still lug about either laptops or netbooks, believing that the advantages significantly outweigh the disadvantages.

If Microsoft can tempt this group to switch to its Surface tablet, which is more like a tablet/netbook hybrid than an iPad clone, it stands a good chance of being very successful. *Jezclayton*

*Marie Brewis, managing editor, wrote: Microsoft has in the past tried and failed in producing a Windows tablet, and it's latest attempt sees it entering a fierce market in which Apple's 70 percent share suggests it took the correct approach with its iPad. Neither is the Surface the only tablet to which you can attach a keyboard and peripherals, but it will be the first such slate to run Windows RT. That may be the key here, but we won't know for sure until launch.*

*In the meantime, this Crucial SSD might just improve your computing experience with that laptop you insist on lugging about...*



Our Star letter writer wins a 128GB Crucial m4 SSD with Data Transfer Kit, worth £126. For your chance to win, tell us your thoughts on the latest tech issues:

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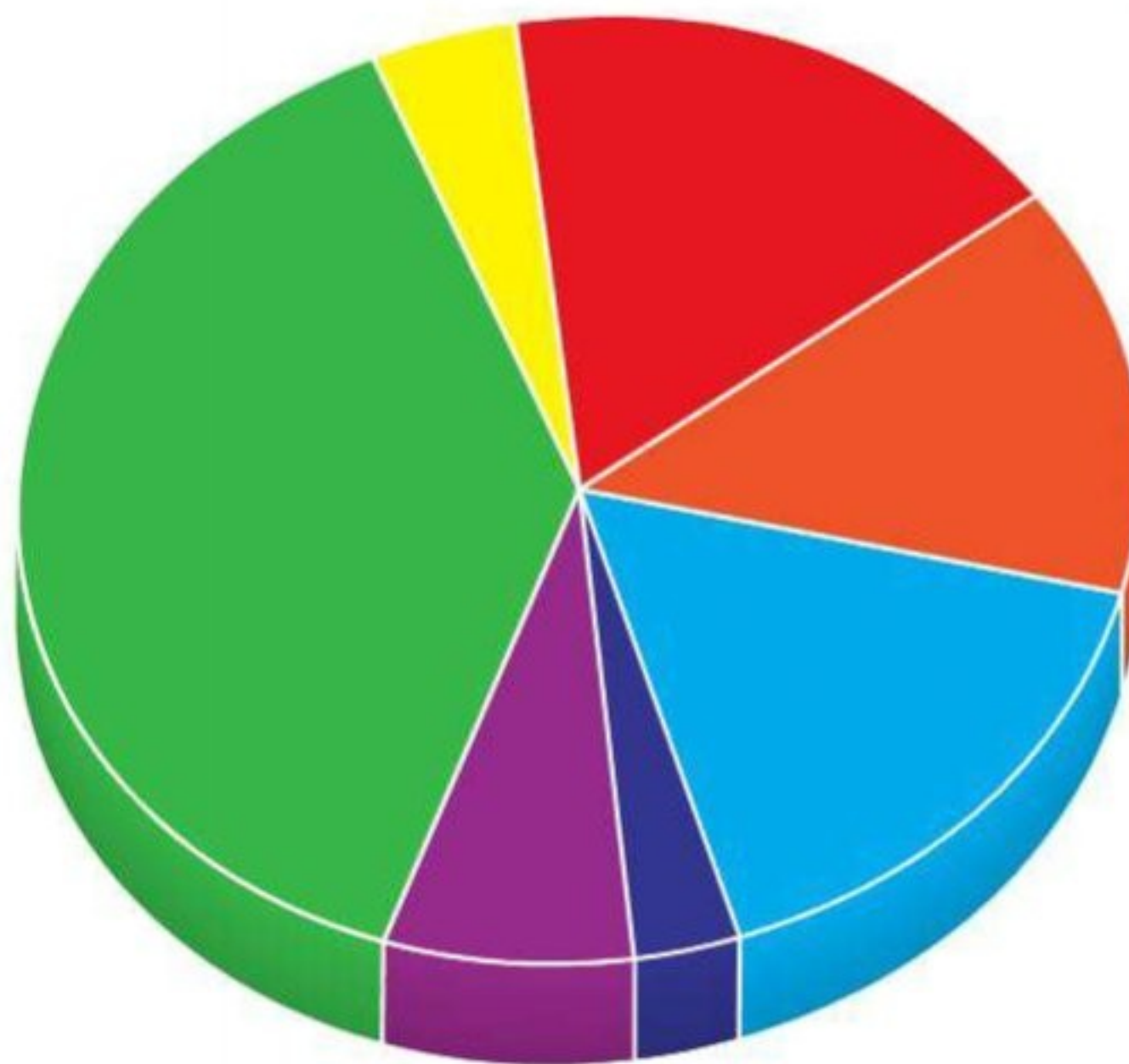
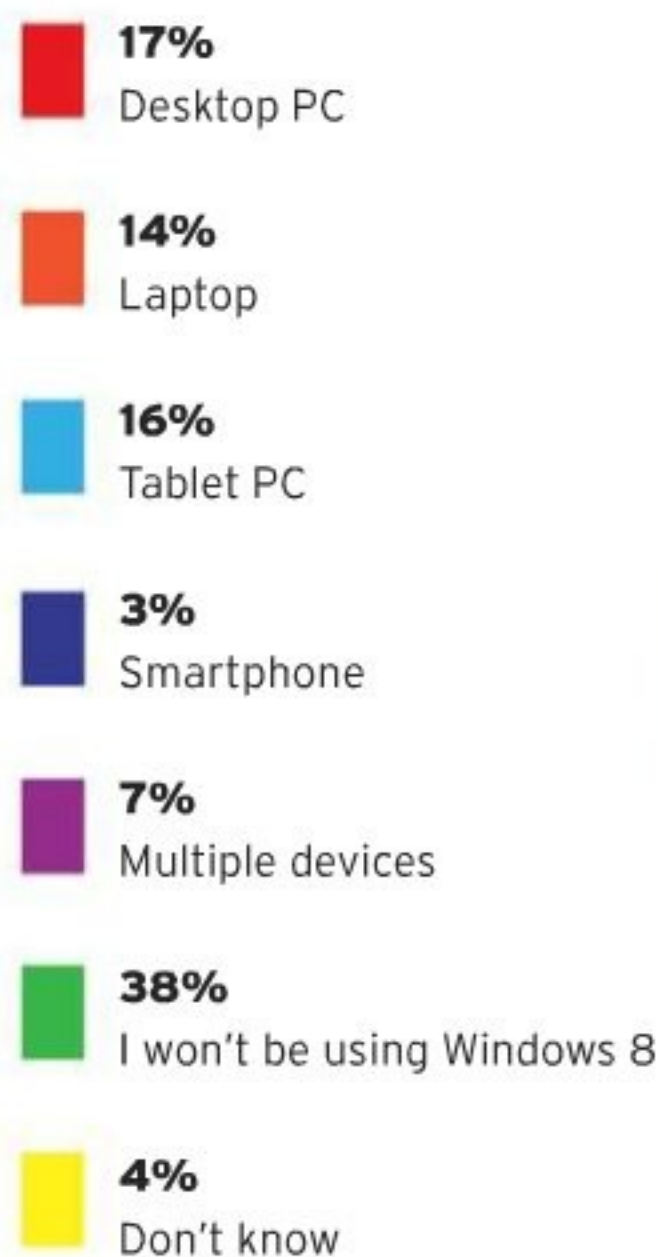




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## pcadvisor.co.uk/polls

On which type(s) of device would you prefer to use Windows 8



tinyurl.com/8s9mqrh

## facebook.com/pcadvisor



### No Mac users allowed

When we told readers how to install Windows .exe files on a Mac, *Antony D'Andrea* thought we were being generous. "Mac users should be punished and not allowed to use Windows at all (like it is vice versa)," he wrote.

### Check your broadband speed

Ofcom has announced that the UK's average broadband speed has increased from 7.6- to 9Mbps, so we invited our Facebook fans to try the broadband speed test on our website (speedtest.pcadvisor.co.uk). "I barely get 1.5Mbps here, and BT won't do anything about it," wrote *Gill Williams*. *Issac Yua* was more enthusiastic, and wrote: "7.2Mbps is available in all the major Nigerian cities. Nigeria is the hub of internet in Africa!"

### Students with cash

We posted photos of the budget Windows laptops in this issue's group test (turn to [page 58](#) to read our reviews), expecting them to appeal to students who were about to go back to school or university. But the kids have more cash than we thought - "Macbooks all the way," wrote *Aidan Lovegrove*.

### iPhone 5 design

The rumour mill is going into overdrive over a forthcoming iPhone 5, despite Apple having yet to officially confirm such a device will ever exist, and multiple fake images have 'leaked' online. "The iPhone 5 looks the same as all the others. Apple should take itself to court and sue itself over the design," joked *Craig Frank*.

### Same but different

The ongoing court battle between Apple and Samsung is constantly in the news, with seemingly no end to the drama. We posted a leaked slide from a Samsung document, in which it compares the iPhone to one of its own handsets in an effort to improve its design, but notes that it must remove the "feeling that the iPhone's menu icons are copied by differentiating design".

"That's great. So, let me get this straight, its R&D consists of making the Samsung user interface more iPhone-like, but without implicating a direct copy? Imitation is the sincerest form of flattery..." commented *Stephane Trahan*.

"We find it hilarious," chirped our sister mag, *Macworld UK*. Yeah, we bet you do... ☒

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### Internet addicts

Our **Forum Editor** recently admitted to being an internet addict, and he's certainly not alone at PCA Towers - nor in Speakers Corner, as you'll discover at [tinyurl.com/8ewjz3b](http://tinyurl.com/8ewjz3b).

**rdave13**: "Any queries then it's a search engine; banking, then it's online. No snail mail, no telephone (except in special circumstances) - it's all at your fingertips. I'd rather do without the TV than the net."

**LastChip**: "I would find life without the internet ridiculously hard. My wife recently researched and booked a holiday; my only prerequisite was that the destination must have internet access. No internet, no booking!"

**woody**: "I use the web because it's a way of keeping in touch with the outside world without leaving the house. Like a number of inventions, it can be both your best friend and your worst enemy... But, if I had to count the pennies, it would be one of the first things to go."

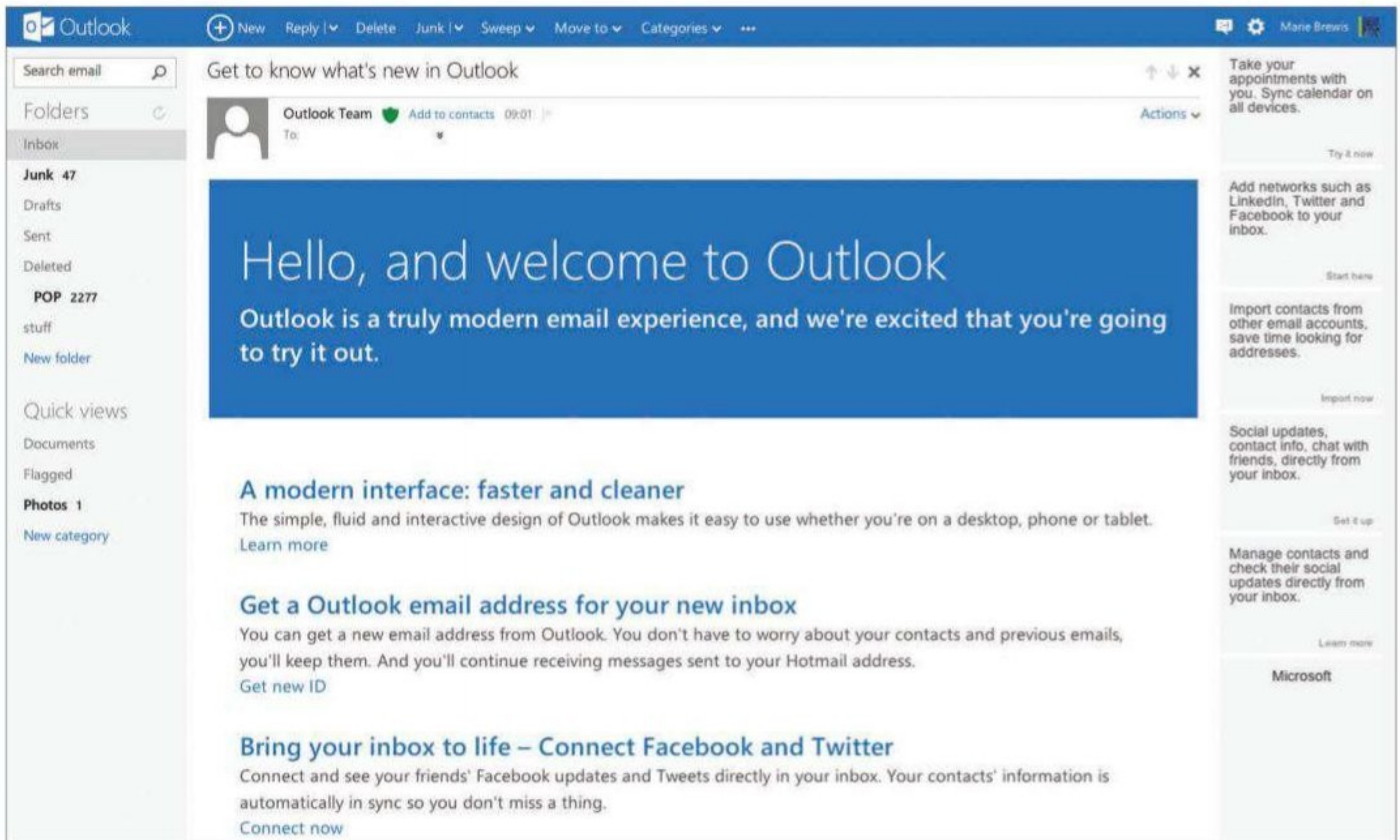
**Aitchbee**: "I think I could survive without the internet because I don't shop, bank, or download video or music online. But I would miss *PC Advisor* (aww), and with all that extra free time I would be able to catch up with my household chores."

**fourm member**: "I'm facing the prospect of going without my web connection for 25 days, and I don't like it one bit. I'm sure my friends couldn't survive 25 days of me popping round to borrow their connection, because I know I couldn't go 25 days offline."

**amonra**: "I think I could manage okay without an internet connection, but my wife says I would be hell to live with!"



Got a story? Contact Chris Martin  
chris\_martin@pcadvisor.co.uk



# OUTLOOK.COM REPLACES HOTMAIL

Microsoft unveils its modern inbox, with a cleaner interface, plus social-media and SkyDrive integration

Microsoft has overhauled its Hotmail email service and replaced it with Outlook.com.

The preview of Outlook.com went live in August, with a clean interface and no adverts. One million users signed up within a few hours of the launch.

Microsoft describes Outlook.com as a "modern email designed for the next billion mailboxes". It expects Outlook.com to draw away people from competing webmail services, such as Gmail and Yahoo Mail.

"We needed to take a bold step, break from the past and build you a brand-new service from the ground up," it said.

## Outlook improvements

Outlook.com integrates with Facebook, Twitter and SkyDrive, while Skype support is to be added in the near future. This means you'll see photos of your friends and their recent status updates, and you'll be able to conduct IM and video chat.

Outlook.com can sort your messages by type. For example, email from contacts, newsletter subscriptions, e-commerce sites and social networks is separately grouped.

According to Microsoft, the cleaner interface allows you to preview 30 percent more of a single message, or view more email subjects onscreen at once.

The webmail service also includes Office Web Apps, the online versions of Word, Excel, PowerPoint and OneNote, along with the SkyDrive storage service.

Existing Hotmail users can try out the new service by clicking Upgrade in the Options menu; it's also possible to add an @outlook.com email address. Alternatively, you can simply log into Outlook.com using your Windows Live ID. Passwords, contacts, old messages and any rules you previously created are automatically transferred.

The response from analysts hasn't been as positive as Microsoft hoped, however.

## Not so hot

"This will probably appeal to Microsoft loyalists and those tied to the Outlook email client. However, there aren't any revolutionary features here," said Greg Sterling of Sterling Market Intelligence.

He said the lack of adverts might lure users from Yahoo Mail, but there's not enough to tempt Gmail fans.

"There is no new technology here. The filtering tools have been around for some time, as has social-network integration," added Matt Cain, a Gartner analyst.

"What is new is the cleaned-up user interface, the marketing spin, and the tight integration with Office Web Apps and SkyDrive, and the forthcoming integration with Skype," Cain added.

Eventually, Outlook.com will completely replace Hotmail, but Microsoft will allow users to retain their @hotmail.com, @live.com and @msn.com email addresses.



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# MICROSOFT OPENS OFFICE STORE FOR APPS

With billions of Office users worldwide, the Office Store presents a huge opportunity to developers

Microsoft has opened a preview version of its Office 2013 app store.

The software giant unveiled the next version of its productivity suite in July (see [page 14](#)), and is now offering a look into what we can expect in the way of apps for Office. Microsoft said it has built the store for three reasons: integration, simplicity and developer opportunity.

Vivek Narasimhan, Microsoft's product marketing manager for Office, said: "We are excited to take you behind the scenes to meet one of the best kept secrets in the next version of Office and SharePoint: the Office Store."

"We've built the store so you can integrate the very best of the web with the powerful features of Office and SharePoint."



Microsoft is adopting a similar approach to Apple with a strict app-screening process. "All apps that are listed in the Office Store are extensively validated so users can trust them," it said.

You can add apps to Office by selecting 'Apps for Office' from the Insert tab.

Many apps are already available in the store, and all are based on web standards. This means they will load straight away, without a complex installation routine.

Your apps follow you to whichever machine you log in from. Send a document created with an app and the recipient will be pointed toward the appropriate app download prior to viewing.

Microsoft touts the Office Store as a massive opportunity for developers, since billions of people use Office. Microsoft will demand a 20 percent stake in all transactions that take place in its store, although developers can also list free apps and link to their own site for purchases.

## Microsoft Surface RT tablet to launch with Windows 8 in October

ARM-powered tablet will be competitively priced against comparable tablets and Intel Ultrabooks



Microsoft has announced that its Surface RT tablet will be released on 26 October, along with its Windows 8 operating system.

As expected, Surface will go onsale at the same time as Microsoft's revamped OS, but only in its ARM-based Surface RT form; the Ivy Bridge-powered Surface Pro is due to appear some 90 days later, in early 2013.

"The next version of our operating system, Windows 8, will be generally available on 26 October 2012. At that time, we will begin selling the Surface, a series of Microsoft-designed and manufactured hardware devices," said Microsoft.

Microsoft has yet to reveal pricing information for either version of the Surface tablet. It's rumoured that Microsoft will follow Google's lead with the Nexus 7 and sell the product as a loss leader (see [page 18](#)), but it isn't giving anything away.

"Suggested retail pricing will be announced closer to availability and is expected to be competitive with a comparable ARM tablet or Intel Ultrabook-class PC," said Microsoft.

Surface has already caused some controversy, given that Microsoft is a software company that traditionally partners with hardware vendors to create products.

## Amazon e-books outselling paperbacks in the UK

The success of the Kindle e-reader could signal the end of the paperback book

Amazon has announced that e-books are outselling print books on its UK website.

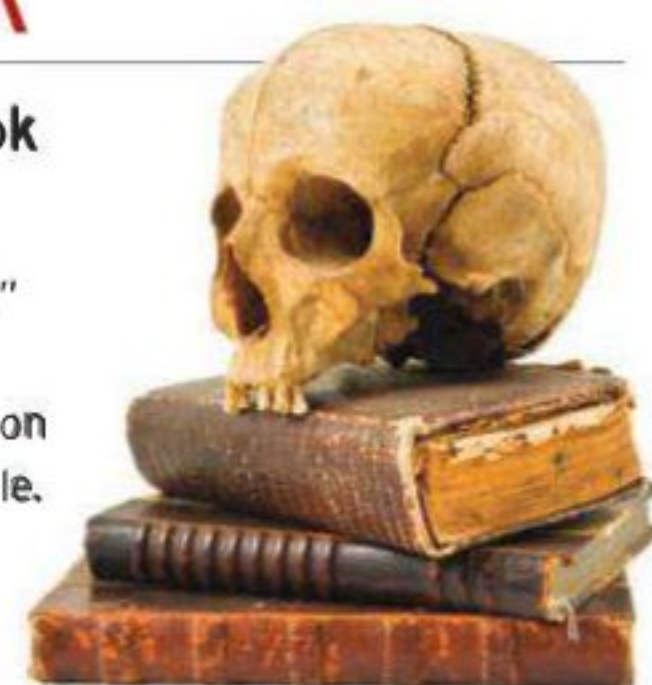
The Kindle e-reader maker said that for every 100 paper- and hardback books it sold, it now sells 114 e-books.

Jorrit Van der Meulen, vice-president of Kindle, said: "As a result of the success of Kindle, we're selling more books than ever.

"UK customers are now choosing Kindle books more often than print books, even as our print business continues to grow."

The 6in-screen Kindle launched in 2010, and has proved particularly popular as a gift with the standard Wi-Fi-only version costing just £89. Touch and Keyboard versions are also available.

The firm said it hit the same milestone in the US less than four years after introducing Kindle; to reach this target within two years in the UK shows how quickly e-books have taken off.







## BT has 500,000 London hotspots

BT announced that it reached its target of 500,000 Wi-Fi internet hotspots across London for the 2012 Olympic Games. The broadband provider launched new hotspots along the River Thames, and set more live inside the Olympic Park. A total of 200,000 hotspots were added over the past three months to achieve the target in time for the Opening Ceremony.

**MORE:** [tinyurl.com/bvtnk3s](http://tinyurl.com/bvtnk3s)

## Virgin touts 3m Tube Wi-Fi users

Virgin Media has announced its London Underground Wi-Fi network has delivered nearly three million online sessions, consisting of tasks such as sending a tweet or email and visiting websites. The firm put the Wi-Fi network in place for the London 2012 Olympic Games and, since then, 2.7 million sessions have been delivered.

**MORE:** [tinyurl.com/9tvb5tv](http://tinyurl.com/9tvb5tv)

## O2 launches Pocket Hotspot

O2 has launched its Pocket Hotspot, a mobile Wi-Fi internet gadget (see [page 28](#)). The pocket-size mobile Wi-Fi device lets you simultaneously access the internet on up to five devices, including smartphones, tablets and laptops. The O2 Pocket Hotspot costs £59 inc VAT, while O2 offers a range of data packages.

**MORE:** [tinyurl.com/cczjnhc](http://tinyurl.com/cczjnhc)

# OFCOM REVEALS LATEST 4G AUCTION PLANS

98 percent of the UK is expected to be within range of a 4G network by 2017

Ofcom has announced its plans for the auction, rollout and consumer availability of 4G mobile broadband.

The regulator has confirmed that the process will be underway by the end of 2012. However, bidding won't take place until early 2013. Ofcom expects rollout to start from mid-2013, and for 4G broadband to be available to consumers later in the year.

"The largest ever auction of spectrum for mobile services in the UK is set to get underway by the end of 2012, laying the path for next-generation 4G networks to be rolled out next year," it said.

The spectrum auction will offer around three quarters of the



spectrum currently in use, and 80 percent more than the 3G auction of 2000. Ofcom intends for 98 percent of the UK to be able to access 4G broadband by the end of 2017.

Ed Richards, Ofcom's chief executive, said: "The 4G auction has been designed to deliver the maximum possible benefit to consumers and citizens across the UK."

There will be at least four credible national wholesalers of 4G mobile services, according to Ofcom. A minimum amount of spectrum will also be reserved for a fourth operator - either Hutchison 3G or a new candidate.

The 4G auction will offer at least two spectrum bands, 800MHz and 2.6GHz, with the former well suited to providing high levels of coverage.

## TALKTALK OFFERS FREE YOUVIEW SET-TOP TV BOXES

TalkTalk has announced it will give its customers free YouView set-top boxes.

As with BT, the ISP is bundling the TV service with its broadband internet packages. TalkTalk Plus customers can get a free YouView box, worth £299, without an extra monthly fee.

As always with deals such as this, there is a catch: existing

customers will have to sign a new 24-month contract, while new customers will be subject to an 18-month contract. There's also a £50 installation fee, which will apply during the rollout phase.

YouView offers Freeview TV channels, plus catch-up and on-demand services, such as BBC iPlayer and 4OD. You can record, pause and rewind live TV and, for

an extra charge, tune in to Sky Sports and Sky Movies.

The firm plans to launch a TV service for TalkTalk Essential customers next year.

TalkTalk has also launched a deal in which it will offer existing Plus customers a free year-long subscription to Lovefilm Instant, worth £4.99 per month, for unlimited movie streaming.

## Ofcom gives Everything Everywhere 4G boost



Telco allowed to utilise 2G bandwidth for 4G service

Ofcom has allowed Everything Everywhere (EE) to re-use its existing 1,800MHz spectrum for next-gen 4G LTE and WiMax.

Ofcom intends to vary EE's 1,800MHz licence to allow it to be used for 4G services. The operator will begin its 1,800MHz 4G trial in Bristol in April.

Ofcom said: "Allowing EE to re-use its spectrum in this way is likely to bring material benefits to

consumers, including faster mobile broadband speeds and wider mobile broadband coverage in rural areas."

However, Vodafone responded: "The regulator has shown a careless disregard for the best interests of consumers, businesses and the wider economy through its refusal to properly regard the competitive distortion created by allowing [only] one operator to run [4G] services." ☒



# D3200



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*At the heart of the image*





# Office 2013: Great enhancements; great big holes

Jean Carlos Perez finds that although Microsoft has made major improvements in Office's user interface and application functionality, the lack of an iPad version is concerning

**T**he new version of Microsoft's Office productivity suite offers compelling enhancements to its capabilities and interface design, as well as improvements in cloud functionality that should make it a far better product than its predecessor.

However, Office 2013 has gaps in support for non-Windows mobile platforms, while questions about pricing and a continued reliance on locally installed software weaken the suite's potential for success and could open the door to competitors.

That's the initial assessment from various industry analysts who are following the release of Office 2013's public beta.

"There's a lot of value there," said Sarah Rotman Epps, a Forrester Research analyst. "It's the best ever version of Office."

So far, the consensus among many analysts and reviewers seems to be that Microsoft has done an outstanding job in simplifying and improving the suite's user interface, which has been criticised in the past as cluttered and confusing, and optimising it for tablets that use hand gestures and styluses for input.

Also getting nods are new features such as a Read Mode in Word that improves the reading experience, and a PDF Reflow capability for opening and editing PDF files.

A Presenter View in PowerPoint has also been praised because it shows various elements to the presenter that aren't visible

to the audience, including notes, slides and a clock for timing presentations. A better user experience and more powerful data-analysis tools have been highlighted in Excel, too.

"There is a lot of new features in the applications themselves," said IDC analyst Melissa Webster. "They add up to increased user productivity."

## Office 365

Microsoft is also getting applause for its advancements in cloud functionality. While the company will continue selling Office via an upfront, perpetual licence, a cloud-based subscription service, which carries the Office 365 brand, will also be available.

In its current form, Office 365 is an online productivity suite for business users that typically includes versions of Exchange, Lync and SharePoint, as well as Office Web Apps. Microsoft will extend Office 365's availability to consumers, where it will work as a hosted version of Office 2013. Although it is a cloud-based service, including online storage and upgrades delivered automatically, most of the software components need to be installed locally. Buyers will be able to install the software on up to five computers.

Other cloud enhancements include tighter integration with Microsoft's SkyDrive storage service, which lets you save files and preferences online, then access them from multiple devices. Office on Demand will even

let you stream a full version of Office to a PC you don't own for one-off sessions.

"The cloud is a big theme in this release. We see Microsoft's cloud strategy evolving and taking another big step," said Webster.

## Installing the cloud

Unlike Google, whose various apps are installed on its own servers and accessible through a web browser, Microsoft's Office 365 suite must still be installed on each device on which you wish to use it. However, the Home Premium version will offer 20GB of SkyDrive storage space for documents.

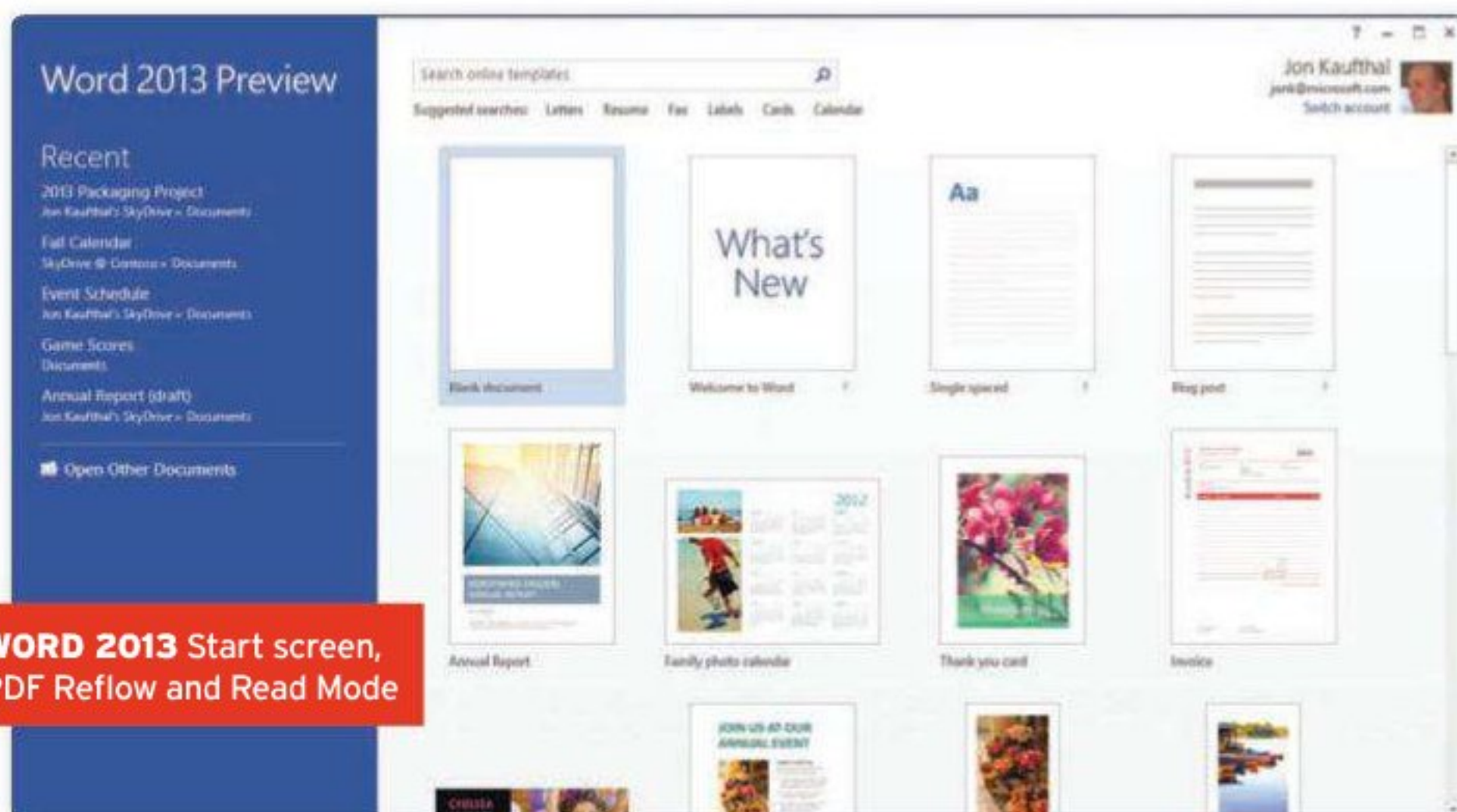
The conundrum for Microsoft is that there's a limit to the functionality that vendors can provide in fully cloud-hosted applications. That's the case with Office Web Apps, for instance.

"To run the full, high-octane versions of the applications, you need them installed on the user's machine," said Webster.

Eventually, browser-based applications will reach a level of functionality that's on par with locally installed applications, said Rob Koplowitz, a Forrester Research analyst.

That future is closer in some applications, such as webmail, but further away in others, such as spreadsheets, he said.

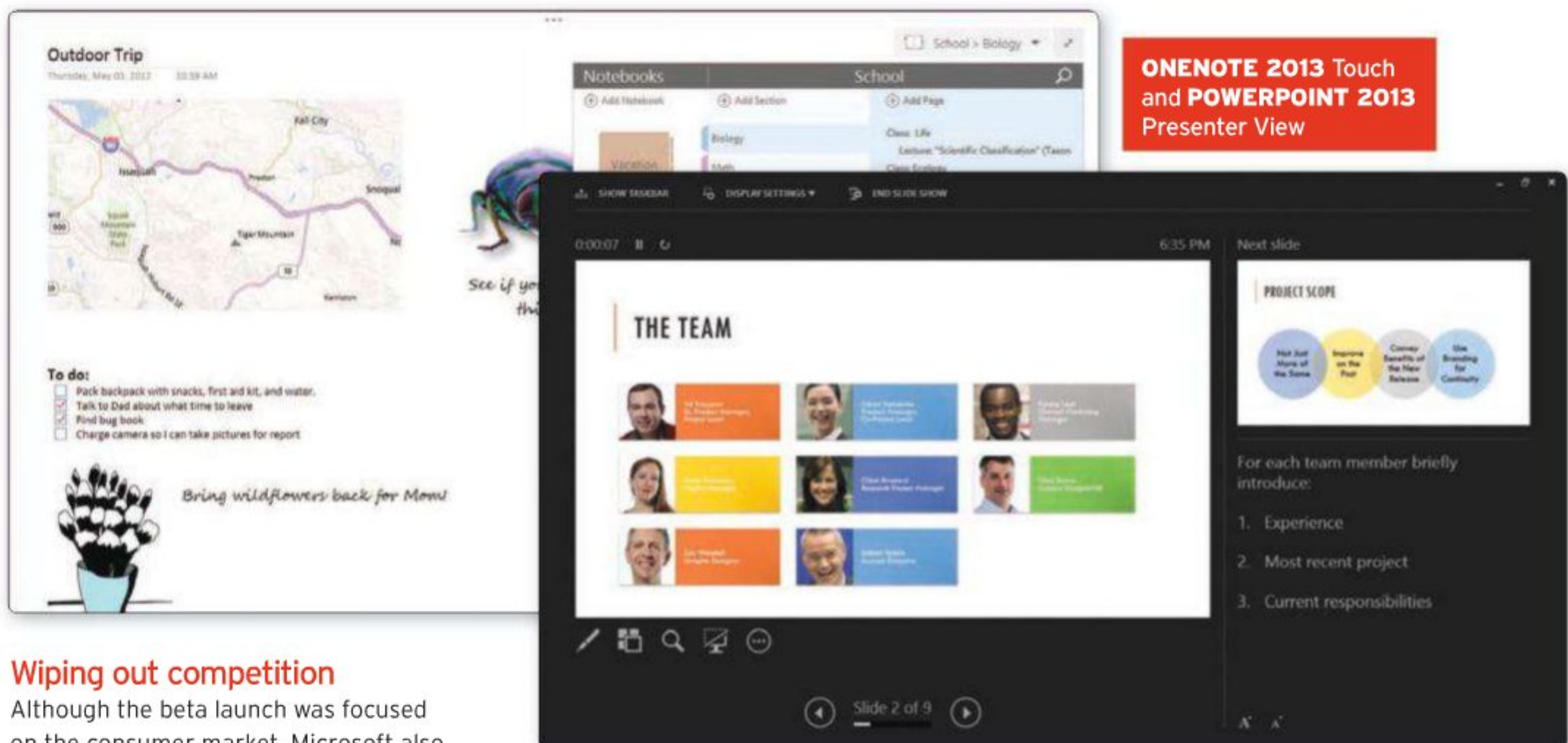
"For the time being, Microsoft is leveraging the cloud in a clever way to bring together the best of both worlds," said Koplowitz.



**WORD 2013** Start screen, PDF Reflow and Read Mode







## Wiping out competition

Although the beta launch was focused on the consumer market, Microsoft also addressed the SMB and enterprise markets by stressing that the upgrade effort extends to collaboration and communication server products such as Exchange, Lync, Yammer and SharePoint, and by announcing new subscription options for workplace use.

By tying together all these different products, Microsoft is making an aggressive move to try to wipe out the many startups that have sprung up in recent years to provide solutions for enterprise collaboration, cloud file storage, and sharing and productivity applications, Koplowitz said.

"Microsoft is following a strategy of bundling and integrating products, making them work well together, and pushing down competitors' products to the level of features, so it can own the knowledge worker experience from end to end," he said.

## Platform support

Microsoft is also stressing the point that Office 2013 is available across a variety of Windows 7 and Windows 8 devices, including desktop PCs, laptops, tablets and smartphones. It will also be available for OS X desktops and laptops.

However, a gaping hole in this strategy is Microsoft's silence and apparent reticence to create versions of Office for non-Windows tablets and smartphones, in particular iOS and Android devices.

Both at home and at work, people are using a variety of devices - Windows and Mac OS desktops and laptops, iPads, iPhones, Android smartphones and so on - and expect apps and data to be available across them.

"The big question is what Microsoft's mobile strategy is beyond Windows," said Rotman Epps. "It leaves Office 2013 open to disruption."

Particular threats are productivity suites that, despite lacking the comprehensive feature set of Office, work on iOS and Android devices, such as Quickoffice.

Another area where Microsoft can improve is in simplifying the bundling and licensing of Office 365, which now encompasses many options, variables and packages for consumers, SMBs, enterprises, government agencies and schools.

In this area, Google Apps has managed to appeal to customers attracted by its simpler and more streamlined offer, with fewer packages and straightforward pricing, said Guy Creese, a Gartner analyst.

"Microsoft should be using the cloud as an opportunity to simplify things and it isn't," Creese said. "It's better than it was, but not as clean as it could be."

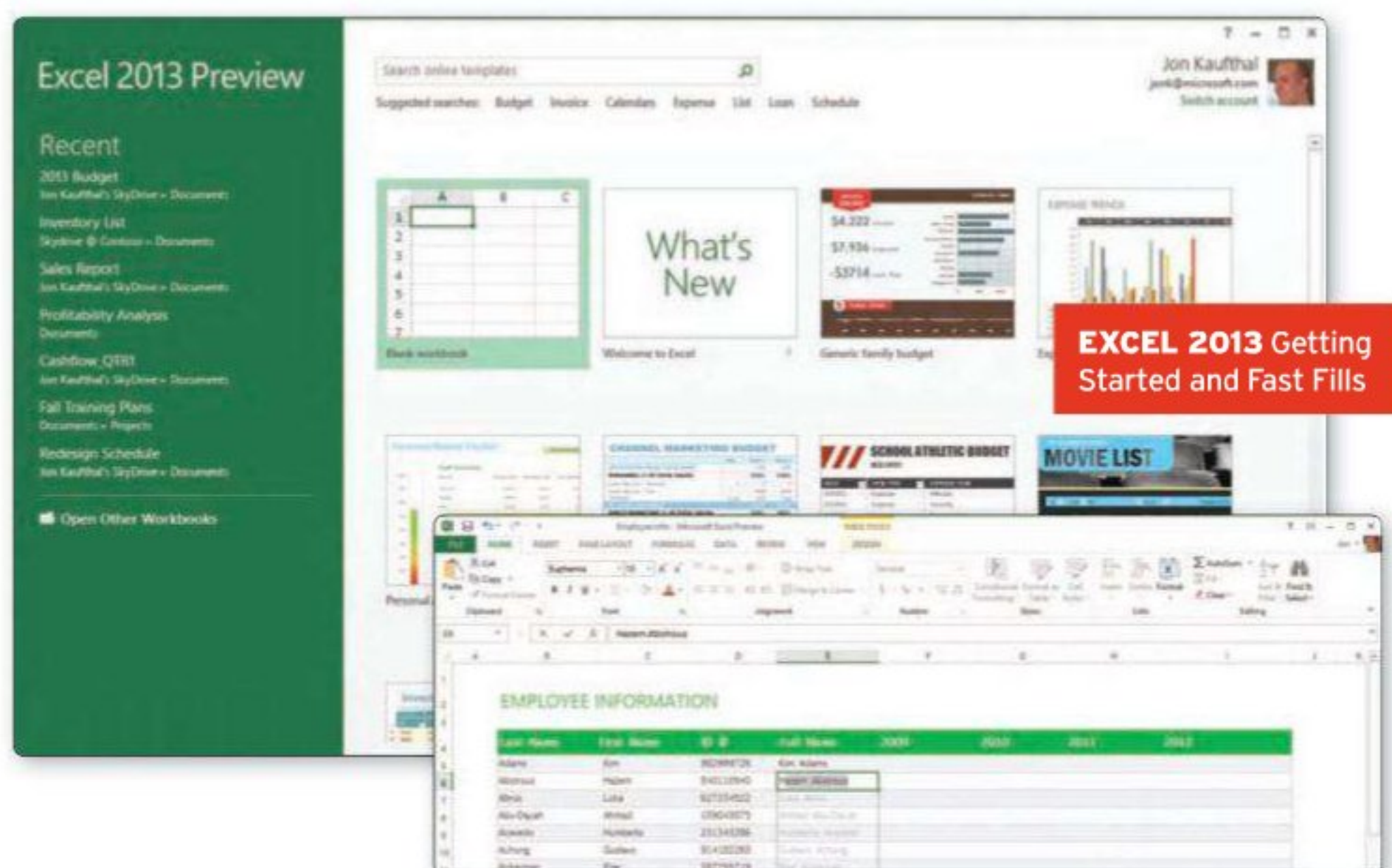
## Pricing

A big, unanswered question is price. Office has never been cheap and, with increasing pressure from free and low-cost alternatives, the issue has become a critical element for consumer and workplace buyers.

"The shoe waiting to drop is how much it's going to cost," Creese said. "It's the part everyone wants to know before making a decision on whether to purchase Office."

The new subscription-based model, in which customers pay a monthly or annual fee, could entice some buyers who have been put off by the perpetual licence price. However, depending on the monthly or annual fee, it could serve as a disincentive.

Microsoft has yet to announce a shipping date for Office 2013 and 365. Windows 8 will ship on 26 October. ☒



**EXCEL 2013** Getting Started and Fast Fills





## Apple slaps Google with the iPhone 5

Daniel Ionescu says that the iPhone represents the bitter end of Apple- and Google's relationship

**T**he next-generation iPhone is set to bring some radical changes to users, and it will also mark a very public break-up between Apple and Google. Much-loved Google products on iOS will now disappear or be replaced with Apple variants, while hardware design changes will bring long-term improvements, but short-term headaches for some users.

The latest beta releases of iOS 6.0 are giving a clearer indication of which of Google's services Apple will drop or replace with its own, with several reports indicating forthcoming design and hardware changes that you'll want to keep in mind. Until the new iPhone is announced on 12 September, as reports indicate, here are the changes being discussed and what they mean.

### Google Maps

Apple bought several mapping companies to produce its own mapping product, replacing the Google Maps app. The main difference between Apple and Google's products is that the former uses resolution-independent vector maps, while the latter uses layered images for each zoom level. The advantage of Apple's solution is that you don't have to wait for blocks to load as you zoom in, which makes for a smoother experience.

Like Google Maps for Android, Apple is introducing in its iOS 6.0 Maps app 3D buildings and turn-by-turn (voice) navigation,

but there will be one thing missing: Street View. Google already has the Earth app for iOS, so it's entirely possible that the company could release a standalone Google Maps app in the App Store, just like it said it would with another soon-to-be-gone iOS app: YouTube.

### YouTube

YouTube is another Google app to be spiked from iOS. The video-watching app dates from the early days of iOS, but won't be offered with version 6.0. Instead, Google said it is developing its own YouTube iOS app, to be launched in the App Store at a later date.

The lack of a YouTube app probably won't make a big difference to users. You will be able to watch YouTube clips within Safari via the mobile version of the site, rather than having a link open automatically in the YouTube app.

In developing its own YouTube app, Google will also have the ability to introduce advertisements in the app, and more frequently update the app with new features. In Apple's hands, the YouTube app has seen very little improvement over the years.

### 30-pin dock connector

The next-generation iPhone is expected to have a 19-pin dock connector, a change that could disrupt the accessories market that caters to the 30-pin connector currently found on the iPhone. The current 30-pin

connector has been around since the first iPods, but Apple needs a smaller connector to make the new iPhone thinner and to incorporate a 4G radio.

However, moving to a new and smaller dock connector won't be without its problems. While accessory manufacturers slowly start adopting the plug as iPhone 5 sales grow, Apple is expected to introduce an adaptor that would make the iPhone (and later iPads) compatible with the old-style connectors. However, the new dock connector should also make people less reliant on using wired accessories and push sales of AirPlay-compatible devices.

### Arrivederci microSIM

Another change designed to leave more space inside the iPhone 5 for components is a smaller SIM card. NanoSIMs are around 40 percent smaller than the microSIM cards introduced with the iPhone 4 (they measure 12.3x8.8x0.7mm). Apple proposed this standard over competing proposals from Nokia and Motorola, and the design will offer the same functionality as current SIM cards.

While the smaller SIM card might make a difference for Apple's internal iPhone design, for users the transition should be relatively straightforward. The nanoSIM can be packaged and distributed in a way that is backward-compatible with existing SIM card designs. ☒





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## Why Google is selling its Nexus 7 so cheaply

Matt Egan examines Google's motivation for launching the Nexus 7, and asks whether it's a good deal for consumers

**T**he birth of the iPad breathed life into the tablet market. It also killed it dead. At the same time as making tablets the most desirable tech objects around, the iPad dominated the market to such an extent that it hasn't yet endured a decent rivalry. We hope the Microsoft Surface will bring something new to the market - the RT should in principle match iPad-like specs with the world's most ubiquitous computing platform. But, to date, Android tablets have merely been blown-up budget smartphones, and Windows tablets shrunk-down laptops.

The former is better than the iPad at nothing, and may be prone to malware. The latter is... well, there's a reason Microsoft doesn't shout about X86 Windows tablets,

and it relates to the fact that, in use, my Samsung Series 7 slate stretches to about four hot-and-heavy hours of battery life before it keels over. (And the Series 7 is the best Windows tablet I've tried.) The Surface Pro (with its Core i5 CPU) may be in the public domain only because Microsoft doesn't want to annoy Intel.

Things recently changed in the tablet world, however. Google has taken Asus' putative MeMo tablet, rebranded it as the Nexus 7, and is selling it for less than half the price of an iPad. This is, as they say, somewhat disruptive.

Now when people ask me what tablet to buy, I can honestly give them a more interesting answer than 'get an iPad'.

At 7in, the Nexus 7 is a more portable device than the iPad, and retailing from just £159 it's a massive bargain. It's not an iPad-killer, far from it. The iPad is closer to a full-spec PC in its functions, whereas the Nexus 7 is a consumption device. It's a souped-up iPad touch or Amazon Kindle, designed to be your greatest tech toy. If you want to spend £499 on an iPad, you'll be getting the best tablet you can buy; at less than half the price, the Nexus 7 is a bargain for those who don't require the iPad's creative capabilities.

I've been using the Nexus 7 for a couple of weeks now, and it's the first non-Apple tablet I've liked without reservation. It's a high-quality web-browsing and email device - but you'd expect that. What's interesting is



“

The Nexus 7 is that rare thing - an unmitigated bargain

”

that I've spent more money in Google Play in two weeks than I did in two years of using other Android tablets. In part this is because the Play Movies, Play Books and Play Music apps make it easy and desirable to do so. But also it reflects the generally slick and consumer-friendly nature of both Android 4.1 Jelly Bean and the hardware itself, and the fact that I just want to use the Nexus. All the time. It's a great device at a fabulous price.

There are things missing: cellular connectivity, storage, a proper camera, to name but a few. But you don't miss them if your principle reason for using the Nexus is to watch movies, play games, listen to music and read books, on the move or on the couch. If you're on a train then you'd be more likely to Tweet and email from your phone, anyway. Within reach of your home network, the Nexus 7 is ideal for social networking, email and browsing.

### How can Google sell the Nexus 7 so cheaply?

Various publications have pulled to pieces the Nexus 7, and suggest that the parts alone would cost in excess of £100. So when manufacturing, marketing, distribution and software-licensing costs are taken into account, there is no doubt that Google is taking a hit on every Nexus 7 it is selling - given the sold-out signs on display in the Google Play store, that's a lot of hits. Google has deep pockets, but it seems strange that it would sell a new product at a loss.

It's not unheard for good tablets to be sold at knock-down prices. Both the BlackBerry PlayBook and HP TouchPad are prime examples. And although they are cheap because they failed, they do offer a clue as to what Google is up to.

The problem for both the PlayBook and TouchPad is that although they are both excellent hardware devices, they are the only tablets on their particular platforms. As a consequence the BlackBerry App World is a lonely place, and WebOS is no more. One of Apple's undisputed strengths is the quality and breadth of the content on iTunes, both apps and media. And with Microsoft's Windows Store about to come on stream with a potential audience of billions, and the

Amazon Kindle Fire soon to bring Amazon's deep well of movies, music and reading matter to UK tablet users, Google needs to get its tablet users spending money in its own app store, Google Play.

Google's wealth is built on giving things away for free and then charging advertisers to talk to its audience. It's rubbish at extracting cash from punters. But by the end of this year Microsoft and Amazon will join Apple in doing exactly that via tablets, and Google cannot afford to miss out.

Although Android smartphones proliferate in huge volume, their users tend to spend a lot less money on apps and media. App developers find the wide variety of Android OSes different to write for, too. This means that although Google claims that there are 600,000 apps in the Play store, this is a lot fewer than Apple claims for iOS, and few are optimised for tablets.

Lack of apps and media is in turn a reason to turn away from Google and toward Apple (or Microsoft or Amazon). This makes Google Play less desirable to app makers and media owners, and so the vicious cycle continues.

Google is hoping that the Nexus 7 will not only drive sales of Android devices, but kickstart app and media sales via Google Play, in turn attracting developers and media owners, and creating a more attractive market for other hardware makers. It's not generosity on Google's behalf that purchasers get £15 of credit any more than is a free joint from a drug dealer - you're being invited to try spending in Android's store, and with the Nexus 7 you may find you like it.

The Nexus 7 is that rare thing - an unmitigated bargain. Buy it and you may find yourself spending much more on movies, music and books. But, if my experience is anything to go by, you won't mind. ☒

See Outbox, [page 146](#), for Window RT and Windows 8 apps analysis >>

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**Requirements**

- Wi-Fi use requires 802.11 b/g/n access point (router).
- Syncing services (such as backup) require a Google account.

**What's In The Box**

- Nexus 7 tablet
- USB sync/charge cable
- Dual-voltage USB wall charger
- Quick start guide

**Order Help**

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**Monitor specification :** e2343Fi, 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 docking station



# LTE telephony slowly takes flight

**Lack of phones and financial upside for operators may hinder the popularity of Voice-over-LTE, says Mikael Ricknäs**

**T**he first commercial Voice-over-LTE (VoLTE) services have launched, but most operators are likely to take a cautious approach as they face technical and business challenges.

US operator MetroPCS and South Korean SK Telecom and LG Uplus will be the first to offer VoLTE services. There's no word yet on VoLTE in the UK.

"It is the crystallisation of all we have been working on in the past two years," said Dan Warren, director of technology at GSM Association, which has led the work to implement VoLTE.

Eric Ericsson, head of the Mobile Telephony Evolution Program at Ericsson Networks, agrees: "It is proof that VoLTE works. I find it difficult to believe that someone would make a commercial announcement without being sure that it works from a technical standpoint," he said.

However, take-up of telephony will be slow compared to the rollout of commercial LTE networks for mobile broadband, which is expected to reach 150 networks by the end of the year, according to the Global Mobile Suppliers Association (GSA).

Expectations for VoLTE are much lower than they are for mobile broadband, said market-research firm Dell'Oro Group.

"There will be up to 10 commercial launches next year around various parts of the world. The success or failure at MetroPCS, and shortly thereafter Verizon Wireless, and what happens in Korea, will determine whether the other projects go ahead quickly or slowly," said Chris DePuy, an analyst at Dell'Oro.

## Cost vs profit

For operators, VoLTE has to make sense both technically and financially, and the latter may be a struggle in the short term, according to DePuy.

"The problem with VoLTE is that operators aren't able to charge more than they do for current voice services. Carriers are spending money, but not getting more revenue; they're possibly getting even less, because voice usage is going down and it's very competitive," said DePuy.

Swedish TeliaSonera was the first operator to launch a commercial LTE network for mobile broadband in 2009. When it comes to moving voice to 4G, however, the operator won't be an early adopter. It sees few advantages over existing systems, said the company's vice-president of system development, Tommy Ljunggren.

"The drivers for us in Europe to implement VoLTE for economic reasons are not strong. In the long term - and that is in the very long term - it will be easier for us to handle just IP. But producing VoLTE isn't automatically cheaper than circuit-switched voice," said Ljunggren.

TeliaSonera will instead continue to rely on Circuit-Switched (CS) Fallback, a mechanism that allows smartphones to access the internet using LTE and then switch to GSM or 3G when there is an incoming call. Without CS Fallback, the smartphone's battery life would be reduced because the radios for GSM, 3G and LTE would be turned on simultaneously.

But Warren isn't a big proponent of CS Fallback. "I'm hoping the first launches will give a strong indication that within the next 12 to 18 months operators can step directly into VoLTE and not encumber themselves with a CS Fallback launch," he said. >>



## HD Voice

Proponents say VoLTE will result in better voice quality, thanks to lower latency and HD Voice becoming a defacto standard. There is nothing in the VoLTE specification that makes implementing HD Voice mandatory, but most operators are still expected to do so, according to Warren.

The improved quality HD Voice offers is possible thanks to Adaptive Multi-Rate Wideband (AMR-WB), a speech-compression algorithm that doubles the range of voice frequencies transmitted.

To take full advantage of HD Voice, users also need phones and headsets with good sound quality.

"More and more people are using headsets, and you can really hear the difference in quality. There are lots that are really bad," said Ljunggren.

However, HD Voice isn't a VoLTE exclusive, and has already been implemented in more than 40 3G networks, according to GSA.

## Prioritisation

Lower connection times should give VoLTE an edge over CS Fallback, but the technology also introduces new potential problems. That's because the implementation of VoLTE also means telephony traffic is moved from a circuit-switched world to one where everything is IP-based.

Previous mobile networks have been optimised for telephony and SMS, while LTE has been optimised for offering broadband

connections that are as fast as possible, said Ericsson. The challenge is to ensure the quality of the voice service on that data-centric network, including at the edge of a cell or network where the available bandwidth is limited. The key to doing that is prioritising voice over data.

"From the LTE device, telephony is sent using one radio bearer or pipe and data is sent using another pipe; if a conflict arises, the telephony gets priority," said Ericsson.

Getting the quality right will be important to operators. The disaster scenario is that the quality and coverage isn't as good as the old telephony systems, according to DePuy, who nonetheless is still optimistic about the outlook for the pioneering operators.

"I do think they will be successful. Technically, it will work," said DePuy.

The use of traffic prioritisation opens up discussions on network neutrality, but Ljunggren isn't too worried. "As long as we offer other services the same possibilities to use QoS and priority, I don't see a problem with using it for VoLTE," he said.

## IMS and RCS

VoLTE is powered by the IP Multimedia Subsystem (IMS) framework, the implementation of which also allows operators to roll out over-the-top services, such as instant messaging based on a specification called Rich Communication Suite (RCS). Work on the suite started in 2008, and the goal was to turn IMS into

standardised services for operators. IMS had been around for a long time but, due to the framework's complexity, it hadn't taken off - a situation that RCS was meant to change.

Even though it's off to a slow start, there is a lot of hope in the industry that RCS will help operators develop more attractive offerings and compete with web-based services, while at the same time potentially delaying the arrival of VoLTE.

"In the past month or so, bundling voice and messaging has become a priority for operators, and that is having a delaying effect," said DePuy.

The combination of VoLTE and RCS will allow users to communicate in new ways, according to Warren. The vision is that they will be able to see who is available, chat and share files across any device, on any network, with anyone in their address book.

"What I think will be really interesting is the step beyond that when operators expose those capabilities to application developers," said Warren.

## Compatible handsets

Even if VoLTE works well, it won't take off until there are a number of compatible smartphones, including a future iPhone.

"Handsets will initially ship in small volumes, and that isn't good for keeping prices low," said DePuy.

TeliaSonera's motivation to implement VoLTE isn't helped by the fact that Europe is behind the US in rolling out 4G. That has resulted in fewer smartphones and tablets being adapted for the EU spectrum bands.

The launches in South Korea and the US are backed by LG and Samsung, with smartphones such as the Galaxy S III available. It's good news that Samsung is onboard, said Warren, but he isn't as hopeful when it comes to the other leading smartphone manufacturer, Apple.

"When it comes to this kind of tech evolution, Apple isn't on the bleeding edge. It is relatively cautious," said Warren.

Still, the arrival of the first VoLTE services is a positive step for 4G, and shows that LTE can become the pre-eminent technology for all services, Warren said. ☒





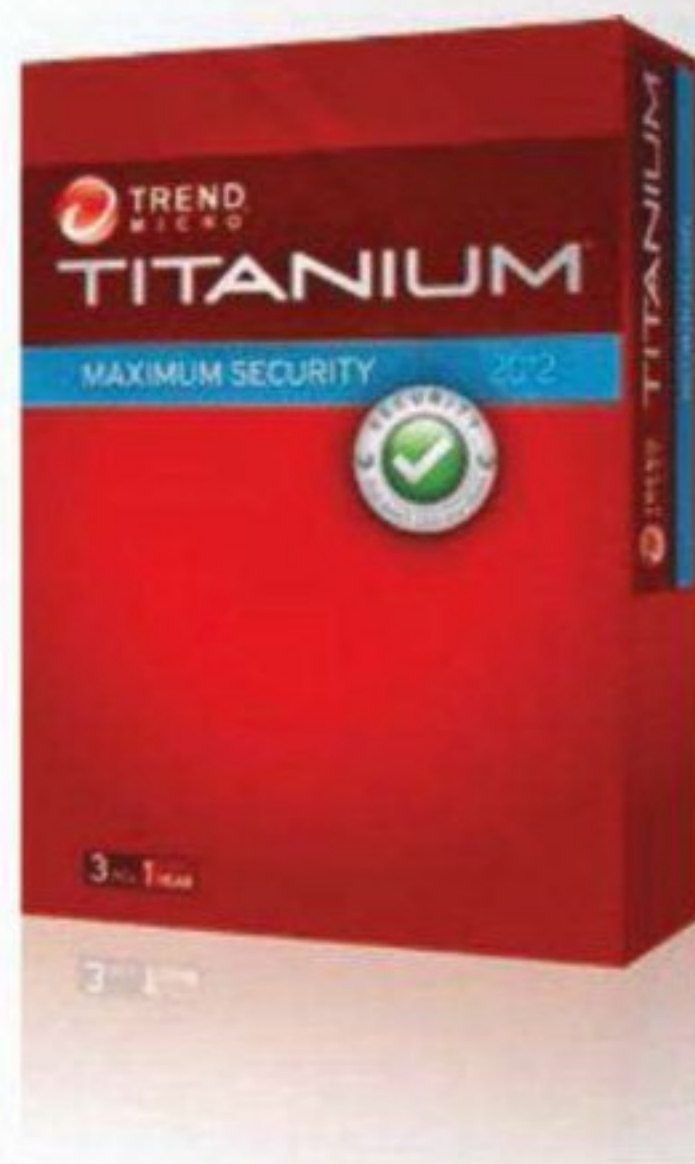
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# NEW PRODUCTS

From laptops and cameras to satnavs and smartphones, Chris Martin gets his hands on the best new tech gadgets



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With a 4.3in (540x960) screen, Android 4.0 Ice Cream Sandwich and an nVidia Tegra 2 dual-core processor, the Grand X from ZTE is an ideal budget smartphone for gaming. Other specifications include 4GB of internal storage and a 5Mp rear-facing camera.

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Huawei hopes its MediaPad will rival the likes of Apple's iPad and Samsung's Galaxy Tab. Its 10.1in screen has a higher-resolution display than most tablets of this size, at 1920x1200. The Huawei runs Android 4.0 Ice Cream Sandwich and features a 1.2GHz dual-core CPU and an 8Mp camera.

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## >> Microsoft Wedge Mobile Keyboard

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## << Microsoft Wedge Touch Mouse

*Mouse*

The first mouse designed for Windows 8, the Wedge Touch Mouse is small enough to fit in your pocket. It provides four-way touch scrolling and navigation, while BlueTrack Technology lets you use it on almost any surface.

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*Webcam*

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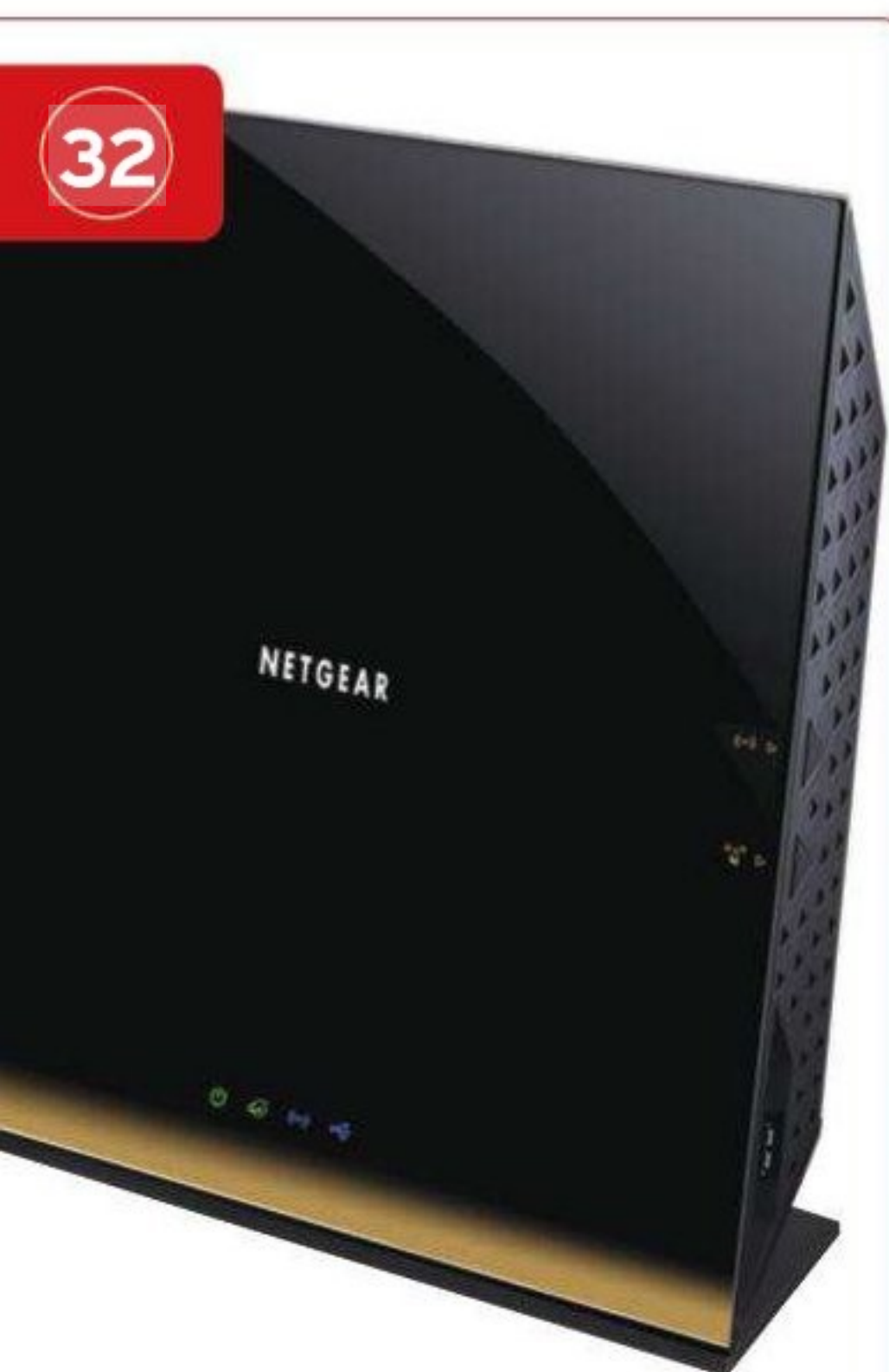


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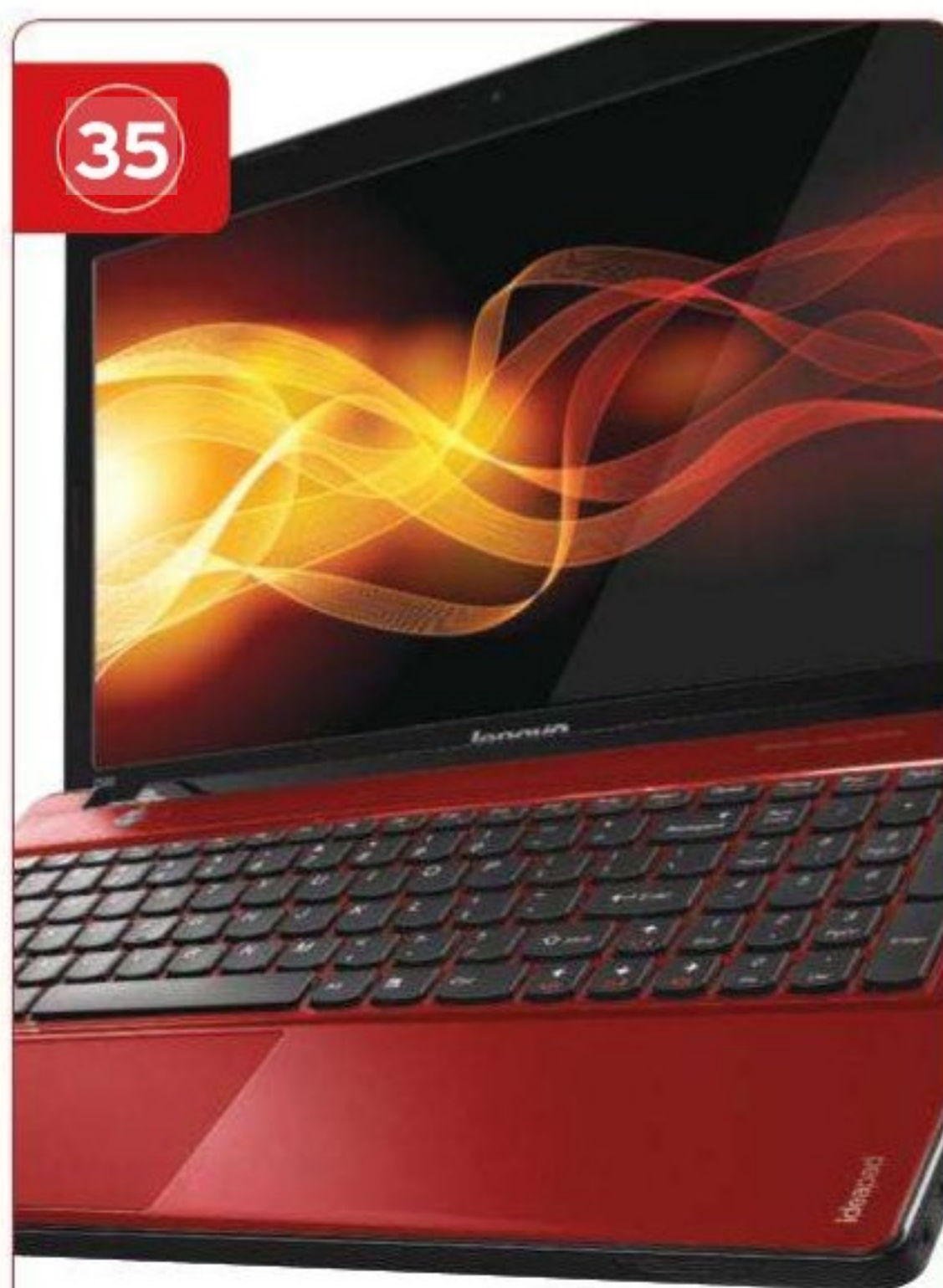


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# The truth about wireless speeds

Most people will find 802.11n wireless networking sufficiently fast, but it's actually slower than last century's wired ethernet. A truly nippy wireless data system is long overdue.

Surfing the web, even streaming video or music, there's little reason why you'd need anything faster than 802.11n. Yet I've been eagerly awaiting the arrival of 802.11ac. This is the new 'gigabit wireless' that will become standard within two years.

The problem with today's 802.11n is it's just too slow for moving around data. I'd be more content if it performed at the speed the industry would have us believe is possible. After all, 802.11n's advertised '450Mbps' is nearly five times quicker than the 100Mbps fast ethernet we used in the 90s. And I could work with that.

## Real-world wireless performance

The practical speeds of Wi-Fi have always been inflated, but it's a problem that got much worse with the launch of 802.11n.

In 1999, 802.11b networks were said to operate at 11Mbps; actual results were closer to 2Mbps, but this was quick enough for the 512kbps ADSL of the day.

Then came 802.11g in 2003. They said: 54Mbps. Real speed: 15Mbps. A theme began to appear, in which the real-world speed was one-third or less than that promised.

When '300Mbps-capable' 802.11n launched, the waters were further muddied. This transmit rate is theoretically possible using 40MHz channels, two spatial streams and two antennae; most laptops, and every phone or tablet, use one aerial to ride a single 150Mbps stream. These devices are lucky to see 50Mbps.

But the real fraud is the discrepancy between the headline sync speed (transmit rate), and the speed at which your data travels. The engineers know it, but marketing departments don't promote it.

Unlike wired ethernet, which has little overhead and can deliver your data at more than 90 percent of the so-called PHY layer's rating, wireless communications need a lot more error correction. Most of the data zipping across your wireless link isn't your data, but background chit-chat propping up the system. In fact, a fraction is your data; the rest is housekeeping.

So the '300Mbps' printed so clearly on your router's box often translates into 100Mbps, or much less, of real data throughput - still assuming two antennae, in ideal conditions.

It's an arms race out there, and router brands work hard to sell their products. Little wonder that it could be easy for end users to get confused and believe they are getting their data transmitted at the gross speeds promised.

Broadcom sells its wireless chips to almost every router maker, and in its marketing material it carefully picks its words in order to stay the right side of telling lies. Consider the following statement:

"5G WiFi from Broadcom works three times faster than the current standard for the most common devices, offering you a streaming video- and data-syncing experience with transmissions in excess of a gigabit per second."

Yes, you can stream video and sync data. And 1,300Mbps raw transmissions are in excess of a gigabit per second. But that's two separate statements, wrapped to give semblance of a related clause.

Powerline tech that sends data over the mains is just as bad - '200Mbps' HomePlug AV delivers around 65Mbps. Turn to [page 66](#) for our group test of powerline adaptors.

Meanwhile, the world's first 802.11ac routers from Buffalo and Netgear are tested overleaf. Each promises speeds of 1,300Mbps; based on what you've just read, see if you can guess what performance they deliver. ☒

## PC ADVISOR TEST CENTRE

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**Specification**

Dual-band 802.11b/g/n/ac wireless router; concurrent 2.4GHz and 5GHz radios; IEEE 802.3/802.3u/802.3ab; 1x gigabit WAN; 4x gigabit ethernet; WPA2-PSK (AES, TKIP)/WPA-PSK (AES, TKIP)/128/64bit WEP; Mac Address Filter; USB 2.0; 212x183x34mm; 510g

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



## WIRELESS ROUTER

### Buffalo AirStation 1750

The AirStation 1750 is a dual-band wireless router built for 802.11ac. This latest wireless standard is specified to operate at up to 1,300 megabits per second (Mbps).

The '1750' in the name refers to the sum of the notional speeds from both 2.4GHz and 5GHz radios: 450Mbps plus 1,300Mbps.

The AirStation stands 214mm high, and removable feet mean you can also lie it down flat. Fixing screws are included for wall-mounting.

Smart and businesslike, the Buffalo has matt black sides and a gunmetal-coloured surround band. The antennae are hidden inside.

Running up the rear edge of its plastic casing are the necessary wired ins and outs: gigabit ethernet for WAN, four more for LAN, 12V DC power and USB 2.0 for printer or storage sharing.

Setup is relatively easy if you're familiar with using a router's web interface. The text-based pages look dated, but get the job done. And there's enough here to keep technical dabblers busy, provided they don't mind rebooting the router after nearly every change.

Buffalo also loaned us an AC1300/N450 Media Bridge with which to test the 1750's 802.11ac performance. This is very much like the 1750, but it lacks a WAN port and uses different software.

Our tests of the AirStation 1750 fell far short of four-figure speeds. We even re-ran our tests on a second unit to rule out faulty equipment, but discovered that the problem more likely lay in the product's marketing.

We ran close- and long-range tests, at 1m and 9m with two plaster walls between the host and client, using zPerf to measure throughput.

At 1m, the best result recorded was 417Mbps. That's a fantastic performance when judged by 802.11n standards, but it's disappointing when 1,300Mbps is promised.

We experimented with shorter distances, and ensured that no other wireless devices were interfering with the Buffalo's signal.

With the router and bridge just 10cm apart, we measured a transfer speed of 443Mbps when averaged over 30 seconds.

Slightly better performance was found with the second pair of units, with best results of 461Mbps at 1m. That was over a 10-second slot; averaged over 30 seconds, we recorded 432Mbps.

The speed held relatively well at 9m, and we noted 345Mbps. This suggests a more consistent connection at greater distances than 802.11n, with which performance tends to drop rapidly in the 5GHz band after around 5m.



Until 802.11ac becomes commonplace, the AirStation is likely to be used in 802.11n mode. We measured the throughput in this mode from a MacBook Pro Retina, making use of the Broadcom 4331 chipset's three-stream capability.

At 1m over 5GHz, the best figures were around 300Mbps, with the Mac indicating a nominal transmit rate of 450Mbps. Over 2.4GHz, the best it could muster was 137Mbps.

Moving to 9m, data throughput was up to 152Mbps over 5GHz.

## Verdict

The top speed of this 802.11ac router in our tests was 462Mbps, which is around one-third the advertised speed of 1,300Mbps. If you need to build a wireless data connection across a few metres, it's faster than 802.11n. **Andrew Harrison**

**£200** inc VAT

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■ [netgear.co.uk](http://netgear.co.uk)

**Read more**

■ [tinyurl.com/8s55k7w](http://tinyurl.com/8s55k7w)

**Specification**

Dual-band 802.11b/g/n/ac wireless router; concurrent 2.4/5GHz; 1x gigabit WAN; 4x gigabit LAN; 2x USB 2.0; 205x255x77mm; 654g

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



## WIRELESS ROUTER

### Netgear R6300

Buffalo was the first to launch an 802.11ac wireless router in the UK (reviewed above), but Netgear was close behind with its R6300.

This is Netgear's flagship router, and offers most of the features you'd expect from a comprehensive home hub. In essence it has the same functionality as the Buffalo: it's a dual-band 802.11ac router with a four-port gigabit switch and a gigabit WAN port.

The R6300 is the largest router we've ever tested, standing more than 8in tall and stretching even wider. It's designed to stand upright.

The shiny plastic chassis is smooth and obsidian-glass-like to the front, and perforated with

hundreds of small triangles across the back and bevelled sides, which should allow ventilation. The triangular theme continues with WPS and Wi-Fi buttons on the side.

The R6300 is angled backward in a rakish manner and, from the front, resembles a small black TV or monitor, with a central Netgear logo shining in bright white lights like a TV broadcaster's logo.

Two USB ports are available, with one on the side and one behind. Like Buffalo, Netgear has scrimped by issuing only the USB 2.0 version.

Inside, the Netgear is based on very similar components to the Buffalo, with a Broadcom BCM4360 wireless chipset for the 5GHz band.

Netgear has a more consumer-focused graphical look for its admin interface, which it calls Netgear Genie. From here you can use a setup wizard to configure the router, and alter settings for QoS, port filtering, port forwarding, security and other optional administration tasks.

The interface doesn't offer the same low-level tweaks as the Buffalo, but focuses on the adjustments that most people would need.

Separate apps are available for iPad and iPhone, which allow useful feedback on router status and some configuration options.

We tested the performance in 5GHz 802.11ac mode at short ranges of 1m and less, as well as over a 9m



**£299** inc VAT**Contact**■ [wdc.com](http://wdc.com)**Read more**■ [tinyurl.com/8qyvqgm](http://tinyurl.com/8qyvqgm)**Specification**

Dual-band wireless router with hard disk; 2.4GHz and 5GHz dual-band; 802.11a/b/g/n; 3x3:3 MIMO wireless; 4x gigabit ethernet; 1TB WD hard disk; cooling fan; 1x WAN Port; 1x USB 2.0; FastTrack Plus; Personal WD2Go cloud; Apple AFP server; UPnP; DLNA; IPv6; push-button WPS; WPA2; 32x244x170mm

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## WIRELESS ROUTER

## WD My Net N900 Central

The My Net N900 Central is the flagship model in Western Digital's new router line-up, and includes various features that may have its competitors worried.

At first glance, the N900 isn't especially striking in its styling. On the front of its plain black enclosure is a series of functional status lights; on the rear is a discrete fan for cooling. There are four gigabit ethernet ports, a single WAN for hook-up to a separate modem, plus USB 2.0 for connecting a printer or external hard disk. Given the Western Digital's premium price, we were hoping for USB 3.0, too.

The N900 is built for the 802.11n standard and incorporates a 3x3:3 MIMO antenna array. The multiple antennae allow three data streams to enhance range and throughput for file transfers and HD video.

The N900 Central is a dual-band router, offering 2.4GHz for range and widespread compatibility, and the media-friendly, if short-range, 5GHz band for higher throughput. Both are said to operate up to 450Mbps; while neither will approach that notional figure, 5GHz is typically faster at short range.

A standout feature is the router's built-in hard drive, either 1- or 2TB in capacity. The N900 Central can be used as a NAS for storing media across the network.

Western Digital also offers a service called WD2Go, which allows you to access your router's internal disk (and connected USB drives) from any PC with a web connection. If your network includes Macs you can also enable the AFP server, which allows the N900 to be used as an iTunes server and for Time Machine backups.

Despite its extensive feature list, setting up this router is extremely simple. Out of the box the router sets up an unsecured wireless network; simply join the network, type 'wdrouter' into your browser and follow the instructions.

The elegance and simplicity of the setup and menu system are to be applauded. However, we strongly recommend upgrading the firmware; our review model had teething troubles with its supplied software.

We used iPerf with an ethernet-connected server and a wirelessly connected laptop to measure the wireless performance of Western Digital's N900 Central. At a range of 1m, the 2.4GHz channel averaged 110 megabits per second (Mbps), and the 5GHz band averaged 170Mbps. With the range increased to 7m, the performance of the 2.4GHz band dropped to 75Mbps, and the 5GHz band to 125Mbps.



These are reasonable performance figures, and roughly what you can expect from an 802.11n 3x3:3 MIMO wireless router.

A vaunted FastTrack Plus feature is designed to automatically prioritise streaming media. We found it worked as advertised. While simultaneously transferring data across the network and playing HD video, the data bandwidth dropped by between 20 and 35Mbps - exactly the difference required for the 1080p stream to run unimpeded. As soon as the video was closed the overall data-transfer bandwidth returned to normal.

**Verdict**

The Western Digital My Net N900 Central offers plenty of features and decent 802.11n performance. If you need an all-in-one router with storage now, the My Net 900 Central is a fast, solid, if pricey option, at £299 for the 1TB version and £349 for 2TB. But remember that faster 802.11ac models, such as the two reviewed opposite, are already hitting the market. **John Taylor**



span through two thin plaster walls. Netgear doesn't offer a dedicated wireless bridge model, so we used a second Netgear R6300 router as the receiving client and configured

it for wireless bridge mode through its admin interface.

At 1m distant, the R6300 averaged data transfers of around 400Mbps. Best, if impractical, results were found when that span was reduced to 0.4m, which hit a maximum of 480Mbps. That just exceeds the best-case results we recorded from the Buffalo, but it's still well below the advertised speeds of 'up to 1,300Mbps'.

Tested at the 9m range, the Netgear lost little of its close-range speed. We saw speeds averaging 391Mbps, with one measurement even returning 411Mbps.

Used in 5GHz 802.11n mode with a MacBook Pro Retina, the Netgear

R6300 allowed strong connections to be made. OS X indicated a steady and consistent transmit rate of 450Mbps, and real-world performance of around 300Mbps.

**Verdict**

The Netgear is a well-featured home wireless router with good performance over 2.4GHz and 5GHz 802.11n. In 802.11ac mode it was marginally faster than the similar Buffalo AirStation 1750. At around £200, it's considerably more expensive than its rival, but also offers better usability and more stable operation. Expect many more 802.11ac routers to come on to the market soon. **Andrew Harrison**



£129 inc VAT

Contact

■ [cisco.co.uk](http://cisco.co.uk)

Read more

■ [tinyurl.com/bl8cvac](http://tinyurl.com/bl8cvac)

Specification

Dual-band wireless router; Cisco Connect Cloud software; 4-port gigabit switch; 802.11a/b/g/n; 2.4GHz and 5GHz concurrent radio; six internal antennae, 3x3:3 configuration; WEP/WPA/WPA2 encryption; USB 2.0; UPnP media server; SPI firewall; WPS; 12V/2A mains adaptor; 225x160x25mm; 360g



## WIRELESS ROUTER

# Cisco Linksys EA4500

The Cisco Linksys EA4500 is in essence identical to our Best Buy award-winning E4200 wireless router (page 140). There's the same compact clutch-bag design with metallic strap detail and satin-black finish; only the product name below the light-up Cisco logo has changed.

Tweaks to the hardware have been made, or are at least suggested by the fact the EA4500 is now marketed as a '450 + 450Mbps' wireless base station.

The real headline changes are not in the hardware, but the firmware: Cisco Cloud Connect (CCC), the software that drives this home hub, has received a complete makeover. Its now web-based nature simplifies remote access from a PC or smartphone app - but you also grant Cisco the same permission, and therein lies the problem.

When CCC launched, Cisco reserved the right to monitor your use of the internet, your network traffic and your internet history. It wanted to block customers from accessing pornography or downloading copyright material, and threatened to discontinue its service to offenders.

An inevitable backlash resulted in most of the abusive conditions being removed from the end-user licence agreement and the CCC Terms of Service, but we're still troubled by the fact Cisco retains the right to change its terms of service without direct notification.

Since the debacle, Cisco made available the original non-cloud firmware for this router and the E4200 Mk II. It's not clear whether it will continue to maintain and update the classic firmware with essential security and bug fixes.

We set up the EA4500 using the supplied CD, which works with Windows and OS X. This should automatically configure your internet connection, although our static line caused it problems.



## Software

The interface is more cuddly and simplified than that we saw with the E4200, and most of the old features remain available. It's slower to operate, though, and every tweak takes seconds to register - presumably because any changes have to authenticate with Cisco's US servers. Whether you're accessing your router from the comfort of your home or another city, it operates equally slowly.

CCC makes it impossible to fully administer your router without going through the Cisco servers. You can disconnect the WAN line and then log into the router, but you're given only a simplified interface until you reconnect to the web to sync with Cisco.

We also had problems logging into the portal during times of high local network traffic, even though other websites loaded fine.

Among the new features touted for CCC routers are additional apps. A Dashboard interface lets you put commonly used facilities on the front page of the admin interface.

Third-party developers can also create mobile device apps; several are available, such as Block the Bad Stuff and Gemini IP Camera Viewer.

## Performance

We tested both 2.4- and 5GHz wavebands at 1m close range and 9m distant. Despite Cisco's claims that the 2.4GHz band operated at up to 450Mbps, we didn't see a transmit rate (TR) that exceeded 300Mbps. This suggests only a two-stream MIMO antennae

configuration is in active use, although it's unclear whether that limitation is with our laptop or the router.

At 1m, we saw data-transfer speeds average 112Mbps, falling to 55Mbps at 9m. These figures don't meet one-quarter of the claimed 450Mbps speed, but are in line with other routers.

In the router's 5GHz mode, our short-range test saw occasional TR readings of 450Mbps, although 270-, 300- and 405Mbps were more common. In real terms, our wireless setup could average 135Mbps at 1m, falling to 93Mbps at 9m.

CCC offers an easy-to-use graphical interface for quality of service (QoS) setup, which worked better than it did with the E4200. With that router we saw a 50 percent reduction in internet speed when Skype was selected for prioritisation, even when the VoIP service wasn't running; with this EA4500, CCC wouldn't allow webchat and other heavy internet activity to occur simultaneously.

## Verdict

The Cisco Linksys EA4500 is as well styled and constructed as the E4200 before it. The Cisco Connect Cloud service is a neat idea, but poorly executed by a company that seemed to expect indiscriminating users to click through worrying terms and conditions without reading them. The latest revision to the terms for using CCC is less offensive, but could be changed again without the user being expressly notified.

If you object to the possibility of having your internet activity tracked by your router manufacturer in the future, non-CCC firmware is still available that doesn't require US-based control of the router.

✉ Andrew Harrison





## LAPTOP

## HP Envy Ultrabook 6-1010ea

HP's Envy Ultrabook 6-1010ea is a stylish and relatively low-cost 15.6in ultraportable laptop, at just £699.

A red underside appears to glow below the smart black aluminium lid and keyboard surround. This finish does attract fingerprints, though.

The Scrabble-tile-style keyboard allows for comfortable typing, but the arrow keys are too small. The wristrest remains cool in use, although we found it difficult to click without moving the cursor using the buttonless multitouch trackpad.

Sound is delivered by a pair of speakers and what HP refers to as

a subwoofer (it's really just a small loudspeaker). An onscreen panel with various controls includes a graphic equaliser and sliders for space and focus. The sound quality is decent, yet lacks bass.

The display's 1366x768 resolution is disappointing for a 15.6in screen. Its glossy finish is also reflective, and viewing angles are poor.

We'd usually expect more in the way of connectivity from a 15.6in laptop, but the HP's assortment of HDMI, gigabit ethernet, two USB 3.0, one USB 2.0 and an SD card reader is generous for an Ultrabook. No optical drive is fitted.

Windows 7 Home Premium 64bit is preinstalled, and the laptop's overall build quality is reasonable. HP has instead cut costs on the CPU. Its 1.7GHz Core i5-3317U is an Ivy Bridge chip, but the slowest there is.

In WorldBench 6, the Envy scored a not-so-ultra 112 points.

This is partly due to its use of a slow hard disk in place of solid-state

storage; while HP lists an mSATA SSD in the specification, our sample came with a 500GB hard disk.

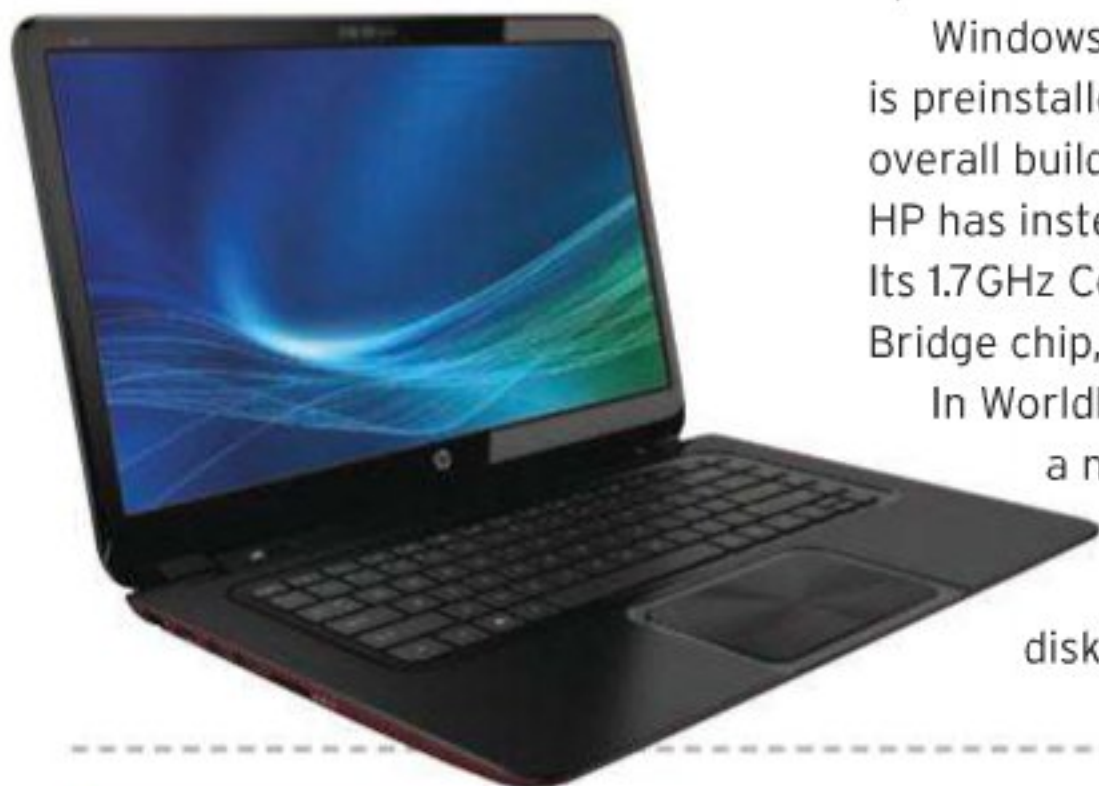
In common with most budget and ultraportable laptops, there's no discrete graphics processor; the Envy relies on the Intel HD Graphics 4000 integrated to its Core i5 chip. This is adequate for playing HD video and low-level gaming.

We saw 20fps in Fear at Maximum detail, and the HP could even manage intensive game Crysis with the detail turned down. At 1024x768, DirectX 9 and Low detail, the Envy recorded a playable 46fps.

HP quotes an eight-hour battery life. We recorded just over seven hours (426 minutes) in MobileMark.

## Verdict

The Envy has little to offer beyond its stylish looks. It's not terribly fast, won't play games particularly well, and it has a poor screen. But if you simply want a lightweight 15.6in laptop with strong battery life, the HP should appeal. **Chris Martin**



£699 inc VAT

## Contact

■ [hp.com/uk](http://hp.com/uk)

## Read more

■ [tinyurl.com/8jf3yig](http://tinyurl.com/8jf3yig)

## Specification

1.7GHz Intel Core i5-3317U (2.6GHz Turbo) dual-core;  
Windows 7 Home  
Premium 64bit; 4GB  
1,600MHz DDR3 RAM;  
500GB SATA hard disk;  
15.6in (1366x768) LCD;  
Intel HD Graphics 4000;  
802.11b/g/n; gigabit  
ethernet; 2x USB 3.0;  
1x USB 2.0; HDMI; SD slot;  
HD webcam; stereo  
speakers; Kensington  
lock; 59Wh battery;  
374x253x20.5mm; 2.07kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



## LAPTOP

## Lenovo IdeaPad Z580

Lenovo's Z580 is a classic 15.6in laptop that's affordable, attractive and capable, if not particularly portable, at 2.4kg.

What the Z580 lacks in sleek build it makes up for in style. The laptop features a brushed gunmetal grey lid and keyboard surround. The screen bezel is a less attractive glossy black, while the remainder of the device is plain black plastic.

Like many 16:9 widescreen laptops, a numberpad is wrapped around the arrow keys. The Return key has been reduced in size to accommodate this arrangement and, while the keys are comfortable to type on, they are a little noisy.

The smooth multitouch trackpad is soft to the touch. It's a good size, partly thanks to integrated buttons, and responsive. Five touch-sensitive buttons are also present to control volume, power and recovery.

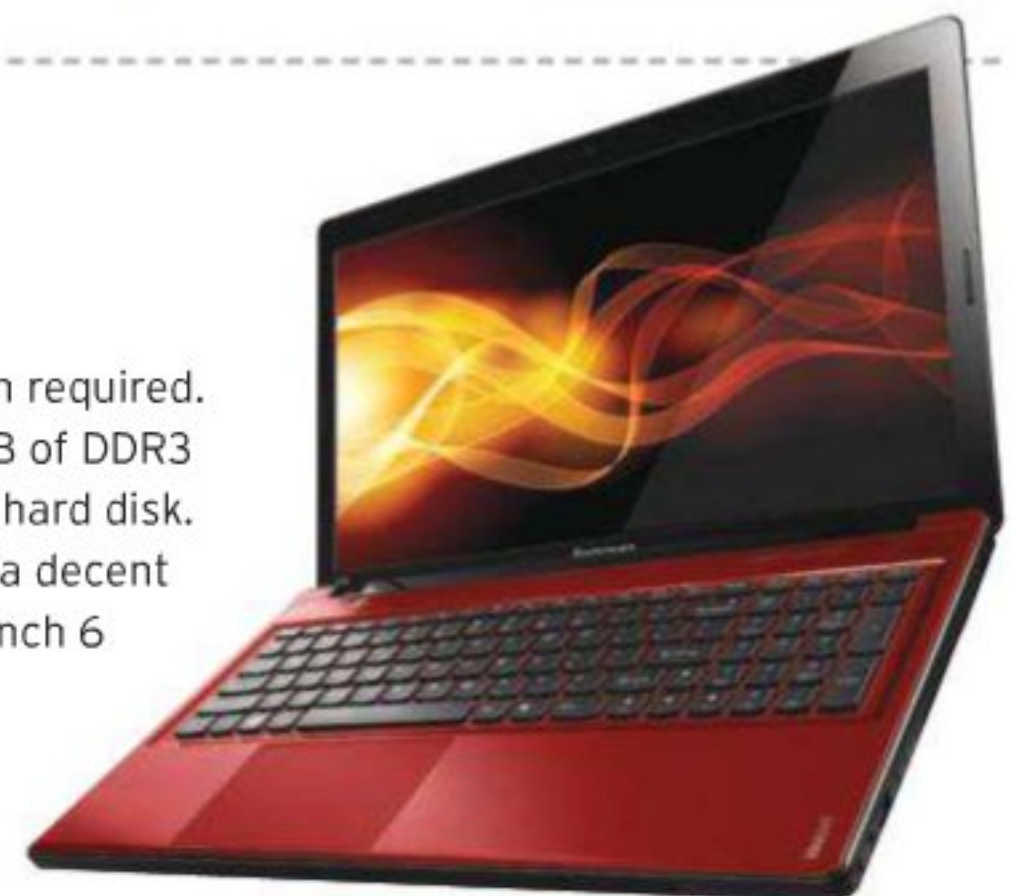
At the heart of this Windows 7 Home Premium laptop is an Intel Ivy Bridge Core i7-3612QM, a 2.1GHz quad-core processor that can

auto-boost to 3.1GHz when required. There's also a healthy 8GB of DDR3 1,600MHz RAM and a 1TB hard disk. The Lenovo Z580 scored a decent 153 points in our WorldBench 6 real-world speed test.

The Lenovo also offers capable gaming performance, with an nVidia GeForce GT 630M and 2GB of GDDR5 video memory under the bonnet. We recorded 79fps in Fear at Maximum detail, and the Lenovo could even produce playable framerates in Crysis: 31fps, DirectX 9, High detail; and 49fps, DirectX 10, Medium detail. Only at Very High detail did the Lenovo produce unplayable framerates.

The LCD supports 1366x768 pixels, a mediocre if familiar resolution for budget 15.6in Windows laptops. Its glossy finish is reflective and viewing angles are poor.

Ports include VGA, HDMI, gigabit ethernet and an SD card reader. Of the four USB ports, only two support USB 3.0. Lenovo has also fitted a



Blu-ray reader and webcam, and included Bluetooth 4.0 and 802.11n wireless connectivity.

The Lenovo Z580 has a 48Wh removable battery, which lasted just under six hours (349 minutes) in our MobileMark test.

## Verdict

The Lenovo Z580 is a stylish and reasonably well-built laptop, with a Blu-ray reader and capable graphics. If you don't have a specific need for its discrete graphics processor, though, we recommend you instead look to the £200 cheaper Dell Inspiron 15R ([tinyurl.com/6v8cs84](http://tinyurl.com/6v8cs84)).

**Chris Martin**

£799 inc VAT

## Contact

■ [lenovo.com/uk](http://lenovo.com/uk)

## Read more

■ [tinyurl.com/92goLxy](http://tinyurl.com/92goLxy)

## Specification

2.1GHz Intel Core  
i7-3612QM quad-core;  
Windows 7 Home  
Premium 64bit; 8GB DDR3  
RAM; 1TB SATA hard disk;  
15.6in (1366x768) LCD;  
nVidia GeForce GTX 630M,  
2GB VRAM; 802.11b/g/n;  
gigabit ethernet;  
Bluetooth 4; 2x USB 3.0;  
2x USB 2.0; HDMI; VGA;  
BD-ROM/DVD ± RW DL;  
Kensington lock slot;  
SDHC slot; 48Wh battery;  
376x245x35mm; 2.44kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★





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**£1,200** inc VAT**Contact**■ [eclipse-computers.co.uk](http://eclipse-computers.co.uk)**Read more**■ [tinyurl.com/8d522bw](http://tinyurl.com/8d522bw)**Specification**

3.4GHz Intel Core i5-3570K (overclocked to 4.7GHz); Windows 7 Home Premium 64bit; Gigabyte GA-Z77X-D3H; 16GB DDR3 RAM; 1TB SATA hard disk; 128GB Crucial M4 SSD; X11 X-Station case; 550W XFX PSU; XFX AMD Radeon HD 7950, 3GB GDDR5 VRAM; 6x USB 3.0; 4x USB 2.0; DVI; HDMI; DisplayPort; 2x Mini DisplayPort; 22x DVD ± RW DL; 1-year RTB warranty

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**GAMING PC****Eclipse Vengeance i5357r795 OC**

Eclipse's Vengeance desktop PC delivers good gaming performance and an arresting selection of components and features.

With an Ivy Bridge Core i7 processor inside, overclocked from 3.4- to 4.7GHz, the Eclipse recorded a very good WorldBench 6 speed score of 218 points. That's higher than any of the machines in our Top 5 chart (see [page 131](#)).

Capable support is lent by 16GB of Corsair's trusty Vengeance chips. There's little to find fault with in the storage system either: an 128GB Crucial m4 SSD affords the PC extra pace, while there's a 1TB hard disk to supplement capacity.

The AMD Radeon HD 7950 graphics card is outflanked by nVidia's 2012 GeForce models, but it's a fast card nonetheless. The XFX version here boasts 3GB of video RAM and delivers strong framerates.

We recorded 141.3fps in Stalker: Call of Pripyat in Day mode, and the Eclipse averaged 120.1fps across all modes (Ultra detail settings).

We found a similar story in Crysis, with the Eclipse able to produce figures of 112-, 69- and 62fps in our standard test configurations.

The X11 X-Station chassis is hard to miss: its polished white exterior, with celestially bright light emanating from within, gleams out from the dark morass of gaming PCs.

It's not large, though, with the cables from the large Zalman fan protruding into the middle of the case. Another Zalman sits on the processor, and yet more cooling comes from a large manual fan.

The XFX Pro Core Edition PSU is specified at a healthy 550W. The PC consumed 111W when idle, and drew 239W in Crysis. For a gaming PC, the Eclipse is reasonably quiet, and added 11dB above ambient noise.

A 24in full-HD screen and a wireless keyboard and mouse are



supplied, but there's no Blu-ray support. Features such as eSATA, wireless connectivity and a card reader are also absent. Connections include six USB 3.0, four USB 2.0, two Mini DisplayPort and HDMI.

**Verdict**

The Eclipse Vengeance is an extremely fast gaming PC, and comes with a number of juicy hardware features. Its case, while a bit small, is certainly distinctive, and overall performance is very good. Given that the price includes a display, this system offers plenty of bang for your buck. **✉ Robin Morris**

**£379** inc VAT**Contact**■ [motorola.co.uk](http://motorola.co.uk)**Read more**■ [tinyurl.com/98od9qq](http://tinyurl.com/98od9qq)**Specification**

1.2GHz Texas Instruments OMAP 4430 dual-core; 4.3in (540x960) 256ppi Super AMOLED display; Google Android 2.3.6 Gingerbread; 1GB RAM; 16GB flash storage; microSDHC; 802.11b/g/n; Bluetooth 4; Micro-SIM; A-GPS; 8Mp rear camera with LED flash; 1.3Mp front camera; Micro-USB; Micro HDMI, 12.2Wh non-removable battery; 69x131x10.6mm; 144g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTPHONE****Motorola Razr Maxx**

The Razr Maxx is closely modelled on Motorola's original Razr smartphone, but it's slightly fatter to accommodate a larger battery.

It feels as solid as a rock, with a Gorilla Glass front and woven Kevlar rear. Power and volume buttons are on the right, while Micro-SIM and microSD card slots hide below a plastic flap on the left.

The Razr Maxx copies its predecessor's spec, with a 1.2GHz dual-core processor and 1GB of RAM. This combination performed well in our tests, with 1,084 points scored in Geekbench 2.

A 16GB internal storage allocation is enough for your apps and a collection of music and films, although you can add up to 32GB via the aforementioned microSD slot.

The Motorola's 4.3in Super AMOLED screen comprises 540x960 pixels. Bright, vivid and reasonably sharp, it has a pixel density of 256ppi. The large size lends itself well to web browsing, gaming and watching video.

There are two cameras: an 8Mp rear snapper with LED flash, plus a 1.3Mp front-facing cam. The camera app, accessible via the lock screen, offers a range of effects and settings. Results in our tests were consistently good, with detailed and natural-looking photos. Full-HD video recording is also possible.

When we reviewed the Razr Maxx it was running Android 2.3.6, although Motorola has now rolled out an update to 4.0 Ice Cream Sandwich. We'd still like to see an upgrade to 4.1 Jelly Bean, however.

The user interface runs well, with smooth animations. Plenty of apps are preloaded, including the usual gang of Google services, Amazon Kindle, Quickoffice and GoToMeeting. Don't get excited by the appearance of Need for Speed: Hot Pursuit - it's a trial version.

We liked Motorola's own Smart Actions app, which adjusts settings based on user-defined parameters. It can, for example, turn off certain functions when the battery drops



below a certain level, or enable silent mode at specified times.

A whopping 12.2Wh battery doesn't disappoint. The Maxx lasted four days before needing a recharge.

**Verdict**

Motorola's Razr Maxx has a decent specification, and its exceptional battery life helps it to stand out from the crowd. **✉ Chris Martin**



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**Contact**

■ [orange.co.uk](http://orange.co.uk)

**Read more**

■ [tinyurl.com/cxc7f7k](http://tinyurl.com/cxc7f7k)

**Specification**

Intel AZ210A smartphone; 1.6GHz Intel Atom Z2460, single-core; Android 2.3.7 Gingerbread; 1GB RAM; 16GB storage (not expandable); 4.03in (1024x600) touchscreen; 8Mp rear camera, LED flash, full-HD video; 1.3Mp front-facing cam; 802.11n; Bluetooth 2.1; Wireless Display; Micro HDMI; Micro USB; lithium-ion battery, non-removable; claimed battery life: 8 hours talk time, 14 days standby; 63x123x9.9mm; 117g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



SMARTPHONE

## Orange San Diego

Orange's San Diego is the first Intel-powered smartphone to hit the UK's ARM-dominated mobile market. It's been on the cards for years, but the PC and laptop processor maker first had to reduce the power consumption, heat generation and even the dimensions of its x86 chips to cram them into mobile devices.

The San Diego runs old Android 2.3.7 Gingerbread, with an upgrade promised to Ice Cream Sandwich, but in fact it looks more like an iPhone 4 than the army of Google phones with which it competes. This black slab feels very sturdy, if a little plasticky. A matt, slightly rubberised rear contrasts to the glossy front fascia, and usefully aids grip. An 8Mp camera juts out at the rear; all other ports are housed within a silver plastic band that circles the chassis.

The 4.03in touchscreen has a 1024x600 resolution, with a pixel density of 295ppi. This is notably higher than many of the smartphones with which the San Diego competes, yet it looks rather dull at its default setting. The screen runs short of the handset's edge, with a raised rim interrupting its otherwise smooth surface. At the bottom are touch buttons for Back, Options, Home and Search.

Entering the market with a budget handset is a clever move on Intel's part. This smartphone need not compete against ARM supermodels in the form of the Galaxy S III and iPhone 4S; at just £199, its more immediate rivals include the HTC One V, LG L3, Huawei Ascend G 300 and other budget Android handsets.

In this market, the 1.6GHz processor is exemplary; paired

with 1GB of RAM, it gives Intel the performance lead it needs to turn heads. Although this chip is clocked faster than those of market-leading phones, for example the S III's 1.4GHz Exynos 4 Quad and iPhone 4S' 1GHz dual-core Cortex A9, it is only a single-core model.

Thus the San Diego is not the fastest smartphone you can buy. But it is the fastest budget handset we've seen. Whereas the One V recorded 282 points in Geekbench, the L3 managed 434, and the Huawei got a slightly better 525, the San Diego scored 889. It also impressed in SunSpider, where it recorded a fantastic 1,383.9ms.

### Intel and apps

Third-party apps not written for the x86 processor architecture must pass through an emulation layer to correctly operate. It was feared that between 5- and 30 percent of the apps in Google Play would be incompatible with Intel chips; taking into account the apps you might actually use, it's closer to 10 percent.

Of the top 100 free and 100 paid apps in Google Play, only 19 are incompatible. Most notable of which is iPlayer, but you can still view content through the BBC's mobile site. Other favourites, including social-media apps (of which there are none by default), work fine.

Note that the 16GB of provided storage is non-expandable, and that only 10.71GB is available to the user.

Intel has left Orange to interpret Android how it sees fit, and it's responded with a lick of orange paint in the software and more than a few branded features, including Orange Gestures and Orange



Wednesdays. We particularly like the former, which lets you define up to 27 gestures for launching apps, although it isn't a true timesaver.

A Swype keyboard is available, with which you draw a path through letters rather than individually tapping each key. The San Diego also supports Wireless Display and NFC.

Unlike most budget phones, the San Diego has an 8Mp rear camera with an LED flash, 8x digital zoom and a plethora of manual settings. There's so much to play with that you may not even notice its dull, blurry and poorly lit pictures. Recorded video is also something of a let-down, if full-HD in size.

A 1.3Mp front-facing camera is also provided; you can toggle between the two cameras, making the front cam as useful as a mirror as it is for video chat.

One of the things Intel hopes to offer is improved battery life, yet we've seen no evidence of this here. It claims the non-removable battery will run to 8 hours of talk time, or 14 days on standby. In our own tests, with normal usage, the battery was down to 41 percent after 10 hours.

### Verdict

The San Diego is significantly faster than its similarly priced rivals, with a very good screen, loads of tweakable camera settings and full-HD video recording. On the down side, battery life is poor, the 16GB of storage can't be expanded, and some of your favourite apps may not be supported. If this is what Intel's low-end Z2460 chip has to offer, though, we can't wait to see its Z2580. Marie Brewis

## INTEL ENTERS THE SMARTPHONE MARKET

Previously known as the Santa Clara, and internally by Intel as the AZ210A, the Orange San Diego marks Intel's entrance to the smartphone market. Faced with a battery of rivals running ARM chips under various guises, the San Diego has an Intel Atom Z2460 processor clocked at 1.6GHz. This single-core x86 CPU is paired with PowerVR graphics architecture to form Intel's 'Medfield' system-on-a-chip (SoC) platform.

It's Hyper-Threaded, meaning it can simulate dual-core operation, while Intel

Burst Performance Technology allows it to ramp up the clock speed when required.

Expect this to be the first of many Intel handsets to launch. Later this year the chip maker will release a Z2580 dual-core chip - another 32nm CPU, but one that promises twice the performance of this Z2460.

In 2013 we can expect both high- and low-end 'Merrifield' 22nm chips, while 2014 should bring 14nm mobile processors. Intel claims these CPUs will bring faster performance and longer battery life.



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**£96** inc VAT**Contact**■ [uk.gigabyte.com](http://uk.gigabyte.com)**Read more**■ [tinyurl.com/9oswmk2](http://tinyurl.com/9oswmk2)**Specification**

nVidia GeForce GT 640 OC; 2GB DDR3 RAM; 1,050MHz core clock; 1,800MHz memory clock; 400MHz Ramdac; 128bit memory interface; 384 stream processors; 32 texture units; 16 ROP units; PCI Express; DirectX 11; 1x VGA; 2x DVI; 1x HDMI; 3-year warranty



## GRAPHICS CARD

**Gigabyte GeForce GT 640 OC**

The GT 640 is a budget graphics card that's built on a smaller, much less complex piece of silicon than the GTX 670, 680 and 690, but still constructed using a 28nm process.

This Gigabyte version has been factory overclocked, with its core clock speed pushed from 900MHz to 1,050MHz, and the memory clock from 891MHz to 900MHz.

The video memory is of the DDR3 variety, so the GT 640 runs at a modest effective rate of 1.8GHz.

Even with enhancements, the 128bit memory interface means the memory bandwidth is only 28.8GBps. The texture fill rate has received a slight boost to 33.6GTps.

By comparison, the similarly priced Gigabyte HD 7770 OC offers a texture fill rate of 44GTps and memory bandwidth of 80GBps.

In practice, the 640 OC is very much below par. In our BattleForge test, it scored 28.9- and 25.3fps at resolutions of 1680x1050 and 1900x1200 respectively; the HD 7750 managed 31.3- and 27.5fps.

Even with its higher clock speeds, the GT 640 OC still trailed the significantly cheaper 7750.

In Crysis 2, for example, the 640 recorded 18.1- and 16.8fps at 1680x1050 and 1900x1200, while the 7750 hit 19.9- and 18.2fps.

This theme continued in Stalker: Call of Pripyat, where the 640's 28.5- and 25fps at 1680x1050 and 1920x1200 was beaten by the 7750's 30.8- and 27.3fps.

We stress that these differences come despite the overclocked speeds. You can buy standard versions of the GT 640 for around the same price as the 7750, but we suspect they would offer slower performance.

While reference boards (and many retail versions) of the 640 come with just two digital connectors, the 640 OC has HDMI and a pair of DVI ports. This allows



three displays to be used with nVidia's Surround technology.

Given the dearth of processing power, the card won't be suitable for high-level gaming. But it is reasonably quiet, and barely registered on our sound meter.

**Verdict**

The nVidia GT 640 simply can't compete with its AMD Radeon counterparts. The 7750 offers marginally higher performance for considerably less, while the 7770 goes far beyond its capabilities, despite costing just a few pounds more. **✗ Robin Morris**

**£1,500** inc VAT**Contact**■ [hdanywhere.co.uk](http://hdanywhere.co.uk)**Read more**■ [tinyurl.com/c4ske3w](http://tinyurl.com/c4ske3w)**Specification**

Network media distribution; HDBaseT protocol; 100m nominal range; Transmitter: 4x IR blaster; 4x HDMI; 4x HDBaseT; 2x ethernet RJ45; 440x200x45mm; Receiver: 1x HDMI; 1x HDBaseT; 2x ethernet RJ45; 110x23x23mm



## HDBASET DISTRIBUTION SYSTEM

**HDanywhere Multiroom+**

There's a revolution taking place in the world of HD-video-signal distribution, but the arrival of HDBaseT is potentially the biggest game-changer. This allows a single ethernet cable to deliver lossless HD video and audio, 100Mbps internet, and up to 100W of power for up to 100m without signal degradation.

HDBaseT kit has previously been prohibitively expensive, but this £1,500 package features everything you need to install a multiroom HDBaseT system.

The main controller sports four HDMI inputs and four RJ45 ethernet outputs. Each output tethers to one of four small HDBaseT receivers. Since the Multiroom+ unit doesn't implement power over IP, these receivers have their own power supplies. A simple remote control is included for the main unit.

Setup is simple. Just plug in your sources at the hub end, connect the receivers via their HDMI output to the screens at your networked locations, and turn on the power. All



connected feeds become accessible at all your display points.

The build quality is outstanding. With a somewhat industrial design, these units don't look as though they'll fall apart any time soon.

Of course, it's not just sound and vision that can be poured over HDBaseT. The transmitter will also pipe your local ethernet network across the cable; a LAN connection is provided for your router.

The receivers have a convenient ethernet output, which enables PCs, Smart TVs, games consoles and whatnot to get online.

Performance is outstanding. We analysed full-HD 1080p test charts, played from Blu-ray, and witnessed no artefacting, stuttering or dropped frames.

The picture quality appears transparent to the source, even over a 100m run. The system is

3D-compliant, and is said to support 4k (we were unable to test this). There's negligible latency.

The Multiroom+ will also deliver bitstream audio intact, such as DTS or AC3, a trick that sets it apart from most of its HD distribution rivals.

Both Dolby TrueHD and DTS HD Master Audio soundtracks found their way over our HDBaseT network to a waiting AV receiver.

**Verdict**

HDBaseT is a technology to watch, and this adept multiroom system is the tip of a connectivity iceberg. Projectors with HDBaseT made their first appearance at the recent Infocomm trade show, and TVs, AV receivers and other media sources are expected to follow. The Multiroom+ is a versatile distribution solution, both easy to install and an excellent performer. **✗ Steve May**



**£500** inc VAT

**Contact**

■ [samsung.com/uk](http://samsung.com/uk)

**Read more**

■ [tinyurl.com/cp5pkqo](http://tinyurl.com/cp5pkqo)

**Specification**

46in LCD TV; 1920x1080; Freeview HD, DVB-S2 tuners; 3x HDMI; 1x Scart; 1x Composite/Component; 2x 10W sound system; coaxial S/PDIF; headphone jack; 10/100 ethernet; 802.11n via USB adaptor; 2x USB 2.0; CI slot; 62W average power consumption; 928x551x93mm; 9kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



46in TV

## Samsung UE40EH5300

Samsung's Series 5 LCD TVs may forego such fripperies as 3D, motion control and USB timeshift recording but, if you're looking for a big-brand, internet-enabled television, they're very temptingly priced.

The design is generic. At 93mm deep, this big screen isn't as svelte as its more glamorous stablemates. Not that you'd be able to tell when viewed square-on; the set has a glossy front with a slim bezel.

Two HDMI inputs are found at the rear, nestled between the Scart and AV jacks. Also here are ethernet, an optical digital audio output and a headphone mini-jack.

A third HDMI port is mounted on the side, as are a couple of USB ports and a CI slot. Wi-Fi isn't built in, although the set will work with an 802.11 wireless dongle.

The user interface is clean and colourful. Samsung's online portal offers a selection of streaming services, including BBC iPlayer, Netflix and Skype, plus plenty of apps of more variable interest.

Multimedia file playback support is also excellent. MKV, AVI, MOV and MP4 all play from a USB stick or NAS, while audio compatibility embraces FLAC, WMA, MP3 and AAC.

Audiovisual performance is good, with caveats. There are no high-speed refresh modes to bolster this 100Hz panel, which means motion resolution brick-walls at just under 800 lines. The LED MotionPlus function fails to resolve this issue, but it does drop the set's brightness. If you're looking for a TV that delivers crisp sporting detail, you'll need to look further up Samsung's range.

For less frenetic viewing, the UE40EH5300 is fine. There's no horizontal judder on pans, and pictures have an immediately appealing dynamism. The colour reproduction is vivid, with reds tending toward orange, but blacks are sufficiently deep.

Backlight uniformity, the bane of most edge-lit screens, is good; only



a low-level glow emanates from the corners of this Samsung panel.

Take care with placement, though, since off-axis viewing is limited. Contrast and colour drop away quickly when viewed side-on.

### Verdict

Widely available at significantly less than Samsung's list price, the UE40EH5300 should be considered solid value. While it's not the prettiest Freeview HDTV on the block, nor the best equipped, it dazzles with HD content and offers plenty of streaming entertainment.

✉ Steve May

**£699** inc VAT

**Contact**

■ [sony.co.uk](http://sony.co.uk)

**Read more**

■ [tinyurl.com/9od8qxp](http://tinyurl.com/9od8qxp)

**Specification**

32in LCD TV; LED edgelight; 1920x1080; stereo speakers with 2x 10W amp; Freeview HD tuner; 7-day EPG; 4x HDMI; 1x Scart; 1x Composite/Component; digital audio coaxial S/PDIF; headphone jack; 802.11n; 10/100 ethernet; Wi-Fi Direct; 2x USB 2.0; CI slot; 56W consumption; 756x473x59mm; 8kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



32in 3DTV

## Sony KDL-32HX753

Few would deny this television is pageant-show pretty, with its glossy black bezel and metallic edging. Connectivity is also generous, with four HDMI ports, Scart, component, VGA, CAM, twin USBs and ethernet.

The integrated wireless supports Wi-Fi Direct, which is great for non-LAN hook-ups. This set will also record to an external USB drive, but it's limited by a single tuner.

The Sony Entertainment Network portal is organised into easily manageable blocks of apps, movies and music. In addition to iPlayer there's Demand Five, YouTube, Netflix, LoveFilm and loads more. You can stream films from Sony's Movies Unlimited service, and there are apps for Facebook and Twitter.

Sony has struck a partnership with Opera, and the resulting Opera TV store dispenses casual games, music and weather services. The TV listings guide is a standard Freeview offering, with a live TV window.

Picture quality is relatively refined, with vibrant colour. Our

test footage of gleaming brass instruments exhibited a convincing golden sheen, while blacks were deep and smooth. The dimly lit action in Ryan Gosling's

*Drive* looked glossy, not gloomy.

The Sony panel has moderate reflectivity, somewhere between matt and gloss.

The inclusion of active-shutter 3D is creditable, but if stereoscopy is your bag then a larger screen is essential. You'll need to get comically close to enjoy any depth. Crosstalk is sporadic, but not intrusive. You'll need to buy the 3D glasses separately.

Where this flatscreen flounders is in its flat audio. For watching anything other than daytime TV, you'll want a separate speaker package or soundbar.



The screen's multimedia file support snubs MKV, a discrimination that extends from USB media to network NAS. Other popular file types unspool without fuss.

### Verdict

The KDL-32HX753 is an expensive, undeniably stylish, Freeview TV with a fine feature set. The streaming content from Sony's online portal is dizzying, and HD picture quality is solid. The set's multimedia file support is incomplete, and sonic performance is distinctly average, but don't let those niggles put you off this set. ✉ Steve May



**£70** inc VAT**Contact**■ [logitech.com](http://logitech.com)**Read more**■ [tinyurl.com/9u6ek8z](http://tinyurl.com/9u6ek8z)**Specification**

Wireless keyboard with solar power; full-size qwerty keys with number pad; photovoltaic solar cells and internal rechargeable battery; flip-down rear risers; 431x155x8mm; 734g

**WIRELESS KEYBOARD****Logitech Wireless Solar Keyboard K750**

Logitech's K750 is a full-size keyboard for Mac users. It's closely modelled on Apple's own wired keyboard, but with the benefit of solar power and a wireless connection.

Anyone familiar with Apple's current Bluetooth peripherals will know they can chomp through AA batteries, so a keyboard that will never need another battery appeals on ecological and economical levels.

The K750 is nearly the same width as Apple's keyboard, at 431mm, but 155mm rather than 113mm deep. The extra depth is for two banks of photovoltaic cells that stretch across the top. The system is remarkably efficient. Rather than worry about sun-free days causing your typing to peter out, we found the keyboard always topped up.

The Solar App is a lightweight OS X application that displays ambient light level, in lux, on a speedo dial. The battery level is shown below. Logitech says a full charge will power the keyboard in darkness for three months.

A slide switch in the top-right corner turns off the keyboard, and smiley or sad faces notify you of its current status. This button also launches the Solar App. Unfortunately, Logitech forgot the LED indicator for Caps Lock.

Apple-specific shortcuts are available on the Function keys, including brightness up/down on F1/F2, and Mission Control on F3.

The wireless connection to the PC is through an RF link, which requires a tiny 4mm USB dongle. A Bluetooth link would have been more sensible for Mac portables with only two USB ports.

We weren't particularly impressed with the keyboard's plasticky build. It flexed too easily in our hands, while the dimpled keys clatter and wobble as you type.

More disconcerting are the flimsy fold-out legs on the rear that are essential to raise the keyboard to a comfortable angle. These bend, too.



The combination of a flexy keyboard chassis, spongy keys and a wobbly rear supports makes this a noisy and unsteady keyboard in use. That's a shame, because the concept is so good.

**Verdict**

Solar power works well on this wireless keyboard, but we would prefer a Bluetooth wireless connection than give up a valuable USB port to an RF dongle. The K750 is a great idea, let down by cheap-feeling build quality.

✉ **Andrew Harrison**

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- VGA and 2 x HDMI input connectivity

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## CONTENT TOOL

## Google Play Movies &amp; TV

## Free

## Contact

■ play.google.com

## Read more

■ tinyurl.com/czoenmx

## System requirements

Android 2.2 smartphone/

Android 3.2 tablet or

later



Google Play Movies & TV operates as a window into the Google Play store, allowing you to rent movies, which can be streamed or downloaded via a web page, Android phone or tablet, and view video from other sources on the same devices.

Google Play Movies & TV is as important to Google as its Nexus 7 tablet. The Nexus is, as we know, a loss leader from Google aimed at generating more revenue via the Google Play Store. It's why Google is giving away £15 of credit with each Nexus 7 purchase, and why the product costs little more than the sum of its parts.

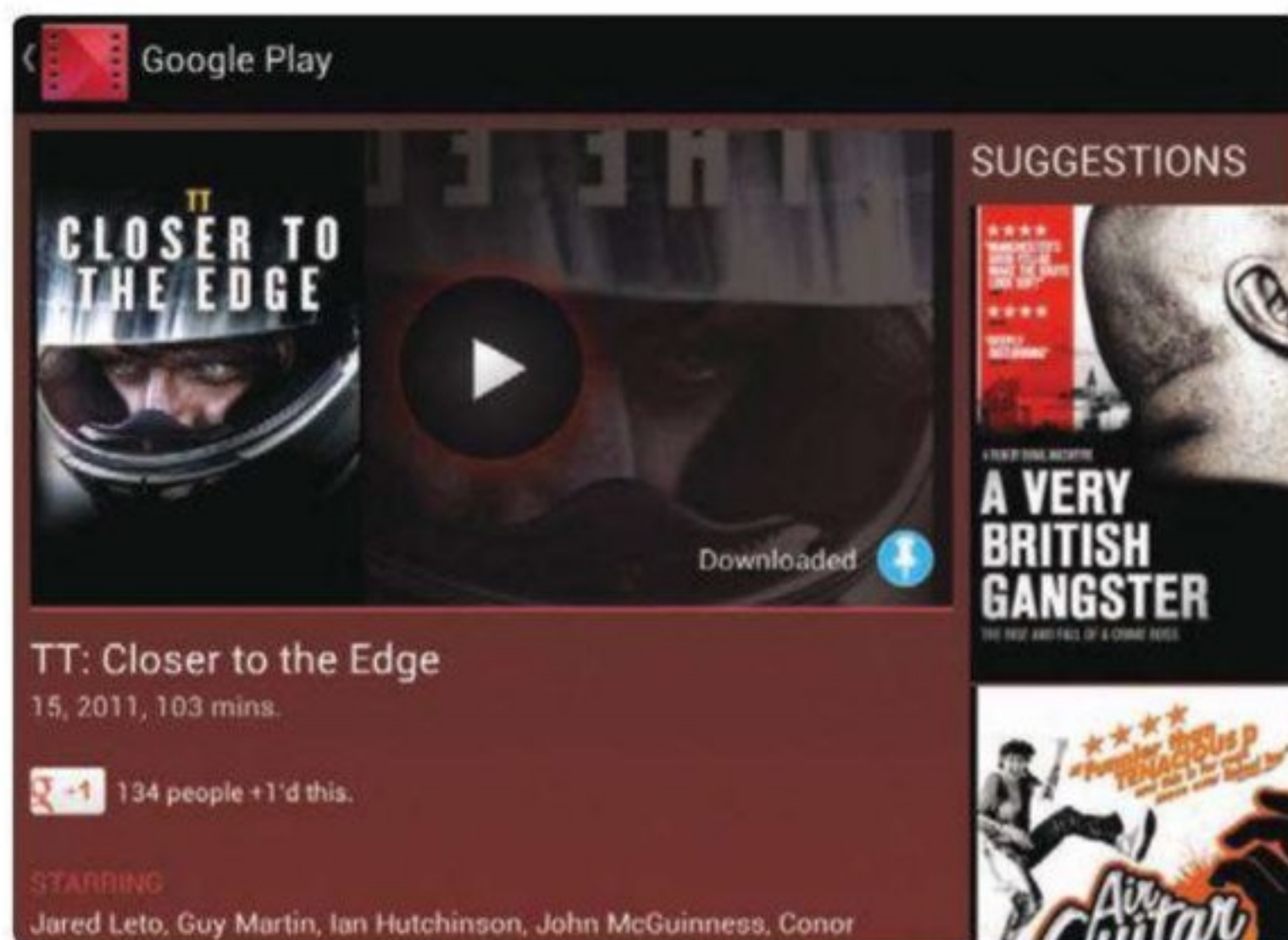
## Getting to grips

The app is compatible with Android 2.2 phones and 3.2 tablets or later, and comes preloaded on most. It is a video player, meaning you can play your own video files through the app. More importantly, alongside Google Play Music (not yet available in the UK) it is Google's answer to iTunes, in that it purports to be a consumer-friendly one-stop shop for movies and TV.

Google Play is different, however. This app is principally a player for movies you rent and a means of helping you to find new movies to watch. The movies themselves can be found on Google Play, and then downloaded to or streamed and viewed with the app.

Opening up the Google Play Movies & TV app on our Nexus 7, we find two tabs at the top: Movies and Personal Videos. US users will find a third tab for TV Shows, but here in the UK we are not yet so blessed, due to licensing restrictions.

The Personal Videos section displays videos you create using your Android smartphone or tablet,



as well as any videos that you copy over to your device. Unfortunately, it's by no means the most versatile video player for Android. You'll need another third-party app to play QuickTime movies, for instance.

More fun can be had via the Movies tab. Here you'll find self-explanatory sections entitled My Rentals and My Movies. These display all your recent Google Play movie rentals, as well as any films you've purchased from the Google Play store (although the latter is not currently possible for UK users).

Each movie entry includes artwork and information, as well as whether you have downloaded it and how long you have left to watch it. Movie rentals cost from £1.49 to £3.49 in standard-definition form, going up to around £4.49 for new high-definition releases.

## Movies, movies, movies

There are lots of movies in the Google Play store, including recent Hollywood releases and a good number of classics. Once you've rented a movie you can view it on various devices – an Android phone or tablet, or even via the website on any web-connected Windows PC, laptop or Mac. Watching online is straightforward; simply sign in to your Google account and you can watch just as you would on your Android device.

The rental system could be confusing to some. You have to watch rented movies within 30 days of making the purchase, and once you start watching you

have 48 hours in which to finish it. During this time you can watch the film multiple times.

We tried streaming *Transformers: Dark of the Moon* on our Nexus 7 over Wi-Fi and found the quality perfectly adequate on the tablet's 7in display. Our office's flaky Wi-Fi was a problem, however, and playback was occasionally a little jerky. You can also stream over 3G, so truly mobile movie watching is possible, although the signal would have to be robust.

We were more successful when we downloaded *TT: Closer to the Edge*, a movie that then played seamlessly. The rental purchase system is simple, too: if you are already logged into a Google account with either a debit- or credit card attached, you simply hit rent and the movie is yours. We'd recommend the download option for the reasons outlined above. It took around 25 minutes to pull down 'TT' to our Nexus over Wi-Fi.

## Verdict

Combined with the large numbers of Hollywood releases now proliferating the Google Play store, and hardware such as the Nexus 7, Google Play Movies & TV is a game changer for Google. It offers a seamless and consumer-friendly way for Android users to watch high-quality movies. We'd like to be able to buy movies, and the 'TV' part of the app's name is currently a misnomer, but both are licensing issues and should be resolved in time. This app is great news for Android. **✉ Matt Egan**





## NAVIGATION

## NavFree for iOS

## Free

## Contact

■ [navmii.com](http://navmii.com)

## Read more

■ [tinyurl.com/d4t5de3](http://tinyurl.com/d4t5de3)

## System requirements

iOS 4.0 or later;  
443MB storage; also  
available for Android 2.2  
or later; 14MB storage

NavFree is a free satellite-navigation app for the iPhone and iPad. It operates just as a TomTom or Garmin satnav would: you enter a postcode or an address, and it provides a quick and effective route to get you where you need to be. You can also carry out a Google search for a business name, then navigate to that business based on the results fed back to the app.

You've got a choice of two voices – Kate and Dave – within the UK & Ireland version, and they do a good job of keeping you informed along your route. You can substitute these options with one of 15 alternatives, most of which are available free of charge. If you want Snoop Dog directing your car then you'll have to pay £2.99, though.

Satnav apps need not cost a fortune, and NavFree is an example of a free app that performs well. You can remove the banner ad at the top of the window for £1.99, although it didn't interfere with the operation of the app in our tests.



Additional street maps for France, Germany, Austria and other European countries cost £1.99 each. Also available for £1.99 is a speed-camera database, which can help you to maintain a safe, legal driving speed. Remember to regularly update the database if you plump for this add-on.

## Verdict

NavFree is a fully featured satnav app that will allow your iPhone or iPad to replace a dedicated satnav. We tested the app with an iPhone, however, and worry that a much larger iPad might obstruct your view of the road too much to be useful.

☒ David Bradforth



## GAME

## Amazing Alex Free

## Free

64p for full game

## Contact

■ [rovio.com](http://rovio.com)

## Read more

■ [tinyurl.com/cyhzce7](http://tinyurl.com/cyhzce7)

## System requirements

Android 2.1/iOS 4.2 or  
later; storage: 22MB  
Android, 19.8MB iOS

Rovio is best known for the avian antics of its popular Angry Birds, but Amazing Alex is proof that the software developer is more than a one-trick pony. This adventure puzzle game for Android smartphones and tablets is every bit as addictive as hanging out with Black Bird, Yellow Bird, Big Brother Bird et al, if less ground-breaking.

Amazing Alex isn't about to reach the dizzying heights of success of Angry Birds, particularly given the limited amount of gameplay available in the free version, but you could easily lose entire train journeys interacting with the various toys stored in this little boy's house.

Although the concept of the game itself is different, the interface borrows heavily from that of Angry Birds – you'll find the same restart, menu and sound icons, and an identical level structure in which each task is grouped into a larger set. In familiar Rovio fashion, up to three stars are awarded – but, like Cut The Rope, these depend on how many



stars you collect within the game, rather than how highly you score.

Only the first group of 16 levels, called 'The Classroom', is unlocked in Amazing Alex Free. There's not enough here to keep you playing for long, but it serves as a decent demo to help you decide whether you want to pay 64p for the full game, which has 100 levels across four settings.

As in Angry Birds, the first few levels are ridiculously easy: you simply have to correctly position a wooden bench, book, box, balloon or pair of scissors to create a chain reaction that will, for example, land a football in a basket when it's rolled

toward it, or pop a balloon let off in the direction of a pair of scissors.

You don't even need to work out where to put the items in the first eight levels, since the area is highlighted onscreen. You must work it out yourself thereafter and, in some cases, there may be more than one possible solution. No problem is overly difficult.

## Verdict

Rovio hasn't got another Angry Birds on its hands here, but it has developed yet another instantly addictive timewaster, suitable for all ages. ☒ Marie Brewis





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## SOFTWARE

## OPERATING SYSTEM

## Apple OS X 10.8 Mountain Lion

£13.99 inc VAT

## Contact

■ [apple.com/uk](http://apple.com/uk)

## Read more

■ [tinyurl.com/9eLfq6e](http://tinyurl.com/9eLfq6e)

## System requirements

OS X Mountain Lion requires a Mac with a 64bit kernel. Mountain Lion supports the following Mac models: iMac Mid 2007 or later; MacBook 13in Aluminum 2008/13in Early 2009 or later; MacBook Pro 13in Mid 2009 or later/15in 2.4/2.2GHz/17in Late 2007 or later; MacBook Air Late 2008 or later; Mac Mini Early 2009 or later; Mac Pro Early 2008 or later; Xserve Early 2009

PC ADVISOR  
GOLD

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★



**MESSAGES** allows you to instant message with iPhones and iPads

Big updates to Apple's OSes are typically gifted with a new feline name. Mountain Lion, otherwise known as Apple OS X 10.8, is more an incremental upgrade to last year's Lion OS X 10.7, yet it introduces fundamental changes to this accessible operating system.

Apple claims that more than 200 new features are present, many of which are small enough to be missed by most users. There are some real headline changes, though, along with minor but significant tweaks.

Among the stand-out features are examples of iOSification, additions that echo features familiar to iPhone and iPad users.

Notifications, like the drop-down menu on the iPhone, provides instant updates on Calendar events, FaceTime, Mail, Messages and two new additions in Mountain Lion, Reminders and Game Center.

Notifications appear in a bubble in the screen's top-right corner. To see all notifications you swipe with two fingers from the right of the trackpad. This has the effect of sliding the entire desktop a few inches to the left. It's a convenient way to quickly keep track of incoming information.

Reminders is a handy way to set yourself prompts for forthcoming events, and will sync with those set on your iOS devices via iCloud, too.

## AirPlay Mirroring

Also borrowed from iOS is AirPlay Mirroring. This allows certain media content, such as video and music, to be beamed from a mobile device to an Apple TV. In effect, it makes it easy to put on to your large TV screen what was once confined to the smaller PC display.

In Mountain Lion, Apple has upped the ante to allow a Mac's



The default OS X **DESKTOP** is close to that of Lion, but with new wallpapers

entire screen to be pushed across to the TV screen. When a Mountain Lion Mac is on the same network as an Apple TV, the AirPlay icon appears in Finder's top menu. Selecting this mirrors the entire display on the Apple TV, with no further configuration required. It's a system that works effortlessly to share what you're seeing on the big screen, with audio, too.

## Game Center

Just like in iOS, Game Center lets you log into a shared network of gamers, where you can play against friends or strangers. This means the Mac can now battle against iPad and iPhone users on the same turf.

## Safari

Apple's default web browser across all its products is Safari. Its respected open-source core is also used by other developers - notably Google in Chrome.

Many of the latest tweaks to Safari are copied from other popular browsers. The URL you see in the address bar has the top-level domain in bold for clarity, with the remaining sub-domain in grey. The leading 'http://' has been omitted.

A unified URL and search bar takes the place of separate address and search windows, as seen in Firefox's Awesome bar. Google is still the default search engine, with Bing and Yahoo also available in the browser's preferences.

When downloading files through Safari, a crazy swoop animation is shown onscreen as your file heads to the Downloads folder icon in the Dock. A sharing button in the

toolbar lets you add the current page to your Reading List, Add Bookmark, Email this page, or share through Messages or Twitter. The cloud button next to it lets you synchronise open tabs with those on other Apple devices.

A useful trick we've not seen elsewhere is Tab view. Selecting this from the View menu displays all your open windows as scrollable thumbnails in a single pane. You can access this useful feature by pressing Shift, Cmd, \ or using a pinch-to-zoom gesture.

## Security

Several signs show that Apple is taking security more seriously these days, no doubt spurred on by vulnerabilities in third-party software that hit the headlines this year and reflected poorly on the platform as a whole.

While OS X and its Unix foundation are relatively secure compared to Windows, any user can unwittingly approve the installation of malware. Apple has introduced GateKeeper as a simple way to mitigate against the modern computer's most exploited and exploitable weakness: the user with administrator privileges.

Mountain Lion takes the iOS model for security as an option, that is, to not allow the installation of programs that have not first been screened by Apple.

Three options are listed. The default is a middle-ground, allowing you to install only apps downloaded from the Mac App Store or developers that have been identified in Apple's code-signing process.







Code signing underwrites trusted software that's been authenticated by a developer's security certificate. If you try to launch an unsigned program, it won't run.

You can further tighten security to allow downloads only through the Mac App Store; or loosen it, allowing apps to be installed from anywhere.

This move is a serious speedbump against Trojans that masquerade as popular plug-in updates, such as drive-by malware disguised as Adobe Flash updates. This is probably the biggest tightening of security the platform has seen since the launch of Mac OS X with its BSD Unix core in 2001.

Also under the Security tab is more control over which apps can access your personal data – specifically, your Contacts address book. When an app that asks for such access is installed, a pop-up dialog requests your approval. You can change

your mind about its access privileges from the Privacy tab within the Security pane.

### Other tweaks

Inevitably, iCloud is more prominent in OS X 10.8 Mountain Lion. One place we keep seeing the silver cloud icon is when saving documents in TextEdit and Pages – the default behaviour is now to save direct to iCloud. And when opening that app, you're offered a window to browse saved documents, from iCloud or the Mac.

But what happens if you did decide to save it to iCloud, but are currently offline when you want to open your file? In our experience with a MacBook, we found the same documents were offered even with Wi-Fi switched off, suggesting that a local cache must exist on the Mac. This should make the save-to-cloud option slightly less daunting to anyone concerned about losing access

**TAB VIEW** offers a neat way to slide between open browser tabs

**SAFARI's** sharing options make it easy to save pages for later or email them to friends


to their important documents when a web connection isn't possible.

Power Nap leverages new tricks in Intel processors that allow them to carry out limited work when the computer is in standby mode. Updates pushed from iCloud servers, such as new mail and calendar events, run while the Mac is asleep; when it's awoken it'll already be up to date. Further, if a MacBook is connected to a power source, it will also download new software updates, ready for you to install next time you use it, or automatically if the option for 'Install system data files and security updates' is selected within System Preferences.

Chinese support has also been added, with a new dictionary and eight fonts. Mail now has compatibility with popular Chinese email providers QQ, 163 and 126, while the Baidu search engine is offered in Safari.

In use, we found few issues in Mountain Lion. Even long-standing niggles that appeared in Lion, such as apps reopening their previous windows on the next launch when specifically told not to, have been fixed. And now, if you want everything to reopen when restarting your Mac, you must deliberately opt in to do so.

### Verdict

A slew of minor features and tweaks in Mountain Lion makes it a worthy upgrade for Lion users. The new security features should reduce the remaining vector of infection on what is already the safest mainstream PC operating system around. Snow Leopard hold-outs can be assured that the king of the beasts has been groomed in his high-altitude form, making the Mac run smoother than ever.  **Andrew Harrison**

New **SECURITY** settings should help to avoid the accidental installation of Trojan malware





## INTERNET SECURITY SUITE

# G Data Total Protection 2013

**£40** inc VAT (1 PC)

### Contact

■ [gdatasoftware.co.uk](http://gdatasoftware.co.uk)  
Read more  
■ [tinyurl.com/bvyh7ug](http://tinyurl.com/bvyh7ug)

### System requirements

Windows XP/Vista/7;  
1GB RAM

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★



Total Protection 2013 combines antimalware with a cloud component and twin antivirus engines, a firewall, antispam and parental controls.

The main control panel is busy, but it's easy to find your way around. On the right are separate panes covering the key functions, such as scanning and updates, plus secondary functions such as parental control and tune-up. Oddly, the colour scheme of the latter makes it look as though they are greyed out and unavailable.

To the left are two real-time graphs of processor usage, so you can see at a glance how intensely the CPU is working in general and on protecting your machine.

You can direct scans at specific folders or files, but there's no Windows widget for quick single scans. Of the other modules, the Tuner does an effective job of mainstream housekeeping, such as defragmenting hard drives, and also suggests improvements it can make.

We tested the scanning component with our usual 50GB basket of assorted test files. On the first run it scanned 8,809 files in just over 30 minutes; in two subsequent runs it checked the same number of files in 7 seconds. This is because Total Protection 2013 uses fingerprinting to ensure it checks unchanged files only once.



**G DATA TOTAL PROTECTION** has a busy yet easy-to-navigate interface

G Data automatically scans a PC while it's idle, which means it has a low system footprint. It took 57 secs to copy a 1GB file with a G Data scan running in the background, which is only 17 secs longer than when the system was idle. The copy time was extended by 42 percent, putting it in fourth place among the suites we've tested in performance terms.

Independent testing lab AV-Test awarded G Data Total Protection 2013 15.5 out of a possible 18 points. This is a very good score, if not the highest on record.

In the Protection part of the test, G Data was awarded 5.5 out of 6 points. Total Protection detected all new and established malware, but lost half a point to zero-day attacks.

Under Repair, it was able to remove 100 percent of malware

components, and repair 73 percent of critical system changes (the average here is 63 percent).

G Data lost 1.5 points in Usability, with AV-Test accusing it of fostering a greater-than-average system slowdown. We were surprised by this, given its preference to scan during idle time and speedy performance in our own tests.

## Verdict

With an innovative fingerprinting technique speeding up its file-scan performance, we found G Data Total Protection 2013 very fast to scan our PC – although AV-Test would disagree. This security suite is well featured, and its antivirus protection is thorough. However, it's also expensive, particularly for a single licence. **Simon Williams**

## INTERNET SECURITY SUITE

# Microsoft Security Essentials 4.0

**Free**

### Contact

■ [microsoft.com](http://microsoft.com)  
Read more  
■ [tinyurl.com/9hdxofr](http://tinyurl.com/9hdxofr)

### System requirements

Windows XP/Vista/7

Usability: ★★★★★

Features: ★★★★★



For a long time Microsoft kept well away from anti-malware software, perhaps worrying about more competition troubles, as it had with bundling Internet Explorer.

Microsoft Security Essentials isn't yet included with any version of Windows, but it is free for home- and small-business use.

It works with Windows Defender, which defends against spyware, but instead concentrates on viruses, rootkits and Trojans.

The interface is very simple, comprising a single pane with four tabs labelled Home, Update, History and Settings.

The Home tab enables a manual scan – quick, full or custom – and

lets you set an automatic schedule. Update shows the version and date information on virus definitions and enables a manual update.

The History tab is a bit of a misnomer, as there's no built-in log of scans or results, although any positive hits and actions from a scan are recorded here.

If you just need to know that a security scan has completed, you have to delve into Windows Event log, which isn't something most people will do lightly.

The Settings tab offers most of the usual controls, although the default scheduled scan is at 2am on a Sunday and assumes that you leave the PC switched on over the

weekend. Many people will want scan their PC more than once a week, too.

We scanned our usual 50GB bundle of assorted files and were surprised by the results. Security Essentials claimed to have scanned 1,251,750 files, which is five times as many as any other antivirus program we've tested, and a lot more than the 8,780 files Windows claims are in the folder. Even when we included in the count the number of files compressed in Zip archives, we couldn't understand how the program had managed to scan files that simply didn't exist.

Security Essentials also took more than double the amount of time required by other security



## DISK UTILITY

## Paragon Partition Manager 12.0 Home

**\$40 (£25)****Contact**■ [paragon-software.com](http://paragon-software.com)**Read more**■ [tinyurl.com/cx2sbxk](http://tinyurl.com/cx2sbxk)**System requirements**

Windows 2000/XP/  
Vista/7; 256MB RAM;  
1GB drive space

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★



There are several reasons for wanting to adjust the number or size of partitions on a hard drive. For example, you may need to reallocate space from one partition to another as your storage needs change.

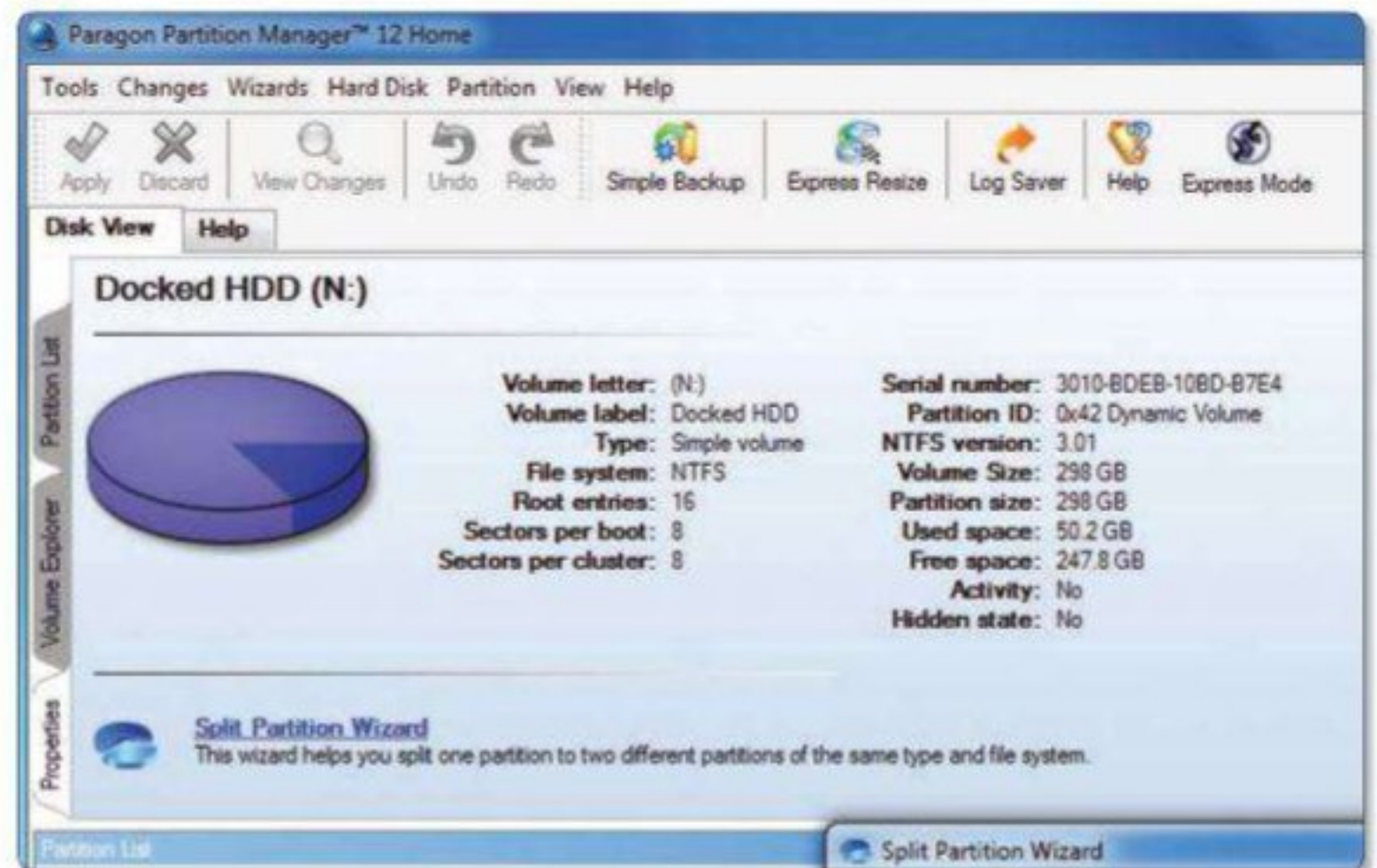
Windows has a habit of wiping the data on a partition when you change it, but Partition Manager can achieve most changes without disturbing resident data. Version 12.0 can split an existing partition, distributing files from the old partition between the new ones in an arrangement of your choice.

This partition-splitting feature's absence is something for which the product has been criticised in the past. Paragon offers a wizard to achieve the split, which is just one of many such help tools available.

You choose a partition, then specify which of the folders stored within that you want to move to the new partition. Paragon splits the partition and distributes the files accordingly. This simple process won't work with Dynamic partitions, though, and you'll need the Pro version to convert partitions from Dynamic to Basic.

The program works with FAT, NTFS, Apple HFS and versions of the Linux EXT file system.

Paragon offers a new partitioning engine in version 12.0 Home, so we checked its performance by splitting



**PARTITION MANAGER 12.0 HOME** can split partitions without data loss

and then merging the partitions of a 320GB SATA disk. The splitting process took 18 minutes 48 seconds, and the merging required 18 mins 37 secs. These type of tasks could easily be completed in a lunch hour.

The main screen will be familiar to anyone who has used an earlier version of the program. The top panel shows details of the currently selected partition, including a pie chart of its usage, while two shuttered panels show a partition list and a graphical disk map.

You can access tools to create, delete, format and label partitions. The main interface also offers the aforementioned partition-merging functionality, although they must be adjacent on the same disk. Extras include simple file backup,

which enables you to select files and folders and back them up to another partition, and a boot manager.

As well as a \$40 (around £25) single-PC licence, which runs for a year, a \$10 (£6) 10-day licence is available. The latter makes a lot of sense if you simply need to use the program once to configure a new PC.

**Verdict**

Paragon Partition Manager 12.0 Home is a pleasing revision to the product, adding the ability to split partitions and perform basic functions without data loss. The versatile pricing structure is welcome, given that the £25 annual price will be expensive for those who need to use Partition Manager only once. **Simon Williams**



**SECURITY ESSENTIALS** has a very simple interface

products to scan the imaginary files, at 2 hours 42 minutes. A repeat scan took even longer at 2 hrs 45 mins. Fortunately, the scanner doesn't place a big burden on the system,

with only a 38 percent increase in the copy time when a scan is running in the background.

AV-Test has evaluated Security Essentials 4.0 and awarded it 13.5 out of a possible 18 points. This compares with 14.5 points for Avast Free Antivirus 7.0 and 15.5 points for AVG Free 2012.

Perhaps more worrying is that Microsoft's product scored only 2.5 points in the Protection category.

Although it scored 100 percent in the detection of widespread malware, and it performed slightly better than average in spotting two- to three-month-old threats, it was a long way behind in zero-day detection. Here, it scored 76- and

80 percent in consecutive months, against an average of 88 percent.

All this means that top protection from brand-new malware will be better provided by one of the other free antivirus applications.

Although it's free, make sure you download Security Essentials from a reliable source. The application is said to be the second most popular antivirus software in the world, and has attracted malicious imitations.

**Verdict**

It's hard to be critical of a free product, but other free antivirus suites do a better job. Security Essentials is very easy to use, but slow. **Simon Williams**



## WEB DESIGNER

# Serif WebPlus X6

£81 inc VAT

### Contact

■ [serif.com](http://serif.com)

### Read more

■ [tinyurl.com/8gokgqr](http://tinyurl.com/8gokgqr)

### System requirements

Windows XP/Vista/7;  
512MB RAM; 100MB drive  
space; Internet Explorer  
6.0 or later

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★

★★★★★

Serif's WebPlus X6 combines blogging and social-media access with an easy-to-use WYSIWYG website-development tool.

It can import HTML files from a local source or URL, and comes preloaded with around 30 theme layouts, a handful of X6 Pro templates, and a link to free content packs on Serif's site.

Each template and layout includes different colour themes. You can use any of the colour themes for any layout.

Each layout comes in two general sizes: one for desktop websites, and one for mobile. It's up to you to cut and paste the content, though. Visitors are automatically redirected to the correct version depending on their device.

WebPlus X6 includes a good balance of professional-looking business sites, and more relaxed, playful ideas. Each includes almost everything you'd expect from a website template, including home, contact us and gallery pages.



**WEBPLUS X6** is a very easy-to-use site builder with plenty of templates

WebPlus includes quickshapes, line drawing, artistic text and a generic image editor, but it's easy to use even if you're not a designer.

Create a new page from scratch and you're prompted to select a page size suitable for a typical smartphone, iPhone, small or widescreen monitor, or create a custom size. You then choose a navbar style and Assets.

WebPlus X6 includes a lot of content, including graphics, stock

images, panels, buttons, picture frames, content and backgrounds.

Smart content, such as blogs, forums and hit counters, is accessible through a Web Resources User account, which is free for up to 512MB of traffic per month.

## Verdict

WebPlus is simple to use, yet has all the tools you'll need to create an online presence, both in desktop and mobile form. **Clare Brandt**

## GAME

# The Walking Dead (episodes 1 & 2)

£20 inc VAT

### Contact

■ [telltalegames.com](http://telltalegames.com)

### Read more

■ [tinyurl.com/chaensy](http://tinyurl.com/chaensy)

### System requirements

2GHz processor;  
Windows XP/Vista/7/  
OS X 10.6 or later;  
3GB RAM; 2GB drive  
space; AMD/nVidia  
graphics with 512MB  
memory

Zombies seem to have lost all mystique yet, amazingly, The Walking Dead manages to outdo both the comic and the TV show of the same name. It takes the pseudo hand-drawn visual style of the former, and the character relationships of the latter, to create something darkly memorable, packed with difficult decisions and horrible consequences.

Rather than an action game, the focus is on making choices intended to keep a small group of apocalypse survivors alive. The story is split into five episodes, which means you must wait an indeterminate period for the next.

The game doesn't follow the established characters; instead, it tells the tale of ex-con Lee Everett, a good man with a dark past who becomes a father figure to a young orphaned girl, and the lynchpin of a band of survivors who can't stand to be in the same room as each other.

Choices such as who to side with in an argument, or who to save when



Your decisions may have disastrous consequences in **THE WALKING DEAD**

the undead break the barricades, have to be made incredibly quickly. If the timer runs out, inaction will likely mean double-disaster.

Received wisdom is that zombie games should be grim and gloomy, but this bright and exaggerated stage means the horror of the undead attacks is more pronounced.

Less successful are more direct attempts at action, which tend to mean quick-reaction button-pushing to boot a zombie in the face before it eats your brains.

The game has so far avoided the soap-opera-esque water-treading of the TV series. Three episodes remain but, if they're as strong and striking as this, we're looking at something very special indeed.

## Verdict

What could have been an ugly mess of quick-time events and abstract puzzles turns out to be a sober, moving study of the difficult decisions that must be made at the end of the world. **Alec Meer**

OVERALL

★★★★★



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**£265** inc VAT

#### Contact

■ [kodak.co.uk](http://kodak.co.uk)  
Read more  
■ [tinyurl.com/cmd5xyk](http://tinyurl.com/cmd5xyk)

#### Specification

Sheet-fed desktop scanner; 600dpi; 24bit colour; colour duplex; 20-sheet feeder capacity; USB 2.0; 500-sheet daily duty volume; Twain/Isis/WIA-compliant; NewSoft Presto BizCard software; 3-year warranty; 289x107x78mm (closed); 289x330x160mm (open); 1.3kg

Build: ★★★★★  
Features: ★★★★★  
Performance: ★★★★★  
Value: ★★★★★



#### DOCUMENT SCANNER

### Kodak ScanMate i940

Kodak's ScanMate isn't attractive by any means, and it doesn't offer the fastest performance, but it's a reasonably solid and cost-effective sheet-fed scanner, at just £220.

When closed, the Kodak's slightly gawky shape lacks the polish of competing models; open, it's even less attractive, all sprawling paper feed and inelegant internal design.

But we had few problems in use, and the page holder feels reasonably secure and kept sheets in place.

Kodak claims the ScanMate can handle up to 20 sheets at a time, and you're advised not to feed it more than 500 pages per day.

The front panel can be lifted with a firm pull, should you need to get inside and fix a jam. It's tricky to open, particularly if you have a stack of sheets loaded.

The i940 is a doddle to use at its automatic settings. Load in your documents, press Start, and you're away. Once we'd worked out how to access it through the Windows taskbar, it was easy to get at the front-end and alter the settings.

The usual selection of file formats are supported, but no advanced file types or archive formats are available.

You can use cloud facilities to access SharePoint and EverNote.

Should you want greater control over scans, the Page Perfect section lets you play with settings

such as resolution, colour and automatic straightening. It's a little long-winded, and isn't perhaps the most comprehensive of editors.

Newsoft Presto BizCard 6.0 is a capable application for converting business cards, but there's otherwise a marked lack of software. A Mac version of this scanner, the i940M, comes with Presto PageManager and BizCard Xpress.

The Kodak isn't the fastest model when creating searchable PDFs. Even on AC power – you can run the i940 on most PCs using just USB power – we struggled to get above 12 pages per minute (ppm) at 150dpi when creating a 20-page document.

The Kodak performs much faster when required only to turn pages into simple JPEG images, and higher resolutions don't have too much of an impact on speed. We created 300dpi images at 8.2ppm.

Most users will want to stick with a minimum resolution of 300dpi, and here the Kodak ScanMate does a very satisfactory job of creating colour. In fact, it was able to show



us shades that we hadn't even noticed on the original document.

The scanner struggles at the extreme ends of the spectrum, and it doesn't make a great job of distinguishing between slightly varied black shades. But for general magazine articles, not to mention easier subjects, such as letters and bills, the Kodak works perfectly adequately at 300dpi.

Text reproduction is reasonably accurate, and most of our search words were fine. At the i940's lower resolutions, the results are less reliable and consistent, and colours are patchier and more inaccurate.

#### Verdict

The Kodak ScanMate i940 is inexpensive for a business sheet-fed scanner. As such, you shouldn't expect the fastest performance, amazing quality or a raft of features and software titles. If you just want a solid sheet-fed that can convert bills, letters or loose magazine pages, the Kodak is a cost-effective solution.

✉ **Robin Morris**

#### 21.5in MONITOR

### Philips 221S3UCB/00

The Philips 221S3UCB/00 is one of the simplest monitors you can buy. It requires no additional power, has no control buttons, and hooks up

to a PC via a single USB cable.

If you're using a laptop with a small screen, or you simply want to boost productivity with some extra desktop space, a USB monitor can be a good plug-and-play solution.

This is especially true when you don't have any spare monitor connectors.



The monitor itself appears unremarkable, with plain styling and sound build quality. It includes an ergonomic tilt-and-swivel stand, which also offers up to 70mm of height adjustment.

Its housing creates the illusion of slimness by being much thinner at the edges, with a square bulge in the middle, like well-stuffed ravioli. While many LED-based monitors are thinner throughout, this is achieved through an external power brick.

The 221S3UCB/00 offers no controls or switches of any kind – there isn't even a power button. This makes the Philips easy to use, but you'll have no control over brightness, contrast or colour.

The monitor uses DisplayLink technology, which requires a driver to be installed on the PC. Our 64bit Windows 7 PC detected the display and automatically installed drivers.

Connecting the display to a three-monitor system was less successful. While the automatic installation started as normal, we were soon met by a BSoD; following a restart only two monitors were working correctly, and with no Windows Aero effects.

The product manual states that OS X isn't supported, although the DisplayLink website suggests it is under development.

The supplied USB cable has two connectors, which should be plugged



## LAPTOP

## Acer TravelMate P6

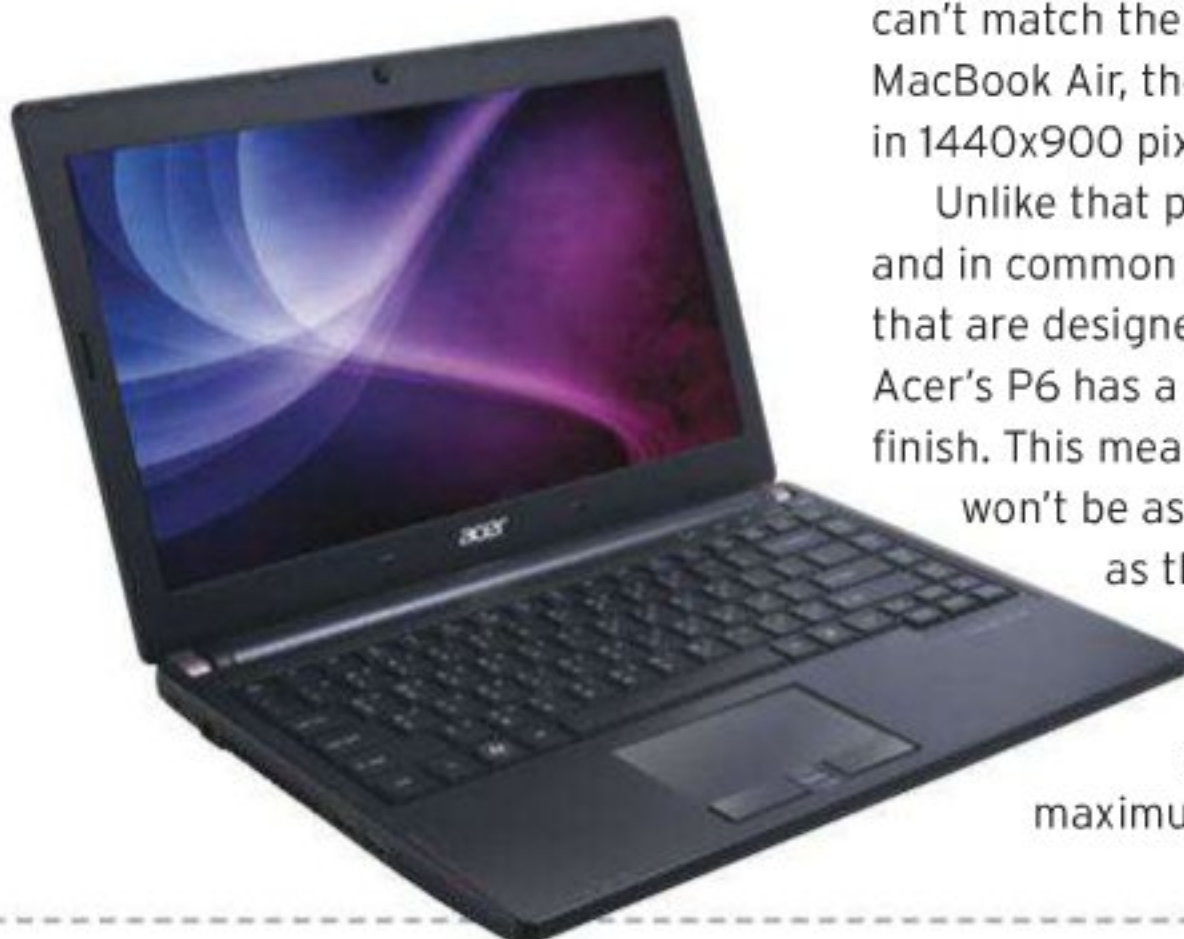
Acer's TravelMate P6 is a 13.3in-screen business laptop that offers decent performance and outstanding battery life.

The P6 looks simple yet sleek. Its mostly plastic construction is afforded a touch of class with a brushed-metal lid. The battery sticks out at the rear to angle the keyboard in a comfortable typing position.

At just over 1.9kg, the Acer is easily luggable. And despite the P6's compact dimensions, its keyboard is of a decent size – only the Enter key has been squashed into place.

The slightly small trackpad supports two-finger scrolling and pinch-zooming; two buttons and a fingerprint scanner are found below.

A fast Intel Core i7-3520M dual-core processor runs at 2.9GHz



(3.1GHz with Turbo Boost), and is paired with a generous 8GB of 1,333MHz DDR3 RAM. Windows 7 Professional 64bit is preinstalled on a 500GB hard disk. This combination produced a useful 145 points in WorldBench 6.

Acer isn't appealing to gamers with the P6, although games will be playable at moderate detail levels. Graphics are the sole responsibility of the Intel HD 4000 chip integrated to the CPU, which produced 31fps in Fear (Maximum detail). It also managed 77fps in Crysis (1024x768, DirectX 9, Low detail).

The 13.3in LCD screen is a highlight. It has a resolution of 1366x768 pixels, with a tighter pixel density than the 15in panels that are popular in the consumer market. It can't match the quality of the 13in MacBook Air, though, which crams in 1440x900 pixels.

Unlike that portable, however, and in common with most laptops that are designed for work use, Acer's P6 has a matt anti-glare finish. This means reflections

won't be as great a problem as they are with glossy screens. On the down side, matt screens suffer low maximum brightness and

poor viewing angles, which is a shame for business users who need to show colleagues what they're up to onscreen.

Connectivity options are typical for a business machine. You get VGA, HDMI, gigabit ethernet, three USB 3.0, headphone-out, mic-in and an SD/MS card reader. There's also an ExpressCard slot and an eSATA port, which doubles as USB 2.0.

A member of Acer's TravelMate family, the P6 is designed to go along for the ride wherever work takes you. Battery life is important, and the Acer doesn't disappoint.

The TravelMate P6 comes with a large 88Wh battery, which lasted an incredible 759 minutes (12 hours 39 mins) in MobileMark 2007.

Unfortunately, the model supplied to us for review doesn't appear to exist in the UK. The closest alternative we could find costs £849 and lacks the Core i7 CPU, 8GB of RAM and large battery.

## Verdict

If you're looking for a business laptop with the stamina to be your travel companion, the Acer TravelMate P6 is a good fit. It's compact, durable and runs fast. Perhaps more importantly, it offers amazing battery life. **Chris Martin**

**£707** ex VAT  
Around **£849** inc VAT

## Contact

■ [acer.co.uk](http://acer.co.uk)

## Read more

■ [tinyurl.com/8wps2c6](http://tinyurl.com/8wps2c6)

## System requirements

2.9GHz Intel Core i7-3520M (3.6GHz Turbo) dual-core; Windows 7 Professional 64bit; 8GB 1,333MHz DDR3 RAM; 500GB SATA 3Gbps hard drive; 13.3in (1366x768) LCD; Intel HD 4000 graphics; 802.11a/b/g/n; gigabit ethernet; Bluetooth 4.0; 3x USB 3.0; 1x eSATA; HDMI; VGA; ExpressCard 34; Kensington lock slot; SD/MS slot; fingerprint scanner; HD webcam; 87Wh lithium-ion removable battery; 324x245x24.7mm; 1.94kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★



into separate USB ports on your PC. If this isn't possible, Philips sells an external power supply.

In general use, the 221S3UCB/00 performed competently. You're unlikely to notice that it's working over USB until you hit it with something taxing such as HD video.

So that's exactly what we did, and we were pleasantly surprised to find the Philips could make a good stab at it. Although the motion wasn't smooth, it was no slideshow either.

The performance varied with the video content; at times faint colour banding was visible in moving video, which would then disappear when the action paused. The DisplayLink monitor driver software includes an

'Optimise for video' option, but this made no visible difference.

We wouldn't recommend this monitor for use where fast-motion performance is important, but it's perfectly acceptable for text and other office applications.

The viewing angles aren't great, but overall colour reproduction and contrast are better than we would have expected from a budget USB monitor. If you like yours turned up bright, perhaps to compete with sunlight from a window, you may find the fixed brightness too low.

We had to measure the power consumption drawn by the whole PC, first with the monitor connected and then without; the difference was

the power needed by the display. We measured power consumption at a pleasingly low 10W.

The maximum contrast in our checkerboard test was 700:1, and the 221S3UCB/00 could reproduce 74 percent of the Adobe RGB gamut and 94 percent of sRGB.

## Verdict

If you don't have a standard monitor connection or a mains outlet available, the Philips 221S3UCB/00 will make a convenient second display. Don't rely on it to work seamlessly with every PC, though, since it requires special drivers. Note that standard 21.5in screens are much cheaper. **Paul Monckton**

**£112** ex VAT  
**£135** inc VAT

## Contact

■ [philips.co.uk](http://philips.co.uk)

## Read more

■ [tinyurl.com/cqk8kde](http://tinyurl.com/cqk8kde)

## Specification

21.5in monitor; 1920x1080; 16:9 aspect ratio; 0.284mm pixel pitch; matt TN panel; 507x400x220mm; 4.55kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★





PRINTER

## Dell B1260dn

Single-function mono-laser printers are currently enjoying something of a revival in the home and small-business market. This Dell B1260dn is one low-cost option.

Predictably square and compact, the B1260dn does its best to appear unassuming in its all-black casing. It feels relatively robust, and prints efficiently without paper jams.

Given that Dell's two key selling points for this model are price and speed, most features are basic and designed with usability in mind. The controls are kept to a discreet column on the top right, comprising warning lights for toner and status,

plus four buttons for power, stop, test print and Eco mode.

The B1260dn is also short on connectivity options, offering only a single USB 2.0 and one ethernet port for hookup to a PC or network. We aren't surprised to not find Wi-Fi at this price, although Samsung has managed to include it in its even cheaper ML2955DW (reviewed at [tinyurl.com/ccLszdm](http://tinyurl.com/ccLszdm)).

The Dell does support printing through various mobile platforms, including Dell Mobile Print, AirPrint and Google Cloud Print.

The input capacity from the 250-sheet paper tray found in the base is supplemented by a 10-sheet multipurpose tray at the Dell's front. This tray is frustratingly stiff to release and reconnect. There's also a 150-sheet output tray, which folds down from the top and is, by contrast, very user-friendly.

The B1260dn offers fast print speeds. We recorded 25 pages per minute (ppm) for text documents, which dropped

to a still reasonable 12ppm in auto-duplex mode.

Mono-laser printers often produce graphics that are noticeably darker than the originals, but the Dell's print quality is very good.

Whether the B1260dn is suitable for your purposes may ultimately be decided by your monthly printing volume. Dell specifies a monthly duty cycle of 20,000 pages, which is around 1,000 pages per working day.

You can choose to use a £51 standard black toner cartridge that stretches to 1,500 pages, which works out at 3.4p per page, or a £68 higher-yield 2,500-page cartridge, which costs 2.7p per page.

### Verdict

The low-cost Dell B1260dn is worth considering if your business' print requirements are modest. It's quick to print and offers good-quality results, but we'd like to see wireless connectivity included and slightly cheaper running costs.

✉ Martyn Clayden

£109 ex VAT

£131 inc VAT

#### Contact

■ [dell.co.uk](http://dell.co.uk)

#### Read more

■ [tinyurl.com/9577dbt](http://tinyurl.com/9577dbt)

#### Specification

Mono laser printer; 64MB memory; 1200x1200dpi print resolution; 28ppm specified speed; auto duplex; 250-sheet input; 10/100 ethernet; USB 2.0; 348x338x197mm; 7.2kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



£235 ex VAT  
£283 inc VAT

#### Contact

■ [brother.co.uk](http://brother.co.uk)

#### Read more

■ [tinyurl.com/96cp7q6](http://tinyurl.com/96cp7q6)

#### Specification

Mono A4 laser printer; 64MB memory; 1200x1200dpi print resolution; 38ppm specified speed; duplex; 250-sheet input; 10/100 ethernet; USB 2.0; 371x384x245mm; 10.5kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



PRINTER

## Brother HL-5450DN

Brother has already won itself a considerable stake in the A4 mono-laser printer market, where it currently claims a 24.5 percent share; next on its list are SMEs, to which its speedy HL-5400 series should prove an attractive option.

All the printers in this range have the same squat appearance. We got our hands on the HL-5450DN, which measures a tidy 371x384x245mm, weighs just 10.5kg, and almost lives up to its manufacturer's 'invisible printer' marketing.

The HL-5450DN is never going to be a style icon, but it feels solid. Designed principally as a workhouse, it looks very functional.

The HL-5450DN has very little in the way of markings, and the controls consist of only two buttons to start and cancel print jobs, plus a column of status lights.

There's no LCD display, since all operations are performed via the supplied software or a mobile device that supports AirPrint, Google Cloud Print or Brother iPrint&Scan.

The base paper tray holds 250 sheets of A4, while the fold-down multipurpose tray adds a further 50 sheets. If your daily output is higher than this, consider upgrading to the HL-5450DNT model, which is supplied with an extra 500-sheet feeder tray.

Money-saving features include automatic duplex printing and adjustable sleep timing. Print costs are also very reasonable, with two types of toner cartridge available. A basic 3,000-page cartridge costs £64, and works out at around 2.1p per page, while a high-yield 8,000-page unit costs £94, equating to 2.1p per page.

An ethernet port allows the Brother to be connected to a network, while a USB 2.0 port is for hookup to a PC or Mac.

Performance was very good in our tests, with the first page available in a swift 8.5 seconds. Standard A4 documents zipped out at 32ppm, which dropped to a still



very useful 18ppm in duplex mode. The HL-5450DN is Brother's fastest mono-laser printer to date.

The print quality is solid, with no signs of faded or feathered text. Images emerge a few shades darker than the originals, however.

### Verdict

The Brother HL-5450DN is built for speed rather than beauty, and performed very well in our tests. SMEs and home workers will value its print quality and the ease with which they can hook it up to a network. ✉ Martyn Clayden



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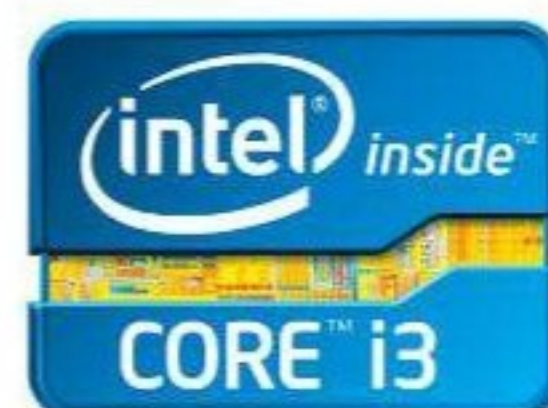
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## GROUP TEST

# Budget laptops

Get the perfect laptop for less than you think. Sandra Vogel reviews six low-cost models that can do just about everything

**W**ith the economy showing no signs of a long-awaited recovery, everyone is trying to make savings wherever they can. If your old laptop or PC is well past its best and you need a replacement, then your eye may be drawn to cheaper laptops in the hope of finding a machine that can do what you need it to, without putting too much of a dent in your bank balance.

The good news is that, in the £400 to £600 price range, variety appears to be the spice of life. If you think that all laptops around this price are basically the same, think again. We've assembled a collection of laptops in this price range and, although all have a similar screen size, there's plenty of variation in their specification.

If storage and sheer power are among your key requirements, our experience shows that you can get up to 1TB of storage and a range of processor and graphics chips within this price range. Carefully choosing a combination ought to mean you can watch video or play games on a competent screen and work more productively when you need to.

Think very carefully about your choice of screen. The difference between a glossy or matt finish is significant. The former tends to be great for watching video, but it isn't ideal for working with a light source behind you; glossy screens are highly reflective. If you're a regular traveller who has to use their laptop in a range of environments, which could include sitting by a window (in a train, for example), then matt is usually the better choice. Plus, as you'll learn from our reviews, not every glossy screen is suited to video.

Laptops in this price range can turn up some surprising features. Two laptops here offer alternative logins to the basic Windows password approach: the Lenovo G570 includes face recognition, while the HP is fitted with a fingerprint reader. Lenovo also squeezes into its budget a Blu-ray drive.

This price range even includes laptops that double up for home and work use. The HP is a business model, which runs Windows 7 Professional. This provides a range of useful features removed from Windows 7 Home Premium that are appropriate for office use.

Even the humble keyboard and touchpad can exhibit great variety. There are choices between buttoned and buttonless touchpads, and in the presence or absence of a number pad. As the keyboard is one of only two interfaces between you and your computer, it's important to make the right choice here. Again, our reviews will tell you all you need to know.

All this adds up to an exciting array of laptops. Deciding on the right laptop for you shouldn't be a matter of picking a particular brand: you can afford to shop around and be specific about your requirements, even at these prices. These days, buying budget doesn't mean settling for less.







Photography by Dominik Tomaszewski





Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

**PC ADVISOR**  
RECOMMENDED

## ASUS K55VD

**£599** inc VAT • [uk.asus.com](http://uk.asus.com) • [tinyurl.com/8ct9nxx](http://tinyurl.com/8ct9nxx)

The K55VD is one of the cheapest Ivy Bridge laptops we've seen, and it can be found for less than £599 if you shop around. Its Core i5-3210M processor is nippy, and the Asus' score of 132 points in our WorldBench 6 test is a good result.

There's nothing to complain about here, since the K55VD easily outstrips other laptops at this price and will even please most gamers, thanks to its GeForce 610M graphics chip with 2GB of video memory. It managed a respectable 46fps in our Fear game test at Maximum detail settings.

It's difficult to overlook the plastic construction, even if the metal wristrest adds a touch of class. With the lid shut, there's no mistaking the Asus for a more expensive model. It weighs 2.6kg, so you're going to notice it on your shoulder, too.

There's 6GB of RAM, which should be plenty, built-in 802.11n Wi-Fi, Bluetooth, an HDMI output and a pair of USB 3.0 ports. One sign of cost-cutting is a relatively low-capacity 500GB hard disk.

The 15.6in screen has a 1366x768 resolution and a glossy finish. It's bright, with vibrant colours, but suffers from narrow vertical viewing angles. The speakers are better than average, delivering decent audio volume and quality.

We like the large keyboard with its numberpad to the right. The keys have enough travel for good feedback and fast typing. Our only concern with the keyboard layout is its narrow cursor keys, which might be fiddly for fat fingers to control.

We're not taken with the button-less touchpad. It's good to see multitouch support for scrolling and zooming, but clicking the buttons below makes the cursor jump around the screen. This meant it was tricky to click and drag, or even to click on small objects.

Battery life is good, and the 50Wh pack lasted five and a half hours in MobileMark. This is all the more respectable when you take into account the performance on tap. Plus, Asus offers the K55VD with a two-year warranty.

**VERDICT:** It isn't the prettiest laptop, but the Asus K55VD delivers good performance for your money. The touchpad takes some getting used to, and we'd like to see more storage; neither are deal-breakers. **JM**



Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

**PC ADVISOR**  
RECOMMENDED

## DELL INSPIRON 15R

**£549** inc VAT • [dell.co.uk](http://dell.co.uk) • [tinyurl.com/d7h4xww](http://tinyurl.com/d7h4xww)

For a low-cost laptop, the Dell Inspiron 15R is remarkably well made. Its curved corners make it stand out from the usual laptops that hover around this price, and you can give its appearance a boost by adding a coloured lid (£30). Our metallic grey sample would look dowdy next to Peacock Blue, Lotus Pink or Fire Red versions.

There's a bit of give in the lid, which might not bode well if you need to travel a lot with this laptop. At 2.7kg, it will make your bag feel considerably heavier, too.

The trackpad is sensitive, but not overly so. We found it comfortable to use. It's indented in the wristrest, which helps your fingers find the trackpad when you're looking at the screen.

The keyboard isn't backlit, but that's not surprising at this price. Many laptops with 15.6in screens manage to incorporate a number pad in their keyboard, but not the Inspiron 15R. Instead, the isolated keys are generously spaced, and there's space to the left and right of the keyboard. This makes for clean-looking lines, but anyone who works with numbers might feel disappointed.

The Intel Core i3 processor performs reasonably well, with 6GB of RAM to help it along, but you can get faster laptops with Ivy bridge processors for similar money. A dedicated graphics processor in the shape of AMD's Radeon HD 7670M means gaming performance is reasonably good, too. Our Fear benchmark clocked 42fps at Maximum detail settings, which is enough for smooth gameplay.

We were pleased to find that all four USB ports are made for the faster USB 3.0 standard. This is backward-compatible with the older USB 2.0 standard, and won't hold back the latest high-speed peripherals when it comes to data-transfer speeds. The presence of a 1TB hard drive is great to see, too.

The 1366x768 glossy screen is much like that of the Asus K55VD: bright and colourful, but with narrow vertical viewing angles. You have to tilt it in just the right angle to get the best contrast.

**VERDICT:** The Dell Inspiron 15R is a well-made laptop with a solid and attractive design. It doesn't have the fastest processor, but the four fast USB 3.0 ports and a capacious 1TB hard drive should please most people at this price.





Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

## HP PROBOOK 4530S

**£562 inc VAT** • [hp.com/uk](http://hp.com/uk) • [tinyurl.com/84bfm4x](http://tinyurl.com/84bfm4x)

When we first reviewed this laptop late last year it cost around £100 more. Back then, we said it was sturdy and versatile. We hold to that, although the build quality isn't what you might first expect.

The HP looks like a solid metal laptop, thanks to the silver sheen on the lid and around the keyboard. In fact, it's part plastic, and part metal-skinned. It's more rugged than we'd expect from a laptop that costs less than £600.

As befits a laptop suitable for the office, there's a matt finish to the screen. This could help if you need to travel a lot with your laptop and find yourself working next to a window in the glare of direct sunlight. In general, we prefer matt screens, although gaming and video fans might prefer glossy panels.

The keyboard has isolated keys and is mostly efficient, although the up and down cursor keys are tiny and fiddly, and the keyboard isn't as comfortable under the fingers as some competing designs. You can disable the touchpad with a double-tap on its upper left corner; another double-tap re-enables it.

HP's ProBook 4530s runs Windows 7 Professional and could suffice as a low-cost work laptop. The presence of an ExpressCard slot potentially gives it a further plus in the office although, in reality, these are becoming less frequently used. There's also a fingerprint reader for the security-conscious.

We found a couple of disappointments in the ProBook's specification. For example, none of the four USB ports are specified for the faster USB 3.0 standard, and the 640GB hard drive, although ample for most users, is among the lower-capacity models here.

An AMD graphics card is paired with a full gigabyte of video memory and ensures good graphics performance for the price: not too many business laptops can claim to run our Fear test at 42fps.

Decent general Windows performance from the Intel Core i5 processor is helped by 4GB of system RAM. And battery life isn't bad, but other laptops lasted longer than five hours - the 4530s ground to a halt just before that milestone.

**VERDICT:** The HP ProBook 4530s could double up as an office and home laptop, and its fingerprint reader is a nice extra.



Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

## LENOVO G570

**£500 inc VAT** • [lenovo.com/uk](http://lenovo.com/uk) • [tinyurl.com/cfe2m53](http://tinyurl.com/cfe2m53)

We've seen the G570 a couple of times before, albeit with different specifications. This model has a Core i5 processor and a Blu-ray reader, making it immediately stand out for multimedia fans.

The glossy finish to the screen helps movies look sharp and clear, although reflections can be a problem. There are volume controls on the cursor keys, plus playback controls that are useful for skipping through video and music. The 750GB hard drive ought to provide enough space for your movies and tunes.

But the audio system can't keep up. Twin speakers deliver sound that's loud enough for movies, but there's not enough bass for audio.

The Radeon HD 6370M graphics chip managed only 22fps in our Fear test. It's underpowered by today's standards, although the Lenovo is a capable laptop for playing casual games.

Lenovo's G570 makes no bones about its plastic chassis, and the shiny black lid is a dead giveaway. It's solidly built, but it will be hard to keep this laptop clean and scratch-free.

Lenovo keyboards are among our favourites. The isolated keys look attractive with their off-square shaping and, more importantly, they feel great under the fingers. The trackpad's scroll zone has a slightly raised line of orange dots, which makes it very easy to find. The trackpad is on the small side, though.

With three USB 2.0 ports, and a fourth combined with eSATA, plus HDMI, connectivity is reasonable, but there's no support for USB 3.0. A rather generous 6GB of RAM supports the Intel Core i5 CPU, and the laptop feels very responsive.

Among the somewhat overwhelming array of bloatware, much of which you may wish to delete as soon as you turn on the laptop, comes the ability to create an ooVoo video-chat and IM account. Potentially more usefully, Lenovo includes its EE Boot Optimiser, which is meant to improve boot speeds. We didn't notice a vast improvement, though. You may enjoy tinkering with VeriFace for logging into Windows simply by staring into the webcam.

**VERDICT:** While we like the keyboard and appreciate the Blu-ray drive and generous RAM and storage allocations, this version of the G570 is too short on graphics oomph to recommend over its rivals.





Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

## SAMSUNG SERIES 3 300E5A

**£420** inc VAT • [samsung.com/uk](http://samsung.com/uk) • [tinyurl.com/7kan7bw](http://tinyurl.com/7kan7bw)

When you see a laptop with a price tag of just £420, you naturally ask yourself what corners have been cut to get there. The Samsung Series 3 exhibits evidence of some trade-offs, but not so many as to make it an unattractive option.

There's a Core i5 processor with 4GB of RAM, a combination that did a decent job in our benchmarks. The integrated Intel graphics pulled things back a little, and our Fear games test racked up just 12fps at Maximum detail settings. Gamers steer clear, then.

If you're after a laptop to double as a TV for watching BBC iPlayer or DVDs, the matt screen might not appeal. The videos we played exhibited somewhat washed-out colours. Sound quality is fine, though, and in line with most laptops.

The touchpad is large and comfortable to use, and the keyboard is pleasant to type on. It isn't the best, but it is very usable.

Samsung has found room for just three USB ports, none of which support USB 3.0. The storage capacity is also disappointing, at just 500GB, although it will suffice for those users who simply require a laptop for logging into Facebook, storing some digital photos and doing the odd spot of online shopping.

Samsung's chassis punches above its weight in the looks department, with a rather stylish two-tone silver and black lid. Still, its rather flimsy lid could put off some people. To counteract that, if you need to carry a laptop often or for long distances, the 2.3kg weight might appeal. We tend to find most 15.6in laptops weigh closer to 3kg than to 2kg.

If battery life is important then our MobileMark 2007 result of 331 minutes (five and a half hours) is worth noting. How that pans out in the real world will depend on how you use the laptop, of course, but it's perfectly respectable, provided that you don't expect the Series 3 to last all day away from the mains.

**VERDICT:** The Samsung Series 3 300E5A is a relatively inexpensive laptop and its price ought to mean a fair few cut corners. In reality, Samsung has mostly made its cuts in appropriate places, and even this laptop's slightly unimpressive screen will be fine if your needs don't include a lot of video viewing or photo editing.



Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

## SONY VAIO SVE1511K1E

**£499** inc VAT • [sony.co.uk](http://sony.co.uk) • [tinyurl.com/bvf9aw5](http://tinyurl.com/bvf9aw5)

Sony's Vaio E series has had a revamp for 2012. This model is one of the cheapest in the range and, unlike its more expensive brethren, doesn't sport one of the latest Ivy Bridge processors. Still, it's hard to complain when it costs a shade under £500.

It has a reasonable specification that includes a second-gen Sandy Bridge Intel Core i3 processor and 4GB of RAM, a 750GB hard drive and a glossy 15.5in screen.

The Vaio is a rather chunky machine, which isn't helped by its fat edges. It's on the heavy side too, at 2.7kg, and it might not be the laptop to choose if you intend to take it everywhere with you. Build quality is up to Sony's usual standard, though, and this could make a good choice as a family laptop.

The glossy finish to the 15.5in screen is far from unusual for consumer laptops, but this is one of the more reflective varieties. We found it very difficult to use with a light source behind us. It's superb for watching video, though, and the speakers are very good.

The integrated graphics were up to scratch in our video tests, but no good for gaming. Our Fear benchmark returned only 13fps.

Sony has included a single USB 3.0 port, which opens up the possibility of high-speed data transfer to external devices; this will appeal to those looking for a measure of future-proofing for their potential new peripherals.

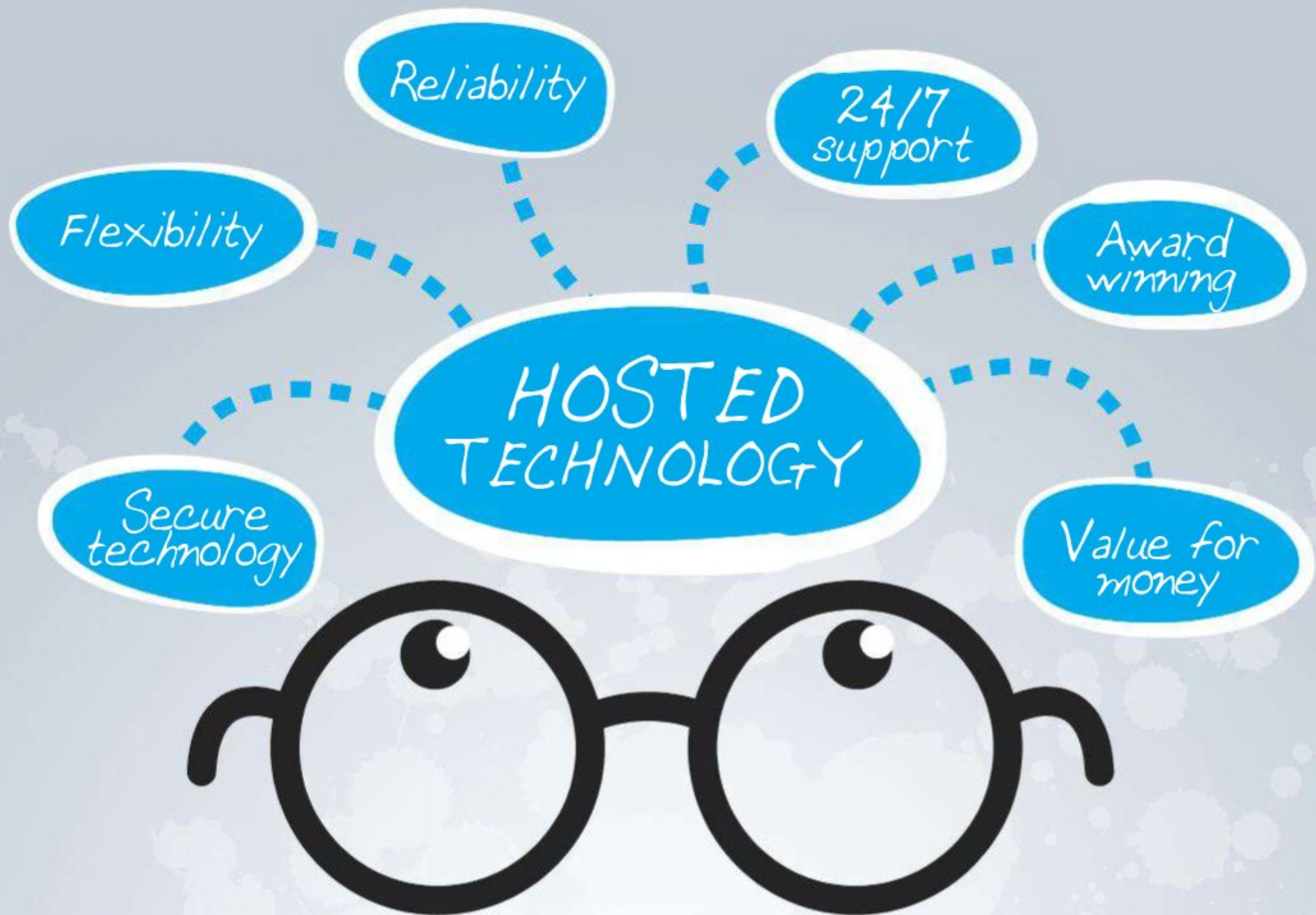
While the isolated keyboard is comfy enough to use, the trackpad disappoints. Its buttonless design is hard to get used to, and we prefer to use separate buttons than pressing down on the trackpad.

Sony has incorporated gesture controls, which can be used via the built-in webcam to help you control Windows Media Player, Media Gallery and Internet Explorer. You can pause, go back and forward, and control the volume. Some may find this something of a gimmick; for others it will be useful.

Battery life is very impressive: we recorded just over six hours.

**VERDICT:** The Sony Vaio SVE1511K1E feels slightly clunky and we aren't fans of the buttonless trackpad. The gesture control is something of a gimmick, too. Nonetheless, this laptop is a decent performer - gaming aside - and has a great screen for watching video.





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## How we test

Our laptop tests involve three formal benchmarks and a range of real-world activities. MobileMark gives us an idea of runtime by performing a series of pre-configured tasks until the battery is depleted. WorldBench gives us a productivity rating by running a series of tasks through several complete iterations. And Fear tests the gaming potential of a laptop's graphics processor.

Our real-world tests replicate everyday usage. We browse the web, type documents, watch video, listen to music and more.

## Conclusion

There's a lot of competition in the £400 to £600 price range, but plenty of opportunity to differentiate. What's interesting about this

group is the variety of specifications we found. We weren't expecting, for example, to find so many laptops capable of handling games at playable resolutions and framerates. Those that can naturally sit at the top end of the price scale.

Entertainment-wise, Lenovo's £500 G570 is the only laptop here to include a Blu-ray reader. It also boasts alternative Windows logins with face recognition. The Sony Vaio E, meanwhile, uses its built-in webcam to offer gesture controls in Internet Explorer, Windows Media Player and Media Gallery, and the HP boasts biometric security with a fingerprint reader.

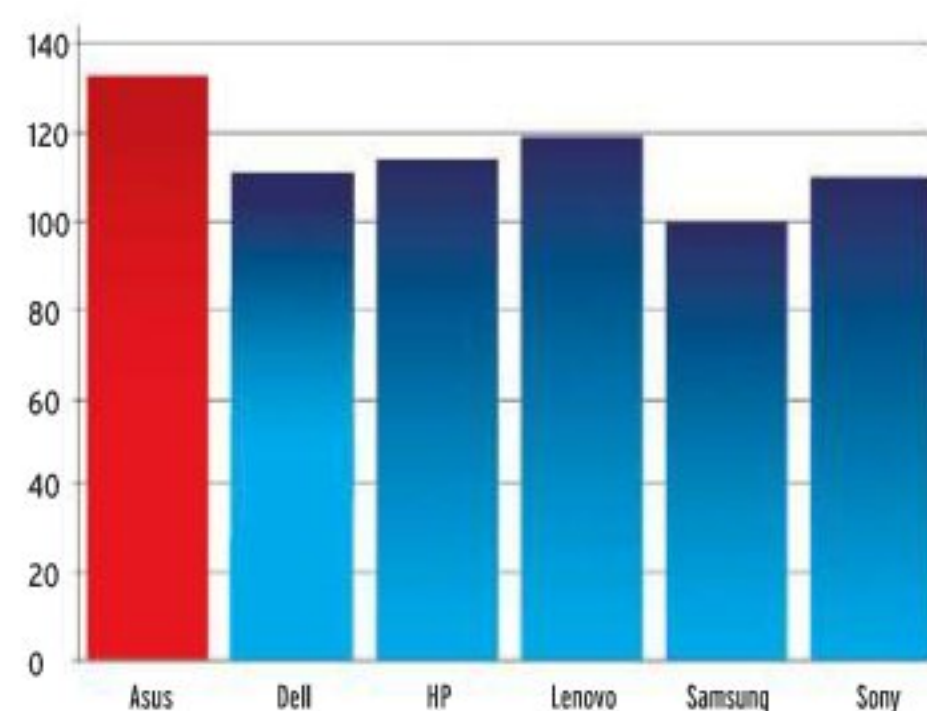
Of the group, the Dell and Asus emerged as the clear award winners, but the HP ProBook and Samsung Series 3 would also make a strong purchase. ☒

	<b>ASUS</b> <b>£599 inc VAT</b>  	<b>DELL</b> <b>£549 inc VAT</b>  	<b>HP</b> <b>£562 inc VAT</b> 
Model	<b>K55VD</b>	<b>Inspiron 15R</b>	<b>ProBook 4530s</b>
Product code	K55VD- SX218V	N0015R33	LH311EA#ABU
Processor	2.5GHz Intel Core i5-3210M	2.4GHz Intel Core i3-2370M	2.3GHz Intel Core i5-2410M
Graphics	nVidia GeForce 610M with 2GB memory	AMD Radeon HD 7670M with 1GB memory	AMD Radeon HD 6470M with 1GB memory
Display	15.6in (1366x768) gloss	15.6in (1366x768) gloss	15.6in (1366x768) matt
Operating system	Windows 7 Home Premium 64bit	Windows 7 Home Premium 64bit	Window 7 Professional 64bit
Storage	750GB 7,200rpm SATA	1TB 5,400rpm SATA	640GB 5,400rpm SATA
Memory	8GB 1,600MHz DDR3	6GB 1,600MHz DDR3	4GB 1,333MHz DDR3
Ethernet	Gigabit	Gigabit	Gigabit
Optical drive	DVD±RW	DVD±RW	DVD±RW SuperMulti DL
Video out	HDMI, VGA	HDMI, VGA	HDMI, VGA
Wi-Fi	802.11b/g/n	802.11b/g/n	802.11b/g/n
Bluetooth	4.0	4.0	3.0
Webcam	0.3Mp	1Mp	0.9Mp
Speakers	Stereo speakers	Stereo speakers	Stereo speakers
Audio in	Built-in mic, stereo 3.5mm line-in	Built-in mic, stereo 3.5mm line-in	Built-in mic, stereo 3.5mm line-in
Audio out	3.5mm headphone/line-out	3.5mm headphone/line-out	3.5mm headphone/line-out
USB	2x USB 3.0, 1x USB 2.0	4x USB 3.0	4x USB 2.0
eSATA	N/A	N/A	N/A
Other ports	N/A	N/A	ExpressCard/34
Card slot	SDHC	SDHC, MS	SDHC/MS
Trackpad	105x74mm buttonless multitouch	107x80mm two-button multitouch	93x67mm two-button multitouch
Other software	N/A	Microsoft Office Starter	ArcSoft Total Media Suite
Power adaptor	90W AC adaptor	90W AC adaptor	90W AC adaptor
Battery	50Wh lithium-ion, removable	48Wh lithium-ion, removable	47Wh lithium-ion, removable
Dimensions	377x252x33mm	378x257x32mm	374x256x32mm
Weight	2.59kg	2.74kg	2.36kg
Warranty	2-year collect-and-return	1-year collect-and-return	1-year collect-and-return
WorldBench 6 <sup>1</sup>	132	109	115
Battery life <sup>2</sup>	329 mins	297 mins	284 mins
Gaming score <sup>3</sup>	46fps	42fps	42fps

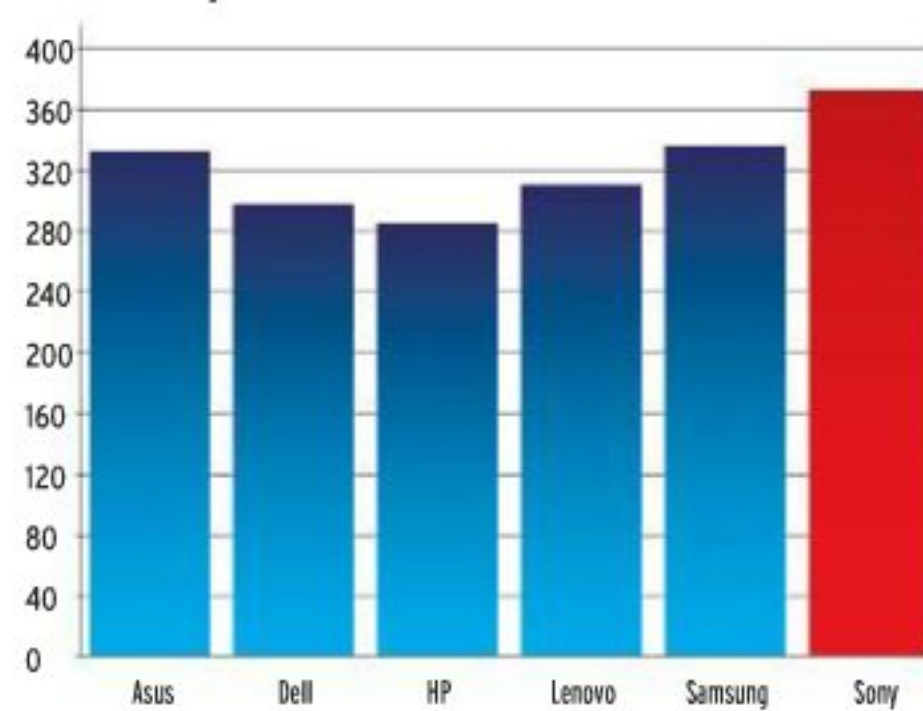
<sup>1</sup>For an explanation of WorldBench 6 see [page 78](#) <sup>2</sup>Tested using the BAPCo MobileMark 2007 Productivity benchmark <sup>3</sup>Tested in Fear at Maximum detail settings



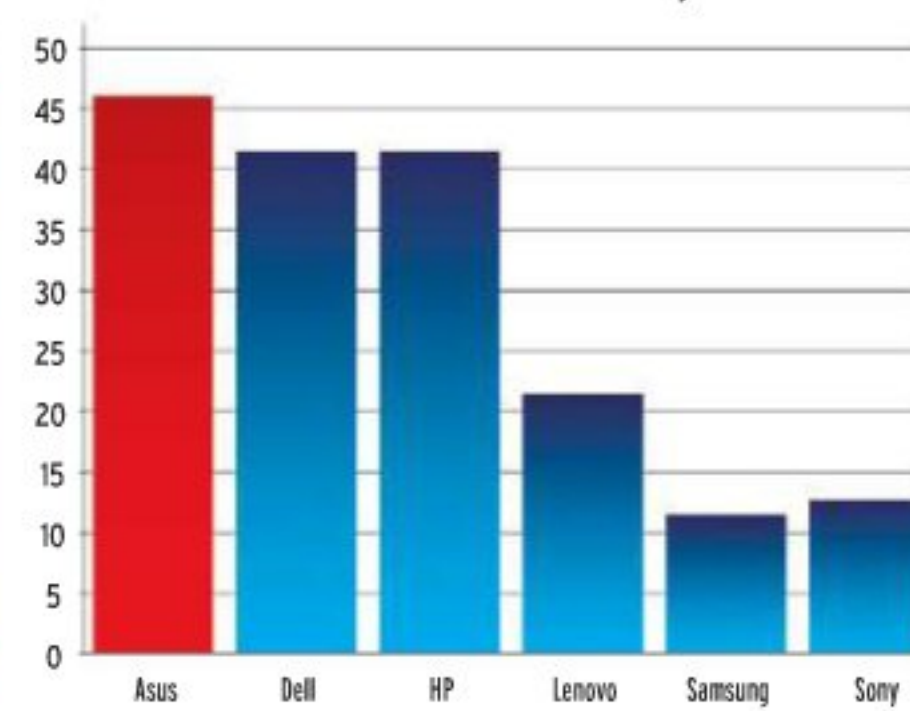
WorldBench 6 score



Battery life (mins)



Fear, Maximum detail (fps)


**LENOVO**  
**£500 inc VAT**
**G570**

M51BPUK

2.5GHz Intel Core i5-2450M

AMD Radeon HD 6370M

15.6in (1366x768) gloss

Windows 7 Home Premium 64bit

750GB 5,400rpm SATA

6GB 1,333MHz DDR3

10/100

BD-ROM/DVD±RW DL

HDMI, VGA

802.11b/g/n

2.0

2Mp

Stereo speakers

Built-in mic, stereo 3.5mm line-in

3.5mm headphone/line-out

3x USB 2.0

eSATA/USB 2.0 combo

N/A

SDHC, MS

82x64mm two-button scrollable

VeriFace

90W AC adaptor

48Wh lithium-ion, removable

378x250x35mm

2.45kg

1-year collect-and-return

119

307 mins

22fps

**SAMSUNG**  
**£420 inc VAT**
**Series 3**

NP300E5A-A01UK

2.2GHz Intel Core i3-2330M

Intel HD Graphics 3000

15.6in (1366x768) matt

Windows 7 Home Premium 64bit

500GB 5,400rpm SATA

4GB 1,333MHz DDR3

Gigabit

DVD±RW

HDMI, VGA

802.11b/g/n

3.0

0.3Mp

Stereo speakers

Built-in mic, stereo 3.5mm line-in

3.5mm headphone/line-out

3x USB 2.0

N/A

N/A

SDHC

102x70mm two-button multitouch

Microsoft Office Starter, CyberLink Media Suite

60W AC adaptor

48Wh lithium-ion, removable

368x243x27-33mm

2.23kg

1-year collect-and-return

100

331 mins

12fps

**SONY**  
**£499 inc VAT**
**Vaio SVE151K1E**

SVE151K1E

2.4GHz Intel Core i3-2370M

Intel HD Graphics 3000

15.5in (1366x768) gloss

Windows 7 Home Premium 64bit

750GB 5,400rpm SATA

4GB 1,333MHz DR3

Gigabit

DVD SuperMulti

HDMI, VGA

802.11b/g/n

4.0

1.3Mp

Stereo speakers

Built-in mic, stereo 3.5mm line-in

3.5mm headphone/line-out

1x USB 3.0, 3x USB 2.0

N/A

N/A

SDHC, MS Pro

100x57mm buttonless multitouch

Sony utilities

76W AC adaptor

44Wh lithium-ion, removable

372x253x16-35mm

2.41kg

1-year collect-and-return

108

370 mins

13fps

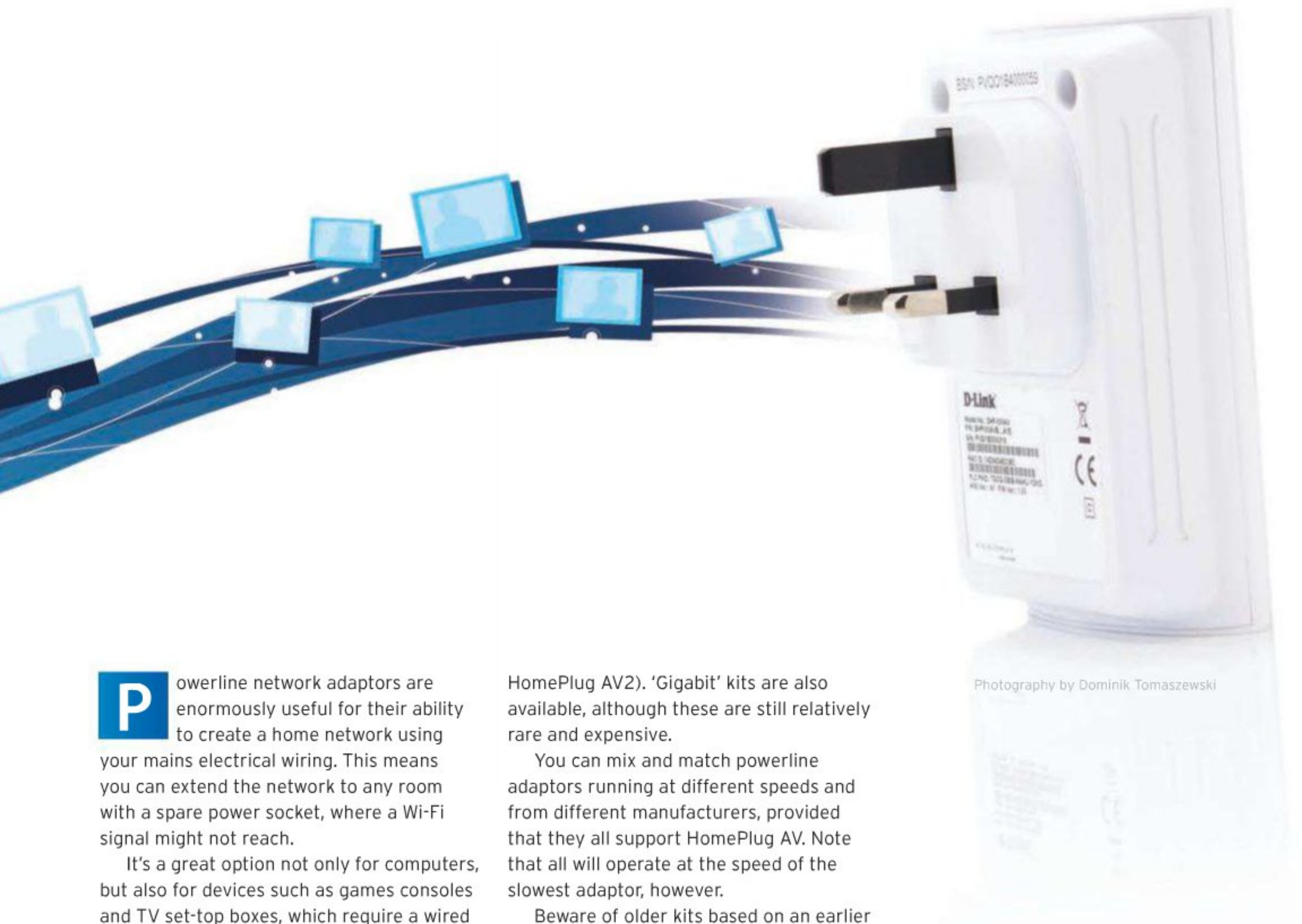




# Powerline network adaptors

Turn your mains wiring into an instant network with these HomePlug adaptors. Cliff Joseph tests six starter kits





Photography by Dominik Tomaszewski

**P**owerline network adaptors are enormously useful for their ability to create a home network using your mains electrical wiring. This means you can extend the network to any room with a spare power socket, where a Wi-Fi signal might not reach.

It's a great option not only for computers, but also for devices such as games consoles and TV set-top boxes, which require a wired network connection, but may be some distance from your router.

You'll need one adaptor for your router and typically one for each device you want to connect to the network. Adaptors can be bought individually, although in this group test we've rounded up starter kits that include two – the minimum you'll need to connect a single device.

To ensure compatibility between products from different manufacturers, most have adopted a standard networking protocol known as HomePlug. Despite there being competing standards available, the terms powerline and HomePlug are often used interchangeably.

Kits that support the HomePlug standard may run at different speeds. Most of the kits reviewed here adopt the HomePlug AV standard, which nominally operates at 200 megabits per second (Mbps). This is fine for web browsing and most streaming video.

However, if multiple computers need to simultaneously play high-speed online games and stream HD video, you might want to consider slightly more expensive kits specced at 500Mbps (also known as

HomePlug AV2). 'Gigabit' kits are also available, although these are still relatively rare and expensive.

You can mix and match powerline adaptors running at different speeds and from different manufacturers, provided that they all support HomePlug AV. Note that all will operate at the speed of the slowest adaptor, however.

Beware of older kits based on an earlier standard called HomePlug 1.0. These promise a maximum speed of 85Mbps, and will probably be adequate for many home users, but they're not compatible with faster HomePlug AV products listed at 200Mbps or more. They'll co-exist on the same mains wiring, but cannot talk to each other. To keep things simple, we recommend sticking with the newer HomePlug AV products.

### Features to look for

Most powerline adaptors include only a single ethernet port, but you can buy adaptors with three or four connections that are ideal for connecting multiple devices at a single mains outlet.

If there are rooms in your home that can't receive a strong Wi-Fi signal, look for a kit with a Wi-Fi extender option. You plug one of the adaptors into a mains socket to create a wired connection to your main router, then use the adaptor's wireless features to also set up a mini Wi-Fi network. Such adaptors also have one or more ethernet ports.

The distance between each socket won't affect performance in most homes and

offices, but the age of the electrical wiring may do so in older buildings.

Avoid plugging a powerline adaptor into a multi-way extension; they need to be plugged directly into a mains socket. You can try your adaptors in a multi-way extension, but don't be surprised if they can't connect to each other or have even slower transfer speeds.

You may also find that some electrical devices, such as mobile phone chargers, can cause interference if they're plugged into the same electrical circuit.

You can enable encryption in adaptors, but they will talk to other adaptors only on the same mains network (usually wiring that's attached to one electricity meter). This means your neighbours in a block of flats, for example, won't be able to access your network if they install adaptors, too.

For the most part, powerline networking really is straightforward. It's simpler than setting up an ethernet network, and can reach further than a Wi-Fi network. That makes it ideal for both home and business users who want to connect multiple rooms to their network with the minimum of fuss.





### DEVOLO dLAN 200 AV WIRELESS N

**£119** inc VAT • [devolo.co.uk](http://devolo.co.uk) • [tinyurl.com/coy5ste](http://tinyurl.com/coy5ste)

It's a little on the expensive side, but Devolo's dLAN 200 AV Wireless N kit provides good performance and some useful extra features.

The two adaptors provided in this starter kit look different. The primary adaptor, which connects to your router, is equipped with a single ethernet port and is therefore rather small. The secondary adaptor, meanwhile, is double its size, with three ethernet ports. It will be particularly useful for those who need to connect multiple devices in a single room.

This secondary adaptor also acts as wireless access point, allowing you to extend an existing 802.11n Wi-Fi network into areas in which a Wi-Fi signal might not reach.

Both Devolo adaptors are easy to set up, with push-button security to protect your network and a separate power switch for the Wi-Fi radio.

A Cockpit program is supplied for Windows, Mac and Linux, which provides additional features, such as the ability to set a timer for the wireless hotspot in order to limit access.

However, we were surprised to find only one ethernet cable in the box: this is pretty stingy, given that most home users won't have spare ethernet cables to hook up their set-top box or console.

The adaptors performed well for a product in the 200Mbps category, and transferred our 1GB test file in just under two minutes. This equates to 70Mbps.

**VERDICT:** Cheaper HomePlug kits are available, but the three ethernet ports and wireless connectivity provided by the dLAN 200 AV Wireless N will be ideal for people who need to connect multiple devices to their home or office network.



### D-LINK POWERLINE AV 500 NSK

**£65** inc VAT • [dlink.co.uk](http://dlink.co.uk) • [tinyurl.com/cz99sfm](http://tinyurl.com/cz99sfm)

Ordinary HomePlug AV kits that run at 200Mbps (around 70Mbps in real-world terms) are fine for streaming HD video, but if you have more than two adaptors on your network and want to stream, say, two HD films at once, and play online games, there may not be enough bandwidth.

In this case, you can benefit from faster devices that promise speeds of up to 500Mbps. So-called HomePlug AV2 kits are more expensive than their 200Mbps counterparts, but D-Link's Powerline AV 500 Network Starter Kit is competitively priced at around £65.

The two identical adaptors have a neatly curved design that makes them look less bulky than most HomePlug adaptors. It's odd that a single ethernet port is located on the side of each adaptor, and could cause problems if the adjacent mains socket is in use, but this also serves as an advantage if your power sockets are close to the floor.

A security button allows you to quickly establish an encrypted network, but the option isn't covered in the Quick Start guide and is likely to go unused.

Despite a dearth of features, the main reason for buying this kit is its 500Mbps headline speed; the Powerline AV 500 doesn't disappoint on this score. It was able to transfer our 1GB test file in 77 seconds (106.4Mbps), which gives it a significant speed advantage over rival products.

**VERDICT:** The Powerline AV 500 Network Starter Kit offers good value if speed is your primary concern. However, it'll work out far more expensive if you need to connect more than one device to your network, since both adaptors have only one ethernet port.



### LINKSYS PLWK400

**£119** inc VAT • [linksys.com](http://linksys.com) • [tinyurl.com/c7pn3et](http://tinyurl.com/c7pn3et)

The PLWK400 kit from Linksys includes wireless connectivity, allowing you to extend an existing Wi-Fi network into an area in which your signal won't reach. However, aspects of its design are rather unwieldy.

Most HomePlug devices point downward from the mains socket, allowing the ethernet cables to trail straight down to the floor and be tucked out of sight. Linksys has placed a single ethernet port on the top of each adaptor, which means the cables must protrude upward for several inches in a rather unsightly fashion. This will be an advantage if your mains sockets are close to the floor, of course.

A Simple Connect button allows you to automatically create an encrypted link between the two adaptors, and to quickly add further adaptors. A similar security button is provided for the built-in 802.11n Wi-Fi, although the WPS system can easily be compromised - don't choose any Wi-Fi kit because it has push-button security.

The manual and configuration software provided don't explain very clearly how to set up the Wi-Fi, so beginners could get lost here. The Linksys' manual also fails to explain other options, such as the QoS feature that allows you to prioritise certain types of network traffic.

The PLWK400 offers respectable performance, and was able to copy our 1GB test file at 60.2Mbps.

**VERDICT:** From a technical viewpoint the PLWK400 kit works well, and its Wi-Fi option will be useful to many people. However, the unhelpful manual and configuration software mean you'll need some network know-how to get the most from it.





Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

### NETGEAR POWERLINE NANO500 SET

**£79** inc VAT • [netgear.co.uk](http://netgear.co.uk) • [tinyurl.com/d24tk2b](http://tinyurl.com/d24tk2b)

We admire the simplicity of HomePlug networking products, but they're not known for their elegant design. If you'd prefer to buy something a little neater, Netgear's Powerline Nano500 Set should appeal.

As the name implies, the Nano500 is smaller than most HomePlug products. In fact, each adaptor is barely half the size of a conventional HomePlug, at 67x55x42mm.

They're very simply designed, too, with a single ethernet port on the base of each adaptor and a security button that you can press to create an encrypted network.

It's easy to add additional adaptors, although no software is supplied with the kit that would allow more knowledgeable users to configure the settings themselves.

There's also a clever Pick A Plug feature that allows each adaptor to test the speed of the network when plugged into various mains sockets. An LED on the front of the adaptor indicates the speed, allowing you to choose the electrical socket that provides the best performance.

Our only real complaint is that this rather expensive kit allows you to connect only a single device to your network per adaptor. Note that a less expensive 200Mbps version is also available.

Performance is very good, though, and the best here in our tests. The Nano500 Set is said to operate at up to 500Mbps and transferred our 1GB file at 112.2Mbps.

**VERDICT:** The Nano500 Set is expensive, given that it allows you to connect only a single device to your network, but it's also well designed and fast. The clever speed test option will ensure that you get the best performance for games and streaming video.



Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

### SOLWISE 200MBPS HOMEPLUG AV EK

**£38** inc VAT • [solwise.co.uk](http://solwise.co.uk) • [tinyurl.com/ch496Lc](http://tinyurl.com/ch496Lc)

It won't win any prizes for design, but the 200Mbps HomePlug AV Ethernet kit from Solwise provides a simple, affordable option for first-time powerline networkers.

The two adaptors included in the kit are fat, chunky devices that protrude from the wall socket by a good 3in. Despite their size, only a single ethernet port is found on each adaptor, allowing you to connect to the network one device per plug.

However, it's hard to complain at this price, and Solwise sells additional adaptors for as little as £18, so it won't cost much to expand your network if you need to. Solwise also sells a mini pair of adaptors that are much smaller and neater, at around £50.

A security button on each adaptor allows them to automatically generate a password for an encrypted connection. However, the skimpy leaflet included in the box does little to explain this feature, so we had to delve into the mass of files included on the CD to find a more detailed PDF manual.

An additional configuration program is found on the CD, but works only in Windows; rival HomePlug products provide better support for Mac and Linux.

The kit took just over two minutes to transfer our 1GB test file. That's solid, rather than outstanding, performance (it equates to 64.5Mbps), but the Solwise will prove perfectly adequate for streaming video and routine web surfing and email.

**VERDICT:** At this price, it's no surprise that the 200Mbps HomePlug AV Ethernet kit is rather basic. However, it works perfectly well, and will be a good choice for home users who need a single wired network connection for their laptop, console or TV set-top box.



Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

**PC ADVISOR  
RECOMMENDED**

### WESTERN DIGITAL LIVEWIRE

**£59** inc VAT • [wdc.com](http://wdc.com) • [tinyurl.com/cuxq9aq](http://tinyurl.com/cuxq9aq)

Western Digital's Livewire kit has an unusual design that proves to be much more versatile than most conventional HomePlug devices.

Most HomePlug adaptors are fat plugs that are inserted directly into a mains power socket. Western Digital's adaptors each come with a removable power cable for plugging into the mains, giving you more freedom in terms of where you position each adaptor.

Even better is the fact that each adaptor has four separate ethernet ports, allowing you to connect seven devices to your network (the eighth port is used for your router, of course). With a single Livewire kit, you could set up one adaptor in your living room, then connect a couple of computers, a games console and a set-top box.

Setup of the Livewire is straightforward, and there's a Sync button that allows the adaptors to automatically create an encrypted connection. A clear, helpful user manual is also included on a CD.

The Livewire nominally operates at 200Mbps, and took 135 seconds to transfer our 1GB test file. That's 60.7Mbps - a little below average for 200Mbps kit, but still perfectly adequate for most people.

It's a shame that Western Digital doesn't yet make a '500Mbps' version, and neither does it sell individual adaptors. For now, the only way to extend your network to multiple rooms is to buy another complete kit containing two adaptors.

**VERDICT:** The clever design and multiple ethernet ports provided by the Livewire make it one of the most versatile options here for setting up a small powerline network in a home or office. With a recent price cut to £59, it offers very good value, too.



## How we test

The starter kits reviewed here include two HomePlug adaptors, which we used to create a simple network connection between a router and a laptop. The computer and router were situated in opposite corners of the same room.

Although we also tested each kit with the two adaptors in separate rooms, we found it made no difference to their measured performance. Do note that the distance between adaptors and the quality of wiring can affect the performance you see, however.

Our Western Digital MyNet N900 Central router has a built-in hard drive for creating network backups, so we used the powerline connection to copy some test files from the laptop to the router's hard disk. Our two tests comprised a 1GB video file and a folder containing 1GB of assorted files.

We ran each test three times, then calculated the average time required in seconds and performance in megabits per second for each set of HomePlug adaptors.

	<b>DEVOLO</b> <b>£119 inc VAT</b> ★★★★★ <b>PC ADVISOR</b> <b>BEST BUY</b>	<b>D-LINK</b> <b>£65 inc VAT</b> ★★★★★	<b>LINKSYS</b> <b>£119 inc VAT</b> ★★★★★	
Product name	dLAN 200 AV Wireless N Starter Kit	Powerline AV500 Network Starter Kit	Powerline AV Wireless Network Extender Kit	
Part code	1409	DHP-501AV	PLWK400	
Standard	HomePlug AV	HomePlug AV	HomePlug AV	
Specified speed	200Mbps	500Mbps	200Mbps	
Adaptors	2	2	2	
Ethernet ports (sender/receiver)	1/3	1/1	1/1	
Push-button security	✓	✓	✓	
Mains passthrough	✗	✗	✗	
Wi-Fi extender	802.11n	✗	802.11n	
Dimensions	80x65x45mm; 110x65x65mm	100x70x53mm	100x70x40mm; 115x75x45mm	
Warranty	3-year return-to-base	2-year return-to-base	2-year return-to-base	
Performance				
1GB single file (time)	117 secs	77 secs	136 secs	
1GB batch (time)	122 secs	82 secs	145 secs	
1GB single file (speed)	70.0Mbps	106.4Mbps	60.2Mbps	
1GB batch (speed)	67.2Mbps	99.9Mbps	56.5Mbps	






## Conclusion

If you simply want an affordable wired connection for hooking up a single computer or other device to your broadband network, it's hard to beat the £38 200Mbps HomePlug AV Ethernet from Solwise.

We're not convinced that you need anything faster for gaming or streaming video, but 500Mbps powerline adaptors provide faster connections for network backups and file transfers. Of the two such kits in our round-up, the D-Link Powerline AV500 is well priced at around £65, while the mini Netgear provides faster performance.

Returning to the 200Mbps category, the unusual design of Western Digital's Livewire kit makes it appealing. It provides four ethernet ports on each of its two adaptors, while removable power cables mean you won't need to have an unsightly adaptor on display.

If you've got an annoying wireless hotspot then a kit that includes wireless connectivity is ideal. Both Devolo and Linksys offer this option, but we prefer the Devolo with its three ethernet ports and good software support for PCs, Macs and Linux. ☒

	<b>NETGEAR</b> <b>£79 inc VAT</b> 	<b>SOLWISE</b> <b>£38 inc VAT</b> 	<b>WD</b> <b>£59 inc VAT</b> 	<b>PC ADVISOR</b> <b>RECOMMENDED</b>
	Powerline Nano500 Set	200Mbps HomePlug AV Ethernet	WD Livewire	
	XAVB5101	PL-200-AV-TWIN	WDBABY0000NBK-EESN	
	HomePlug AV	HomePlug AV	HomePlug AV	
	500Mbps	200Mbps	200Mbps	
	2	2	2	
	1/1	1/1	4/4	
	✓	✓	✓	
	✗	✗	✗	
	✗	✗	✗	
	67x55x42mm	90x45x75mm	32x119x86mm	
	1-year return-to-base	1-year return-to-base	1-year return-to-base	
	73 secs	127 secs	135 secs	
	77 secs	145 secs	155 secs	
	112.2Mbps	64.5Mbps	60.7Mbps	
	106.4Mbps	56.5Mbps	52.9Mbps	



# ALL IN ONE PCs



All-in-one PCs offer space-saving advantages and a big screen, making them useful entertainment centres. Paul Monckton looks at six very different all-in-ones with unique strengths and weaknesses

**C**hoosing an all-in-one PC is about more than just performance. Often used as family multimedia systems, all-in-ones can be treated much like TVs and will be subject to the same aesthetic considerations as any other entertainment system you install in the home.

Many Windows all-in-one PCs incorporate Blu-ray players and TV tuners, and come with remote controls. They often incorporate a touchscreen interface, freeing you from using a keyboard and mouse for input in most computing activities.

Windows 7 incorporates multitouch control as standard, so you can try navigating your way around the operating

system using your fingertips. However, don't expect to have much fun jabbing away at the standard Windows 7 interface. Windows Media Center and Windows 8 are more easily accessible via a finger or remote control than a keyboard and mouse.

Many all-in-one PC vendors add their own software overlay to protect you from the ill-suited Windows desktop, making the interface more touch-friendly.

## Windows 8

When the final version launches in October, Windows 8 will make better and greater use of touch input. However, Microsoft places stringent requirements on a touch interface

that is to be certified 'Windows 8-ready'. Most touchscreen PCs will work with the OS but, because many gestures involve swiping the finger in from off the side of the screen, raised bezels can get in the way. It's also a requirement that at least five touch points are recognised, so those systems that support only two points (of which there are many) will struggle.

Of the systems reviewed here, only the Lenovo meets both these requirements, although it doesn't claim to be Windows 8-compatible. With few good standalone touchscreens available, a suitably specced all-in-one may be the best way to get a PC now that will work well with Windows 8.





Photography by Dominik Tomaszewski

## Other considerations

As with any display or TV, you should also consider the screen size you need. Larger screens are more expensive, but provide a better viewing experience for multiple viewers. In many cases, all-in-one PCs have an HDMI input for plugging in a set-top box or console. You also get HDMI outputs, which let you add another screen or projector.

All the systems in our group include full-HD (1080p) or higher-resolution screens. Look for a Blu-ray drive to take advantage of these panels when watching films.

With all their components crammed into a thin housing, all-in-one systems must make compromises between performance

and noisy cooling. To cut down on heat and power consumption, some machines use low-power processors, such as the Intel Core i5-3450S, or mobile processors, such as the Intel Core i7-3610QM. These PCs are generally quieter in use and third-generation Intel processors pack more than enough power for the vast majority of users.

Watch out for systems that use standard desktop chips, such as the i5-3570K. Powerful as they are, the level of cooling required often results in a noisy PC.

Due to space and cooling constraints, all-in-one systems rarely offer strong gaming performance. With modern Ivy Bridge processors, enough graphics power

is provided for multimedia and even low-level gaming. In many cases, there's now no need to pay for discrete graphics.

However, most of the systems here incorporate a mobile nVidia chip to give a boost to graphics performance. The PC Specialist uses a desktop graphics card, which gives considerably faster gaming framerates, but is particularly noisy.

All-in-one PCs aren't all about fun and games. If you're a designer working from home who needs workstation-level performance, reliability and service, take a look at HP's unique Z1 workstation.

Here, we present a range of all-in-one PCs, with prices starting from £799.



## ASUS ET2411INTI 990PT-S60B10100C

**£999** inc VAT • [uk.asus.com](http://uk.asus.com) • [tinyurl.com/chjdomu](http://tinyurl.com/chjdomu)

Excellent build quality, good all-round performance and a strong feature set make Asus' all-in-one PC an attractive, if pricey, purchase.

Its 23.6in full-HD touchscreen strikes a happy medium between smaller 21.5in displays, which may be too small for watching a film with friends, and larger 27in models that could dominate small rooms.

Solidly built, and incorporating a metal stand, its build quality is head and shoulders above the cheaper entries here.

A hinged flap on the right conceals a memory-card reader and three USB ports, two of which are specified for the faster USB 3.0 standard, while the other doubles up as an eSATA port. Three more USB are found at the rear, along with ethernet and video ports.

The display is based on twisted-nematic (TN) panel technology, which suffers from restricted viewing angles. It performed relatively well in our tests, producing consistent colour, but poor contrast.

With a quad-core Intel Core i5-3450 inside, the Asus has ample power for all manner of family PC tasks, particularly multimedia. It's also fitted with an nVidia GT 630M graphics processor, which more than doubles the gaming performance of the integrated solution.

Uniquely in this group, the Asus has a separate bass speaker. It's nothing like a dedicated home-cinema sub, but it delivers an extra kick to the bass that monitor-based speakers can't deliver. Our review model came without a TV tuner, but it's an optional extra.

Asus' comprehensive software bundle includes touch-enabled apps for video chatting, photo browsing and face detection.

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
<b>Overall</b>	★★★★★



The touchscreen works with Windows 7, but it falls short of the requirements for Windows 8, with support for only two touch points.

**VERDICT:** The Asus ET2411INTI is one of the more impressive-looking Windows all-in-ones in this round-up. It combines good ergonomics, great sound quality and solid all-round performance with decent software support. However, its two-point touchscreen isn't well suited to Windows 8 and the price is high, given the poor-quality panel.

## CHILLBLAST FUSION FLEX AIO

**£899** inc VAT • [chillblast.com](http://chillblast.com) • [tinyurl.com/c2d2nto](http://tinyurl.com/c2d2nto)

Assembled from off-the-shelf components, the Fusion Flex AIO from Chillblast represents a radically different approach to the ground-up-design employed by Asus, HP, MSI, Lenovo and Apple.

It exudes a distinctly do-it-yourself feel, dominated by plastic and with an obvious emphasis on low cost rather than classic design.

On the underside is a standard motherboard back plate, into which video and USB cables have been connected and then pulled through the case to drive the display and 10-point touch interface.

This also means that most of the connectors, including audio, ethernet and a pair of USB 3.0 ports, are tucked away. USB 2.0 ports are provided at the side of the case, as is a memory-card reader, a Blu-ray drive and a row of buttons for the display.

This approach gives Chillblast the freedom to install standard PC components, creating a truly custom system. It's opted to fit a Wi-Fi card with two rather large antennae and a Freeview TV tuner - it's the only one here to support two channels simultaneously.

Processing power comes from a quad-core Intel Core i5-3450 chip, which delivers reasonably speedy performance. Its score of 161 points in our WorldBench 6 real-world speed test is a little lower than most of the competition, however.

The biggest performance drift arises because the Fusion Flex AIO has no discrete graphics, instead relying on the graphics capabilities integrated to its Intel processor. The Chillblast delivered only half the framerates of the competition in our gaming tests. Regardless,

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
<b>Overall</b>	★★★★★



most users will have no need for a dedicated graphics card, since the Chillblast has no trouble handling HD multimedia or low-level gaming.

**VERDICT:** It's certainly not pretty, but the Fusion Flex AIO's use of off-the-shelf components makes maintenance and upgrades easier and keeps down costs. Gamers will bemoan the lack of a graphics card, but most users won't miss it at all. The 10-point touchscreen and dual-Freeview tuners are a welcome bonus.



**HP Z1 (WM429EA)****£2,500** inc VAT • [hp.com/uk](http://hp.com/uk) • [tinyurl.com/cj8mcma](http://tinyurl.com/cj8mcma)

HP's Z1 is a professional workstation that features a huge 27in screen and weighs in at more than 20kg; it's monster of a PC. The build quality is on a completely different level to a consumer system.

The HP's massive hinged stand allows it to tilt into a horizontal position; you can then click into place two latches and open up the main unit as though the screen were a car bonnet. The screen is held in place by a piston stand, which also helps you to gently close it.

Many of the core components can be upgraded without the need for so much as a screwdriver. Of course, these are workstation-grade components, which means an nVidia Quadro graphics card and an Intel Xeon processor. You also get a three-year onsite warranty, with guaranteed next-day service.

The quad-core Xeon E3-1280 is clocked at 3.5GHz and Turbo boosts to 3.9GHz, it also supports Hyperthreading and has a larger cache than standard Core i7 processors. The Z1 came top in our WorldBench 6 tests, although by only a relatively small margin.

The Z1's display is the best of the group. It doesn't feature a touch interface, but it does have a stunning 2560x1440 in-plane switching (IPS) panel, capable of eye-wateringly bright output. It's also capable of displaying up to one billion colours and features extra-wide viewing angles, with sleek edge-to-edge glass.

This all-in-one isn't designed for multimedia, so no Blu-ray drive is included. The HP does feature somewhat higher-quality speakers than we expected, though, plus a full-HD webcam.

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

**PC ADVISOR  
RECOMMENDED**

Our one quibble is with the hard-to-access placement of most ports and connectors behind the stand.

**VERDICT:** A truly impressive, and very expensive feat of engineering, the HP Z1 features professional-grade build quality and components. Its tilting, hinged design allows for quick, tool-free maintenance, and it delivers excellent performance and superb graphics via its 27in IPS display. A three-year next-day onsite warranty is fantastic.

**LENOVO IDEACENTRE A720****£1,299** inc VAT • [lenovo.com/uk](http://lenovo.com/uk) • [tinyurl.com/93euu4f](http://tinyurl.com/93euu4f)

The IdeaCentre A720 is not only one of the sleekest, most stylish all-in-ones we've seen, but it also offers a glimpse into the future.

With its ultra-slim 27in multi-domain vertical alignment (MVA) panel featuring frameless edge-to-edge glass and a 10-point touchscreen, it's the only system here that approaches Microsoft's requirements for Windows 8 - although it isn't certified as such.

This delightful construction of metal and glass exudes a rather Mac-like aesthetic, which is sure to appeal to home users.

Built using mobile technologies, the PC components fit into what is in essence the base of the monitor. The display is then mounted on a hinged stand, enabling it to switch from vertical to horizontal mode, so you can use the Lenovo like a large tablet.

The wide viewing angles help somewhat, although we found the display needed calibrating to fix the image.

The A720 is fitted with a quad-core Intel Core i7-3610QM mobile processor, which runs at a nominal 2.3GHz, and boosts to 3.3GHz when necessary. It was the slowest all-in-one here in our WorldBench test, but 140 points is still a respectable score. Used in family and multimedia applications, the Lenovo never felt slow.

Also included is an nVidia GeForce GT 630M mobile graphics processor, which makes light work of casual games.

Our review model came with a Freeview TV tuner, a remote control, a 720p webcam and a Blu-ray player, making it a versatile family multimedia centre. Lenovo's extensive software suite ensures

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★

**PC ADVISOR  
BEST BUY**

an exciting out-of-the-box experience, too, rather than slowing down things with annoying and obstructive bloatware.

**VERDICT:** Lenovo's IdeaCentre A720 all-in-one PC looks great and has excellent build quality. Lenovo's attention to detail and well considered software support makes it a joy to use. It's a stylish and powerful PC that you will feel proud to own and show off to friends. A very reasonable alternative to the iMac.



## MSI WIND TOP AE2281G

**£799** inc VAT • [uk.msi.com](http://uk.msi.com) • [tinyurl.com/9nwt94v](http://tinyurl.com/9nwt94v)

MSI's compact all-in-one PC features a low-power Core i5-3450S Ivy Bridge processor and costs £100 less than any other in this group.

Part of this saving is due to a small 21.5in screen that supports only two-point multitouch. Corners have also been cut in the 4GB RAM allocation and 500GB storage capacity. The DVD writer doesn't support Blu-ray, but you can hook up an external player via HDMI.

Although it's constructed mainly from plastic, the Wind Top is considerably better-looking than the homespun systems from Chillblast and PC Specialist. It also comes with a matching wireless mouse and keyboard, and is available in black or white.

A row of control buttons on the left side lets you configure the monitor via an onscreen menu, but the placement of the power button alongside makes it too easy to accidentally shut down the PC when you really just want to tweak brightness.

The Intel processor, combined with an nVidia GeForce GT 630M graphics processor, enables the Wind Top to deliver good all-round performance and playable gaming framerates. You also get a USB Freeview TV tuner and an HD webcam.

MSI's bundled software package includes system-diagnostic and -maintenance tools that you won't get from a barebones system.

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★



**VERDICT:** This low-cost system offers good value for money and performs, for the most part, just as well as many more expensive PCs in this round-up. It can't match their premium build quality and styling, though. The memory and storage provision are on the skimpy side, and there's no Blu-ray reader.

	<b>ASUS</b> <b>£999 inc VAT</b> ★★★★★	<b>CHILLBLAST</b> <b>£899 inc VAT</b> ★★★★★	<b>HP</b> <b>£2,500 inc VAT</b> ★★★★★ <b>PC ADVISOR</b> <b>RECOMMENDED</b>
Model name	<b>ET2411INTI</b> <b>990PT-S60B10100C</b>	<b>Fusion Flex AIO</b>	<b>Z1 (WM429EA)</b>
Processor	3.1-3.5GHz Intel Core i5-3450, quad-core	3.1-3.5GHz Intel Core i5-3450, quad-core	3.5-3.9GHz Intel Xeon E3-1280, quad-core
Motherboard	Custom Intel H61	Asus P8H61-M LE/USB3 Intel H61	Custom Intel C206
Memory	6GB 1,600MHz DDR3	8GB 1,333MHz DDR3	8GB 1,600MHz DDR3
Storage	1TB SATA 6Gbps HDD	2TB SATA 6Gbps HDD	1TB SATA 6Gbps HDD
Screen	23.6in (1920x1080) LED-backlit TN 2-point touchscreen	22in (1920x1080) TN 10-point touchscreen	27in (2560x1440) backlit IPS
Graphics	nVidia GeForce GT 630M, 1GB VRAM	Intel Graphics HD 4000	nVidia Quadro 1000M, 2GB VRAM
Sound	Sonic Master DTS Surround Sensation UltraPC	Onboard Intel HD Audio	SRS Premium Sound
Optical drive	BD-ROM/DVD±RW	BD-ROM/DVD±RW	DVD±RW
Connectivity	Gigabit ethernet, 802.11b/g/n	Gigabit ethernet, 802.11b/g/n dual-band	Gigabit ethernet, 802.11a/b/g/n dual-band
Ports & connectors	2x USB 3.0, 3x USB 2.0 (1x eSATA combo), HDMI in/out, VGA	6x USB 2.0, 3x USB 3.0, VGA	4x USB 2.0, 2x USB 3.0, 1x FireWire, DisplayPort
Keyboard & mouse	Wireless	None	Wired
Operating system	Windows 7 Home Premium 64bit	Windows 7 Home Premium 64bit	Windows 7 Home Professional 64bit
Dimensions	590x461x230mm	550x405x135mm	660x419x59mm
Weight	10.8kg	9kg	21kg
Extras	Card reader, external subwoofer, 1.3Mp webcam	Dual Freeview TV tuner, remote control	Card reader, 2Mp webcam
Warranty	1-year return-to-base	2-year collect-and-return	3-year onsite, next-day service
Power consumption <sup>1</sup>	34/93W	57/99W	82/210W
WorldBench 6 score	163	161	172
MediaEspresso	5 mins 46 secs	1 min 58 secs	4 mins 59 secs
Games score (fps) <sup>2</sup>	103.6/6.7fps	42.8/2.4 fps	108.8/6.6fps
Display parameters <sup>3</sup>	218cd/m <sup>2</sup> , 480:1, 3.3, 4.7	299cd/m <sup>2</sup> , 700:1, 3.0, 4.5	461cd/m <sup>2</sup> , 580:1, 4.3, 4.7

<sup>1</sup>Tested with the machine idling at 120cd/m<sup>2</sup> and under load in Crysis <sup>2</sup>Tested in Crysis at 720p 'Low' detail and 1080p 'Very High' detail with 16x AA <sup>3</sup>Brightness, contrast, tone score, colour score



## PC SPECIALIST POWERGLIDE EXTREME GT640

**£899** inc VAT • [pcspecialist.co.uk](http://pcspecialist.co.uk) • [tinyurl.com/9k8wgso](http://tinyurl.com/9k8wgso)

As the only all-in-one PC here aimed at gamers, the PowerGlide Extreme GT640 offers a distinct advantage in graphics performance. It also uses a quad-core Intel Core i5-3570K processor, which is, aside from the HP Z1's Xeon chip, the most powerful CPU of the group.

The PowerGlide Extreme is the fastest overall performer, yet at only £899 it's also one of the least expensive. Inevitably, there are some compromises, and the build quality simply doesn't live up to the performance. Like Chillblast's Fusion Flex AIO, the PowerGlide is built from off-the-shelf components.

PC Specialist has opted for Gigabyte's GB-AEGT all-in-one chassis, which allows graphics cards to draw up to 400W. An nVidia GeForce GT640 is key to the PowerGlide's gaming performance.

The chassis includes an external SATA slot, into which you can slide a 2.5in hard disk or SSD to expand the already capacious 2TB of storage. It also features a 24in screen with two-point multitouch and a tilting 2Mp webcam. All cabling is tucked away inside.

Considerable cooling is required, and the PowerGlide is fitted with noisy fans that get even louder under load.

Other than the operating system, no software is preinstalled. You'll also need to add a keyboard and mouse.

Build	★★★★★
Features	★★★★★
Performance	★★★★★
Value	★★★★★
Overall	★★★★★



**VERDICT:** With uninspiring plastic looks, noisy fans and no preinstalled software, this is no family PC. The majority of users simply wouldn't put up with it. Where the PowerGlide Extreme GT640 scores highly is in raw speed, particularly in gaming, where support for powerful graphics cards and processors gives it an advantage.

**LENOVO**  
£1,299 inc VAT

★★★★★

**PC ADVISOR**  
BEST BUY

**MSI**  
£799 inc VAT

★★★★★

**PC SPECIALIST**  
£899 inc VAT

★★★★★

## IdeaCentre A720

2.3-3.3GHz Intel Core i7-3610QM, quad-core

Intel HM76

8GB 1,600MHz DDR3

750GB SATA 2 HDD

27in (1920x1080) backlit MVA 10-point touchscreen

nVidia GeForce GT 630M, 2GB VRAM

Dolby Home Theater V4

BD-ROM/DVD ± RW

Gigabit ethernet, 802.11b/g/n

2x USB 2.0, 2x USB 3.0, HDMI in/out

Wireless

Windows 7 Home Premium 64bit

650x220x480mm

11.6kg

Card reader, Freeview TV tuner, remote control, 720p webcam

1-year return-to-base

45/111W

140

4 mins 56 secs

111.3/7.5fps

257cd/m², 970:1, 1.0, 4.7

## Wind Top AE2281G

2.8-3.5GHz Intel Core i5-3450S, quad-core

Custom Intel H61

4GB 1,333MHz DDR3

500GB SATA 3 HDD

21.5in (1920x1080) backlit TN 2-point touchscreen

nVidia GeForce GT 630M, 2GB VRAM

THX Trustudio Pro

DVD ± RW

Gigabit ethernet, 802.11b/g/n

4x USB 2.0, 2x USB 3.0, HDMI in/out

Wireless

Windows 7 Home Premium 64bit

555x405x66mm

9.1kg

Card reader, Freeview TV tuner, 1.3Mp webcam

1-year collect-and-return

48/108W

163

6 mins 45 secs

108.8/7.5fps

249cd/m², 770:1, 3.5, 4.5

## PowerGlide Extreme GT640

3.4-3.8GHz Intel Core i5-3570K, quad-core

Custom Intel H61

8GB 1,333MHz DDR3

2TB SATA 3 HDD

24in (1920x1080) TN 2-point touchscreen

nVidia GeForce GT 640, 1GB VRAM

Onboard Intel HD Audio

BD-ROM/DVD ± RW

Gigabit ethernet, 802.11n

5x USB 2.0, 2x USB 3.0, HDMI in/out, VGA

None

Windows 7 Home Premium 64bit

571x128x464

10.5kg

Card reader, SATA dock, tilting 2Mp webcam

1-year collect-and-return, 1-year parts, 3-year labour

54/132W

169

5 mins 2 secs

121.7/11.5fps

212cd/m², 630:1, 2.8, 4.5

&gt;&gt; How we test and our conclusion



## Conclusion

If you intend to use an all-in-one PC in the home, perhaps as a lounge entertainment centre, its appearance will be important. In terms of sheer aesthetics, Lenovo's IdeaCentre A720 is streets ahead of the competition. It may cost more than most, but many users will find the design alone worth the extra outlay. The Lenovo incorporates one of the largest screens, with superior panel technology and a frameless 10-point touchscreen, giving it a headstart if you're considering upgrading to Windows 8. It also comes with a good selection of software.

For serious work, HP's Z1 workstation is in a class of its own. Some will find it prohibitively expensive but, for those who require the ultimate in performance and easy maintenance, it can't be beaten. Many core components can be swapped out without tools. It has no touchscreen, but it's the only PC here with a professional-grade display. You'll also be able to rely on a three-year onsite warranty with next-day service.

The Asus ET2411INTI is a good mid-range system, which retains a high-level of build quality in a 24in package. It delivers good all-round performance, while user-friendly software enables you to try a touchscreen environment today. It may not work as seamlessly under Windows 8, however.

For the budget-conscious, MSI's Wind Top AE2281G is the least expensive of the bunch, yet it still offers decent performance. You'll have to make do with a smaller screen and forego the Blu-ray player, though. It, too, comes preinstalled with software designed for home users.

If you prefer to install your own software and would rather have a more configurable or upgradable system, you could go for one of the PCs from Chillblast or PC Specialist. These vendors have taken a pre-built housing and added their own components.

Build quality suffers with these PCs, which have a distinctly DIY feel to them. However, they use many desktop-grade

components and can, to some extent, be user-upgraded like a regular desktop PC.

### The iMac challenge

The resurgent popularity in all-in-one computers can be traced to Apple's iMac. It's evolved from the classic Bondi Blue model of 1998 to the flatscreen form now emulated by other PC vendors, and comes in either 21.5in or 27in screen sizes.

Apple's iconic all-in-one still offers the finest balance of a high-grade IPS screen, like that in the HP Z1 workstation, along with peerless build quality and cool, quiet operation. Prices start at £999 for the model we tested in our January issue all-in-one PC round-up, or £1,399 for the 27in model we tested in the June issue.

All iMacs sport quad-core processors and discrete graphics, although the range has yet to be upgraded with Ivy Bridge processors and USB 3.0 ports. A new iMac line-up is expected imminently.

## How we test

### Application performance

Core system performance is measured using WorldBench 6. This customised test suite runs several desktop Windows applications with real-world workloads, mimicking how PCs are used on a daily basis.

These workloads include tasks such as editing documents and images, compressing files, browsing the web and encoding video. Some tasks are then run simultaneously to form an additional test of the PC's multitasking capabilities.

In total, eight applications are used: Adobe Photoshop Creative Suite 2.0, Autodesk 3ds Max 8.0, Firefox 2.0, Microsoft Office 2003, Microsoft Windows Media Encoder 9.0, Nero 7.0 Ultra Edition, Roxio ViewWave Movie Creator 1.5 and WinZip Computing WinZip 10.0.

Results from 10 individual tests are combined and weighted to produce a numerical score relative to a baseline PC.

Our baseline configuration runs a 2.4GHz Core 2 Duo E6600 processor, 2GB of DDR2 RAM, an nVidia GeForce 7900 GS graphics card, twin Western Digital Caviar WD3200KS hard drives in a striped Raid array, and Windows Vista Home Premium 32bit. This PC scored 100 points in WorldBench 6.

### Transcoding performance

We set each PC the task of converting a batch of 1080p Mpeg4 video clips for use on the iPad 2 and recorded how long it took to complete. We used CyberLink's MediaEspresso software.

This software is able to make use of hardware-accelerated decoding and encoding built into graphic cards and CPUs with integrated graphics-processing capabilities. These techniques can often shorten conversion times by a factor of 10. Multiple CPU threads are also fully exploited, allowing quad-core CPUs to shine when compared to dual-core versions.

### Power consumption

Unlike most desktop machines, all-in-one computers may often be left switched on for extended periods. We measure power consumption when idle and when running the CyberLink MediaEspresso test with the display panel set to the default brightness.

### Gaming performance

These PCs aren't designed for gamers, but we run two tests using Crysis, which still has the power to stretch modern graphics to the limit. We've included a 720p Crysis

test to give PCs running integrated graphics a chance. For those with discrete chips we crank up the resolution to 1080p, set the quality to Very High and use 16x AA.

### Display quality

We use a Datacolor Spyder4 calibrator to measure colour gamut and accuracy, contrast and uniformity across the surface of the screen. We also take into account the viewing angles afforded by the display technology each panel uses. We have produced a score out of five for accurate and uniform brightness and colour reproduction.

### Subjective assessment

It's not all about speed. We also pay close attention to the physical characteristics of each all-in-one PC, its noise output and build-quality, and take note of important features such as the quality of components.

### Support

Differences in warranty terms can have a big effect on our verdict. Longer warranties are better, but we also look at the terms and conditions - specifically, whether faulty systems must be returned at your cost, and whether parts and labour are included. ☒



## CUSTOM BUILT GAMING PCS



### ND 4000 Gaming PC

- ✓ CPU: Intel i7 3770K 4 x 3.5 GHZ
- ✓ RAM: Corsair 16 GB DDR3 1333 MHZ
- ✓ HDD: 1 TB (1000 GB) SATA-III HDD
- ✓ Graphics Card: ATI Radeon HD 7850 2 GB
- ✓ Motherboard: Gigabyte Z77
- ✓ Case & PSU: Coolermaster 690 II & 700W PSU
- ✓ CPU Cooling: Arctic Freezer 13
- ✓ Optical Drive: 22x Dual Layer DVD Re-Writer
- ✓ O/S: Windows 7 Home Premium 64 BIT

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- ✓ RAM: 16 GB DDR3 1600 MHZ
- ✓ HDD: 120 GB SATA-III SSD & 2 TB HDD
- ✓ Graphics Card: NVIDIA GTX 680 - 2 GB
- ✓ Motherboard: Gigabyte Z77
- ✓ Case & PSU: Coolermaster HAF-X & 700W PSU
- ✓ CPU Cooling: Corsair H60 Liquid Cooling
- ✓ Optical Drive: 22x Dual Layer DVD Re-Writer
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## WHO'S WATCHING YOU?

**Martyn Casserly investigates who's keeping tabs on your online activities and what you can do about it**

**T**he internet is undoubtedly one of the greatest inventions of the modern age. Never have so many people had access to so much free information, while projects such as Wikipedia have shown what can be achieved when the power of the masses is harnessed to achieve a common goal.

Whereas previous generations turned to the Encyclopaedia Britannica in their quest for knowledge, provided that they were fortunate enough to own the multi-volume repository, people now access its online contemporaries: Google, Wikipedia, even Twitter. The Encyclopaedia Britannica is itself available in subscription-based online form, and the ability to frequently update the information it provides means it's now more reliable as a research tool.

Social media has also grown at a phenomenal rate, and with it transformed our ability to communicate on a wider scale. Tracking down old friends and colleagues is no longer the preserve of amateur detectives with a battered book of phone numbers and addresses circa-1993; today, more often than not, you can simply log into Facebook and type in their name.

We have available to us an incredible number of free online services - Skype, Gmail, Google Docs, Twitter, Facebook, Dropbox... many have become an essential part of our daily lives. For consumers, this truly is a golden age for technology. But what do the sites and services themselves get out of it?

### The hidden costs of free services

We know that businesses need to make money to even exist, let alone thrive. Google's data centres are famously home to thousands of computers, each holding fragments of the world wide web. Around 48 hours of video is uploaded to YouTube every minute, which translates to eight years of content per day. And Facebook has a population larger than most countries, with some 900 million monthly active user accounts.

We don't pay to search, upload badly taken photographs of school plays, or watch little pandas sneezing, yet Google is one of the most profitable companies in the world and Facebook is valued at £66bn.

So how do they do it? What's the secret to their success? Technical brilliance aside, the answer is very simple: you. Or more accurately, what you like and what you might want to buy.

The free services we access on a daily basis are watching us - where we go, what we do - and using that information to provide their advertisers, or even other companies' advertisers, with profiles that enable them to sell to us more effectively and increase the chance that we will click the 'Add to basket' button.

Remember that old phrase: if you're not paying for it, you're not the customer; you're the product being sold.







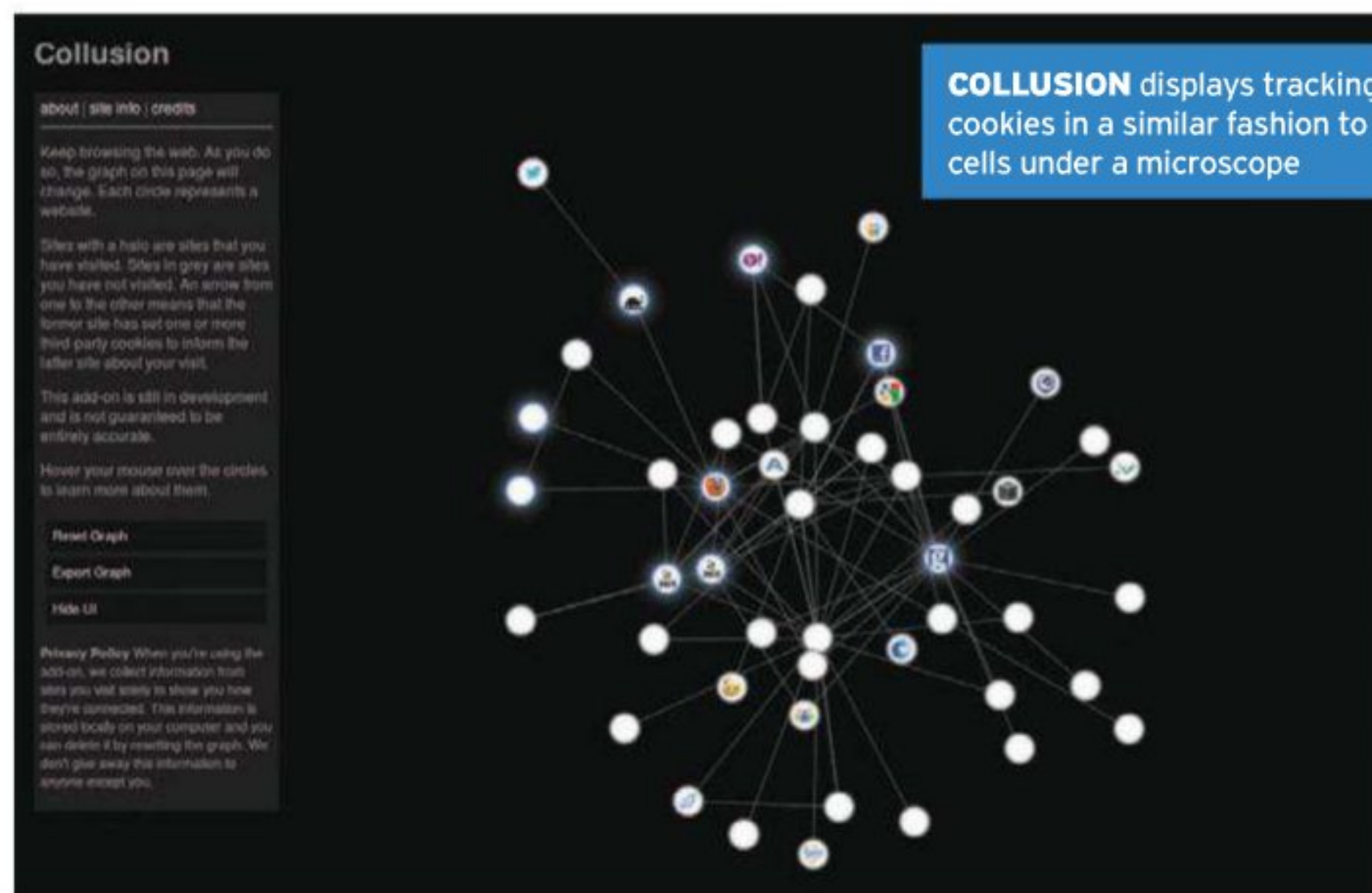
## Me and my shadow

During his recent TED talk, 'Tracking the Trackers' ([tinyurl.com/bp37rL8](http://tinyurl.com/bp37rL8)), Mozilla CEO Gary Kovacs discussed the idea of behaviour tracking and its proliferation across the web. In essence, when you visit a website a cookie is created in your browser that allows the site to know you are there and help it to perform basic tasks, such as maintaining the contents of your shopping basket while you continue browsing the site.

Cookies can also gather information on the pages you visit and items on which you click, so that the content you're offered is more relevant. Generally, cookies enhance the browsing experience (try disabling them in your browser's privacy settings to see just how clunky the web can be) and often save you from having to log in or set preferences each time you visit a site. All this is perfectly acceptable, helpful even; more worrying is the fact the behaviour Kovacs discussed can continue after you leave the site.

You might expect a site to retain the information on the cookie for the duration of your stay, then for that cookie to become inert when you leave. This isn't always the case. Third-party cookies can continue watching your movements, sometimes across several sites - to none of which you have given your consent.

The effects are easy to observe - in fact, you've probably already seen them. Search for details on, say, Batman, and it won't be long until related products begin appearing in the advertisements on other sites you visit, sometimes with unnerving accuracy.



This is made possible by the relationships between the host sites and online advertising companies, such as [scorecardresearch.com](http://scorecardresearch.com), [tribalfusion.com](http://tribalfusion.com) and [doubleclick.net](http://doubleclick.net). The idea is to provide you with a tailored experience, and tempt you to make a purchase.

Revenue generated from these advertisements is staggering. In 2011, Google was reported to have made \$37bn, with nearly all of this derived through AdWords and AdSense. Facebook also raked in a respectable \$3.7bn, with 85 percent the profits of advertising. It's no surprise that companies are keen to know what we want to buy, and the most effective way to place those products in front of us.

The idea of our habits being monitored, especially by those who would hope to seek profit, is an uncomfortable truth that accompanies our heavily interconnected online world. Gary Kovacs puts it very eloquently: "We are like Hansel and Gretel, leaving breadcrumbs of our personal information everywhere we travel through the digital woods".

To observe tracking, Mozilla has developed the Collusion Project, available as a Firefox plug-in, which displays tracking cookies in a similar fashion to cells under a microscope. It doesn't take long for those cells to multiply.

"On a technical level, Collusion plugs into your browser and watches all these requests

## IN WITH THE OUT CROWD

If you've ever thought about quitting a service such as Facebook then you'll realise just how big a decision that actually is. Google has heavily promoted its Google+ service, but struggled to draw the kind of numbers needed to make it a serious rival.

Primarily, this is because most people who would ever use a social network are already using Facebook; more importantly, so are their friends. Who really has the time to update two or three social networks and, even if you did, what's the point?

If the privacy compromises associated with either social network have so far put you off signing up and catching up with long-lost friends and family, several alternative options are available - provided you can convince your friends to sign up too.

Diaspora ([joindiaspora.com](http://joindiaspora.com)) is one of a new breed of social networks that belong to the users; its decentralised network means no-one holds all the information. Instead, the site works via local pods that join together to form the network. The service



also allows you to link your Facebook, Twitter, or Tumblr account and still chat with your existing friends. Although it's invite-only at the moment, it shows promise for the future.

Another independent site worth checking out is Friendica ([friendica.com](http://friendica.com)). It offers many of the same features as Diaspora, but adds some interesting ideas, such as content automatically expiring after a given period of time and the ability to create posts of unlimited length. Bloggers should be happy here.



to websites and third parties involving cookies," explains Mozilla's Ryan Merkley. "Firefox already makes a record of some of this (your browsing history) and Collusion is recording a little bit more so it can be drawn on your screen. The more you browse, the more Firefox and Collusion accumulate about relationships, and your graph gets larger."

That's something of an understatement. In our own experiment we cleared the browser history, installed Collusion, then visited some of our bookmarked sites: The Guardian, Football365, Facebook, Twitter and a few others. After viewing just nine sites, and spending less than 20 minutes online, we had been tracked by thirty-five cookies.

In another test we reset the browser and visited the site of a popular high-street videogame retailer; the results were startling. Just by landing on the home page we saw 11 third-party links appear on our Collusion graph. Ryan Merkley's initial experience of the application was equally concerning.

"I first tried Collusion when one of our engineers shared an early proof of concept," he says. "I was shocked at the number of trackers and, most of all, by the number of times a very small group of trackers showed up. Those few trackers know more about my combined browsing habits than any website ever would. It made me want to know how they use that data, and have a tool to decide for myself whether they would be able to collect my data at all."

### Company tracking

It's not just the secret third-parties that watch what we do, sometimes it's the sites we trust. In late 2011 blogger Nik Cubrilovic showed how Facebook was using persistent cookies that could track web use even after a user had logged out from the social network (see [tinyurl.com/77dy5w](http://tinyurl.com/77dy5w)).

The news that the social-media giant might be quietly watching exterior online behaviour quickly spread across the internet and brought angry responses on blog posts and forums (which, to be fair, is not an unusual location for those sort of reactions).

Facebook immediately addressed the issue and went to great lengths to reassure people that it hadn't gathered information; rather, the cookies were used as a form of security against spammers and unauthorised log-ins, or worked with the 'Like' functions found on various sites around the web. Within two days of the news breaking, Facebook fixed the apparent bugs.

But that wasn't the end of the matter: shortly afterwards, Cubrilovic was contacted by a friend on Twitter who had found a third-party site on which Facebook had set one of the previously offending 'datr' cookies, only now it was capable of returning information to Facebook without the user having logged in.

The cookie worked behind the 'Like' function on the page and was able to identify the user even if they didn't interact with the widget. Cubrilovic investigated further and found several other sites now ran these cookies.

Facebook was again quick to respond. It said it wasn't a re-enabling of the cookies, but rather a bug that affected certain sites that called the API in a non-standard way. It fixed the issue and assured users that it didn't build profiles using this kind of data.

Although it's reasonable to accept what Facebook says - after all, it did move quickly to plug the gaps and was open about its reasons for using cookies - this isn't the only occasion on which its attitude to user privacy has been brought into question.

Several times in the past few years Facebook has introduced new functions and automatically opted-in users, often making data that was previously private suddenly public - at least until users sent around instructions of how to reverse the problem.

The latest instance was in June, when Facebook replaced each users' email address with an @facebook.com alternative, without asking their permission or letting them know it had happened. A story also emerged in July that revealed the existence of a Facebook 'Data Science department', which analyses information on its users to search for patterns that may be of later use.

Many of the sites you use will utilise some form of **BEHAVIOUR TRACKING**

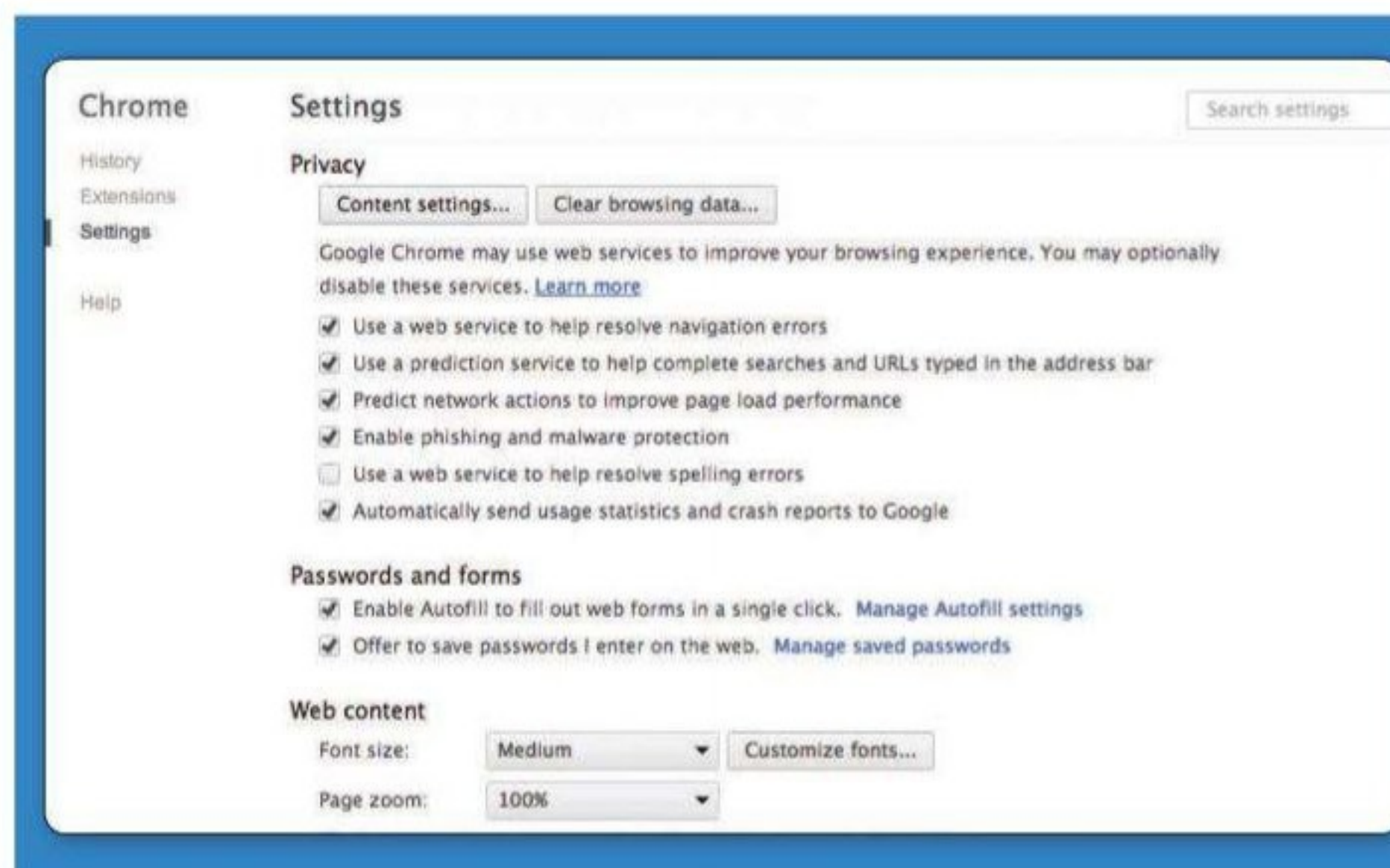


In an article by Tom Simonite, which appeared on MIT's Technology Review site ([tinyurl.com/cjdc3e5](http://tinyurl.com/cjdc3e5)), it was reported that one of the team's data scientists, Etyan Bakshy, had already conducted an experiment. According to Simonite, Bakshy "messed with how Facebook operated for a quarter of a billion users".

Over a seven-week period, the 76 million links shared by Facebook's users were logged. Then, on 219 million randomly chosen occasions, Facebook prevented someone from seeing a link shared by a friend.

Hiding links this way created a control group, so that Bakshy could assess how often people promote the same links as their friends because they have similar information sources and interests.





## CHROME PRIVACY

Changing your settings in Google's Chrome web browser is easy. Simply open Chrome, click the spanner icon, then choose Settings. Scroll down to and click 'Show advanced settings' to reveal the Privacy menu.

Ensure that the 'Enable Phishing and Malware protection' box is ticked, then click the Content Settings button. Leave alone the Cookies setting, but be sure to enable 'Block third-party cookies and site data'. For added safety you can also select the option below, which clears your data when you close Chrome. Click Ok and close the Settings tab.

The theory might be interesting, and the results potentially useful, but the methods of obtaining the information are questionable.

Of course, it's not only Mark Zuckerberg and his social scientists that are watching our clicks with interest. Twitter recently hit the headlines when it was revealed that the micro-blogging company had sold two years' worth of archived Tweets to data-research company DataSift.

Social-media app Path was found to be uploading contact data from iPhones without the consent of their owners. Android phones (mainly in the US) were being sold preinstalled with Carrier IQ software that some analysts believed was capable of tracking keystrokes and text messages.

And last February, *The Wall Street Journal* reported that Google had been tracking users of Apple's mobile Safari browser through cookies that acted as if the user had granted permission for ads to be displayed, despite

the 'do not track' setting being enabled. During the investigation, it was discovered that a few other large advertising companies were also using similar coding to capitalise on the loophole in Safari.

Google responded that the newspaper mischaracterised what happened and said in a statement that it "used known Safari functionality to provide features that signed-in Google users had enabled. It's important to stress that these advertising cookies do not collect personal information."

Google promptly disabled the code and Apple set about closing the loophole in its browser. Google didn't have to admit to any wrongdoing, but the US Federal Trade Commission fined it \$22.5m for misrepresenting what it was doing. The fine is the single biggest penalty it has enforced.

The search giant also drew criticism from privacy groups after it announced the unification of its privacy policy. Previously,

each of its services had individual policies, all of which were specifically tailored to the nature of the application. When it decided to bring together more than 60 of them under one banner, it also meant the services themselves would be able to share information to build up a better picture of a user and their practices.

Google wasn't collecting more information, simply organising it better. Due to the composite nature of the different sets of data, the information would be more valuable to advertisers.

Recently, the company also revealed a new feature for its Android mobile operating system: Google Now. It acts as a personal assistant, similar to Apple's Siri, but the aim of Now is for it to learn about your behaviour - where you live, how you travel, foods you like to eat, places you like to shop... It will then combine this with location data to provide you with information relevant to







your interests. It's hugely ambitious, possibly brilliant, but your privacy is once again being brought into a questionable area where a device is tracking how you live.

### The law

In response to the ever-increasing issues surrounding privacy, EU Law has put in place the e-Privacy Directive. This states that no user should be tracked without their consent. You may have noticed the pop-up boxes that now appear at the top of websites announcing that they use cookies; they will either require you to click to accept this or, in some cases, state that by continuing to use the site you are giving your consent.

The short explanations very rarely mention anything about third-party cookies, and often appear only the first time you visit the site. If you fail to spot the notifications or think you'll have a look when you have more time on your hands, you will continue to be tracked as before.

To learn how the site uses cookies, you normally have to click the privacy policies link highlighted in the message. Sometimes you can select which cookies will be used, with the BBC website being a good example here.

For a more permanent solution it would be wise to consider using your web browser's private or 'Incognito' mode, which stops sites from adding permanent cookies or tracking your web history.

Another sensible move is to visit the security settings in your browser of choice and look for the 'Do Not Track' or 'Do not allow third-party cookies' option. Plug-ins

such as Ghostery are available for most browsers and offer an enhanced level of security, while Internet Explorer users can use 'Tracking Protection Lists' to prevent known offending sites to place cookies on their machine.

Sadly, even these settings can be overcome by something called device fingerprinting. Your system is made up of lots of small details – such as the browser type, operating system, plug-ins, and even system fonts – that can be scanned and interrogated to reveal an individual digital fingerprint that identifies your machine on the web.

The Electronic Frontier Foundation (eff.org) is a digital rights group that campaigns against invasions of civil liberties. To illustrate the effectiveness of device fingerprinting, it set up the Panopticlick website (panopticlick.eff.org). Here, users are able to measure how easily identifiable their systems are.

We tested our road-worn laptop and were slightly unnerved to discover that, out of the 2,287,979 users that had scanned their

machines on the site, ours was unique and therefore trackable.

Some would argue that the ability for companies to track our interests is a fair price to pay for the free services we receive. After all, websites are only offering opportunities for advertisers to pitch their products to us. Television, radio and cinema all do the same thing, and use demographic profiling to promote certain products at calculated times – hence all the beer and crisp commercials during football coverage.

No-one forces us to use social networks, and there are alternatives to all Google's online offerings. But is it such a bad thing that we are being watched – what have you got to hide? Well, that all depends on who is doing the watching, and why.

### The spying game

Currently negotiating its way through parliament is the government's Communications Data Bill, or the 'Snooping Bill', as opponents prefer have termed it.

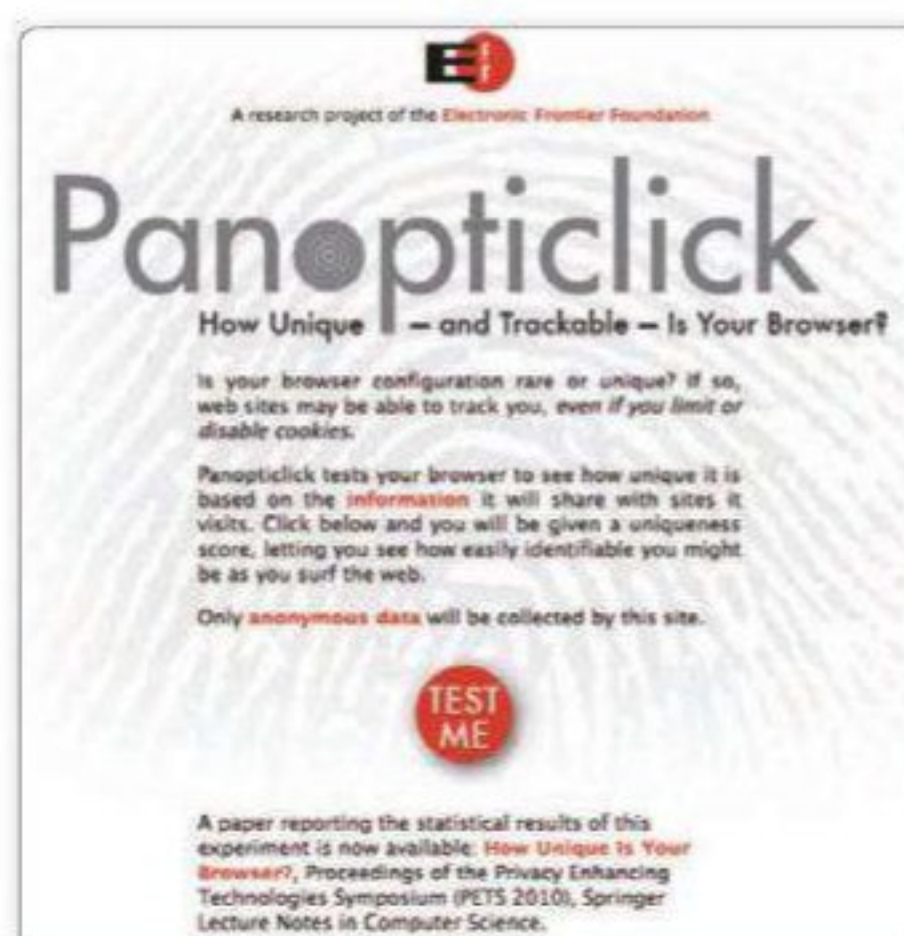


## CALL THE PROS

Allow (i-allow.com) is a UK company that specialises in helping you to manage your online profile. Its subscription-based plan offers useful services such as searching the web to see on which marketing databases your name appears and helping to remove you from them. There is also a Google Chrome ad-blocking plug-in, and a tool that randomly generates addresses for filling out forms or anonymously subscribing to websites.

Allow's social-media tools are able to analyse your privacy settings and warn you if your data is in danger, while a profiling service shows you how potential employers might view your publicly available content.

The details of this brand-new service are still being finalised, but expect to pay around £6 per month.



**PANOPTICCLICK** allows visitors to its site to establish whether their PC is trackable





This radical restructuring of British law would force ISPs to retain communications data for all emails, web browsing and even mobile phone use in the UK.

The authorities would then be able to access the information in a limited capacity at any time, or in its entirety when granted a warrant. The government is also claiming that it will be able to decode SSL encryption as part of the process.

For a nation that's already heralded as the most surveillance-heavy country in the world, this might seem to many a step too far. What some privacy campaigners see as the real problem, though, isn't necessarily the government prying into our digital lives

(although that's obviously a concern that they rate highly), but rather the fact that so much information about us will be collected and stored, with potentially dangerous consequences.

Most of us would agree that although we might not always like how our elected officials behave, we still have a reasonably accountable government. We could also agree that while companies such as Facebook and Google make money from us in a less-than-transparent manner, they too are not out to harm us. But the fact that all are intent on assembling hugely detailed data sets poses a problem if that information is ever used by organisations that are not so benign.

In January 2010 Google announced that it had been the victim of a sophisticated cyberattack originating in China. The hackers had gone after the email addresses of human rights activists, journalists, and some senior US officials. Wikileaks then released leaked cable communications that suggested a senior member of the Chinese Politburo had been involved in the attacks. Some reports suggested that the motives behind the attack were to identify and locate political dissidents who were speaking out against the government's human rights records.

The following year saw the rise of the 'Hacktivist', modern day protestors against abuses of civil liberties or digital freedom.

## SIMPLE WAYS TO PROTECT YOURSELF



1. Limit the information you share publicly. If you're including your birthday in a social profile, avoid stating your birth year - this is a key identifier, which trackers can use to distinguish you from other people with the same name.
2. Use a secondary email address when registering for websites, forums, competitions or shopping online. Hotmail and Yahoo offer free, quick to set up accounts.
3. Use one browser for general web activities and another for more sensitive information. Avoid using 'Like' and '+1' buttons.
4. Regularly change your passwords and use a separate one for each account. A password manager can be useful here.
5. Make sure any browser you use has the Privacy settings switched on. These are often off by default.





Among the high-profile victims of groups such as Anonymous and LulzSec are Sony, the US Bureau of Justice, our own Ministry of Justice, the Home Office, several Chinese government sites and even the Vatican... twice. In fact, Verizon released figures reporting that more than 100 million users' data had been compromised by the Hactivist groups in the past year.

Although the motivation behind the Hactivists efforts are generally for the greater good, the ease with which they seem to be able to either bring down or infiltrate supposedly secure sites should bring into question the wisdom of having so much personal information stored in one location, undoubtedly attached to the internet.

### Protect yourself

So what can we do? The Communications Data Bill is yet to be passed as law, so contacting your MP could be a good place to start. In fact, getting as many people as possible to contact their MPs would be a better place.

A more immediate solution is to ensure that you and anyone else who uses your computer is aware that the data they put online is not private. Also use tools such as Collusion ([mozilla.org/collusion](http://mozilla.org/collusion)) to monitor who is watching you.

You can change your browser's security settings to stop these cookies being stored

in the first place, and regularly clear out the history and cookies to remove those that slip through the net. Limit the use of location services, resist clicking the 'Like' button, and even use a different browser for all interaction on social networks.

The more cautious could boot a Linux operating system from a USB flash drive when using public Wi-Fi, or download Wi-Fi Guard from AVG.

In the end, though, the most potent weapon we can use against those who would try to profit from tracking us is an awareness of what might be happening.

The internet is growing up and maturing into a stunningly powerful tool and an amazing place to explore. Like any great adventure, there are a few dangers to negotiate along the way.

We shouldn't let the fear of a Big Brother state or shadowy data brokers deny us the advantages of services such as Google and Facebook, and if we're careful to limit the important data we share then we should be able to protect ourselves in some measure.

Ryan Merkley sums it up rather well: "A no-tracking universe probably isn't the answer. We want users to be informed and in control of their web experience: the more they know, the less likely anyone can track them without their knowledge. Informed and empowered users has always been the best thing for the web." ☒

## SUPER COOKIES

Cookies serve a useful purpose on most sites, able to remember your user settings and preferences, but not all cookies are good news. Flash, Super and Zombie cookies threaten our privacy and can prove harder to eradicate.

"These types of cookies work by storing a unique ID in multiple places at the same time," explains AVG's chief technology officer Yuval Ben-Itzhak. "For example, if a user deletes a traditional cookie in the browser but not in Flash, a tracking network could identify the user through Flash and rewrite the original browser cookie with the same unique ID. This makes the ID persistent and very effective in tracking users over a long period. By simultaneously removing all types of cookies or other places where unique IDs are stored, it is possible to minimise the chances of being identified and tracked."

The software company has also developed a Do Not Track (DNT) feature for its Internet Security 2012 package, which is compatible with Internet Explorer, Chrome and Firefox. DNT could provide more effective protection than standard methods.



"The 'passive' DNT feature used in web browsers works by providing a DNT header to the sites a user is visiting," says Ben-Itzhak. If this header is activated, the browser asks the site not to track the user. The problem is that adhering to DNT isn't compulsory.

Rather than hoping the website will not track the user, AVG actively blocks the connection. Blocking third-party cookies doesn't guarantee users can't be tracked; only by actively blocking the tracking is the user fully in control.





# OPEN UP

WITH THE ACER **ASPIRE S5** ULTRABOOK™

He is known for speed, determination, intensity and a fair number of explosions. But he has another side. A sweet fluffy cupcake side. Yes, it took us by surprise too. But once we'd recovered we decided to help him by designing the new Aspire S5 Ultrabook™. It's not only 11mm thin and weighs just 1.2kg, but underneath its sleek exterior lies an Intel® Core™ i5 or Core™ i7 processor, a solid state drive and a lightning fast thunderbolt connection. So, besides a good egg beater and reliable convection oven, it's all Kiefer needs to explore his baking passion.

Search 'Aspire S5'





Ultrabook™ Inspired by Intel

Acer recommends Windows® 7.





# Join the 3D revolution

With the right kit, you can play games, watch Blu-ray movies, view photos and even surf some websites in 3D. Mike Bedford explains

**G**etting 3D on your PC might sound expensive, but there are plenty of ways in which you can experience it on your current machine at little or no cost.

Most modern computers are capable of generating a 3D image; it's the display hardware you're probably lacking, and this is where things can get expensive. 3D monitors start at around £150 for a 22in screen; 3D laptops such as the HP Envy 17-1195EA and the glasses-free Toshiba Satellite P855-10G cost more than £1,000; 3D projectors are also in the £1,000-plus price range. Chances are, though, you already have a means of displaying 3D images, without buying any new tech.

It's estimated that between 17- and 50 percent of us will own a 3D-ready TV by 2016, and many of us already do so – even if it didn't come with a pair of the special glasses that are required to enjoy the 3D effect. If you're planning to buy a new TV and will be spending more than £450, you'll likely find it supports 3D as standard.

Even if you have no dedicated 3D hardware, you can still join the 3D revolution. The results might not be as good as they are with a stereoscopic monitor or TV, but we'll see how you can enjoy 3D content on an ordinary monitor. We'll also show you how to create your own 3D content using nothing more than a digital camera and a cheap piece of hardware you can make yourself.

3D images aren't viewable only onscreen; the effect can also be created on the printed page. We'll show you how to produce 3D prints from your own home printer or an online printing service.









## What do we mean by 3D?

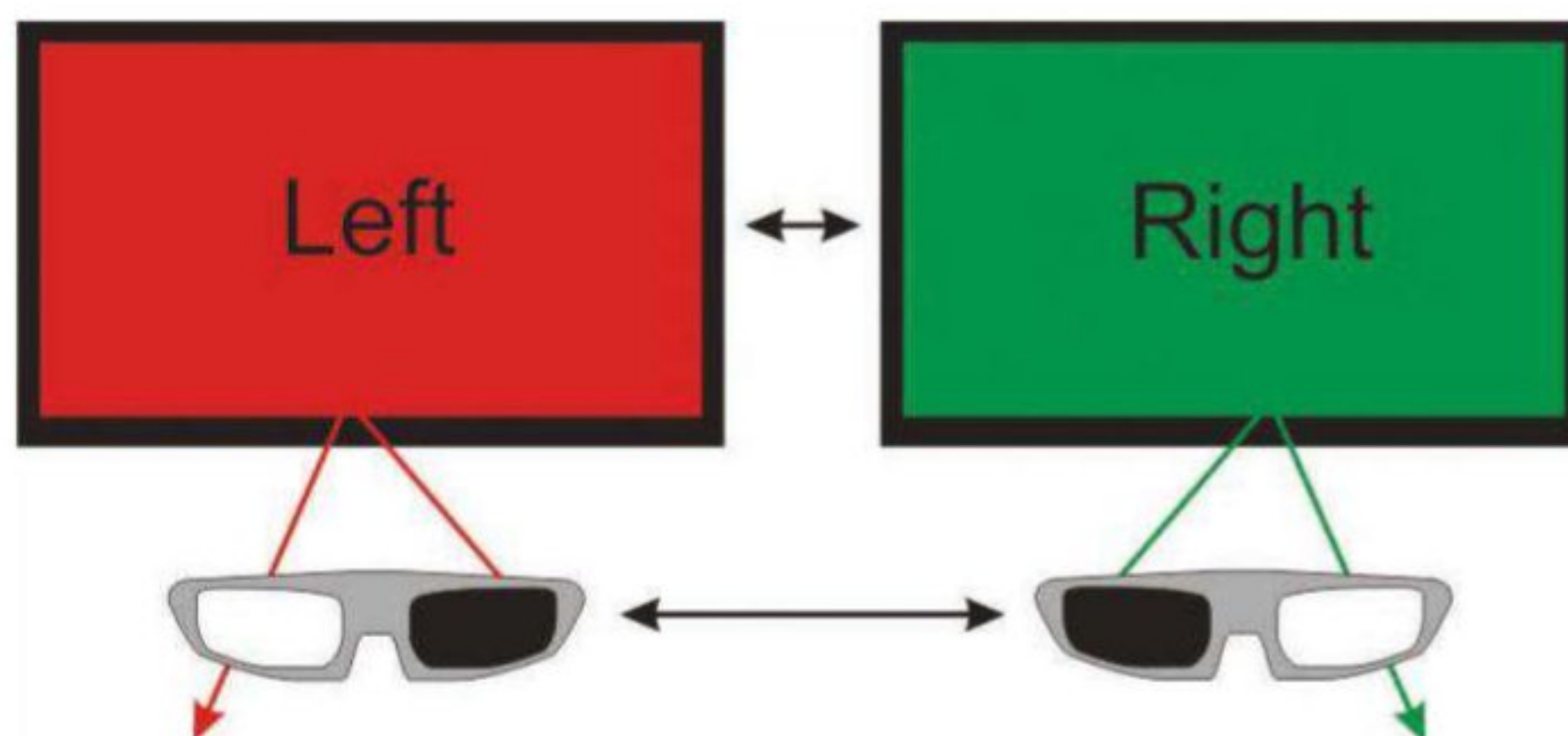
Graphics-card manufacturers have been claiming for years that their products provide 3D graphics, but by this they simply mean that the graphics card has sufficient processing power to render a 3D scene in an almost photo-realistic way.

And by its very definition, any camera that has ever existed has been able to create a photo-realistic image. Be it a graphics card, a camera or a TV, many of the standard non-3D gadgets we already own are able to reproduce many of the attributes of the real world that we use to judge depth.

Such attributes are perspective, a reduction in the intensity of colour with distance, the way in which nearby objects can partially obscure more distant ones, shading and shadows. However, one important factor is missing: binocular disparity.

Binocular disparity occurs because we look at the real world from two perspectives - with our right- and left eyes - and our brain merges them into one. Only stereoscopic display systems can replicate this effect to offer what we now refer to as true 3D.

Stereoscopic-imaging systems must either generate or record two slightly different images, then provide a means of viewing so that each eye sees a different image.



A stereoscopic image is what most people think of as proper 3D but, even here, some elements of the real world that we use to recognise depth are not present. One such element is motion parallax; you'll notice it as you move your head to the left and right. The closer an object is to you, the more it appears to move with respect to more distant objects.

Then there's something known as accommodation, which is the technical term for the way we are able to focus on objects at certain distances, while rendering closer and more distant objects out of focus. The science of holography is able to reproduce

**ACTIVE DISPLAYS** work by displaying left and right images alternately, and must be used with glasses containing electronics

these and any other imaginable ways in which humans see in 3D.

Holographic displays are in production, but they're far from becoming commercial products. Given that the first photographic hologram was produced in 1962 and you still can't buy a mainstream holographic camera, holographic graphics cards and monitors might be some way off yet.

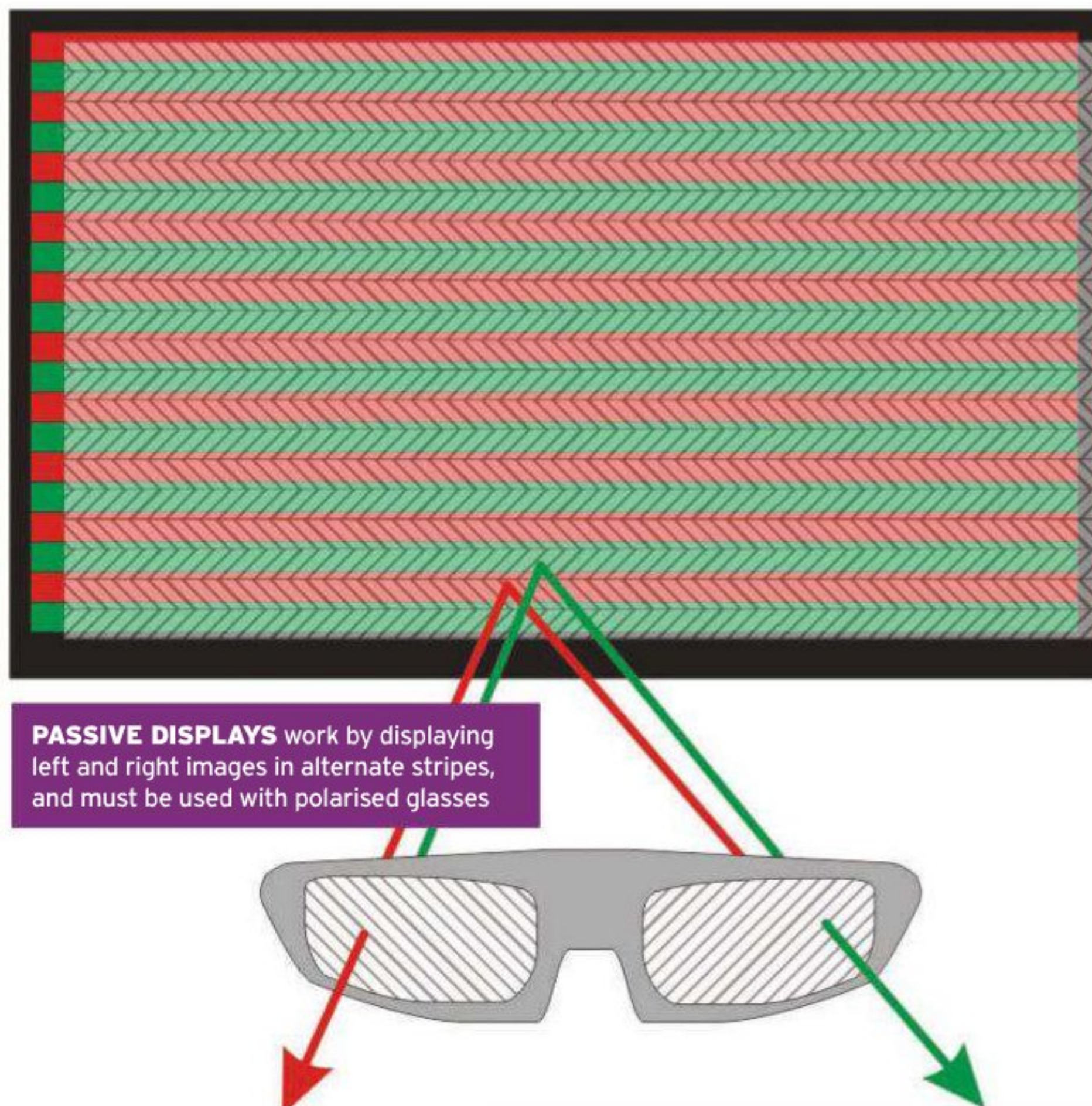
## How 3D displays work

It isn't difficult to appreciate how a camera with two lenses is able to record the two images necessary for stereoscopic display. Similarly, the software required to render a scene could be designed to do so from two slightly different viewpoints.

It's equally easy to appreciate that the only real constraint on the processing of a stereoscopic pair of images is sufficient power. A CPU has to process both images in the same time that would normally be required to manipulate a single image. For video in the UK, that means a minimum of 25 pairs of images per second.

What's much more difficult is designing a viewing system that ensures each eye sees only one of those two images. Over the years, countless types of stereoscopic display have been devised - we'll see some of these later in this feature when we turn our attention to viewing 3D images on an ordinary monitor. First, though, we'll look at the three methods that are currently used on most 3D monitors, laptops and televisions.

The most common 3D technology is active display, and to appreciate the effect you must wear glasses that contain active electronic circuitry. Left and right images are displayed one at a time, with the hardware swapping



**PASSIVE DISPLAYS** work by displaying left and right images in alternate stripes, and must be used with polarised glasses





between them in quick succession. Clever electronics automatically switch each lens from opaque to transparent when the image intended for that eye is on display.

For the technology to work smoothly, the display must reveal two frames in the same time it would usually show just one. Returning to our UK example, the display would have to show 50 rather than 25 images per second.

The next most common 3D technology is the passive display. Rather than interleaving two images in time, they're interleaved in space. In other words, a single image is composed of horizontal lines from both the left and right stereo images, which are displayed alternately down the screen.

Immediately in front of the screen's LCD panel is a polarising filter. This is made up from alternate horizontal strips of right- and lefthand polarising material, which line up with the horizontal stripes of the image. This means the stripes in one of the images becomes left-polarised, and those in the other are right-polarised. The passive 3D glasses used with this sort of display also contain left- and righthand polarising filters, with one over each eye. These don't contain any electronic circuitry.

A left-polarising filter will allow left- but not right-polarised light to pass, and vice versa. This ensures that each eye is able to see only the image intended for it.

The drawback of this method is that the horizontal resolution is halved: a full-HD screen using passive 3D can show only 540 lines from each 1920x1080-pixel image.

It's possible that a better-equipped monitor with twice the vertical resolution could overcome this limitation, but none exist in the shops today.

On the plus side, passive glasses are far less expensive than active ones, which cost upwards of £50 per pair. They are also slimmer and lighter, making them more comfortable to wear.

A third technology, which is surely going to become more popular in future, is the auto-stereoscopic screen. This is otherwise known as 'glasses-free 3D', and means no viewing aid is required to enjoy the 3D experience. You are potentially able to watch 3D content with friends, without forking out for additional pairs of specialist glasses, and without anyone worrying about how they look.

As with passive 3D displays, the two images intended for the left and right eye are interleaved in the form of thin stripes. In this case, however, they are vertical stripes.

Rather than placing a polarising filter over the panel, auto-stereoscopic displays use a lenticular sheet. This is comprised of thin vertical cylindrical lenses, which cause the alternate stripes of the two images to be directed left and right toward the eye for which they are intended.

Apart from the halving of the vertical resolution, the main disadvantage of this technology is narrow viewing angles. For a TV that's going to be viewed by several people this is a show-stopper. Lenticular monitors and laptops are available to buy now.



## CAN YOU SEE IN 3D?

If you're thinking of shelling out on some gear to experience the latest 3D content, you should first make sure you'll be able to enjoy the experience. An estimated 12 percent of people can't view stereoscopic images - so if you're one of those people, you'll be wasting your money.

Unless you know someone with a 3D-ready TV, Blu-ray player and some 3D movies, find a local cinema that's screening a 3D film. If you can't tell the difference when you put on the glasses, there's little point in investing in 3D hardware for your PC.

The other thing this exercise would tell you is whether you find the 3D experience comfortable to watch. Viewing stereoscopic content can sometimes result in headaches and nausea, and some people are more susceptible than others.

Even if you do find that you're feeling a bit iffy at the end of the movie, all isn't necessarily lost. The secret is not to overdo it and watch 3D content only in small doses.

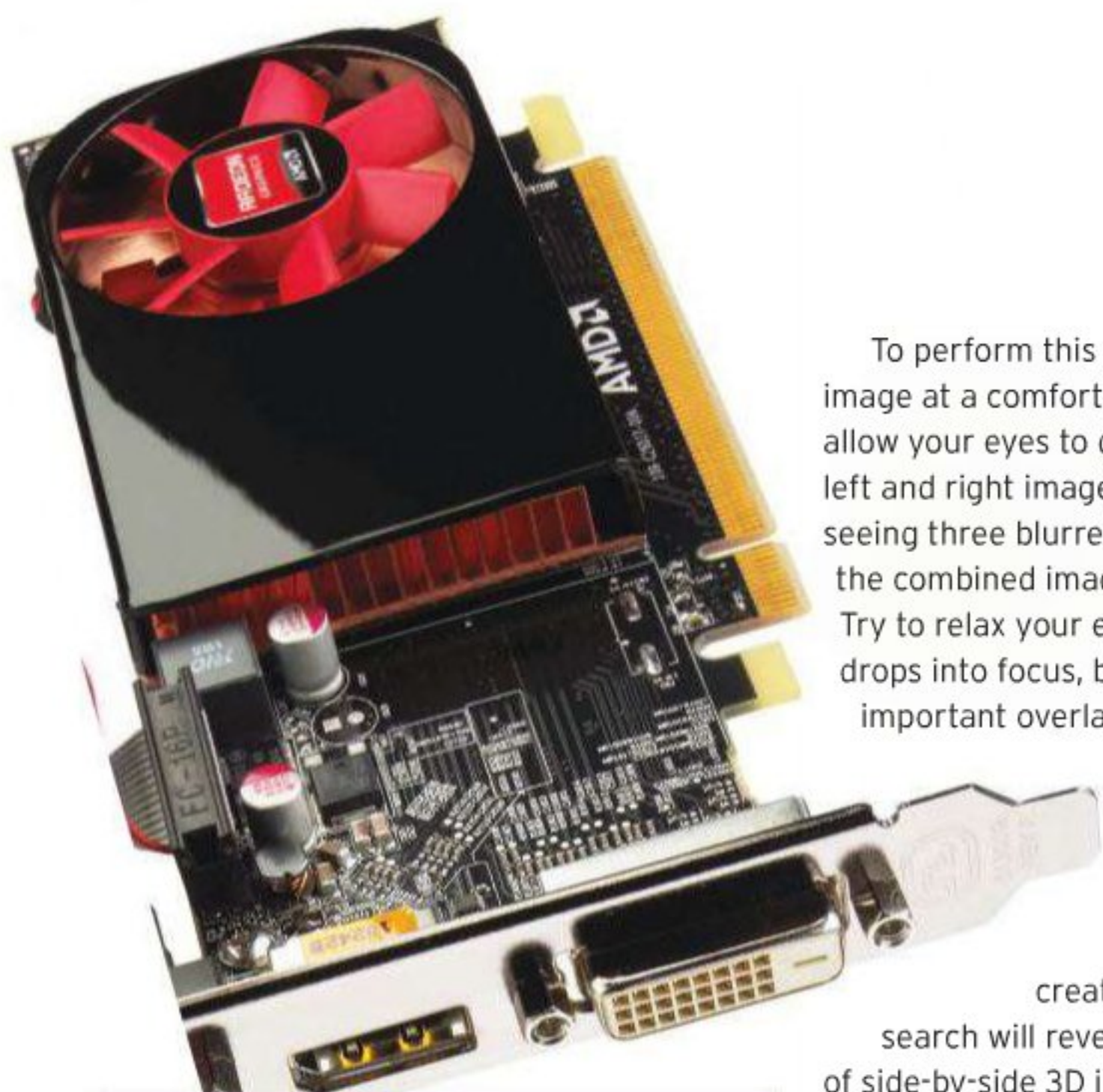
## Get 3D for free

There are two main ways in which you can view stereoscopic images on a screen that contains no special 3D hardware. These methods can be used with specially prepared photos, movies and websites.

We'll also explain how you can generate your own 3D content to view this way. You might consider the first method old hat, but it's so simple and a lot more effective than you might expect.

The stereo image shown above left is called an anaglyph, and it's the type that's viewed using those cardboard glasses with the red and blue lenses. The first anaglyphs were monochrome, but colour was added later. Colour accuracy is sacrificed, but the end result can be pretty impressive.





If your processor doesn't have the necessary capabilities, you'll need to invest in a **3D-CAPABLE GRAPHICS CARD**

An anaglyph superimposes the left and right images on top of each other, with one printed in shades of red and the other in cyan. Because the red lens in the glasses passes the red image but stops the cyan image, and vice versa, each eye sees only the correct image. And because, between them, the two lenses allow the three primary colours of red, green and blue to pass, a full colour image is achievable.

Some DVD movies are available in anaglyph 3D versions, and there's no shortage of anaglyph photo galleries and movie clips online. Even Google Maps has anaglyph support - just click on the image and press T in Street View. Glasses for anaglyph viewing are widely available - for pennies, if you buy them in bulk, otherwise you'll pay a pound or so for a single pair.

Make sure you get the red-cyan glasses as opposed to the various alternative anaglyph glasses, such as the red-green type that are suitable only for red-green monochrome anaglyphs.

The second free method is even more surprising, since you need nothing at all - not even a pair of cardboard specs. The two images are displayed side by side onscreen, the left image on the left and the right one on the right. All you have to do is persuade your eyes to see a 3D result.

It does take several attempts to get the hang of this, and the size of the image is limited. However, as your skill improves in the necessary visual gymnastics, you'll be able to see larger images in 3D.

To perform this feat, view the onscreen image at a comfortable viewing distance and allow your eyes to go cross-eyed, merging the left and right images. You'll find you're now seeing three blurred images: the left image, the combined images, and the right image. Try to relax your eyes so the centre image drops into focus, but without losing that all-important overlap. When you achieve this the centre image will appear in 3D.

In the main you'll be using this method with content you've created yourself, but a Google search will reveal no shortage of galleries of side-by-side 3D images.

## Upgrade your PC for 'real' 3D

You'll need a suitable graphics chip to display real 3D on your PC. There are three main manufacturers: Intel, nVidia and AMD. As long as your PC is relatively new, it should already have the necessary tech.

If your PC has an Intel processor, look for integrated HD Graphics 2000 or later. Most Sandy- and Ivy Bridge Core i3, i5 or i7 processor have built-in graphics chips, but not all. AMD's A-Series APUs also support 3D.

If your PC doesn't have a 3D-capable graphics chip already, you'll need to install a new graphics card. The nVidia GeForce GTX 600 series is a good place to start as the cards don't cost a fortune.

If you'd rather plump for an AMD-based graphics card, the Radeon HD 6450 or later will do the trick. Given that you can pick one up for just £25, it's a low-cost route into 3D if your CPU doesn't have the necessary capability.

The other piece of the 3D puzzle is the monitor. If you're in the market for a 3D upgrade, you might prefer to first choose your monitor and then turn your attention to the graphics card. This is because the monitor will probably be your most expensive purchase, and your selected model may support only a specific 3D standard.

Those with support for nVidia's 3D Vision require an nVidia graphics card, for example.

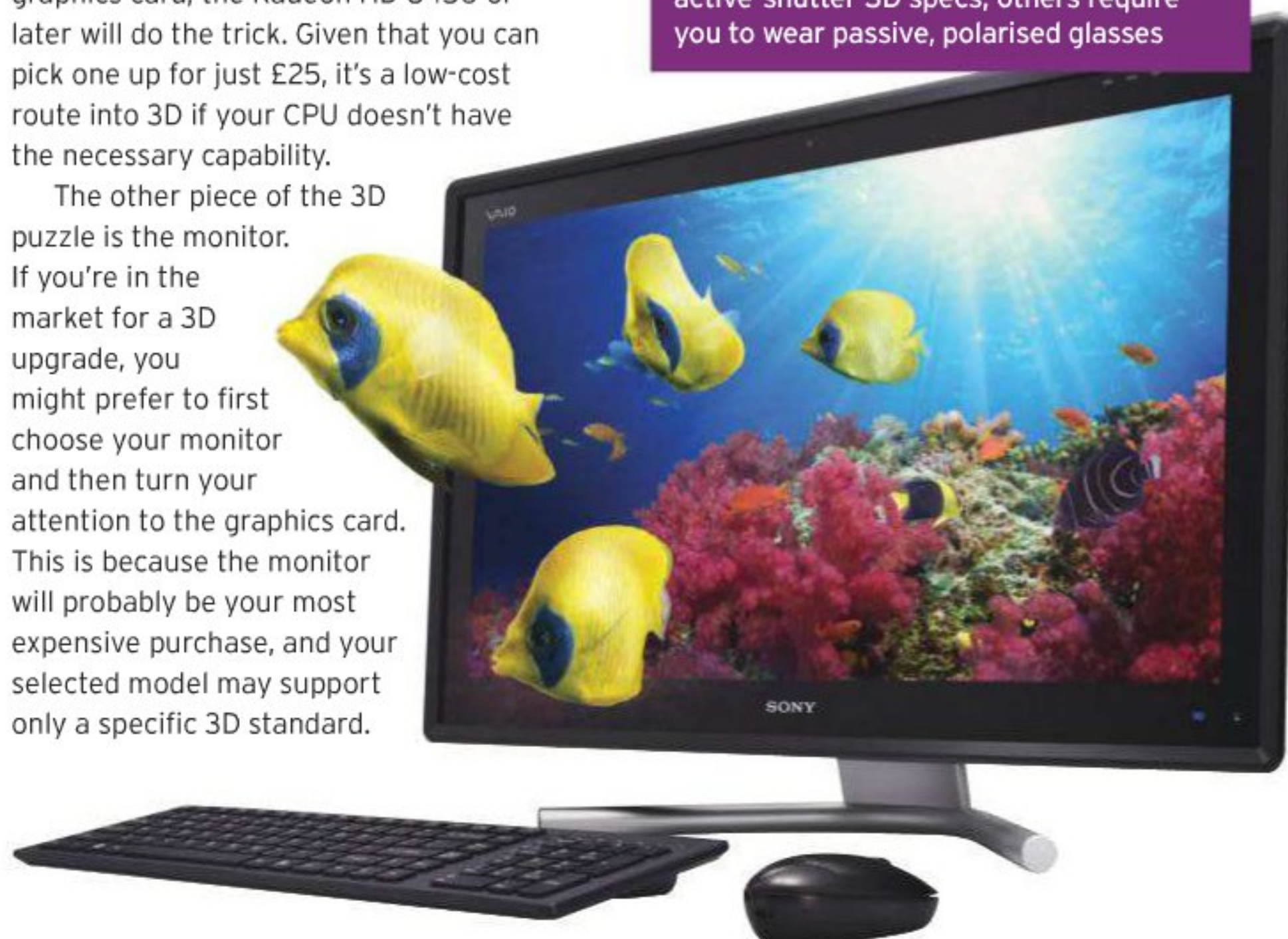
Due to the huge number of possible hardware combinations, we can't provide a definitive list of which monitors will work with which graphics cards. It's vitally important that you check before you buy that your selected products will work together.

Many monitors are bundled with the necessary 3D glasses. You can buy an entry-level passive monitor for as little as £155 with the 23in LG D2342P-PN. If you'd prefer to use an active-shutter version, prices start at around £260 with the 24in Acer Aspire 3D GD245HQA, which is bundled with 3D Vision glasses and has a built-in wireless transmitter. Naturally, you can spend much more on a 3D monitor; check out our reviews of other models at [tinyurl.com/d29rwou](http://tinyurl.com/d29rwou).

None of this hardware is any use without the necessary software, of course, so you'll need to invest in some suitable applications. If your prime interest is in watching 3D movies, the latest versions of the big-name movie-playing software will all be able to handle 3D Blu-ray; some will also upscale 2D films and photos to 3D. Such upscaled content won't be nearly as impressive as genuine 3D movies or photos, of course.

Some examples include CyberLink PowerDVD 12.0, Roxio CinePlayer BD with 3D and ArcSoft Total Media Theatre.

**3D MONITORS**, such as the one supplied with the Sony Vaio L all-in-one PC, require active-shutter 3D specs; others require you to wear passive, polarised glasses





If you have a **3D-READY TV**, you may be able to experience true 3D from your PC at no additional cost



For gamers, the list of native 3D games is constantly growing, and converting games from 2D to 3D on the fly by interpreting the DirectX stream is also possible. Watch out for compatibility issues, as some support only nVidia 3D Vision and might require the TriDef 2D-to-3D conversion middleware to work with Intel or AMD hardware.

### Display 3D images on a 3DTV

If you already have a suitable graphics card, an Intel processor with at least Intel HD Graphics 2000 or an A-series AMD APU, and you happen to own a 3D-ready TV, the two can be used together to experience full stereoscopic 3D at virtually no cost. However, there are one or two potential pitfalls of which you need to be aware.

First, even an HD-ready TV will have a lower resolution than the best PC monitors. For applications such as gaming, you might be prepared to sacrifice resolution for size, but it's something to consider. Second, you'll need to buy a cable to connect your TV to the graphics output connector on your PC. If your PC has an HDMI connector then a simple HDMI-to-HDMI cable will do the trick and costs only a couple of pounds.

If, on the other hand, your PC has only a DVI output, you'll need a DVI-to-HDMI converter, which costs around £5. In this case, you'll need to separately route the audio.

Finally, if you're using an nVidia graphics card, you'll need a software product called

3D TV Play (£27, [tinyurl.com/bwyu7ox](http://tinyurl.com/bwyu7ox)), which is in essence a driver that allows output to a TV rather than a 3D Vision monitor.

### Print 3D images

So far, our discussion of 3D has concentrated purely on monitors and TVs, but what if you want to experience the third dimension on the printed page? Active- or passive 3D technology doesn't translate into print, but the free viewing methods we've discussed all lend themselves to printing.

If you have an anaglyph that you can view onscreen using those oddly coloured glasses, you can print them in colour and view them in exactly the same way.

The same applies to side-by-side viewing, but here you might like to consider using a cheap stereoscope, such as the inexpensive Loreo Lite Fold-flat 3D Viewer (£5.50, [widescreen-centre.co.uk](http://widescreen-centre.co.uk)). This is easier to use when viewing a printed rather than onscreen image, and means you won't need to cross your eyes to view the 3D picture.

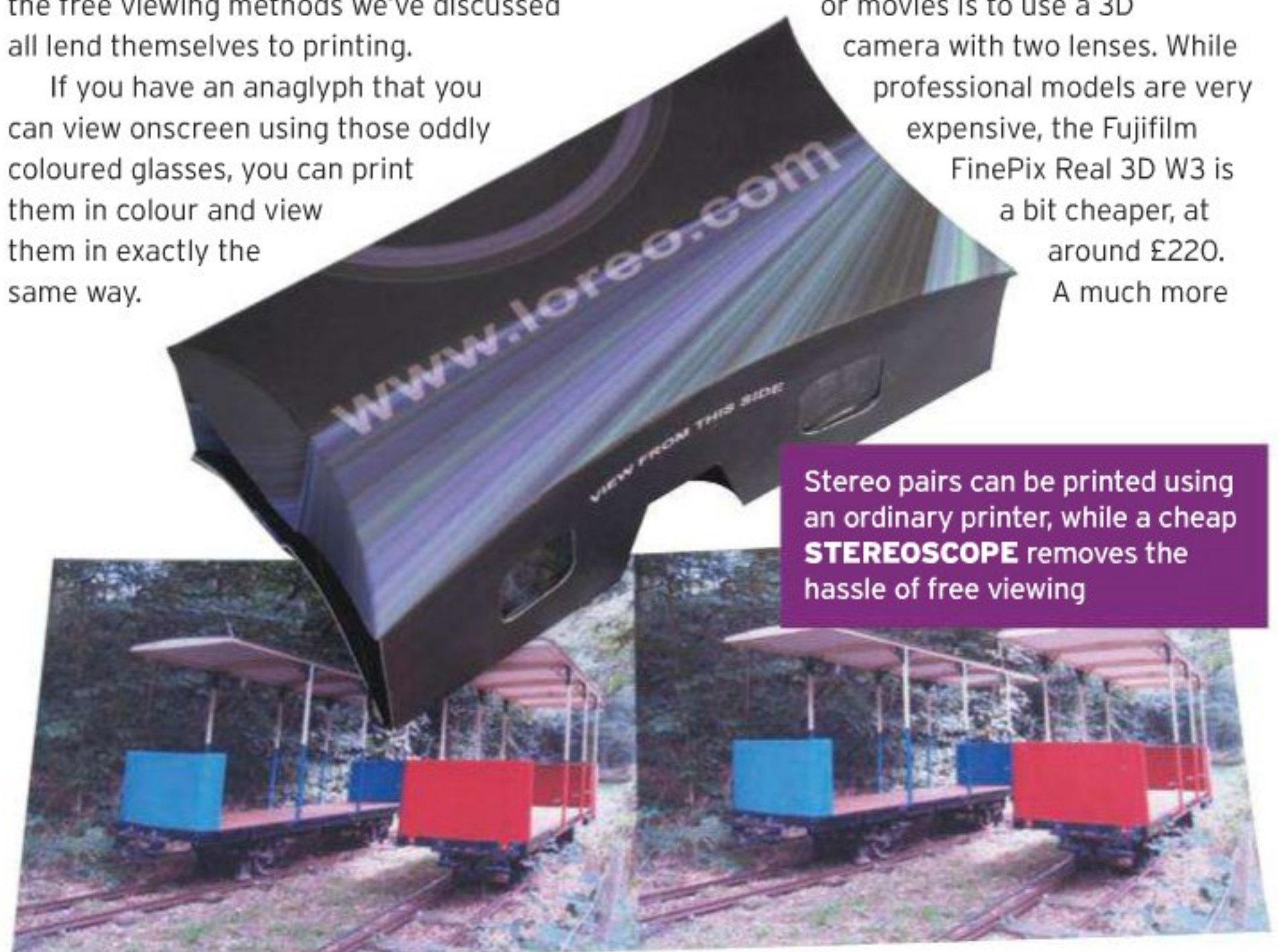
Just print your pair of photos at the correct size for your stereoscopy and place them side by side. View the images through the stereoscope for hassle-free 3D.

The other option, which requires no viewing aid, is to turn your stereo content into a lenticular print that works in the same way as auto-stereoscopic laptops. Doing this yourself is tricky, but FujiFilm has launched a useful service for its Real 3D cameras.

Simply upload your prints in .mpo format (this is an export option available in StereoPhoto Maker, see overleaf) to [fujifilmreal3d.com](http://fujifilmreal3d.com) and the prints will be with you in a week. Prices range from £4.28 for four 3x2.25in mini-prints to £4.99 each for 9x6in shots; delivery is steep at £5 per order. Note, though, that the lenticular printing process is more fussy than it is for anaglyphs or side-by-side viewing, and you should take a look at the 3D Print Guide section of the website for guidance.

### Generate your own 3D content

The best way to create stereoscopic photos or movies is to use a 3D camera with two lenses. While professional models are very expensive, the Fujifilm FinePix Real 3D W3 is a bit cheaper, at around £220. A much more



Stereo pairs can be printed using an ordinary printer, while a cheap **STEREOSCOPE** removes the hassle of free viewing



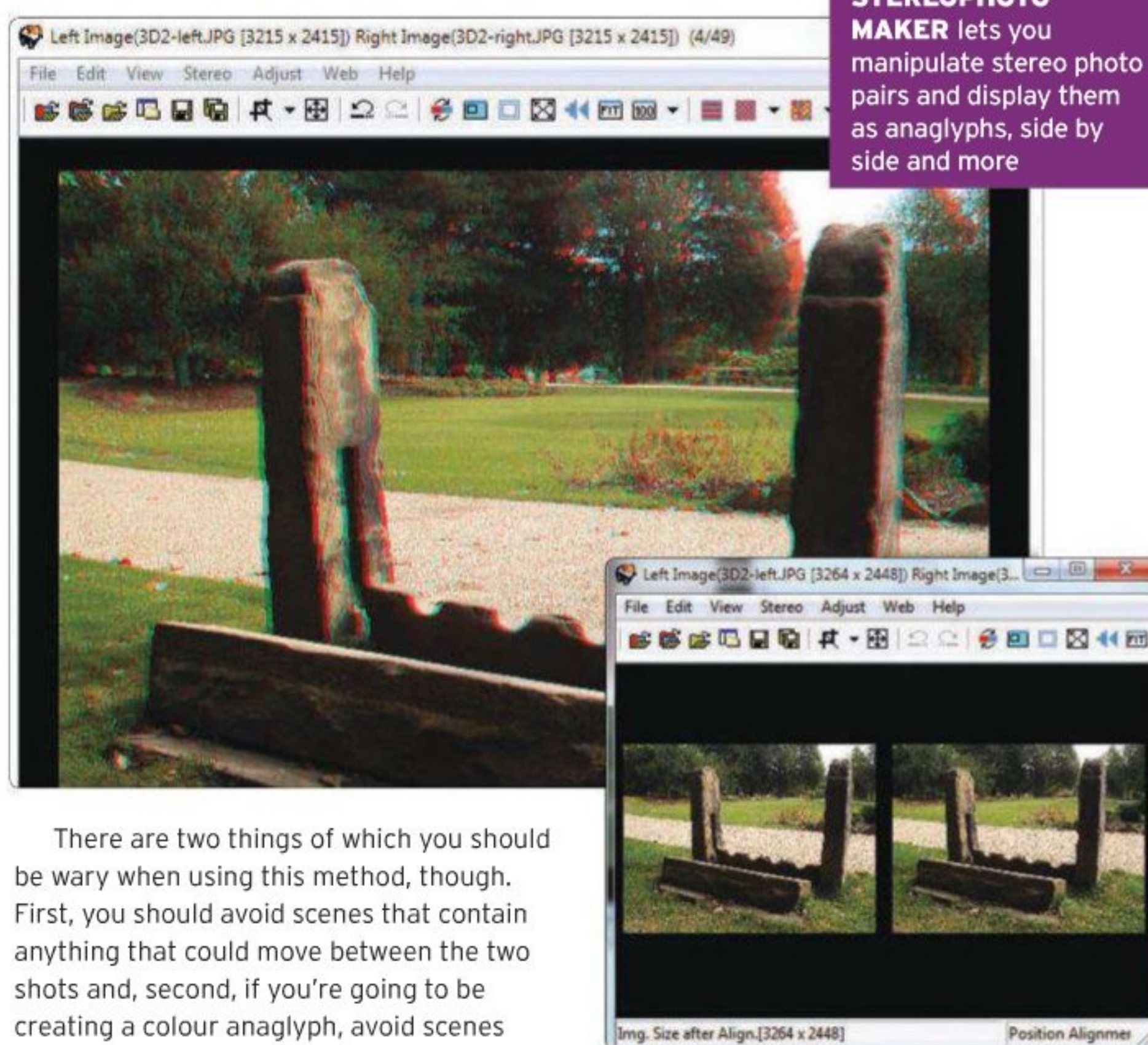
affordable option is to create your own 3D photos with your existing digital camera.

The first method couldn't be simpler: take one photograph, move the camera 70mm to the right (the distance between your eyes) and take another. You then have a stereo pair of photographs that you can turn into an anaglyph or display side by side.

Although 3D software makes a good stab at correcting alignment errors, it's better to avoid them in the first place, which is why our second solution is recommended. This method relies on a simple bit of kit called a slide bracket (pictured below), which you can build from a few pieces of chipboard. The only thing you can't see is the socket on the bottom, which allows you to fix it to a tripod.

Photographic shops often have boxes full of bits and pieces for sale at rock-bottom prices; the chances are you'll be able to pick up something containing that all important tripod socket. The only other thing to know is that the inside width of the bracket should be the width of your camera plus 70mm.

To take your stereo pair, mount your slide bracket on the tripod and make sure it's horizontal. Put your camera in the back lefthand corner of the bracket and take a photo. Now slide the camera to the right until it's in the back righthand corner and take another shot. Both shots will have been taken with the camera pointing in exactly the same direction and at the same height.



**STEREOPHOTO MAKER** lets you manipulate stereo photo pairs and display them as anaglyphs, side by side and more

There are two things of which you should be wary when using this method, though. First, you should avoid scenes that contain anything that could move between the two shots and, second, if you're going to be creating a colour anaglyph, avoid scenes containing strong red or blue objects.

Having shot your pairs of photos you need to process them. StereoPhoto Maker is free from [tinyurl.com/r7xqcf](http://tinyurl.com/r7xqcf). It's simple enough to use - just load your left and right images, carry out an auto alignment, then decide how you want to view them.

You can also store your pair of photos as a single stereo photograph in one of the

various 3D file formats, including JPS, STJ and MPO. Note, though, that due to a quirk in the software, your images must be displayed side by side before you save them in a stereo file format.

The simple methods we've seen for creating 3D still photos won't work if you want to shoot video footage. For this your only option is to buy a 3D camcorder. It's certainly true that you generally get what you pay for, but you can start

out without paying a fortune. Sony's 3D Bloggie MHS-FS3, for example, costs less than £100. Panasonic's vastly superior SDT750 is more expensive at around £600.

Having taken your 3D footage you can watch it on a 3DTV or suitably equipped PC. However, if

you want to edit your 3D movie, and perhaps convert it to an anaglyph for posting on YouTube, you'll have to make sure you have a video-editing package that can cope with 3D video. This functionality is becoming available in standard editing packages: CyberLink's £50 PowerDirector 10.0 Deluxe is one such example. ☒



**SLIDE BRACKET:** This simple bit of kit will help you take perfectly aligned stereo photos using an ordinary camera





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## Better, faster internet

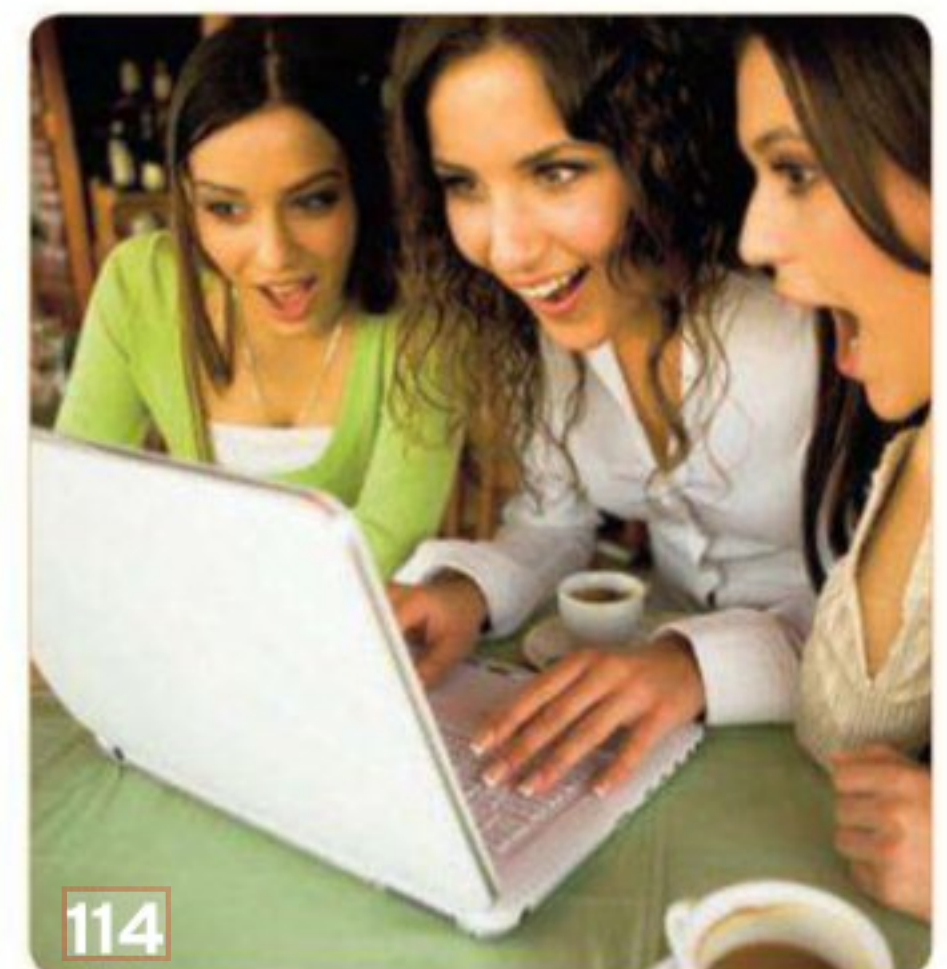
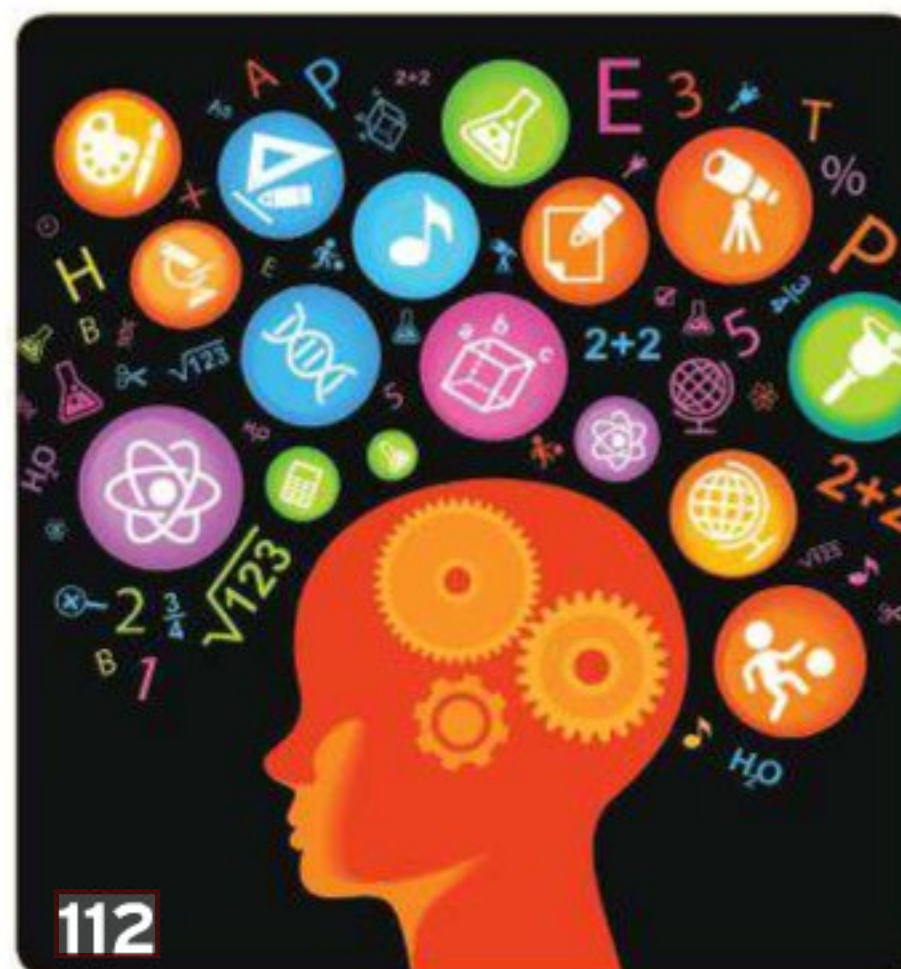
Wireless internet access is something most people take for granted. Fantastic though it is, isn't always possible to get a strong Wi-Fi signal in every part of your house or garden. We lay out the options for boosting your wireless coverage overleaf.

Google is probably the biggest name on the internet, but Facebook is the undisputed king of social networks. The search giant has tried and failed in the social-networking world in the past, but its relatively new Google+ service has some unique features which make it well worth investigating. Turn to [page 114](#) to find out what's on offer.

With more and more digital information to deal with, keeping track of everything can be a burden. Evernote is a free application that works with your PC, laptop, smartphone and tablet to let you manage and synchronise your notes, pictures in a single place. Find our step-by-step guide to Evernote on [page 112](#).

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## QUICK TIP: COLOUR-CODE FOLDERS IN WINDOWS 7

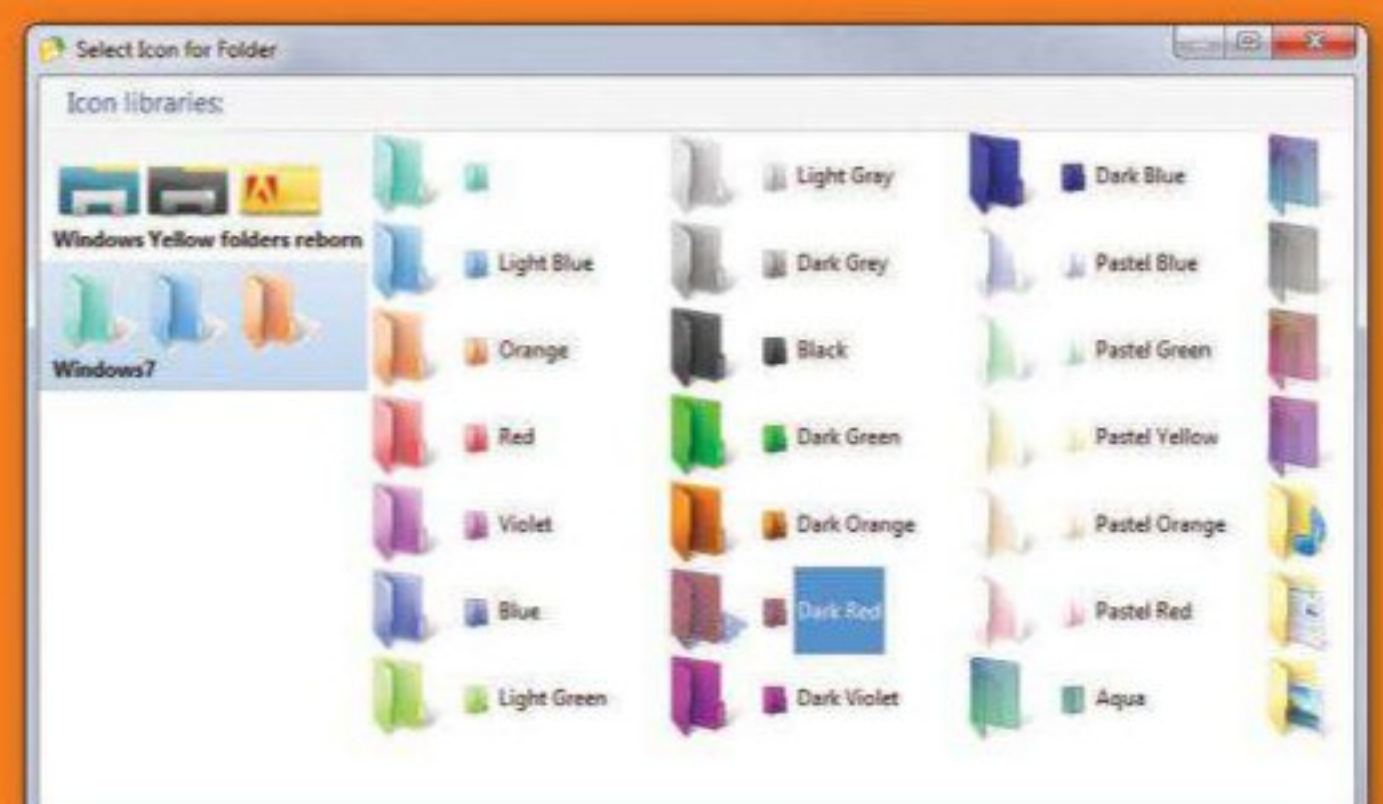
Unlike OS X, Windows doesn't allow you to change the colour of folders. This means you may have to search through a sea of yellow icons to find the folder you need.

With the free Folderico utility installed, though, you can right-click a folder and colour-code it as you wish. You'll then be able to instantly locate the folder you wish to access.

Head to Shedko's website ([tinyurl.com/clwq62](http://tinyurl.com/clwq62)) and click the green 'Download (mirror)' button to download Folderico 4.0. You'll be taken to a file-hosting site such as Oron. You don't need to sign up for a premium account - it's always possible to download the software for free, but you may have to wait a minute or so before the Captcha box appears.

Enter the Captcha when prompted and a new page will load with a blue Download link; click this to download a Zip file containing the program. Double-click the file to unzip Folderico, then run the setup file found within.

Right-click a folder and choose the Folderico option, then click the Select icon... button. Choose to view Windows 7 folders and a



range of colours will be displayed in the preview pane. Highlight the colour you'd like to use and click Select, Apply.

Tap F5 to refresh the Explorer window if the folder in question isn't displaying in your chosen colour. ☒



## Boost Wi-Fi coverage

Rosemary Hattersley looks at ways in which you can improve your wireless network's coverage

**W**ireless web connections allow you to get online whenever you want and on whichever device you choose. The mere fact that it's possible to browse the web and check email without a wire tethering you to a router is impressive enough; that a single router can allow several devices to do so at once and simultaneously stream music and photos makes the headaches that can be involved in setting up a wireless network worthwhile.

But a single Wi-Fi router is often not enough. As we consume more and more media and do so on several devices, that once-adequate wireless network can begin to show the strain. If you've got lots of gadgetry to get online, consider whether they might be competing for a look-in.

### Overwhelming demand

You might have a very fast web connection, but that doesn't automatically translate to speedy page updates. If you're using outdated wireless hardware or sharing your connection with too many devices, you'll likely find slow performance on even a 50 megabits per second (Mbps) connection.

### Secure it

Ensure only trusted family members can use your bandwidth. You don't want neighbours or passers-by piggybacking on your Wi-Fi connection and slowing things down. If your broadband connection is subject to a monthly limit, it's especially important that you're aware of who's using it and the amount of data being downloaded.



### Mixed coverage

When you first set up your wireless network, you probably did so with a clear idea of where in the home it would be used. However, if you later have a loft conversion or build a home office at the bottom of your garden, that coverage may need to be extended.

Using Wi-Fi devices in an increasingly ad-hoc fashion flags up patchy coverage. A single router may offer a reliable wireless connection for a laptop sited at the other side of the room, but the signal won't necessarily carry through thick walls or up to the top floor in a townhouse.

There are a couple of ways around this. You could buy a wireless repeater, which is a basic device that pumps out the Wi-Fi signal at a remote point; or you could take advantage of the spare router that

came free with your broadband package, either by using it as an 'dumb' access point (not using its modem or routing capabilities), or reinstating it as the main router and using your replacement router as the access point. With two routers on your network, you'll also have additional ethernet ports for wired devices. This could

be handy if you need to connect, say, home-entertainment kit that doesn't support Wi-Fi.

Importantly, you need to ensure that the second router is put into bridged wireless mode. There may be an explicit setting, or it may be a case of disabling the router's DHCP server so the second router doesn't try to also assign IP addresses. The second router needs to be connected via an ethernet cable to the original router (see *Powerline networks*, opposite page, if you can't physically run a long network cable).

If you do have an office at the end of the garden, take a look at Solwise's USB extender. It includes a lengthy weatherproof USB cable with the necessary antenna to extend your Wi-Fi beyond its boundaries.

### Improving current hardware

It's worth seeing whether moving your existing router helps things. Routers aren't the most attractive of products, so it's understandable that they're often pushed out of sight - but if yours is tucked away in a corner, and surrounded by electrical cables, it's going to struggle. Place your router at waist-height or even eye-level on a bookshelf or other convenient spot; make sure any antennae are upright. Routers with more than one antenna are designed to have them splayed apart - the angle between them will strengthen the wireless signal.

**CISCO LINKSYS' E4200** is our Best Buy 802.11n wireless router







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**Tech Help**



Some models have no visible antennae – they're hidden within the box. If your router has detachable antennae, you can try swapping them for high-gain versions that are more efficient at transmitting and receiving wireless signals. These cost from £10 upwards. Periodic firmware updates can sometimes bring speed improvements, too, so keeping your wireless router up to date may be worth the effort.

Another reason to move your router is to get it away from anything that may interfere with its signal. A cordless telephone, baby monitor, microwave and security system can all adversely affect performance.

### Re-broadcast the signal

You may find your laptop can obtain a strong signal from your router, but other wireless devices such as smartphones and tablets can't. A good solution for this problem is a utility called Connectify (connectify.me).

In essence, Connectify turns your laptop into a Wi-Fi hotspot, to which other Wi-Fi devices can connect. Provided that your laptop is powered on and Connectify is running, nearby Wi-Fi devices will have a strong connection to the internet and other devices on your network.

### Choosing a new router

The most common Wi-Fi routers are known as wireless-N products, and some operate on two frequencies: 5GHz as well as 2.4GHz. Dual-band operation increases the likelihood of your router finding some clear air in which to broadcast its signal; it also allows you to route certain devices or content across the 5GHz frequency and others via 2.4GHz.

Bear in mind that some older devices, such as internet radios, smartphones and Wi-Fi printers, may not support 802.11n at all, let alone 5GHz 802.11n. For these to be able to connect to your router at the same time as newer 5GHz-compatible devices, you'll need a router that can simultaneously operate both 2.4GHz and 5GHz radios. An example is found in our Top 5 wireless routers chart (see [page 140](#)), in the form of the £100 Cisco Linksys E4200.

You can expect advertised transfer rates of up to 300Mbps (the Cisco Linksys claims 450Mbps). Real-world speeds are far lower, but transfer rates of around 75Mbps are achievable. Compare this with the maximum of '54Mbps' that 802.11g promises, which tends to deliver around 15Mbps.

The first routers that support the latest wireless standard, 802.11ac, are creeping on



**BUFFALO'S AIRSTATION 1750** is one of a new breed of 802.11ac Wi-Fi routers

to the market. The speed benefits of 802.11ac will become evident as new hardware products add support for the protocol. Read our reviews of the Buffalo AirStation 1750 and Netgear R6300 802.11ac wireless routers on [page 32](#).

### Powerline networks

For devices that don't support Wi-Fi, or if you'd prefer a more consistent connection, it's worth investigating powerline network adaptors (also known as HomePlugs).

Powerline uses your home's mains wiring as a ready-made alternative to installing ethernet network cables in your walls or running them awkwardly through doorways to other rooms.

Wherever you have a mains socket you can use a powerline network adaptor. They're ideal when you need a fast connection for streaming TV shows from a NAS drive to an Xbox 360 or PlayStation 3 for watching on your big-screen TV, for example.


Some cheaper HomePlug kits are specified at only '85Mbps' throughput (with actual speeds considerably slower). We'd recommend HomePlug AV ('200Mbps') as the minimum, which tends to perform at around 50Mbps.

For more on powerline network adaptors, see our group test on [page 66](#). As well as basic adaptors with a single ethernet port, some have multiple ports or even integrated Wi-Fi in one adaptor. This means you can use them to extend Wi-Fi coverage to remote areas (such as that garden office) with the minimum of hassle. ☒

## Getting Started is Easy!

- 1 Set your Hotspot Name and Password
- 2 Select the Internet connection you want to share
- 3 Click Start Hotspot Thats it!

Plus, there is an easy to use Troubleshooter should you need any additional assistance!



CONNECTIFY turns your laptop into a Wi-Fi hotspot





YOUR QUESTIONS ANSWERED

## Expert computing advice

**Paul Monckton** tackles readers' hardware and software conundrums

### DRIVING ME MAD

**Q** I have recently rehoused my PC in a new system case. Everything seemed to be working fine until I started getting errors from the hard drive; occasionally, the system wouldn't recognise it at all. I tried the drive in another system and it works without issue. What can I do?

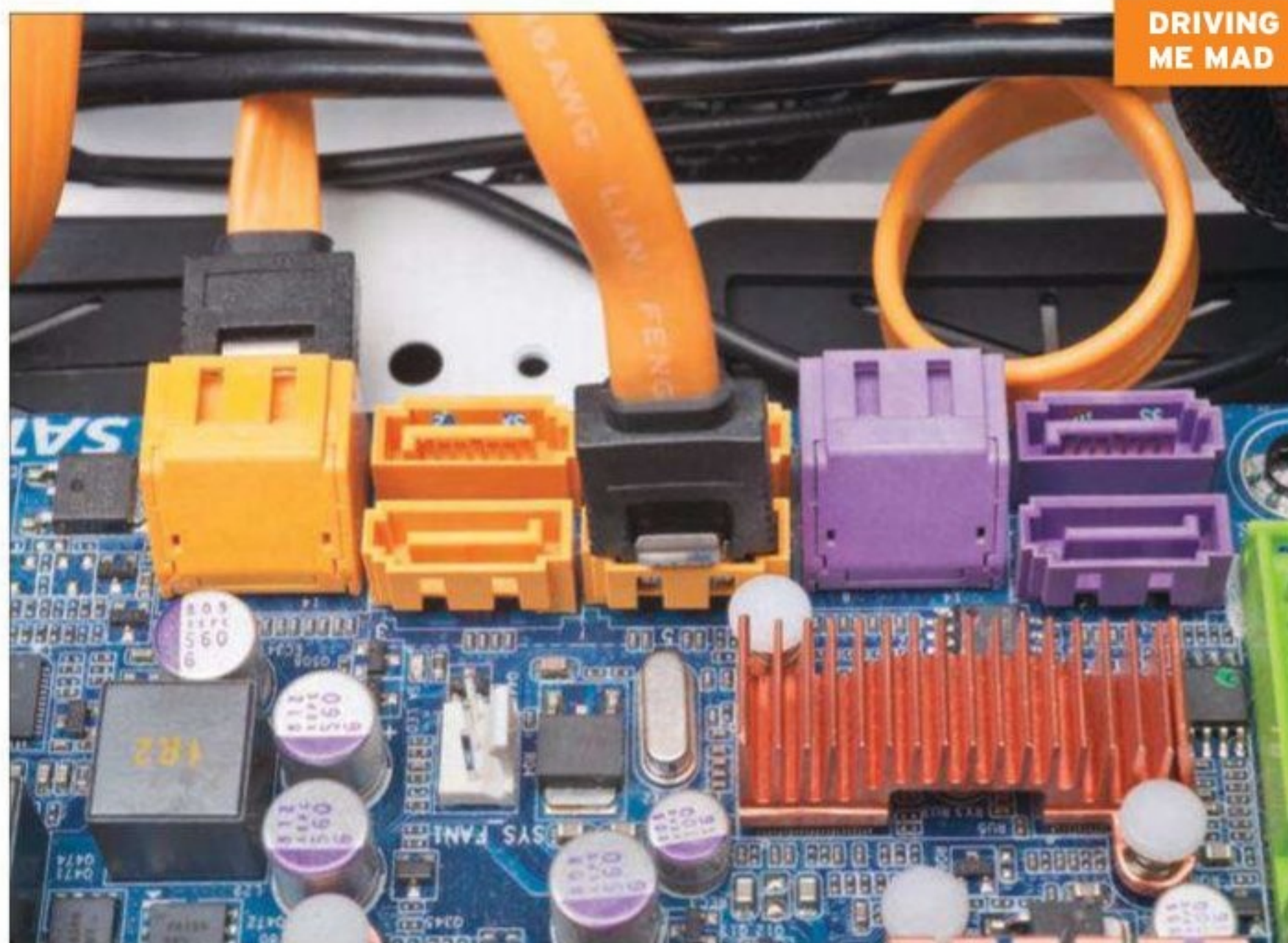
Problems such as this are often due to faulty SATA cables or connectors. We suggest trying a new SATA cable to see if the problem is rectified. It's also worth trying a different SATA port on your motherboard.

### USB DIFFICULTIES

**Q** My laptop has three USB ports, but this isn't enough to cater for my two external hard drives, a mouse, a USB flash drive and an external USB keyboard. Sometimes I also attach my phone via USB to use as a modem. I've invested in a four-port USB hub, with which the keyboard, mouse and USB flash drive work fine, but not the external hard drives or phone. What can I do to fix the problem?

This issue is almost certainly down to the amount of power required by your USB devices. Portable external hard drives require significantly more power than a USB flash drive or keyboard, and this power has to come from the USB port.

To ensure these peripherals work correctly, you'll need to use a powered hub. This comes with an external power supply that you plug into the mains. Many hubs



DRIVING ME MAD

come without power supplies, but have a socket for you to attach one later. Have a look and see if this is the case with your hub - you may be able to buy a power supply rather than another hub.

### WEBMAIL WON'T DOWNLOAD

**Q** How do I download emails to my hard drive for offline viewing? I access my email via Workspace Webmail. In most open windows there's a way to save files to disk, but this doesn't seem to be the case with email.

Webmail is designed to work this way as a convenience, allowing you to access your

email from anywhere you have an internet connection and without downloading your personal email to a PC you may not own.

Since you want to be able to view your messages offline, you will need to use an email client that uses the IMAP or POP3 protocol and will download your messages so they're stored locally. Mozilla's free Thunderbird is one such application, available free from [tinyurl.com/6qLry7q](http://tinyurl.com/6qLry7q).

Most services that provide a webmail system also work with applications such as Thunderbird, so we suggest searching through the support documentation for IMAP or POP3 instructions.

When you set up the software on your PC it will ask you to enter the relevant server details. It will then download all your email on to your PC, where you can browse and edit them at your leisure.

### UNSUCCESSFUL UPDATES

**Q** I read with interest *Updates at every shutdown* in the September Helproom. I've been experiencing a similar problem since the end of last year, and it's getting worse. It started with just one download and has now escalated to six, each time the PC is shut down. On each occasion the updates reportedly successfully install.

I tried the fix you suggested, but to no avail. How can I stop these updates

### USB DIFFICULTIES







from downloading and installing successfully every time I shut down?

The specific updates causing the problem are KB2600217, KB2686827, KB2656405, KB2656368, KB2604121 and KB2656351.

All these updates are for Microsoft .Net Framework 4.0, and we suspect it's the installation of .Net Framework 4.0 itself that has become corrupted.

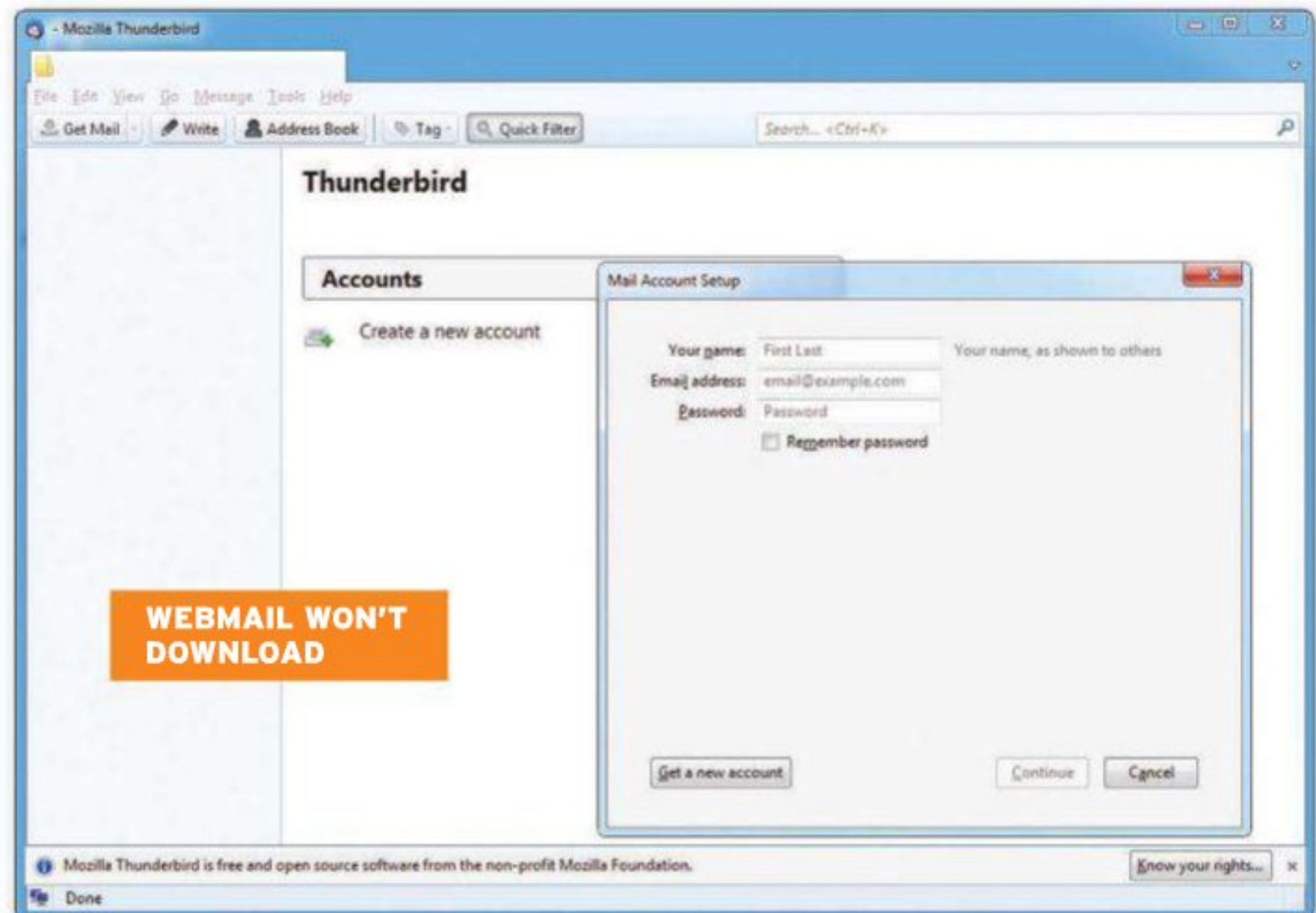
First, try to repair your installation of Microsoft .Net Framework 4.0 by typing uninstall in the Start menu Search box and selecting 'Uninstall a program'. Select Microsoft .Net Framework 4.0 Client Profile, then choose the Repair option. You will be prompted to restart the PC.

Next, try running Windows Update to find out whether the problem has been resolved. If this doesn't work, you can try the .Net Framework Cleanup Tool, available from [tinyurl.com/2ehnr4](http://tinyurl.com/2ehnr4).

## SLOW AND NOISY

**Q** My PC has recently begun crashing and restarting itself without warning. I haven't installed any new hardware or drivers, and the crashes aren't triggered by a particular program - often they happen when the PC is idle. How can I fix this problem, please?

The problem you describe is often caused by overheating problems, which can be caused by a build-up of dust that clogs up the fans



and blocks essential ventilation. Typically, you can check the internal temperatures by entering the Bios and looking for a menu that contains fan-speeds and temperature information. This should show you if a fan has failed, or if temperatures are sky-high. Alternatively, download and install Speedfan from [almico.com/speedfan.php](http://almico.com/speedfan.php).

If you're lucky, you'll be able to resolve the issue without opening the case, simply by blowing dust away from the fans. You can use a compressed air canister to do this, but be sure to first turn off and disconnect the PC from the mains.

In more extreme cases, you may find that enough dust has entered the case to require you to open it up. This is usually as simple as removing a couple of screws at the back and sliding off the panel.

Assuming that you're happy to delve inside, you should carefully examine and clean each cooling fan. While inside, also check the processor cooler, which is prone to dust build-up.

Following a good clean, your computer should start to operate at a lower temperature and the random crashes should stop. You may find that the PC operates more

Continues >>



## QUICK TIP: COMMAND PROMPTS

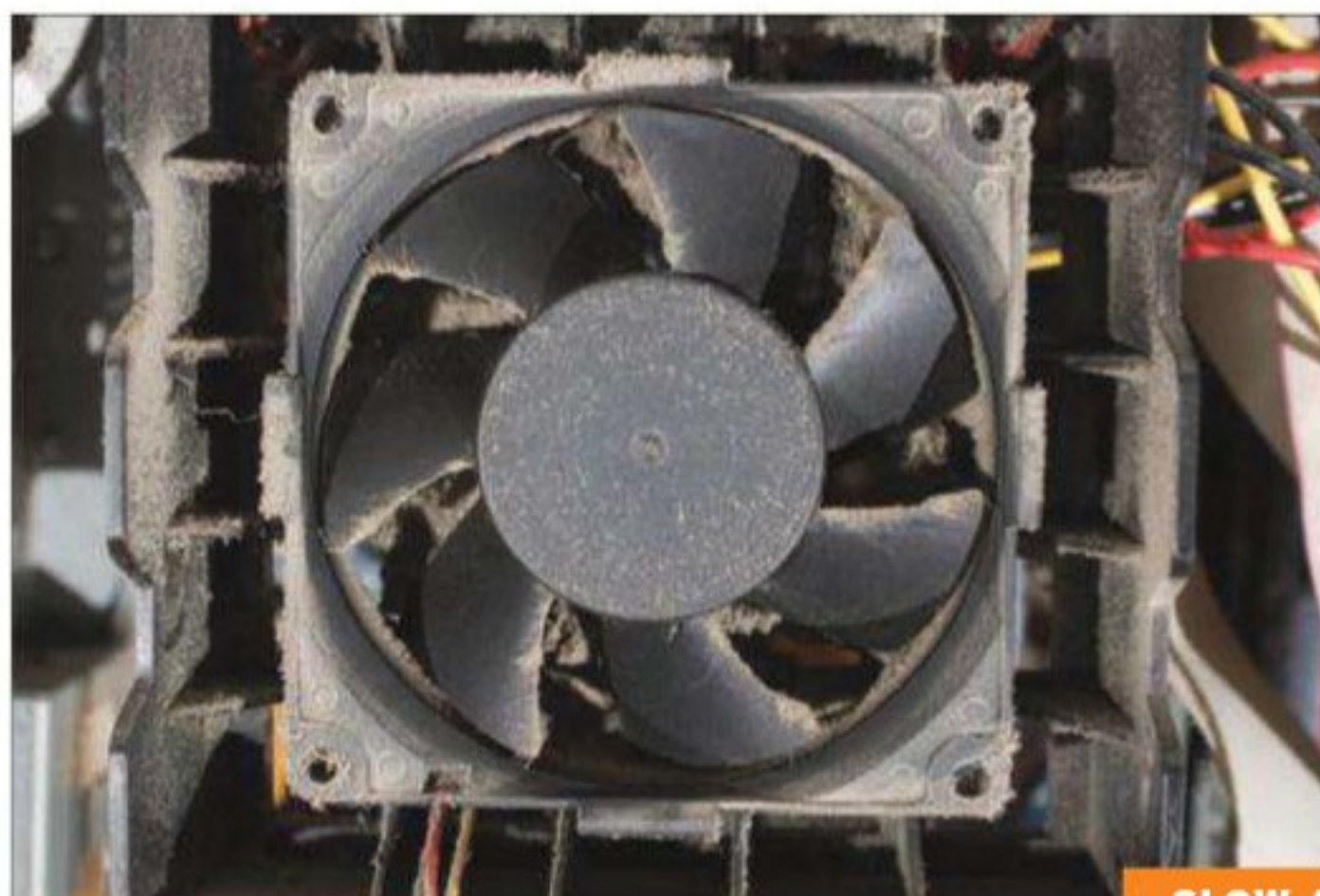
The mouse-driven point-and-click interface provided by Windows is user-friendly and easy to grasp but, occasionally, and especially when things go wrong, you'll need to delve into the command prompt.

The command prompt allows you to issue precise text-based commands, which can be used to access software utilities that have no mouse-operated counterpart. For example, **SFC /SCANNOW** runs the System File Checker, and **IPCONFIG** shows the status of your network interfaces. The latter includes useful information such as your local IP address, which it can also renew for you.

It's simple to open a command prompt. In Windows 7, click the Start menu and type **command** or **cmd** into the search box. Next, click the command prompt icon. The process is the same in Vista; in XP, you should choose Start, Run, type **cmd** and press Enter.

In versions of Windows from Vista onwards, some advanced commands may require you to use an account with administrator privileges to work. In this case, you need to run the command prompt program in Administrator mode. To do so, simply right-click the command prompt icon and select Run as Administrator.





SLOW AND NOISY



quietly, since the thermostatically controlled fans won't need to run at full speed.

To prevent this happening again, you may like to place some dust filters inside your case, which can trap the dust before it gets to the PC's internal components.

You'll know if one or more fans have stopped working because your PC's Bios will warn you with an annoying beeping noise. It is possible for these warnings to be turned off, however, so it's worth checking to be sure. Faulty fans are easy to replace and relatively cheap to buy. You could also take this opportunity to purchase a quieter fan.

## MONITOR FOR WINDOWS 8

**Q** I need to replace my ageing PC monitor and I want to buy one that will work well with Windows 8 when it launches. I've read that Windows 8 works best with a multitouch display, but I don't want to replace my entire PC. Can I buy a touchscreen now that will work with both Windows 7 and 8?

Windows 8 is designed to work on tablets as well as PCs, and therefore is designed to be easy to use with a touchscreen.

Windows 7 also supports touch input, although the interface is far less sophisticated. Many displays are available that support touch input in Windows 7, but the requirements for Windows 8-certification are much more stringent and the vast majority won't pass muster.

That's not to say the current crop of touchscreens won't work at all, it just means that Windows 8-certified displays will deliver a better experience.

If you're going to choose a monitor now that you hope to later use with Windows 8, one important thing to watch out for is the design of the bezel. Because Windows 8 makes use of gestures, which require you to swipe your finger inwards from off the edge of the screen toward the centre, you'll find that displays with raised bezels usually make it very difficult to touch the far edge of the screen.

It's a requirement of Windows 8 certification that the bezel should be flush with the display or incorporate a 20mm border between the edge of the display and the start of the bezel.

Few standalone monitors provide this feature, although there are some all-in-one

PCs that come with flush touchscreens (such as the Lenovo reviewed on [page 75](#), although it isn't Windows 8-certified).

You'll also want to ensure you get a monitor that supports at least five touch points to take advantage of all the new gestures. Most current touchscreens support only two-fingered gestures.

Avoid these, and also any product that doesn't have a capacitive touchscreen. Some cheaper, older models have infrared sensors, or even webcams that detect your position.

Although it isn't Windows 8-certified and doesn't have edge-to-edge glass, Dell's ST2220T 21.5in multitouch display has received favourable comments from some users who have tried it with Windows 8.

Most other display manufacturers also make touchscreens, but we would recommend waiting until fully certified models become available rather than spending any serious money now.

## COPY DATA FROM A BROKEN PC

**Q** My old desktop computer has broken. I think the hard drive is damaged and the system won't power up to let me attempt recovery. How can I get my files off my old hard drive and load them on to my new PC?

Rather than risk further damage to your data by attempting to repair your old PC with the hard drive in place, we would suggest removing the old disk and attaching it to your new PC for inspection.

Removing a hard drive is relatively simple and can usually be achieved using only a screwdriver. First, you will need to unplug your old PC and open the case.

With any luck the hard drive will be easily accessible and held in place by four screws



MONITOR FOR WINDOWS 8



or a removable caddy. It will probably have two cables plugged into it, both of which will need to be removed.

Depending on the age of your original PC, your hard drive may be a SATA or IDE type. Your new PC will have SATA connectors.

If your old hard drive is also of the SATA type, and you're confident with such installations, you could install it inside your new PC using a spare SATA connector on the motherboard (see our step-by-step guide on [page 111](#) for more details). An easier method, however, would be to externally connect the drive using a USB enclosure. IDE caddies (in which you simply slot the drive) are also available, although less common.

If your PC has USB 3.0 ports, plump for a USB 3.0 caddy. This will greatly reduce the time needed to copy files.

If your old hard disk turns out to work fine, then an external drive enclosure would enable you to continue using the drive as portable storage. The drive caddy option takes less time to set up, too, as you simply slot in your hard drive rather than having to install it inside an enclosure.

Whichever method you choose, you should now be able to access the data from your old system on your new PC. This, of course, depends on whether or not your old hard drive has been damaged. If it's seriously broken, you may not see it show up at all on the new PC.



**COPY DATA FROM  
A BROKEN PC**

If this is the case, you may have to send it away for specialised data recovery. That said, there are some data-recovery applications that are able to recover data from a hard drive that doesn't show up in the PC's Bios.

We've previously had success with R-Studio from R-Tools Technology, although many other data-recovery tools are available. Most let you try before you buy, so you can find out exactly which files would be recovered before having to pay for the software.

## CONNECT MY PCs TOGETHER

**Q** I'd like to network my Vista and Windows 7 PCs, which sit side by side. Can I do this with a USB cable? The ethernet ports on both PCs are already in use to connect them to the Internet.

If your PCs are situated next to each other and are both connected to the internet via ethernet, it's almost certainly the case that they are already physically connected to the same router and are therefore already wired up for networking.

If, for some reason, they're connected to different networks, you can still connect them via ethernet using a network switch and advanced router functions. But we'll assume they are on the same network.

If you were using Windows 7 on both PCs, you could take advantage of the Homegroup feature. To do this, you would go to the Start menu, search for Homegroup, then click the 'Create a Homegroup' option to get started.

Because one of your PCs is running Vista, however, you'll need to manually configure the network. First, ensure that both PCs are members of the same workgroup. It's likely that they are and that this workgroup will be called 'WORKGROUP', but it's best to check.

From the Start menu, right-click Computer and select Properties. Now look under 'Computer name, domain and workgroup settings'. The workgroup name

Continues >>

## TECH JARGON BUSTER

**LED TV:** In almost every case, an LED TV is a television set with an LCD panel that's illuminated by light-emitting diodes (LEDs), just like most flat-panel PC monitors. LEDs have all but replaced the older cold-cathode fluorescent (CCFL) backlight, and can allow for reduced power consumption, slimmer design and improved image quality, thanks to better contrast and a greater range of displayable colours.

**802.11ac:** This is the latest version of the 802.11 Wi-Fi standard. It improves on previous versions (including 802.11n) by enabling much faster transmission speeds and better performance on crowded networks. Turn to [page 32](#) for our reviews of the first 802.11ac wireless routers from Buffalo and Netgear.

**USB 3.0:** Version 3.0 is the fastest USB standard to date, and is increasingly becoming available in the latest PCs and laptops. USB 3.0 provides connection speeds around 10 times faster than its predecessor, and offers more power to external devices. USB 3.0 ports tend to be blue, but some are black.

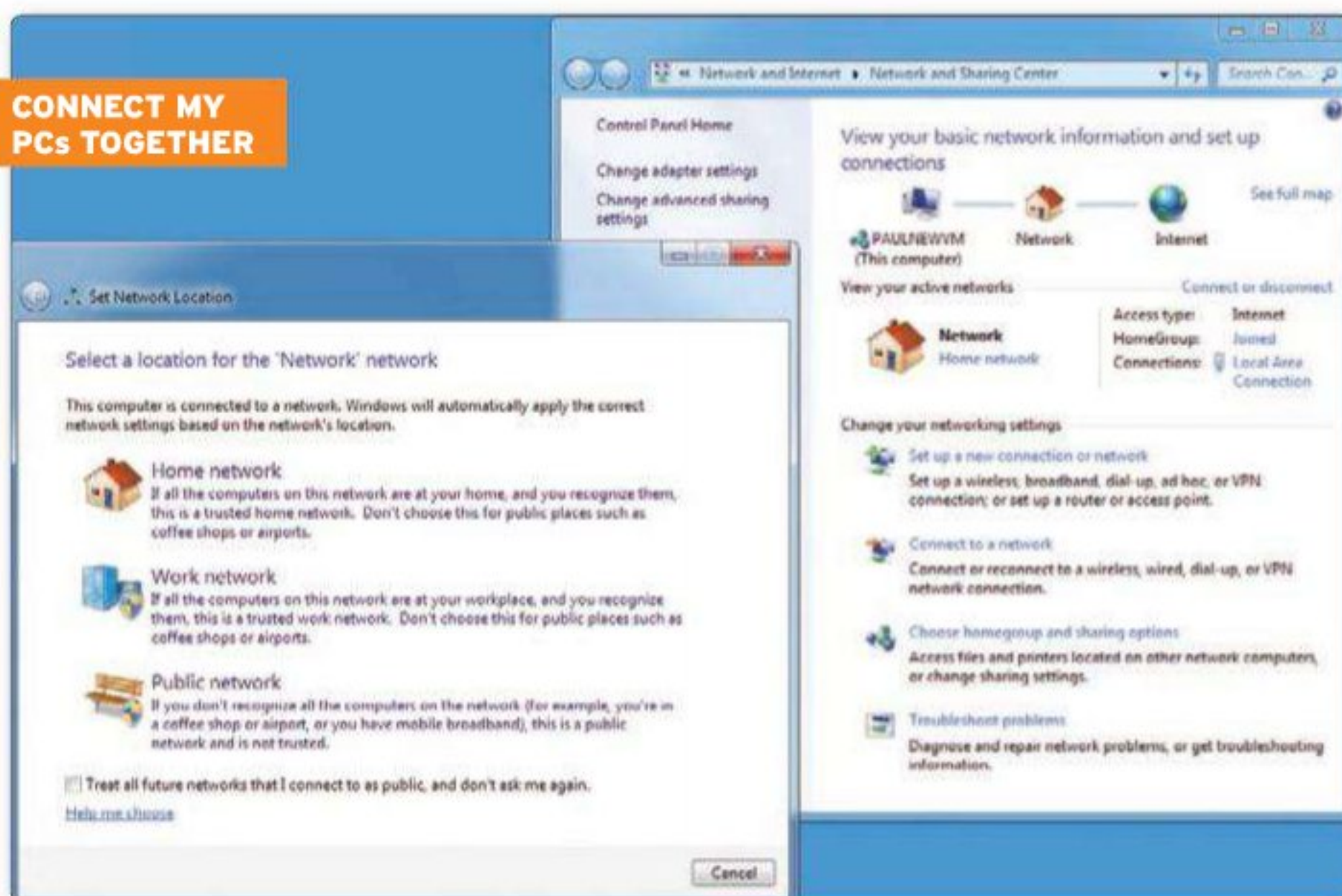
**SATA 6Gbps:** Also known as SATA 3, this connection between a motherboard and hard- or solid-state drive offers double the speed of its predecessor. Like USB 3.0, SATA 6Gbps ports tend to be blue.

**Ivy Bridge:** The codename for Intel's third generation of CPUs. The line-up includes Core i5 and i7 3xxx chips, which deliver better performance and lower power consumption than their predecessors.

**Capacitive touchscreen:** Most commonly used in premium smartphones and tablets, capacitive touchscreens are able to sense the electrical conductivity of a human fingertip and use it to determine its location on the screen. Insulating materials such as gloves will prevent such touchscreens working but, unlike resistive alternatives, they don't require you to exert physical pressure on the screen.

**Ultrabook:** A marketing term for a laptop that has been built to a specification set by Intel, in order to ensure a high-quality user experience. The requirements change as new chips are released and, for Ivy Bridge systems, currently include fast startup, a maximum thickness that varies according to the screen size, and a battery life of at least 5 hours.





will be displayed at the bottom of this section, which you'll need to change if the two PCs don't match.

Click the Change Settings link in the same window, then click Change in the System Properties window that pops up. A restart will be required.

Next, you'll need to ensure that both PCs are configured to use the same network location. Set this to 'Home' as it will allow you to share the most between your PCs.

Open the Network and Sharing Center and look for your network connection under 'View your active networks'. If your network location is set to Public, network sharing

will have been disabled for security reasons. Click this and change it to Home.

You will need to share at least one folder on one of the computers to start with. The simplest way would be to create a folder and right-click it, then select Properties. On the Sharing tab click Share and choose with which users the folder should be shared. It's a good idea to set up password-protected user accounts on both PCs before you complete this step.

If you have any trouble, click the link 'I'm having trouble sharing'. For more information, including how to network PCs running XP, see [tinyurl.com/d6Lmp2o](http://tinyurl.com/d6Lmp2o).

## CONTACT US

Email your Helproom questions to [helproom@pcadvisor.co.uk](mailto:helproom@pcadvisor.co.uk). Please use 'Helproom' as the subject header and give your full name, the operating system you're using and other product details. We will let you know by email if your query has been selected for inclusion in these pages. If your query is urgent, you may find it useful to visit our forum at [pcadvisor.co.uk/helproom](http://pcadvisor.co.uk/helproom).

Helproom aims to give you the best assistance possible. But, given the

limitations of this type of advice, we can't guarantee what we say will work and we can't accept responsibility for any damage arising as a result.

Always back up your system before you make any changes, including software installations.

Please note that we are unable to respond to letters or telephone requests, but we will endeavour to answer queries submitted by email or via our Helproom forum.

For more PC help go to:  
[pcadvisor.co.uk/helproom](http://pcadvisor.co.uk/helproom)



SEARCH THE  
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The PC Advisor online Helproom contains an indispensable database of answers to common questions regarding all aspects of PC problems. This ranges from general Windows issues to problems with specific apps, and covers all types of PC hardware and software, including system components and peripherals.

Alternatively, you can ask for help from the experts on our online forums. Sign up to be a registered user - which is free - and then browse to one of the discussion forums. In the Helproom your first stop should be the searchable database of frequently asked and previously answered queries. With more than 1.5 million forum posts, you'll almost certainly find your answer in this archive of queries - just enter a few keywords.

If our online database can't solve your problem, try posting a question in the Helproom forum, where more than 200 queries are answered every day. The forum is manned by our team of Helproom Angels, who are ready and willing to lend a hand with anything from system crashes to virus alerts.

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# PITY THE SOUND'S AS THIN AS THE TV.



There's one problem with flatscreen TVs. The sound quality's a bit flat too.

That's why OrbitSound have developed the revolutionary new T12 Spatial Stereo TV soundbar and iPod dock.

With its integrated 100-watt amplifier and standalone bass subwoofer, the T12 brings

cinema-quality sound to your living room, without the need for multiple speakers and yards of cabling.

And thanks to our unique spatial stereo technology, you hear true stereo sound wherever you're sitting in the room.

We call it the infinite sweetspot, and it's

infinitely better than conventional systems.

But don't take our word for it. Come and listen to the T12 for yourself.

Ears don't lie.



Available at John Lewis or buy online at [orbitsound.com](http://orbitsound.com)

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BELIEVE YOUR EARS



# HOW TO

## Replace your PC's hard disk with an SSD



Improve boot times and speed up your system with an SSD. Orestis Bastounis shows you how to install an SSD as your Windows boot drive



In the previous issue we explained how to boost a laptop's performance by fitting it with a solid-state drive (SSD). This enables Windows to boot and shut down more quickly, load applications faster, and make your machine feel more responsive overall.

SSDs have benefits for desktop computers, too, and a gradual price drop over recent months means they're now a far more affordable upgrade. Here, we'll show you how to install an SSD in a desktop, and configure your old hard drive as a storage medium.

Just about every PC case has spare 3.5in internal bays for adding hard disks, although SSDs tend to be 2.5in wide. You'll almost certainly need a mounting bracket to fit the SSD inside your case.

The £180 240GB Kingston HyperX 3K upgrade kit we're using here comes with just such a bracket, as well as a screwdriver to help you complete the job. It's capable of reading and writing data at 500MBps via a SATA 3 port.

It doesn't matter if your computer doesn't support

SATA 3. SSDs are backward-compatible, and the reduced latency over traditional hard disks has a greater impact on performance than which flavour of SATA is supported. It takes considerably less time to access data from an SSD's Nand flash memory than for a hard disk's mechanical arm to move into position.

If you're considering an upgrade then you should note that SSDs cost more per gigabyte of storage than a traditional hard disk, and that their storage capacities top out at around 512GB - well short of the current 4TB maximum for hard disks.

It makes sense to install Windows and your applications on the SSD, where they will benefit from the improved load times, and large media collections on a separate hard disk. We'll explain how to configure the Bios and Windows accordingly.

We're using a desktop PC with an Asus P8P67 Pro motherboard and a Fractal Design Define R3 case. You can install a fresh copy of Windows 7 or transfer your current operating system.

## INSTALL A SOLID-STATE DRIVE IN YOUR DESKTOP PC



**START** Unscrew the sides of your computer's case and remove them from the chassis. Some have latches holding them in place, which must be pushed open. Make sure you have clear access to the motherboard's SATA ports and hard-disk bays.



**4** Switch on the PC, insert the Windows 7 DVD, then (typically) press Delete or F2 to enter the Bios. All motherboards are different, but you should see a menu with a boot-order option. Put your DVD drive at the top of the list, save the setting, then reboot.



**7** The computer will reboot once the Windows installer has finished. At this point, you may need to enter the Bios and make the SSD the main boot device. The Windows installer will then run the final setup, asking for a user- and computer name.





**2** Place the SSD into its mounting bracket or a removable bay, line it up with the holes underneath, then screw it in. Position the mounting bracket into a spare 3.5in hard-disk bay and secure it using the holes at the side.



**3** Connect the L-shape end of a SATA cable to the SSD, and the other end to a spare SATA port (SATA 6Gbps ports are blue). Connect a SATA power cable to the SSD. For a fresh Windows installation, disconnect any other hard disks inside your PC.



**5** Press a key when prompted to install Windows 7. The installer should start and, after a while, you should see a language screen. Choose English (United Kingdom) from the Time and currency format field. Click Next, then Install Now.



**6** Tick the box to accept the licence terms, then click Next. Choose a custom installation, then select your SSD in the list. If you have already disconnected your other hard disks, it should be the only option. Click Next to begin the installation.



**8** Create a username and password, review your settings, then click Next. After you configure your computer's network location, Windows 7 will finalise your installation, display the Windows desktop, and begin installing software updates.



**9** Switch off the computer, reconnect any other hard disks, then reassemble your case. Turn on the computer, enter the Bios and ensure the SSD remains the main boot device. Reboot once again. Finally, check Microsoft Update for any OS updates.

Continues overleaf >>



# CONFIGURE WINDOWS FOR USE WITH AN SSD

Not so long ago, Windows needed tweaking to work effectively with an SSD. The purpose of which was to save storage space and maintain the drive's reliability.

Flash memory can be written to a limited number of times, so certain Windows programs, such as Defrag, which have no benefit to an SSD, would serve only to shorten the drive's lifespan. In addition, small files occupying a block of flash memory can slow write speeds, so performance worsens over time.

Today, these issues are less problematic. Modern SSDs have built-in wear-levelling techniques that ensure writes are spread across a drive, which can significantly increase its lifespan. Windows 7 was also designed with SSDs in mind, with the option to defragment SSDs disabled. A low-level command called Trim can free up blocks that would otherwise slow write performance.

Provided that you're using a modern SSD, you shouldn't need to make tweaks to disable write-heavy functions such as indexing, Superfetch and Windows Search. You won't see a particular improvement to your drive's lifespan or performance by disabling these features.

However there are some nifty tricks that can improve an SSD in Windows 7, even if it's just to free up a few extra gigabytes of space.

## Move the swap file

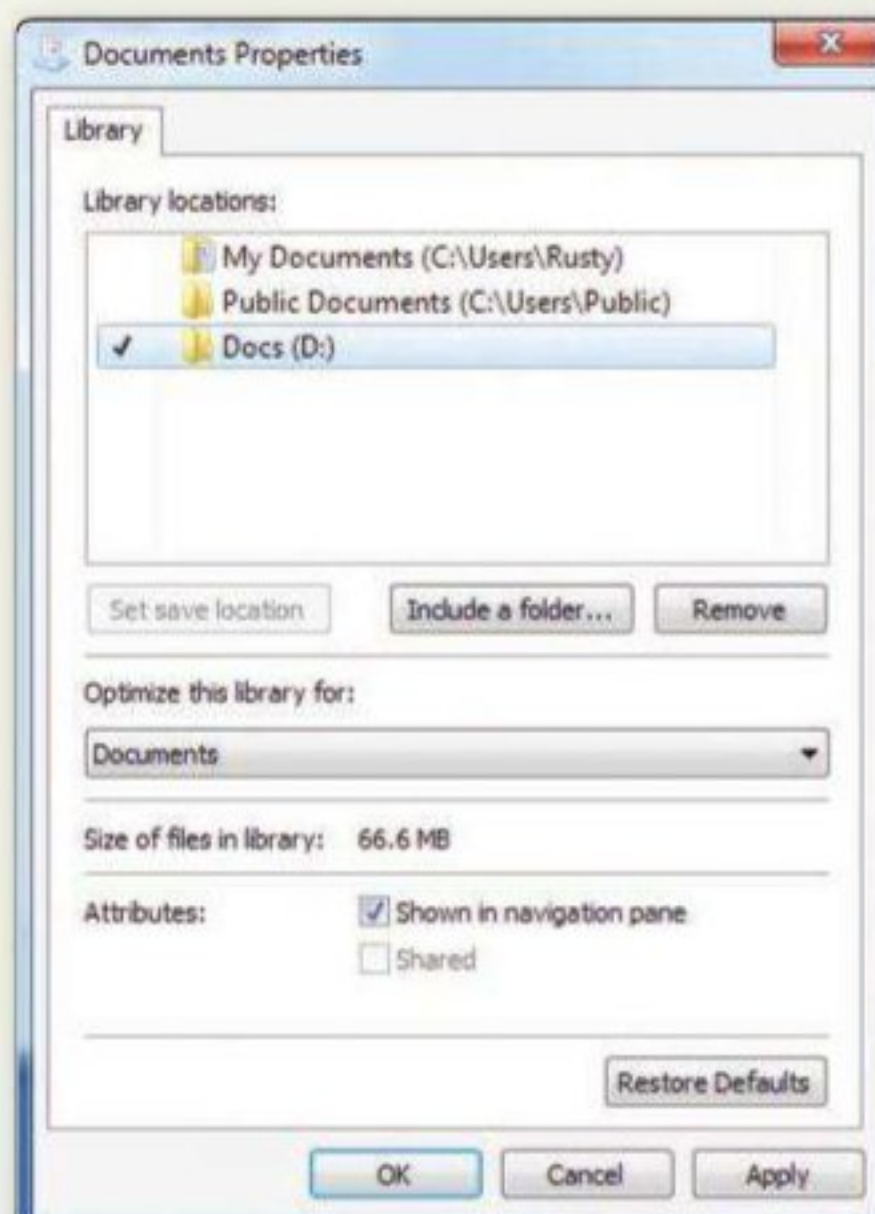
Click Start, right-click Computer and select Properties. Choose 'Advanced system settings', open the Advanced tab, and click Performance. Open the Advanced tab in this window, then click Change under the Virtual memory heading.

You can now move your page file to a hard disk. Select the SSD, then select the 'No paging file' option. Choose a hard disk and select 'System managed size'. Windows needs a swap file, so leave it as it is if you don't have a second hard disk.

## Disable System Restore

System Restore writes a lot of data to the SSD. Disabling it will free up a considerable chunk of storage space and may improve your drive's performance over time. Warning: you will lose the ability to restore Windows to a previous state.

Click Start, right-click Computer and select Properties. Click System Protection, then Configure. Choose 'Turn off system protection' and click Ok.



## Turn off Hibernation

Hibernation is ideal for Windows PCs that take an age to boot up, letting you quickly resume from where you left off, but you'll find that Windows already boots much faster from an SSD. You can save storage by disabling Hibernation mode.

Click Start, type `cmd`, then right-click the command prompt icon that appears and select 'Run as administrator'. Enter the command `powercfg -h off`.

## Use Windows 7 Libraries

You can free up space on your SSD by moving picture collections, movies and documents on to your old hard disk. There are numerous ways in which this can be achieved, but the most elegant method is to use Windows 7's Libraries feature.

Create a folder on your hard disk, then right-click it and choose Library,

Documents library. Copy your documents from the My Documents folder to your new one. You can do the same for movies, music and pictures, keeping your files close without them residing on the SSD.

## Inspect your storage use

With small-capacity SSDs and hard disks, running out of storage can be an unavoidable problem. Over time, your SSD will become filled with temporary files and unnecessary installation programs. Knowing which files you can safely delete can be tricky, though. WinDirStat ([windirstat.info](http://windirstat.info)) provides a visual representation of all your files and how much storage they're using, so you can decide whether to keep them.

## No GUI boot

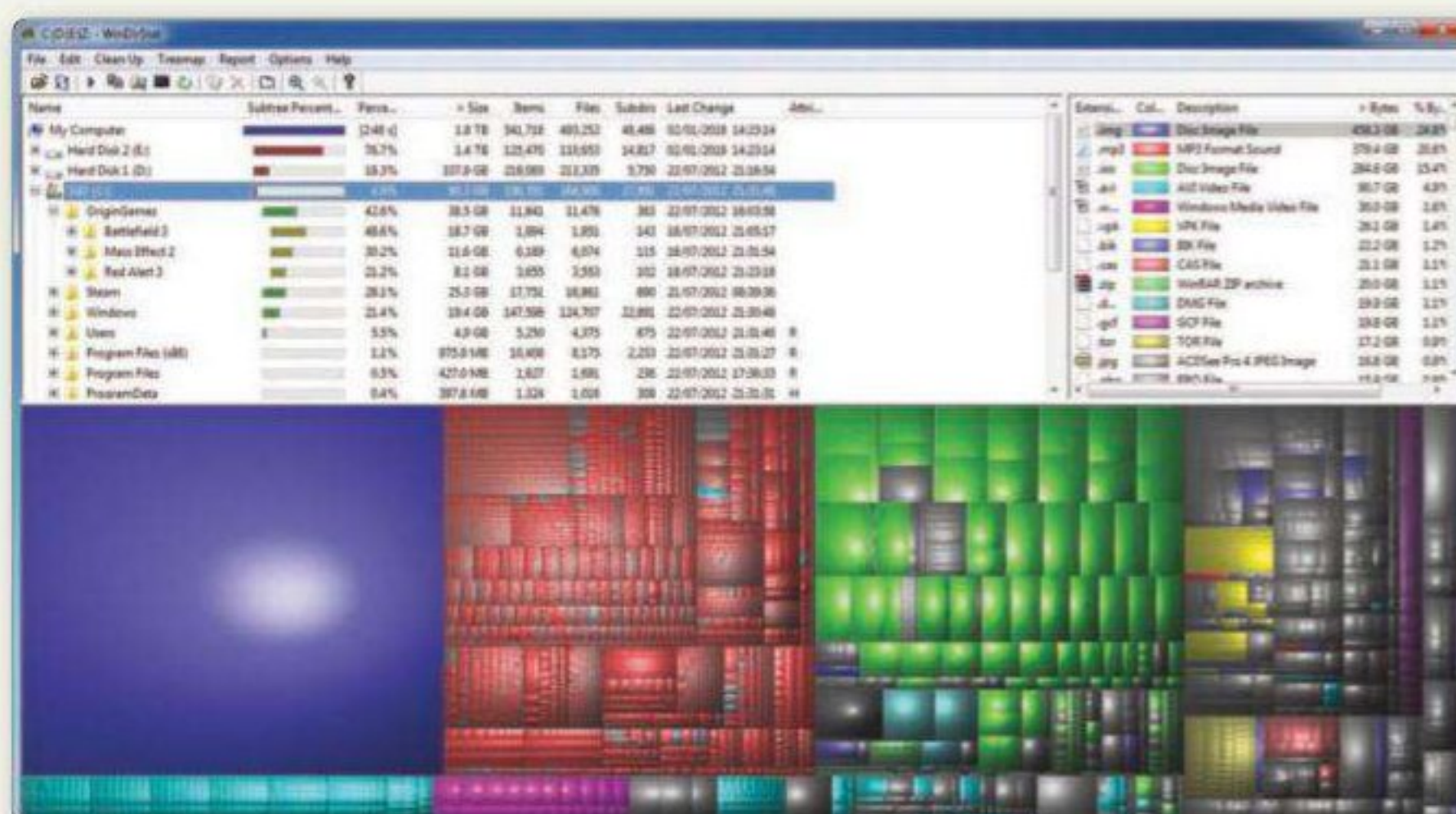
Disabling the Windows splashscreen while booting can shave off a few extra seconds from boot times. Click start, type `msconfig`, then press Enter. Open the boot tab, tick 'No GUI boot', then restart the computer.

## Move Steam games

If you're a gamer, you'll probably have the Steam software installed, and already know that having only a few modern titles in your Steam library can take up a huge amount of storage space.

In computers with SSDs, Steam really needs to be installed on a secondary hard disk. The down side to this is that your favourite games will load as slowly as ever.

Steam Mover ([tinyurl.com/396j764](http://tinyurl.com/396j764)) can solve this problem, by moving the game between the SSD and hard disk in a single click. You can move the game on to the SSD when you want to play it, and return it to the disk when you need storage space.





## INSTALL A SECONDARY HARD DISK FOR EXTRA STORAGE

In 2011, hard-disk prices roughly doubled after factories in Thailand were devastated by flooding. Storage prices are slowly returning to their previous levels, with hard disks relatively affordable once again.

A year ago, some vendors were selling 2TB hard disks for close to £150; you can now find them for £75 if you shop around. Large-capacity 3TB hard disks offer better value for money, and 4TB disks are now

available if you need even more storage. The latter cost around £275.

Since we've talked in this workshop about opening up your PC's case and installing an SSD, it may be a good time to think about a hard disk upgrade, too.

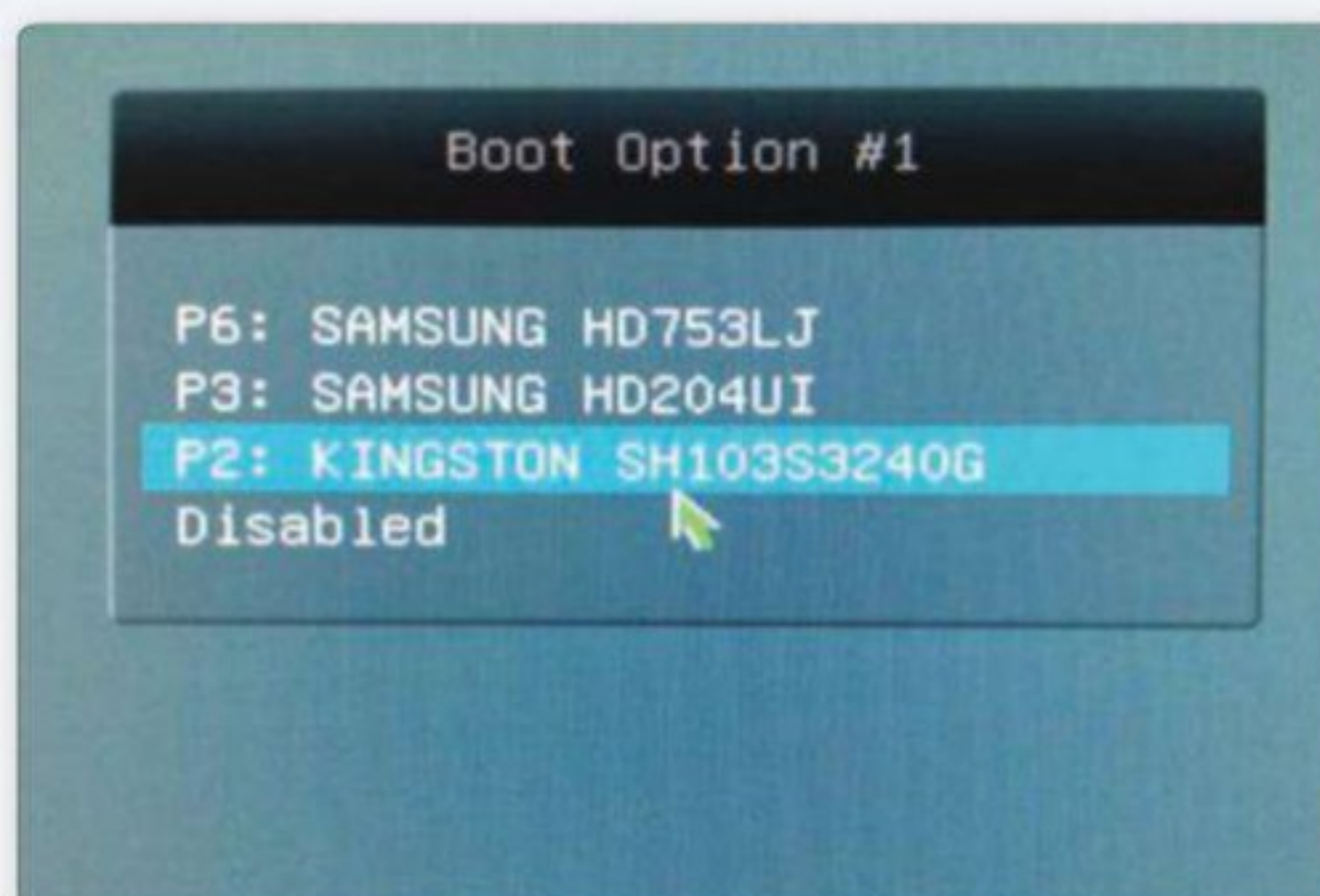
When you have multiple drives installed, it's important to check that the Bios knows which drive to boot from. Press Delete, F2 or look for an onscreen

message that tells you which key to press to enter the Bios.

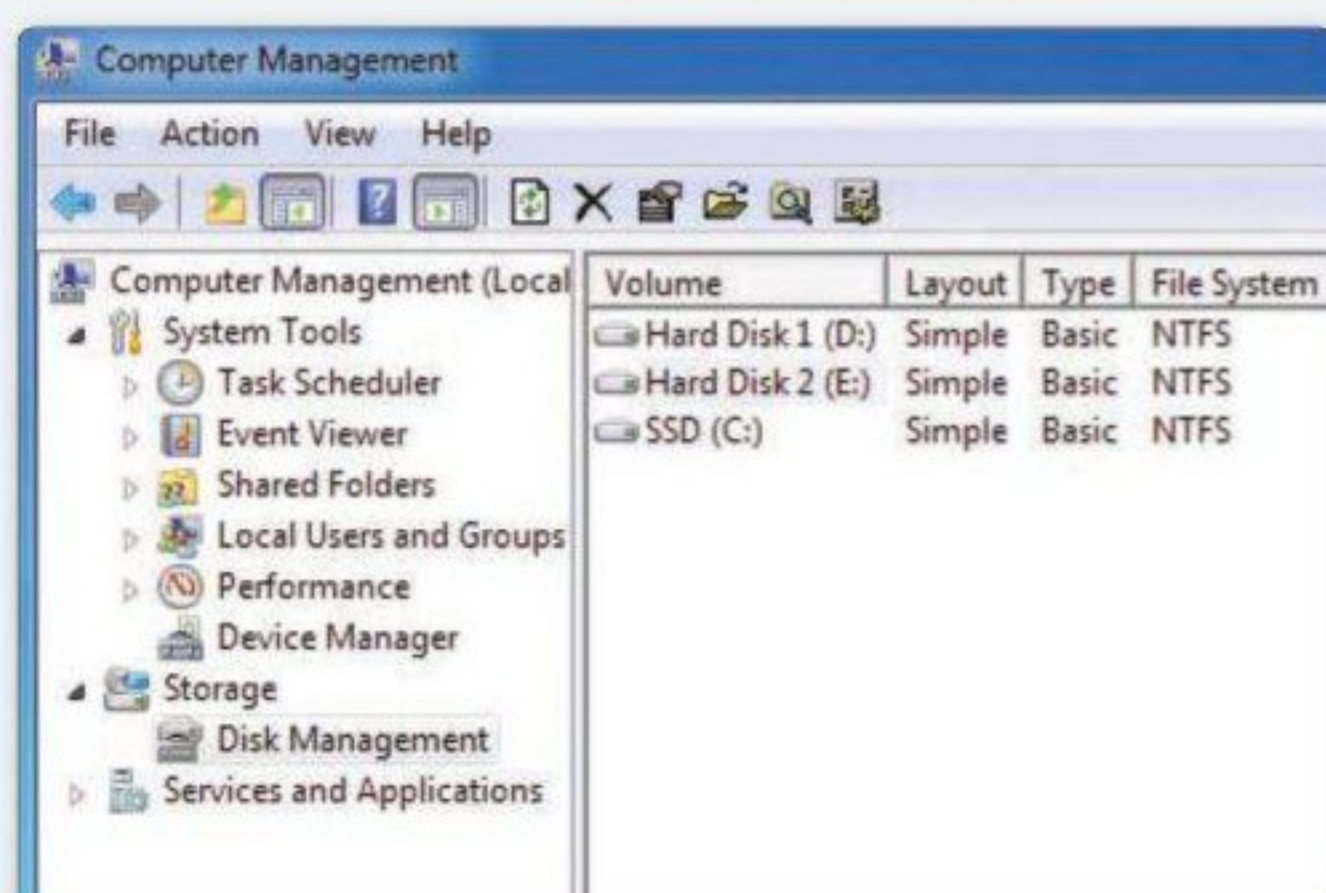
Connecting a hard disk to a SATA 3 port, or buying a hard disk that supports SATA 3, will make no improvement to its performance. As we mentioned in our introduction, hard disks are limited by their mechanical nature and, unlike an SSD, they simply can't outstrip the 3Gbps maximum transfer capacity of a SATA 2 port.



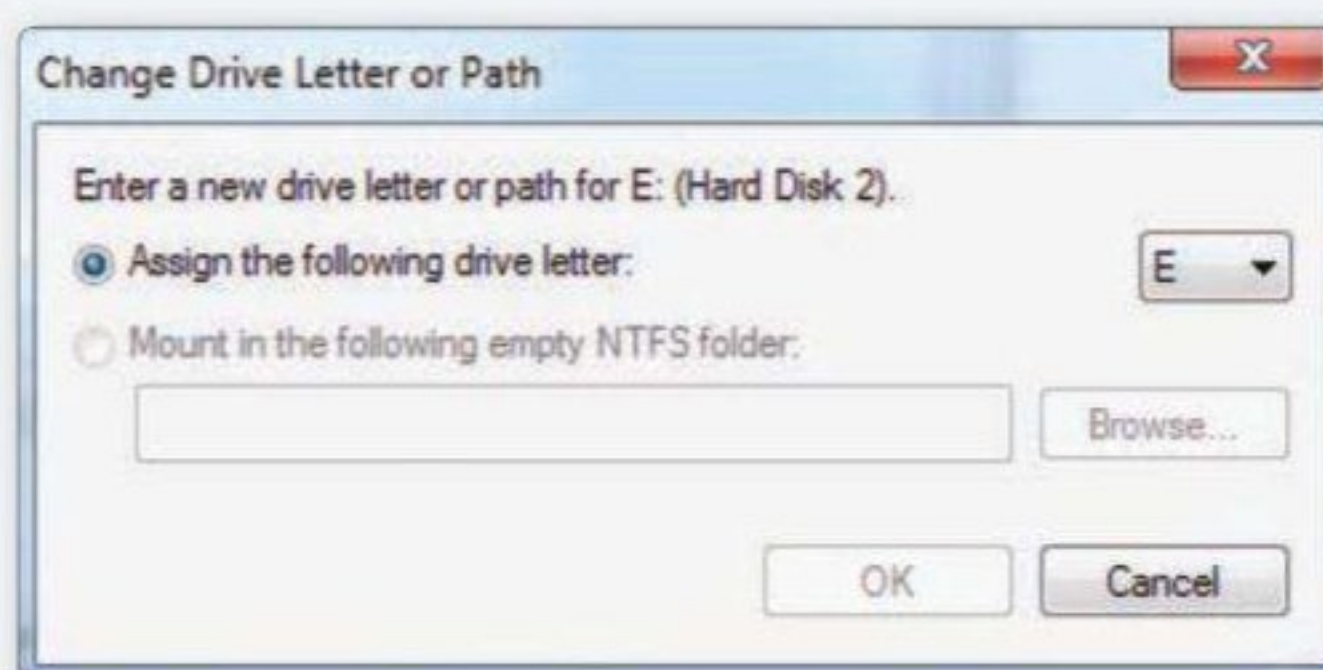
**START** With the sides of your PC case removed, insert the new hard disk into a 3.5in removable bay and secure it with screws. Connect a SATA cable in the same way as you did with the SSD, with the L-shape end (if there is one) connected to the hard disk, and the other end connected to the motherboard. Older cases that lack removable bays will still have space for an extra hard disk, with holes that line up with the hard disk bored directly through the chassis.



**2** The computer might display an error message suggesting that 'NTLDR is missing' or 'Operating system not present' when you first switch it on. Don't panic. The computer is trying to load Windows from the new hard disk rather than the SSD. You'll need to enter the Bios (you typically must press F2 or Delete) and ensure that it's configured to boot from the SSD in the boot-order menu. The SSD should be given the highest priority in the boot order.



**3** Your new hard disk may not be ready for use when you first turn on the computer. Open Computer Management by clicking the Start icon, right-clicking Computer and choosing Manage, Disk Management. The new disk should be listed in the centre panel. Right-click the black unused area next to your drive, then choose Create partition. It doesn't matter whether you create a primary, extended or logical partition. Finally, format the partition you've created.



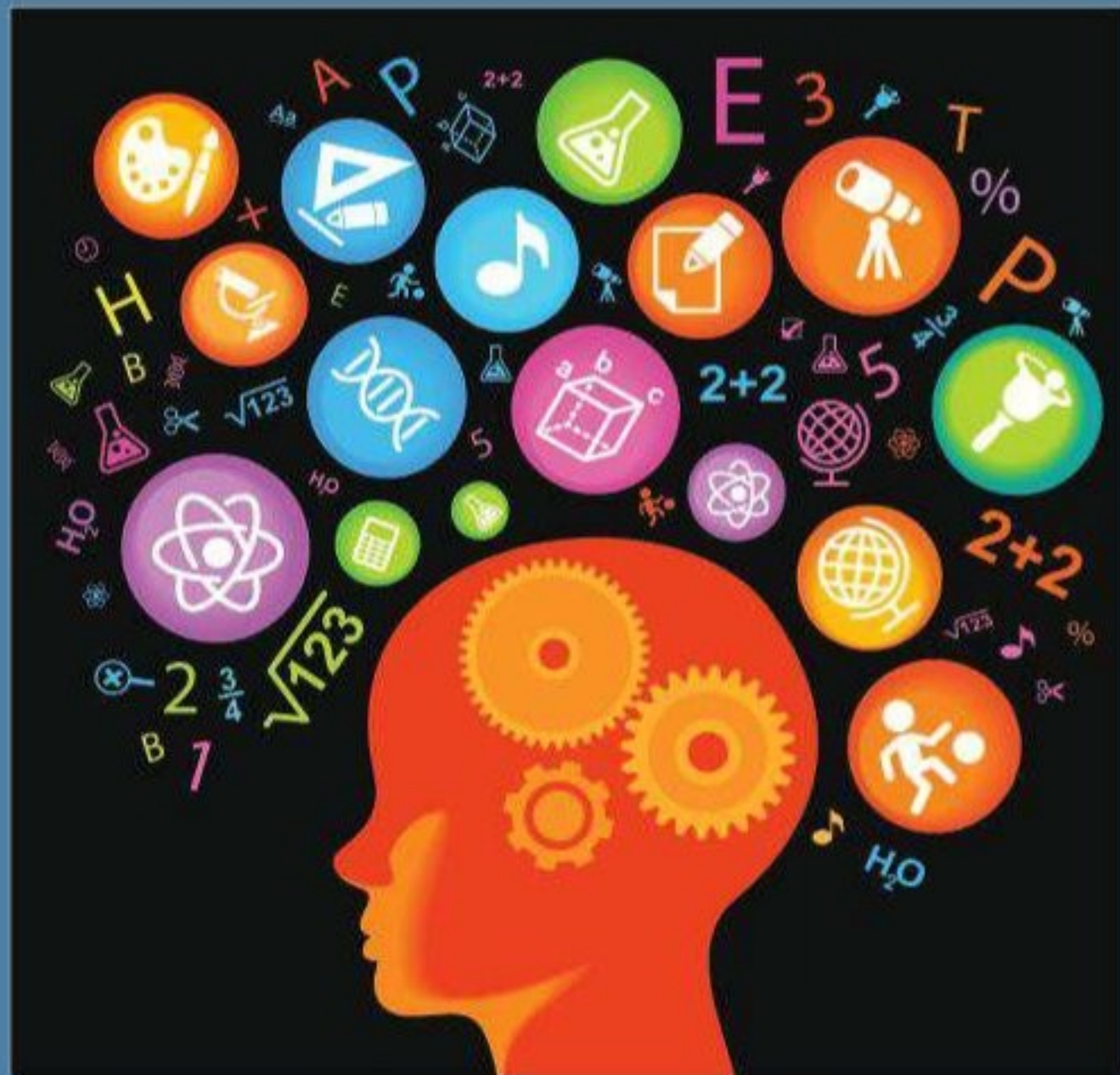
**4** Your computer is likely to be configured so the C drive is the SSD, the D drive is the DVD writer, and the E drive is your new hard disk (possibly F if you installed an SSD and kept your PC's original hard disk). We prefer to have the DVD drive as the final drive letter. Open Computer Management, right-click your hard disk's newly created partition and choose 'Change Drive Letter and Paths'. Click Change, then choose a temporary drive letter. Follow the same steps for your DVD drive. ☒



# Remember everything



Keep all your notes, ideas and even photos organised across all your devices. Sandra Vogel explains how to get started with the free Evernote service



How many times have you had a great idea, or been given some useful information, but had nowhere to store it? How often have you written it on a scrap of paper and stuffed it in a pocket, only for it to end up a sodden, unusable clod in the washing machine? It's easily done, but easier to prevent.

Evernote is a universal note-taking tool that's as good for jotting down phone numbers and shopping lists as it is for grabbing photos of the things you want to remember and taking detailed minutes during a meeting.

Notes can be collected and organised into notebooks, with Evernote used as a permanent or temporary store. We often use Evernote to grab different types of information, such as photos, URLs and written notes, which can otherwise be difficult to store in one place.

Evernote works with your PC, laptop or mobile device, and can be accessed from any

web browser. A personal email address lets you upload items via an email message, too.

Items are automatically synchronised with Evernote's online servers when your device is connected to the web, ensuring that only the most up to date information is at your fingertips.

Evernote is a two-tier application: a free component allows you to make notes and synchronise them across devices; a paid-for account (£35) increases your storage capacity, provides offline access and lets you share notebooks with others for collaborative working.

Use Evernote wisely and you just might be able to rid your world of those little scraps of paper, remember things you'd otherwise forget, become a lot more organised and, ultimately, stop worrying so much about the little things so you can concentrate on the big things in life.

## GET STARTED WITH EVERNOTE

**START**

Head to [evernote.com](http://evernote.com) and create an account by choosing a username and password. As is usual for web-based services that are accessible on a range of devices, you can use this to log into Evernote from your phone, tablet or any computer.

**4**

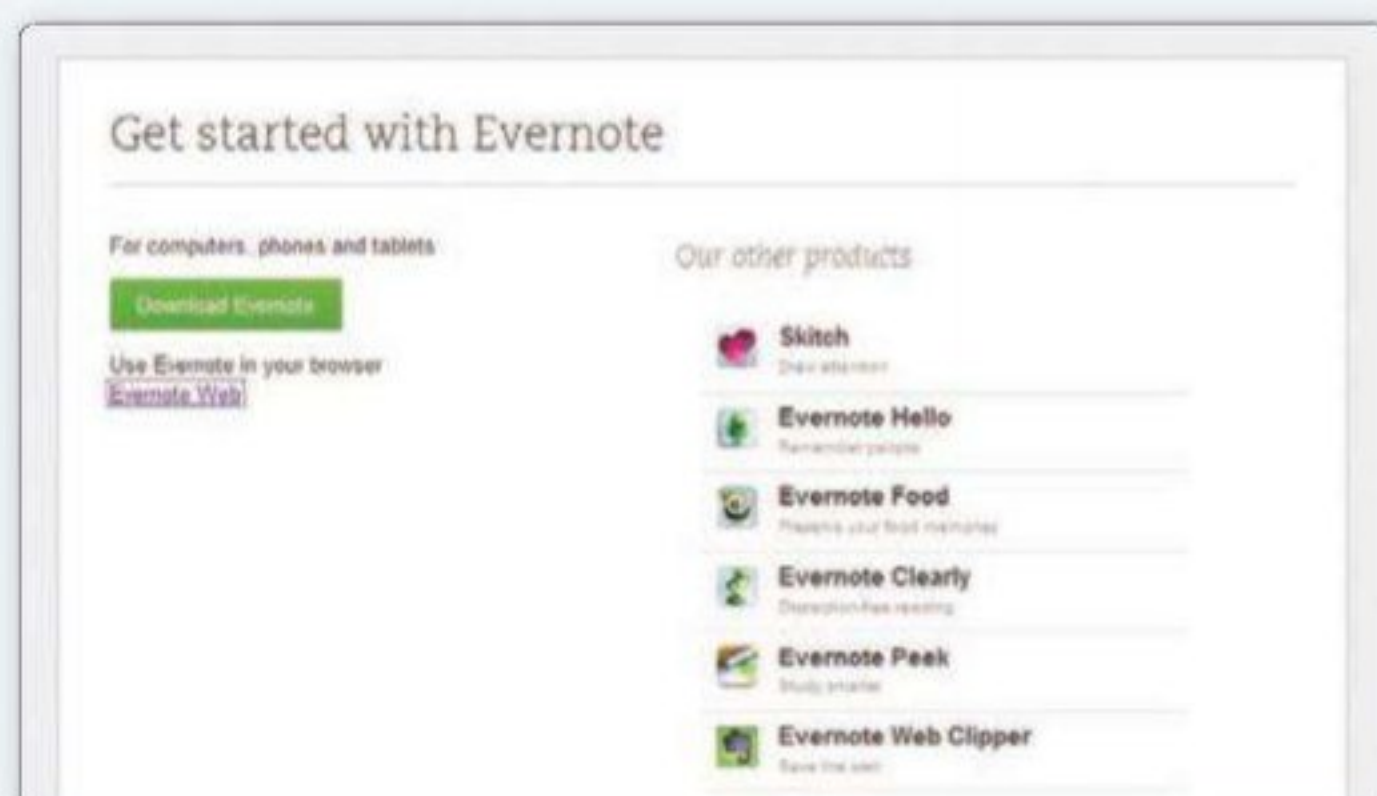
Enter a title and add some text to create your first note. Use the formatting ribbon if desired. Your note will automatically be saved and become visible in the centre panel if Evernote's Auto Save function is enabled. Click Done to finish.



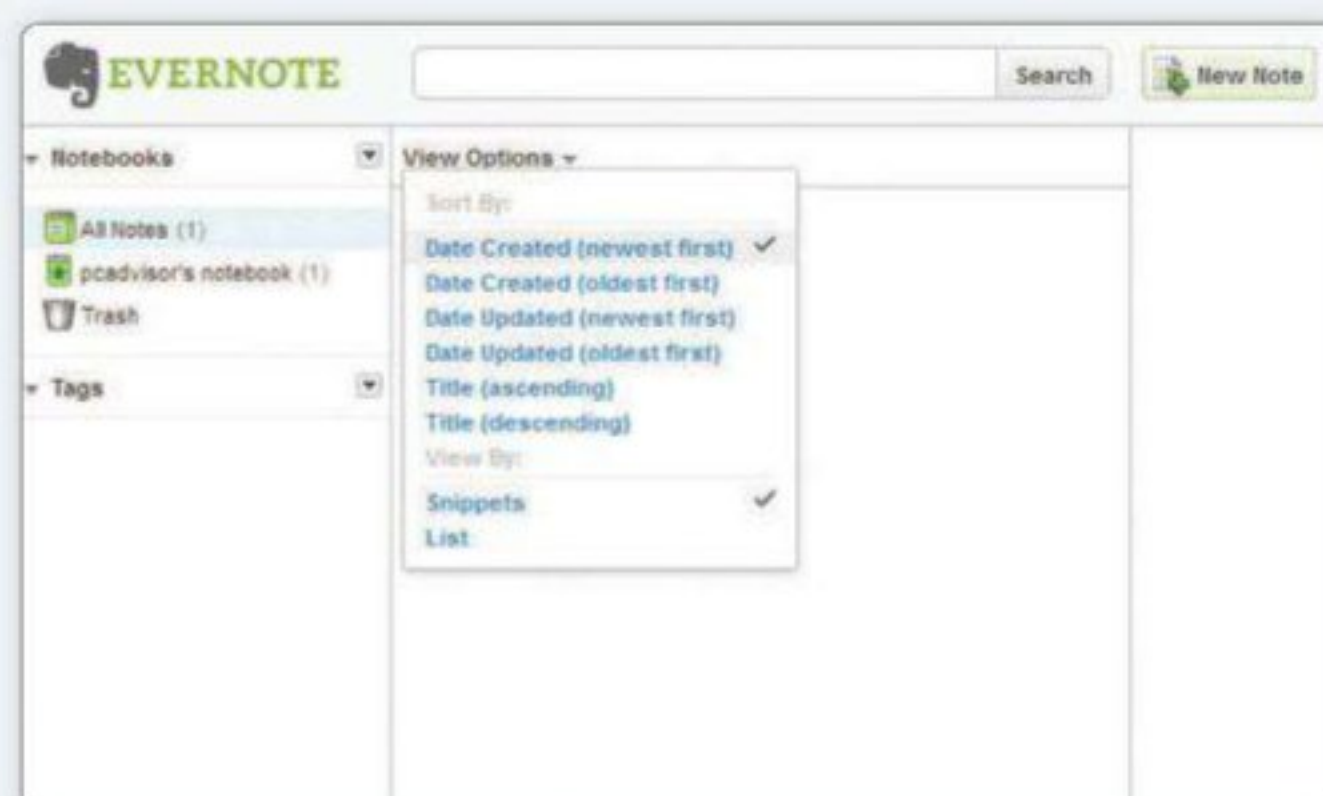
**7**

Download Evernote apps for all the mobile devices you own. Log into your account from each device, and the software will automatically sync your files. Free apps are available for iOS, Android, BlackBerry and Windows Phone 7.

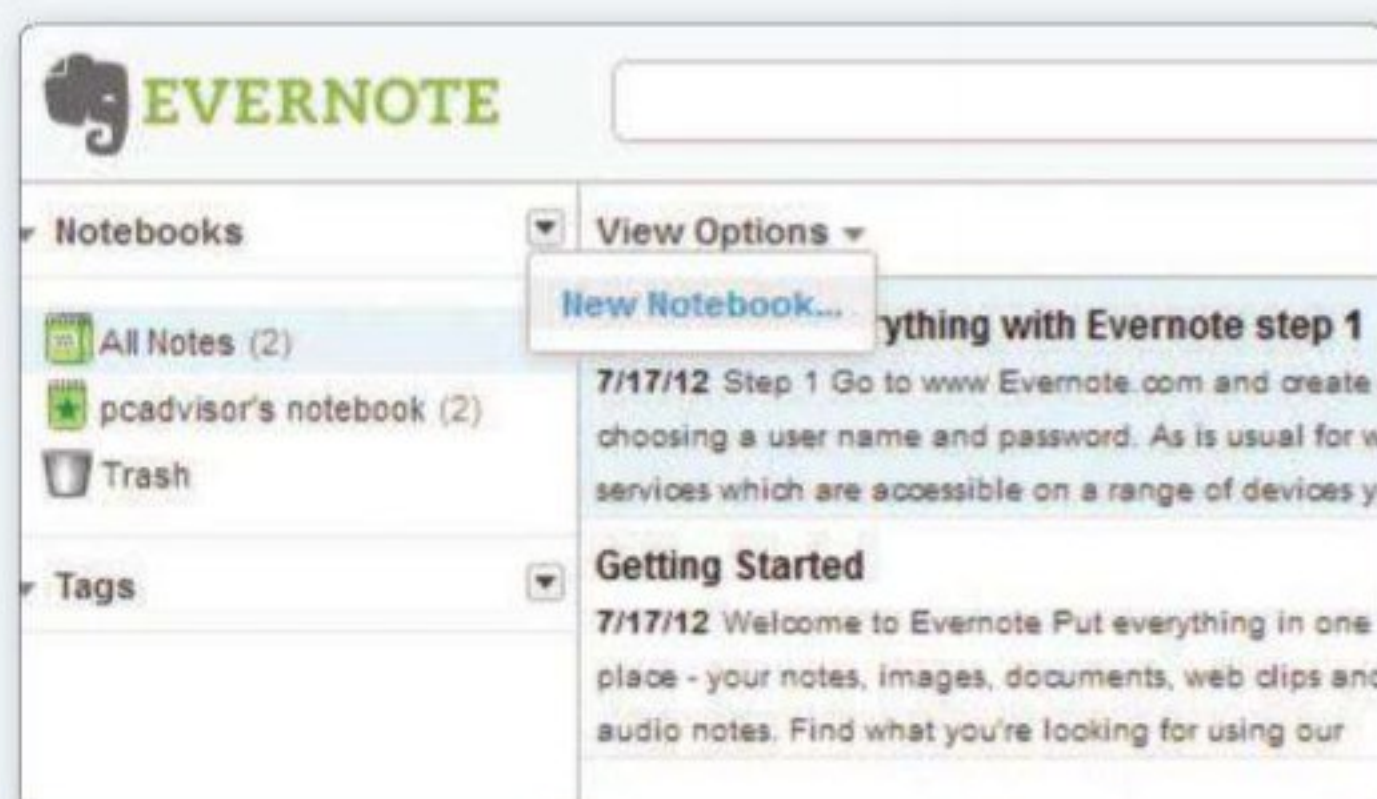




**2** Check your inbox for an account-confirmation email and browse to the link provided to complete your registration. Evernote works on various devices, but we're going to use the web client here. Click Evernote Web to begin.



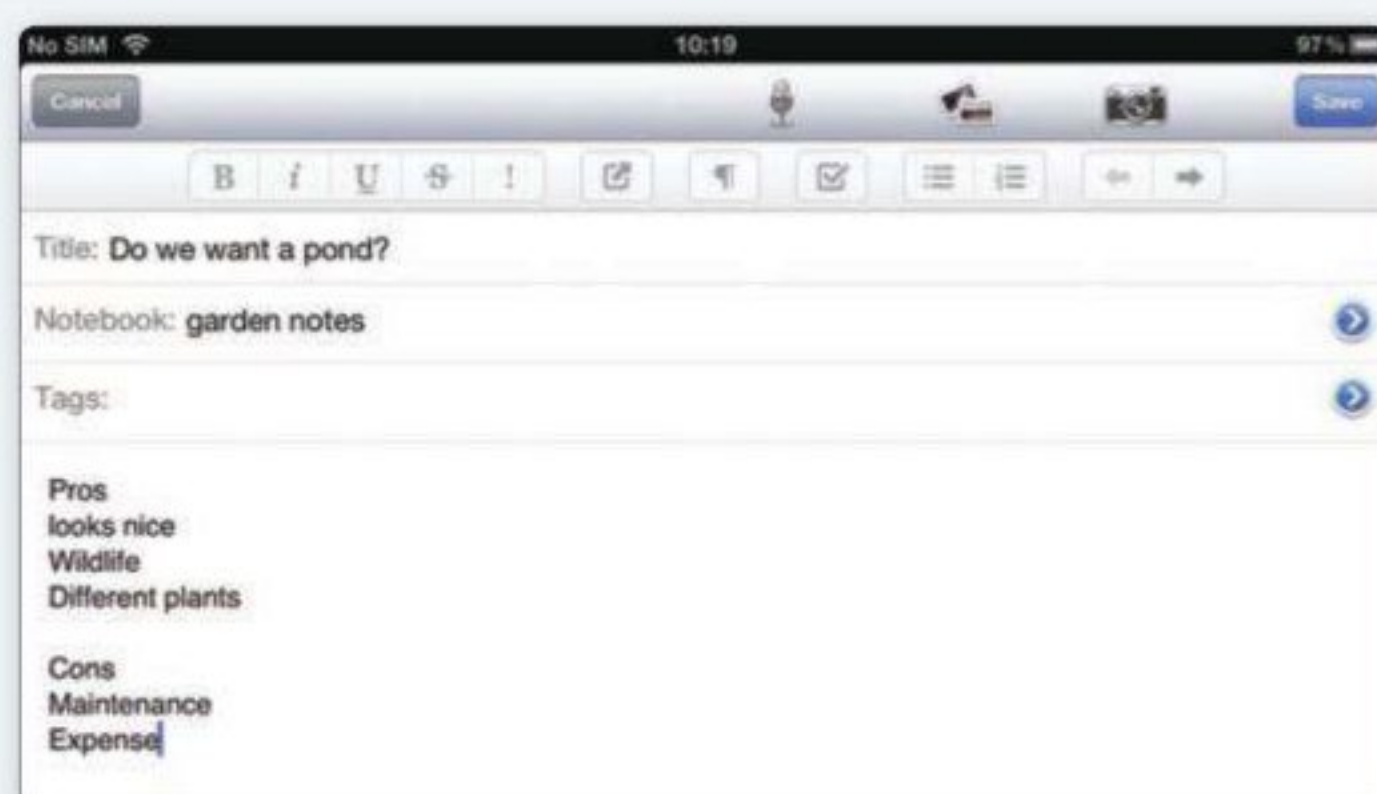
**3** Once logged into your account you'll see three panels: Notebooks, which are collections of individual notes; a preview panel, where you can specify view options; and an editing panel. Click New Note.



**5** Click the down arrow next to Notebooks in the left panel, then choose New Notebook to create a collection. Select this Notebook in the Notebooks panel to begin adding notes. You can attach files by clicking the paperclip icon in the ribbon.



**6** Click the down arrow next to a Notebook to share it with others. Select 'Share this Notebook', then enter the email addresses of those with whom you'd like to share the Notebook. They can edit your files only if you have a premium subscription.



**8** Using the iPad app, for example, you can easily create new content, which will then sync with your account and become available on your other devices. Mobile devices can also append location information to your notes.



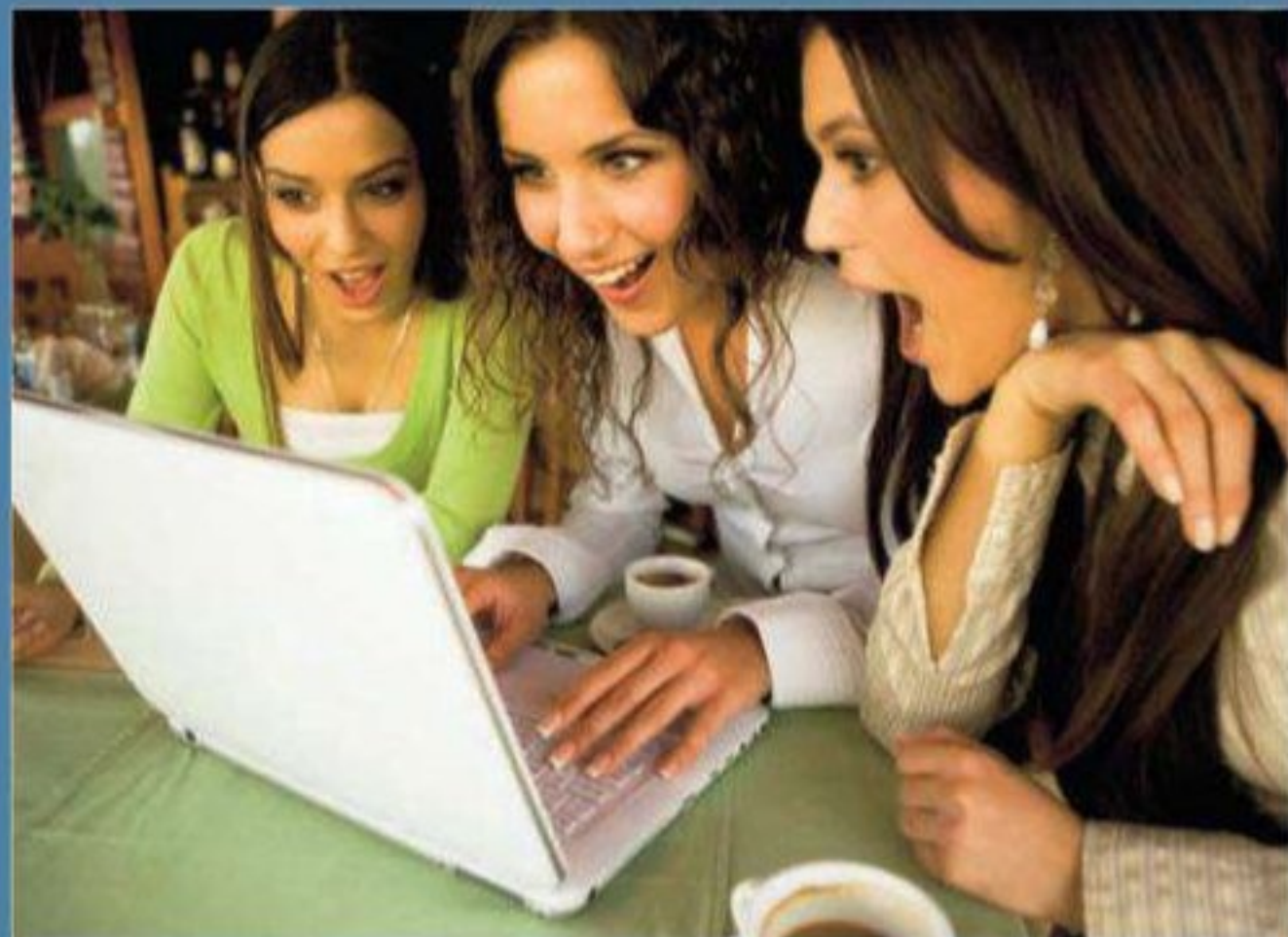
**9** Some other tools that work with Evernote are available at evernote.com, including Skitch, Web Clipper, Hello, Food, Clearly and Peek. These utilities don't work across all platforms, but you're bound to find something you like. ☒



# Master Google+



You may be a regular Facebook user, but it's not the only social network on the block. Mary-Ann Russon shows you how to make the most of Google+



After repeatedly trying and failing to buy or even gain a stake in Facebook, Google decided last year that it would start its own social network. It isn't the company's first foray into the world of social networking, although Google Buzz and Wave are two apps perhaps best left in the past.

Envisioned by CEO Larry Page as a way to transform the "overall Google experience", Google+ is similar to Facebook. It has a news feed where you can share updates with friends, a way to upload photos and share them in galleries, plus events you can join and games to be played.

The difference between the two social networks is that Google+ is tightly integrated with Google's other services. If you already use Gmail, for example, you're automatically logged into Google Chat, its instant-messaging service. Chat is also part of Google+, so you can talk with both your email- and social contacts at the same time.

New to Google+ is the ability to conduct a video conference with several of

your contacts, an activity known as a 'hangout'.

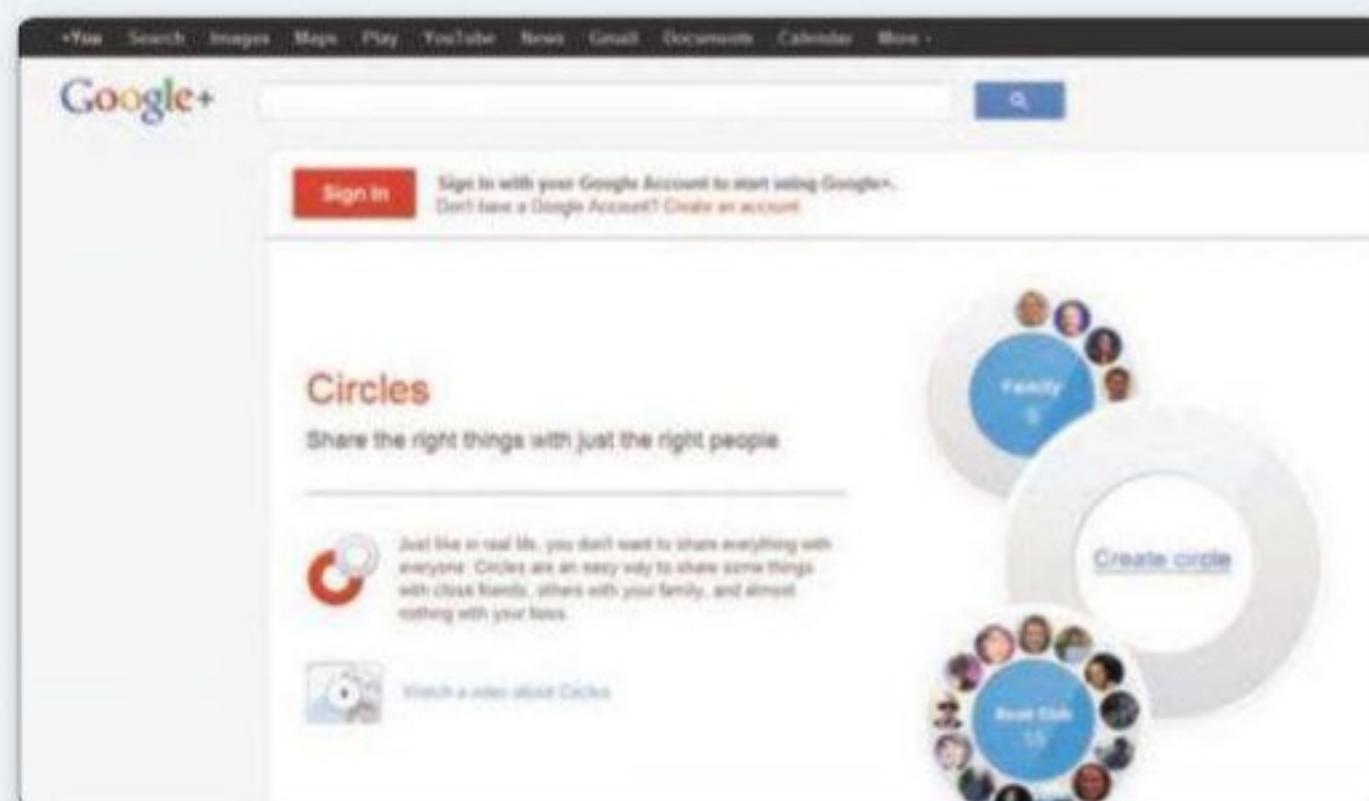
Log into your Google account and all the company's services you use now appear in the top bar of the browser, from YouTube to RSS feeds and Google Drive.

Google+ has a strong focus on sharing content, and any pages that your friends have '+1d' will be tagged with their profile picture in the list of Google Search results.

If you're worried about privacy, it's important to understand who can see your posts. We'll show you how to make them public or visible only to certain 'circles'.

Whether you think Google+ is just a Facebook clone or doubt that any of your friends are actually using it, the fact remains that Google is shaping the future of the internet. As companies, news agencies, brands and celebrities slowly jump on the bandwagon, so too will users; if you don't want to be left standing in the digital dust, it's worth exploring how to create your online presence in Google+. Here, we show you how to get started.

## GET STARTED WITH GOOGLE+



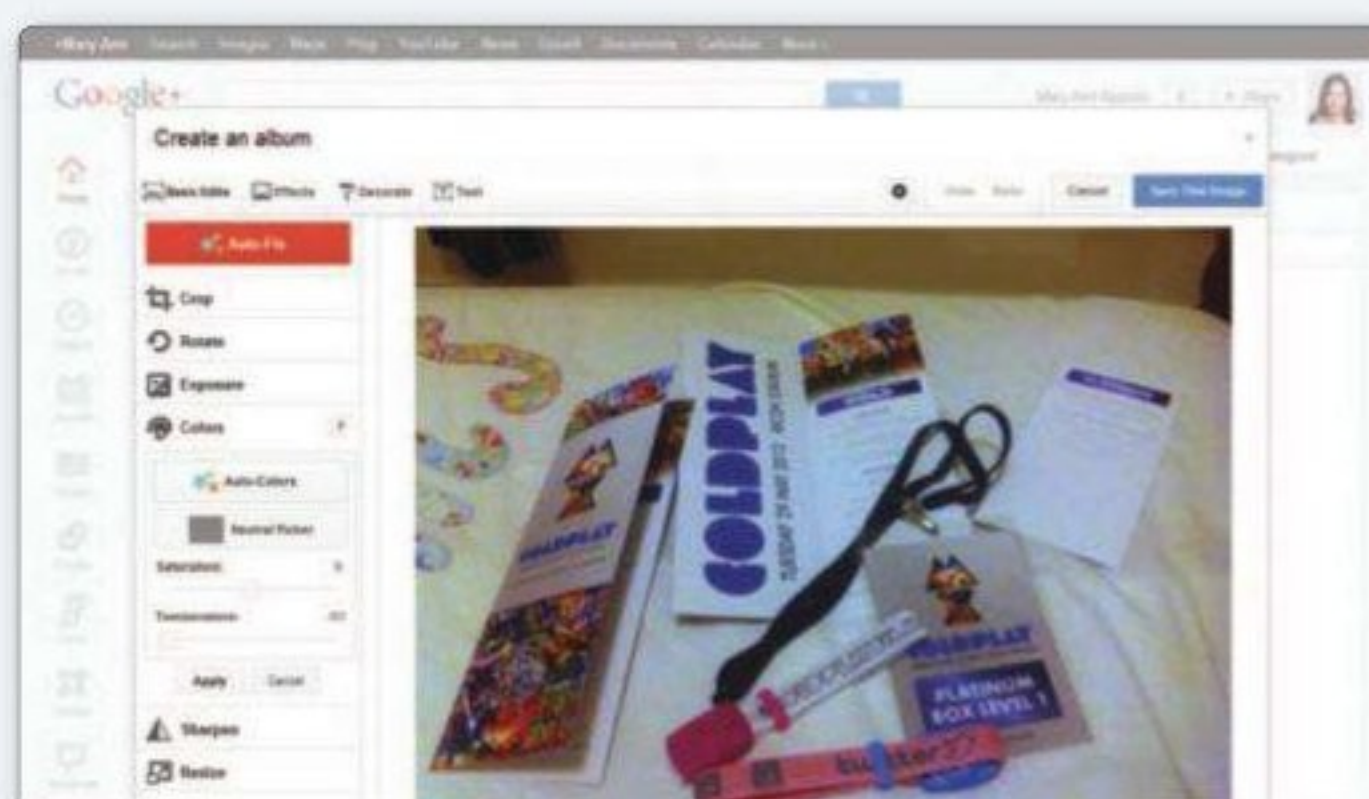
**START**

Head to [plus.google.com](http://plus.google.com) and sign in using your Google username and password. Once logged in, Google will prompt you to add contacts by synchronising your Google+ account with Facebook and your email client.



**4**

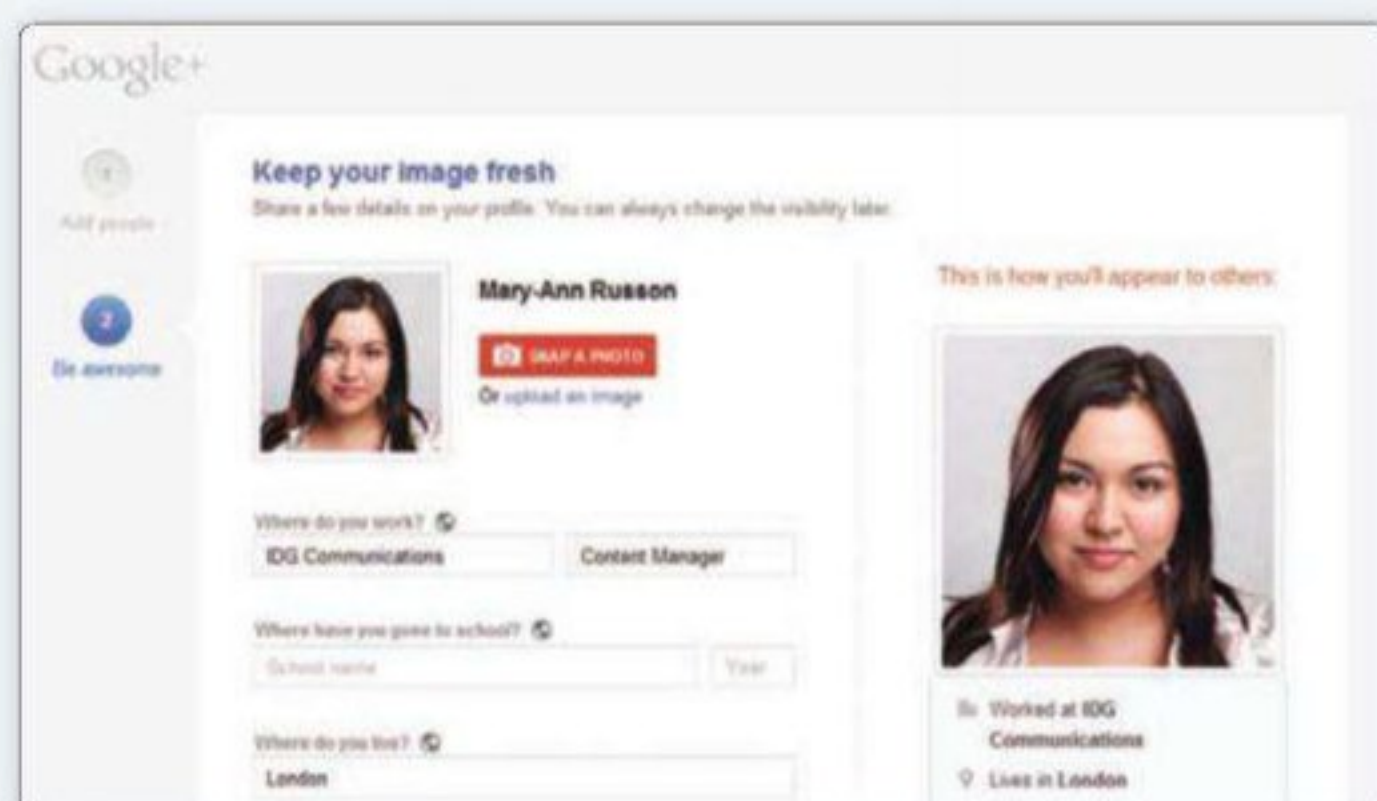
Decide who will see your post. By default your posts are public, but you can click the X on the green Public button to remove this behaviour. Click the 'Add more people' link to select a circle from the drop-down menu or enter individual friends' names.



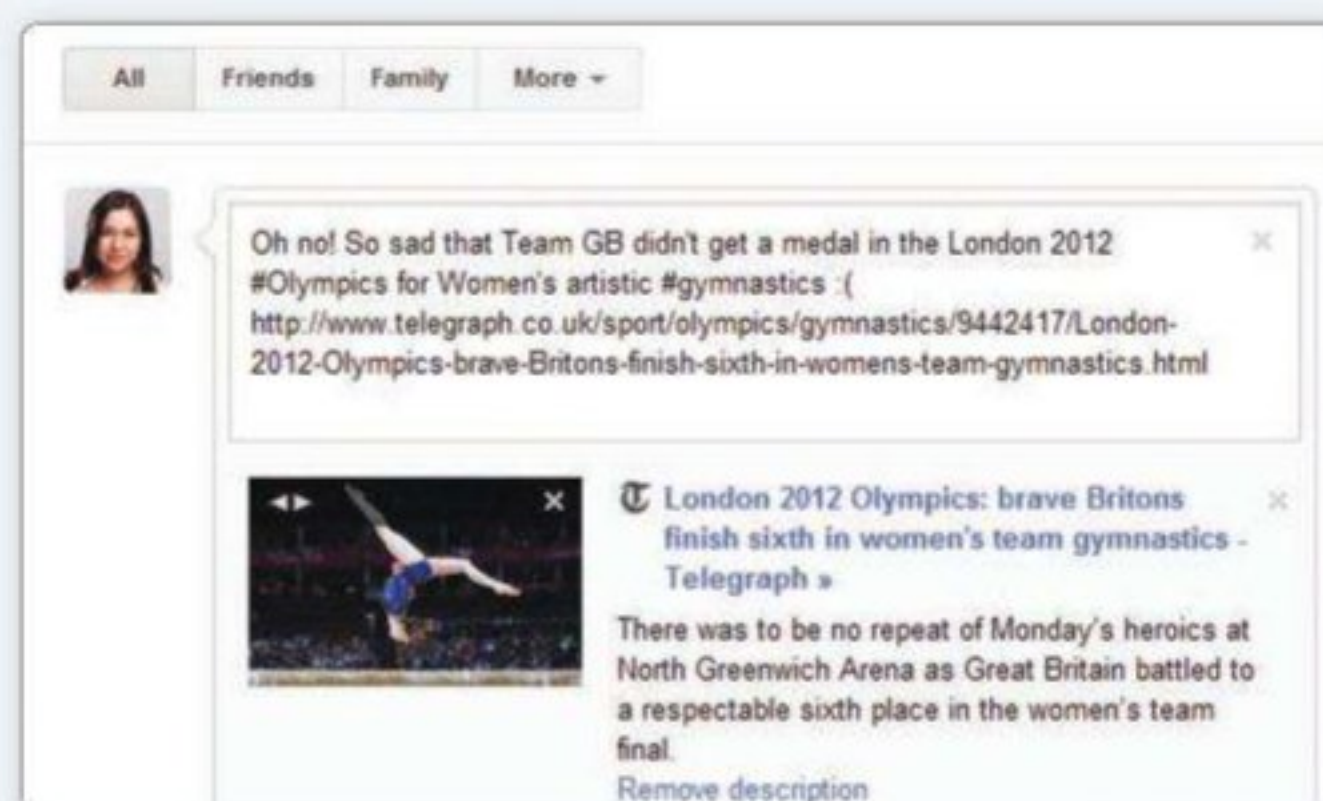
**7**

Click Photos in the left-hand menu if you'd rather upload an album than an individual image. You'll be prompted in a separate window to upload photos and give the album a title. Click on a photo and choose Edit photo to make basic edits.





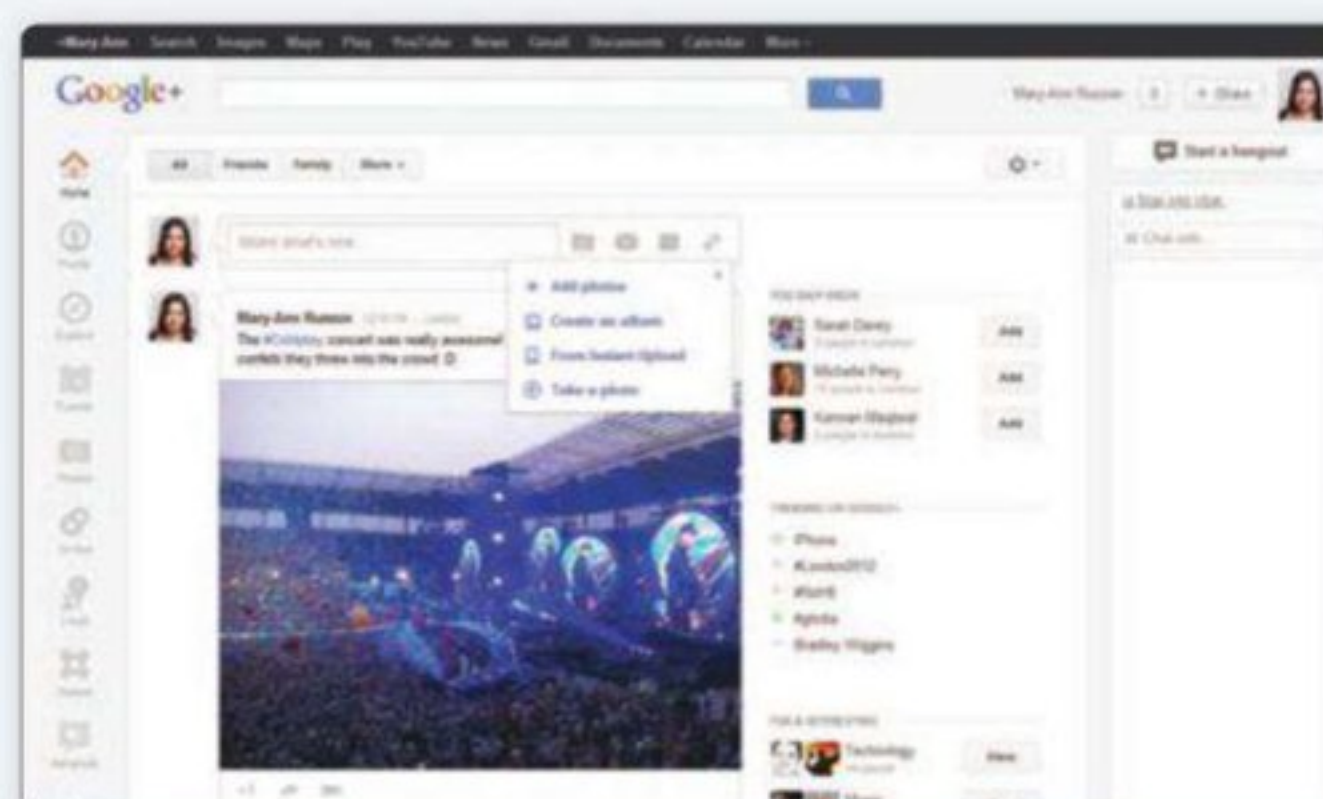
**2** For each contact you add you'll be asked in which 'circle' you'd like to put them, such as Friends or Acquaintances. Google+ will then recommend you upload a profile picture, as well as a few details about where you work, live and went to school.



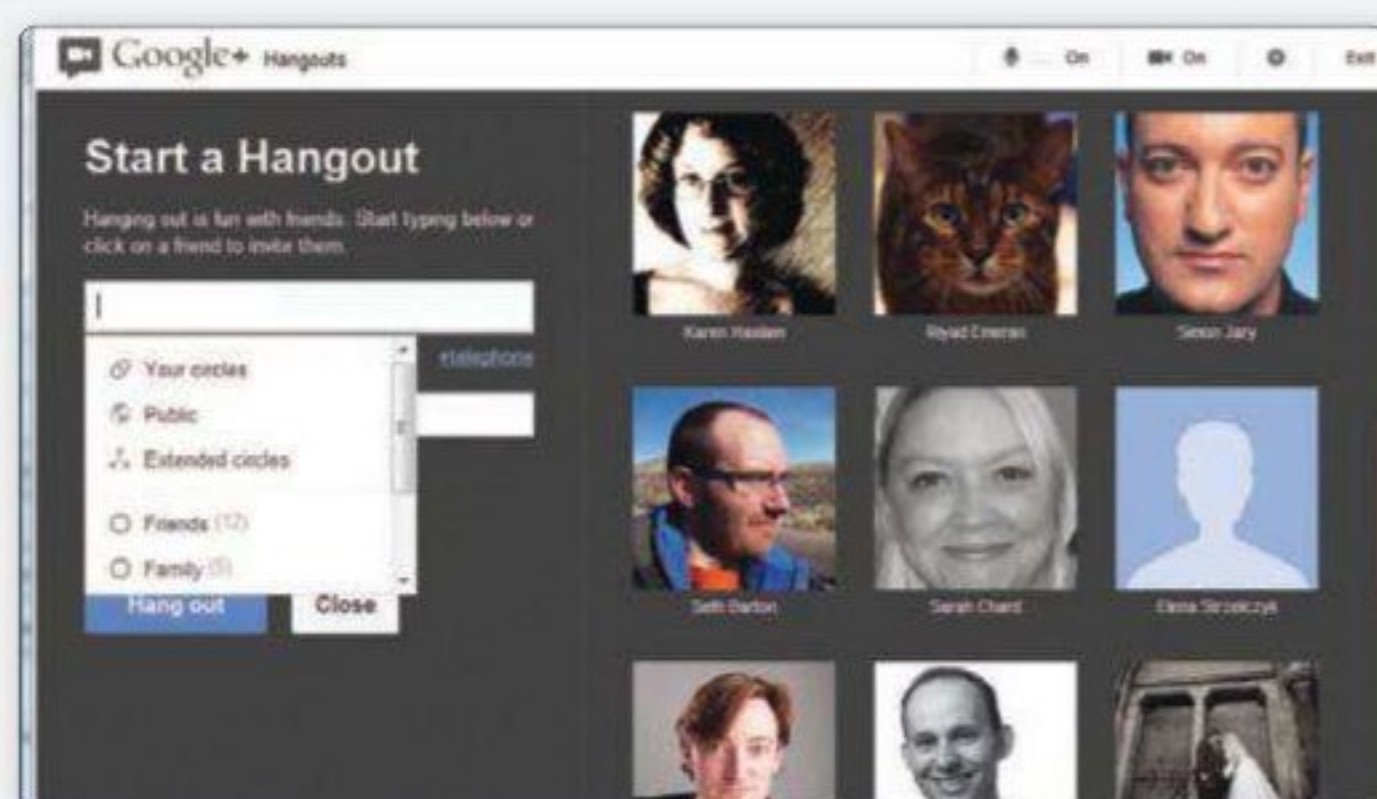
**3** It's time to write your first post. This can be a text-only update, or you can link to a website by pasting its URL into the status field. The linked website appears below the post, complete with a caption and an image.



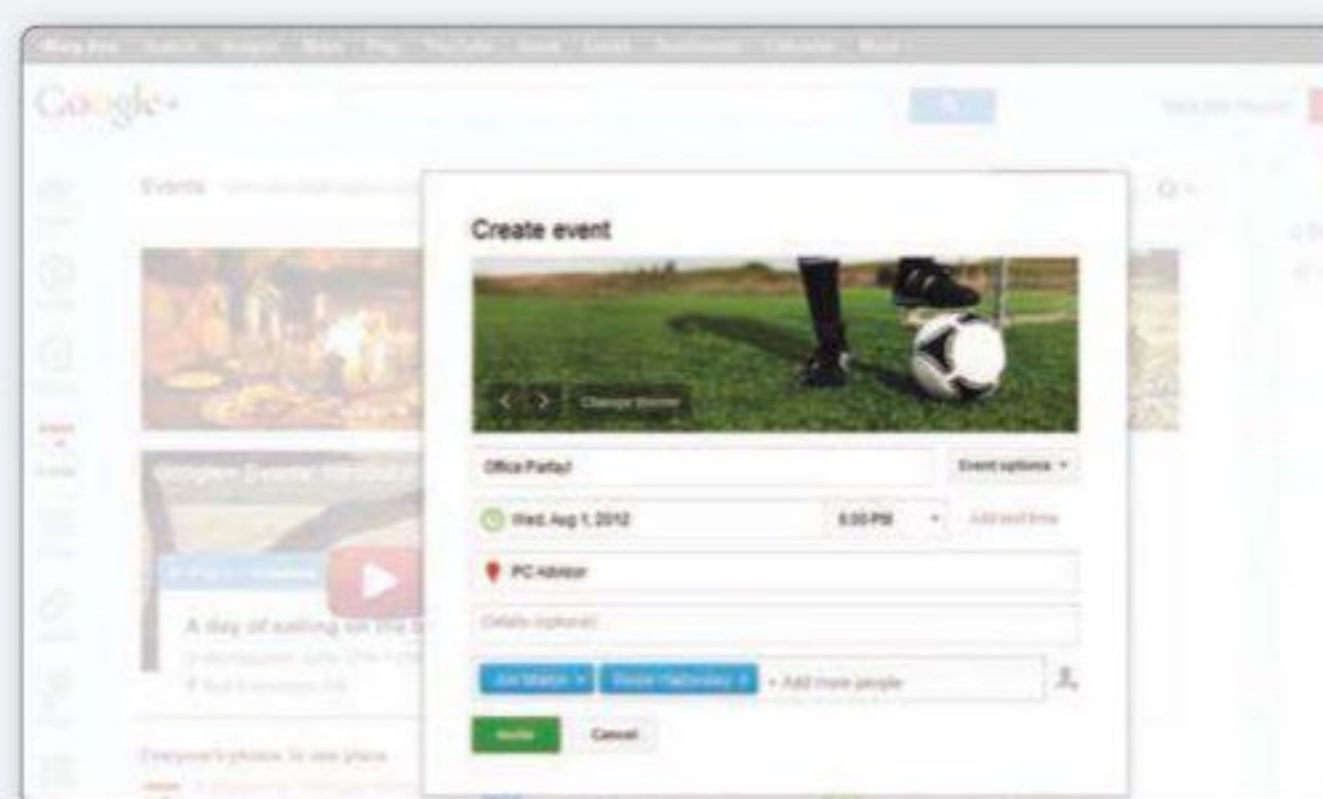
**5** If, in your excitement, you've added everybody you know with a Google+ profile, you might want to filter your news feed so that you see only what your best friends are saying. Buttons at the top of the news feed let you filter the feed by circle.



**6** Click the camera icon below 'Share what's new' to attach a photo to a post. A drop-down menu will appear; click Add photos and browse to the image on your computer. You can then tag any contacts who appear in the photo and add a caption.



**8** Click More at the bottom of the lefthand menu and choose Hangouts to begin a video chat with one or more friends. Click 'Start a Hangout', then add contacts. You can share documents, YouTube videos and screenshots, and even play games together.



**9** Click Events in the lefthand menu and choose Create Event to set up an event. You'll be able to invite circles or individual contacts in the window that pops up, plus set a time and location, and add details. ☒



## Beginner's guide to using Twitter



Getting started with the micro-blogging site can be daunting. @mrjimmartin demystifies the world of tweeting and hashtags so you can jump onboard



With half a billion account holders, Twitter is one of the top 10 most visited websites on the internet. It's the place to go to find the latest news, as well as to chat with friends and share photos.

Many people still don't understand what Twitter's all about, though, and don't see the need for any other social network beyond Facebook. Here, we'll explain exactly what Twitter is and why you might want to use it.

Twitter is in essence a collection of short text messages known as tweets. Tweets are similar to Facebook status updates, which might tell you what friends and family were doing or feeling when they were published.

Although many people use Twitter for exactly this purpose, you can also share links to an online article or video, or attach a photo. You can also share your location.

Tweets can be only up to 140 characters long, so you must be concise to get your message across. You don't need an account to read tweets, but you will have to log in to write your own.

Not everything's done in public view, though. You can send a direct message (DM) to anyone who 'follows' you. This is a private message, which only the recipient can read.

You can follow any Twitter user without their permission, and vice versa, although it is possible to block particular members. Any tweets you write will appear in your followers' timeline, while tweets written by the people you follow will appear in yours.

Twitter is a great place to find like-minded people. Should you feel the need, it's also a better platform than Facebook for the odd spot of celeb-stalking, since their accounts are mostly genuine.

Enter a person's name or a term on which you want to gauge public opinion into the search box; both people and tweets are returned, and you can toggle between the two. Twitter uses hashtags to mark keywords in a tweet, which you'll often see at the start of TV programme, such as #bbcqt for *Question Time*. You can make up your own, but it's best to use those for which people are already searching.

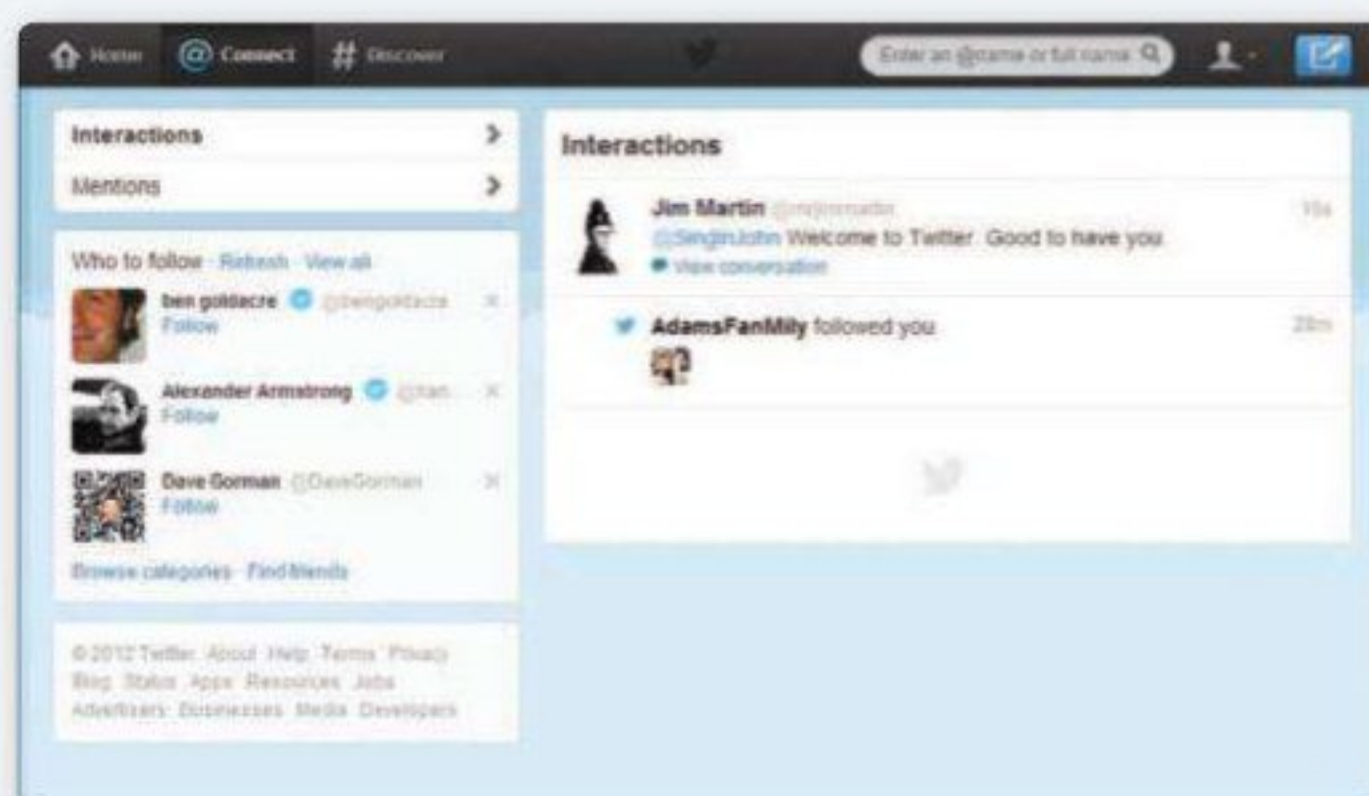
## GET STARTED WITH TWITTER



**START** Head to [twitter.com](http://twitter.com) and enter your full name, email address and a password. Choose a username in the next screen, then click 'Create my account'. Check your inbox for a confirmation email, then browse to the link it provides to sign in.



**4** When you've finished searching for people to follow, you can set about customising your profile page. Uploading a photo of yourself and entering a short Bio will help others identify you and establish whether you have any interests in common.



**7** At the top of the screen are Home, Connect and Discover links. Click Connect to see who's mentioned you in a tweet and any interactions, such as people who followed you, replied to your tweets or retweeted one of your tweets to their own followers.





**2** You can choose to either follow the introduction to Twitter now shown onscreen or skip this step. It recommends popular celebrities who have Twitter accounts; if you choose to follow them their tweets will appear in your timeline.



**3** Once you've followed a few people, Twitter will prompt you to let it find your friends by matching your email contacts to its database. Enter your email address, password and a verification code to allow Twitter access to your contacts.



**5** Click Done when you're happy with your profile. Your Twitter timeline will display onscreen, with your information at the top left and recommendations of people to follow and trending topics below. To the right is the timeline, with the latest tweets at the top.



**6** Post your first tweet by entering a message in the 'Compose new Tweet...' field. You can direct it at a particular contact by including @their name in the message. Click the Tweet button and you'll see the message appear in your timeline.



**8** Click the head icon at the top right to open a menu with more options. Here you can view and reply to direct messages, sign out and change your account settings. Settings include email notifications and the background image behind your timeline.



**9** You aren't limited to using only Twitter's own website for managing your tweets. TweetDeck is a popular alternative, while mobile apps are available for iPhone, iPad, Android, BlackBerry and Windows Phone 7. ☒



## Plan a cycle route



With technology at your disposal, it's easy to plan a great cycle route. Jim Martin explores the options on offer and shows you how to plan your next ride



If you've been inspired by Team GB's cycling success in the Olympics, you're probably thinking about digging out your bike from the shed and putting some air in its tyres.

Before you head out, though, consider using a route planner. Some allow you to find a quiet route away from busy traffic, while others can work as navigation apps during the ride.

If you have an iPhone or Android smartphone, Bike Hub is one such free app. It lets you first plan a route, then guides you along it using your phone's GPS receiver. The latest version offers circular route planning and offline map caching.

If you don't have a smartphone or don't want to risk damaging your device in the event that you take a tumble, a handful of websites can help you plan your trip before you leave home. You can then upload the route to your device or print a copy.

Whichever site you use, look for OpenCycleMap data. This is a version of OpenStreetMap designed with cyclists in mind. It highlights roads and paths that are

suitable for cycling and incorporates elevation data.

Many cycle routes are part of the National Cycle Network, which was created by the charity Sustrans. Usefully, all such routes are signposted.

An associated Complete National Cycle Network app is available for iOS and Android. It's free and allows you to store Ordnance Survey maps offline, but lacks gradient and turn-by-turn navigation data.

Another free app worth investigating is CycleStreets, which uses OpenCycleMap to help you plan a route.

If you prefer to plan a route on your PC, check out [gpsies.com](http://gpsies.com). The Track Creator can help you plan a route, or you can search for those created by others. These can be downloaded in GPX format, which most bike satnavs use.

A similar website is [bikeroutetoaster.com](http://bikeroutetoaster.com), where you can also plan, save and export routes. If you'd rather just ride a route someone else has already planned, check out [cycle-route.com](http://cycle-route.com).

Bear in mind that routing software isn't infallible; always apply a little common sense when following the route.

## MAP A CYCLE ROUTE WITH GPSIES.COM

Register at [GPSies.com](http://GPSies.com) - advantages

As a registered user you can easily manage or change your tracks. All of your private data, including your email address, will not be distributed to anyone.

Username [ A-Z, a-z, 0-9 - \_ ] \*

**BradleyWiggins**

Password \*

.....

Confirm password \*

.....

E-Mail address \*

**brad@teamgb.com**

Country

**United Kingdom**

☒ Accept Terms of Use \*

**START** Head to [gpsies.com](http://gpsies.com) and click the Login/Register link. You don't have to create an account to use the site, but doing so allows you to save the routes you plan. Enter your details, accept the terms of use, then sign into your new account.



**4** It's best to make a waypoint at each junction. If you need to follow a cycle path that isn't a road, disable Follow roads in the Settings panel until you reach the next road. Simply click the Undo button if you make a mistake.

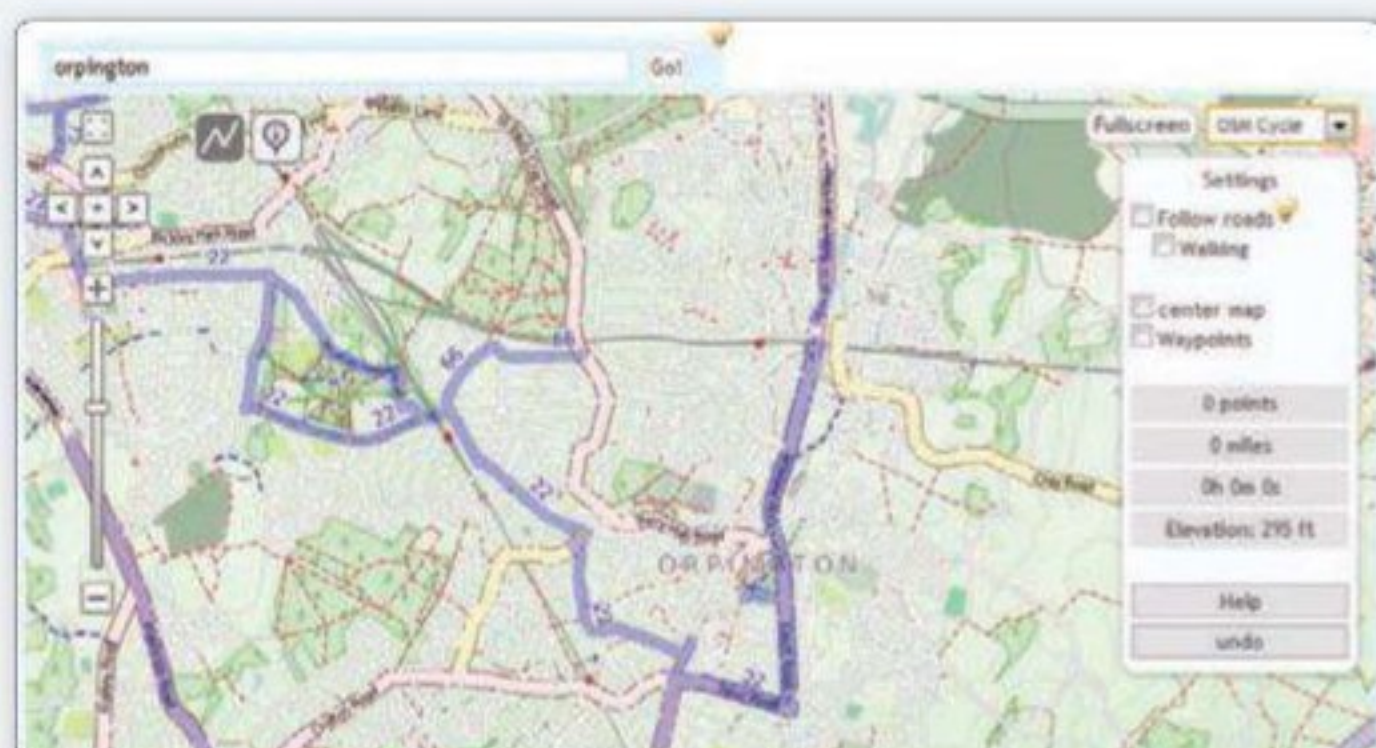
## GPS HARDWARE

If you're the type who is likely to get lost on a cycle ride, GPS hardware can be key to you having an enjoyable day. And although we've mentioned several free apps for your smartphone, there are a few down sides to using your phone on a bike.

One is the screen. As anyone who's ever tried to take a photo in sunny conditions will know, a phone's reflective screen simply isn't bright enough. You'll invariably see a reflection of yourself rather than the map you want to follow.

Two is the speaker, which is unlikely to be loud enough for you to hear voice prompts when you should take the next turn.





**2** Click the Track Creator tab at the top of the website. Enter a city or postcode, then click Go to centre the map on your start point. Select OSM Cycle in the drop-down menu to switch from using Google Maps to OpenCycleMap.



**3** Cycle routes are highlighted in blue and red. Click on the map where you want your route to start, then select Follow roads in the Settings panel. Subsequent clicks on the map will be set as waypoints.



**5** To avoid making your route too difficult, any hills that you cross are interpreted in the elevation graph to the right of the map. Meanwhile, the total distance and estimated riding time are shown in the Settings panel.



**6** Give your finished route a name, then click 'Save on GPSies'. Specify whether the route should be public, then click Save. Choose a format in which to download the route, or click Print to send it to your printer. ☒

Three, this is the UK, and your phone probably isn't waterproof. You can lock it away in a special case, of course, or use a waterproof bike mount such as the £35 Tigra (see [tinyurl.com/bp4k2pq](http://tinyurl.com/bp4k2pq)).

Four: battery life. Smartphone GPS receivers are power-hungry, as are 3G internet connections if you're downloading maps on the fly. The screen is a smartphone's biggest power drain, and you'll need it at maximum brightness to have any chance of reading it.

Dedicated bike satnavs are the best choice, but these aren't cheap at around £150 to £500. We like Garmin's Edge 800, which has a transfective screen and its battery lasts for hours and hours.





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Software editor:  
Letitia Austin  
[dvd@pcadvisor.co.uk](mailto:dvd@pcadvisor.co.uk)

## CyberGhost Premium VPN FULL PROGRAM (SIX-MONTH LICENCE)

ONLINE  
REGISTRATION  
REQUIRED

### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 208\ CyberGhost Premium VPN and open the install file

### Online registration required:

Head to [cyberghostvpn.com/pcadvisor](http://cyberghostvpn.com/pcadvisor). You must activate CyberGhost by 10 Oct 2012 to receive a six-month licence. The software will automatically revert to the free version when the subscription ends.

### System requirements

Windows XP/Vista/7;  
128MB RAM; 100MB drive  
space; 800x600 screen;  
web connection

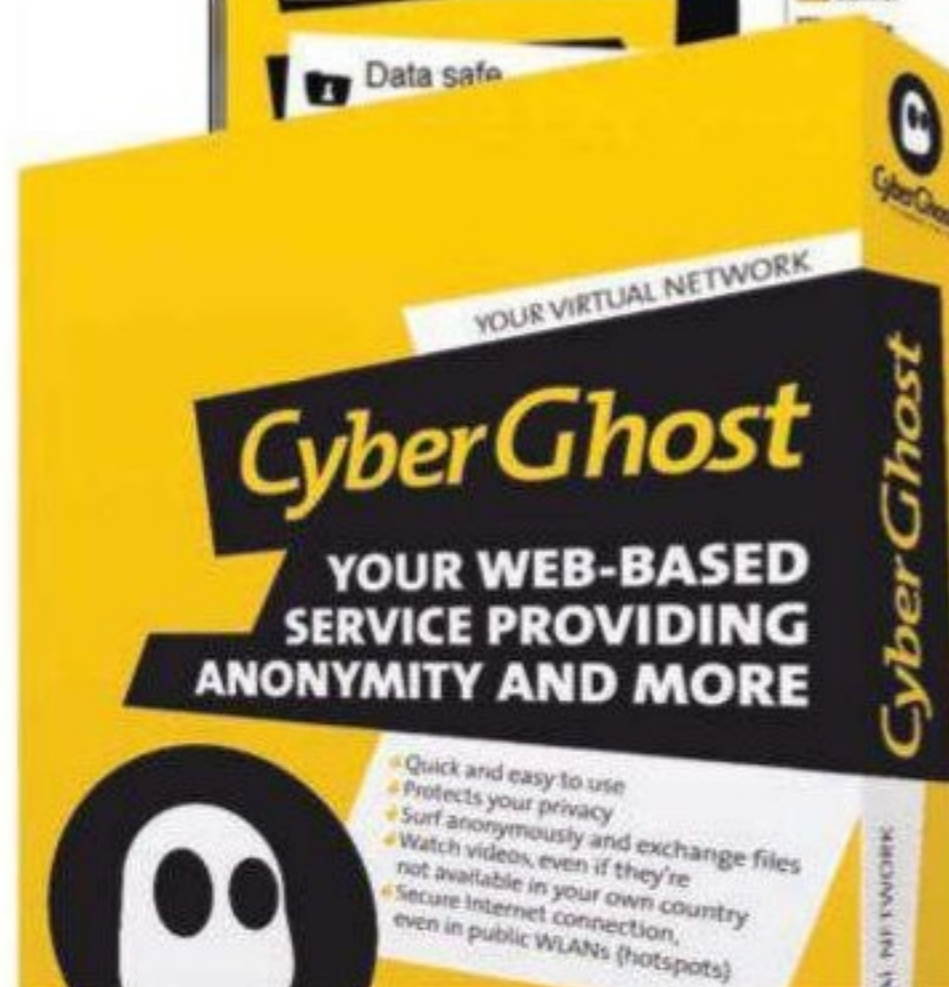
Roam the internet anonymously: PC Advisor and Europe's best-known anonymiser, CyberGhost VPN, will help you visit any web page (even the blocked ones), watch any video (even the restricted ones), and listen to any music. In short, you'll be able to get whatever you need from the world's biggest information and communication tool.

In essence, tools such as CyberGhost are virtual private network (VPN) services. CyberGhost offers a SSL-secured connection from your computer to its servers. Once connected, internet traffic is routed via the server you're logged into, allowing you to surf with security and anonymity. Strong encryption makes this software ideal for use from Wi-Fi hotspots.

CyberGhost is able to hide your identity by switching your computer's IP address with that of its server. Whatever sites you visit, videos you watch and whoever you chat with, no-one will ever know your true identity.

On the VPN itself, you're an unknown visitor of which there are thousands. Hit the web with CyberGhost, and there will never be a way to identify your presence.

CyberGhost's many powerful servers allow you to get online at speeds of up to 6Mbps. It has hardware in several countries worldwide, allowing you to disguise your nationality. ☒



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## Abelssoft JetDrive 5.0 Professional

### FULL PROGRAM

**ONLINE  
REGISTRATION  
REQUIRED**

#### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 208\Abelssoft JetDrive 5 Professional and open the install file

**Online registration required:** follow the links during installation.

#### System requirements

Windows XP/Vista/7;  
512MB RAM; 1024x768  
screen resolution; web  
connection

Do you remember when you bought your PC and everything ran quickly? When applications opened almost instantly? You can regain this lost speed with Abelssoft JetDrive 5.0 Professional.

The arrangement of files on your hard drive becomes more and more chaotic over time, with fragments of individual files spread out across the disk. Your PC has to look up and piece together the individual fragments each time you try to access a file or application stored there, which inevitably takes time. JetDrive Pro defragments your drive and restores it to an optimal state.

This easy-to-use disk-optimisation and -defragmentation suite can not only defrag a hard drive, but it offers a number of features that can further improve a system's efficiency. For example, it



can defragment the Windows Registry, resulting in a significant performance boost for many systems.

If you're short on time and need a quick fix, the Fast Defrag function can defragment only the core system files. It takes just five minutes to complete,

but can result in a 90 percent performance improvement.

JetDrive can also check the hard drive for errors, and optionally remove any junk or temporary files. The software can be configured to run automatically or on-demand. ☒

## Serif WebPlus Starter Edition 3.0

### FULL PROGRAM

**PHONE  
REGISTRATION  
REQUIRED**

#### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 208\Serif WebPlus Starter Edition and open the install file

#### Phone registration required:

FreePhone  
UK: 0800 376 5467  
US: 1-88-644-2766  
ROI: 1-800-646 515  
International:  
+44 115 914 5479  
Quote the registration  
code and installation  
number displayed in  
the Registration Wizard

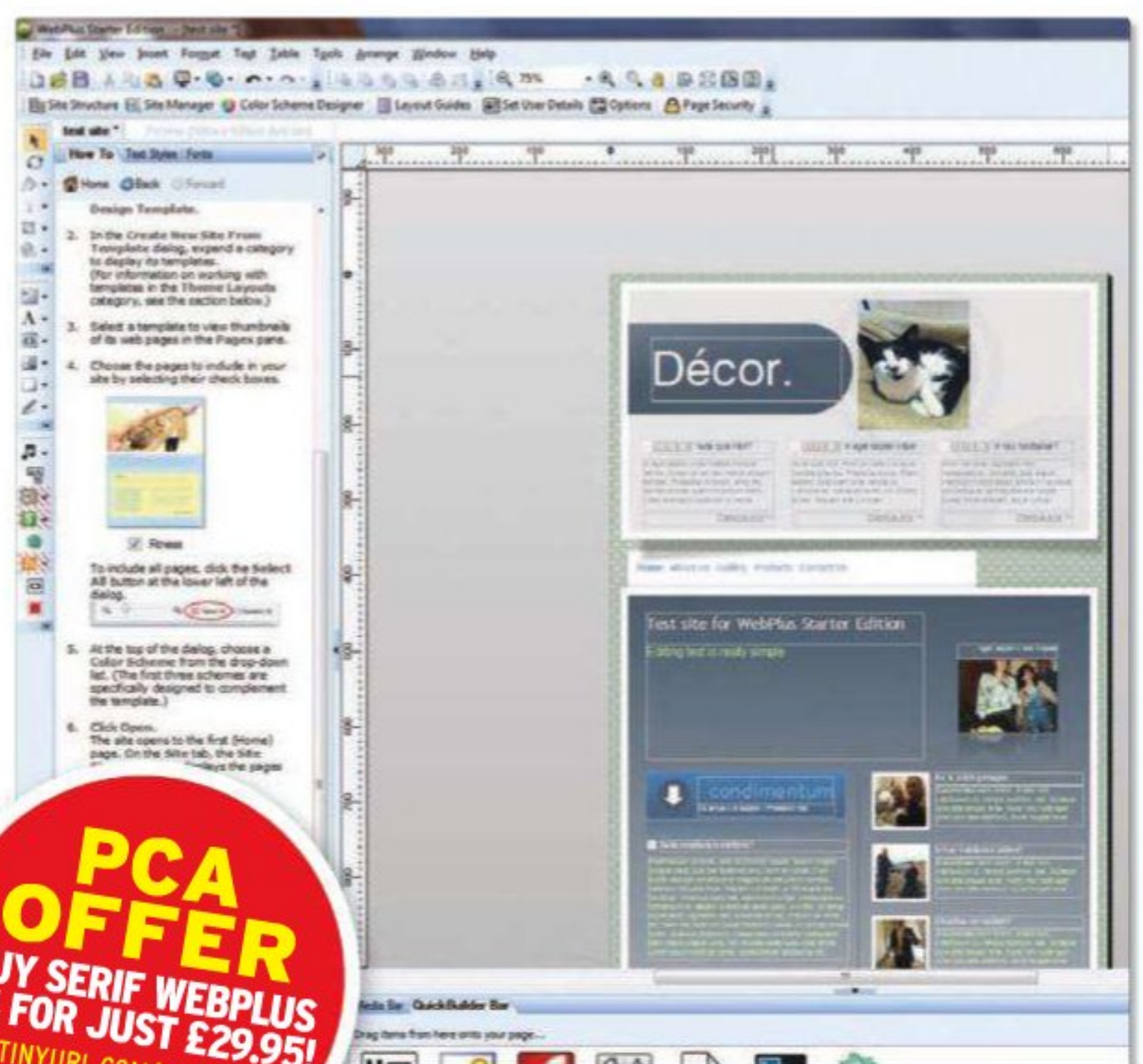
#### System requirements

Windows XP/Vista/7;  
512MB RAM; 100MB  
hard-disk space

Use WebPlus Starter Edition to design great-looking websites for businesses, organisations, clubs, societies and individuals.

If you've ever wanted to design a website but have been put off by the thought of HTML coding and technical jargon, WebPlus offers an ideal solution. Its DTP-style approach to web publishing lets you create stunning websites without any programming knowledge.

With WebPlus Starter Edition, creating and publishing a website couldn't be easier. Choose to design a site from scratch or use an easily customisable template, then add interactive content in minutes. ☒





# Auslogics File Recovery 3.2

## FULL PROGRAM (SIX-MONTH LICENCE)



### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 208\ Auslogics Recovery 3.2 and open the install file

**Online registration required:** follow the links during installation. Offer ends 10 Oct 2012.

### System requirements

Windows XP/Vista/7; 512MB RAM; 25MB drive space

Auslogics File Recovery can restore any file from any media device or operating system. Don't give up hope on your data - start recovering your deleted documents, photos and other important files now!

File Recovery uses advanced techniques that make it possible to recover your files even when they've been damaged by a virus or spyware, or are located on a damaged or deleted partition of your hard drive.

All you need to do is follow the prompts of the Recovery Wizard. Flexible search options minimise file-recovery time - you can specify the drive on which the file was



located and the file type, and filter the results by the date last modified, all files within a given time frame, or simply by file name.

You can also preview photos, videos, documents and PDFs within the program, which is helpful when the file you need is poorly labelled. ☒

# Ashampoo Music Studio 2012

## FULL PROGRAM



### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 208\ Ashampoo Music Studio 2012 and open the install file

**Online registration required:** follow the links during installation.

### System requirements

Windows XP/Vista/7; 512MB RAM; 128MB drive space; Internet Explorer 6.0 or later

Ashampoo Music Studio 2012 can burn, rip, edit and repair your digital audio files. Its clean interface offers all the music-editing functions you'll ever need.

A built-in Cover Editor enables you to create disc labels and jewel case inserts. ☒



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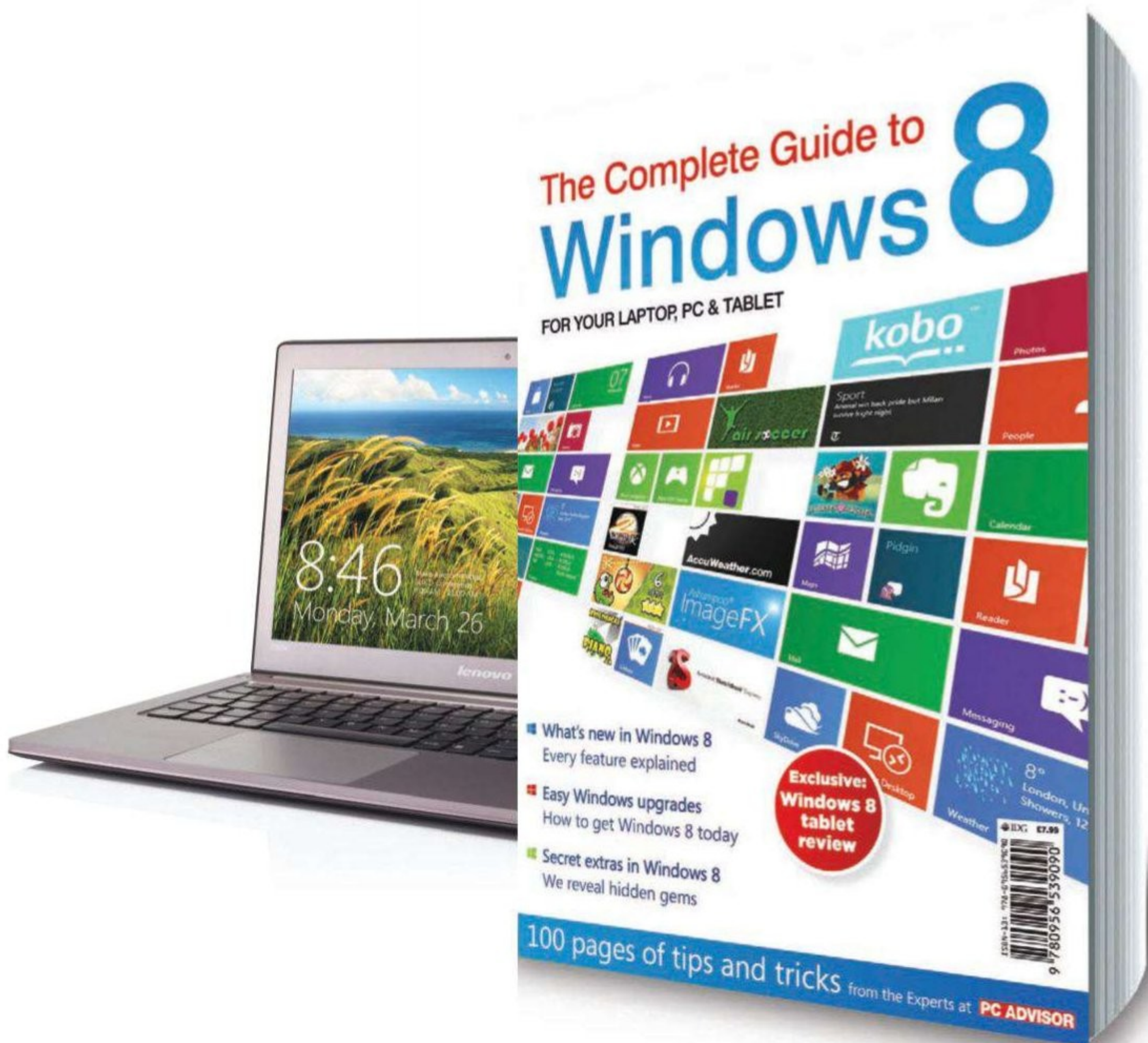


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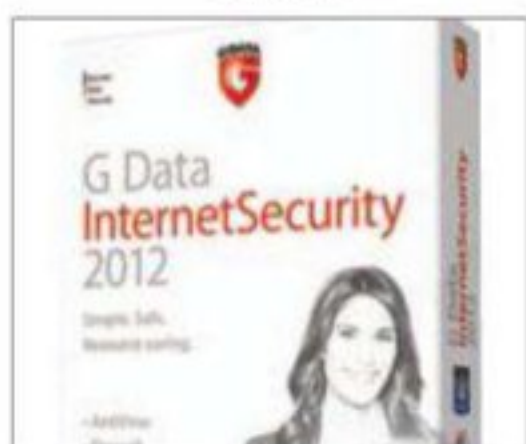
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Ultraportable laptops					
	1  PC ADVISOR BEST BUY	2  PC ADVISOR RECOMMENDED	3  PC ADVISOR RECOMMENDED	4 	5 
	Apple MacBook Air 11in	Samsung 900X4C	Asus Zenbook UX31E-DH53	Toshiba Satellite Z830-10U	HP Envy Ultrabook 6-1010ea
Price	£849 inc VAT	£1,299 inc VAT	£999 inc VAT	£899 inc VAT	£699 inc VAT
Website	Apple.com/uk	Samsung.com/uk	Uk.asus.com	Toshiba.co.uk	Hp.com/uk
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	1.7GHz Intel Core i5-3317U	1.7GHz Intel Core i5-3317U	1.8GHz Intel Core i7-2677M	1.6GHz Intel Core i5-2467M	1.7GHz Intel Core i5-3317U
RAM	2GB DDR3	8GB DDR3	4GB DDR3	6GB DDR3	4GB DDR3
Storage	64GB SSD	128GB SSD	256GB SSD	128GB SSD	500GB hard drive
Screen size	11.6in	15in	13.3in	14in	15.6in
Screen resolution	1366x768 pixels	1600x900	1600x900	1366x768 pixels	1366x768 pixels
Graphics	Intel HD Graphics 4000	Intel HD Graphics 4000	Intel HD Graphics 3000	Intel HD Graphics 3000	Intel HD Graphics 4000
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n	802.11a/b/g/n	802.11b/g/n	802.11a/b/g/n	802.11a/b/g/n
Ethernet	100Mbps with USB adaptor	Gigabit	N/A	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 1x USB 2.0	1x USB 3.0, 2x USB 2.0	2x USB 3.0, 1x USB 2.0
FireWire	x	x	x	x	x
Thunderbolt	✓	x	x	x	x
DisplayPort	✓	x	x	x	x
HDMI	x	✓ (Micro HDMI)	✓	✓	✓
DVI	x	x	x	x	x
VGA	x	x	✓	✓	x
eSATA	x	x	x	x	x
Media card slot	x	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Speakers, headphone jack	Speakers, headphone jack
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam, multitouch trackpad, backlit keyboard	Webcam	Webcam	Webcam	Webcam, Kensington lock slot
Operating system	Mac OS X 10.7 Lion	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit
Bundled software	iLife 11	Samsung Recovery Solution	None	None	None
Fear (Max detail)	28fps	28	Not tested	16fps	20fps
Battery	35Wh lithium-ion	62Wh lithium-ion	50Wh lithium polymer	46Wh lithium-ion	59Wh lithium-ion
Battery life	6 hrs 10 mins	8 hrs 3 mins	7 hrs 17 mins	6 hrs 10 mins	7 hrs 6 mins
WorldBench 6 score	129	125	119	106	112
Dimensions	300x192x17mm	375x237x15mm	326x223x18.1mm	316x227x16mm	374x253x20.5mm
Weight	1.07kg	1.67kg	1.4kg	1.09kg	2.07kg
Warranty	1 year return-to-base	1 year return-to-base	1 year return-to-base	1 year return-to-base	1 year return-to-base
Verdict	<ul style="list-style-type: none"> <li>Reasonable price tag</li> <li>Very light and compact</li> <li>Strong performance for size</li> <li>Good graphics</li> <li>Great build quality</li> </ul>	<ul style="list-style-type: none"> <li>Sleek and stylish</li> <li>Good matt screen</li> <li>Comparatively fast</li> <li>Great battery life</li> <li>Lots of memory</li> </ul>	<ul style="list-style-type: none"> <li>Superb design</li> <li>Nice range of connectors</li> <li>Impressive battery life</li> <li>MacBook Air is faster and has a better display</li> </ul>	<ul style="list-style-type: none"> <li>Highly portable</li> <li>Rather fragile</li> <li>Poor gaming speed</li> <li>Usable keyboard</li> <li>Only 128GB storage</li> </ul>	<ul style="list-style-type: none"> <li>Good-looking laptop</li> <li>Decent sound quality</li> <li>Slow processor</li> <li>Poor gaming option</li> <li>Reflective screen</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/CCPOANM">TINYURL.COM/CCPOANM</a>	<a href="http://TINYURL.COM/6VZ5TOG">TINYURL.COM/6VZ5TOG</a>	<a href="http://TINYURL.COM/6PG68Z3">TINYURL.COM/6PG68Z3</a>	<a href="http://TINYURL.COM/7WTKM8G">TINYURL.COM/7WTKM8G</a>	<a href="http://TINYURL.COM/8JF3YJG">TINYURL.COM/8JF3YJG</a>

## >> Buying advice



### Ultraportable laptops

Apple's MacBook Air sets the standard for thin-and-light laptops, which are usually referred to as Ultrabooks or ultraportable laptops.

Most run fast and silent SSDs for storage, which can partly explain their higher retail price, but some manufacturers are now fitting slim 7mm hard disks.

All Ultrabooks run Intel CPUs (AMD variants are known as Sleekbooks), often a low-power version identifiable by its U suffix. The 1.7GHz Intel Core i5-3317U is a popular example.

Beware of cheap glossy panels with poor contrast and colour gamut and, if possible, judge in person the screen quality and viewing angles before you buy.

Ports are limited due to space constraints, but look for built-in ethernet or dongles that allow full-size ports to be connected.

A smaller chassis also means a smaller, often non-removable battery. Expect five hours of life.

There's no room for an optical drive, but you can always connect an external USB version.

READ MORE: [TINYURL.COM/CEAHEZK](http://TINYURL.COM/CEAHEZK)



<div> <div>£501-£1,000 laptops</div> <div> <div>1</div> <div>PC ADVISOR BEST BUY</div> </div> <div>2</div> <div>PC ADVISOR RECOMMENDED</div> <div>3</div> <div>4</div> <div>5</div> </div>					
	Lenovo G570	Dell XPS 14z	Dell Inspiron 15R 5520	HP Pavilion dv7-6101sa	Lenovo IdeaPad Z580
Price	£596 inc VAT	£949 inc VAT	£579 inc VAT	£700 inc VAT	£699 inc VAT
Website	Lenovo.com/uk	Dell.co.uk	Dell.co.uk	Hp.com/uk	Lenovo.com/uk
Build rating	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★★☆
Processor	2.5GHz Intel Core i5-2450M	2.8GHz Intel Core i7-2640M	2.5GHz Intel Core i5-3210M	2.1GHz AMD A4-3310MX	2.1GHz Intel Core i7-3612QM
RAM	6GB DDR3	8GB DDR3	4GB DDR3	6GB DDR3	8GB DDR3
Storage	750GB hard drive	750GB hard drive	1TB hard drive	1TB hard drive	1TB hard drive
Screen size	15.6in	14in	15.6in	17.3in	15.6in
Screen resolution	1366x768 pixels	1366x768	1366x768	1600x900	1366x768
Graphics	AMD Radeon HD 6370M	nVidia GeForce GT 520M	Intel HD Graphics 4000	AMD Radeon HD 6515G2	nVidia GeForce GTX 630M
Video memory	1GB	1GB	N/A	1GB	2GB
Wireless	802.11b/g/n	802.11a/b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	4x USB 2.0	1x USB 3.0, 1x USB 2.0	1x USB 3.0, 1x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 2x USB 2.0
FireWire	×	×	×	×	×
Thunderbolt	×	×	×	×	×
DisplayPort	×	✓	×	×	×
HDMI	✓	✓	✓	✓	✓
DVI	×	×	×	×	×
VGA	✓	×	✓	✓	✓
eSATA	×	×	×	×	×
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Stereo speakers, built-in mic	Headphones, speakers, mic	Stereo speakers, built-in mic
Optical drive	2x BD-ROM, 8x DVD±R, 4x DVD±RW, 8x DVD-ROM	8x DVD±R, 6x DVD-RW, 8x DVD+RW	8x DVD±R drive	8x DVD±R drive	BD-ROM, 8x DVD±R drive
Extras	Webcam	Webcam	Webcam	Webcam, fingerprint reader	None
Operating system	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit
Bundled software	None	None	InterVideo WinDVD 8.0	None	PowerDVD 10
Fear (Max detail)	32fps	46fps	20fps	46fps	79fps
Battery	48Wh lithium-ion	58Wh lithium-ion	48Wh lithium-ion	60Wh lithium-ion	48Wh lithium-ion
Battery life	5 hrs 1 min	6 hrs 46 mins	6 hrs 24 mins	5 hrs 6 mins	5 hrs 49 mins
WorldBench 6 score	96 (with an i3 processor)	143	150	84	153
Dimensions	377x250x35mm	335x234x23.8mm	378x252x35mm	416x275x35mm	376x245x35mm
Weight	2.6kg	2.1kg	2.75kg	3.1kg	2.44kg
Warranty	1 year return-to-base	1 year return-to-base	1 year limited	1 year return-to-base	1 year return-to-base
Verdict	<ul style="list-style-type: none"> <li>• Superb price</li> <li>• Blu-ray drive</li> <li>• Good overall performance</li> <li>• Some gaming capability</li> <li>• Now has a Core i5 CPU</li> </ul>	<ul style="list-style-type: none"> <li>• Modern and stylish looks</li> <li>• Impressive battery life</li> <li>• Good features for money</li> <li>• Plenty of memory</li> <li>• Screen suffers from glare</li> </ul>	<ul style="list-style-type: none"> <li>• Good value for money</li> <li>• Screen a little too glossy and has poor viewing angles</li> <li>• Disappointing graphics</li> <li>• Questionable build quality</li> </ul>	<ul style="list-style-type: none"> <li>• Poor overall performance</li> <li>• Graphics performance is much better</li> <li>• Large and heavy</li> <li>• Vast 17in screen</li> </ul>	<ul style="list-style-type: none"> <li>• Blu-ray playback</li> <li>• Strong overall performance</li> <li>• Stylish casing</li> <li>• Good complement of RAM</li> <li>• Screen a little too glossy</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/6FZZ4XE">TINYURL.COM/6FZZ4XE</a>	<a href="http://TINYURL.COM/6P2AVFP">TINYURL.COM/6P2AVFP</a>	<a href="http://TINYURL.COM/6V8CS84">TINYURL.COM/6V8CS84</a>	<a href="http://TINYURL.COM/79DS9U6">TINYURL.COM/79DS9U6</a>	<a href="http://TINYURL.COM/92GOLXY">TINYURL.COM/92GOLXY</a>

## >> Buying advice



### £501-£1,000 laptops

If you're prepared to pay more than £500, you can get a laptop with a better selection of internal components, a higher-quality build, and faster performance.

Most laptops at this price have 15.6in widescreen displays, but beware of budget panels with a coarse resolution - 1366x768 pixels is wide, but creates fuzzy text and

images. Look for anti-glare matt panels over glossy screens.

Intel introduced its third-gen Core chips in 2012, aka Ivy Bridge, which offer integrated GPUs capable of half-decent gameplay. You'll also find 2011's Sandy Bridge chips, identifiable by a leading 2 rather than 3 on the part number.

Battery life can stretch to six hours, but don't take it as a given.

Expect at least one USB 3.0 port, which allows for faster data transfer with compatible peripherals. Gigabit ethernet is now standard, and you may find even faster ports such as eSATA or Thunderbolt at this price.

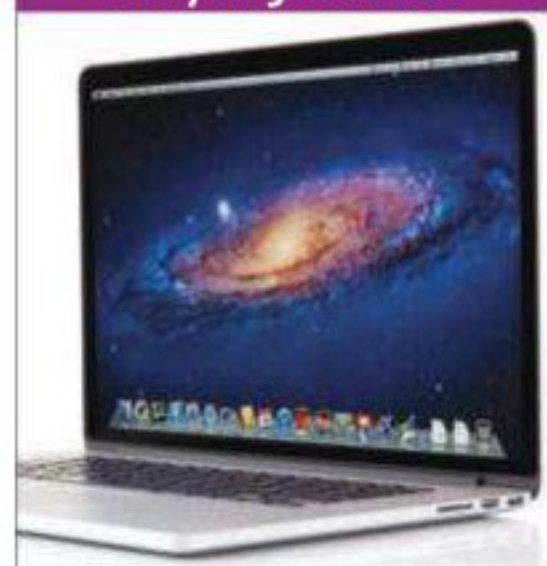
Look for 4GB of RAM, and an SSD if you don't mind offloading media files to external storage.

**READ MORE:** [TINYURL.COM/BUHSEAR](http://TINYURL.COM/BUHSEAR)



£1,001+ laptops					
	1	2	3	4	5
	Apple MacBook Pro Retina	Alienware M14x	Dell Latitude E6420 ATG	Rock Xtreme X685-i5-2540M	Toshiba Qosmio X870-11Q
Price	£1,799 inc VAT	£1,398 inc VAT	£1,293 inc VAT	£1,229 inc VAT	£1,699 inc VAT
Website	Apple.com/uk	Alienware.co.uk	Dell.co.uk	Rockdirect.com	Toshiba.co.uk
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.3GHz Intel Core i7-3615QM	2.66GHz Intel Core i7-3720QM	2.8GHz Intel Core i7-2640M	2.6GHz Intel Core i5-2540M	2.3GHz Intel Core i7-3610QM
RAM	8GB DDR3L	8GB DDR3	4GB DDR3	6GB DDR3	16GB DDR3
Storage	128GB SSD	64GB SSD, 500GB HDD	128GB SSD	500GB hard drive	128GB SSD + 1TB hard drive
Screen size	15.4in	14.1in	14in	15.6in	17.3in
Screen resolution	2880x1800	1600x900	1366x768 pixels	1920x1080 pixels	1920x1080 pixels
Graphics	nVidia 650M, Intel HD 4000	nVidia GeForce GT 650M	Intel HD Graphics 3000	AMD Radeon HD 6990	nVidia GeForce GTX 670M
Video memory	1GB	1GB	N/A	2GB	3GB
Wireless	802.11a/b/g/n	802.11b/g/n	802.11a/b/g/n	802.11a/b/g/n	802.11b/g/n
Ethernet	x	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0, 1x USB 2.0	3x USB 2.0	2x USB 3.0, 2x USB 2.0	4x USB 3.0
FireWire	x	x	x	x	x
Thunderbolt	✓ (2)	x	x	x	x
DisplayPort	✓	✓	x	x	x
HDMI	✓	✓	✓	✓	✓
DVI	x	x	x	✓	x
VGA	x	✓	✓	x	✓
eSATA	x	x	✓	✓	x
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, Toslink out	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	2x Harman Kardon speakers
Optical drive	N/A	8x DVD±R, 2.4x DVD-RW, 4x DVD+RW, 8x DVD-ROM	8x DVD±R, 2.4x DVD-RW, 4x DVD+RW, 8x DVD-ROM	6x BD-ROM, 8x DVD±R, 2.4x DVD-RW, 4x DVD+RW	BD-RE/DVD±RW DL
Extras	HD webcam, multitouch trackpad, backlit keyboard	N/A	Webcam, fingerprint reader	Webcam, fingerprint reader	HD 3D webcam, Kensington lock slot
Operating system	Mac OS X 10.7.4 Lion	Windows 7 Home Prem 64bit	Windows 7 Pro 32bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit
Bundled software	iLife 11	None	None	None	Toshiba Blu-ray Disc Player
Fear (Max detail)	N/A	84fps	17fps	275fps	205fps
Battery	99Wh lithium-polymer	63Wh lithium-ion	60Wh lithium-ion	76Wh lithium-ion	47Wh lithium-ion
Battery life	N/A	5 hrs 7 mins	6 hrs 24 mins	2 hrs 30 mins	2 hrs 18 mins
WorldBench 6 score	N/A	168	155	124	170
Dimensions	359x247x18mm	337x258x38mm	352x241x35mm	376x256x43mm	417x272x43.7mm
Weight	2.02kg	2.9kg	2.7kg	3.1kg	3.45kg
Warranty	1 year return-to-base	1 year in-home support	3 years onsite	3 years onsite	1 year carry-in
Verdict	<ul style="list-style-type: none"> <li>Gorgeous super-resolution Retina display</li> <li>Outstanding build quality</li> <li>Wonderfully light and slim</li> <li>Effortless to use</li> </ul>	<ul style="list-style-type: none"> <li>Great gaming system</li> <li>Stunning WorldBench score</li> <li>Cool looks</li> <li>Glossy screen can be difficult to read</li> </ul>	<ul style="list-style-type: none"> <li>Rugged build quality</li> <li>Fantastic general speed</li> <li>Lacklustre for gaming</li> <li>Long battery life, given the performance</li> </ul>	<ul style="list-style-type: none"> <li>Great performance</li> <li>2GB AMD Radeon graphics</li> <li>Incredible gaming machine</li> <li>Very poor battery life</li> <li>Wonderful glare-free screen</li> </ul>	<ul style="list-style-type: none"> <li>Desktop-replacement model</li> <li>Huge 16GB of RAM</li> <li>Poor build quality</li> <li>Active-shutter 3D tech</li> <li>Good for gaming</li> </ul>
FULL REVIEW	TINYURL.COM/7YGC3KJ	TINYURL.COM/CLGSCMV	TINYURL.COM/CBA725B	TINYURL.COM/BTZSQ97	TINYURL.COM/C3F8XP2

## >> Buying advice



### £1,001+ laptops

Invest £1,000 or more in a laptop, and you can be reasonably sure of getting a high-quality PC.

Sometimes that money will be spent on getting a thin-and-light laptop, with good performance to boot. Alternatively, you may prefer a rugged laptop that's able to withstand wear and tear on the road, or a performance-first

high-powered workstation.

Whatever your need, accept no compromises in build quality.

The best laptops should offer very good screens. Beware of glossy shiny panels that allow distracting reflections in certain lighting conditions.

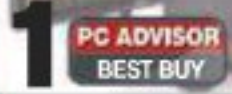



Ultratables may have 256GB or more of solid-state storage, but won't have an optical drive or GPU.

Workstation laptops will have faster - often quad-core - CPUs and a mobile graphics processor.

Rugged laptops are engineered for strength, at the expense of light weight and sleek design. Look out for milspec standard ratings, such as MIL-STD-810G.

You'll find a wide range of ports, high-grade components and extras. [READ MORE: TINYURL.COM/CC3KBMM](http://tinyurl.com/cc3kbmm)



Gaming PCs					
	 1	 2	 3	 4	 5
	Yoyotech Warbird 3570XTA	Arbico Elite 5357 0CX	Dino PC Maxosaurus 3570K	CyberPower Fang III Rattler	Vibox Juggernaut XL
Price	£1,149 inc VAT	£1,200 inc VAT	£1,399 inc VAT	£1,399 inc VAT	£1,499 inc VAT
Website	Yoyotech.co.uk	Arbico.co.uk	Dinopc.com	Cyberpowersystem.co.uk	Vibox.co.uk
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	3.4GHz (4.5GHz) Intel Core i5-3570K	3.4GHz (4.4GHz) Intel Core i5-3570K	3.4GHz (4.4GHz) Intel Core i5-3570K	3.4GHz (4.5GHz) Intel Core i5-3570K	3.4GHz (4.4GHz) Intel Core i5-3570K
CPU cooler	Arctic Freezer cooler	Xigmatek Gaia	Xigmatek Prime SD1484	Advanced water cooling	Corsair Hydro H60
Memory	8GB DDR3	16GB DDR3	16GB DDR3	8GB DDR3	16GB DDR3
Storage	120GB SSD + 2TB 3.5in HDD	120GB SSD + 2TB 3.5in HDD	60GB SSD + 1TB 3.5in HDD	128GB SSD + 1TB 3.5in HDD	120GB SSD + 1TB 3.5in HDD
Power supply	550W OCZ	580W Xilence	700W Xigmatek	650W Cooler Master GX650W	700W Corsair
Motherboard	Asus P8Z77-V LX	Asus P8Z77-V LX	Asus P8Z77-V	Asus P8Z77-V Pro	Gigabyte GA-Z77X-D3H
USB	3x USB 3.0, 5x USB 2.0	4x USB 3.0, 12x USB 2.0	6x USB 3.0, 2x USB 2.0	6x USB 3.0, 3x USB 2.0	6x USB 3.0, 4x USB 2.0
Screen	23.6in Asus VS247H (1920x1080)	Not supplied	23.6in Asus VS247H (1920x1080)	Not supplied	24in BenQ G2420HDBL (1920x1080)
Graphics	2GB PNY GeForce GTX 670	2GB Palit GeForce GTX 680	2GB Zotac GeForce GTX 670	2GB Palit GeForce GTX 670	2GB EVGA GeForce GTX 670
Sound	Onboard	Onboard	Asus Xonar DGX PCIe	Onboard	Onboard
Connectivity	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet, 802.11b/g/n	Gigabit ethernet, 802.11b/g/n	Gigabit ethernet, 802.11b/g/n
VGA	x	x	x	x	x
DVI	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)
HDMI	✓	✓	✓	✓	✓
DisplayPort	✓	✓	✓	✓	✓
FireWire	x	x	x	x	x
eSATA	x	✓	x	x	✓
Case	Gigabyte Luxo X10	CIT Jupiter	Corsair Carbide 300R	Azza Fusion 3000	Cooler Master CM 690 II Lite
Keyboard & mouse	Microsoft Wired Desktop 400	Not supplied	Razer Arctosa, Gigabyte M8000X	Not supplied	Razer Lycosa, Razer Death Adder Re-Spawn
Optical drive	BD-ROM/DVD+/-RW	BD-ROM/DVD+/-RW	BD-ROM/DVD+/-RW	BD-ROM/DVD+/-RW	BD-ROM/DVD+/-RW
Operating system	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit
Extras	None	None	None	Microsoft Office 2010 Starter	Three free game downloads from Steam
WorldBench 6 score	209	214	213	205	200
Gaming performance <sup>1</sup>	106/68/53/111fps	110/75/57/118fps	102/67/52/110fps	105/66/51/109fps	106/68/53/110fps
MediaEspresso time	4 mins 3 secs	4 mins 1 sec	4 mins 13 secs	Not tested	4 mins 1 sec
Power Consumption <sup>2</sup>	89W/185W	63W/192W	83W/194W	98W/160W	61W/182W
Warranty	3-year RTB (labour)	2-year RTB (labour)	3-year RTB (2yr parts, labour)	3-year RTB (labour)	3-year RTB (labour), 3m C&R
Verdict	<ul style="list-style-type: none"> <li>• Low price</li> <li>• Very good performance</li> <li>• GTX 670 graphics card isn't the fastest on offer</li> <li>• Only 8GB of RAM</li> </ul>	<ul style="list-style-type: none"> <li>• High WorldBench score</li> <li>• GTX 680 ensures excellent games speed</li> <li>• Limited motherboard</li> <li>• Strong storage capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Strong general performance</li> <li>• Keyboard and mouse are proper gaming models</li> <li>• Graphics card only an nVidia GTX 670</li> <li>• Sound card a cut above onboard solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Water-cooled system</li> <li>• Premium motherboard</li> <li>• Easy-swap drive bays</li> <li>• Performance could be better, given the water-cooling capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• WorldBench score is comparatively low</li> <li>• Not the cheapest price tag</li> <li>• Flat-panel stretches to 24in</li> <li>• Keyboard and mouse above average</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/7KPQCY6">TINYURL.COM/7KPQCY6</a>	<a href="http://TINYURL.COM/7CL6865">TINYURL.COM/7CL6865</a>	<a href="http://TINYURL.COM/6RSJEY2">TINYURL.COM/6RSJEY2</a>	<a href="http://TINYURL.COM/BSC6RB2">TINYURL.COM/BSC6RB2</a>	<a href="http://TINYURL.COM/76QWZKK">TINYURL.COM/76QWZKK</a>

<sup>1</sup>Tested in Crysis at 1080p, High (no AA)/V High (no AA)/V High (16x AA)/Stalker: Call of Pripyat at 1080p, Ultra <sup>2</sup>Tested when idle and in Crysis

## >> Buying advice



## Gaming PCs

Changes in exchange rates and component supply issues mean we can't guarantee PCs listed here will be available as specified. All our prices include delivery charges.

Gaming PCs put performance and upgradability before subtlety and quiet operation. Many run overclocked CPUs to eke out every bit of available speed.

Intel's Core i5-2500K is a popular choice of CPU, but will require a decent cooler and beefy PSU. The HyperThreaded i7-2600K is slightly faster, but dearer.

Cooling is essential for stability. Liquid-cooling systems, dust filters, fan-speed controls and good cable-management can aid airflow.

Most important of all is the graphics card; vendors will often





skimp on storage, networking and other features and throw all their budget at the graphics card.

AMD's Radeon HD 7970 delivers unparalleled performance - but at a price. Cheaper solutions include the nVidia GeForce GTX 560 Ti.

Look for wired peripherals and a headset. Good warranty terms are crucial for overclocked PCs.

READ MORE: [TINYURL.COM/CZXH443](http://TINYURL.COM/CZXH443)



Media PCs	 1 PC ADVISOR BEST BUY	 2 PC ADVISOR RECOMMENDED	 3 PC ADVISOR RECOMMENDED	 4 PC ADVISOR RECOMMENDED	 5 PC ADVISOR RECOMMENDED
	Chillblast Fusion Vacuum Mini	Apple Mac mini	Quiet PC Streamcom FC5-Z77	Tranquil PC Media One	Quiet PC Zeno NT-H67
Price	£999 inc VAT	£896 inc VAT	£1,491 inc VAT	£1,009 inc VAT	£1,444 inc VAT
Website	Chillblast.com	Apple.com/uk	Quietpc.com	Tranquilpc.co.uk	Quietpc.com
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.1GHz Intel Core i5-3450S	2.53GHz Intel Core i5-2520M	2.5GHz Intel Core i7-3770T	2.5GHz Intel Core i3-2100T	3.3GHz Intel Core i3-2125
RAM	8GB DDR3	4GB DDR3	8GB DDR3	4GB DDR3	8GB DDR3
Storage capacity	240GB SSD	500GB 2.5in HDD	128GB SSD	80GB SSD	1TB 2.5in HDD
Motherboard	Asus P8H77-I	Apple Mac mini board	Gigabyte GA-Z77M-D3H	Intel DH61AG	Gigabyte GA-H67N-USB3-B3
CPU cooler	Passive cooler	Custom active cooler	Heatpipes built into case	Tranquil cooling solution	Zeno heatpipe cooling
Power supply	External 150W Pico	85W Delta Electronics	External 160W Pico	External 19V DC supply	1,000W Zeno
Graphics	Intel HD Graphics 4000	AMD Radeon HD 6630M with 256MB video memory	Intel HD Graphics 4000	Intel HD Graphics 3000	Intel HD Graphics 3000
TV tuner	BlackGold BGT3620	x	TBS 6284 Quad DVB-T2	x	Black Gold BGT3600
Wireless	802.11n via adaptor	Dual-band 802.11n	x	x	x
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	x	✓	x	x	x
USB	2x USB 3.0, 8x USB 2.0	4x USB 2.0	2x USB 3.0, 4x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 4x USB 2.0
Ports	S/PDIF, HDMI, VGA	S/PDIF, HDMI, FW800, TB	HDMI, VGA, DVI	S/PDIF, HDMI, DVI	S/PDIF, HDMI, VGA
Case	Streamcom FC8 Black fanless	Apple Mac mini unibody	Streamcom FC5	Tranquil PC Media One	Zeno NT-TX2000
Keyboard and mouse	Xebec	Bluetooth Keyboard, Magic Trackpad	Microsoft Wireless Desktop 3000	x	Microsoft Wireless Desktop 3000
Remote control	✓	✓	✓	✓	✓
LCD screen	x	x	x	x	x
Optical drive	Sony BD-ROM	SuperDrive DVD±RW	Sony BD-ROM	Sony DVD±RW	BD-ROM/DVD±RW
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Operating system	Windows 7 Home Prem 64bit	Mac OS X 10.7 Lion	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit	Windows 7 Home Prem 64bit
Media software	WMC	iLife	WMC, ArcSoft TotalMedia	WMC	WMC, ArcSoft TotalMedia
Crysis (Low/Medium)	40/19	77/48fps	48/31	27/13	45/20fps
MediaEspresso time	1 min 57 secs	8 mins 33 secs	1 min 42 secs	4 mins 14 secs	3 mins 14 secs
WorldBench 6 score	169	123	172	123	141
Idle consumption	26W	10W	28W	19W	36W
Max consumption	73W	Not tested	74W	45W	Not tested
Warranty	2-year collect-and-return	1 year collect-and-return	2-year collect-and-return	3-year return-to-base	2 years collect-and-return
Verdict	<ul style="list-style-type: none"> <li>Generally noiseless operation</li> <li>Cute looks and great build quality</li> <li>SSD is fast, but more storage is needed</li> <li>Xebec keyboard replaces a remote control</li> </ul>	<ul style="list-style-type: none"> <li>Beautifully compact</li> <li>Great for graphics</li> <li>Good performance</li> <li>No DVD drive</li> <li>Very low power consumption</li> <li>Quiet and elegant</li> </ul>	<ul style="list-style-type: none"> <li>Generally noiseless operation</li> <li>Great performance</li> <li>SSD is fast, but more storage is needed</li> <li>Price tag is high</li> </ul>	<ul style="list-style-type: none"> <li>High-quality looks</li> <li>No Blu-ray or TV support</li> <li>External storage needed</li> <li>Not great performance</li> </ul>	<ul style="list-style-type: none"> <li>Blu-ray drive included</li> <li>Silent, fanless operation</li> <li>Best multimedia playback of group</li> <li>Dual digital TV tuners</li> <li>Stylish Zalman case</li> <li>Expensive</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/BQM62QH">TINYURL.COM/BQM62QH</a>	<a href="http://TINYURL.COM/88GUG5H">TINYURL.COM/88GUG5H</a>	<a href="http://TINYURL.COM/D9GP87X">TINYURL.COM/D9GP87X</a>	<a href="http://TINYURL.COM/C4NPQ5F">TINYURL.COM/C4NPQ5F</a>	<a href="http://TINYURL.COM/7S2ZWXD">TINYURL.COM/7S2ZWXD</a>

GLOSSARY: FW800: FireWire 800 TB: Thunderbolt WMC: Windows Media Center

## >> Buying advice



## Media PCs

Changes in exchange rates and component supply issues mean we can't guarantee PCs listed here will be available as specified. All our prices include delivery charges.

You can use any PC to create a media centre, but a quiet system is preferable. It's important to strike a balance between power consumption and performance -

not only will the PC probably be left switched on for long periods, but a high-performance processor will generate large amounts of heat, and cooling that chip can involve noisy whirring fans.

Fanless systems can be built using large passive heat sinks or heat pipes, although you can find ultra-quiet tweakable fans if fitting one is unavoidable.






SSDs have no moving parts, making them silent in use. They're expensive, mind, so consider setting up a NAS elsewhere in your home for extra storage.

A TV tuner is desirable; you'll need a dual-tuner to watch and record shows simultaneously.

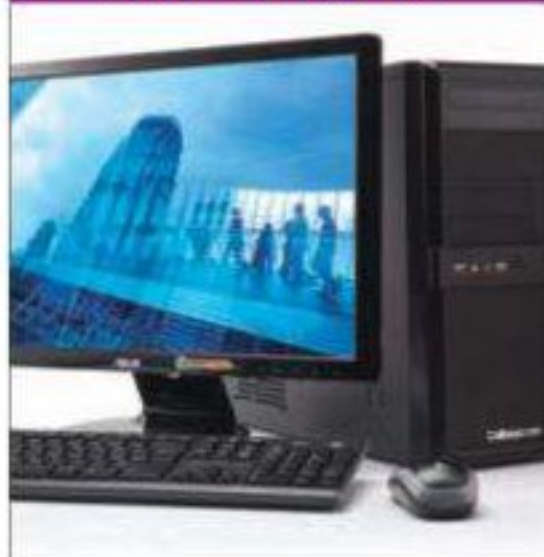
Also look for a Blu-ray drive and a wireless keyboard and mouse.

READ MORE: [TINYURL.COM/CGFOD2K](http://TINYURL.COM/CGFOD2K)



Business PCs					
	 1 <b>PC ADVISOR BEST BUY</b>	 2 <b>PC ADVISOR RECOMMENDED</b>	 3 <b>PC ADVISOR RECOMMENDED</b>	 4 <b>PC ADVISOR RECOMMENDED</b>	 5
	Chillblast Fusion Obsidian	Apple Mac mini	PC Specialist MPC-2120	Eclipse eBiz i321r755	Arbico FX4130 Office PC
Price	£549 inc VAT	£529 inc VAT	£539 inc VAT	£599 inc VAT	£500 inc VAT
Website	Chillblast.com	Apple.com/uk	Pcspecialist.co.uk	Eclipsecomputers.com	Arbico.co.uk
Build rating	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	3.4GHz Intel Core i5-3570K	2.3GHz Intel Core i5-2415M	3.3GHz Intel Core i3-2120	3.1GHz Intel Core i3-2100	3.6GHz AMD FX-4100
RAM	8GB DDR3	2GB DDR3	4GB DDR3	8GB DDR3	8GB DDR3
Storage capacity	1TB SATA 6Gbps	500GB SATA	1TB SATA 6Gbps + 120GB SSD	1TB SATA 3Gbps	500GB SATA 6Gbps
Motherboard	Asus P8H61-M LE/USB3	Apple Mac mini board	Intel DH67CF	Asus P8H61-M LE/USB3	Asus M5A78L M/USB3
CPU cooler	Standard Intel cooler	Custom active cooler	Standard Intel cooler	Standard Intel cooler	Xigmatek Apache
Power supply	500W EZCool	85W Delta Electronics	160W Power Man	450W unbranded	650W Ace
Screen	21.5in Asus VE228T	N/A	N/A	2x 21.6in AOC F22+	N/A
Screen resolution	1920x1080 pixels	N/A	N/A	1920x1080	N/A
Graphics	Intel HD Graphics 4000	Intel HD Graphics 3000	Intel HD Graphics 2000	AMD Radeon HD 7750	Asus nVidia GT 430
Video memory	N/A	N/A	N/A	1GB	1GB
USB	2x USB 3.0, 8x USB 2.0	4x USB 2.0	2x USB 3.0, 7x USB 2.0	3x USB 3.0, 6x USB 2.0	2x USB 3.0, 4x USB 2.0
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	Built into monitor	Not supplied	Not supplied	Not supplied	Not supplied
Case	Cit Shade	Apple Mac mini unibody	In-Win BM643	Generic 437-16 series	Ace Ecco 250
Keyboard	Logitech MK260 (wired)	Bluetooth Keyboard, Magic Trackpad (optional)	Logitech K200 (wired)	Logitech MK120 (wired)	Logitech MK120 (wired)
Optical drive	24x Sony DVD±RW	N/A	8x Samsung DVD±RW	22x Samsung DVD±RW	24x Sony DVD±RW
Operating system	Windows 7 Professional 64bit	Mac OS X 10.7 Lion	Windows 7 Professional 64bit	Windows 7 Home Prem 64bit	Windows 7 Professional 64bit
Bundled software	Microsoft Office 2010 Starter	iLife	Microsoft Office 2010 Starter	Microsoft Office 2010 Starter	None
WorldBench 6 score	176	117	154	139	128 (est)
Power consumption	39W/97W/9,603J	9W	22W/55W/11,440J	43W/93W/48,081J	63W/163W/73,676J
Warranty	2-year collect-and-return	1-year collect-and-return	3-year RTB (labour only)	1-year RTB	2-year RTB (labour only)
Verdict	<ul style="list-style-type: none"> <li>Packs the latest Ivy Bridge processor</li> <li>Strong components and performance</li> <li>Superior 22in flat-panel</li> <li>HD 4000 a cut above the usual onboard graphics</li> </ul>	<ul style="list-style-type: none"> <li>Beautifully compact</li> <li>Good performance</li> <li>No DVD drive</li> <li>Very low power consumption</li> <li>Quiet and elegant</li> <li>Versatile OS X operating system</li> </ul>	<ul style="list-style-type: none"> <li>Small-form-factor PC takes up little desk space</li> <li>Very low power consumption</li> <li>Performance is adequate, but not stunning</li> <li>Graphics card only an onboard HD 2000</li> </ul>	<ul style="list-style-type: none"> <li>Dual-screen system</li> <li>Neither of the screens are of great quality</li> <li>CPU isn't very powerful</li> <li>Windows 7 Home Premium not aimed at office users</li> </ul>	<ul style="list-style-type: none"> <li>Sound-damping materials keep noise to a minimum</li> <li>Low price for a system with Windows 7 Professional</li> <li>Performance some way behind the fastest here</li> <li>No monitor included</li> </ul>
FULL REVIEW	<a href="http://tinyurl.com/cnoalaz">TINYURL.COM/CNOALAZ</a>	<a href="http://tinyurl.com/88gug5h">TINYURL.COM/88GUG5H</a>	<a href="http://tinyurl.com/ct9zr4j">TINYURL.COM/CT9ZR4J</a>	<a href="http://tinyurl.com/cvfkrrz">TINYURL.COM/CVFKRRZ</a>	<a href="http://tinyurl.com/crtc8m8">TINYURL.COM/CRTC8M8</a>

## >> Buying advice



### Business PCs

Changes in exchange rates and component supply issues mean we can't guarantee PCs listed here will be available as specified. All our prices include delivery charges.

Provided you have sufficient RAM (at least 2GB, but preferably 4GB), any modern CPU will provide enough power for low-level admin tasks. Intel's Core i3 provides

ample performance for general use and come with integrated graphics, saving you the cost of buying an additional card.

In a typical networked business environment there will be storage available on the LAN, so you're unlikely to need a large hard drive. A 500GB drive should be ample.

Wireless keyboards and mice can cause issues in the workplace

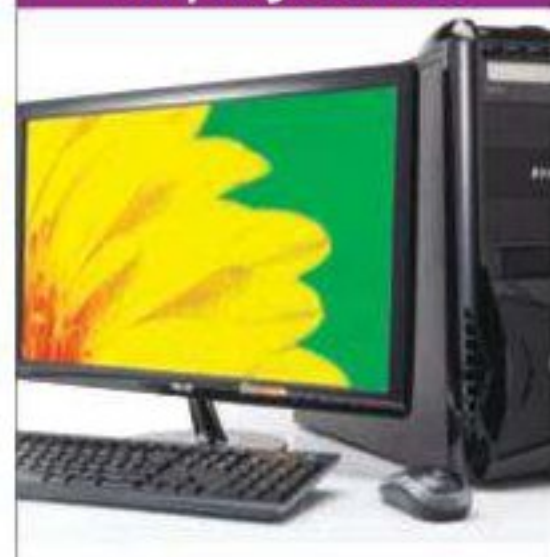
due to interference between adjacent workstations. A decent wired kit is ideal, while quiet-typing keyboards can be less distracting.

For small businesses with just one or two PCs, Windows 7 Home Premium is cheaper but can't connect to servers. The Pro edition is a better option for businesses, especially if you need compatibility with older software.



Family PCs	1	2	3	4	5
	Chillblast Fusion Longbow	PC Specialist Fusion FX-41	Arbico eXcel 2568HD	Eclipse Matrix i323R685	Quiet PC Nofan IcePipe A40-Z77
Price	£799 inc VAT	£649 inc VAT	£849 inc VAT	£699 inc VAT	£1,124 inc VAT
Website	Chillblast.com	Pcspecialist.co.uk	Arbico.co.uk	Eclipsecomputers.com	Quietpc.com
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.4GHz Intel Core i5-3570K	3.6GHz AMD FX-4100	3.3GHz Intel Core i5-2500	3.3GHz Intel Core i3-2310	3.3GHz Intel Core i5-2500k
RAM	16GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage capacity	1TB HDD	1TB HDD	1TB HDD, 60GB SSD	1TB HDD	120GB SSD
Motherboard	Asus P8H77-M Pro	Asus M5A78L-M	Asus P8Z68-V LX	Asus P8H61-M LE	Gigabyte GA-Z77-D3H
CPU cooler	Standard Intel cooler	Standard AMD cooler	Standard Intel cooler	Standard Intel cooler	Nofan CD-100A
Power supply	700W Cit	450W FSP	500W Cooler Master	650W EZCool	400W Nofan
Screen	23.6in Asus VS247H	23.6in Edge 10 M240	23.6in Hanns-G HH241H	23in AOC E2350SDA	N/A
Screen resolution	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	N/A
Graphics card	AMD Radeon HD 6850	Powercolor Radeon HD 7750	AMD Radeon HD 6870 OC	AMD Radeon HD 6850	Intel Graphics HD 3000
Video memory	1GB	1GB	1GB	1GB	N/A
Wireless	802.11b/g/n	802.11b/g/n	N/A	802.11b/g/n	N/A
USB	2x USB 3.0, 6x USB 2.0	2x USB 3.0, 4x USB 2.0	2x USB 3.0, 6x USB 2.0	2x USB 3.0, 6x USB 2.0	4x USB 3.0, 4x USB 2.0
Media card slot	✓	✓	✗	✗	✗
Sound card	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	2x Logitech S220	2x Logitech S220	2x Logitech S120	2x Logitech S220	N/A
Case	Cit Vantage	PCS Enigma Piano Black	Revoltex 67	Unbranded model 437-16	Nofan CS-30
Keyboard	Logitech Cordless MK260	Microsoft Optical Desktop 400	Logitech Cordless MK260	Microsoft Optical Desktop 400	Microsoft Wired Desktop 600
Optical drive	Samsung Blu-ray/DVD combo drive	Samsung Blu-ray/DVD combo drive	LG Blu-ray/DVD combo drive	LG Blu-ray/DVD combo drive	Samsung SH-S222 DVD drive
Operating system	Windows 7 Home Premium 64bit	Windows 7 Home Premium 64bit	Windows 7 Home Premium 64bit	Windows 7 Home Premium 64bit	Windows 7 Home Premium 64bit
Bundled software	Free utilities	Office 2010 Starter, BullGuard	CyberLink PowerDVD	Office Starter 2010, BullGuard	N/A
Crysis (Low/Medium)	156/109	104/68	161/113fps	122/84fps	37/19
WorldBench 6 score	189	134 (estimated)	175	151	177
Warranty	2 years collect-and-return	3 years RTB (1 year parts)	1 year return-to-base	1 year return-to-base	2 years collect-and-return
Verdict	<ul style="list-style-type: none"> <li>Ivy Bridge technology</li> <li>Superb performance</li> <li>Great feature set includes 16GB of memory and a capable graphics card</li> <li>Strong display</li> </ul>	<ul style="list-style-type: none"> <li>Appealing price tag</li> <li>Good features for the money</li> <li>Speed figures not the highest in our tests</li> <li>Lengthy warranty</li> </ul>	<ul style="list-style-type: none"> <li>Fantastic gaming machine</li> <li>Top-notch all-round Windows performance</li> <li>SSD is fast, but the 60GB of storage needs management</li> <li>Speakers and peripherals not the best</li> </ul>	<ul style="list-style-type: none"> <li>Cheapest Intel system here</li> <li>AMD systems are better for tasks that benefit from multiple CPU cores</li> <li>Solid gaming capabilities</li> <li>Capable all-round list of components</li> </ul>	<ul style="list-style-type: none"> <li>Completely silent operation</li> <li>Strong overall performance</li> <li>Fast but small-capacity SSD, with no HDD to supplement storage needs</li> <li>High asking price</li> </ul>
FULL REVIEW	TINYURL.COM/CALEP8W	TINYURL.COM/CWKY96A	TINYURL.COM/BUS9XJP	TINYURL.COM/CPJR64T	TINYURL.COM/CFJJ4J2

## >> Buying advice



## Family PCs

Changes in exchange rates and component supply issues mean we can't guarantee PCs listed here will be available as specified. All our prices include delivery charges.

A family PC needs to offer decent performance in every area, able to cater for the needs of each individual - but there are some areas where you can cut costs.

If you're not itching to play the latest games, opt for integrated rather than dedicated graphics. AMD processors are more adept in this regard, while Intel CPUs offer faster application performance.

Intel's Core i5-3570K will form the core of a powerful home PC, although the older Core i5-2500K may be offered at lower cost and supports easy overclocking.

Consider 4GB of RAM and a 500GB hard drive as the minimum; both are easy to upgrade later.

Screen quality is crucial, with the best displays using IPS tech. A Blu-ray drive will help make the most of a 23.6in full-HD monitor.

For Skypeing, watching films and listening to music, decent speakers and a webcam are essential.

READ MORE: [TINYURL.COM/BL4UREB](http://TINYURL.COM/BL4UREB)

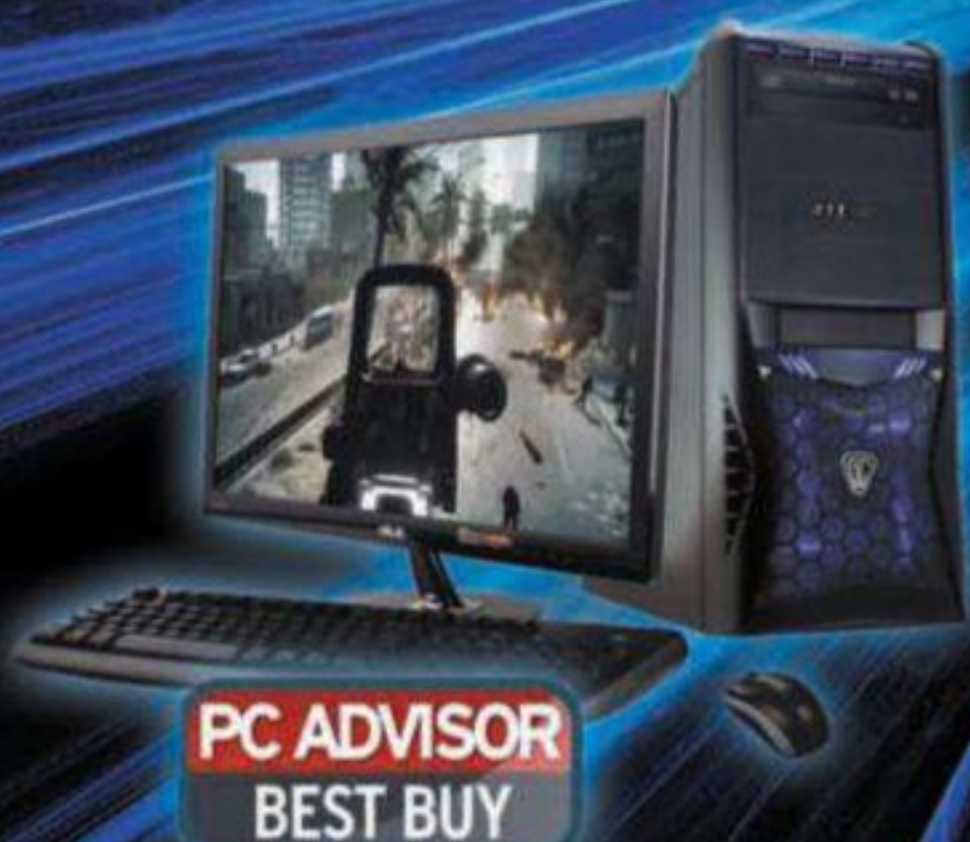


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- 1000GB SATA III 7200rpm Hard Disk
- Samsung Blu Ray / DVD-RW Combo Drive
- Chillblast 700watt EZCool PSU
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- 8GB PC3-10666 DDR3 Memory
- Intel HD4000 Graphics Card
- 240GB SATA III Mushkin Solid State Drive
- Sony Slot loading Blu Ray / DVD-RW drive
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- Windows 7 Home Premium 64bit OEM
- Ultra-compact keyboard/remote/trackpad

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- Asus P8H61-M LE/USB3 Motherboard
- 8GB PC3-10666 DDR3 Memory
- Intel HD4000 Graphics Card
- 1000GB SATA III 7200rpm Hard Disk
- Sony 24x DVD RW Drive
- 500W EZCool Power Supply
- Windows 7 PROFESSIONAL 64bit OEM
- Top quality 22" Asus VE228T Monitor
- Logitech Keyboard and Mouse
- All systems come with 2 year warranty!

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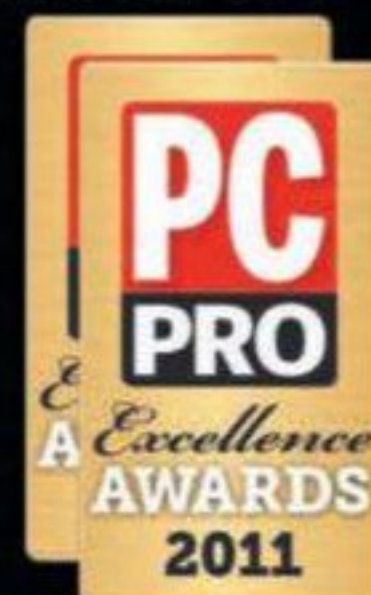
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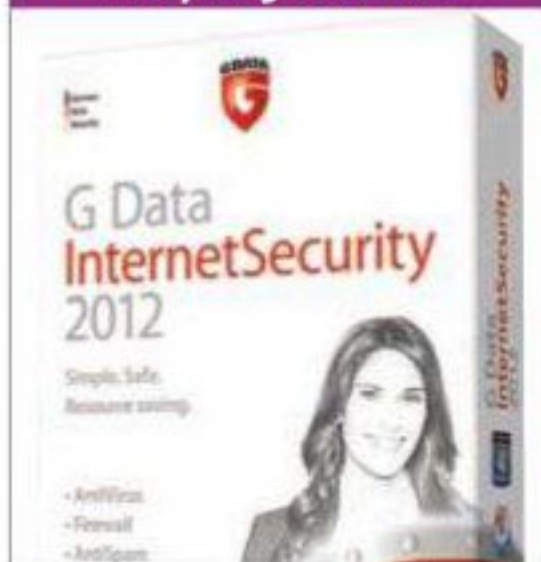


Internet security suites					
	G Data InternetSecurity	Norton Internet Security	Bitdefender Internet Security	Kaspersky Internet Security	Trend Micro Titanium IS
Annual price	£34 inc VAT	£49 inc VAT	£29 inc VAT	£39 inc VAT	£39 inc VAT
Licence terms	1 PC, 1 year	1 PC, 1 year	1 PC, 1 year	1 PC, 1 year	3 PCs, 1 year
Website	Gdatasoftware.co.uk	Uk.norton.com	Bitdefender.co.uk	Kaspersky.co.uk	Uk.trendmicro.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Signature-based detection	100 percent	99.9 percent	100 percent	99.3 percent	97.5 percent
Malware blocking (full)	100 percent	100 percent	96.2 percent	100 percent	92.3 percent
Malware blocking (partial)	N/A	N/A	0 percent	N/A	3.8 percent
Clean-up of malware	60 percent	50 percent	90 percent	60 percent	70 percent
On-demand scan speed	109 secs	68 secs	116 secs	71 secs	93 secs
On-access scan speed	116 secs	154 secs	265 secs	280 secs	314 secs
Interface design	Good	Very good	Superior	Very good	Very good
Verdict	<ul style="list-style-type: none"><li>• Excellent detection rates</li><li>• Good value</li><li>• Low impact on resources</li><li>• Confusing interface</li></ul>	<ul style="list-style-type: none"><li>• Good all-rounder</li><li>• Fast scan times</li><li>• Clean interface</li><li>• Flagged some false-positives</li></ul>	<ul style="list-style-type: none"><li>• Impacts system resources</li><li>• Very strong malware blocking and removal</li><li>• Intuitive interface</li></ul>	<ul style="list-style-type: none"><li>• Strong block rate</li><li>• Above-average scan times</li><li>• Can affect PC performance</li><li>• Interface needs tweaking</li></ul>	<ul style="list-style-type: none"><li>• Set-it-and-forget-it security</li><li>• Flagged some false-positives</li><li>• Reasonable scan speeds</li><li>• Ideal for novice users</li></ul>
FULL REVIEW	<a href="http://TINYURL.COM/7CZT5XB">TINYURL.COM/7CZT5XB</a>	<a href="http://TINYURL.COM/CVVDWUR">TINYURL.COM/CVVDWUR</a>	<a href="http://TINYURL.COM/75H3WUK">TINYURL.COM/75H3WUK</a>	<a href="http://TINYURL.COM/6UEHPMW">TINYURL.COM/6UEHPMW</a>	<a href="http://TINYURL.COM/7QTBP6">TINYURL.COM/7QTBP6</a>

GLOSSARY: • IS: Internet Security

Antivirus software					
	Norton AntiVirus	Bitdefender Antivirus Pro	G Data AntiVirus	Kaspersky Anti-Virus	Trend Micro Titanium AV+
Annual price	£39 inc VAT	£24 inc VAT	£34 inc VAT	£39 inc VAT	£39 inc VAT
Licence terms	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year
Website	Norton.com	Bitdefender.co.uk	Gdatasoftware.com	Kaspersky.co.uk	Uk.trendmicro.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Signature-based detection	98.7 percent	97.5 percent	99.4 percent	95.7 percent	98.4 percent
Malware blocking (full)	96 percent	68 percent	84 percent	88 percent	88 percent
Malware blocking (partial)	0 percent	20 percent	4 percent	4 percent	8 percent
Clean-up of active malware	80 percent	80 percent	80 percent	80 percent	80 percent
On-demand scan speed	121 secs	126 secs	111 secs	103 secs	187 secs
On-access scan speed	272 secs	327 secs	336 secs	310 secs	249 secs
Interface design	Very good	Very good	Very good	Very good	Very good
Verdict	<ul style="list-style-type: none"><li>• Smooth user interface</li><li>• Large 'Fix Now' button</li><li>• Moderate impact on system performance</li></ul>	<ul style="list-style-type: none"><li>• Very good performance for malware removal</li><li>• Average scan speeds</li><li>• Three interface tiers</li></ul>	<ul style="list-style-type: none"><li>• Strong malware detection, blocking and removal</li><li>• Good user interface, but poorly translated</li></ul>	<ul style="list-style-type: none"><li>• Well-designed interface</li><li>• Easy to use</li><li>• On-demand single-file scans</li><li>• Impacts PC performance</li></ul>	<ul style="list-style-type: none"><li>• Set-it-and-forget-it security</li><li>• Cloud-based protection</li><li>• Requires web connection</li><li>• Good performance</li></ul>
FULL REVIEW	<a href="http://TINYURL.COM/4P5YCX">TINYURL.COM/4P5YCX</a>	<a href="http://TINYURL.COM/66SK77U">TINYURL.COM/66SK77U</a>	<a href="http://TINYURL.COM/6BFXWCS">TINYURL.COM/6BFXWCS</a>	<a href="http://TINYURL.COM/6HQA2WB">TINYURL.COM/6HQA2WB</a>	<a href="http://TINYURL.COM/4HUORV3">TINYURL.COM/4HUORV3</a>

## >> Buying advice



## Security software

Every connected PC should have at least antivirus, antispyware and a firewall, and it's important that each is kept up to date. Avoid installing more than one real-time scanning component.

We work with world-renowned independent security testing lab AV-Test.org to evaluate the effectiveness of security software.

No security software is foolproof, but some are significantly better than others. And factors such as ease of setup, scan speeds, interface design and ability to deal with new threats set them apart.

The best products will offer parental controls, cloud protection, anti-phishing, anti-rootkit, virtual web browsers and keyboards, link

and file scanners, gaming modes, online backup and more.

The best value is usually offered by a three-user licence, but you can save some cash if your household has only one PC.

There are some good free antivirus products but, as in life, you get what you pay for.

READ MORE: [TINYURL.COM/7NR8FSM](http://TINYURL.COM/7NR8FSM)

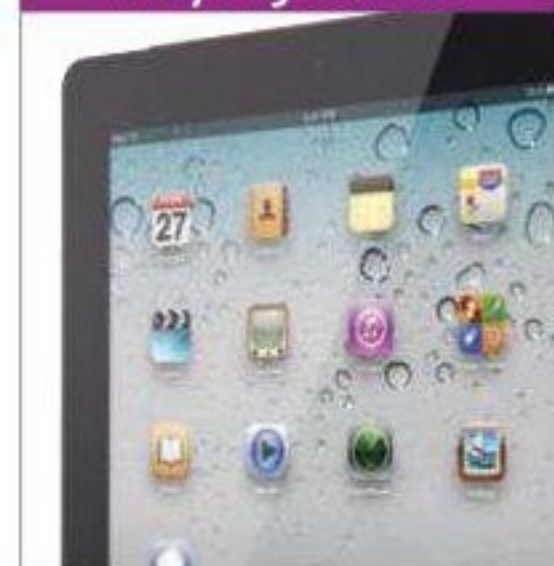


Tablets	1  PC ADVISOR GOLD	2  PC ADVISOR GOLD	3  PC ADVISOR GOLD	4  PC ADVISOR RECOMMENDED	5  PC ADVISOR BEST BUY
	Apple iPad (3rd gen)	Google Nexus 7	Apple iPad 2	Asus Eee Pad Transformer Prime	BlackBerry PlayBook 2.0 7in
Price	£399 inc VAT	£159 inc VAT	£329 inc VAT	£510 inc VAT	£199 inc VAT
Website	Apple.com/uk	Play.google.com	Apple.com/uk	Uk.asus.com	Uk.blackberry.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Apple iOS 5.1	Google Android 4.1 Jelly Bean	Apple iOS 5.0	Google Android 3.0 Honeycomb <sup>2</sup>	BlackBerry PlayBook OS 2.0
Screen size/resolution	9.7in/2048x1536	7in/1280x800	9.7in/1024x768	10.1in/1280x800	7in/1024x600
Storage/media card slot	16GB/none	8GB/none	16GB/none	32GB/microSD	32GB/microUSB
Connectivity	802.11a/b/g/n, Bluetooth <sup>1</sup>	802.11a/b/g/n, Bluetooth	802.11a/b/g/n, Bluetooth <sup>1</sup>	802.11b/g/n, Bluetooth	802.11a/b/g/n, Bluetooth
Processor	1GHz Apple A5X	1.3GHz nVidia Tegra 3	1GHz Apple A5	1.4GHz nVidia Tegra 3	1GHz Cortex-A9
RAM	1GB	1GB	512MB	1GB	1GB
Claimed battery life	10 hrs	10 hrs	10 hrs	12 hrs	10 hrs
Cameras (front/rear)	0.3/5Mp	1.2Mp/none	0.3/0.7Mp	1.2/8Mp	5Mp/3Mp
Dimensions	241x186x9.5mm	120x199x11mm	241x186x8.8mm	263x181x8.8mm	194x130x10mm
Weight	652g	336g	597g	596g	425g
Warranty	1 year	1 year	1 year	1 year	1 year
Verdict	<ul style="list-style-type: none"> <li>Breathtaking display</li> <li>Searing performance</li> <li>32GB version recommended</li> <li>Supports 4G where available</li> </ul>	<ul style="list-style-type: none"> <li>Best budget tablet</li> <li>Strong build quality</li> <li>Nice screen</li> <li>No 3G option</li> </ul>	<ul style="list-style-type: none"> <li>Exceptional touchscreen</li> <li>Beautiful design and build</li> <li>Best selection of apps</li> <li>10-hour battery life</li> </ul>	<ul style="list-style-type: none"> <li>Fast quad-core processor</li> <li>Excellent Super IPS panel</li> <li>Stunning battery life</li> <li>Best Android tablet</li> </ul>	<ul style="list-style-type: none"> <li>Very good 1024x600 screen</li> <li>Excellent value for money</li> <li>Comfortable to grip</li> <li>Good navigation system</li> </ul>
FULL REVIEW	TINYURL.COM/6MTG9OW	TINYURL.COM/CGBA439	TINYURL.COM/4XV7Q4K	TINYURL.COM/7U67UBN	TINYURL.COM/79QB7PP

<sup>1</sup>3G available at additional cost <sup>2</sup>Android 4.0 available

Smartphones	1  PC ADVISOR GOLD	2  PC ADVISOR BEST BUY	3  PC ADVISOR RECOMMENDED	4	5
	Apple iPhone 4S	Samsung Galaxy S III	HTC One S	Sony Xperia P	Huawei Ascend G 300
Price	£499 inc VAT	£500 inc VAT	£449 inc VAT	£330 inc VAT	£110 inc VAT
Website	Apple.com/uk	Samsung.com/uk	Htc.com	Sony.co.uk	Vodafone.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Apple iOS 5.0	Android 4.0 ICS	Android 4.0 ICS	Android 2.3 Gingerbread	Android 2.3 Gingerbread
Processor	1GHz ARM Cortex A9	1.4GHz Exynos 4212 Quad	1.5GHz Qualcomm Snapdragon	1GHz NovaThor U8500	1GHz Qualcomm MSM7227A
Storage/media card	16GB/none	16GB/microSDXC	16GB/none	16GB/none	2.5GB/microSD
Screen size/resolution	3.5in/960x640	4.3in/800x480	4.3in/960x540	4in/960x540	4in/480x800
Input method	Capacitive multitouch	Capacitive touchscreen	Capacitive multitouch	Capacitive touchscreen	capacitive touchscreen
Connectivity	HSDPA, Bluetooth, Wi-Fi	HSPA+, GSM, Bluetooth, Wi-Fi	HSDPA, Bluetooth, Wi-Fi	HSDPA, Bluetooth, Wi-Fi	HSDPA, GSM, Bluetooth, Wi-Fi
Battery life (talk/standby)	8 hrs/200 hrs	11 hrs/750 hrs	Not specified	8.5 hrs/470 hrs	5 hrs/350 hrs
Camera	8Mp, 1080p video	8Mp, 1080p video	8Mp, 1080p video	8Mp, 1080p video	5Mp, 480p video
GPS	A-GPS, Glonass	A-GPS, Glonass	A-GPS	A-GPS	A-GPS
Dimensions, Weight	59x10x115mm, 140g	70x137x9mm, 133g	65x130.9x7.8mm, 119.5g	59x122x10.5mm, 121g	63x123x11mm, 130g
Warranty	1 year	2 years	1 year	1 year	1 year
Verdict	<ul style="list-style-type: none"> <li>Superb Retina display</li> <li>Fast graphics</li> <li>Responsive touchscreen</li> <li>Siri voice-recognition</li> </ul>	<ul style="list-style-type: none"> <li>Best choice for Android</li> <li>Superb 4.8in screen</li> <li>Strong build</li> <li>Difficult to use one-handed</li> </ul>	<ul style="list-style-type: none"> <li>Very good for multimedia</li> <li>Excellent build quality</li> <li>Good performance</li> <li>Sense interface</li> </ul>	<ul style="list-style-type: none"> <li>Good all-round handset</li> <li>Attractive value</li> <li>Sturdy design</li> <li>Mid-range hardware</li> </ul>	<ul style="list-style-type: none"> <li>Excellent price tag</li> <li>Screen can be unresponsive</li> <li>Good battery life</li> <li>Camera captures VGA video</li> </ul>
FULL REVIEW	TINYURL.COM/62TEB9G	TINYURL.COM/CQ4FM7X	TINYURL.COM/BSXFL6G	TINYURL.COM/C2KJ8Y3	TINYURL.COM/D50Q55X

## >> Buying advice



### Tablets

Tablet PCs combine the mobility and connectivity of a smartphone with a larger screen and more powerful processor. Rather than struggle with Windows, they run a lightweight, touch-focused OS.

You have two main choices: a tablet running iOS or Android. iOS is slick, supremely easy to use, and has a library of hundreds of

thousands of apps. But the iPad is expensive, it doesn't support memory cards, and the whole system is locked down.

Android tablets are available at lower prices. Many have ports for adding storage and connecting devices, and plenty of apps are available via Google Play – although Google doesn't vet them.

Look for a dual-core processor for smooth operation and good multi-tasking. Opt for a capacitive rather than resistive touchscreen if possible, and consider a smaller screen to minimise weight.

3G tablets are available on subsidised tariffs, but it's usually cheaper to buy them outright.

READ MORE: [TINYURL.COM/7YGV8Q6](http://TINYURL.COM/7YGV8Q6)



Sub-£150 printers	1	2	3	4	5
	 PC ADVISOR BEST BUY	 PC ADVISOR GOLD			
	Oki C110	Samsung ML-2955DW	Kodak Hero 5.1	Canon Pixma MG4150	Canon i-Sensys LBP-7010C
Price	£107 inc VAT	£100 inc VAT	£77 inc VAT	£60 inc VAT	£108 inc VAT
Website	Oki.co.uk	Samsung.com/uk	Kodak.co.uk	Canon.co.uk	Canon.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Technology	Colour laser	Mono laser	Colour inkjet	Colour inkjet	Colour laser
Max print resolution	1200x600dpi	1200x1200dpi	9600dpi	4800x1200dpi	5760x1440dpi
Actual print speed	B=15.8ppm/C=2.5ppm	B=22.2ppm	B=12.2ppm/C=6.8ppm	B=8.6ppm/C=3.8ppm	B=13ppm/C=3.3ppm
Scan/fax facilities	None	none	1200dpi scans	1200x2400dpi scans	None
Supported interfaces	USB 2.0	USB 2.0, 802.11b/g/n, ethernet	USB 2.0, 802.11b/g/n, cloud	USB 2.0, 802.11b/g/n	USB 2.0
Cost per page	B=3.6p/C=5p	B=2.7p	B=1.8p/C=3.3p	B=2.8p/C=4.5p	B=3.8p/C=13.8p
Media card/auto duplex	xx	x✓	✓✓	✓✓	xx
Input capacity	100 sheets	251 sheets	100 sheets	100 sheets	150 sheets
Dimensions	396x380x275mm	348x338x197mm	422x399x183mm	449x304x152mm	400x398x223mm
Weight	14.4kg	7.2kg	6.3kg	5.7kg	12.3kg
Warranty	3 years	1 year	1 year	2 years	2 years
Verdict	<ul style="list-style-type: none"> <li>Attractive pricing</li> <li>Performs better than an equivalent inkjet</li> <li>No duplex mode</li> </ul>	<ul style="list-style-type: none"> <li>Speedy for the price</li> <li>Slim but well-defined text</li> <li>Reasonable running costs</li> <li>Wi-Fi/wired network support</li> </ul>	<ul style="list-style-type: none"> <li>Printer/scanner/copier</li> <li>Lowest cost per print</li> <li>Built-in Wi-Fi</li> <li>Could be faster</li> </ul>	<ul style="list-style-type: none"> <li>Excellent value at £60</li> <li>Decent middle-mode speeds</li> <li>Complex control panel</li> <li>High text running costs</li> </ul>	<ul style="list-style-type: none"> <li>Great value colour laser</li> <li>High-quality colour prints</li> <li>Slow colour performance</li> <li>Expensive replacement inks</li> </ul>
FULL REVIEW	TINYURL.COM/YLNO5RV	TINYURL.COM/CCLSZDM	TINYURL.COM/6S5BW3B	TINYURL.COM/6UJBGDJ	TINYURL.COM/7TLXCBK

£151+ printers	1	2	3	4	5
	 PC ADVISOR BEST BUY	 PC ADVISOR BEST BUY		 PC ADVISOR BEST BUY	 PC ADVISOR RECOMMENDED
	Kyocera Mita FS-1320D	Kyocera FS-C5250DN	Dell C3765dnf A4 Colour	Epson WP-4535 DWF	HP LaserJet Pro 400 M451nw
Price	£170 inc VAT	£450 inc VAT	£700 inc VAT	£180 inc VAT	£300 inc VAT
Website	Kyoceramita.co.uk	Kyoceramita.co.uk	Dell.co.uk	Epson.co.uk	Hp.com/uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Technology	Mono laser	Colour laser	Colour laser	Colour inkjet	Colour laser
Max print resolution	1200x1200dpi	600x600dpi	600x600dpi	4800x1200dpi	600x600dpi
Actual print speed	B=26.1ppm	B=24.8ppm/C=18.3ppm	B=35ppm/C=35ppm	B=15.4ppm/C=7.5ppm	B=14.3ppm/C=9.1ppm
Scan/fax facilities	None	None	Scanner and fax	Scanner and fax	None
Supported interfaces	USB 2.0	USB 2.0, ethernet	USB 2.0, ethernet	USB 2.0, 802.11b/g/n, ethernet	USB 2.0, 802.11b/g/n, ethernet
Cost per page	B=1.4p	B=1.2p/C=5.2p	B=0.9p/C=1.8p	B=1p/C=3.6p	B=2.1p/C=11.3p
Media card/auto duplex	✓✓	x✓	x✓	x✓	xx
Input capacity	250 sheets	500 + 50 sheets	550 + 150 + 50 sheets	250 + 80 sheets	250 + 50 sheets
Dimensions	375x393x250mm	390x523x397mm	558x439x530mm	460x420x341mm	405x454x322mm
Weight	12kg	30kg	32.6kg	13.8kg	22.8kg
Warranty	2 years	2 years	1 year	1 year	1 year
Verdict	<ul style="list-style-type: none"> <li>No frills business laser</li> <li>Lacks Wi-Fi and ethernet</li> <li>Modest running costs</li> <li>Auto-duplex support</li> </ul>	<ul style="list-style-type: none"> <li>Blistering speed</li> <li>Huge paper capacity</li> <li>Colour printing isn't perfect</li> <li>Hefty</li> </ul>	<ul style="list-style-type: none"> <li>High speed and quality</li> <li>Wireless as an option</li> <li>Low running costs</li> <li>Multiple paper-feed sources</li> </ul>	<ul style="list-style-type: none"> <li>Exceptional value for money</li> <li>Great connectivity</li> <li>Very low running costs</li> <li>Text not up to laser-quality</li> </ul>	<ul style="list-style-type: none"> <li>Fast for its price</li> <li>Smart Install feature</li> <li>Strong for text</li> <li>Colour costs are high</li> </ul>
FULL REVIEW	TINYURL.COM/6GG9UKV	TINYURL.COM/7QMXVZA	TINYURL.COM/DXVAWRG	TINYURL.COM/C82FY6K	TINYURL.COM/7D366WF

GLOSSARY: • B: mono • C: colour • ppm: pages per minute

## &gt;&gt; Buying advice



## Printers

Most printers are inkjet or laser models, and there are colour and mono flavours of each. Lasers tend to be more expensive to buy, but provide better-quality output, particularly where text is involved.

The price you pay in-store is only the beginning; also consider the cost of replenishing the ink and paper. Duplexing lets you print to

both sides of a sheet, saving paper but slowing output.

Multifunction printers can save you money if you also require scanning facilities; some models include copy and fax functions, too.

A USB port lets you connect a printer to a single PC, but built-in wireless networking allows it to join a home or office network.


A memory card slot will let you bypass a PC for printing.

Never trust a manufacturer's claimed print speeds; we run our own tests to properly assess each printer's performance.

High-capacity paper trays and auto document feeders are also worth looking for.

READ MORE: [TINYURL.COM/BUX9QMO](http://TINYURL.COM/BUX9QMO)



Blu-ray drives					
	1	2	3	4	5
	LG BE12LU38	LG BH10LS38	Asus SBW-06C1S-U Slim	Lite-On iHBS212	Buffalo BR3D-12U3
Price	£125 inc VAT	£65 inc VAT	£130 inc VAT	£90 inc VAT	£199 inc VAT
Website	Uk.lge.com	Uk.lge.com	Uk.asus.com	Liteonit.eu	Buffalotech.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Blu-ray speeds	12x -R, 12x -R DL, 2x -RE, 12x -ROM	10x -R, 8x -R DL, 2x -RE, 10x -ROM	6x -R, 4x -R DL, 2x -RE, 6x -ROM	12x -R, 8x -R DL, 2x -RE, 8x -ROM	12x -R, 12x -R DL, 2x -RE, 8x -ROM
DVD speeds	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 12x -RAM, 16x -ROM	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 12x -RAM, 16x -ROM	8x ±R, 6x ±R DL, 6x -RW, 8x +RW, 5x RAM, 8x ROM	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 12x -RAM, 16x -ROM	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 5x -RAM, 8x -ROM
Max storage	50GB	50GB	50GB	50GB	50GB
Interface type	USB 2.0, eSATA (external)	SATA (internal)	USB 2.0 (external)	SATA (internal)	USB 3.0 (external)
Label technology	LightScribe	LightScribe	None	LightScribe	None
Software	PowerDVD, PowerProducer	(OEM - add £5 for software)	PowerDVD, PowerProducer	CyberLink Blu-ray Suite	PowerDVD, PowerProducer
Dimensions	163x260x50mm	146x170x41mm	157x142x21mm	146x170x41mm	160x220x50mm
Weight	1.38kg	749g	364g	650g	1.1kg
Warranty	1 year	1 year	2 years	2 years	2 years
Verdict	<ul style="list-style-type: none"> <li>12-speed external writer</li> <li>Stocks now limited</li> <li>Supports eSATA, USB 2.0</li> <li>Awkward to carry</li> </ul>	<ul style="list-style-type: none"> <li>10-speed internal writer</li> <li>Attractive front panel</li> <li>Reliable performance</li> <li>Very good value</li> </ul>	<ul style="list-style-type: none"> <li>Super-slim six-speed drive</li> <li>No power supply required</li> <li>Portable</li> <li>Slow but reliable</li> </ul>	<ul style="list-style-type: none"> <li>12-speed internal writer</li> <li>Issues during testing</li> <li>Noisy during operation</li> <li>Average with 4x media</li> </ul>	<ul style="list-style-type: none"> <li>12-speed external writer</li> <li>Power supply required</li> <li>Bulky design</li> <li>Expensive</li> </ul>
FULL REVIEW	TINYURL.COM/8YVFLFP	TINYURL.COM/8YTUJEF	TINYURL.COM/7S3WPV6	TINYURL.COM/65PXHUJ	TINYURL.COM/453BX7L

Wireless routers					
	1	2	3	4	5
	Cisco Linksys E4200	Apple AirPort Express	AVM FritzBox Fon 7390	D-Link DIR-857	TP-Link TL-MR3020
Price	£102 inc VAT	£79 inc VAT	£190 inc VAT	£150 inc VAT	£40 inc VAT
Website	Linksysbycisco.com	Apple.com/uk	Fritzbox.eu	dlink.co.uk	Tp-link.com/en
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Standards supported	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n	802.11b/g/n
Frequency modes	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz
WEP/WPA/WPA2	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
USB port/Network port	✓✓	✓✓	✓✓	✓✓	✓✓
Firewall	NAT/SPI	NAT/SPI	NAT/SPI	NAT/SPI	NAT/SPI
Eco mode	x	x	x	x	x
Ethernet ports	Gigabit WAN, 4x gigabit LAN	10/100 LAN, 10/100 WAN	4x gigabit LAN	4x gigabit LAN, 1x gigabit WAN	1x 10/100 WAN/LAN
Throughput (near/far)	226/92Mbps	94Mbps/not tested	92/38Mbps	125/37Mbps	Not tested
Dimensions	225x160x25mm	98x98x23mm	226x160x48mm	212x160x34mm	74x67x22mm
Weight	335g	240g	not specified	342g	250g
Warranty	1 year	1 year	5 years	1 year	3 years
Verdict	<ul style="list-style-type: none"> <li>Excellent wireless performance</li> <li>Dual-band Wi-Fi</li> <li>Guest login feature</li> </ul>	<ul style="list-style-type: none"> <li>Sleek, flat and square look</li> <li>Concurrent 2.4/5GHz</li> <li>Extremely easy setup</li> <li>Digital audio output</li> </ul>	<ul style="list-style-type: none"> <li>Supports landline and internet telephony</li> <li>Dual-band Wi-Fi</li> <li>USB port</li> </ul>	<ul style="list-style-type: none"> <li>Parental controls</li> <li>Media-sharing options</li> <li>3x3 Mimo antenna for speed</li> <li>Strong performance</li> </ul>	<ul style="list-style-type: none"> <li>Portable 3G router</li> <li>Tiny and lightweight</li> <li>Mains-/USB-powered</li> <li>Reliable performance</li> </ul>
FULL REVIEW	TINYURL.COM/6Z7BDM	TINYURL.COM/C4ZAYEM	TINYURL.COM/3QUJZBX	TINYURL.COM/82KWLJO	TINYURL.COM/85P7R9P

## >> Buying advice



### Blu-ray drives

A single Blu-ray Disc holds the equivalent of 35 CDs or five DVDs. It might look like a DVD, but its shorter wavelength and narrow blue laser beam allow it to hold greater capacity. It's the storage method of choice for HD and 3D video content.

External drives are easier to install, portable, and can be shared

between PCs, but they will cost you considerably more than internal models, and may not be as quick.

If you opt for an internal drive, ensure you have enough space inside your PC. Most internal drives use the SATA interface, so check you've got a compatible port.

Look for a drive that also supports several DVD formats, but don't obsess about write speeds.

You should be able to get 16-speed DVD writing, but it's not worth paying more to save seconds.

You may find that the Blu-ray media currently on the market isn't fast enough to enjoy your chosen drive's maximum write speeds. Six-/eight-speed BD-R capabilities are standard, but even six-speed BD-R media is still rare.

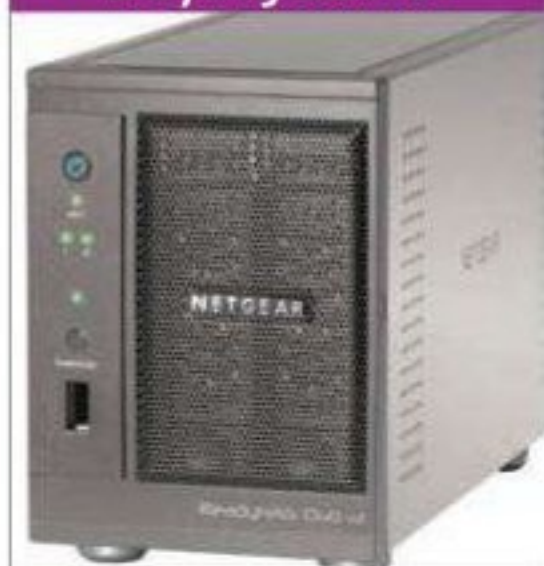
READ MORE: [TINYURL.COM/70EPYL6](http://TINYURL.COM/70EPYL6)



External hard drives	1	2	3	4	5
	PC ADVISOR BEST BUY	PC ADVISOR RECOMMENDED	PC ADVISOR GOLD		PC ADVISOR BEST BUY
	Seagate FreeAgent GoFlex	iStorage diskAshur DT 3TB	G-Tech G-Raid Thunderbolt	WD My Book Thunderbolt Duo	WD My Passport Studio
Price	£180 inc VAT	£295 inc VAT	£750 inc VAT	£390 inc VAT	£130 inc VAT
Website	Seagate.com	Istorage-uk.com	G-technology.com	Wdc.com	Wdc.com/en
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity tested	3TB	3TB	8TB	4TB	1TB
Capacity range	1TB to 3TB	1TB to 3TB	4TB to 8TB	4TB to 6TB	500GB to 1TB
Disk size	3.5in	3.5in	3.5in	3.5in	2.5in
Spin speed	7,200rpm	5,400rpm	7,200rpm	7,200rpm	5,400rpm
Transfer speed	94MBps (USB 3.0)	155MBps (USB 3.0)	329MBps	223MBps	76MBps (FireWire 800)
Encryption	192bit	256bit	None	None	256bit
Other interfaces	Optional FireWire 800	None	None	None	FireWire 800, USB 2.0
Software	Memo Backup	None	None	WD Drive Utilities	WD utilities
Dimensions	158x124x44mm	183x112x40mm	235x130x85mm	165x157x99mm	126x84x22mm
Weight	1kg	1.2kg	2.3kg	2.2kg	334g
Warranty	2 years	3 years	3 years	3 years	3 years
Verdict	<ul style="list-style-type: none"> <li>Great speed for USB 3.0</li> <li>Great value for capacity</li> <li>Separate storage drive and USB 3.0 dock</li> </ul>	<ul style="list-style-type: none"> <li>Hardware encryption is difficult to break and requires no software</li> <li>Superb performance</li> </ul>	<ul style="list-style-type: none"> <li>Fast Thunderbolt interface</li> <li>Real-world speed can exceed 200MBps</li> <li>Pricy, but huge capacity</li> </ul>	<ul style="list-style-type: none"> <li>Thunderbolt interface</li> <li>Not as fast as some Thunderbolt Raid drives</li> <li>Quiet and cool operation</li> </ul>	<ul style="list-style-type: none"> <li>Superbly built</li> <li>FireWire 800 and USB 2.0 interfaces</li> <li>AES encryption</li> </ul>
FULL REVIEW	TINYURL.COM/BN2Z92F	TINYURL.COM/BMGKSVY	TINYURL.COM/CXEF6MH	TINYURL.COM/C6TADAH	TINYURL.COM/6FAWBNE

NAS drives	1	2	3	4	5
	PC ADVISOR BEST BUY	PC ADVISOR RECOMMENDED	PC ADVISOR RECOMMENDED		
	Synology DS412+	Zyxel NSA325	Qnap TS-419P II	Netgear ReadyNAS Pro 6	Iomega StorCenter px6-300d
Price	£510 inc VAT (diskless)	£120 inc VAT (diskless)	£492 inc VAT (diskless)	£865 inc VAT (diskless)	£576 inc VAT (diskless)
Website	Synology.com	Zyxel.co.uk	Qnap.com	Netgear.co.uk	Go.iomega.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Drive bays	4	2	4	6	6
Processor	2.13GHz Intel Atom D2700	1.6GHz processor	2GHz Marvell 88F66282	2.66GHz Intel Pentium	1.8GHz Intel Atom D525
Memory	1GB DDR3	512MB DDR2	512MB DDR3	2GB DDR2	2GB DDR3
Remote access	✓	✓	✓	✓	✓
eSATA	✓	✗	✓	✗	✗
USB port	2x USB 3.0, 1x USB 2.0	2x USB 2.0	4x USB 2.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 2x USB 2.0
Raid options	0/1/5/5+s/6/10/JBOD	0/1/JBOD	0/1/5/6/10/JBOD	0/1/5/6/10	0/1/10/5/5+s/6
Software	DSM 4.0	zPilot	TurboNAS 3.6.1	Netgear RAIDiator	EMC LifeLine, Iomega Link
Dimensions	165x203x233mm	108x205x147mm	177x180x235mm	170x250x285mm	257x176x270mm
Weight	2kg	1.8kg	3kg	7.3kg	4.9kg
Warranty	2 years	1 year	2 years	5 years	3 years
Verdict	<ul style="list-style-type: none"> <li>Superb read/write performance</li> <li>Powerful options</li> <li>Attractive and intuitive</li> </ul>	<ul style="list-style-type: none"> <li>Cheapest drive here</li> <li>Decent performance and features for the money</li> <li>Complex interface</li> </ul>	<ul style="list-style-type: none"> <li>Well priced</li> <li>Robust cabinet construction</li> <li>Solid performance</li> <li>Old but effective interface</li> </ul>	<ul style="list-style-type: none"> <li>Most expensive NAS here</li> <li>Mostly strong performance</li> <li>Internal power supply</li> <li>Complex admin interface</li> </ul>	<ul style="list-style-type: none"> <li>High-quality construction</li> <li>Features suitable for home and business use</li> <li>Decent performance</li> </ul>
FULL REVIEW	TINYURL.COM/6UUL4DE	TINYURL.COM/7B9EPW8	TINYURL.COM/72N4GBN	TINYURL.COM/84JD226	TINYURL.COM/7AT8HA5

## >> Buying advice



### NAS drives

NAS drives are ideal for businesses or home users who require large amounts of dependable and secure storage, accessible to anyone logged into the local wired or wireless network.

Instead of connecting a hard disk directly to one PC, the NAS is typically connected to a network router. Many NAS drives are

typically supplied without disks, letting you add your own selection.

Most NAS drives allow virtual partitions, letting you keep data such as PC backups separate from media files. Home-oriented NAS drives also include media servers to allow easy streaming of content.

To augment data integrity, access speed, capacity, or all

three, individual hard disks can be combined in a number of Raid configurations. Raid 0 'stripes' data across multiple drives to increase access speeds. Raid 1 mirrors the contents of one drive on to another, providing a cloned backup. Raid 5 is available with three-plus drives and combines both advantages.

READ MORE: [TINYURL.COM/7H3HCNR](http://TINYURL.COM/7H3HCNR)

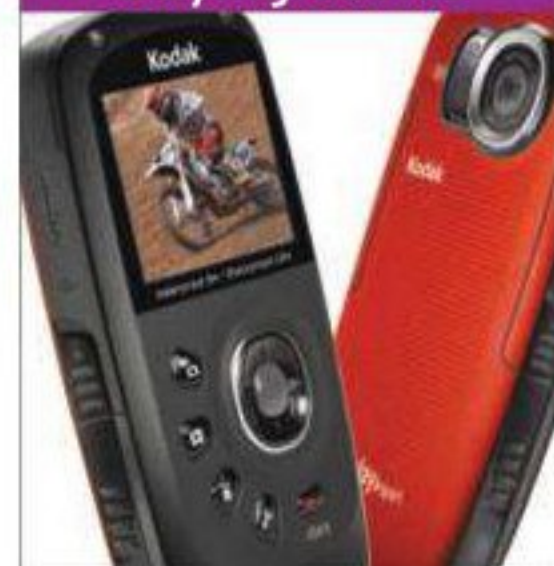


Projectors					
	InFocus ScreenPlay SP8600	Vivitek Qumi Q2	Dell M110	NEC NP43	ViewSonic PJD7383i
Price	£660 inc VAT	£435 inc VAT	£400 inc VAT	£610 inc VAT	£1,129 inc VAT
Website	Infocus.com	Vivitek.co.uk	Dell.co.uk	Nec-display-solutions.co.uk	Viewsoniceurope.com/uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Projection technology	DLP	DLP	DLP	DLP	DLP
Resolution (pixels)	1920x1080	1280x800	1280x800	1024x768	1024x768
Brightness <sup>1</sup> , Contrast	1,800, 5,000:1	300, 2,500:1	300, 10,000:1	2,300, 1,600:1	3,000, 3,000:1
Image size	300in	30-90in	80in	300in	30-300in
Supported aspect ratios	16:10, 16:9, 4:3	16:10, 16:9, 4:3	16:10, 16:9, 4:3	16:9, 4:3	4:3
Noise levels (dB)	30 (26 eco)	32 (28 eco)	36 (32 eco)	37 (32 eco)	32 (27 eco)
Connections	VGA, HDMI, CM, CP, SV, USB	VGA, HDMI, USB	VGA, HDMI, CM, CP, USB	VGA, SV, USB	VGA, CP, SV, USB
Lamp/lamp life	230W/4,000 hrs	LED/30,000 hrs	LED/10,000 hrs	200W/1,000 hrs	210W/4,000 hrs
Dimensions	326x254x104mm	162x102x32mm	105x104x37mm	246x72x177mm	290x126x254mm
Weight	3.4kg	635g	360g	1.7kg	3.5kg
Warranty	5 years	3 years	2 years	2 years	3 years
Verdict	<ul style="list-style-type: none"> <li>• Smooth video playback</li> <li>• Full-HD resolution</li> <li>• Great contrast levels</li> <li>• Bright, colourful image</li> </ul>	<ul style="list-style-type: none"> <li>• Now fantastic value</li> <li>• Lightest model here</li> <li>• DLP-Link enables 3D display</li> <li>• Exceptional lamp life rating</li> </ul>	<ul style="list-style-type: none"> <li>• Ultra-small and -light</li> <li>• Good colour</li> <li>• Long-life LED lamp</li> <li>• Remote control costs extra</li> </ul>	<ul style="list-style-type: none"> <li>• Portable business model</li> <li>• Strong Auto Focus</li> <li>• Customisable settings</li> <li>• Decent image quality</li> </ul>	<ul style="list-style-type: none"> <li>• Ultra-short throw</li> <li>• Gets very warm in operation</li> <li>• Lacks HDMI and DVI</li> <li>• Creston RoomView software</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/3HQANPV">TINYURL.COM/3HQANPV</a>	<a href="http://TINYURL.COM/3TXMWPk">TINYURL.COM/3TXMWPk</a>	<a href="http://TINYURL.COM/77S8D6D">TINYURL.COM/77S8D6D</a>	<a href="http://TINYURL.COM/62W3796">TINYURL.COM/62W3796</a>	<a href="http://TINYURL.COM/3BW7ZZW">TINYURL.COM/3BW7ZZW</a>

<sup>1</sup>Ansi lumens GLOSSARY: • CM: component • CP: composite • SV: S-Video

Digital camcorders					
	Kodak PlaySport Zx5	Sony Bloggie Touch MHS-TS20	JVC Everio GZ-HM650	Canon Legria HF R106	Kodak Playfull ZE1
Price	£90 inc VAT	£70 inc VAT	£300 inc VAT	£275 inc VAT	£106 inc VAT
Website	Kodak.co.uk	Sony.co.uk	Jvc.co.uk	Canon.co.uk	Kodak.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Maximum resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Aspect ratio	16:9	16:9	4:3, 16:9	16:9	16:9
Display	2in	3in	2.7in	2.7in	1.5in
CCD sensor	1/3.2in	1/2.5in	1/4.1in	1/5.5in	1/3.2in
Zoom	4x digital	4x digital	200x digital, 40x optical	80x digital, 20x optical	4x digital
Supported formats	Mpeg4, Jpeg	Mpeg4, Jpeg	Mpeg4, Jpeg	AVCHD, Jpeg	Mpeg4, Jpeg
Storage (media card)	128MB (SD/SDHC)	8GB (SD/MS)	8GB (SD/SDHC/SDXC)	none (SD/SDHC)	128MB (SD/SDHC)
Connections	Micro-HDMI, MicroUSB	HDMI, USB 2.0	HDMI, USB 2.0	HDMI, USB 2.0	Micro-HDMI, MicroUSB
Dimensions	58x112x18mm	47x9x106mm	51x55x111mm	60x64x124mm	42x100x16mm
Weight	125g	125g	195g	319g	95g
Warranty	1 year	1 year	1 year	1 year	1 year
Verdict	<ul style="list-style-type: none"> <li>• Ruggedised design</li> <li>• Comfortable to hold</li> <li>• 2in screen rather small</li> <li>• Takes AAA batteries</li> </ul>	<ul style="list-style-type: none"> <li>• Useful 8GB memory</li> <li>• Awkward to hold</li> <li>• Ideal for video; stills less so</li> <li>• No built-in flash</li> </ul>	<ul style="list-style-type: none"> <li>• Lightweight, easy to use</li> <li>• Excellent 40x optical zoom</li> <li>• 6.5-hour recording memory</li> <li>• Supports 32GB SDXC cards</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent-value HD model</li> <li>• 2.7in flip-out LCD</li> <li>• Smooth 20x optical zoom</li> <li>• Great colour balance</li> </ul>	<ul style="list-style-type: none"> <li>• Simplicity itself to use</li> <li>• One-touch record and share</li> <li>• Tiny LCD</li> <li>• Rather toy-like</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/3U3Y2CA">TINYURL.COM/3U3Y2CA</a>	<a href="http://TINYURL.COM/332UOQJ">TINYURL.COM/332UOQJ</a>	<a href="http://TINYURL.COM/453U838">TINYURL.COM/453U838</a>	<a href="http://TINYURL.COM/2VFVLQX">TINYURL.COM/2VFVLQX</a>	<a href="http://TINYURL.COM/79HCGJC">TINYURL.COM/79HCGJC</a>

## >> Buying advice



## Digital camcorders

The quality varies enormously between low-cost camcorders, and we wouldn't be surprised if your smartphone took better stills and video. Still, it can be useful to have a weather- or waterproof model, or simply something cheap you can take to the beach.

Look for an optical zoom that lets you get closer to the action.

A flip-out LCD will also help you follow the action more easily.

Avoid models that don't support HD. Note that full-HD can refer to 1080i or 1080p, with the latter progressive scan preferable.

If you're paying a little more, look for some kind of image stabilisation feature and more control over your footage. A large






LCD can be useful here, with the more pixels the better.

Video is usually compressed with Mpeg4, and often wrapped in AVCHD. You'll need good software and a powerful PC to edit video.

Save room in your budget for a memory card, as most camcorders have little or no memory built-in.

READ MORE: [TINYURL.COM/7KQNLMB](http://TINYURL.COM/7KQNLMB)



Compact digital cameras					
	1 <b>PC ADVISOR</b> RECOMMENDED	2 <b>PC ADVISOR</b> BEST BUY	3 <b>PC ADVISOR</b> RECOMMENDED	4	5
	Nikon Coolpix S9100	Panasonic Lumix DMC-TZ20	Nikon 1 J1	Samsung MV800	Canon PowerShot G12
Price	£190 inc VAT	£170 inc VAT	£350 inc VAT	£170 inc VAT	£400 inc VAT
Website	Nikon.co.uk	Panasonic.co.uk	Nikon.co.uk	Samsung.com/uk	Canon.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Megapixel rating	12.1Mp	14.1Mp	10.1Mp	16.2Mp	10Mp
Maximum resolution	4000x3000 pixels	4320x3240 pixels	3872x2592 pixels	4608x3456 pixels	3648x2736 pixels
Optical zoom	18x	16x	3x	5x	5x
Maximum aperture	f3.5-f5.9	f3.3-f5.9	N/A	f3.3-f5.9	f2.8-f4.5
LCD size	3in	2.8in	3in	3in	2.8in
Media card	SD/SDHC	SD/SDHC	SD/SDHC	MicroSD	SD/SDHC
Battery/life	1x lithium-ion/270 shots	1x lithium-ion/260 shots	1x lithium-ion/230 shots	1x lithium-ion/not specified	1x lithium-ion/370 shots
ISO range	160 to 3200	100 to 1600	100 to 3200	125 to 3200	80 to 3200
Dimensions	106x35x62mm	105x33x58mm	106x30x61mm	92x18x56mm	112x48x76mm
Weight	214g	219g	274g	124g	401g
Warranty	2 years	1 year	2 years	2 years	1 year
Verdict	<ul style="list-style-type: none"> <li>Excellent photo quality</li> <li>Longest zoom range here</li> <li>1920x1080-pixel video</li> <li>Incredible 240fps slow-mo</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive menu</li> <li>Warm, natural colour range</li> <li>GPS geotagging support</li> <li>AVCHD or Mpeg video</li> </ul>	<ul style="list-style-type: none"> <li>Mirrorless semi-compact</li> <li>Solid construction</li> <li>Good range of video modes</li> <li>Deep colours</li> </ul>	<ul style="list-style-type: none"> <li>Flip-up touchscreen LCD</li> <li>Limited 5x optical zoom</li> <li>Better for video than photos</li> <li>Great panorama mode</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive feature set</li> <li>High dynamic range setting</li> <li>Ideal step-up from compacts</li> <li>Easy to use</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/6E457PY">TINYURL.COM/6E457PY</a>	<a href="http://TINYURL.COM/6XNRWUO">TINYURL.COM/6XNRWUO</a>	<a href="http://TINYURL.COM/7ZC25FY">TINYURL.COM/7ZC25FY</a>	<a href="http://TINYURL.COM/83SSNQX">TINYURL.COM/83SSNQX</a>	<a href="http://TINYURL.COM/4QHAF66">TINYURL.COM/4QHAF66</a>

Compact system cameras					
	1 <b>PC ADVISOR</b> BEST BUY	2 <b>PC ADVISOR</b> RECOMMENDED	3 <b>PC ADVISOR</b> GOLD	4	5
	Nikon D5100 (18-55mm)	Panasonic DMC-G3 (14-42mm)	Sony Alpha NEX-5 (18-55mm)	Canon EOS 600D (18-55mm)	Olympus E-PM1 (14-42mm)
Price	£500 inc VAT	£400 inc VAT	£510 inc VAT	£590 inc VAT	£390 inc VAT
Website	Nikon.co.uk	Panasonic.co.uk	Sony.co.uk	Canon.co.uk	Olympus.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Megapixel rating	16.2Mp	16Mp	14.6Mp	18Mp	12.3Mp
Maximum resolution	4923x3264 pixels	4592x3448 pixels	4592x3056 pixels	5184x3456 pixels	4032x3024 pixels
Optical zoom	3x	3x	3.1x	3x	3x
Maximum aperture	f3.5-f5.6	f3.5-f5.6	f3.5-f5.6	f3.5-f5.6	f3.5-f5.6
LCD size	3in	3in	3in	3in	3in
Media card	SD/SDHC/SDXC	SD/SDHC/SDXC	MS/SD/SDHC	SD/SDHC/SDXC	SD/SDHC/SDXC
Battery/life	1x lithium-ion/660 shots	1x lithium-ion/270 shots	1x lithium-ion/not specified	1x lithium-ion/440 shots	1x lithium-ion/330 shots
ISO range	100 to 6400	100 to 6400	200 to 12800	100 to 6400	200 to 12800
Dimensions	124x97x79mm	115x84x47mm	111x59x38mm	133x100x80mm	110x64x34mm
Weight	510g	336g	229g	570g	217g
Warranty	3 years	3 years	1 year	1 year	2 years
Verdict	<ul style="list-style-type: none"> <li>Excellent stills and video</li> <li>Suitable for novice and intermediate photographers</li> <li>Plenty of lenses available</li> </ul>	<ul style="list-style-type: none"> <li>Great dSLR alternative</li> <li>Rotating touchscreen</li> <li>Strong video-capture mode</li> <li>Very fast autofocus</li> </ul>	<ul style="list-style-type: none"> <li>Compact</li> <li>Great performance</li> <li>Great colour fidelity</li> <li>Takes clean, sharp shots</li> </ul>	<ul style="list-style-type: none"> <li>Top-notch photo results</li> <li>Fully auto/manual modes</li> <li>Articulated LCD screen</li> <li>Strong video capture</li> </ul>	<ul style="list-style-type: none"> <li>Compact camera</li> <li>Likable art filter modes</li> <li>High ISO suffers noise</li> <li>No built-in flash or EVF</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/6UTE9KK">TINYURL.COM/6UTE9KK</a>	<a href="http://TINYURL.COM/7JCXJCR">TINYURL.COM/7JCXJCR</a>	<a href="http://TINYURL.COM/37XOZX5">TINYURL.COM/37XOZX5</a>	<a href="http://TINYURL.COM/72STE88">TINYURL.COM/72STE88</a>	<a href="http://TINYURL.COM/BLMYMJW">TINYURL.COM/BLMYMJW</a>

## >> Buying advice



### Compact digital cameras

Compact cameras are available for as little as £50. Budget models don't necessarily entail reduced image quality, but they do tend to offer fewer features.

The sweet spot is around £120. At this price you should expect great photo and video quality, but not much in the way of manual control, such as depth-of-field.

It's not uncommon to find 14Mp-plus compacts for less than £100, but cramming so many pixels into a small sensor means less light falls on to each receptor. The ISO is increased to compensate for dim lighting, which can result in noisy (grainy) images.

A large 3in LCD screen is useful for image composition and review; a viewfinder is also useful in bright

sunlight. Look for a minimum 260,000-dot screen resolution.






The optical zoom is more important than a camera's digital equivalent, which merely crops in on images. Most compact cameras have a small optical zoom.

Be sure to include a memory card in your budget. Note that not all cameras support SDXC cards.

**READ MORE:** [TINYURL.COM/7ZOS7LP](http://TINYURL.COM/7ZOS7LP)



Sub-£150 graphics cards					
	1 PC ADVISOR GOLD	2	3	4 PC ADVISOR RECOMMENDED	5
	MSI HD 6850	MSI HD 7770 OC	Sapphire Radeon HD 7750	PowerColor Radeon HD 6790	Asus Radeon HD 6670
Price	£100 inc VAT	£105 inc VAT	£80 inc VAT	£90 inc VAT	£60 inc VAT
Website	Uk.msi.com	Uk.msi.com	Sapphiretech.com	Powercolor.com	Uk.asus.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Graphics processor	AMD Radeon HD 6850	AMD Radeon HD 7770	AMD Radeon HD 7750	AMD Radeon HD 6790	AMD Radeon HD 6670
Installed RAM	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB DDR3
Memory interface	256bit	128bit	128bit	256bit	128bit
Core/memory clock	820MHz/1.1GHz	1.1GHz/1,250MHz	800MHz/1,125MHz	840MHz/1,050MHz	800MHz/900MHz
Ramdac	400MHz	400MHz	400MHz	400MHz	400MHz
Stream processors	960	640	512	800	480
Power connectors	1x 6-pin	1x 6-pin	None	2x 6-pin	None
Interface	PCI Express	PCI Express	PCI Express	PCI Express	PCI Express
DirectX	11.0	11.1	11.0	11.0	11.0
Digital interface	DVI, HDMI, DisplayPort	DVI, HDMI, Mini-DisplayPort	DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort	DVI, HDMI
Warranty	3 years	3 years	2 years	2 years	3 years
Verdict	<ul style="list-style-type: none"> <li>The best 6850 available</li> <li>Powerful card for the price</li> <li>Good memory bandwidth</li> <li>256bit memory interface</li> </ul>	<ul style="list-style-type: none"> <li>Faster than 7750</li> <li>Good value at just £25 more</li> <li>Only 128bit memory</li> <li>Low sound levels</li> </ul>	<ul style="list-style-type: none"> <li>Better value for money than the 6790 and 6770</li> <li>Uses some 7970 architecture</li> <li>Light on power</li> </ul>	<ul style="list-style-type: none"> <li>Playable framerates</li> <li>Strong memory bandwidth</li> <li>6800-series cards faster</li> <li>256bit memory interface</li> </ul>	<ul style="list-style-type: none"> <li>Great-value video card</li> <li>800MHz core clock memory</li> <li>128bit memory limits appeal</li> <li>Lacks power for some games</li> </ul>
FULL REVIEW	TINYURL.COM/3XRUQW5	TINYURL.COM/BWJ7BL9	TINYURL.COM/7ZB5OE3	TINYURL.COM/6P9B7KZ	TINYURL.COM/3LM8HGE

£151+ graphics cards					
	1 PC ADVISOR RECOMMENDED	2	3	4	5
	MSI GeForce GTX 670	Zotac GeForce GTX 680	XFX 7970 3GB GDDR5	Asus HD 7870 DirectCU II	Gainward GeForce GTX 690
Price	£300 inc VAT	£410 inc VAT	£350 inc VAT	£275 inc VAT	£900 inc VAT
Website	Uk.msi.com	Zotac.com	Xfxforce.com	Uk.asus.com	Gainward.de
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Graphics processor	nVidia GeForce GTX 670	nVidia GeForce GTX 680	AMD Radeon HD 7970	AMD Radeon HD 7870	nVidia GeForce GTX 690
Installed RAM	2GB GDDR5	2GB GDDR5	3GB GDDR5	2GB GDDR5	4GB GDDR5
Memory interface	256bit	256bit	284bit	256bit	2x 256bit
Core/memory clock	915MHz/1,502MHz	1,006MHz/1,502MHz	925MHz/1,375MHz	1,010MHz/1,210MHz	915MHz/6,008MHz
Ramdac	400MHz	400MHz	400MHz	400MHz	400MHz
Stream processors	1,344	1,536	2,048	1,280	2x 1,536
Power connectors	2x 6-pin	2x 6-pin	1x 6-pin, 1x 8-pin	2x 6-pin	2x 8-pin
Interface	PCI Express	PCI Express	PCI Express	PCI Express	PCI Express
DirectX	11.0	11.0	11.1	11.1	11.0
Digital interface	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini-DisplayPort	DVI, HDMI, 2x Mini-DP	3x DVI, 1x Mini-DP
Warranty	2 years	5 years	2 years	2 years	2 years
Verdict	<ul style="list-style-type: none"> <li>Almost on a par with 7970</li> <li>Low power consumption</li> <li>Same memory bandwidth as GTX 680</li> </ul>	<ul style="list-style-type: none"> <li>Fastest single-GPU card</li> <li>Low power consumption</li> <li>Price drop to 7970 weakens this card's value for money</li> </ul>	<ul style="list-style-type: none"> <li>Good performance</li> <li>Not as powerful or as efficient as GTX 680</li> <li>Close to 7870 on value</li> </ul>	<ul style="list-style-type: none"> <li>Affordably priced</li> <li>Cheaper than GTX 670, but behind on framerates</li> <li>Modest power consumption</li> </ul>	<ul style="list-style-type: none"> <li>Incredibly fast dual-GPU card</li> <li>Eye-watering price tag</li> <li>Not as power-hungry or as loud as you'd expect</li> </ul>
FULL REVIEW	TINYURL.COM/CRDW78J	TINYURL.COM/C6C37QO	TINYURL.COM/6UZRVXC	TINYURL.COM/BUFMAFF	TINYURL.COM/D7A2XU3

## >> Buying advice



## Graphics cards

The key feature of a graphics card is its GPU. Produced by AMD or nVidia, this determines the quality of images displayed and their refresh speed. The more powerful the GPU the better, but you can get away with a lesser card by turning down a game's detail levels.

Even those on a budget should be able to get at least 1GB of DDR

video memory. Look for GDDR5 rather than GDDR3 RAM. This in effect quadruples the clock speed (GDDR3 merely doubles it).

The memory interface (or bus) governs how much data can be sent at once, so a 256bit interface lets through twice as much data as a 128bit interface. Graphics cards with the best combination of memory interface size and

clock speed should produce the best performance.

DirectX 11.x support is required for advanced, modern games; cheaper cards lack the firepower to do such titles justice, however.

Check that a card will fit inside your PC and you have sufficient connections from the power supply unit before you buy.

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Sub-£200 flat-panels	1	2	3	4	5
	Viewsonic VX2336s-LED	AOC i2352Vh	AOC i2353Fh	Hanns-G HL249DPB	Iiyama ProLite XB2472HD
Price	£130 inc VAT	£132 inc VAT	£145 inc VAT	£108 inc VAT	£190 inc VAT
Website	Viewsoniceurope.com	Aoc-europe.com	Aoc-europe.com	Hannsg.com	Iiyama.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	23in	23in	23in	23.6in	24in
Panel type	In-plane switching	In-plane switching	In-plane switching 3D	Twisted nematic	Vertical alignment
Native resolution	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels
Pixel pitch	0.27mm	0.27mm	0.27mm	0.27mm	0.28mm
Brightness	233cd/m²	258cd/m²	225cd/m²	247cd/m²	Not measured
Static contrast ratio	710:1	731:1	666:1	740:1	Not measured
Response time	14ms	5ms	5ms	5ms	8ms
Digital connector	DVI	DVI, HDMI, VGA	2x HDMI, VGA	DVI	DVI, HDMI
Dimensions	548x426x201mm	247x185x399mm	550x388x188mm	563x211x403mm	570x215x438mm
Weight	3.6kg	3.2kg	5.6kg	3.8kg	6.2kg
Warranty	3 years	3 years	3 years	3 years	3 years
Verdict	<ul style="list-style-type: none"> <li>Excellent value IPS panel</li> <li>Strong image quality</li> <li>No HDMI or speakers</li> <li>Slow response rate</li> </ul>	<ul style="list-style-type: none"> <li>Good value IPS panel</li> <li>Accurate colours</li> <li>Plain styling</li> <li>Few extras</li> </ul>	<ul style="list-style-type: none"> <li>Wide viewing angles</li> <li>Excellent colours</li> <li>Attractive, slimline design</li> <li>No DVI connection</li> </ul>	<ul style="list-style-type: none"> <li>Extremely low price</li> <li>Pleasing image quality</li> <li>Low power consumption</li> <li>Only a TN panel</li> </ul>	<ul style="list-style-type: none"> <li>Wonderful 24bit colour reproduction</li> <li>Viewing angles not great</li> <li>Height-adjustable stand</li> </ul>
FULL REVIEW	TINYURL.COM/86JF4W2	TINYURL.COM/7HXTPVV	TINYURL.COM/7TWLB2A	TINYURL.COM/C95859A	TINYURL.COM/3DYX75Z

£200+ flat-panels	1	2	3	4	5
	ViewSonic VP2365-LED	Philips Brilliance 241P4QPYES	Acer V273HL	NEC MultiSync EA232WMI	ViewSonic VP2765-LED
Price	£205 inc VAT	£252 inc VAT	£220 inc VAT	£246 inc VAT	£360 inc VAT
Website	Viewsoniceurope.com/uk	Philips.co.uk	Acer.co.uk	Nec-display-solutions.co.uk	Viewsoniceurope.com/uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	23in	24in	27in	23in	27in
Panel type	In-plane switching	Advanced MVA	Twisted nematic	In-plane switching	Advanced MVA
Native resolution	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels	1920x1080 pixels
Pixel pitch	0.27mm	0.28mm	0.31mm	0.27mm	0.31mm
Brightness	238cd/m²	299cd/m²	315cd/m²	Not measured	1,200cd/m²
Static contrast ratio	681:1	1,691:1	850:1	Not measured	378:1
Response time	6ms	12s	5ms	14ms	25ms
Digital connector	DVI	DVI, DisplayPort	DVI, HDMI	DVI, DisplayPort	DVI, DisplayPort
Dimensions	548x433x250mm	565x220x395-518mm	644x445x195mm	550x220x379mm	642x365x474-608mm
Weight	5.4kg	5.9kg	6.9kg	5.8kg	8.5kg
Warranty	3 years	3 years	3 years	3 years	3 years
Verdict	<ul style="list-style-type: none"> <li>Premium IPS panel</li> <li>Superb colour reproduction</li> <li>Wide viewing angles</li> <li>DVI port only</li> </ul>	<ul style="list-style-type: none"> <li>Very strong image quality</li> <li>Excellent viewing angles</li> <li>Rotate, height adjustability</li> <li>Four-port USB hub</li> </ul>	<ul style="list-style-type: none"> <li>Large screen for the money</li> <li>Average viewing angles</li> <li>Reasonable colour quality</li> <li>Functionality over style</li> </ul>	<ul style="list-style-type: none"> <li>High-calibre IPS screen</li> <li>Impressive colour depth</li> <li>Poor 14ms response rate</li> <li>Height/tilt-adjustable stand</li> </ul>	<ul style="list-style-type: none"> <li>Large 27in display</li> <li>Low resolution for size</li> <li>Poor viewing angles</li> <li>Slow response for games</li> </ul>
FULL REVIEW	TINYURL.COM/5WMJLR9	TINYURL.COM/6VVODAP	TINYURL.COM/7J3NO55	TINYURL.COM/4CQGNVW	TINYURL.COM/86T3PFM

## >> Buying advice



### Flat-panel displays

You'll spend most of your working day staring at the screen, so it makes sense to choose one that's comfortable to view.

The panel size will largely depend on your budget and amount of desk space, but those measuring 22in and above tend to offer a full-HD resolution. All bar the cheapest models also have at

least one digital interface (DVI, HDMI or DisplayPort). VGA (or D-Sub) is an analogue interface, and won't provide as clean a signal.

The panel technology is important. Twisted nematic (TN) is the budget option, offering fast response times but limited viewing angles. Multiple vertical alignment (MVA) and patterned vertical alignment (PVA) screens offer

better viewing angles and higher contrast ratios than TN, but slower response times. Advanced MVA screens are more responsive.

In-plane switching (IPS) panels offer excellent viewing angles, contrast and colour accuracy, but they can be rather pricey.

Get a matt rather than gloss coating for fewer reflections.

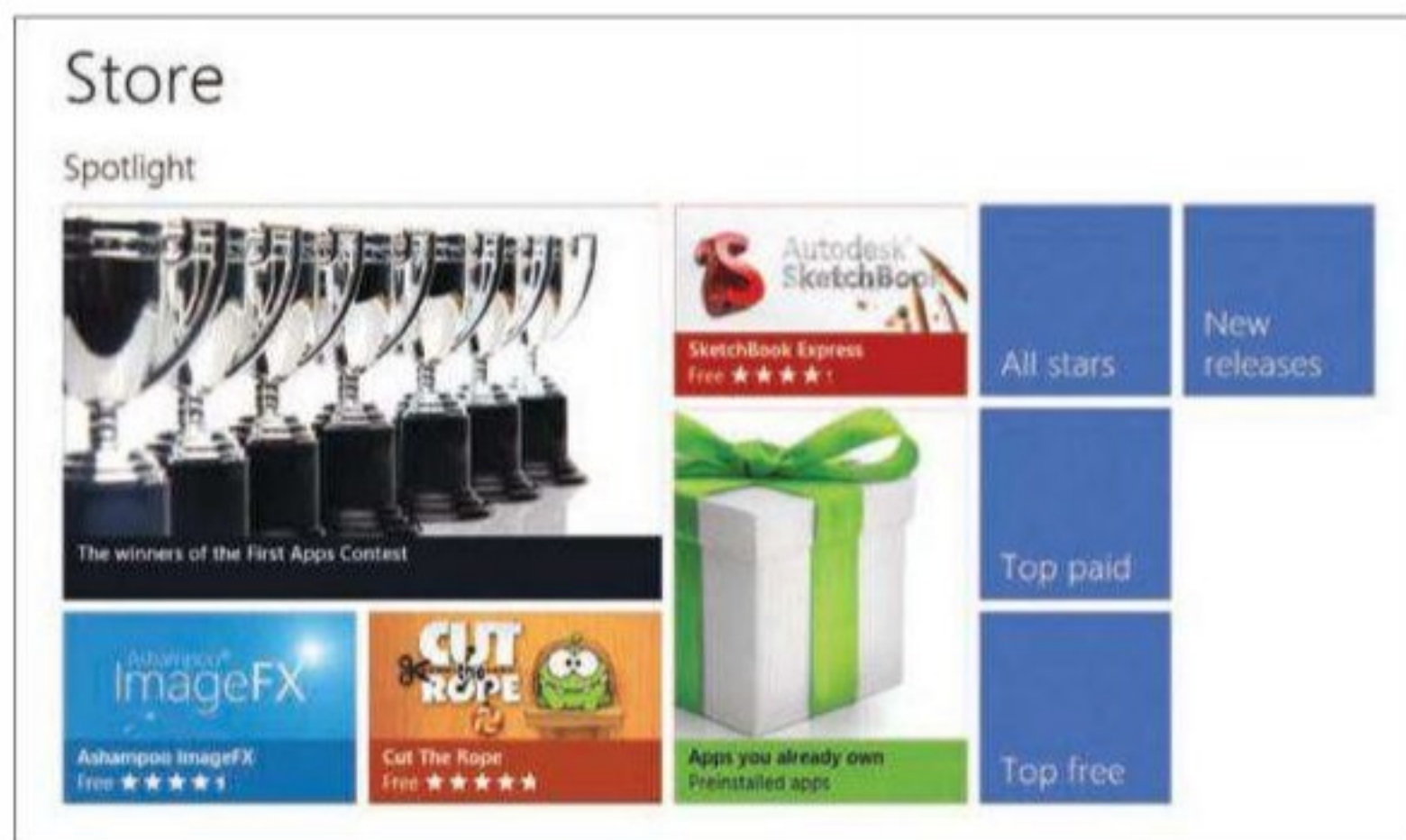
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JIM MARTIN

## Windows 8: all about the apps



Like it or not, Windows 8 is coming. Buy a new computer this Christmas and, provided that it doesn't have an Apple logo on the front, you'll get a copy of Microsoft's latest OS.

We, along with others, have voiced our concerns about how Windows 8 will work on a desktop or laptop PC that doesn't have a touchscreen. We can only hope that Microsoft's Windows president, Steven Sinofsky, has listened to feedback and made sufficient changes that the keyboard and mouse don't feel like second-class devices in comparison to the touchscreen.

Regardless of whether every new PC and laptop will have a touchscreen (they won't), people will still want to use a keyboard and mouse when they realise that a vertical touchscreen can be very uncomfortable to use.

Plus, while apps designed for the new Windows 8 interface will be easier to use with a finger or two, legacy programs may not. Spreadsheet, word-processing and video-editing programs are just three types of complex software that can't easily be rewritten for a touchscreen without being dumbed down.

Apple has proven with iMovie that it's possible to edit video on a touchscreen, but the process is not without its compromises. Anyone serious about editing video wouldn't touch it. (No pun intended.)

The potential problem is that app developers will want to create a single version of an app that will run on PCs, laptops and tablets. But not only is the hardware unequal, so are the aspirations of its users.

We hope apps will take advantage of a PC's high-resolution screen and powerful hardware, rather than viewing a Windows RT tablet as the lowest common denominator and catering only for that specification.

Paying for apps is another obstacle. If you've already paid for Photoshop, for example, you won't want to shell out again for a Windows 8 version - especially if it's less capable.

Yet another hurdle Windows 8 must counter before it's accepted is the fact that all apps must be downloaded via the Windows Store. This will have the advantage of being a safe, curated place, but it means a far smaller choice of programs compared to Windows 7 (at least to start with) and a step backward in terms of freedom.

The apps themselves must deliver for Windows 8 to be a success, and we're sure that those currently conspicuous by their absence in the Store will be present in six months' time. If not, or if they fail to deliver the features people want, it's not only Microsoft's success in the tablet market that's at stake. ☒

## >> Next issue

ISSUE 209 ON SALE 11 OCTOBER 2012

**TEST CENTRE**

### Smartphones round-up

Few tech purchasing decisions are more personal than that of which smartphone you'll carry with you wherever you go. We round up the latest smartphones to drop by our Test Centre.

**TEST CENTRE**

### 7- & 10in tablets on test

We look at the latest and greatest large- and small-screen tablets, so you can choose the best buy on any budget.

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### Family PCs group test

Looking for a PC that can cope with the kids' homework, mum's online shopping addiction and dad's attempts at Call of Duty? We review six PCs that will be a perfect fit for your family.

### Protect your tech kit

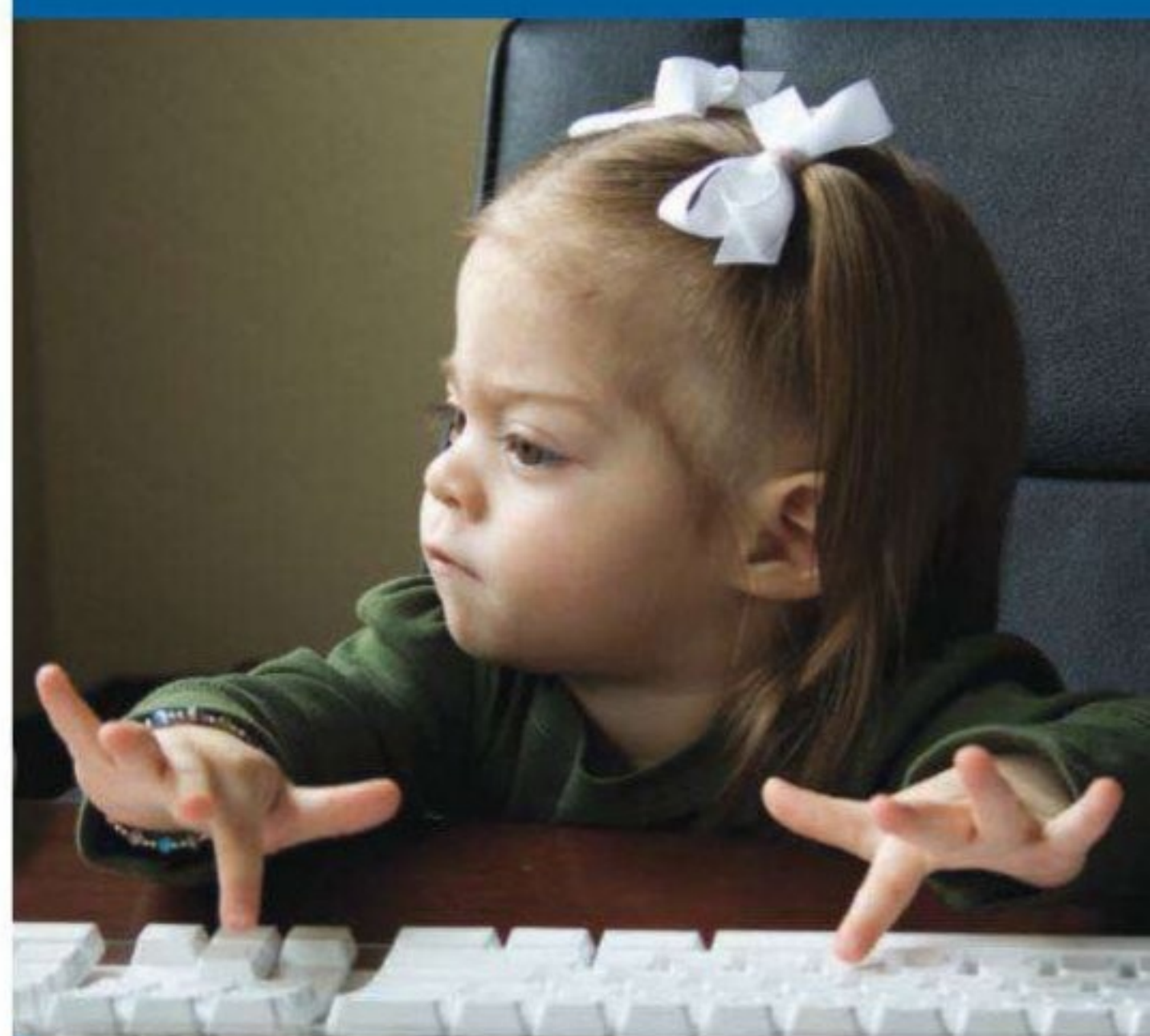
If you tend to carry your laptop, tablet or smartphone everywhere with you, check out our practical advice on how to ensure it isn't damaged or stolen.

### Keep your kids safe online

You can't watch your children every second they're on Facebook or YouTube. We show you how to keep them safe with some free desktop and mobile apps.

### Weekend project

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