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# PC ADVISOR

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**54**  
LAPTOP & PC  
REVIEWS  
INSIDE

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iPhone 5s  
iPhone 5c  
Nokia 1020



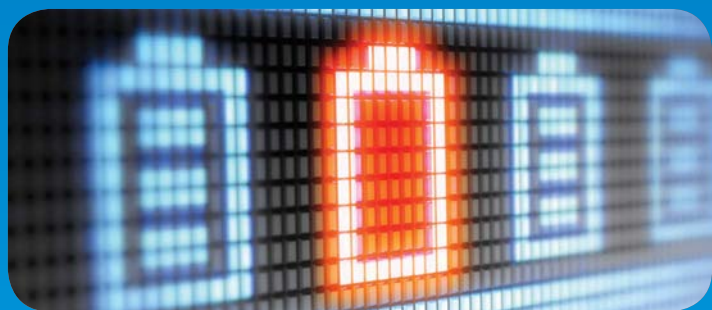
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## 64 GAMING PCs ROUND-UP



## 72 HDTVs ON TEST



## 80 WIN 8 FEATURES IN WIN 7



## 96 BOOST LAPTOP BATTERY LIFE

## Regulars & offers

6	Welcome	120	Cover Disc+
6	Contacts	124	Subscribe!
8	Inbox	146	Outbox
12	News	146	Next month
24	New Products		



## 12 News & analysis

### 16 Enough speed

How fast is fast enough? We consider whether consumer technology has now reached the point where it must become better, not faster.

### 18 Intel announces Bay Trail chips

As Intel launches its Bay Trail CPUs, we explain why you should take note.

### 20 Microsoft buys Nokia's mobile unit

We examine the consequences of Nokia's acquisition of Nokia's mobile business, drawing five conclusions and asking one key question.

### 21 Why Google has called Android 4.4 'KitKat'

Google has named its forthcoming Android operating system after a chocolate biscuit. What happened to 'Key Lime Pie', and what does this mean for branding opportunities?

### 22 Four new smartphone OSes take on Android and iPhone

We introduce Mozilla Firefox OS, Canonical Ubuntu, Jolla Sailfish and Tizen. Can any of these contenders break the smartphone duopoly of Android and iOS?

## 30 Reviews



### HARDWARE

- 32 Apple iPhone 5s
- 33 Apple iPhone 5c
- 34 Gigabyte S1185
- 35 Samsung Series 7 Ultra
- 36 Samsung Series 7 Chronos
- 37 Chillblast Messiah i7 GTX780M
- 38 Toshiba Satellite P70-A-109
- 39 PC Specialist Optimus V
- 40 HP Pavilion 14-c002ea Chromebook
- 41 BenQ GW2760HS
- 41 WD Se 4TB
- 42 Scan 3XS Mirage A10245
- 42 Arbico H4676 Quiet PC Package
- 43 nVidia GeForce GTX 780
- 44 Google Nexus 7
- 44 Samsung Galaxy Note 8.0
- 45 Nokia Lumia 1020
- 45 Archos Titanium 97b
- 46 Humax HDR-1010S
- 46 Citizen Eco-Drive Proximity
- 47 TP-Link TL-WDR4900
- 47 Devolo DLAN 500AV
- 48 Edifier Sound To Go Plus
- 48 Denon Cocoon Home

### APPS

- 50 Best apps for students
- 52 Blippar
- 52 Bloom.fm
- 53 Plants vs Zombies 2

### SOFTWARE

- 54 EaseUs Todo Backup Home
- 54 Advanced System Optimizer 3
- 55 Panda Global Protection 2014
- 56 Apple iOS 7
- 57 Corel Painter X3
- 58 Grand Theft Auto V

### BUSINESS

- 60 Lenovo ThinkPad Helix
- 61 Canon Pixma MX525
- 61 Epson Perfection V370 Photo
- 62 Dell B1265dfw
- 62 Epson Expression Photo XP-950
- 63 Extensis Fusion Suitcase 5

### GAMING PCs

- 66 Arbico Elite 4670 OCX
- 66 Chillblast Fusion Uzi
- 67 Computer Planet ND 3000
- 67 Mesh Elite Gamer PCA
- 68 PC Specialist Vanquish GT1
- 69 Wired2Fire Diablo Predator Z87

### HDTVs

- 74 LG 42LA690V
- 74 Panasonic TX-L39E6
- 75 Philips 42PFL6188S
- 75 Samsung UE40F6800
- 76 Sony KDL-40W905A
- 76 Toshiba 40L7355



## On the cover



## 64 Features & group tests

### 64 Gaming PCs round-up

High-end gaming is one area in which the desktop PC still reigns supreme. We test six machines to see which plays the nicest.

### 72 HDTVs on test

We round up a selection of HD- and 3DTVs with screens ranging from 39- to 42in. Which is worthy of your living-room entertainment?

### 80 Get Windows 8 features in Windows 7

Windows 8 does more than introduce live tiles and gesture control. We explain how to add the best bits of Windows 8 to Windows 7.

### 85 12 technologies that should go

Legacy hardware often outstays its welcome. These 12 components, ports and devices have lingered far beyond their time.

### 88 Online privacy

A VPN for your PC, tablet or phone will boost security by anonymising your web connection.

### 90 Clean your PC, smartphone & tablet

When was the last time you cleaned your keyboard or disinfected your smartphone? Probably never, which makes the fact smartphones carry 10 times more bacteria than a toilet seat all the more worrying.

### 93 Is your PC making you ill?

Although a PC can take its toll on your health, most of the risks can easily be prevented. We provide some guidance to keep you healthy while you work.

### 96 Extend your laptop's battery life

Most laptops don't last too long when you unplug them from the mains. Some don't even have removable batteries, so swapping in a spare isn't an option. So what can you do to improve a laptop's runtime?

### 100 How to edit PDFs

Edit PDFs and add annotations without investing in expensive software.

## 127 Top 5 charts: Buyer's guide

TEST  
CENTRE

- 128 Ultraportable laptops
- 129 Sub-£500 laptops
- 130 £501-£1,000 laptops
- 131 £1,001+ laptops
- 132 Tablets
- 132 Smartphones
- 133 All-in-one PCs
- 134 Office PCs
- 135 Family PCs
- 136 Mini PCs
- 139 Internet security suites
- 139 Antivirus software
- 140 Printers
- 141 Blu-ray drives

- 141 Wireless routers
- 142 USB & NAS drives
- 143 Projectors
- 143 Solid-state drives
- 144 Graphics cards
- 145 Flat-panel displays

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See page 124

## 103 How to

Tech  
Help

Get help with computer problems and learn how to improve your PC setup.

### 104 Helproom

PC Advisor's team of experts solves the computing problems you pose.

### 110 How to: Online anonymity

Use a virtual private network to stay safe, secure and anonymous online.



### 112 How to: Doodle

Cut out the hassle of arranging meetings with free online scheduling tool Doodle.



### 114 How to: Fit a graphics card

Turn your desktop into a games machine at a fraction of the cost of a next-gen console.

### 116 How to: Check CPU temp

Use SpeedFan to check the temperature of your CPU and other core components.

### 117 How to: Transfer photos

We explain how to copy photos from a camera's memory card to your laptop.



### 118 How to: Make a ringtone

We show you how to turn your favourite MP3 into a ringtone for iOS or Android.

JIM  
MARTIN

## Christmas has come early

With so many tempting new products this month, prepare to max out your credit card

**W**elcome to another packed issue of *PC Advisor*. It's been a bumper month for new kit, with the long-awaited update to Google's Nexus 7 arriving (page 44) along with two new iPhones (page 32).

Phone and tablet launches don't stop there - even Tesco has launched an Android tablet (page 13). At only £119, it undercuts Amazon and Google's tablets and doesn't lock you into buying apps from its own app store.

Microsoft hasn't given up on its Surface tablets after failing to sell as many as it had hoped, launching a pair of updated slates as we went to press (page 25). The Surface Pro 2 is the most interesting, as its Core i5 chip means it could replace a high-end laptop. It remains to be seen whether the combined keyboard and battery will enable you to work all day.

Nokia, meanwhile, is hoping to sell more smartphones running Windows Phone 8 by strapping a huge camera on the Lumia 1020 - find out whether it's any good on page 45.

Intel announced its assault on the tablet and smartphone market with a range of more powerful Atom processors. They're capable of running the full version of Windows 8, which means we'll soon see a raft of tablets that can run Photoshop as well as Office and Windows games. You can find out all about the so-called Bay Trail chips on page 18.

The ultimate in speed, however, can be found in our power PCs group test on page 64. Equipped with the latest Core i5 and i7 processors, along with super-fast graphics cards, they'll cope with anything you can throw at them, including the latest games. It's a huge shame that GTA V (page 58) is available only on the Xbox 360 and PS3 for now. We're hoping a PC version will arrive in time for Christmas.

If you really want to go to town, you could connect your PC to one of the TVs in our group test on page 72. We've rounded up a great selection of this year's best models, so whether your priority is image quality, price or internet services, you'll find something to suit.

Not everyone needs a new PC, of course, and if yours is in need of a speed boost, a graphics card upgrade should help. Our step-by-step guide on page 114 explains everything you need to know. While you're at it, don't miss our guide to cleaning your PC, laptop, phone and tablet on page 90.

If your laptop battery isn't lasting as long as it used to, turn to page 96 to find 10 brilliant tips on tweaking Windows to improve battery life. ☐

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What do you think of this issue of PC Advisor? We welcome feedback - email Jim Martin at [jim\\_martin@pcadvisor.co.uk](mailto:jim_martin@pcadvisor.co.uk) and include the issue number in the subject heading



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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 YouTube

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**Windows tablets on the up**  
Despite owning an iPad, I can't help thinking its days are numbered. I've seen the latest Windows 8 hybrid tablet/laptops and I'm impressed. Sure, they're a bit heavy, but for sheer breadth of use they outclass the iPad. In a year's time Windows hybrids will be lighter, offer longer battery life, and Windows 8 will have the same wide range of apps as Apple. But, please, drop the price!  
**Mark Hazelton**

**Satellite broadband**  
I read with interest your review of satellite broadband (see [tinyurl.com/cvoztv8](http://tinyurl.com/cvoztv8)). I have never exceeded my monthly data allowance of 30GB, but if I use more than 6GB in a week my download speed is severely curtailed. I think the way satellite broadband is sold and marketed needs to be addressed, since few people will check the fair-use policy. **John Roberts**

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**Nokia Lumia 1020 is rock hard**  
Nokia's Lumia 1020 (reviewed on page 45) has found fans among our readers for many reasons, but we like *will's* reasoning the best: "The Lumia rocks. You can actually use it to smash any other phone to bits in under a minute. But you have to drive a truck over the Lumia [to break it]." Remind us to hide our smartphones when *will* is around.

**eBay, Argos click and collect**  
eBay has struck a deal with Argos that will allow customers to buy items from sellers and collect their goods from a local Argos store within an hour ([tinyurl.com/kjch6we](http://tinyurl.com/kjch6we)). Confused? So is *Maggie*: "I can't see how that can work! How can anything even get to an Argos store in an hour? Yet another of eBay's stupid ideas!"

**Copycat**  
"I'm sick and tired of hearing that Android has copied iOS, or vice versa. Everything they use is copied. What would your phone be without Bluetooth, Wi-Fi, 3G, internet, filesharing, email, instant messaging, GPS, and all the extras, such as calculators, MP3 players, video players and so on?"



"Do you really think Apple made the internet in your phone, or Google dreamed up GPS? We should be celebrating creativity and resourcefulness, not arguing over who made something, because we all made all of it."

"The big companies make the plastic, glass and design. The people make it work," wrote *arggggg*.

**Make your own stylus**  
We explain how to make your own stylus at [tinyurl.com/6uctwcy](http://tinyurl.com/6uctwcy), but *david* thinks he has a better idea. "Foam is not as good as conductive rubber (usually synthetic). I stripped down an old calculator to recover the conductive rubber mat inside, cut it into a long strip and rolled it up, pushing it into a metal ballpen casing," he wrote.

## Flagged: Star letter

### Windows on the desktop is doomed

People no longer want to be forced to buy and learn an ever-more-bloated, bug-ridden operating system every three years. A new OS often needs a new computer to run, which brings with it all the hassle of reinstalling your software and drivers - if these are even available.

And who cares about the OS anyway? It should simply be something that runs under the bonnet. I can buy specific apps to meet my exact needs, including standard productivity functions. This approach also lets me avoid expensive software that contains features I will never use. **Ian Rutter**

*Jim Martin, editor, replies: No OS is perfect, and no-one is being forced to upgrade every three years. Millions of people still run Windows XP, which is over 10 years old.*

*However, you raise an interesting point that the OS should in essence be transparent. It's something that Google is trying with Chromebooks, but not all of us are ready to work exclusively in the cloud.*

*The fact is, however, most people don't pay separately for their OS as it comes with the hardware. If Microsoft wants the Modern UI to succeed it needs to persuade developers to make apps that people want.*



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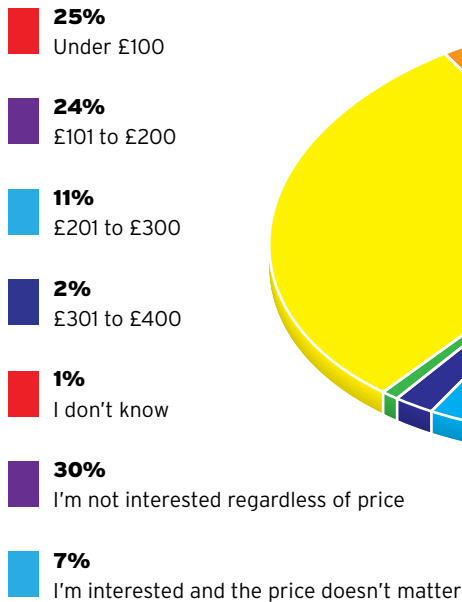


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See page 124

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We now know the iPhone 5c costs £469, but at what price would you have been interested in buying Apple's 'budget' smartphone?



Based on 12,229 votes, [tinyurl.com/nvxxLjr](http://tinyurl.com/nvxxLjr)

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### Big brother

In the light of new evidence leaked via Edward Snowden that GCHQ and the NSA can circumvent the usual security safeguards in HTTPS, SSL and VoIP communications, we asked forum members what steps they were taking to reduce the amount of surveillance on their private lives. The results were, erm, enlightening.

**wiz-king** Nowt.

**spuds** No comment, in case someone is checking this forum.

**Mr Mistoffelees** Contact me and I'll send you one of my lead balaclavas.

**Fruit Bat /\O/\** As I am not (nor intend to be) planning anything subversive, illegal or even immoral, I'll let them bore themselves to death reading whatever they want of mine.

**Jockle** I've got nothing to hide.

**Algerian Peter** Carrier pigeons.

**John Bunyan** The terrorists and drug dealers are the ones they are after. Provided the data is not sold or used for commercial purposes I see no point in worrying about it.

**marvin42** I don't think there are enough civil servants to read each and every email. If there are then we should sack some instead of cutting other services.

**woolwell** This is a no-win situation. Whenever there is a terrorist attack people jump up and down and ask why the intelligence agencies didn't know about it, but at the same time they don't want surveillance. Getting the right balance is difficult.

**mahituna** Does the government care what you're doing? No. Why? You're not that important. ☒

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### iPhone mania

By 8.30am on the day of the iPhone launch Apple Stores had sold out of the iPhone 5s. Even so, we were shocked to see one sell on eBay just a few hours later for £2,050.

"Why? The buyer could have gone to the Apple shop... or bought one from the Apple website!" wrote *James Foster*.

"More money than sense if you ask me," wrote *Keith Bishop*. "How long would it have taken by post, even with next-day delivery? Madness, all for a phone!"

"With knowledge of the supply problems, Apple should have limited the 5s to one per customer. And if anyone is so desperate to get hold of one on the first day, let them queue for it! I understand that by allowing two phones per customer the resulting quick sell-out plays well for publicity in some respects, but conversely provides the knockers with a big stick with which to hit Apple!" wrote *Hilbo6Ostwin*.

### New Surface tablets

For those of you not interested in the iPhone launch, Microsoft has unveiled its second-gen Surface and Surface Pro tablets (page 13).

"Not a fan of Apple's phone? Get Microsoft's tablet today! ROFL!" joked *Andy Anthony Lee James*. Okay, point taken.

### iOS 7 downloads

Along with its new iPhones, Apple made available the next version of its iOS mobile operating system. But the rush to download the OS by users all over the world meant many were frustrated by failed downloads or surprisingly long download times. Our record estimate for the download was 12 years, but PCA contributor *Martyn Casserly* can beat even that: "3Gs owners - never!" he wrote.

### Every little helps

We already have cheap tablets from Amazon and Google, with their prices subsidised through content sales, and now Tesco is getting in on the act. Even without content sales, it has managed to undercut both Google and Amazon at a tiny £119.

"Will they call it the Aspirin then?" asked *Paul Neaves*. No, Paul, although your suggestion possibly makes a little more sense than the product's eventual name: Hudl. Read more about Hudl on page 13.

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CHRIS  
MARTINMicrosoft's **BALLMER**  
& Nokia's **ELOP**

# MICROSOFT BUYS NOKIA MOBILE AS BALLMER ANNOUNCES RETIREMENT

Nokia took the plunge with Windows Phone, but now Microsoft must make the platform pay off

Microsoft is to acquire Nokia's Devices & Services unit, which includes the smartphone and mobile phone businesses, and license the Finnish company's patents for a total of €5.44bn (£4.57bn) in cash, the companies announced in September.

Microsoft will pay €3.79bn (£3.19bn) for the Devices & Services business, and €1.65bn (£1.39bn) to license Nokia's patents at the close of the transaction.

Nokia CEO Stephen Elop will move over to Microsoft to head up an expanded devices team. Microsoft said it will draw on its overseas cash resources to fund the transaction.

"This announcement is a bold step into the future. For Microsoft it's a signature event in our transformation. We think this is a win-win for employees, win-win for shareholders, and win-win for customers of both companies. Through our partnership [with Nokia] we have already accomplished so much, and yet the opportunity ahead is remarkable. And I am incredibly optimistic about what we can achieve together," said Microsoft CEO Steve Ballmer.

"We have no significant plans to shift around the world where work is done. Finland will become the hub in the centre for our phone research and development, and we are counting very much on the

incredible talent of Nokia employees to be a key part of driving and propelling Microsoft forward," he added.

Building on the partnership with Nokia it announced in February 2011, and the increasing success of Nokia's Lumia smartphones, Microsoft aims to accelerate the growth of its share and profit in mobile devices through faster innovation, increased synergies, and unified branding and marketing, according to the company.

Although it already makes the Xbox games console and Surface Windows tablets, this move is a big step toward Microsoft becoming an established hardware manufacturer.

Nokia has been building smartphones around Microsoft's Windows Phone operating system in a bid to boost flagging market share, besides focusing on feature phones for emerging markets.

Following the transaction, Nokia plans to focus on its network infrastructure and services business called NSN, its Here mapping and location services, and Advanced Technologies, focused on technology development and licensing. It will continue to own and maintain the Nokia brand, but will license Microsoft to use the brand on existing and subsequently developed phones for a 10-year period.

## Ballmer steps down

Shortly before the announcement, Ballmer confirmed that he would retire as Microsoft's CEO within the next 12 months. The news came as a shock to many, with Ballmer having drafted a major business reorganisation that was mid-implementation.

"There is never a perfect time for this type of transition, but now is the right time," Ballmer said. "We have embarked on a new strategy with a new organisation and we have an amazing senior leadership team. My original thoughts on timing would have had my retirement happen in the middle of our company's transformation to a devices and services company. We need a CEO who will be here longer term for this new direction."

"This is an emotional and difficult thing for me to do. I take this step in the best interests of the company I love; it is the thing outside of my family and closest friends that matters to me most," Ballmer said, adding that Microsoft has "all its best days ahead".

The company's board of directors has created a special committee to find Ballmer's replacement. Nokia's Elop is tipped as the front runner.

What does the Nokia acquisition mean for Windows Phone? See page 20.



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## TESCO UNVEILS £119 ANDROID TABLET

The Hudl tablet undercuts Google and Amazon offerings

Tesco has taken the wraps off its budget tablet, known as 'Hudl', which will undercut Google, Apple and Amazon at just £119.

Philip Clarke, CEO of Tesco said: "Hudl is a colourful, accessible tablet for the whole family to enjoy. The first stage in our tablet offering, it's convenient, integrated and easy to use with no compromise on spec. Customers are very discerning about the technology they buy, so we knew we had to be competitive on all fronts."

Tesco says the Hudl has been designed for 20 million customers and more. Whether it expects to sell that many units is another matter. Hudl has been designed and built by Tesco from scratch.

The Tesco Hudl has a 7in screen with a 1440x900 resolution, a 1.5GHz quad-core processor, 16GB of internal storage and a microSDHC card slot.

Other specifications include a Micro-HDMI port, dual-band Wi-Fi connectivity, Bluetooth 4.0 and GPS. The Hudl is said to offer up to nine hours of battery life.

The Hudl will be available in four colours: black, blue, red and purple. The tablet runs Android 4.2.2 Jelly Bean and has access to Tesco's content services Blinkbox and ClubCard TV.

Keep an eye out for a full review at [pcadvisor.co.uk/reviews](http://pcadvisor.co.uk/reviews).

### Tesco Hudl tech specs

- 7in (1440x900) scratch-resistant screen
- Android 4.2.2 Jelly Bean
- 16GB storage (plus microSDHC)
- 1.5GHz quad-core processor
- Up to nine hours video battery life
- Micro-HDMI port
- Bluetooth 4.0, GPS, dual-band Wi-Fi
- Access to Google Play
- Sleek, high-quality design, with a durable, matt, soft-touch back for better grip



## Microsoft announces second-generation Surface tablets

Updated Surface tablets are said to offer performance- and battery life improvements

Microsoft has launched its second-generation Surface tablets, promising significant improvements in performance, graphics and battery life. New peripherals including a Power Cover and a docking station have also been unveiled.

"Surface has been one of the best products Microsoft has ever built," said Panos Panay, the Microsoft vice president in charge of the company's tablet efforts. "Reinventing the wheel is not the goal. Making it better is," he added.

The Surface 2 will cost from £359, available in 32- and 64GB configurations; Surface Pro 2 will cost from £719, in 64- and 128GB versions with 4GB of memory, and 256- and 512GB versions with 8GB of memory.

Surface Pro 2 is faster than 95 percent of all laptops on the market today, Panay claimed, and graphics now run 50 percent faster than those of the previous

generation. Dolby-qualified speakers have been added to improve the sound quality, and an improved kickstand can be angled back further.

Microsoft has also addressed the tablet's battery life. With the new Surface Power Cover, which includes a 30Wh battery, the Surface Pro 2 will have 2.5 times the battery life of the first Surface Pro - more than 10 hours in total.

The Surface Docking Station adds I/O functionality and can power two monitors for a total display resolution of 3840x2160 pixels.

The Type Cover 2 is available in four colours, including cyan, magenta, purple and black. It is 1mm thinner than its predecessor, silent in use, and it includes a backlit keyboard.

Panay also unveiled the Touch Cover 2, a 2.5mm-thick cover that is also backlit. A greater number of sensors inside (up from 80 to 1,092) improve the feel of the device.

The Surface 2 has also been upgraded, with CPU, memory and Wi-Fi performance improvements. "The Surface 2 is the fastest product that I've used relative to a personal tablet," Panay said.

It has the same screen as the Surface Pro 2, but is thinner and lighter. Battery life has increased to 10 hours, and an HDMI output allows users to throw games on the large display.







## YouTube adds offline mobile viewing

YouTube has announced that an update coming later this year will allow users to download videos to watch offline. The video-streaming service said mobile app users will be able to store video clips on their smartphone or tablet. However, these can be kept only for a "short period" of time.

**MORE:** [tinyurl.com/on2bc88](http://tinyurl.com/on2bc88)

## Netflix en route to TiVo boxes

Virgin Media has announced a deal with Netflix that will see the streaming service available to TiVo customers. It's the first time Netflix has been available via a paid-for TV service. A pilot of 40,000 customers began in September, and the Netflix app will be rolled out to 1.7 million TiVo customers later this year.

**MORE:** [tinyurl.com/oduzgc7](http://tinyurl.com/oduzgc7)



## Sony Smart Stick rivals Chromecast

Sony is preparing to launch a rival to Google's Chromecast called the Bravia Smart Stick. The HDMI dongle will retail for \$150 (£93) and offer a variety of services, including access to Amazon Video, Walmart's Vudu, Redbox Instant by Verizon, AOL On, Crackle and Video Unlimited.

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

# VERIZON SALE LETS VODAFONE CONCENTRATE ON 4G

Deal will allow Vodafone to ramp up 4G and fibre-optic networks in the UK

Verizon has agreed to buy Vodafone's 45 percent stake in its Verizon Wireless subsidiary for \$130bn (around £80.8bn).

Under the deal, Verizon will take 100 percent ownership of the wireless unit. This will enhance its ability to offer customers "seamless and integrated services", the network said.

The transaction has been unanimously approved by the boards of both companies and is expected to close in the first quarter of 2014, subject to customary regulatory approvals. Verizon will pay a combination of cash and stock for Vodafone's stake.

"As a wholly owned entity, Verizon will be better equipped to take advantage of the changing competitive dynamics in the market and capitalise on the continuing evolution of consumer demand for wireless, video and broadband services," said Verizon chairman and CEO Lowell McAdam.

"This transaction allows both Vodafone and Verizon to execute their long-term strategic objectives," said Vodafone CEO Vittorio Colao.

In the UK, this means Vodafone can concentrate on its Project Spring, a £6bn investment plan that



will accelerate the rollout of its 4G network and increase investment in laying fibre-optic cables. It will also invest in its high-street stores and continue to develop mobile-payment services.

Verizon has sought to buy out its wireless business, originally formed as a joint venture with Vodafone, for several years. The transaction is unlikely to have a significant impact on US mobile consumers, according to analysts. Vodafone may use the huge windfall to buy smaller carriers and further its pursuit of wireline operations.

# Samsung confirms 64-bit chips for smartphones

Samsung will follow Apple's lead and introduce more powerful 64-bit processors

Samsung has confirmed that its next generation of smartphones, which is likely to include the Galaxy S5, will run on 64-bit processors.

Apple's flagship smartphone, the iPhone 5s, features the A7 64-bit processor with 'desktop-class architecture'. Not to be outdone, Samsung said its future phones will also include this technology.

Shin Jong-kyun, CEO of Samsung Mobile, said: "Samsung understands that Apple intends to boost its mobile business in China, as well as in Japan, meaning that we should try harder in these countries... Our next smartphones will have 64-bit processing."

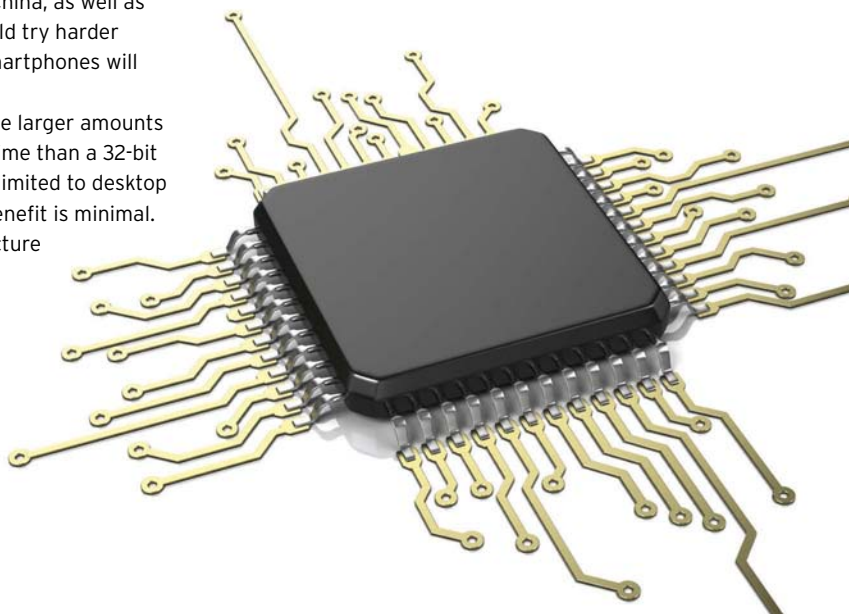
A 64-bit processor can handle larger amounts of data in a shorter amount of time than a 32-bit chip. Until now 64-bit has been limited to desktop computing, so the short-term benefit is minimal.

Samsung is likely to manufacture its own 64-bit chips, although some of Intel's forthcoming Bay Trail processors are also 64-bit chips and aimed at mobile devices including tablets and smartphones (see page 18).

Apple has re-coded iOS 7 for 64-bit, and the iPhone 5s is future-proofed in this sense.

With the iPhone 5s currently the only 64-bit smartphone, it has yet to be seen whether developers will write apps for the architecture.

An app written for 64-bit won't work on a 32-bit chip, but a 32-bit app will work on a 64-bit chip. We'll have to wait and see whether 32- and 64-bit versions of apps appear in the App Store. ☒



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# ENOUGH SPEED: CONSUMERS NEED BETTER BATTERY LIFE AND DISPLAYS

How fast is fast enough? Martyn Casserly considers whether consumer technology has now reached the point where it must become better, not faster

**S**amsung's Galaxy S4 hit the headlines when it was alleged that it was returning artificially enhanced benchmark scores in tests. The discrepancies were revealed by Anandtech following an extensive investigation.

The writers found code that ramped up CPU- and GPU usage when certain benchmark software was detected. The Galaxy S4 would therefore appear faster than it might be in real-world use and, perhaps more importantly, faster than any of its competition.

Samsung was quick to deny any wrong doing, explaining that the behaviour of the chips is altered in response to different user requirements. But Anandtech's finding of a code string named 'BenchmarkBooster' led many to brand it a cheat.

The fact remains that the Galaxy S4 is a screamingly quick handset. So why does it matter what the benchmarks say?

## Benchmark obsession

History offers us several tales of similar obsessions with benchmarks and technical specifications. In the 80s and 90s, PC processor makers would herald even the tiniest speed increases in technically detailed advertisements, the deciphering of which required engineering prowess.

And as a new millennium dawned and digital cameras came to the fore, we saw the beginning of a megapixel race - recently won by Nokia with its 41Mp Lumia 1020.

Today, manufacturers are commencing battle over the number of processor cores and speeds. But do consumers really care?

## Too much power

In the early days of connected computing an awful lot of patience was required.

Dial-up internet was painfully slow, and the miniscule amount of memory fitted inside a PC meant processing was conducted at a pedestrian pace.

Today, things are appreciably different, and almost any computer will meet the demands of the average user. Firing off emails, watching YouTube videos, browsing the web, basic photo editing, media management and even simple video editing are all easily possible on the budget laptop you picked up alongside your sausages and beans in Tesco. Heck, most are possible on the smartphone that's always by your side.

Cloud services and storage are deconstructing the premise that a big desktop machine should be the central repository for your documents and media. And we're seeing new relationships built between our mobile devices and large-screen TVs that bypass the PC altogether.

A PC will always find work in the office or with more processor-intensive tasks, but consumer focus has shifted from business to lifestyle. In smartphones, for example, the camera and battery life are the two specs to which customers pay the most attention.

## Pleasing a minority

With this in mind, it's all the more bizarre that Samsung would risk public disgrace to bump up some numbers that really don't matter to its potential audience.

At the Galaxy S4's launch the company went to great lengths to highlight the various new camera functions, hands-free operating tricks and bespoke software. That's what appeals to consumers.

But whereas the general populace are happily oblivious to the innards of their gadgets, there remains a cadre of customers who care how things work.

They know how much RAM will mean an early retirement from a software upgrade path, or which graphics chip will cope with the latest games.

Nevertheless, recent evidence suggests that even this hardcore chapter is beginning to succumb to the mantra that what we already have is good enough.

## New tactics

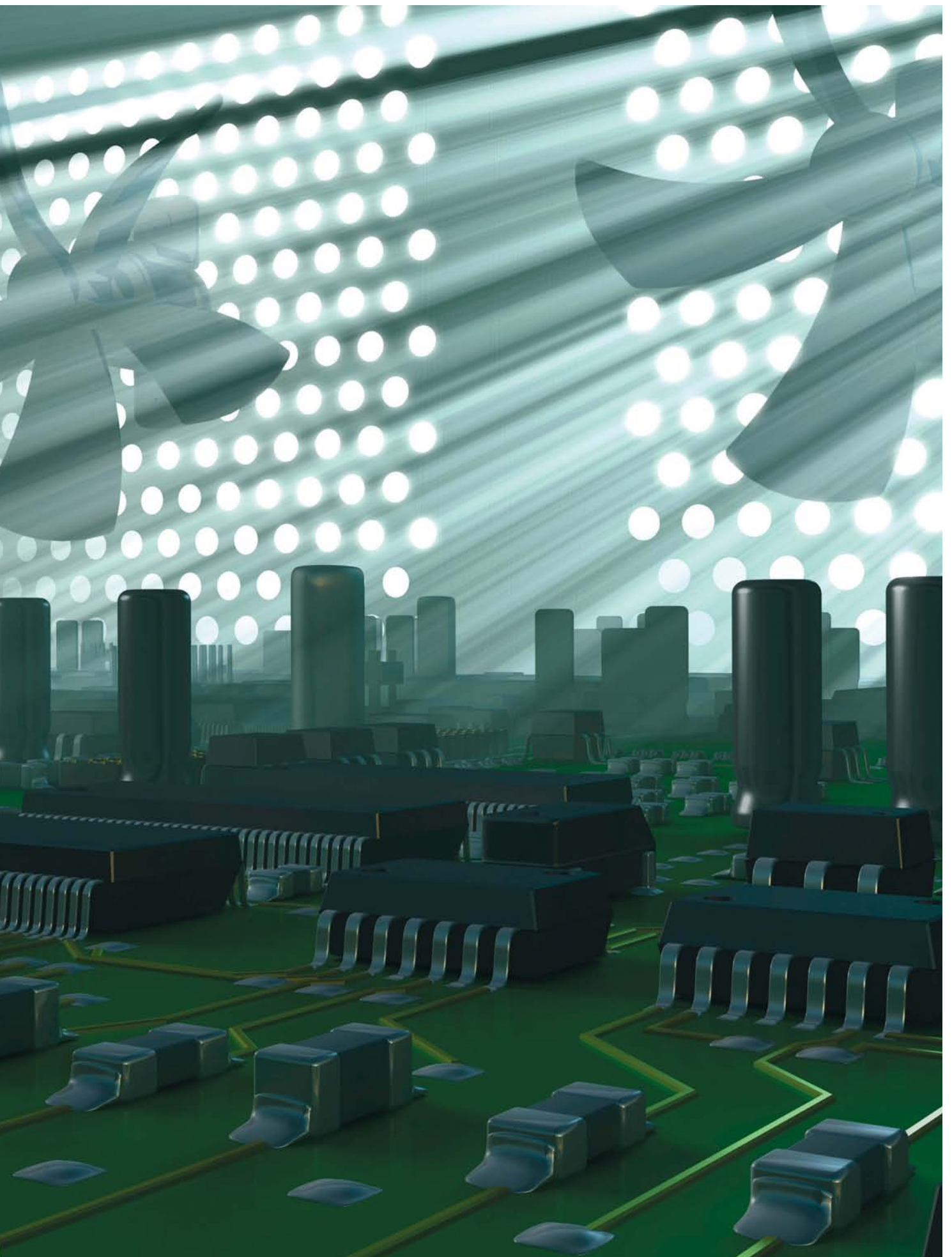
When Google-owned Motorola released a teaser poster for its upcoming Moto X, speculation on the device spread like wildfire. Some hoped for a successor to the Nexus 4, replete with Google-subsidised pricing; others contemplated a superphone to lead the Android charge.

The curtains were raised to outrage and disappointment: the Moto X appeared to be a mid-range handset with a premium price. But the specs didn't tell the full story.

As the first reviews appeared, it became clear that the Moto X was in fact very good. By trading top-end components for those with a slightly lower spec, Motorola had produced a handset with smooth performance and excellent battery life. It might not top the performance charts, but the Moto X ticked all the boxes.

One might suggest that smartphone have now come of age, and the most mileage for future improvements lies in the user interface. Google has worked hard to refine its Android OS, while Microsoft's Windows Phone 8 is unquestionably well designed. Even Apple has given iOS a major overhaul in version 7.

We'll always want faster chips and more RAM, but perhaps the next great battleground will be found not inside our devices but on their screens. There'll be no pulling the wool over our eyes here. ☒





# Intel announces Bay Trail processors

As Intel launches its Bay Trail tablet CPUs, Martyn Casserly explains why you should take note

**I**ntel has launched its low-power system-on-a-chip (SoC) Atom processors, codenamed Bay Trail, in an attempt to take on ARM's dominance in the smartphone and tablet markets.

The range supersedes the chip manufacturer's previous Clovertrail CPUs, which featured in Windows 8 tablets such as the Acer Iconia W510 and Asus VivoTab. The Z3000 Bay Trail series is designed to be at the heart of next-generation smartphones, tablets and low-end laptops, as Intel attempts to increase its impact in an area of the market dominated by ARM chips.

The Z3700 series features four models, each of which is equipped with quad-core processors and Intel HD graphics, while the Z3600 has two dual-core options primed for Android.

## Faster performance

Intel claims that Bay Trail offers twice the CPU speed of Cloverfield, and up to three times the GPU performance. The new designs are said to be up to 40 percent faster than nVidia's Tegra 4 ARM processor (the CPU that powers HP's Slatebook X2), and 60 percent faster than Qualcomm's Snapdragon 800 (which powers handsets such as the Sony Xperia Z1 and is rumoured to be in the forthcoming Nexus 5).

To this end Intel developed the 22-nanometre (nm) Silvermont architecture, which features impressive processor and power-management systems. Perhaps the

most important of these is the Out of Order Execution (OoOE) engine, which circumvents slowdowns traditionally caused by CPUs waiting for data before being able to execute certain instructions. Rather than holding other instructions in a queue, Silvermont allows quick tasks to be completed while the data for slower ones is located.

The Atom design intelligently manages the use of its cores to either improve CPU performance or power management, depending on your needs. Intel claims that CPU/GPU power sharing, allied with its Burst Technology 2.0 resource management, can give devices significant advantages over the ARM-based alternatives.

Intel offered various benchmark results to support these assertions. One notable example compared a Z3770 Bay Trail chip and an nVidia Tegra 3 (installed in a Microsoft Surface RT), with the Z3770 scoring more than three times higher in a 3D gaming test. This could be significant for potential customers who might use their phone or tablet for graphics-heavy first-person-shooter or driving games.

Bay Trail also features Intel's Display Power Saving Technology (DPST 6.0), which lowers the backlight of a screen while enhancing the image to compensate. If the images are as good as Intel claims, we can look forward to extended battery life without toning down brightness.

The HD Graphics architecture supports DirectX 11 and the Open GL ES 3.0 graphics

core – as seen in the Sony Xperia Z, HTC One, and Samsung Galaxy S4. Bay Trail also boasts a respectable range of media capabilities, with full hardware acceleration for video decoding in H.264, VC1, MPEG-4/H.263 and several others. Plus there's support for accelerated encoding in H.264 and a hybrid version for MPEG-2.

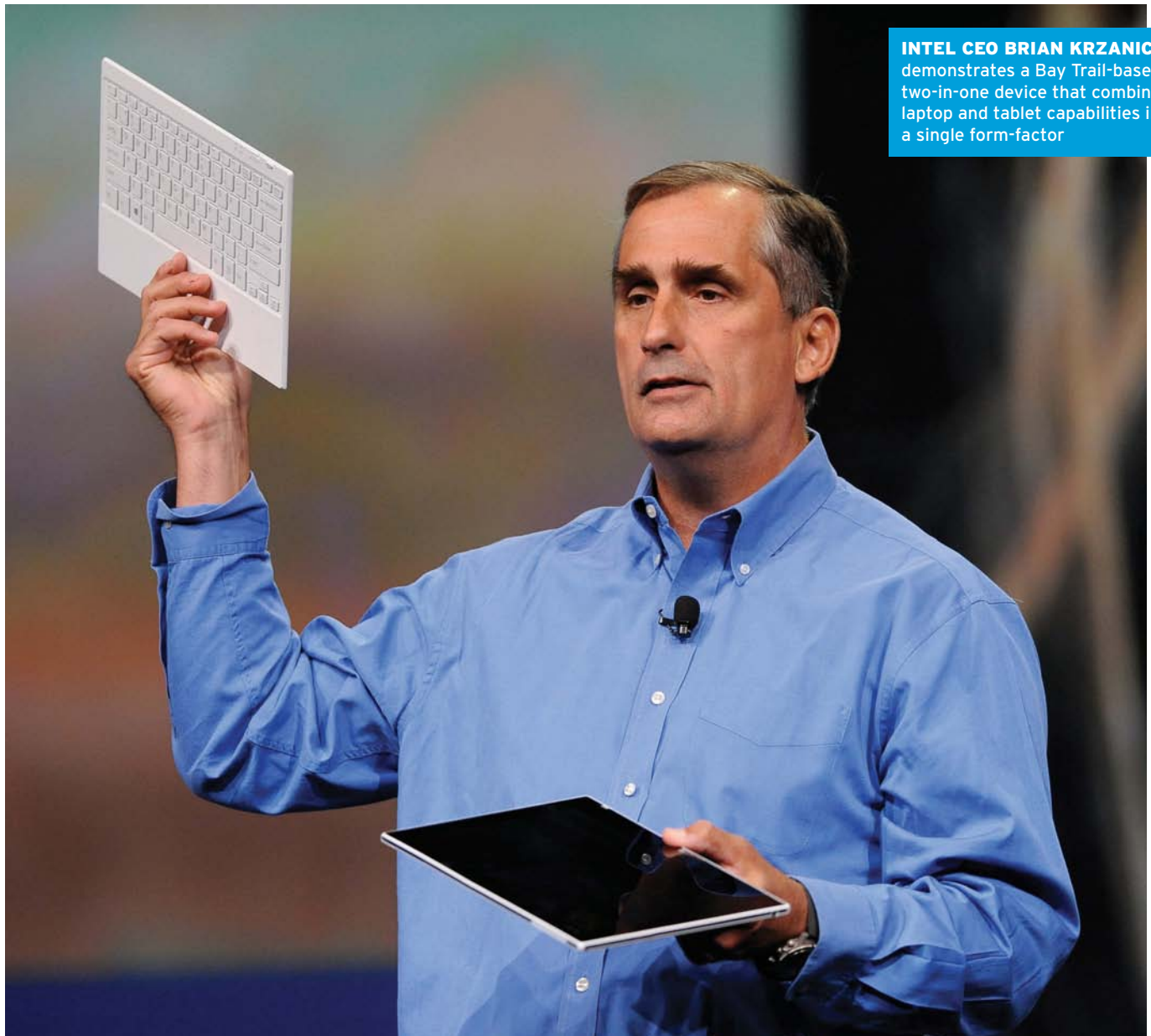
## Mobile future

It's too early to tell whether Intel's performance claims will hold up in the real world, but Bay Trail certainly seems to indicate that it is very serious about tablets and smartphones.

Intel has also announced plans to update its cores each year, in a similar fashion to the tick-tock cycle that has seen the evolution of Sandy Bridge, Ivy Bridge and Haswell in desktop and laptop PCs. Next year it will release a 14nm core bearing the name Airmont, and the following year we'll see a new architecture at the 14nm scale.

ARM designs will also continue to advance, so Intel has its work cut out if it hopes to wrestle market share away from the likes of Qualcomm, nVidia and Apple. As always, only time will tell; but, for now, the fact that an innovative giant such as Intel is bringing its A-game to the mobile space can only be a good thing for customers. With manufacturers battling it out to be the best in what is fast becoming the most important platform in technology, the next few years could be very interesting indeed. [✉](#)

	Z3770	Z3770D
Clock speed	2.4GHz	2.4GHz
Cores	4	4
L2 cache	2MB	2MB
Memory type	LPDDR3 1067 (dual channel)	DDR3L-RS 1333 (single channel)
Memory capacity	4GB	2GB
Max display resolution	2560x1600	1920x1200
Process	22nm	22nm



**INTEL CEO BRIAN KRZANICH** demonstrates a Bay Trail-based two-in-one device that combines laptop and tablet capabilities in a single form-factor

Z3740	Z3740D	Z3680	Z3680D
1.8GHz	1.8GHz	2GHz	2GHz
4	4	2	2
2MB	2MB	1MB	1MB
LPDDR3 1067 (dual channel)	DDR3L-RS 1333 (single channel)	LPDDR3 1067 (single channel)	DDR3L-RS 1333 (single channel)
4GB	2GB	1GB	2GB
2560x1600	1920x1200	1280x800	1920x1200
22nm	22nm	22nm	22nm



# Microsoft buys Nokia's mobile business

Chris Martin examines Microsoft's bold move, drawing five conclusions and asking one key question

**M**icrosoft has bought Nokia's smartphone and mobile business for €5.44bn (£4.5m). Here, we look at what that means for the companies involved, for Windows Phone, and for the mobile market as a whole.

"Building on the partnership with Nokia announced in February 2011 and the increasing success of Nokia's Lumia smartphones, Microsoft aims to accelerate the growth of its share and profit in mobile devices through faster innovation, increased synergies, and unified branding and marketing," said Microsoft.

## An inevitable move

Nokia went all-in with Microsoft with Windows Phone and it seemed inevitable that eventually one would buy out the other; the initial phase of the partnership being a tester for this prospect. Nokia took the plunge, opting not to continue with Symbian or go with Android, but it's now Microsoft's job to make Windows Phone work.

"With mobile now firmly positioned as the world's fastest growing and largest computing platform we see this move as a bold, but entirely necessary, gamble by Microsoft. Mobile needs to be a cornerstone of Microsoft's business for future success.

"The failure of Microsoft's platform-only approach over the past 15 years, initially with Windows Mobile and more recently with Windows Phone, has left it with few alternatives, given its almost complete reliance on Nokia for Windows Phone devices and the competitive ecosystem strength of Google and Apple," said Ben Wood, chief of research at CCS Insight.

## Windows Phone 8's last chance

In terms of market share, Windows Phone is in distant third place behind Apple's iOS and Google's Android. And although Windows Phone has just overtaken BlackBerry in the standings, this will be its last chance.

With Nokia the key partner in the Windows Phone wagon, and little effort from the likes of HTC and Samsung, a consolidated effort is a necessary gamble for the operating system in its bid to become the 'third ecosystem'.

## Microsoft the hardware maker

It's clear that Microsoft is no longer just a software company and is quickly following in the footsteps of Apple and

Google (which bought Motorola) by combining software and hardware. Save for Surface and Xbox, this is Microsoft's biggest plunge into device making yet, with the transfer of 32,000 Nokia employees.

## The app battle is over

The number and quality of apps offered is of huge importance in the fierce smartphone OS battle. If the only serious hardware maker in the Windows world is Microsoft, who is going to bother to make apps for the platform? Future Windows Phones will no doubt come preloaded with Microsoft and Nokia apps, but there needs to be more on offer than a base selection.

It's interesting to note that Nokia is keeping its Here mapping and location services, which it plans to make available across different screens and operating systems. Microsoft should have snapped up that advantage for Windows Phone.

"Handset markets are commoditising. The action is in software, apps and, soon, these will be delivered online. The emergence of HTML5 is an early indication. Smartphones will then become mere windows to the cloud. There will be little that differentiates one phone from another, besides screen quality and battery life.

"Handset manufacturers without a suitable software platform in the cloud stand to suffer, and Nokia is right to sell off its phone business - BlackBerry should do the same. As for Microsoft, it remains to be seen whether it can leverage its still-significant strength in desktop OSes and software and migrate its customers to the mobile cloud," said Ronald Klingebiel, assistant professor of strategy at Warwick Business School.

## Elop to replace Ballmer?

Steve Ballmer has announced that he will step down as Microsoft's CEO in a year's time; could Nokia's Stephen Elop be his replacement? Elop has stepped down from his current position to become executive vice president of devices & services, and will join Microsoft once the acquisition is complete. "Stephen will go from external to internal," Ballmer told *The Seattle Times*.

## Will all Windows Phones be Nokias?

Nokia has always been the main player in the Windows Phone market. HTC and Samsung have clearly lost interest, now concentrating solely on their Android devices. With no Windows Phones in the works from these companies, it seems unlikely that they will continue to fight for the cause. ☒





# Why Google has called Android 4.4 'KitKat'

Google has named its latest OS after a chocolate biscuit, writes Chris Martin

**G**oogle has announced that the next version of Android will be nicknamed 'KitKat', not 'Key Lime Pie' as was previously expected.

Google's naming system for its Android OS versions follow an alphabetical order: first we had Cupcake, then Donut, Eclair, Frodo, Gingerbread, Honeycomb, Ice Cream Sandwich, Jelly Bean and now KitKat. This is the first time we've seen it use a brand name rather than the generic term for a particular sugary treat, so what makes Nestle's chocolate fingers so special?

Google said: "As everybody finds it difficult to stay away from chocolate, we decided to name the next version of Android after one of our favourite chocolate-covered treats, KitKat!"

## Google's explanation

You might be wondering why the makers of a mobile OS with more than 1 billion activations would need to pull a stunt like this, given that no money has changed hands between Google and Nestle. The firm simply wanted to do something "fun and unexpected" - and it certainly was the latter.

## Where's Key Lime Pie?

It was widely thought that Key Lime Pie would be introduced as version 5.0 of Android, offering a significant update to the

operating system. Not so: KitKat 4.4 will follow Jelly Bean 4.3. This suggests KitKat will be a smaller update than we had hoped.

## Marketing opportunity for Nestle

Since no money was involved in the deal, Nestle is the big winner here. Android is the number-one mobile operating system in the world, and it clearly doesn't need any help raising consumer awareness.

As a result of the deal, Nestle will be able to incorporate the Android branding and mascot in its own marketing, inevitably leading to increased sales.

"To make this release even sweeter, KitKat is giving you the chance to win a Nexus 7 or Google Play credit. Just look for specially branded KitKat chocolate

bars featuring the Android robot in a shop near you," said Google.

As well as the promotional bars, the KitKat website has been transformed into a spoof smartphone page advertising its 'adjustable orientation' and 'compatibility with all liquid accessories'.

## Bad news for Google?

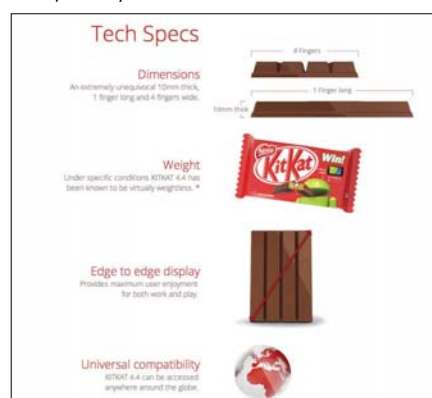
When two companies co-brand each is automatically associated with the other. We still haven't forgotten the criticism levelled at Nestle for promoting its powdered baby milk in the developing world, fixing the price of chocolate and being involved with child labour in the production of cocoa.

Even Google has admitted that it's a risk: "When you try to lead a new way of communicating and profiling a brand you always have a higher risk than doing something much more traditional.

"You can go round the swimming pool 10 times wondering if the water is cold or hot, or you say: 'Let's jump!'"

## A sign of things to come

We can expect the name of KitKat's successor to start with the letter L. But rather than 'Lollipop' or 'Lemon Meringue Pie', it's now possible we could see Google join forces with Lucky Charms, Laffy Taffy or even Lemonhead. ☒





# Four new smartphone OSes

Mikael Ricknäs examines the contenders trying to break up the smartphone duopoly

**F**our new mobile platforms intend to challenge Apple and Google's dominant position in the smartphone OS market. Mozilla's Firefox OS is the first out the gate, but Canonical, Samsung and Intel, and Jolla Mobile are also busy readying their alternatives.

Phone makers and mobile operators are worried about the Android-iOS duopoly into which the smartphone market has evolved. This concern has given birth to a new generation of OSes that its respective backers are hoping will make a mark.

## Mozilla Firefox OS

Of the four challengers, Firefox OS is the furthest along. The platform is already running on devices on the market.

"At the moment it looks like Firefox OS is in the best position to break out from niche status because it has strong support from major mobile operators and handset vendors such as ZTE. That gives it an above-average chance of success," said Neil Mawston, executive director at Strategy Analytics.

Telefónica and Deutsche Telekom have started selling the Alcatel OneTouch Fire and ZTE Open in Spain, Colombia, Venezuela



and Poland, with more countries on the way. Sales figures are not yet available.

"It is difficult to gauge exactly what is the level of demand," said Geoff Blaber, director of devices and platforms at CCS Insight.

What is known is that ZTE sold 1,975 units of the Open via eBay in the US and UK for \$79 and £59 respectively. It sold out in one day in the US and in two days in the UK.

To put that number in perspective, about two million smartphones based on Android and 82,000 based on Windows Phone were sold to end users per day during the second quarter, according to Gartner. Android continued to dominate the smartphone sector during April to June, while Windows Phone surpassed BlackBerry to take third place.

"The challenge for Firefox OS is broadening the carrier support beyond the likes of Telefónica and Deutsche Telekom and provide a user experience that is comparable to Android. But it is in a good starting position," Blaber said.

To succeed on a bigger scale, both Firefox OS and the other newcomers must become popular in China and/or the US because of their size, according to Mawston.

## Canonical Ubuntu

While devices running Firefox OS have gone on sale, Canonical and Jolla are still working on getting smartphones based on Ubuntu and Sailfish OS into the hands of consumers.

Canonical's campaign to raise \$32m (£20.4m) for the production of its Edge smartphone-PC project ended with only

\$12.8m (£8.2m) in the pot. This is nowhere near the ambitious target it set, but enough to make it the biggest fixed-target crowdfunding campaign so far.

"The idea was to signal opportunity for more innovation in hardware manufacturing. The specification and feature set we built into the campaign was advanced in terms of the Edge being a device that could be both a smartphone and a PC," said Richard Collins, product manager for Ubuntu Mobile.

The first milestone for the OS will come in October when Canonical will release a version mature enough for hardware makers to start working on devices that would then become available during the second quarter next year. Those first devices will be more akin to smartphones than the converged device the Edge was intended to be.

"Our discussions with hardware manufacturers have been very productive. But there is a difficulty and inertia about them thinking about what's going to change and what can be done. The reason for that is with existing OS providers there isn't the scope to deliver the kind of product we were promoting," Collins said.

The success of Ubuntu will depend on hardware manufacturers recognising that there is not sufficient opportunity for them just working with Android, said Collins.

## Jolla Sailfish

Jolla has announced that the first production batch of Sailfish smartphones has been fully booked by consumers and sales channels in 136 countries, which shows that there is

# take on Android and iPhone

demand for more OS options, said Jolla's CEO Tomi Pienimäki.

"The number of countries was a real surprise. Yes, we knew that there was interest elsewhere than Finland and Europe, but not to that extent," said Pienimäki.

The company doesn't want to say how large is the batch. But the development of the OS and the first smartphone, which was announced in May, is going well. On the software side, the company is working on improving performance, adding features and fixing bugs, said CTO Stefano Mosconi.

"The production has started and we have received many different rounds of prototypes. Overall, the situation looks extremely positive," Mosconi said.

The first Jolla smartphone is expected to begin shipping by the end of the year, starting in Europe.

## Tizen

Not much has been heard regarding Tizen OS devices since February's Mobile World Congress. Operators Orange and DoCoMo said then that they planned to start selling the first smartphones running Tizen during the second half of the year.

"From our perspective not much has changed regarding our position on Tizen. We have always been relatively clear that we are supporting Tizen to bring more diversity, and that is still the case," said Patrick Remy, vice president of devices at Orange Group.

But when it comes to the availability of the first devices, Remy had little to add.

"There is nothing specific we can announce at the moment, but in the coming months we are hoping to be a bit more vocal about the work we are doing," Remy said.

Orange is also monitoring the progress made by the other new OSes, and will add devices if they gain traction, said Remy. But Android, with its stability, aggressive pricing and large ecosystem, is Orange's choice for low-end smartphones.

Despite the lack of news, Tizen is still the one to watch, according to Blaber.

"That is purely because of Samsung. Samsung sees itself as a platform company, and it wants to take control of the OS to drive product development, service and content rollouts across multiple product categories, not just mobile," he said.

Behind the scenes Intel and Samsung have been spending money to lay the groundwork for getting developers onboard.

For example, with money from Intel, cross-platform development vendor Appcelerator has added support for Tizen to its development platform.

Vendors of other cross-platform development tools are also lining up behind Tizen, including Sencha and Unity.

and 78 percent showed the same level of interest for Android. Even though more apps are being added all the time, the survey underlines that Microsoft is still struggling to attract developers. Only about 37 percent of respondents said they were very interested in Windows phones.



## What do consumers want?

A survey conducted by Appcelerator and IDC in April suggested that Samsung and Intel have an uphill battle ahead of them. Only 9 percent were very interested in Tizen, compared to 19 percent for Ubuntu and 25 percent for Firefox OS.

Even though Mozilla is seemingly doing better than the backers of the other new platforms, the company still has a lot of work to do before it reaches the level of interest developers are showing for iOS, Android and, to a lesser extent, Windows Phone.

About 87 percent of respondents said they were very interested in Apple's iOS,

"As we have seen with Windows Phone, the challenge for any new platform is to ensure you get the leading apps market by market, and you can tick the boxes for the leading top 20," Blaber said.

Getting developers and consumers onboard was never going to be easy, but the interest in these alternative platforms show that there is a demand.

"We are not going to see a significant change to Android's dominance anytime soon. But it is feasible that Firefox, Ubuntu, Sailfish and Tizen can maintain presence as long as there is a reasonable demand and costs are kept low," Blaber said. ☒





### Samsung Galaxy Note 3



#### Phablet

Now in its third incarnation, the Galaxy Note 3 has a 5.7in screen with Full HD resolution. As usual, the device comes with the S Pen stylus. This now features Air Command, which has five tools for you to use. The device also has a leather rear cover to protect it, but a steep price tag.

**£649 inc VAT**

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

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## Surface 2 & Surface Pro 2 ↗

### Tablets

Microsoft has refreshed its Surface line-up, despite poor sales of the first-generation tablets. The Surface 2 and Pro 2 look similar to their predecessors, but have upgraded specifications and a new silver colour. Each has improved processing performance and battery life, and the Pro 2 is sold with larger storage capacities. New accessories include a docking station and a power cover; the latter adds a second battery.

**Surface 2 from £359 (32GB); Surface Pro 2 from £719 (64GB)**  
[microsoftstore.com](http://microsoftstore.com)



## LG G Pad <<

### Tablet

After a long break, LG's latest crack at the tablet market is the G Pad 8.3. The name signifies not only its screen size, but its thickness, too. The device has a quad-core processor, Android 4.2 Jelly Bean and some add-ons, including the ability to switch the screen on with a double-tap called KnockOn.

**Price TBC**  
[lg.com/uk](http://lg.com/uk)







## Samsung Galaxy Gear <<

### Smartwatch

The Galaxy Gear is the much-anticipated smartwatch from Samsung. This wearable gadget has a built-in camera and 1.6in screen. It comes in a variety of colours and connects to a handful of Galaxy smartphones via Bluetooth.

**£299 inc VAT**

**samsung.com/uk**

## >> Toshiba Encore

### Tablet

Windows tablets tend to be big and bulky, but the Toshiba Encore measures just 8in and weighs just over 450g. It runs on Windows 8.1, the latest version, and employs an Intel Atom processor. There's up to 64GB of storage on offer here and plenty of ports, including micro HDMI.

**£250 inc VAT**

**toshiba.co.uk**



## Sony Xperia Z1 <<

### Smartphone

The replacement for our number one smartphone, the Xperia Z, is the Xperia Z1. Sony has made a number of improvements including a more shapely, albeit larger, aluminium design. Its processor, software and camera have also been upgraded.

**£599 inc VAT**

**sony.co.uk**

## >> Acer Iconia A3

### Tablet

Looking similar to the Samsung Galaxy Tab 10.1, Acer's Iconia A3 is a simple and affordable 10in Android tablet. Apart from the usual things you'd expect to find, the A3 has Dolby Digital Plus onboard and a micro-HDMI port.

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**acer.co.uk**



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## HTC Desire 601 <<

### Smartphone

The Desire 601 offers similar styling to its flagship One range but with a 'mid-range' price. The smartphone combines a 4.5in screen, a 5Mp camera and support for 4G LTE networks. It has features from the One range including HTC BlinkFeed, HTC Zoe with Video Highlights and HTC BoomSound.

Price TBC  
htc.com/uk

## >> Sony QX10

### Camera lens

If you're not happy with the camera on your smartphone, then the QX10 might be the answer. It's a lens with an 18Mp Exmor R CMOS sensor and a 10x optical zoom that can be strapped onto and hooked up to almost any smartphone with a combination of NFC and Wi-Fi.

£179 inc VAT  
sony.co.uk



## Dell Venue ^

### Tablet

Dell's new range of Venue tablets is aimed at business and home users alike. Only one model - with an 8in 1920x1080 screen - has been unveiled, but all will use Intel's new Atom processors, which are by far the most powerful yet. With the full version of Windows 8, you can run Adobe Photoshop or any other Windows program on the Venue.

Price TBC  
dell.co.uk

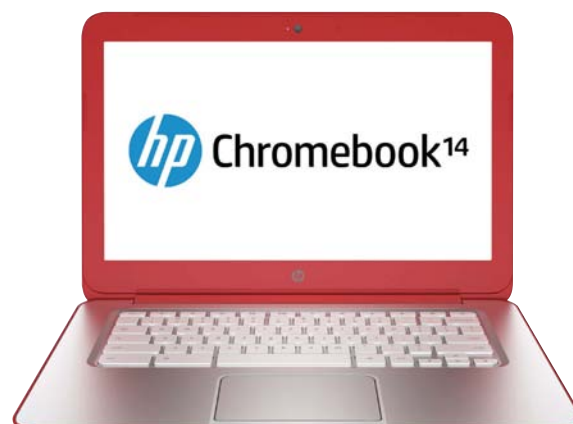
## > HP Chromebook 14

### Laptop

With a 14in screen, HP's Chromebook is the biggest yet. Available in several eye-catching colours, it's also the best-looking. Thanks to new Chrome apps that run offline, and Intel's low-power Haswell processor, this is set to be one of the best low-cost laptops around.

See page 40 for our full review.

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Apple iPhone 5c **33**



ANDREW  
HARRISON

# The Big Apple doublephone

**T**ech news in late September was dominated by the launch of not one, but two new iPhones. The playful 5c and the serious 5s – along with the interface revamp of iOS 7 to power all Apple mobiles – puts more power in users' hands than ever before. Read all about these handsets overleaf.

With 4G chipsets these phones can spread their cellular wings on more networks around the world than ever, ensuring even jetsetters should stay connected in every country and continent in which they land. Better motion sensing, riding the wave of the fitness-tech fad, means the phone knows which way is up, and more precisely than before. And improved battery life helps keep you on the net for longer.

Yet disclosures about the integrity of our internet may, nay should, come as a shock. Putting your personal life on to a social network to share with friends and followers is one thing, and an opt-in decision for the so inclined. But there is still the principle of confidentiality, of a private life, long assured by the secure encryption we use for online shopping, for email and for video calling.

Thanks to the clever mathematical wrangling of ciphers, leading to encryption standards behind HTTPS, SSL, TLS and VPN, that which you communicate is strictly between you and your recipient – whether it's your card details to an online shopkeeper, your strategies to business associates or intimate words with your lover.

And now it seems, it's between you, them, and the National Security Agency and Government Communications Headquarters. And thereafter the rest of the US and UK government. And the government and security agencies of the three other eyes that make up the intelligence-sharing Five Eyes countries, Canada, Australia and New Zealand. All can and do view the online life of any citizen at will.

So the Snowden affair continues to unravel, with more revelations of how the NSA coerced big tech companies Microsoft, Google, Yahoo and Apple to provide hidden backdoors into everyday services such as Skype, Outlook and BitLocker, Gmail, Yahoo Mail and VPN services.

And the data they don't acquire through corporate complicity is also fair game, it seems, thanks to well-executed NSA operations to weaken security standards underpinning all computers, all internet traffic. While 256-bit encryption is still difficult to crack, weaken it to 60-bit or less with some software 'coding errors' and you're in.

Now all that's required to fulfil an Orwellian horror of catastrophic magnitude is to place electronic bugs on every citizen, rolling out a carry-everywhere device that can give precise long-lat co-ordinates through satellite eyes, that can Hoover up all text and voice communications from its user, that will always be connected to the brotherly network. A device that always knows its owner's orientation in the world, in every sense. ☒

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- 32 Apple iPhone 5s
- 33 Apple iPhone 5c
- 34 Gigabyte S1185
- 35 Samsung Series 7 Ultra
- 36 Samsung Series 7 Chronos
- 37 Chillblast Messiah i7 GTX780M
- 38 Toshiba Satellite P70-A-109
- 39 PC Specialist Optimus V
- 40 HP Pavilion 14-c002ea Chromebook
- 41 BenQ GW2760HS
- 41 WD Se 4TB
- 42 Scan 3XS Mirage AIO245
- 42 Arbico H4676 Quiet PC Package

- 43 nVidia GeForce GTX 780
- 44 Google Nexus 7
- 44 Samsung Galaxy Note 8.0
- 45 Nokia Lumia 1020
- 45 Archos Titanium 97b
- 46 Humax HDR-1010S
- 46 Citizen Eco-Drive Proximity
- 47 TP-Link TL-WDR4900
- 47 Devolo DLAN 500AV
- 48 Edifier Sound To Go Plus
- 48 Denon Cocoon Home

### APPS

- 50 Best apps for students
- 52 Blippar
- 52 Bloom.fm
- 53 Plants vs Zombies 2

### SOFTWARE

- 54 EaseUs Todo Backup Home
- 54 Systweak Advanced System Optimizer 3
- 55 Panda Global Protection 2014
- 56 Apple iOS 7
- 57 Corel Painter X3
- 58 Grand Theft Auto V

### BUSINESS

- 60 Lenovo ThinkPad Helix
- 61 Canon Pixma MX525
- 61 Epson Perfection V370 Photo
- 62 Dell B1265dfw
- 62 Epson Expression Photo XP-950
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#### Specification

4in (1136x640, 326ppi) capacitive multitouch IPS display; A7 64-bit CPU; 802.11a/b/g/n; Bluetooth 4.0; rear-facing camera: 8Mp still/1920x1080 video; front-facing 1.2Mp still/128x720 video; UMTS/HSPA+/DC-HSDPA; GSM/EDGE; LTE; assisted GPS; three-axis gyroscope; proximity sensor; ambient light sensor; digital compass; three mics; mono speaker; 3.5mm stereo headphone/mic jack; Lightning connector; 123.8x58.6x7.6mm; 112g

#### PC ADVISOR BEST BUY

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



## SMARTPHONE

### Apple iPhone 5s

Not so long ago, we'd sit and listen to an Apple keynote and be surprised by the product being launched, but that wasn't the case this year.

Just about every feature of the iPhone 5s had been leaked months or weeks earlier, including the fact that a third colour option - gold - would be introduced. The world also knew that a plastic iPhone - the 5c - would be launched simultaneously, although many people incorrectly assumed the 'c' stood for cheap.

None of this, of course, detracts from the fact that the 5s is a superb smartphone and worthy flagship. Just as the iPhone 4s was almost indistinguishable from the 4, the 5s has only its golden finish to make it stand out. We think this will be the most desirable of the three colour options, but the new Space Grey (a lighter shade than the black iPhone 5) comes in a close second.

But like the 4s, the similarities between last year's iPhone and the 5s are largely superficial.

The first thing you notice about it is the new Home button. Apple has built a Touch ID fingerprint sensor into the button, so you can unlock the device in an instant by touching it. This has already caused a huge amount of controversy (and it isn't even the first to appear on a phone), but there's no denying that this is a seriously convenient - and



cool - feature, which is more secure than the four-digit passcode most smartphone owners use.

Apple's new 64-bit A7 processor is partly to thank for the existence of the Touch ID sensor. It's remarkably fast and means that there's no delay in reading your finger and unlocking the phone.

It also means that iOS 7 is buttery smooth. There's nary a judder or stutter when swiping between home screens, or exiting an app and watching your icons fly into place. Apps launch and web pages load faster than ever.

The A7 also has a motion co-processor - the M7 - which will come into its own when the developers of activity tracking apps update their software to use the new chip. It should mean the 5s can replace the likes of a Fitbit or Withings Pulse.

Both of the cameras have been upgraded, although the number of megapixels on offer stays the same. Instead, Apple has wisely increased the size of the pixels which means better quality in low light.

Importantly, the 5s no longer uses an upscaled 4Mp mode in very low light as the iPhone 5 does, and photos taken in dark conditions have much less noise. In good light, you won't see a huge difference between images from the two phones, but at night, the 5s does a much better job.

The faster A7 processor means there's a new 10fps burst mode, which should ensure you don't miss the crucial moment in the action. Hold your finger on the shutter button and the 5s will keep taking

10 photos per second until you've taken a thousand.

The dual-LED flash delivers much better lighting than the iPhone 5's single LED, giving more natural-looking results. Overall, the low-light improvements make the 5s a better proposition for taking photos when there isn't much light.

One thing that hasn't changed is the 4in Retina display. It still has the same 1136x640 resolution as the iPhone 5 (and 5c) and is a decent screen. However, compared to the larger, Full HD offerings of the 5s' rivals, such as Samsung's Galaxy S4, it's starting to feel a little cramped.

As a trade-off against size and weight, however, the 5s still strikes a good balance. Since it has the same dimensions and button layout as the 5, cases will fit both models, but those with small camera apertures might block the new flash.

Wi-Fi and Bluetooth remain also unchanged, so there's no 802.11ac support in the 5s. Still, with 802.11n onboard, it should be quicker than your broadband even in a year's time. Support for more LTE bands means you will - in the future - be able to roam on 4G in more places than you can with an iPhone 5.

#### Verdict

If you already own an iPhone 5, it's hard to justify upgrading to the 5s. Those with a 4s (or 4) are in for a treat, though. As well as serious performance gains, the bigger screen and lighter weight make a huge difference, and the fingerprint scanner is a bonus. **✉ Jim Martin**



**£469** inc VAT (16GB)  
**£549** inc VAT (32GB)

#### Contact

■ [apple.com/uk](http://apple.com/uk)  
Read more  
■ [tinyurl.com/kn23jd8](http://tinyurl.com/kn23jd8)

#### Specification

4in (1136x640, 326ppi) capacitive multitouch IPS display; 1.3GHz Apple A6 dual-core ARM processor; 1GB RAM; 802.11a/b/g/n; Bluetooth 4.0; rear-facing camera: 8Mp still/1920x1080 video; front-facing 1.2Mp still/128x720 video; UMTS/HSPA+/DC-HSDPA; GSM/EDGE; LTE; assisted GPS; three-axis gyroscope; proximity sensor; ambient light sensor; digital compass; three mics; mono speaker; 3.5mm stereo headphone/mic jack; Lightning connector; 125x59x9.1mm; 131g

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



## SMARTPHONE

# Apple iPhone 5c

In essence, the 5c is an iPhone 5 in a colourful new case. The five colours match the theme of iOS 7 and are certainly bright. Like the iPhone 3G and now Nokia's Lumia range, the handset has a polycarbonate case, and as such is fractionally bigger and heavier than the metal iPhone 5.

It's slightly more than a millimetre thicker and is 16g heavier than an iPhone 5 – nothing major. A 9mm phone is almost thick by today's standard, but the 5c certainly doesn't feel chunky.

The case is glossy, smooth and feels nice in the hand. It shares the same rounded corners and look of the white MacBook, and is the most ergonomic iPhone since the 3GS.

Build quality is excellent, as we've come to expect from Apple. There's not an internal rattle or gap in the casing to be found, and even though its predominantly plastic, the 5c retains that premium Apple feel.

However, despite its nice feel, many cheaper handsets on the market outclass the 5c. For example, the aluminium HTC One can be found for under £400, so a 5c starting at £469 seems overpriced for what is basically a year-old phone in a plastic case. An iPhone 5s with the same amount of storage is only £80 more than the 5c, which is a small price to pay if you're going to shell out for a new smartphone.

As we've said, the 5c is an iPhone 5 with a different case. This is because the hardware on offer is almost unchanged. Inside is the same A6 dual-core processor and, according to the Geekbench 3 app, the device has a 1.3GHz clock speed and 1GB of RAM – no change there then.

iOS 7 running on the 5c feels smooth and responsive.



Geekbench 3 showed that performance is in effect identical to the iPhone 5, scoring 710 points, which is just three points less.

The 5c graphics measured almost the same as the iPhone 5 – it was only one frame/second off in the GLBenchmark 2.5 Egypt HD test with 37fps. The device rated an impressively speedy 788ms in the SunSpider 1.0 browser test.

Apps and web pages load swiftly, and panning around Apple Maps is smooth. The 5c's screen is the same 4in Retina display introduced with the iPhone 5. Although the screen looks crisp and colourful, it's no longer class-leading as Google's hardware makers are fitting larger and higher resolution screens.

Two storage options are available, 16GB and 32GB, and our 16GB test device had 12.6GB available for use.

Crucially, Apple's new phone supports more 4G networks. The iPhone 5 was only compatible with EE's LTE service. The 5c should support all of the UK's 4G networks as they go live over the coming months. Our test unit ran well on Vodafone's 4G network.

Other connectivity remains the same with the 8-pin Lightning connector, dual-band 11n Wi-Fi, Bluetooth 4.0 and GPS. Apple hasn't bothered with Android add-ons like NFC or wireless charging. Unlike the iPhone 5s there's no Touch ID sensor.

There's little change in the camera

specifications. The 5c has the same 8Mp iSight rear camera as the previous model, though, you can rest assured that pictures and video will be of a high quality.


The front FaceTime HD camera is similar to the 5s, but with improved low-light performance thanks to larger pixels and an improved backside illumination sensor.

The camera app in iOS 7 has a square photo mode and new filters, though, we kept accidentally taking multiple pictures by pressing the shutter button for too long.

The iPhone 5c comes with iOS 7 software, the biggest interface redesign since the original iPhone was launched, and gives the whole device a quite different look. It's cleaner and lighter and much more colourful, if a little too bright.

Apple has installed a marginally larger battery, with five percent more capacity than the iPhone 5. The company says it provides an extra two hours of talktime or browsing over 4G LTE, or a further 25 hours on standby. Generally its figures can be trusted, although at the time of writing we hadn't had the 5c for long enough to fully test its battery life.

## Verdict

The iPhone 5c is a nice smartphone. However, it's too expensive for what is in effect an iPhone 5 in a plastic shell with a few minor hardware changes. There are cheaper Android devices on the market, and those wishing to stick with iOS can pay just an extra £80 for the iPhone 5s.  **Chris Martin**





**£574** inc VAT**Contact**■ [uk.gigabyte.com](http://uk.gigabyte.com)**Read more**■ [tinyurl.com/q72wesb](http://tinyurl.com/q72wesb)**Specification**

1.8GHz Intel Core i5-3337U (2.7GHz Turbo boost); Windows 8 64-bit; 4GB DDR3L RAM; 128GB SSD; 11.6in (1920x1080) IPS touchscreen; Intel HD 4000; 802.11b/g/n; gigabit ethernet; Bluetooth 4.0; 1x USB 3.0; 1x USB 2.0; HDMI/VGA; stereo speakers; headphone socket; 1.3Mp front-facing webcam; 5Mp rear camera; 39Wh lithium-ion battery; 304x187x13.5mm; 1kg (1.4kg with keyboard)

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**TABLET****Gigabyte S1185**

Microsoft's Surface hasn't exactly set the world on fire, but there are other manufacturers still trying to find some sort of winning formula for Windows tablets. Gigabyte's S1185 is probably too heavy to appeal to home users, but it does have some interesting features that could find a niche with certain types of business users.

The 11.6in S1185 is currently available in only a single configuration, priced at £574 with a 1.8GHz Intel Core i5 processor - a dual-core Ivy Bridge chip - with 4GB of memory and 128GB solid-state storage. Like the Surface, Gigabyte's tablet has only around 80GB of free space available for your own files, but there's a microSD slot that will allow you to add some extra storage when you need to.

The screen is a bright, attractive IPS panel, with full-HD resolution (1920x1080) and wide viewing angles. It works a treat for watching video or browsing the web.

However, the S1185 is also rather chunky, weighing a full kilogram and measuring 13.5mm thick. You can't easily hold it with one hand and then tap on the touch-sensitive screen with the other, so this is no tablet for relaxing with your feet up on the sofa. The built-in speakers are also feeble, and can barely be heard from even a few feet away.

But, clearly aware of the weight issue, Gigabyte has equipped the S1185 with an optical sensor that's located on the righthand edge



of the tablet (when in landscape orientation). This allows you to control the mouse cursor with your thumb when you're working on ye olde Windows desktop - which, as anyone that's tried to use this by touchscreen has discovered, is actually quite tricky when using just the touch interface.

You can press this sensor to perform a simple left-click action, while set into the left-hand edge of the tablet there's also a pair of small buttons that act like left- and right-mouse buttons. This arrangement took a little getting used to - and certainly seems counter-intuitive on a touchscreen device - but it does give you more precise control when working in the Windows desktop. That could be useful for people who need to stand up and move around while they're working - perhaps for data entry or stock-taking in a shop.

There's a 5Mp front-facing camera for taking pictures onsite, and a slot for a SIM card - described as '3.5G' - for mobile communications when you're out and about. The S1185 isn't 'ruggedized', though, so you'll need a padded case to protect it.

Gigabyte includes a detachable, portable keyboard as standard, so you can sit down and treat it like a laptop when you need proper keyboard input. Although the keyboard makes rattling sounds as you type, the keyboard panel is quite firm and sturdy, and the keys have enough travel to feel quite comfortable when typing.

The S1185 certainly has the performance to match a proper laptop, with its solid-state storage and the main processor's 2.7GHz Turbo Boost capability scoring a healthy 4300 points in PCMark 7. That's more than adequate for running Microsoft Office and even some more demanding CAD or graphics apps.

This tablet's main Achilles heel is the battery life. The powerful processor and IPS screen means it could only just creep past the four-hour mark (242 minutes) when streaming video over its built-in Wi-Fi. This is disappointing for a mobile device that's clearly intended for use on the move.

**Verdict**

There's certainly room for improvement in the S1185's battery life. However, its strong performance and unusual optical mouse sensor could appeal to professional users who need a mobile PC that they can hold in both hands and use while on the move. **Cliff Joseph**



**£1,000** inc VAT**Contact**■ [samsung.com/uk](http://samsung.com/uk)**Read more**■ [tinyurl.com/nv6toqd](http://tinyurl.com/nv6toqd)**Specification**

1.8GHz Intel i5-3337U (2.7GHz Turbo boost); Windows 8 64-bit; 6GB DDR3 RAM; 128GB SSD; 13.3in (1920x1080) gloss TN touch-sensitive display; Intel HD 4000; AMD Radeon HD 8750M, 1GB VRAM; 802.11a/b/g/n; gigabit ethernet; Bluetooth 4.0; 1x USB 3.0; 2x USB 2.0; HDMI; SDXC card reader; 720p webcam with built-in microphone; headphone socket; 57Wh lithium-ion battery; 324x224x18.9mm; 1.65kg

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**LAPTOP****Samsung Series 7 Ultra**

Samsung's laptop range seems a bit untidy at the moment. When it arrived, this system had the name Series 7 Ultra clearly printed on the box, as well as on the aluminium case of the unit itself. Samsung's website, however, refers to it as the Series 7 Touchscreen Notebook. And, just to confuse things even further, there's also a model with the same design, dimensions, and even model number (NP740U3E) that's now referred to as the Ativ Book 7.

But if Samsung's naming system is a mess, we can at least report that the Series 7 Ultra is a smart, attractive laptop that provides good performance for a wide range of applications.

The Series 7 range has been around for a while, and this latest version sticks with the same slimline, silver-grey aluminium casing as its predecessors. That inevitably prompts comparisons with Apple's MacBook Air, but the 13in Series 7 Ultra is actually larger and heavier, measuring 18.9mm thick and weighing 1.65kg, against 17mm and 1.35kg for the 13in version of the MacBook Air. A closer comparison can be drawn to Apple's 13in MacBook Pro.

You do notice that extra weight when you pick up the Series 7 Ultra with one hand, but 1.65kg is still very much in Ultrabook territory, and you can certainly carry it

around in a backpack or briefcase without strain.

It's sturdily built, too, so we wouldn't worry about it coping with the occasional bump along the way.



The keyboard and trackpad are both spacious and comfortable to use, and we like details such as the fact that the symbols are stencilled onto the keys rather than just painted, which allows the Apple-style backlighting to glow right through each individual key. Our only minor complaint is that the hinge for the screen panel is rather springy, and it makes the display wobble a bit when you're typing away on the keyboard.

The 13.3in screen itself is excellent, very crisp and bright, with full 1920x1080-pixel resolution and good viewing angles, although the glossy screen coating will be annoyingly reflective in bright daylight. The screen on this latest model is touch-sensitive, too, and even the JBL speakers stand out, producing a warmer, less tinny sound than most laptop speakers.

Samsung's Series 7 Ultra is currently only available in a single configuration, typically priced at £1,000 with previous-generation Ivy Bridge Core i5 running at 1.8GHz, 6GB of memory, 128GB solid-state storage and both integrated Intel

HD 4000 and discrete AMD Radeon 8750M graphics processors.

This is where you need to watch out for the Ativ Book 7, which has a very similar design and specification, but only includes 4GB of memory and loses the dedicated graphics


processor. Oddly, though, the online prices for both machines are about the same, so we'd recommend you get the Series 7 Ultra as that offers better value for money.

It performed well, too, even if it's still using last year's Ivy Bridge version of the Core i5. A score of 4889 points with the PCMark 7 benchmark means it edges ahead of the current MacBook Air, which scored 4602 points with its modest but more efficient 1.3GHz Haswell Core i5 processor.

The Radeon 8750M isn't state of the art, but its framerate of 39fps when running *Stalker: Call of Pripyat* at 1280x720 pixels and Medium details makes casual gaming possible.

Switching to the more power-efficient integrated graphics allowed us to get exactly five hours (300 minutes) of streaming video from the Series 7 Ultra. You may be able to stretch that with casual web browsing, though, it's still far short of the 14 hours you can get from the MacBook Air these days.

**Verdict**

Samsung's Series 7 Ultra is a very attractive Ultrabook - neatly designed, highly portable and with good all-round performance. It's no match for the battery life of the latest Haswell laptops, but its twin GPUs do give it some graphical horsepower, making it a good choice if you need a lightweight Ultrabook that can handle gaming and other demanding tasks.  **Cliff Joseph**





**£1,050** inc VAT

**Contact**

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

**Read more**

■ [tinyurl.com/kl2henn](http://tinyurl.com/kl2henn)

**Specification**

2.4GHz Intel Core i7-3635QMM (3.4GHz Turbo boost); Windows 8 64-bit; 8GB DDR3 SDRAM; 1TB 5400rpm HDD; 15.6in (1920x1080) gloss TN touchscreen; Intel HD Graphics 4000; AMD Radeon HD 8870M, 2GB VRAM; 802.11a/b/g/n; gigabit ethernet; Bluetooth 4.0; 2x USB 3.0; 2x USB 2.0; HDMI; VGA; SDXC card reader; 720p webcam with built-in mic; headphone socket; 91Wh lithium-ion battery; 376x250x23mm; 2.5kg

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



**LAPTOP**

## Samsung Series 7 Chronos NP780Z5E

There's nothing very fancy about this updated version of Samsung's Series 7 Chronos. It doesn't, for example, have a Haswell processor and it's much too heavy to call itself an Ultrabook, but if you're looking for a smart, powerful desktop replacement machine for use at home or in the office, then the NP780Z5E has a lot going for it.

Externally, this laptop looks very similar to the less expensive Core i5 model that we reviewed earlier this year, with the same brushed aluminium finish as before. However, pretty much all the main components have been upgraded, providing a much more powerful alternative to its predecessor.

The 15.6in display is now touch-sensitive, and provides full-HD 1920x1800 resolution. Image quality is excellent – bright and colourful, and with a wide viewing angle both horizontally and vertically. It's a shame that the anti-glare matt finish of its predecessor has been dropped in favour of a glossy, reflective finish, though.

The spacious keyboard and trackpad are nice and comfortable to use, and we like details such as the stencilled logo on the Windows key that allows the backlight to glow through. Samsung has gone the extra mile with the sound, too, using JBL-branded speakers that produce a much fuller sound than we're used to hearing from the majority of laptops.



It is not, however, the most portable of laptops. The Chronos measures 23mm thick and weighs 2.5kg, which means that this model has actually gained 100g in weight – and that's despite the omission of the optical drive found in its predecessor. But, of course, this laptop is intended to be used indoors most of the time. It's still light enough to carry around when needed.

The Intel Core i5 model we reviewed earlier this year cost £699, but this new model steps up to a quad-core Ivy Bridge Core i7 running at 2.4GHz (3.4GHz with Turbo Boost) along with 8GB of memory, a 1TB hard disk, and AMD Radeon 8870M graphics that

supplements the low-power integrated Intel HD 4000 processor. You can't buy it direct from Samsung, but online pricing seems to typically be around the £1,050.

The Chronos works hard to justify that price, though. It achieved a score of 4742 points when running PCMark 7, which is rather impressive for a laptop equipped with a spinning hard drive.

It certainly has the power required for heavy-duty professional applications

for tasks such as video editing or audio recording.

The Radeon GPU also means that it can handle some serious gaming action, too, hitting 71fps when running *Stalker: Call of Pripjat* at 1280x720-pixel resolution at Medium quality, and only dipping a little to 59fps at full 1920x1080 resolution.

Even more demanding games such as *Batman: Arkham City* didn't faze it, and the Chronos could still manage a smooth 38fps even at 1920x1080 pixels and High settings.

During testing, Samsung's laptop provided pretty good battery life, too. It lasted for seven hours and 10 minutes when streaming video from the BBC iPlayer. That's still short of true all-day battery life, but not bad for a pre-Haswell processor.

We did find that with the 5400rpm hard drive it booted rather slowly. A cold boot took a full 50 seconds, although the Windows 8 fast-start option cut that to 30 seconds. But even that now seems like an age when you've got used to the speedy performance of laptops with solid-state drives.

### Verdict

Samsung's Series 7 Chronos isn't going to win any awards for its sleek design or portability, but the strong performance and multimedia features make it a good Windows desktop replacement system, while still offering usable battery life for those occasions when it needs to go out and about. **✗ Cliff Joseph**



**£1,799** inc VAT**Contact**■ [chillblast.com](http://chillblast.com)**Read more**■ [tinyurl.com/pcjp94q](http://tinyurl.com/pcjp94q)**Specification**

2.7GHz Intel i7-4800MQ (3.7GHz Turbo boost), quad-core; Windows 8 64-bit; 16GB DDR3 RAM; 1TB HDD; 250GB SSD; 17.3in (1920x1080) matt TN display; nVidia GeForce GTX 780M, 4GB VRAM; 802.11b/g/n; WiDi; gigabit ethernet; 3x USB 3.0; 1x USB 2.0; 1x HDMI; 1x DisplayPort; 1x Mini DisplayPort; 1x eSATA; 1x mini-FireWire 400; SDXC card reader; fingerprint scanner; BD-RE optical drive; 2.1Mp webcam with built-in mic; headphone, microphone sockets; 77Wh removable lithium-ion battery; 412x276x55mm; 3.9kg

Build: ★★★★★☆

Features: ★★★★★★

Performance: ★★★★★★

Value: ★★★★★☆

**LAPTOP****Chillblast Messiah 17 GTX780M**

It's not much to look at, but Chillblast's prophetically named Messiah provides pretty serious gaming performance - albeit with an even more serious price tag.

Rivals such as Alienware often adorn their gaming laptops with all sorts of glowing lights and other eye-candy, but Chillblast tends to opt for generic Clevo cases that - at best - look dull. And so it is with the Messiah 17 GTX780M, which comes clad in a bulky matt-black chassis that bears absolutely no distinguishing features other than its sheer size and weight.

The 17in Messiah measures a full 55mm thick and weighs 3.9kg, so it's obviously not a machine that you'll carry around with you on a daily basis. Even so, that's still relatively normal for a gaming laptop of this size, and the Messiah is at least semi-portable for those occasions when you need to take it away from home.

It's solidly built, and the keyboard is firm enough to take a pounding during long gaming sessions. However, the Fn key is rather oddly located on the right-hand side of the keyboard, and the half-size US-style Enter key is a little irritating when you're typing at speed. The trackpad is also small for such a large machine, although most gamers will be using a mouse so that's not a major problem.

The 17.3in screen is bright and clear, with full 1920x1080 resolution and a welcome matt finish that reduces glare. It's not an IPS display, but viewing angles are good, both horizontally and vertically, so you can swerve around in your seat when things get a bit frantic without losing sight of all the action. The screen isn't touch-



sensitive, but that's unlikely to matter to most gamers, and while the speakers do sound a bit tinny they are reasonably loud and also include a small sub-woofer to give explosions a bit more impact.

You can customise most of the Messiah's main components on the Chillblast website. Our review unit was priced at £1,799 with a quad-core Haswell, an Intel Core i7 processor running at 2.7GHz, 16GB of memory and both a 1TB hard disk and a separate 250GB solid-state drive.

Gaming duties are handled by an nVidia GeForce GTX 780M with 4GB of video memory, and Chillblast also provides a two-year back-to-base warranty as a welcome bonus.

The Messiah achieved an impressive score of 6316 points when running PCMark 7, making it one of a select group of laptops to break the 6000-point barrier. Needless to say, it can handle most desktop applications with aplomb, and the inclusion of 16GB of memory and that 1TB hard

drive mean that it could also server for tasks such

as video-editing besides gaming.

There's a FireWire port that will come in handy for importing video and professional audio use, and a Blu-ray writer so you can burn your own HD discs, or just sit back and watch some Blu-ray movies.

But, of course, you're primarily paying for gaming performance, and the Messiah doesn't disappoint on that score. It managed a smooth 64.3fps when running Stalker: Call of Pripyat at 1280x720 resolution with Medium graphics settings, and barely dipped to 63.8fps when we increased this to 1920x1080.

To push it hard we fired up Batman: Arkham City, cranked it up to 1920x1080 resolution with High graphics settings - and saw it cruise along at a smooth average of 50fps. We have seen a few gaming laptops that produced even higher scores, and only at a cost of £2,000 or more, so the Messiah can justify its £1,799 price tag.

Battery life is almost irrelevant on a laptop like this, since it's rarely going to be used outdoors or far from a power socket. However, switching to the low-power integrated Intel HD Graphics 4600 option provided four hours 15 minutes of streaming video over Wi-Fi, so it can provide some useful battery life when necessary.

**Verdict**

It's a shame that Chillblast can't manage some more interesting designs for its laptops. However, the Messiah's gaming performance does justify the price, while its healthy memory and storage, along with features such as the Blu-ray writer and FireWire port ensure that it can handle demanding productivity tasks, too.  **Cliff Joseph**





£1,199 inc VAT

Contact

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

Read more

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

Specification

2.4GHz Intel Core i7-4700MQ; Windows 8 64-bit; 16GB DDR3 RAM; 2x 1TB hard disks; 17in (1920x1080) glossy TN LCD; nVidia GeForce GT 745M graphics; 802.11n; gigabit ethernet; 4x USB 3.0; HDMI; VGA; SD card reader; Blu-ray writer; 418x273x34.1mm; 3kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



LAPTOP

## Toshiba Satellite P70-A-109

We're pleased to see that companies such as Toshiba haven't abandoned traditional laptops in favour of Intel-funded Ultrabooks. Its Satellite P70 does plenty that Ultrabooks simply can't manage, and it makes a strong start with a stunning screen.

The 17in panel is still the cheaper TN technology but has a full-HD resolution of 1920x1080 pixels, and tests with an X-Rite iDisplay Pro colorimeter revealed great quality. The measured brightness of 332cd/m<sup>2</sup> makes for a searing maximum brightness level, and colours are accurate and punchy: the average delta E of 2.5 is excellent, and the measured gamma level of 2.11 isn't far off the ideal figure of two.

The contrast ratio of 613:1 isn't the best we've seen, though, and it's caused by a slightly high minimum black level of 0.54cd/m<sup>2</sup>. It means it's occasionally tricky to distinguish between the deepest black shades - a minor problem that's noticeable only during the darkest movies or games. Despite this, the excellent screen is more than capable of making movies, games and the web look superb.

The Toshiba's media credentials are further enhanced by reasonable speakers. The quartet of Harmon Kardon audio units are among the loudest we've heard on a laptop, and more than capable of filling a room. The treble and high-end sounds are well-balanced and don't sound too tinny, but they still overpower the bass, which is a little weak.

The star on the inside is one of Intel's latest Haswell processors. The Core i7-4700MQ has four Hyper-Threaded cores clocked to 2.4GHz,

and one of those is capable of using Turbo Boost to reach 3.4GHz. The Toshiba also has 16GB of RAM - a huge amount for a laptop.

The processor scored an impressive 4246 points in PCMark 7 - enough power to handle intensive applications. The processor is paired with a GeForce GT 745M, a mid-range nVidia graphics processor. It averaged 86fps in Stalker at 1280x720 resolution and Medium quality settings, and this score dropped to a still-playable 42fps when we upped the resolution and quality level to 1920x1080 and Ultra.

The rest of the specification is mixed. We like the Blu-ray writer, and the pair of hard disks - one with an 8GB solid-state cache - provide 2TB of storage between them. We expect gigabit ethernet and Bluetooth 4, but there's no excuse for 2.4GHz-only single-band 802.11n Wi-Fi in a laptop at this price.

The Scrabble-tile keyboard has a solid base and a comfortable,

snappy typing action, while the Toshiba's sheer size means there's room for a number pad and full-sized keys. The touchpad is good: large, smooth, and with support for Windows 8's gestures.

Little stands out about this expensive machine's exterior. The brushed aluminium finish looks reasonable, but we don't like the visible seals around the edges, nor the slight flexing when we pressed the base and the wrist-rest. It's not exactly portable, either, at 34.1mm thick and 3kg in weight.

A panel on the base grants access to the two 2.5in hard disk bays, two memory slots and the wireless card, and they're all occupied. The port selection is ordinary: four USB 3.0 sockets, VGA and HDMI outputs, an SD card reader and a couple of headphone jacks.

Battery life isn't much to shout about, either - it has a small, removable power pack that lasted for two hours 43 minutes in our looping video battery test. This is below average and the Toshiba won't last too long away from the mains.

### Verdict

The Satellite P70-A-109 doesn't win awards for its build quality, visual design or longevity, but it excels in several other categories: the screen is excellent, the speakers are acceptable for a media machine, and there's plenty of power inside - so this system has the quality to handle media, gaming and work. It's worth considering if Ultrabooks and other 15.6in laptops just aren't powerful or versatile enough. **Mike Jennings**



**£879** inc VAT**Contact**■ [pcspecialist.co.uk](http://pcspecialist.co.uk)**Read more**■ [tinyurl.com/q5qrj2](http://tinyurl.com/q5qrj2)**Specification**

2.4GHz Intel Core i7-4700MQ; Windows 8 64-bit; 8GB DDR3 RAM; 120GB Kingston SSD; 1TB HDD; 17.3in (1920x1080) TN display (matt); nVidia GeForce GTX 765M with 2GB memory; 802.11b/g/n; gigabit ethernet; Bluetooth 4.0; 3x USB 3.0; 1x USB 2.0; HDMI; eSATA; VGA; Pioneer BD-ROM; SD card reader; Onkyo speakers; mic input; headphone jack; 2Mp webcam; eight-cell 76.96Wh lithium-ion battery; 413x278x17.5-44mm; 3.2kg; warranty: 1 year parts, 3 years labour (1-month C&R)

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**LAPTOP****PC Specialist Optimus V**

The Optimus V is billed as a mainstream laptop, but its specifications are pretty impressive by any stretch. Sitting at its heart is the 2.4GHz Intel Core i7-4700MQ processor, a choice from the new Haswell range. Intel's latest batch of chips may have left desktop users slightly underwhelmed, but laptops are more natural territory for them.

Nonetheless, it's worth remembering that this particular laptop is something of a beast. It's not exactly sleek, and feels like a fair weight to support. We weren't very keen on the cooling system, and within an hour the machine was feeling pretty hot on our lap.

Neither is the battery life revolutionary. We got three hours 29 minutes from the 8-cell lithium-ion in MobileMark, which was not unexpected for a laptop with an i7 processor and a 17.3in screen - the not dissimilar (minus Haswell) PC Specialist Optimus IV scored two hours 55 minutes, by comparison.

The Optimus isn't specified to get the most out of Haswell. Nonetheless, it's got some good features. That Haswell chip is backed up by 8GB of DDR3 memory, in a setup that feels remarkably similar to that of the Schenker XMG A523 ([tinyurl.com/kyb9x7w](http://tinyurl.com/kyb9x7w)).

Indeed, the machines offered very similar speed figures. The Optimus scored a mighty 6099 points in PCMark 7. This is only 36 points slower than the Schenker and, in truth, these scores are so similar as to be virtually identical.

This great showing is due, in no small part, to the provision of SSD technology, and the 120GB Kingston V300 drive gives the system an extra injection of acceleration at all the right times.

Plenty of mass storage is provided as well, though, with a Hitachi Travelstar drive offering 1TB, albeit showing its mainstreamness with its 5400rpm speed.

An optical drive is also built in, and the 4x Pioneer Blu-ray combo gives you the option of playing an HD film as well. It was occasionally a little bit noisy, though, and the tray didn't always slide in as easily as we might have liked.

Gaming is capably handled by the main nVidia GTX 765M controller.



This 2GB card delivered playable rates on even fairly complex games, just as long as kept down the resolution and/or details a little.

In Hard Reset, it could muster a mere 32fps at a resolution of 1920x1080 with High settings and full 4x anti-aliasing. This is playable, but only barely. When we dropped to Medium settings and a resolution of 1280x768, we saw the framerate average 74fps.

There's a similar story elsewhere. Stalker: Call of Pripyat produced an average score of 142fps at 1280x768 at Medium quality, moving down to 79fps at 1920x1080 in High settings.

In most cases, the 765M should make a very good job of games, just as long as you're not looking to play at the highest resolution, or with all details pushed to max.

The laptop also has an onboard Intel 4600 controller. There's no need to use this for games, but you can disable the GTX 765M and just use the 4600 at other time. We tested it with some games anyway and, for integrated graphics, the 4600 worked remarkably well.

It could turn out a healthy 52fps in Hard Reset at 1280x768, without anti-aliasing. 4x AA pushed this down to a less tolerable 20fps, while 1920x1080 cut it to a mere 10fps.

In Stalker, 39fps was achieved at 1280x768, dropping to a less bearable 18fps in 1920x1080 and with all options at High. The chances are you'll still want to forget about integrated graphics for gaming, but there's more than enough there for general PC apps.

Once you get to the screen, the sheer size of the Optimus becomes understandable. It's a vast 17.3in

screen with a 1920x1080-pixel resolution that certainly lets

you engross yourself in

movies and games. You can do so even while sitting in bright sunlight, thanks to the screen being matt rather than gloss finish. Viewing angles aren't great, so you may not want too many people crowding round the laptop at close quarters.


Four USB ports are sprinkled around the laptop. Only the single port on the left side is a USB 2.0, with the right side showing two USB 3.0 ports, plus a hybrid USB 3.0/eSATA. HDMI and gigabit ethernet connectors are also located on this side, along with a 9-in-1 memory-card drive. Wi-Fi and Bluetooth are also built in. A 2Mp webcam is located at the top of the screen.

Sound is delivered through two Onkyo speakers. Although you get plenty of volume, bass reproduction is limited, and it's painfully noisy during louder passages.

The keyboard has pleasantly large keys, although the touch feels a little lightweight, and accuracy wasn't always at its best. The 45x90mm trackpad is adequate, if a bit sluggish in places.

It's power hungry, too, measuring around 33W when idling, moving up to close to 80W when being pushed to the maximum during gaming.

**Verdict**

It's not particularly portable, and it's noisy in places. However, the overall specifications are very good, and performance is mostly smooth and versatile. If you want a large system with a 17.3in screen, this is a great performer.  **Robin Morris**



**£250** inc VAT

**Contact**

■ [hp.com/uk](http://hp.com/uk)

**Read more**

■ [tinyurl.com/oe47mop](http://tinyurl.com/oe47mop)

**Specification**

1.1GHz Intel Celeron 847 dual-core; Chrome OS; 4GB DDR3 memory; 16GB solid-state storage; 14in (1366x768) LED screen; Intel HD graphics; 802.11a/b/g/n; 10/100 ethernet; Bluetooth 4.0; 3x USB 2.0; 1x HDMI; SDXC card reader; 0.3Mp webcam with built-in mic; headphone/line-in socket; 37Wh removable lithium-ion battery; 347x238x21mm; 1.8kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



**LAPTOP**

## HP Pavilion 14-c002ea Chromebook

With sales of Windows 8 tablets still flatlining, HP has been telling anyone that will listen that it's prepared to look at other alternatives for its mobile offerings. It's already launched the Android-powered Slate 7 tablet, and has now gone even further down the Google route with the Pavilion Chromebook.

### Build quality

HP's Pavilion Chromebook has a 14in display, and aims to offer the comfort and features of a full-sized laptop. The glossy black plastic casing has a slightly cheap and cheerful feel to it, but it's sturdy enough. Our only real complaint about the build quality was that the keys on the keyboard didn't travel much and felt rather lifeless.

It's a little heavier than we might have liked, at 1.8kg, but that's still light enough to carry around in a backpack without much strain.

The 14in screen isn't the brightest we've ever seen either - and viewing angles are poor with only around 50 degrees limit to either side - but it's fine for browsing the web and watching some streaming video.

The 1366x768-pixel resolution is basic, too, while the built-in speakers sounded tinny. But we've seen and heard worse on Windows laptops costing around £100 more.

### Connectivity

It's well connected, too, with three USB 2.0 ports, HDMI, memory-card slot and even an ethernet socket to complement the built-in Wi-Fi.

The Chrome OS won't run regular software for Windows or Macintosh, and all Chromebooks require a near-permanent internet connection to use Google's cloud services such as Google Drive or the web-based Google Docs.

The Pavilion Chromebook doesn't provide a 3G option either,



as do most of its rivals, so unless you find a way to tether to a smartphone you won't be using this laptop much while on the move.

### Modest specification

The rest of the spec is also modest. A single configuration runs to a dual-core Intel Celeron 847 processor clocked at 1.1GHz, with 4GB of memory and 16GB of solid-state storage. But, to be fair, the machine felt perfectly smooth and responsive during our tests, and more than adequate for browsing, email and routine word processing.

That's because the Chrome OS itself is a lean, stripped-down Linux operating system with the Chrome web browser and just a handful of simple apps running on top.

You can also download a small selection of additional apps from the Chrome Web Store, but for the most part you'll be relying on internet-connected cloud services such as Google Docs for all your work.

Some people have criticised the basic idea of the Chrome OS, as

it requires a permanent internet connection in order to be useful, but that's no longer entirely true. The various Google Docs apps do provide an offline option - available to Chrome OS devices only - that allows you to work online and then sync your documents from the Chromebook's internal SSD so that you can continue to work offline.

### Battery life

Unfortunately, the Chromebook's small, removable battery pack doesn't last nearly as long as you would expect from a mobile device. We got just 181 minutes of streaming video during our tests. But by its very nature, a Chromebook is meant to be always mobile and always connected, so just a few hours from a full charge is disappointing.

It's also worth noting that just as when you use Gmail or Google Docs, Google will collect anonymous data on your actions and use it to target adverts at you as you surf the web.

### Verdict

If you're looking for a cheap laptop for web browsing, word processing and spreadsheets, then the HP Pavilion Chromebook works rather well. A lack of 3G connectivity may help keep down the price, but the offline option for Google Docs means it doesn't turn into an entirely useless lump of plastic when you lose your internet connection.

✉ **Cliff Joseph**



**£210** inc VAT**Contact**

■ [benq.co.uk](http://benq.co.uk)  
 Read more  
 ■ [tinyurl.com/nf3wvfy](http://tinyurl.com/nf3wvfy)

**Specification**

27in (1920x1080) A-MVA display with AG coating and white LED backlight; 16:9 ratio, 0.311mm pixel pitch; 11.5mm bezel; 4ms specified response time (GTG); HDMI, DVI, VGA; 3.5mm mini-jack input and output; stereo speakers with 2W/ch amp; 472x623x191mm; 4.5kg

## PC ADVISOR

### RECOMMENDED

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

★★★★★☆☆

**27in LCD MONITOR****BenQ GW2760HS**

The quality of low-priced monitors has increased tremendously of late, and this BenQ GW2760HS is nothing short of a steal.

Over the past few years LCD monitors have been divided up into two camps: IPS for professionals and TN for everyone else. The IPS models such as Apple's Cinema Display and the Dell UltraSharp U2713HM sit at the higher-end of the market, providing amazing quality for a premium price closer to £1,000. Then AOC upset the cart with its I2757FH, a 27in IPS monitor for £220.

We initially thought the GW2760HS would be another cheap LED variant: it'd be a good bargain but lose out on picture quality. That's not the case. BenQ has thrown a curve ball by using a new-style A-MCA display. This offers a higher contrast ratio than most other monitors - even IPS ones. Our lab tests revealed a colour gamut that is on a par with Apple's 27in displays. An AG matt coating provides an anti-reflective finish.

We ran the GW2760HS through the Spyder4Elite colour calibration process and performed a complete advanced test. The results showed it had a great colour gamut, up to 74 percent of AdobeRGB and contrast ratio up to 950:1. Many manufacturers routinely claim such ratios at or above 1000:1, but few deliver it.

Resolution is below Apple's preferred for a 27in, though. Just 1920x1080 pixels may be 'full-HD' but it's relatively coarse for a large monitor. You won't get the advantage of larger working space, and OS icons and text look jagged.

BenQ uses a new technology called Flicker Free to make the GW2760HS easier on the eye during prolonged use. Flicker is added by some monitor's brightness controls that use Pulse Width Modulation (PWM) to flick on and off very quickly. BenQ instead opts for a simple direct current (DC) method to adjust brightness.



A thin bezel and no lights on the front makes for an unobtrusive design, although the shiny black plastic won't win any awards. The stand is also non-adjustable, which is typical for budget designs.

There's a good range of inputs on offer, with VGA and both HDMI and DVI connections present. It also has 3.5mm mini jack input and output connections.

**Verdict**

This is a superb monitor. At around £200, the GW2760HS offers premium quality and high performance at a price normally associated with much lower quality displays. **Mark Hattersley**

**£210** inc VAT**Contact**

■ [wd.com](http://wd.com)  
 Read more  
 ■ [tinyurl.com/Ldw6nn2](http://tinyurl.com/Ldw6nn2)

**Specification**

4TB hard disk; 3.5in SATA Revision 3 (6Gb/s); 64MB cache; 800,000 MTBF; 300,000 load/unload cycles; 31dB idle (34dB seek) acoustics; 102x147x26.1mm; 750g

**HARD DRIVE****WD Se 4TB**

WD spotted a rich untapped vein when it launched the WD Red hard disk last year. The 3.5in SATA drive neatly filled the gap that existed between the slow-spin Caviar Green drive, often installed in consumer network-storage boxes, and the RE-4 business and enterprise hard disk, optimised for filling racks upon racks of network-storage shelves.

Filling the space between the Red and the Re, as the RE-4 is now known, is the new Se hard-disk drive. It's a full-blooded 7200rpm disk, certified for 24x7x365 operation in enterprise data centres.

It includes StableTrac to stabilise the platters, as well as WD's rotary accelerated feed forward (RAFF) technology; a system used in its Velociraptor drives to monitor and control vibration in real-time through sensor feedback.

WD's assurance of longevity is reduced with the Se, compared to the Re - just 800,000 hours mean time before failure (MTBF) against the latter's 1,200,000-hour figure.

And load/unload operations are rated half that of the Re, too, at 300,000 cycles.

As a full-speed hard disk, you can expect full-ahead performance. And while the spinning disk is left for dust by the solid-state alternatives, the Se showed greater performance compared to traditional technology.

In simple sequential reads, the disk hit its peak performance of 189MB/s in the ATTO benchmark with 8MB data. Write speed in the same test was conspicuously lower, but not significantly so at 176MB/s.

The HD Tune Pro test showed a top read speed of 166MB/s, dropping to 87MB/s at the disk centre. This gave an average read speed of 135MB/s. Write speed was effectively the same in this benchmark.

CrystalDiskMark also let the WD Se show a clean pair of heels, with 176 and 168MB/s respectively for sequential reads and writes, dropping to 59 and 103MB/s for 512kB data samples. Down at the smallest level, 4kB read and write



results were low as we would expect, here just 0.8 and 1.6MB/s.

Used in a large RAID array, we can attest to the drives' quiet and relatively low-vibration qualities. Set up in a Synology DS1813+ they exhibited unusually peaceful operation for a large RAID 5 setup.

**Verdict**

The WD Se is a fast and relatively quiet hard disk that's suited to the needs of business network storage. **Andrew Harrison**

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

★★★★★☆☆



**£1,320** inc VAT**Contact**■ [scan.co.uk](http://scan.co.uk)**Read more**■ [tinyurl.com/nrLsoL8](http://tinyurl.com/nrLsoL8)**Specification**

3.1GHz Intel Core i7-3770S; 8GB 1600MHz DDR3 memory; 128GB Crucial M4 mSATA SSD; 1TB 3.5in SATA hard disk; 23.6in (1920x1080) touchscreen; nVidia GeForce GT 750M; 802.11n; Bluetooth; 4x USB 3.0 ports; 2x USB 2.0 ports; SD card reader; HDMI 1.4 output; HDMI 1.3 input; BD-ROM; 0.9Mp webcam; external PSU

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**ALL-IN-ONE PC****Scan 3XS Mirage AIO245**

All-in-one PCs are always more expensive than equivalent desktop computers, which is justifiable, given the work that's needed in order to squeeze custom components behind a display.

It's refreshing, then, that Scan Computers' 3XS Mirage AIO245 uses affordable off-the-shelf upgrades. It can be configured with, or without, a touchscreen display, there are five processors to choose from, hard disk capacities ranging from 500GB to 3TB, and three sizes of mSATA SSD, along with a variety of memory configurations, operating systems and a choice of optical drive.

One aspect of the Mirage that can't be changed is its chipset, which includes the graphics processor, an nVidia GeForce GT 750M. This isn't a bad choice, though, and we found it more than enough to play games.

We opted for a high-performance configuration, and picked the fastest possible processor, a 3.1GHz Intel Core i7-3700S, with a 1TB hard disk and a 128GB SSD. Also added were the option on a Blu-ray drive, and the standard 23.5in touch-sensitive display. Although this came to £1,320, admittedly a considerable sum, it's a substantial saving over equivalently specified all-in-ones made by big-name firms.

The base configuration - with a Core i3 processor and 500GB hard

disk - is £1,070; but drop the touchscreen and the bundled Windows, and you pay £840.

That's not bad for an all-in-one with a graphics card that's powerful enough to be useful for games and GPU-accelerated functions in certain software. Although no keyboard or mouse is supplied as standard, they can be added as extras on Scan's configuration page.

We were less impressed by the build quality. The plastic rear casing had a small but noticeable gap between the screen and the inside components. Also, the speakers were tinny, and the plastic brightness controller felt like something from a budget radio.

The 23.6in screen is more than adequate. Being a twisted-nematic (TN) panel, colours weren't as vibrant as you'd find with an IPS display, but it still looks good.

Four USB 3.0 and two USB 2.0 ports can be found on the sides, along with analogue audio out, an SD card reader and a gigabit ethernet connector. A great addition is an HDMI input, along with HDMI output for connection to a TV.

The top-end configuration we tested returned a PCMark 7 score



of 5752 points, and 3D Mark 11 score of 2994 points. With the help of its mSata SSD, the Windows 8 boot screen appeared 20 seconds after pressing the power button.

Every game we tested ran well, too. In our standard Stalker: Call of Pripyat benchmark we recorded an average framerate of 125fps, a respectable score, but not record-breaking. All-in-one PCs are no substitute for desktop gaming PCs with discrete graphics cards, but having the ability to run most games on the market is a nice addition.

**Verdict**

The best aspect of the 3XS Mirage AIO245 is its affordable customisation options. The screen is more than adequate and the overall performance is excellent.

✉ **Orestis Bastounis**

**DESKTOP PC****Arbico H4676 Quiet PC Package****£929** inc VAT**Contact**■ [arbico.co.uk](http://arbico.co.uk)**Read more**■ [tinyurl.com/pmk9eka](http://tinyurl.com/pmk9eka)**Specification**

3.4GHz i5-4670; Windows 8 64-bit; 8GB RAM; 2TB HDD; 120GB SSD; 23.6in CTX LCD; CIT Jupiter ATX case; Asus Silent GT; 2x USB 3.0; 11x USB 2.0; BD-ROM/DVD ± RW

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



A modest all-round family PC that benefits from relatively quiet noise levels, the Arbico H4676 will make a decent addition to the home.

It's powered by the trusty Intel Core i5-4670K processor, clocked at 3.4GHz (with a maximum of 3.8GHz) and backed by 8GB of high-calibre 1600MHz Corsair XMS3 memory.

The resulting PCMark 7 score of 5021 is very healthy, and suggests good underlying performance, even if this isn't quite as fast as, for example, the less noise-conscious Chillblast Commando (see page 135).

The Arbico's speed is down to the extensive drive options. A capacious 2TB Seagate Barracuda hard drive is teamed with a high-speed 128GB

Sandisk SSD. And drive complement doesn't stop there as not one but two optical drives are also included.

The LG GH24NS95 is one of the fastest DVD writers around, offering searing 24x DVD ± R writing speeds. But film and gaming enthusiasts are also looked after with the inclusion of a Lite-On iHOS104. This BD-ROM drive performs one function only: that of reading Blu-ray discs. Its 4x playback is wonderfully smooth, allowing seamless Blu-ray film playback. The Logitech three-piece speaker set adds grunt to the sound output, making for a potential budget home-cinema system.

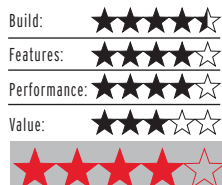
The Asus-made nVidia GT 640 graphics card with 2GB of memory

is a dependable if rather uninspiring choice, and one that lacks the firepower of the '650 and '660s. Demanding titles will push it a little too far. Aliens vs Predator remained playable at 1280x720-pixel size, noodling up to 38fps. At full-HD resolution, though, it fell to a less emphatic 19fps.

The CIT Jupiter ATX case is a modest but tidy affair, with a faint flash of orange and yellow fans glimpsed through the grill. The case isn't particularly large inside, although everything is neatly arranged, and we didn't have many problems getting to tricky components like the memory - two of the four slots are taken up.

**£540** inc VAT**Contact**■ [uk.asus.com](http://uk.asus.com)**Read more**■ [tinyurl.com/nh6p42b](http://tinyurl.com/nh6p42b)**Specification**

nVidia GeForce GTX 780;  
3GB GDDR5; 863MHz Core  
Clock (boost to 900MHz);  
1502MHz Memory Clock  
(6008MHz DDR effective);  
384-bit memory interface;  
2304 Stream Processors;  
192 Texture Units; 48 ROP  
Units; PCIe interface;  
DirectX 11.1; 2x DVI,  
1x HDMI, 1x DisplayPort;  
1x 8-pin and 1x 6-pin  
PSU connector needed;  
3-year warranty

**GRAPHICS CARD****nVidia GeForce GTX 780**

The GeForce Titan took us rather by surprise when it appeared earlier this year. We're less surprised now to be looking at the nVidia GeForce GTX 780. Particularly given that this is really just another Titan, only with access to some areas barred.

Both cards are based on the GK110 GPU, though, some of the Titan's units have been cut. Its 2688 stream processors and 224 texture units, for example, have been reduced to 2304 and 192 respectively.

Not that it's cuts all the way, though. The number of raster operations remains at 48, and (crucially for any chip looking to slay the competition) the 384-bit memory interface remains. And, in fact, there are even a few increases.

Despite costing around £230 less, the GTX 780 has an 863MHz core clock (with boost sending it to 900MHz) as opposed to the 837MHz (876MHz) on that corking Titan.

The GTX 780 has 3GB of memory, which should be sufficient for most high-resolution games. And in terms of memory specifications, it is otherwise essentially identical to the Titan, offering the same 384-bit interface and 1502MHz memory clock (effectively 6008MHz taking into account the clock-quadrupling of the GDDR5). This amounts to the same high memory bandwidth figure

of 288.4GB/s. This dwarves the 224GB/s of the GTX 770, and also, to a lesser extent, the 264GB/s of the AMD Radeon 7970.

In our tests, the 780 was close in performance to the Titan, it's quite a few frames adrift of the dual-chip GTX 690. In *Stalker: Call of Pripyat*, the 780 scored 114.3/82.2fps compared to the Titan's 121.7/91fps. The 690 managed 137.3/101.6fps.

There's also one other peculiar feature of this card. We said earlier that it was effectively the Titan with missing limbs. Well, strangely, you won't know exactly which ones will be lopped off when you buy it.

The sophistication of this product is such that it's very hard to manufacture without defects, and these will appear in different places in every chip. So while nVidia will guarantee that a 780 will have 12 working Streaming Multiprocessors (or SMXes), it can't guarantee exactly which will work.

It has to be said that, even in the case of the high-end Titan, only 14 of a maximum 15 SMXes will be working. And from an end-user point of view, it's pretty irrelevant which do and don't work, as everything will pull together to create one cohesive whole. However, it's strange to think that every GTX 780 will, technically,




be slightly different from most other 780 examples.

It's partly the design issues that causes the 780 to have the same 250W TDP as the Titan, despite being less powerful as a card. Essentially, relaxing the demands means nVidia doesn't have to throw out as many chips.

In testing, we found the difference between this and the 225W GTX 770 to be less than 20 watts. However, it's significantly tougher on power than the 195W GTX 680, for instance, and in real-world testing, we sometimes found the gap to be bordering on 65 watts.

The 780 is relatively quiet - the 680, in contrast, was almost 2dB louder than the 780. The two latest GTX designs may not be focusing on low power consumption, but attempts at keeping the noise down have improved significantly.

**Verdict**

The 780 is an impressive piece of kit. The Titan is too expensive just for gaming, and if you don't want to stretch to the expense of a 690, the 780 is the best gaming choice on performance.  **Robin Morris**




There's more room in which to install a larger graphics card, although the 400W Xigmatek NRP-VC403 PSU isn't amazingly powerful, and may limit your options. The orange Xigmatek cooler does a good job without

taking up much room, and it gets plenty of support from the large yellow fan situated at the back of the case. This PC has 11 USB ports in all. Eight of those are situated at the back (with two of these being USB 3.0). A further three USB 2.0 connectors are provided at the front, one of those included within a memory-card drive. Video ports comprise HDMI and DisplayPort.

The Logitech MK120 wireless keyboard and mouse combo are of adequate quality. Neither too positive nor too soft to the touch, they're easy to type on and use. There are vastly superior combos around, though - Logitech's MK330, for instance.

The 23.6in CTX E24M5G flat-panel is an inexpensive but palatable screen that uses its 1920x1080 resolution to good effect, and offers good clarity of image, if not particularly wide viewing angles.

**Verdict**

It's hard to get too excited about this PC. Many of the components are chosen for value rather than overall performance, and it's not a great choice for gaming. Having said that, the noise levels are comparatively low, and passable home-cinema capabilities and generally consistent performance could make this a discreet and quietly confident pick for the living room.  **Robin Morris**



**£199** inc VAT (16GB)  
**£239** inc VAT (32GB)

**Contact**

■ [google.co.uk](http://google.co.uk)  
Read more  
■ [tinyurl.com/qyudy5c](http://tinyurl.com/qyudy5c)

**Specification**

7in (1920x1080, 323ppi)  
IPS panel; 1.5GHz  
Qualcomm Snapdragon  
S4 Pro 8064 quad-core  
processor; 16GB eMMC  
flash storage; 2GB RAM;  
Android 2.3 (Jelly Bean);  
5Mp rear and 1.2Mp front  
cameras; Bluetooth 4.0;  
802.11a/b/g/n; NFC;  
114x200x8.7mm; 299g

**PC ADVISOR**

**GOLD**

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



**TABLET**

## Google Nexus 7 (2013)

The Nexus 7 was the best value tablet of 2012, a decent device at an absurdly low cost of £159. Thanks to that price, it won our Gold award. This year's model is again built by Asus for Google and starts at £199, so our expectations were high.

It looks very much like the old model, but slimmer and lighter; just 8.7mm and 290g. It's marginally taller, but more millimetres have been trimmed from its waist, making it far easier to hold. Taller proportions means it's not much bigger than a Samsung Galaxy S4.

Without its silver band it's an all-black affair now. Buttons and ports are placed as before, but the rear casing has a completely smooth surface that feels soft to the touch.

Two welcome changes are stereo speakers, now at either end and improving sound; and a notification LED below the screen.

The highlight is an amazing screen – a 7in IPS display with a 1920x1200 resolution. It's simply stunning and without a doubt the

best of any 7in tablet around at the moment.

Google has dropped nVidia for Qualcomm, and has opted for a 1.5GHz Snapdragon S4 Pro quad-core Krait processor and memory doubled to 2GB. This combined with the latest version of Android

meant the Nexus 7 felt super-slick and responsive during our tests.

Dual-band 11n Wi-Fi, Bluetooth 4.0 LE (low energy) and NFC are onboard. A model with 3G/4G mobile data is priced £299.

The Nexus 7 has two cameras. The front remains an acceptable 1.2Mp, while the rear camera is 5Mp with auto-focus but no flash. Photos from the rear are better than we expected with generally crisp shots.

Video can be shot up to 1080p and looks good if you hold the Nexus 7 steady; but panning while filming introduced a lot of jerkiness to footage. You can take still images while filming by tapping the screen.



Android 4.3 brings support for Bluetooth Low Energy, better text input and OpenGL ES 3.0, the latest in graphics. However, the main addition is 'restricted profiles' – you can manage apps and content on separate user accounts.

The battery is smaller, yet Google touts an extra hour of 'active use', to a maximum of nine hours. It has also added Qi wireless charging, which is a feature we always like to see.

### Verdict

The Nexus 7 is now more expensive, but gains an exceptional screen and rear camera, though the battery life is shorter. **Chris Martin**

**TABLET**

## Samsung Galaxy Note 8.0

The Galaxy Note 8.0 is recognisable as a Samsung device, looking like a super-sized Galaxy S4 smartphone.

In the hand, it feels like a nice tablet, although it's a strange size – neither small and pocketable, nor definitively large enough to give easy tablet-size screen viewing. Hidden away in one corner is Samsung's S Pen stylus, which is responsive and easy to use.

At £339, we expected the Galaxy Note to come with some impressive specs. The 1.6GHz Exynos 4412 quad-core processor and 2GB of memory combined are a good start if speed is your thing. However, while it performs well across the board, the screen's 1280x800 resolution isn't breaking any new ground. It matches the Nexus 7 (above), but since the display is larger, it has a slightly lower pixel density of 189ppi.

We had an issue with the lack of available storage on the S4 smartphone, and it's a similar story here. The Note 8.0 includes 16GB of flash storage, but only

9GB is available for your use. As is customary with Samsung devices, a microSDXC card slot will accept up to 64GB capacity cards.

The Note 8.0 offers the kind of photography you'd expect from a mid-range smartphone: 5Mp at the rear with no flash and 0.3Mp at the front. Images aren't very good and video is limited to 1280x720, which is a letdown considering the price.

It comes with Samsung's TouchWiz interface over Google Android 4.1 (Jelly Bean). It's relatively good-looking, but some will find it a little too busy. Luckily, the customisation options mean you can tone things down.

Many Samsung apps are pre-loaded, but unless you're a Samsung devotee you'll end up using Google's own apps for the same tasks. The most useful apps are associated with the S Pen. Without them the stylus would be little more than an alternative to your finger.

When in standby, the Note 8.0's huge 17Wh non-removable battery



holds its charge very well. However, when you use the device, it's not so good. Watching 30 minutes of a TV show on BBC iPlayer used nearly 10 percent of the battery. At that rate, the Galaxy Note would last only five hours on one charge.

### Verdict

The Galaxy Note 8.0 is one of Samsung's better tablets, but it's hampered by an extravagant price tag. Unless you want the S Pen stylus there are better and cheaper alternatives. **Chris Martin**

**£339** inc VAT

**Contact**

■ [samsung.com/uk](http://samsung.com/uk)  
Read more  
■ [tinyurl.com/nn5yrds](http://tinyurl.com/nn5yrds)

**Specification**

1.6GHz Exynos 4412 quad-core ARM processor;  
Android 4.1.2 (Jelly Bean);  
8in screen; Mali-400MP  
GPU; 2GB RAM; 16GB  
internal storage;  
microSDXC card slot; 5Mp  
rear camera; 1.3Mp front  
camera; 802.11a/b/g/n  
dual-band; Bluetooth 4.0;  
infrared; A-GPS/GLONASS;  
Micro-USB; S Pen; 17Wh  
non-removable lithium-  
polymer battery;  
136x211x8mm; 338g

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



**£588** inc VAT**Contact**■ [nokia.com/gb-en](http://nokia.com/gb-en)**Read more**■ [tinyurl.com/kxclsng](http://tinyurl.com/kxclsng)**Specification**

768x1280 pixels; 4.5in screen; 32GB RAM; 2GB processor; dual-core 1.5GHz Krait Qualcomm MSM8960 Snapdragon; 802.11 a/b/g/n; dual-band; DLNA; Wi-Fi hotspot; Bluetooth 3.0; NFC; Micro-USB; 41Mp rear camera; 1.2Mp front camera; Windows Phone 8; 130.4x71.4x10.4mm; 158g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**SMARTPHONE****Nokia Lumia 1020**

The Lumia 1020 is a replacement for the Symbian-based 808 PureView. That model also has a 41Mp camera offering high-quality photography for a smartphone.

At 10.4mm thick, it's a chunky beast, and that's not including protruding the camera, which gets in the way of your index finger in normal use. It's not light either at 158g. The matt polycarbonate body is soft to the touch, and is well-made. The screen is coated in Gorilla Glass 3 and feels more luxurious than previous models.

It's got the same 1.5GHz Qualcomm Snapdragon S4 dual-core processor as the 920, but its memory has been doubled to 2GB. The interface is mostly smooth apart from certain sections of the settings menu and certain apps.

The screen is still 4.5in, surprisingly small considering the outside size of the phone. Resolution is the Windows Phone 8 maximum of 768x1280 pixels, and although it looks good, it's no class leader. Its

strong points are contrast, colour reproduction and excellent outdoor visibility. Plus, the touchscreen works with gloves.

Combined with a Xenon flash, focus-assist light and Pro Cam app, the camera is the most advanced and powerful we've seen on a phone, and the level of detail is incredible in good lighting. The floating lens and optical image stabilisation come in handy for photos and video, helping avoid blurry messes.

Despite a 41Mp sensor, the 1020 takes two photos when you hit the shutter button, one at 34Mp and a smaller, sharable 5Mp version. You can crop the larger image to create new photos on the phone: capture first, edit later.

The Pro Cam app gives you control over settings including ISO, shutter, exposure and focus; one at a time or all in one go. It's a pain having to change 'lenses' (switching apps, in effect) for panoramas and Smart Cam, with its burst mode.



A bunch of Nokia's apps includes Maps, Drive+, Music, Cinemagraph and Creative Studio. But Windows Phone is still leagues behind iOS and Android. Facebook and Twitter are still unofficial and big name apps such as Dropbox are missing.

Battery life is unimpressive, and the 1020 struggled to get through a day of normal use, a poor effort for any smartphone.

**Verdict**

The Lumia 1020 has an amazing camera, the best in a smartphone. However, it's expensive for an out-of-date 920 with a new camera. Poor battery life and a lack of apps put us off most, though. **Chris Martin**

**£209** inc VAT**Contact**■ [archos.com](http://archos.com)**Read more**■ [tinyurl.com/p9d4qnk](http://tinyurl.com/p9d4qnk)**Specification**

1.6GHz Cortex-A9 dual-core processor; Android 4.1.1 Jelly Bean; 9.7in IPS screen (1600x1200, 206ppi); Mali 400 quad-core GPU; 1GB RAM; 8GB internal storage; microSDXC card slot (up to 64GB); 2Mp rear camera; 2Mp front camera; Wi-Fi; Micro-USB; 189 x 242 x 10.5mm; 650g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**TABLET****Archos 97b Titanium**

You might notice that the Archos 97b Titanium looks like a full-size iPad. It has the same screen size, almost the same dimensions (width and height) and identical bezels around the edge.

At a significantly lower price point than the real one, it's no surprise that the 97b is almost entirely plastic. It doesn't feel nice in the hand, but build quality is enough that it doesn't feel like it'll fall apart like many cheap Android tablets.

At 650g it's not especially light for a tablet this size. It's bulky and feels much heavier than most rivals.

Powered by a dual-core 1.6GHz Cortex-A9 processor with 1GB memory and a quad-core Mali 400 GPU, performance isn't great.

We recorded a score of 947 in Geekbench 2, 18fps in GLBenchmark 2.7 and 1970ms in SunSpider 1.0. These are adequate, but the tablet felt slower in actual use.

Ignore Archos' marketing. The 97b Titanium doesn't have "power to spare". Opening apps takes a

few moments and even typing is laggy, leading to frustration and mistakes.

The 9.7in IPS display is just like the iPad, only with a resolution of 1600x1200 giving a pixel density 206ppi - not Retina-quality but good for a budget tablet. Storage is just 8GB, but there's a microSDXC card port that will accept cards up to 64GB.

Both the front and rear cameras are 2Mp, and are placed awkwardly. They also take shockingly bad photos and video footage.

Archos adopts a predominantly plain Android experience. The 97b Titanium runs version 4.1.1 (Jelly Bean) with empty homescreens apart from a few app shortcuts to customise. A couple of extra Archos widgets add to the usual selection.

As well as Google's apps and services, Archos pre-loads a few of its own. We like the visually pleasing Archos Music and Archos Video,



while Media Server lets you share files with other devices on your home network.

Another letdown is the battery. The 97b lasts well on standby, but not in use. We tried to watch a downloaded TV show, and the battery dropped 10 percent in 10 minutes. Later, the tablet shut-down despite showing 14 percent remaining. This is one of the worst performances we've seen.

**Verdict**

The Archos 97b Titanium has a decent screen and a microSD card slot, but everything else in its repertoire goes against it. Poor performance and battery life make it almost unusable. **Chris Martin**



**£265** inc VAT**Contact**■ [humaxdigital.com/uk](http://humaxdigital.com/uk)**Read more**■ [tinyurl.com/nyh9dc5](http://tinyurl.com/nyh9dc5)**Specification**

HD Freesat+ PVR with Freetime interface; HDMI; 1x SCART; Composite video; 2x RCA phono analogue audio; 10/100 ethernet; 2x USB 2.0; S/PDIF output; 2x satellite RF input (F-type); 802.11b/g/n; 1TB HDD; 352x55x238mm; 1.7kg

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**FREESAT PVR****Humax HDR-1010S**

Humax is hard to beat when it comes to personal video recorders (PVR) and Freeview/Freesat devices. Its products include simple user interfaces, and the HDR-1010S continues with this trend. The box is shiny plastic, sturdy enough for its sedentary duties, and available in black or white depending on your preference. The black version is known as the HDR-1000S.

Connections are standard fare for a set-top box, with HDMI, SCART, Composite, ethernet, USB, and two inputs for the cable feed from a satellite dish. Setup only took a few minutes and once the unit powered on, we were presented with the new Freetime interface.

The program guide is actually rather splendid, with an elegant green and grey colour scheme to differentiate between what's on now, and what coming up. As you'd expect from a modern PVR, you can pause and rewind live broadcasts. And recording an entire series entails a couple of button presses.



The interface also lets you move backwards through the guide to see what was on earlier. If the programmes are included in any online catch-up services that Freesat offers – namely BBC iPlayer and ITV player – then you can stream them from here. First, though, you'll need to connect the box to your router via an ethernet cable, or use the built-in Wi-Fi capability. The latter worked fine, but we'd always recommend the direct connection if at all possible.

Picture quality is very good, and as this is an HD-capable box you can also access the few channels that broadcast in this format. The connected box can also play content from DNLA servers on your home network.

The menu is reasonably fast in operation, although not quite as slick as Sky+. One element that does hold the system back is the horrible remote control. It looks

fine, but emits a loud clicking sound in use, which we found quite unpleasant. Humax told us that you can use a universal remote if it has corresponding keys.

We only noticed a couple of pauses while buffering streamed programs (usually longer HD episodes) and recording was on the whole trouble free.

A 1TB internal drive means that it will be some time before you'll run out of space. Actual recording time depends on type of broadcast but Humax lists 500 hours of standard-definition or half that for HD.

**Verdict**

Annoying controller aside, the HDR-1010S is a solid and highly usable Freesat box. The new onscreen UI is a marked improvement on some of the past offerings and having catch-up TV built in is a handy addition. **✉ Martyn Casserly**

**£169** inc VAT**Contact**■ [citizenwatch.com/en-uk](http://citizenwatch.com/en-uk)**Read more**■ [tinyurl.com/mag4tfo](http://tinyurl.com/mag4tfo)**Specification**

Smartwatch, compatible with iPhone 4S and iPhone 5, Bluetooth 4.0, solar powered, world time, dual time, water resistant to 100m, 5-year warranty

Build: ★★★★★★

Features: ★★★★★★

Performance: ★★★★★★

Value: ★★★★★★

**SMART WATCH****Citizen Eco-Drive Proximity**

Citizen is well-known for its stylish timepieces and has clearly decided that what people want is not a smartphone shrunk to wrist size, but a traditional watch that's 'smart'.

Enter the Eco-Drive Proximity, a hefty black beast of a watch with built-in Bluetooth. It can alert you to an incoming phone call or email, an upcoming calendar appointment, and it can sync the time and date with your iPhone.

Because it's a traditional analogue watch, there's no display to tell you who's calling or the subject of an email. Instead, it vibrates and the second hand points at the MAIL or CALL labels so you know what's happening. You dismiss the second hand so it can return to its usual day job by holding the upper or lower button for a couple of seconds.

If the smart features seem basic to you, we'd have to agree. And although you'll know the instant someone is calling you, the minimum polling interval for emails is five minutes, so you'll probably hear

or feel your phone well before the Proximity alerts you.

Another issue is that, because it requires Bluetooth 4.0, it only works with the iPhone 4s or later. Android users are currently out of luck.

Pairing the watch with an iPhone requires the free Citizen Proximity app, which is really just a few toggle switches. Once you've established a connection, it can last for up to six hours, after which it disconnects.

We found the connection wasn't that reliable and it wasn't always simple to reconnect. In theory, you need only press the top button, but more often than not this didn't work.

The app doesn't talk to the built-in iOS Mail app, so you have to enter the details for all your email accounts for which you want alerts. You can enable or disable individual accounts, and choose whether you want alerts for phone calls and meetings. Oddly, there's no alert for text messages, and since there's no label on the dial, we doubt Citizen will (or can) add this feature later.



In terms of construction, the Proximity has a stainless steel body and a leather strap with a nylon backing. There's a choice of two colours, either black and green (above), or black, blue and silver.

**Verdict**

The Eco-Drive Proximity feels like a first-generation product. It will be interesting to see if Citizen can take this kind of smart watch and turn it into something useful, but our eyes are still watching to see what Apple can conjure up. **✉ Jim Martin**

**£80 inc VAT****Contact**■ [tp-link.com](http://tp-link.com)**Read more**■ [tinyurl.com/muxcbnm](http://tinyurl.com/muxcbnm)**Specification**

Dual-band 11n wireless router; 802.11a/b/g/n; 3x3:3 MIMO wireless; 3x external 5dB antennas; 2.4GHz and 5GHz concurrent operation; 4x gigabit ethernet; 1x WAN port; 1x USB 2.0; UPnP; DLNA; IPv6; push-button WPS; WPA2; 243x161x33mm

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

★★★★★☆☆

**WIRELESS ROUTER****TP-Link TL-WDR4900**

The TL-WDR4900 is one of TP-Link's top-end routers. The three large external antennae demonstrate the company's commitment to performance, which is further borne out inside, where there's an 800MHz processor for faster data processing. It even has a hardware NAT chip for offloading the task of translating network addresses from the CPU.

There are four gigabit network ports on the rear of the unit, as well as a WAN socket and two USB ports for hard drives and printers.

Instead of offering an open Wi-Fi network straight out of the box, you plug into the router using an ethernet cable to start the process. There's a quick setup option to get you online and configure the 2.4GHz and 5GHz wireless networks.

The TP-Link router menu itself is also clearly laid out, with all the options you expect displayed down the left-hand side of the screen.

The USB 2.0 ports on the rear of the router allow the connection of NTFS (Windows-formatted)

drives. We tested HFS+ drives (Mac-formatted), but they were not detected.

Once you connect a drive, you can set up a number of different ways to access it. First, the router supports DLNA and lets you use the drive as a media server, sending streaming video to any DLNA-compatible device on the network.

You can also create an FTP server to access your data remotely and transfer files to the hard drive across the internet. The FTP server displays its IP address and port on the main setup screen, so you don't need to hunt for the information.

To test the router's speed, we placed a 3x3 MIMO-equipped laptop at varying distances, and benchmarked the throughput on both 2.4GHz and 5GHz bands.


At 1m the 2.4GHz result was 135Mb/s; we measured 125Mb/s at 5GHz. This was a surprising result, but repeated checking confirmed



that even at close range using the often-faster 5GHz radio band, the router couldn't deliver the 150Mb/s-plus level we would expect.

At 7m, the 2.4GHz channel achieved 95Mb/s and the 5GHz 127Mb/s. Things got interesting at 10m, with a major obstruction in the signal path. The 5GHz band averaged 111Mb/s, while 2.4GHz averaged 66Mb/s. Most routers struggle to hit 50Mb/s.

**Verdict**

Overall, the TL-WDR4900 is a decent offering from TP-Link: it offers some useful speeds and an excellent feature set.  **John Taylor**

**£124 inc VAT****Contact**■ [devolo.co.uk](http://devolo.co.uk)**Read more**■ [tinyurl.com/kc2r6j2](http://tinyurl.com/kc2r6j2)**Specification**

Powerline and 11n wireless adaptor; HomePlug AV standard; dual-band 2.4GHz/5GHz; 802.11b/g/n; WPA2; WPS, dLAN AES; pass-through mains power socket; 3x LAN ports (client), 1x LAN port (host)

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

★★★★★☆☆

**POWERLINE AND WI-FI EXTENDER****Devolo DLAN 500AV**

The DLAN 500AV is part of a growing segment of the home networking market: the powerline adaptor. These let you use the wiring in your house as a data pathway instead of laying down ethernet cable around your house.

The kit consists of two adaptors. One plugs into an electrical socket near your router, then connects using the single ethernet connector. The second unit is plugged into a mains point elsewhere in the house, letting you connect to your network by either ethernet or Wi-Fi.

We tested this unit in a block of flats that were built in the 1960s with wiring of undetermined age. This is important, as it is in part the wiring that will determine the speed of your connection. These tests were ethernet only (no Wi-Fi) with the master unit plugged into the router and the client plugged into a laptop via ethernet cable.

From our results we've drawn two conclusions: first, that the claimed data rate of 500Mb/s is unlikely

to be achieved between rooms if it cannot be achieved even across the same power block. Secondly, that the data rate you get may be determined by the quality and the path of the mains power wiring in your house.

The Devolo unit also provides Wi-Fi on both the 2.4GHz and 5GHz bands. We tested the Wi-Fi at 1m, 5m and 10m with several concrete wall occlusions.

On the 2.4GHz band, the speeds were as follows: 93Mb/s at 1m, 59Mb/s at 5m and 18Mb/s at 10m, the latter arrangement including reflective obstructions. These are respectable speeds compared with other modern routers we have tested using the same setup.


On 5GHz the results were 95Mb/s at 1m, 95Mb/s at 5m and 15Mb/s at 10m, with occlusions. Here the maximum data rate at 1m was very surprising - at 1m a 5GHz signal should have a higher data rate.



However, this was confirmed to be a 5GHz signal in the settings, while the Wi-Fi indicator light backed this up by turning blue (green is for 2.4GHz).

The lack of any drop in data rate at 5m was a good result but, as expected, the 5GHz signal did not fare well with walls.

**Verdict**

The Devolo powerline/wireless unit is simple to set up - over ethernet or 2.4GHz Wi-Fi the unit is literally plug and play. The best-case speeds reached over powerline were far from the claimed 500Mb/s, but this is something that seems to pervade powerline adaptors as much as Wi-Fi underperformance.  **John Taylor**



£29 inc VAT

Contact

■ [edifier-international.com](http://edifier-international.com)

Read more

■ [tinyurl.com/m4j5mnp](http://tinyurl.com/m4j5mnp)

Specification

Portable stereo speaker; 4x 32mm drivers, 1x 30x90mm passive radiator; 1.5W/channel Class D amplifier (10% THD); Frequency response: 270Hz-17kHz ±5dB frequency response; 1x USB 2.0, 1x 3.5mm line-in jack; rechargeable 3Wh lithium-ion battery; 261x36x44mm; 370g

PC ADVISOR

RECOMMENDED

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



PORTABLE SPEAKER

## Edifier Sound To Go Plus

If your laptop suffers from poor sound from its built-in speakers, then you may want to consider Edifier's Sound To Go Plus.

It's a portable speaker for expanding the sound of your smartphone or similar mobile device, but it's primarily designed for use with laptops - think of it as a soundbar for your portable computer. Instead of a wireless connection it uses digital audio over USB, so you just plug the Edifier into your computer and away you go.

Turning the speaker on is easy - just hold down the volume buttons at each end for a couple seconds. This cleverly helps prevent the speaker being accidentally switched on when travelling. A pouch is also included to keep it safe when you carry it around with you.

When plugged into a laptop, the USB connection charges a built-in lithium-ion battery, which provides up to 10 hours of playback. You can adjust the volume using the buttons on the speaker or with your laptop.

As well as connecting to a laptop, the Sound To Go Plus has a 3.5mm input jack and matching cable in the box, so you can hook up a range of devices such as smartphones, tablets and MP3 players.

We like the sleek-and-stylish aluminium design of the speaker, which will suit most laptops. Build quality is best described as solid, and two small rubber feet stop the unit slipping or moving around.

The Sound To Go Plus is small, but may well overlap some of the keys on your laptop as it did on our 13in notebook during testing. It also blocked a small portion of the screen when we were watching a film. At a desk you simply look over the top of it, but the keyboard overlap the bigger issue.

The big question, though, is does it improve the sound of a typical laptop? In short, yes.

The speaker will almost certainly give you a volume boost. It has four small 1.25in drivers - two for

each stereo channel, supported by a 30x90mm passive bass radiator. It's specified with 1.5W of Class D power per channel and usefully the speakers face you.

Whether you're watching a TV show on BBC iPlayer or streaming your favourite music on Spotify, the Sound To Go Plus offers good clarity across a reasonable range. It's far from rich and weighty in quality, but clear enough at lower volumes. Cranking the volume up introduces a lot of distortion, though, so don't expect to fill a room with sound.

### Verdict

There's little to dislike about the Edifier Sound To Go Plus at the price. It's a cheap and effective way of improving the sound from your laptop. Sleek and well finished, it can also be used on the go with a range of devices using its built-in battery. **Chris Martin**



£399 inc VAT

Contact

■ [denon.co.uk](http://denon.co.uk)

Read more

■ [tinyurl.com/kd2p5ym](http://tinyurl.com/kd2p5ym)

Specification

4x 25W Class D amplifiers; 2x 100mm bass-mid, 2x 40mm HF drivers; MP3, AAC, WMA, WAV, FLAC playback; Apple AirPlay; iOS and Android apps; 10/100 ethernet; 802.11n Wi-Fi; retractable 30-pin iPod dock; OLED scrolling display; touch-sensitive buttons for volume, source, skip forward; IR remote control; 451x236x170mm; 5.4kg

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



MUSIC CENTRE

## Denon Cocoon Home D500

This white bean is a high-tech music system that plays internet radio, as well as music from your media server or a docked iPhone.

A black OLED panel slides out when pressed to reveal a platform with a 30-pin dock connector for Apple iDevices up to the iPhone 4s and iPad 3. Models after that will need a 30-pin to Lightning adaptor.

The Denon Cocoon can be networked through ethernet at the or 11n Wi-Fi. With a docked iPhone, it can even learn your wireless network password, saving you the pain of trying to input it.

The simple white plastic remote control has compass-rose buttons, a source button and an on/off is a step in the direction of simplicity.

Most of its features can be controlled with a free iPhone app. Its wallpaper mimics the Cocoon's textile front skin, adding two rows of rounded buttons across the bottom. These give access to Music Player (your iPhone, docked or wireless), Music Server (UPnP NAS drives),

Aux (jack in the back), and USB (thumbdrive in the back again).

A second row of buttons gives you internet radio, and you can save your favourite three stations right from the app's main screen.

A sweeping curve across the screen is a volume slider. A lag here means you're likely to overshoot until you get used to this.

Touch-sensitive volume buttons on the unit's top are slow, and leaving any standby or off button from the front is a pain, too.

The Cocoon worked most of the time, but was unable to play Apple Lossless or any digital music above 48kHz sample rate. It could play 24-bit/44.1kHz, though.

Powered by four 25W Class D amps, the device has plenty of headroom to control stereo speakers, built around 40mm tweeters and 100mm mid-bass drivers. Bass was tubby, plumped up in the upper bass to give it a warmer ghetto-blast kind of impact, especially with the volume up.



With rock and pop we got the drive and low oomph to fill the room. The downside was an indistinct thump from which we couldn't discern pitch. On the plus side, the switching 'digital' amps had good control and reserves to pump loud with that pitch-free pulse. Singing voices were carried cleanly, and dialogue was easy to follow.

As you turn up the wick a fuzzy grain through the desert-dry treble became all too evident. The highest notes sounded cut off, energy focused into a metallic jangle that made music stilted and mechanical.

### Verdict

The Cocoon Home D500 can play music from a variety of sources, though, the sound quality is a letdown. **Andrew Harrison**



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# 5 of the best apps for students

Chris Martin compiles five mobile apps that could help to improve your productivity

**Y**ou've probably got a smartphone or a tablet, maybe even both, but have you unleashed its potential as a workhorse? It might be tempting to crack out a smartphone or a tablet in class to play a bit of Plants vs Zombies 2 (see review overleaf), but why not utilise your gadgets to avoid confiscation and give those grades a boost? We've rounded up five of the best mobile apps for making your school- or university life easier and more productive.



## Evernote

Free

**Available on:** Android, iOS, Windows Phone, BlackBerry, WebOS  
Evernote is the ultimate note-taking app, with apps for every device and extensions for every browser letting you synchronise your to-do lists and notes. Evernote lets you digitise and search the notes you jotted down on paper. On an iPhone, Windows or Android phone you can even use the device's camera to snap a picture of a handwritten note. Any text visible within the image becomes instantly searchable.



## Dragon Remote Microphone

Free

**Available on:** Android, iOS  
A companion app to the Mac- and PC desktop software, Dragon Remote Microphone is a speech-to-text tool that lets you dictate rather than type in your notes and research. You might, for example, want to record what's discussed in a lecture, enabling you to concentrate on listening and understanding the topic rather than frantically jotting down notes. Whether



you're in the pub or on the bus when inspiration for a project hits you, Dragon on your phone or tablet will enable you to quickly and easily make notes for later.



## Quickoffice

Free

**Available on:** Android  
Quickoffice is an Android user's best friend when they need to create, view or edit documents on the move. Owned by Google, the app is free to everyone. Quickoffice can handle Word, Excel and PowerPoint documents (97 to 2010 formats), and includes support for PDF files. There's integration with Google Drive for up to 15GB of cloud storage, plus support for Dropbox, Evernote, SugarSync and more.



## Kindle

Free

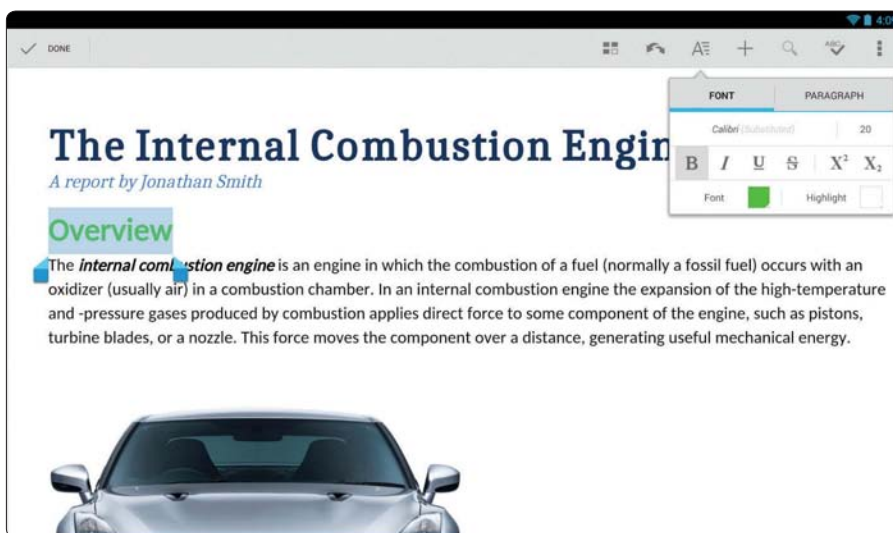
**Available on:** Android, iOS, Windows Phone, BlackBerry  
Studying normally involves lugging around lots of big and heavy textbooks; we prefer the digital alternative from Amazon. You don't need to own a Kindle e-reader to use the Kindle app - it's free on Android, iOS, Windows and BlackBerry. The Kindle app lets you take all your textbooks wherever you go, so you'll never find yourself in a class without the necessary tools. Bookmarks, a dictionary and text highlighting are further advantages over the traditional hard copies, while you might even find your books are cheaper to buy in their digital form.



## Dropbox

Free

**Available on:** Android, iOS, BlackBerry  
You've probably been told again and again to back up your work and, unless you want to spend your weekends re-doing all the projects you've already completed, you really should take that advice. Dropbox is one of the best cloud storage apps for saving a copy of your documents, music and media that you can access wherever you are. It not only synchronises your files across devices, but allows you to easily share that content. Dropbox offers 2GB of storage for free; you can earn more through referrals or pay for extra space. See page 103 for advice on how to share files over Dropbox without signing up.



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## AUGMENTED REALITY APP

## Blippar

Free

## Contact

■ blippar.com

## Read more

■ tinyurl.com/qbmexmp

## System requirements

iOS 4.3 or later, 8.3MB storage; Android 2.3 or later, 8MB storage; BlackBerry 10 or later, 4MB storage

Blippar goes much further than your average QR code reader. It utilises your smartphone or tablet's camera to turn everyday objects into an interactive augmented-reality experience.

When you first load Blippar it tells you to find something to blip, with no indication as to what is blippable. The app then uses your camera to scan whatever is in front of it. If that item is recognised the app brings it to life.

What happens next depends entirely on the product. We scanned a bottle of Diet Coke and a pair of headphones appeared onscreen, the bottle turned into a Coke can-inspired music player, our smartphone began spouting out The Honeyrunners' 'My Garage (Bang Bang Bang)', and we were offered a link to enter Coke Zone.

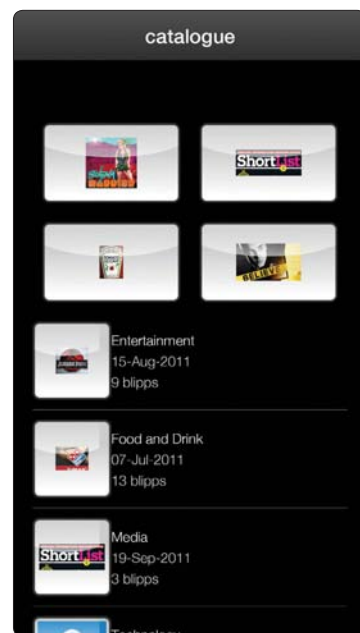
We also tried Blipping the front cover of the film *Oblivion*. This triggered an animated augmented-reality experience in which we could access bonus content, preview the



film, view stills and download the Drone Defender Oblivion game.

Other products might simply load your browser and take you to the manufacturer's website, though.

You can use the built-in catalogue to get suggestions of products to blip, for example Dominos Pizza, Fruit Pastilles, Walkers crisps, Heinz



Tomato Ketchup, the Metro or Shortlist, but very few entries were listed at press time.

## Verdict

Blippar offers a fun new way to utilise your phone or tablet's camera, but more Blippable content is required. **✗ Chris Martin**



## ENTERTAINMENT APP

## Bloom.fm

Free

## Contact

■ bloom.fm

## Read more

■ tinyurl.com/L2qo5ph

## System requirements

iOS 4.3 or later, 4.9MB storage; Android 2.3 or later, 1.3MB storage

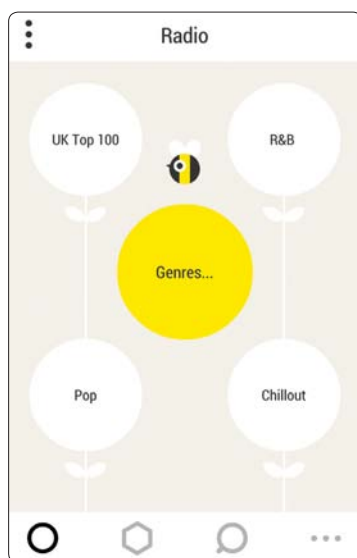
If you want to stream music to your phone or tablet, but don't want to pay through the nose for Spotify Premium, Bloom.fm is a cheaper alternative.

The app itself is free to download; you can then choose to use the free version of Bloom.fm or one of three subscription packages.

In its basic form, Bloom.fm is a free (ad-supported) radio-style streaming app. You select a 'station' based on the top 100, a genre or an artist, and the app devises a playlist from its 22 million-song catalogue. You can skip any you don't like.

The first subscription option is Bloom 20, which lets you 'borrow' (download) or stream over Wi-Fi up to 20 songs for £1 per month. Bloom 200 ups this limit to 200 for £5 per month. The final option, Full Bloom, adds 3G streaming functionality and unlimited tracks for £10 per month.

All three approaches are attractive, but it's the £1-per-month option that really appeals. Twenty tracks might not sound like a lot, but



it's easy to chop and change which tracks you have downloaded before you head out of the house or office.

A beautiful interface combines an eye-catching nature-themed design with great animations, although certain elements look childish. With no tutorial we found navigation difficult at first, but very quickly found our way around the app.

You can search for the music you want to listen to; the app's



innovative petal layout also provides a visual way of finding new artists and bands.

## Verdict

Bloom.fm is a refreshing new player in the music-streaming market. It has a large catalogue of tracks and is very well put together. At just £1 per month to 'borrow' up to 20 tracks, the service is simply a bargain. **✗ Chris Martin**



## GAME

## Plants vs Zombies 2

Free

## Contact

■ popcap.com

## Read more

■ tinyurl.com/n87d46b

## System requirements

iOS 5.1 or later;

44.7MB storage

PC ADVISOR  
RECOMMENDED

A man wearing a steel-pot hat tells you he wants to enjoy the taco he just ate again, so he's going back in time with the help of his talking campervan. That is in essence the plot of Plants vs Zombies 2, the long-awaited sequel to the beloved tower-defence game that pits vegetation against the undead.

This time your adventures in gardening take you to Ancient Egypt, 17th-century pirate-infested waters, and eventually the Old West – plus a mystery world. Despite a freemium model that nearly spoils the crop, Plants vs Zombies 2 is a blue-ribbon title with a charm and humour beyond garden-variety.

Plants vs Zombies 2 eschews the linear formula of the first game for a more classic board-game format. While you'll still deploy little planted peapods and sunflowers to confront rows of bumbling zombies, the levels now exist in a larger world and beating a stage unlocks another along the path. There are forks in the road that let you decide how you'd like to proceed, and even keys to find that open up new areas. Ultimately, your goal is to work your way to a star gate, which takes you to the next world.

Instead of simply defeating several sequences of increasingly complex and uniquely powered zombies, the main campaign has some welcome variety in last-stand challenges, maps with specific restrictions, and new world-specific enemies. You'll slay tombstone-raising zombies in Egypt, and later confront undead sea captains with their nefarious parrots and rope-swinging brethren. While the pacing suffers into lulls at times, the overall



experience is more varied and full than the original, thanks in large part to the scale: now you're no longer just a homeowner, you're a time-travelling adventurer.

**Weapons of mass destruction**

To respond to these threats and challenges, your botanical arsenal has been augmented with bloomerangs, coconut cannons, iceberg lettuces and adorable 'spring' beans, among others. The character design is as charming as ever, with the plant almanac full of chuckle-inducing introductions and adorable biographies. The art is also much improved over the first title, with superior animations, worlds and environmental effects.

Your green thumb also gets a huge upgrade: now you can also feed your plants special plant food that will give them temporary boosts. Sunflowers spit out a huge amount of sun, while peashooters suddenly become gatling-gun-like repeaters that level everything in their path. Experimenting with the different upgrades and unleashing them in timely fashion is one of the best new elements.

There are also god-like powers that you can now utilise. Whereas before you were merely a homeowner with an undead problem, time travel somehow gave you the ability to flick off screen zombies, pinch their heads or strike them dead with lightning. While relatively easy to deploy via the touchscreen, they make any mission a near-walk due to their sheer power. Thankfully, they're somewhat expensive to purchase using the in-game currency, but if you're


willing to throw down real money you'll find the game much easier.

This ability to pay money to make the game easier is a common trope of modern iOS games, but with Plants vs Zombies, a franchise that prides itself on strategy and clever thinking, such free passes seem blasphemous. The game can be completed without paying, but seems to punish you in every way if you choose not to shell out.

If you're playing without paying, you'll see many of your favourite plants locked away behind paywalls (£2 for squash!?), you'll have to trudge through levels again and again to mine for stars (which are used to open star gates), and you'll be handicapped in the use of your superpowers. The game is simply a much longer, thinner and monotonous experience if you decide to keep closed your wallet.

Meanwhile, if you throw down some money, you can use your god-like powers with impunity, have access to the full arsenal of plants, upgrades and unlock new worlds instantly. But it's not just a few quid – you could easily spend £20 on a handful of items. It just feels like needlessly milking a fanbase that is already falling over itself to buy your game.

**Verdict**

Despite our qualms with the freemium model, Plants vs Zombies 2 remains an exceptional, charming tower-defence title that expands on the original while taking you in new and exciting directions. So strap on your steel-pot helmet and grab some fertiliser: you've got some zombies to kill.  **Chris Holt**





BACKUP UTILITY

## EaseUs Todo Backup Home

£19 inc VAT

**Contact**

■ [todo-backup.com](http://todo-backup.com)

**Read more**

■ [tinyurl.com/qxcuet9](http://tinyurl.com/qxcuet9)

**System requirements**

Windows XP/Vista/7/8

Usability: ★★★★★☆

Features: ★★★★★☆

Value: ★★★★★☆



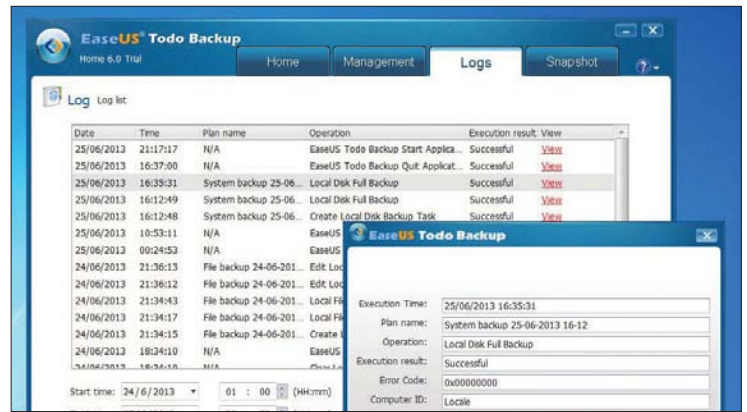
Backing up all your data is a must, and EaseUS Todo Backup Home aims to make it a fire-and-forget task. The interface is clearly set out and easy to follow, and does intelligent things such as offering likely local drives to which you might want to back up and calculating the size of a backup before you choose its destination.

The application supports full backup, where all files are copied every time, incremental backup, where only new and changed files are copied after the first full copy, and differential backup where files deleted from the source are removed from the backup.

It can also manage the number or size of backups on the destination drive. You can specify, for example, that backups are held for a given time or only a set number of copies are maintained. There's no way of allocating a specified amount of space for a backup set, though.

EaseUS Todo Backup Home can copy to a local drive in a Windows PC - hard drive or DVD - or an attached external drive, a network attached drive or to the cloud. It doesn't come with an online account of its own, but works with services such as Google Drive or Dropbox, and any others that provide FTP access.

Compression and encryption are provided, although there's little control other than none,



**EASEUS TODO BACKUP HOME** is a comprehensive backup program.

normal, medium or high settings for compression, and on or off - with a password - for encryption. There's also a built-in scheduler, which offers times in the day, settings for daily, weekly or monthly, and options to start at startup or at logon.

You can have multiple backups for different files, systems and emails all controlled from the same panel. Once set up, the backups run in the background, and although the resource hit isn't too noticeable, it's still best to schedule runs at times that won't interrupt normal work.

There's a good set of tools to round off the package, including clone, for when you're upgrading a hard drive, a secure wipe and a bootable disk creator.

A system backup of the 43.5GB of data on our test PC's 100GB startup partition took 22 minutes

37 seconds, creating a 25.9GB compressed file, using default settings. The software named the file as 'system backup' and added the date and time it completed.

The exact same system backup using Acronis True Image 2013, the market leader, took 19 minutes 57 seconds, and created a 21.3GB compressed file. So, while Acronis' product is faster and with tighter compression, EaseUs' application is quite a bit cheaper.

### Verdict

EaseUS Todo Backup Home is a pretty comprehensive backup tool that covers all the essentials for file and system backup. It doesn't include sync or mobile file access like Acronis True Image 2013, but for mainstream PC data security, it does the job. **Simon Williams**

PC MAINTENANCE

## Systweak Advanced System Optimizer 3

\$40 (£25)

**Contact**

■ [systweak.com](http://systweak.com)

**Read more**

■ [tinyurl.com/opmd75o](http://tinyurl.com/opmd75o)

**System requirements**

Windows XP/Vista/7/8

Usability: ★★★★★☆

Features: ★★★★★☆

Value: ★★★★★☆



There are a lot of applications that aim to keep a PC in trim, by assisting with housekeeping tasks, and often offering protection and backup, too. Systweak's Advanced System Optimizer 3 (ASO 3) has more parts to it than most and the main control panel offers eight areas of expertise.

Registry Optimizers optimises and cleans the Windows Registry. Disk Cleaner & Optimizers offers a System Cleaner and a startup optimiser, and Windows Optimizers handles driver updates and sets a PC up for game playing.

Security & Privacy covers protection against AV and malware, controls browser security, and provides file shredding and

encryption. A quick malware scan took under half a minute, but a deep scan was slow, taking over an hour.

Under Backup & Recovery, there's both file backup and, unusually, system backup, as well as an undeleter that can handle recovery from deleted partitions, as well as accidentally deleted files.

File backup is simple to set up, and you can compress the resulting file into one big 7zip archive.

Backup categories such as Documents or Pictures can be used, but you can also select individual files and folders. A simple scheduler is provided, enabling you to automate one or more backup jobs in a set-and-forget manner.

You can't schedule backups more frequently than once a day, though.

On top of all of these tools sits Smart PC Care, which runs most of the obvious protection scans automatically, to give a rundown of the state of a machine. This is the part you can run for free from Systweak's website.

The problem with the free scan/paid remedy model is that software providers try and play up the problems their software has found. For example, most regular PC users wouldn't consider a tracking cookie much of a threat, though, the less-informed might not know what they are and worry unnecessarily when they're flagged.

**PC ADVISOR**  
RECOMMENDED

## INTERNET SECURITY SUITE

## Panda Global Protection 2014

**£64** inc VAT (3 PCs)

## Contact

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

Read more

■ [tinyurl.com/osp6bn3](http://tinyurl.com/osp6bn3)

## System requirements

300MHz processor;  
Windows XP/Vista/7/8;  
1GB RAM; 275MB drive  
space; Internet Explorer  
6.0 or later

Panda Global Protection 2014 is the first of the new batch of 2014 Internet Security (IS) products we've seen. Its main new claim to fame is its multi-platform provision.

The company was one of the first to start using a cloud-based malware database as part of an IS scheme. The lighter footprint of its scan engine is claimed to hit system resources less than programs that are fully resident.

Panda has taken the Windows 8 look to heart and the main interface is a brightly coloured set of tiles. The top row displays status results from recent scans, the next row calls up key features like scans, reports and backups, but also mixes in services and multi-platform support. The bottom row shows the status of antivirus, firewall, ID protection, anti-spam and parental control. At the bottom are tiny icons for things such as password management along with a virtual keyboard.

The core functions are pretty much set and Panda has tried the same approach with backup, where a complete online copy to the third-party service Mozy is included, as long as it doesn't exceed 2GB. If you'd prefer a local backup, Panda offers drive C as the default location - an odd choice, given you should never back up to the drive you're trying to protect.

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★

**PANDA GLOBAL PROTECTION 2014** offers good malware protection.

We successfully installed the Android version of the software on a Samsung Galaxy Mini. The Mac version requires a minimum of an Intel Core 2 Duo processor and OS X 10.6 Snow Leopard. When the Mac version is installed, it automatically scans any iPod, iPad or iPhone connected to it, too.

Panda claims the suite "enhances the features that have made the solution one of the best security suites on the market", but this doesn't seem to include scan speed. The 2014 version of the suite took 41 minutes 52 seconds to examine 456,376 files from our 50GB basket, giving a scan rate of 181 files/s.


Last year, its 2013 equivalent took 39 minutes 49 seconds to examine 456,329 files, a scan rate of 191 files/s - slightly higher than the new product. When we repeated

the test on the 2014 product, it was a bit quicker but still tested exactly the same number of files.

We expected the software to fingerprint files, so it didn't retest those that were unchanged; the 2013 suite did this and tested 273,770 in 23 minutes 42 seconds. It's a shame the new version doesn't reduce its overhead this way.

When we copied 2GB of files, with a scan running, the copy time increased from 43 to 53 seconds, just 23 percent. This is good hit and well above average for the suites we've tested.

**Verdict**

Panda Global Protection 2014 is easy to set up and use, and offers good coverage of the key malware threats, using cloud support for database and backup.  **Simon Williams**



**ADVANCED SYSTEM OPTIMIZER 3** will help you with your housekeeping tasks


ASO 3 does flag tracking cookies, but doesn't make a big deal of them, just removing them if you tell it. It spots a lot of other things, though, such as adware and spyware, which are worth knowing about, and in our tests was above average in deleting or quarantining what it spotted.

We ran the suite's anti-virus scan on the same 50GB of files we use when evaluating purpose-made Internet Security suites, and it took two minutes two seconds to scan 8761 files, giving a scan rate of 71.8 files/s. A repeat scan looked at the same number of files in the same time, so there's no noticeable fingerprinting of files. The number of files scanned is at the lower end of those suites we've tested, but very similar to dedicated applications from companies such as McAfee, Sophos and ZoneAlarm.

Running a scan while copying a 1GB file took 55 seconds; with no scan the same copy took 41 seconds,

so only a 34 percent increase, which shows a light resource load. In use, ASO 3 is straightforward in layout, with well-structured menus and pop-up dialogs offering three or four options.

**Verdict**

Systweak Advanced System Optimizer 3 is one of the best jack-of-all-trades PC fixers we've come across. Though a dedicated anti-virus suite might be more thorough for internet security and a backup suite might be more flexible, the application covers all the bases in at least moderate depth and isn't full of lightweight make-weights.  **Simon Williams**



## MOBILE OPERATING SYSTEM

# Apple iOS 7

Free

### Contact

■ [apple.com/uk](http://apple.com/uk)

### Read more

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

### System requirements

iPhone 4 or later, iPad 2 or later, iPad mini, 5th generation iPod touch

**PC ADVISOR**  
RECOMMENDED

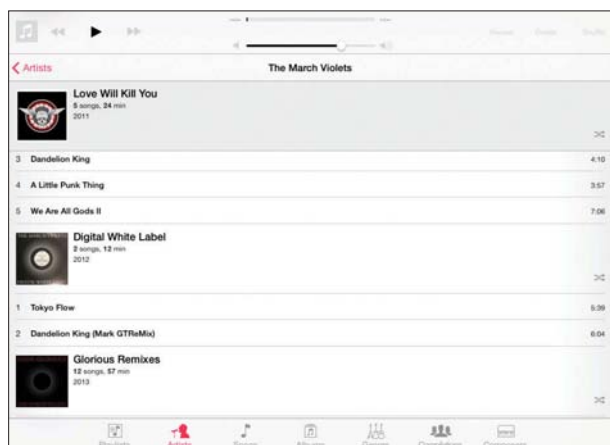
Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★



You can now browse through your music library by **SCROLLING THROUGH** album art



The seventh version of Apple's mobile operating system heralds the biggest change to the visual style of its mobile interface since the original iPhone was demonstrated in 2007. For the first time, the new look is the brainchild of Jonathan Ive, the man behind the hardware design of Apple's products since the original Bondi Blue iMac.

A thinner system font, Helvetica Neue, is used throughout the system. Borders around many apps are plain white with simple black text, with a colour tint used to indicate buttons and interactive elements. Apps such as Game Center and Notepad, which previously used graphical replicas of real-world objects to convey their function, such as yellow notepaper and green table felt, have been scaled back to provide visual information relevant only to the task they perform.

This new look definitely grows on you over time. Behind the simple appearance are subtle and complex ideas. The redesigned Notification Center has a translucent background, allowing the wallpaper and icons to show through, enhancing the sense that each UI element is a physical object lying atop whatever's underneath.

The new Control Centre, accessed by swiping from the bottom of the screen upwards, is similarly see-through, as is the Search bar, which now appears when you swipe down on any empty area of the wallpaper. Control Center provides easy access to commonly adjusted settings such as Flight Mode, Wi-Fi, Bluetooth and Flashlight toggles, something users have been requesting.



The icons in Apple latest iOS have been given a **BRIGHT NEW LOOK**

The transparent effect is striking, and Apple's new set of wallpapers has been carefully chosen to highlight it. Choose a wallpaper with a range of sharp blues, for example, and user interface elements such as the new translucent dock glow with a frosty appearance, almost as through a pane of glass. Change to a purple background and the UI looks totally different.

Another small touch Apple has added to the wallpapers is a parallax effect, where you can tilt your device to slightly roll the image behind the icons, giving the subtle impression they are physical objects on a different plane from the background.

Compared with the radical overhaul made to the appearance of iOS 7, Apple has been more reserved when it comes to adding or removing features from the software. It's a fair assumption that if a certain function was present in iOS 6, you'll find it in iOS 7.

The Music app lets you browse your music via a scrolling list of cover art, with a tap zooming on to the album, displaying a tracklist. The voice recorder, which previously showed a redundant picture of a real microphone, now displays a simple spectral analyser and a list of recordings, along with a big red button to start capturing audio.

The Camera has received perhaps the most attention, and is all the better for it. You can quickly swipe through photography modes: normal, square, panoramic and video, with a set of Instagram-like filters to apply, such as chrome or

sepia. The iPhone 4 doesn't get all these features, though.

You can now open as many tabs as you like in Safari, which has a smaller border around web pages to display more information on the screen. When browsing through your history, you can swipe through screenshots of each page, presented as a 3D roll of pages.

Calendar is perhaps the best example of how iOS 7 uses colour to draw the user's attention to relevant information. The current date is highlighted with a big red circle, instantly drawing your eye to it, with the same shade of red used to highlight other interactive elements.

Apple's much-criticised Maps app is still present, as expected, but with a few small additions. There's a scale indicator in the corner, and bookmarks are now saved in iCloud and shared across devices, a handy addition that we think should have been there in the first place.

Two years after it launched, Siri is no longer in beta. The interface is slightly changed, but the big addition is a wider range of search abilities. Ask it to search Wikipedia, and it comes up with the article without going into Safari and loading the page.

Search the web (amusingly now with Bing, a further severing of Apple's ties to Google) and you get all sorts of relevant information directly in the app. This is a far better approach that makes Siri more useful in itself, rather than as a voice-controlled launchpad to other parts of the system.

The Newsstand app now runs full-screen, with a gorgeous shaded background that shows your wallpaper through it, rather than expanding like a folder as in iOS 6.

We were concerned about the use of cellular data, but Apple includes a handy view of data use by app, so you can find and close those apps that consume the most data.

Multitasking, to simply switch between already open apps, now works as it does on Android or HP's WebOS software. There's a snapshot

of each running app displayed above the icon. Swiping up closes the app.

A small addition is the inclusion of a new set of ringtones. The old ones are still there in a 'classics' folder. There's also dynamic backgrounds, with bubbles that slowly move across the screen if you move the device.

iOS 7 mostly runs well on all the iPads and is fine on the 4s and above, but on the iPhone 4 we found it a slower experience than iOS 6. We'd recommend iPhone 4 owners

against upgrading until they've seen it running on another device.

Battery life on the devices we tested hasn't been as spectacular, sometimes running low after less than a day's light use.

### Verdict

We like iOS 7's redesigned user interface, and there are some useful new features. However, some users have reported speed and battery life problems on older devices.

✉ **Orestis Bastounis**

## DIGITAL PAINTING SOFTWARE

### Corel Painter X3

**£316** inc VAT

#### Contact

■ [corel.com/uk](http://corel.com/uk)

Read more

■ [tinyurl.com/n65quvv](http://tinyurl.com/n65quvv)

#### System requirements

Windows 7/8; Mac OS X 10.7 or 10.8; Intel Pentium 4, AMD Athlon 64 or AMD Opteron; 2GB RAM; 450MB drive space; 1280x800 screen resolution; DVD drive; Microsoft .NET Framework 4.5 and Internet Explorer 8 or higher

As long-term users know, Painter can't be beaten for its tools, which mimic traditional materials in an exceptional manner. It's in a separate league from Photoshop's painting tools, which are great for photo-retouching but less so for digital painting - as they lack the depth and realism of Corel's tools. If you've not used Painter and you want to know whether you should upgrade from Photoshop, the answer's a simple yes - so for the purpose of this review we're going to look at whether X3 is a must-have upgrade from previous versions.

At first glance, X3's interface isn't a big change from Painter 12 - but there are a few significant additions to the toolset that will tempt you to upgrade.

The best thing that has been brought in are the contextual brush controls. A button on the main toolbar brings up a palette called Advanced Brush Controls, which groups together the options available for the current brush.

Painter has so many controls for every single tool, and all those palettes can be pretty confusing - especially as, depending on the tool, only a handful of those options may be relevant to the brush you're using. Grouping the available options together and highlighting the panels is a great help.

The Brush Search feature is something we're less impressed with. Yes, it's nice to be able to put in a search term if you're looking for something specific and maybe this may help you choose something other than the tool you were looking for in an aid for experimentation.



The Mixer panel's **EYEDROPPER TOOL** is selected by default in Painter X3

However, for anyone who works with Painter on a day-to-day basis, we all know custom palettes are great for keeping track of your favourite tools.

That said, though, the implementation of the search is well done, and the dab and stroke preview you get rolling over search items is very handy.

The inclusion of the Reference Image palette is something that seems to have taken Corel an age to catch on to. This is one of our favourite aspects of ArtRage - having reference images around your work area and being able to quickly take sample colours helps a hell of a lot.

It's a shame that with its inclusion into Painter, Corel only saw fit to allow you one reference image. You can comp together a moodboard-style image and then use that as a reference image, but hopefully a future upgrade will step this feature up a bit.

Inspirational Mixers are a useful addition to the Mixer palette. You can select from a series of colour mixers produced by various artists and you can create and import your

own. You can still use the palette like a traditional mixing palette, but being able to bring in an image in a variety of formats is a great idea. We can really see these mixer palettes being shared out amongst the Painter community.

Another small tweak to the Mixer palette is that the eyedropper tool is now selected by default. We've always found it irritating to have to select the eyedropper first, before we start painting.

There are other improvements, too, including universal jitter options and perspective guides and the ability to snap the stroke to those guides. There's also the inclusion of multitouch support for Wacom tablets, improvements in brush sharing, multiple layer transformation, better Photoshop file support and being able to utilise more memory for Macs.

### Verdict

If you're looking to upgrade from a previous version, there are some pretty enticing improvements to Corel Painter X3 that may well be worth it. ✉ **Alec Meer**

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★





GAME

# Grand Theft Auto V

£34 inc VAT

Contact

■ [rockstargames.com/V](http://rockstargames.com/V)

Read more

■ [tinyurl.com/mwqqr14](http://tinyurl.com/mwqqr14)

System requirements

PlayStation 3  
or Xbox 360

PC ADVISOR

RECOMMENDED



GTA V isn't just great fun to play, it **LOOKS SPECTACULAR**, too



Grand Theft Auto V isn't particularly big on surprises. Sure, there's an innumerable collection of activities to pursue, secret references to find and madcap ways to kill or be killed, but this is in essence GTA being GTA on a greater scale than before.

It does this so well that surprises are entirely unnecessary: it makes itself better rather than different. That means cars, guns, gangsters and criminality in a fictionalised American city and its environs. Any over-familiarity is kept at bay by dramatic efforts to make almost every mission bigger and more cinematic than ever before.

It throws some curve balls into the micro-crime capers from its 70-odd core missions, that makes them each feel distinct. So you'll find yourself chasing a stolen yacht down a highway while your partner battles the thieves, or arranging a heist that entails switching between multiple characters.

The latter is the major step forward. No longer do you control just a single protagonist. Instead there's a triumvirate of criminals.

Each of these is based loosely on former 'hero' archetypes of GTA past - the smarmy ex-con of Vice City, the boy from the hood of San Andreas, the outright psychopath of GTAs 1 and 3 - only more fleshed out, especially the latter. For most of the game, you're able to switch between the three at will, when not already engaged on the mission.

Each has their own storyline, side quests and even frippery such as property purchases and haircuts, and on occasion all three meet up for a big, dramatic caper which has you repeatedly jumping between them. These moments are superb,



## New to Grand Theft Auto V is the ability to **SWITCH CHARACTERS**

offering multiple ways to contain a situation and saving harder missions from becoming shooting- or driving-based repetition.

It's a great way of both staving off boredom and mixing up the tone of the game. World-weary Tony Soprano-type Michael brings snark and big money antics to GTA V's satirised Californian setting, a far cry from the dusty poverty and gang culture of up and coming criminal Franklin. Switching between the two feels like moving to a different game, or leaping from glamorous Vice City to rundown San Andreas.

Then there's Trevor, a bitter, ex-military psychopath whose violence and debauchery goes far beyond the others. He's capable of being hilarious, and this extends to offering the game's most madcap missions and absurd cutscenes, but also its most chilling sadism.

There's also the nagging feeling that some of his activities are knowingly designed to attract the kind of mainstream controversy that first made GTA's name back in the 1990s, but which it hasn't seen too much of in recent years.

The game's overall humour suffers from a tired reliance on

back-of-the-class sniggering at cheap innuendo, simplistic references to pop culture and a stream of f-bombs. Decent gags are drowned out by the constant, lazy swearing, and characters and one-liners alike aren't given any room to breathe

by the game's total dependence on drunken football-fan profanity.

You can, of course, ignore this and just go in search of adventure, scenery and no-rules chaos in the biggest environment yet. It doesn't actually feel much bigger, partly because V is slicker at enabling rapid travel from pole to pole; and partly because half of it is basically a desert, but nonetheless it's a playground that once would have seemed impossible on 360/PS3.

The density of the detail is incredible - a circus of the ugly billboards and blocky architecture that characterises the real-life LA, fading out into dusty deserts filled with hick towns, dirt-track airports, enormous military bases and startlingly huge satellite dishes.

Even minigames that you might expect to feel bitty and gimmicky prove to be surprisingly fleshed out. There's a tennis game that could probably be a standalone title if it so wished, or the option to spend half an hour performing a remarkably engrossing triathlon, or full-length TV shows to watch.

'Gigantic' is the only appropriate summation, and there's no plane of reality in which you could argue that this game is not value for money. That it's all accomplished without many loading screens or noticeable stuttering on ageing consoles is almost unbelievable.

## Verdict

A technical marvel and a spectacular swansong for PS3 and 360, this is both the slickest and the most varied Grand Theft Auto yet, but sadly the reliance on hateful characters, ill-judged satire and lowest common denominator humour denies GTA V masterpiece status. **Alec Meer**

# Extreme Gaming PCs



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Intel i7 4770 (4 x 3.4 GHZ)  
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FREE - 12 Month Anti Virus  
FREE - Batman Arkham Origins Game



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#### Contact

■ [lenovo.com/uk/en](http://lenovo.com/uk/en)  
Read more  
■ [tinyurl.com/mxsrke9](http://tinyurl.com/mxsrke9)

#### Specification

2GHz Intel Core-i7-3667U (dual-core, 3.2GHz Turbo); Intel HD Graphics 4000; 11.6in (1920x1080, 190ppi) IPS touchscreen display; Windows 8; 256GB SSD; 8GB DDR3 1333 MHz RAM; gigabit ethernet via adaptor; mini-DisplayPort, VGA via adaptor; stereo speakers; built-in mic, 3.5mm line-in; 3.5mm headphone/line-out; 1x USB 2.0 (tablet), 2x USB 3.0 (tablet+keyboard); NFC; five-button trackpad; fingerprint scanner; 45W mains adaptor; 42Wh lithium-polymer, non-removable battery; 296x187x11.6-20.4mm; 835g (tablet), 1.6kg (tablet+keyboard)

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★☆☆☆



## HYBRID WINDOWS TABLET/LAPTOP

### Lenovo ThinkPad Helix

Lenovo describes the ThinkPad Helix as a "rip and flip" design, and calls it the "ultimate Windows 8 convertible". Prices start at a hefty £1,339, but we took a look at the middle-of-the-range £1,599 model so were expecting great things.

It's not the lightest tablet at 835g, but it's got the specifications of a high-end ultraportable laptop. If you include the docking station, the Helix weighs 1.6kg - reasonable for a laptop. For a hybrid, it's also rather thin at 20.4mm.

But this is no handheld tablet - one-handed anyway. Like Microsoft's Surface, it's too long and bulky, and will put large amounts of strain on the wrist. However, it works well as a desk- or lap-bound tablet. The keyboard is comfortable to use and the five-button trackpad is the best we've seen on a hybrid.

The design is a highlight and it can fold into different shapes like Lenovo's Yoga range. The difference is that, by pushing one button, it can be detached from the keyboard like Asus' Transformer range. It docks forward and backward enabling the different modes - laptop, tablet, stand and tablet+.

As is typical for Lenovo ThinkPad devices, the Helix is well built. It feels sturdy and ready for tough business trips.

Our mid-range sample was powered by a third-generation Ivy Bridge Intel Core i7-3667U processor with 8GB of memory. Aiding performance and providing storage space is a 256GB SSD. Our sample came with regular Windows 8, but the Pro version can be specified.

Benchmarks results from PCMark 7 were marginally higher than the Microsoft Surface Pro,



4811 compared to 4751 points. The Helix is no gaming tablet with a poor 10fps in our Stalker test at the native 1920x1080 resolution. Things weren't much better at a lower in our basic test at 1280x720 resolution, just 17fps.

Lenovo has equipped the Helix with an excellent 11.6in IPS screen protected by Gorilla Glass with a full-HD resolution, matching the Surface Pro. The touchscreen supports up to 10-point multitouch in Windows 8, and a digitiser pen can be used as another input option.

As well as some high-end core specifications, there's mobile technology including the usual Wi-Fi, Bluetooth, plus NFC and optional 4G LTE.

The Helix isn't so abundant when it comes to physical ports.

The tablet has one USB 2.0 port and a Mini DisplayPort. That complement is boosted by two USB 3.0 ports when docked. Lenovo also supplies ethernet and VGA adaptors in the box.

The Helix has a decent 2.1Mp front camera for those important video-conference calls; and if it's of any importance to you there's also a good 5Mp camera on the rear.

Like Asus' Transformer Pad tablets, the Helix has an additional battery inside the keyboard dock. Lenovo touts up to 10 hours battery life when the tablet is docked and six hours for it on its own.

This sounded pretty good to us, but testing both batteries together we managed to squeeze only six hours 30 minutes of video playback when streaming BBC iPlayer over Wi-Fi. Still, it's slightly better than other hybrids we've tested and you may get longer for spartan use such as web browsing and word processing.

### Verdict

The Lenovo ThinkPad Helix is a good effort at a hybrid tablet and laptop. However, it's extremely high price tag means that we'd have to recommend the Surface Pro as a better-value alternative - it's less than half the price. **Chris Martin**



**£66** ex VAT  
**£80** inc VAT

#### Contact

■ [canon.co.uk](http://canon.co.uk)  
Read more  
■ [tinyurl.com/on28thh](http://tinyurl.com/on28thh)

#### Specification

Multifunction inkjet printer; 128MB memory; 4800x1200dpi maximum resolution; 25ppm specified speed; 100-sheet maximum input capacity; 30 sheet ADF; USB 2.0 interface; Wi-Fi 802.11b/g/n; ethernet; 458x385x200mm; 8.7kg

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

#### ALL-IN-ONE INKJET

## Canon Pixma MX525

The Pixma MX525 is a compact and stylish multifunction printer with Canon's characteristically glossy black exterior and curved edges. As it's front loading, the MX525's 458x385x200mm dimensions will fit onto a sturdy shelf able to bear its modest 8.7kg weight.

You're offered the full set of print, copy, fax and scan modes, and the control panel is cleverly worked into the front slope of the lid. While it would have been ideal to see a touchscreen here, Canon still manages to keep the control buttons to a minimum around the 62mm colour display. This is partly achieved by incorporating a dual-function panel - for example, a numberpad lights up when you connect to a phone line for faxing.

Print capacity is predictably modest, with a 100-sheet feeder that drops down from behind the front panel and an additional 30-sheet ADF on top. The structure of the machine feels solid throughout and the economy of space is underlined

by the output tray positioning, directly above the input.

Duplex printing comes as standard and a USB port to the left of the input tray allows you to print with PictBridge and from flash thumb drives without a PC. When you do want to link up to a PC or network, you can choose between USB, 11n Wi-Fi and ethernet.

Android, Windows and Apple devices are also included, with access to Apple AirPrint and Google Cloud Print.

Print operation on the MX525 is relatively quiet, but print speeds are on the sluggish side. The fastest draft black-and-white documents only reached around 11ppm, with 3ppm for standard-quality duplex and 7ppm for standard single-colour colour documents. A4 colour prints and copies managed a more respectable one minute 50 seconds.

The MX525 uses only two ink cartridges and while draft black text documents are perfectly usable,




standard versions remain clear without being outstanding. Colour graphics are generally bright but suffer some banding issues.

Photo quality is above average with a decent amount of detail, but with a tendency towards darker tones than the original.

Fortunately, Canon has produced 600-page XL versions of the two cartridges. These work out at just 3.53p per page, whereas the supplied 180-page standard versions work out at a more hefty 8.32p for black and 11.6p for colour.

#### Verdict

The Pixma MX525 is a stylish, multifunction printer for anyone not looking for more than a good set of features and modest print quality and speed.  **Martyn Clayden**

#### FLATBED SCANNER

## Epson Perfection V370 Photo

Epson's Perfection V370 Photo is a fully-featured A4 scanner that comes with a transparency unit. It's fairly plain-looking, with rather blocky brushed black casing, and a functional four-button control panel.

Another surprising aspect of the design is the positioning of the hinge. Whereas most flatbeds have the hinge at the rear of the scanner, the Epson has its placed to the right, so the V370 opens to the side like a back-to-front book.

Visually then, the V370 isn't impressive. Luckily, it does get better from here: the hinge itself is quite versatile, and can extend to 180 degrees, allowing you to create space underneath the lid for large items. From this point of view, the side-mounted hinge is a solid choice for those needing to scan books and other sizeable materials.

The V370 uses Charge Coupled Device (CCD) in preference to CIS technology. This makes the Epson perhaps less adept at rendering fine lines, but it's able to create

superior colour reproduction and fault-correction.

Considering the price, the specifications are impressive, with the 4800x9600dpi resolution paired with 48-bit output, and a wide optical density of 3.2 DMax.

Scan times are decent but not outstanding, taking 10 seconds to create an A4 image at 200dpi, and 17 seconds at 300dpi. With 600dpi scan time was pushed up to a more long-winded 37 seconds. Photos take less time, and are generated at the three resolutions in seven, 11 and 23 seconds respectively.

Quality is very good, and even 200dpi images are faithful and packed with colour. Push it up to 600dpi, and images are finely rendered, with a deep palette that pays great attention to detail.


A document mat on the underside of the scanner lid can be taken out, and up to four 35mm



slides, or a strip of 35mm film can be fed into the adaptor, producing clear shots even when we were using old and slightly damaged slides.

The software comes with a choice of modes, ranging from auto to professional. The scanning app is extremely versatile, allowing you to restore colours, remove dust and administer basic retouching.

#### Verdict

A significant upgrade from your typical MFD's scanner function, the V370 offers very good quality for a sub-£100 model. It doesn't look great, but overall this is a very strong scanner.  **Robin Morris**

**£73** ex VAT  
**£88** inc VAT

#### Contact

■ [epson.co.uk](http://epson.co.uk)  
Read more  
■ [tinyurl.com/jvqfv5p](http://tinyurl.com/jvqfv5p)

#### Specification

Flatbed scanner; 4800x9600dpi; 48-bit colour; 3.2 Dmax optical density; USB 2.0; ReadyScan LED; 280x430x41mm; 2.2kg

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



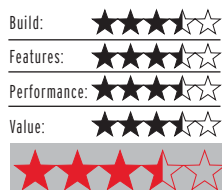
**£149** ex VAT  
**£179** inc VAT

**Contact**

■ [dell.co.uk](http://dell.co.uk)  
Read more  
■ [tinyurl.com/mytbnv3](http://tinyurl.com/mytbnv3)

**Specification**

128MB standard memory;  
1200x1200dpi max  
printing resolution;  
28ppm specified speed;  
auto duplex printing;  
250-sheet standard  
input capacity; 250-sheet  
maximum input capacity;  
10/100 ethernet;  
USB 2.0; 802.11b/g/n;  
406x338x384mm; 11.1kg



MULTIFUNCTION DEVICE

## Dell B1265dfw

Small businesses and home-office workers needing relatively small volumes of black-and-white documents might be attracted to Dell's B1265dfw. And beyond the mono printing, it has further multifunction capabilities.

It feels quite sturdy and solidly built, measuring a compact 406x338x384mm and weighing in at 11.1kg. The cool matt-black exterior means it will remain unassuming in the background, helped by low sound levels during operation that we found almost soothing.

The B1265dfw comes with a full set of print, copy, scan and fax modes, only targeted at low-output users. There's a 250-sheet paper tray in the base of the unit, as well as a single-sheet feeder and a 40-page ADF on top.

In contrast to a growing trend for MFDs with control panels on a surface in front of or on top of the cover, Dell has opted for a small hinged controller that pops up to the far right of the printer. Resembling

an old-style calculator, there's a full number pad and quick access buttons for the main modes, ID cards and Eco function; but the two-line text display is difficult to read except when you're directly in front of it.

We've no complaints about the B1265dfw's connectivity options, though, which comprise 802.11n Wi-Fi, ethernet and USB 2.0. As you'd expect, mobile device and cloud printing are also included, but there's no USB port for flash drives nor memory-card slot.

The printer's finest feature is undoubtedly its speed, as standard black text with a sprinkling of graphics managed to zoom out at around 26ppm. Duplex versions were equally nippy at 12ppm and ADF copies averaged 18ppm.

However, while black text quality is solid and unbroken, copied images are exceptionally dark. Colour scanning to PC provided a much



higher level of clarity and contrast, albeit with a slight blue bias.

The supplied toner cartridge is specified to last for 1500 pages, and at current prices that works out at 3.9p per page. A high-capacity 2500-page alternative costs 2.6p per page - both of which are more expensive than average.

### Verdict

The Dell B1265dfw mono laser MFP will appeal principally for speed and text quality, but it's hampered by expensive running costs and poor graphics quality. [✉ Martyn Clayden](#)

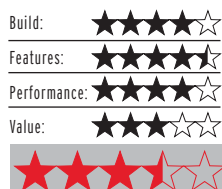
**£228** ex VAT  
**£274** inc VAT

**Contact**

■ [epson.co.uk](http://epson.co.uk)  
Read more  
■ [tinyurl.com/o58gn84](http://tinyurl.com/o58gn84)

**Specification**

Six colour inkjet MFD;  
max print resolution  
5760x1440dpi; quoted  
print speed B=8.5ppm  
C=8ppm; actual print  
speed B=14.3ppm  
C=10ppm; 4800x4800dpi  
scanner; USB 2.0,  
ethernet, Wi-Fi; Epson  
Connect, Apple AirPrint,  
Google Cloud Print; 20+  
20-sheet inputs;  
PictBridge;  
479x356x148mm; 8.8kg



A3 MULTIFUNCTION DEVICE

## Epson Expression Photo XP-950

The Expression Photo XP-950 has one of the printer world's more intriguing designs, its low-slung architecture conceals a series of layers from which pop the Epson's voluminous features.

Two paper trays are loaded into the front, allowing you to switch seamlessly between photo and A4 paper. A third paper feed is located at the back, offering paper support right up to the large A3 size.

A near-3.5in touchscreen lets you access the Epson's features. The TFT is colourful, navigation is easy, and the options are logical. The Epson offers both wired ethernet and Wi-Fi interfaces, and there are cloud and options for hooking up to a mobile device. Memory card and PictBridge compatibility are included.

This being an MFD, there's a scanning component. This isn't the fastest we've seen for the money, taking one minute 17 seconds to create a photo at 600dpi, and one minute 44 seconds for A4. Stepping down to 300dpi brought the times

down to 11 and 13 seconds respectively. It worked well on photos, although less high-quality material was a little washed out.

For features, the XP-950 hits home handsomely, but how does it fare on quality? When we reviewed the XP-750 recently, it did well on photos, but fell down on text. Much the same, can be said of the XP-950. Even at the highest 0.6ppm mode, text isn't perfectly formed.

Auto duplexing is available, and this caused the fastest 14.3ppm mode to drop 53 percent to 6.7ppm. For an inkjet, this isn't too bad, although the speeds weren't really fast enough to begin with to make regular use of this feature.

The Epson did much better on photos. Output here was gorgeous and packed with vibrant colour that brought out fine detail. The draft 10ppm mode was a little too faint, but the medium 1.1ppm mode produced great results. Stunning



A4 prints took under three minutes. A3 output is also possible.

The A3 mechanism isn't the smoothest, though - you have to send the job to the computer first, and then manually feed the A3 paper into the special rear tray. Times aren't too bad, taking 37 seconds in draft mode, and one minute 58 seconds in best.

Running costs are acceptable, costing 2.4p for black and 8.1p for colour. Given the high price of the Epson, we hoped colour prints would work out slightly cheaper.

### Verdict

The XP-950 is a full featured device. However, while the results are good for photo work, it doesn't have the overall quality we'd like to see on such a pricey MFD. [✉ Robin Morris](#)

**Specification**  
Windows XP (32-bit only)/7/8 (will run in 32-bit mode)/OS X 10.6 or later

## FONT MANAGER

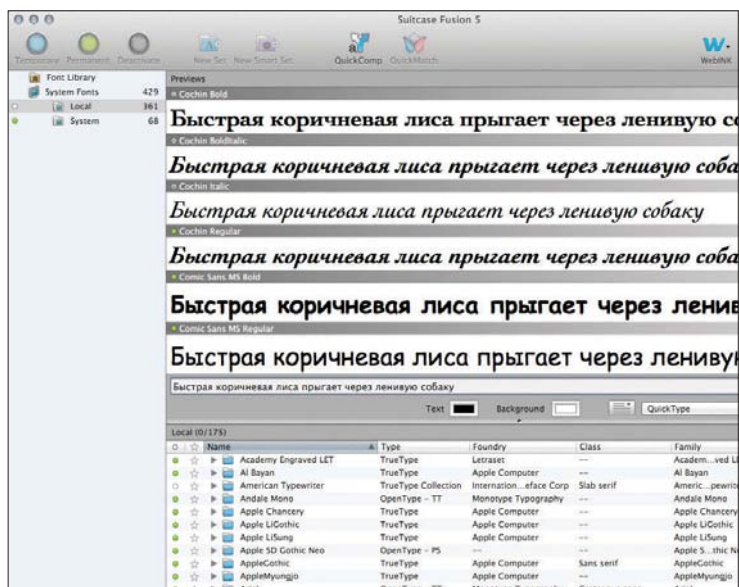
## Extensis Fusion Suitcase 5

Extensis Suitcase Fusion is a venerable, but enduringly useful font-management application for Macintosh and Windows. The software has been around since the dawn of desktop design, letting you organise what may be hundreds or even thousands of fonts on your system into switchable groups for different uses. The Fusion part of its name refers to the program's maintenance- and repair functions.

## New features

The most obvious change in this release is that the user interface has been revised, and now has an extended Toolbar that gives access to frequently used features and a dedicated button for the WebINK online font service. The Info pane has also been enlarged and moved to the right side of the main window.

One new feature is QuickComp, which lets you preview fonts within representative templates for print or web documents. You can click on different elements such as headlines, intros, body text and captions, and then select and preview your choice of font from a scrolling preview list. The resulting font list with previews and specifications can be exported



**QUICKMATCH** displays fonts with similar characteristics to your current font.

as a PDF file. Extensis has already created a library of QuickComp templates, but says it will add more as part of free updates, based on user feedback.


As with Suitcase Fusion 4, this update will connect to and show fonts from online services, specifically WebINK (owned by Extensis) and free Google Web Fonts.

Adobe is promoting its own Typekit service within Adobe CC, but this is unlikely to be supported by Extensis as it's a commercial rival.

Suitcase Fusion installs plug-in font control menus in Adobe's main design applications of InDesign, Illustrator and Photoshop, from CS3 to CC, as well as QuarkXPress. These present a menu where you choose from the font sets you want to use and activate. There's also auto-activation, so if you open a document that contains fonts that are currently deactivated on your system, they become live.

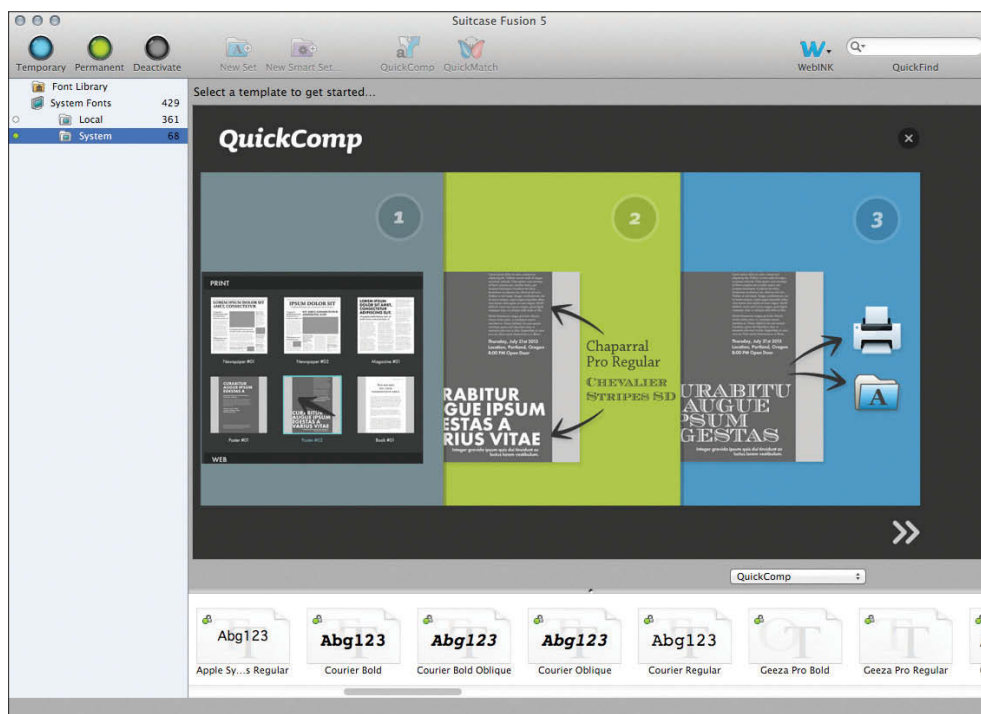
QuickMatch - added in Fusion Suitcase 4 - automatically finds a list of fonts with similar characteristics to your current choice, which can be handy for finding a neatly pairing ampersand or number glyph from another font when the originals don't suit. Performance is improved in most searches. The target font is no longer included in the results list, so it won't scroll out of view.

## Verdict

The latest upgrade doesn't give many new features, but if designers adopt Adobe CC Suitcase Fusion users will need the new plug-ins. QuickComp, is attractive and works well if you're doing initial concept work. And the upgrade price isn't bad: about £42.  **Simon Eccles**



**SPECIAL EFFECTS:** QuickComp allows you to judge the visual effect and balance of fonts in templates





# gaming pcs

High-end gaming is one area in which the desktop PC still reigns supreme. In this category we allow vendors to go all out, kitting out their systems to the best of their abilities. Paul Monckton goes gaming to see which plays nicest





**T**he graphics processor drives the Windows gaming experience, but a PC still needs a central processor. The new Intel Core i5-4670K is difficult to beat for all-round performance at a reasonable price. You can opt for the supreme power of the more expensive Core i7-4770K, which can process double the number of threads, but you'll pay a considerable premium - and crucially, see minimal improvement to gaming framerates.

Any of these 'K-series' processors will allow a reasonable amount of overclocking, but do make sure your system uses a motherboard that supports this function if you want to make the most of such a CPU.

We use PCMark 7 to quantify the general performance of each machine. When most PC vendors are selling in essence the same box of bits, differences can be attributed to the level of overclocking and the use of fast memory and an SSD. Graphics cards still come into play for non-gaming tasks such as converting video formats, which is also reflected in the overall PCMark 7 score.

Graphics cards fall in and out of favour as AMD and nVidia leapfrog each other with the latest technologies. It's wise to base your GPU decision on the type of games you like to play, since many titles are sponsored by one of the two graphics-card designers and are thus likely to run

better on its own cards. In this group test we see examples from both nVidia and AMD.

Never skimp on the graphics card in a gaming PC - it's the single most expensive component, but essential for the best Windows gaming. Accordingly, many of the PCs here are fitted with powerful cards such as the nVidia GeForce GTX 770 or AMD Radeon HD 7870.

You can save money with a factory-overclocked card with a lower base spec. These often cost significantly less, with a minimal reduction in performance.

Dual-card solutions can also be a good idea, depending on the prices of the cards available at any given time. None of the vendors here has gone for such a solution but, if you choose a motherboard that supports nVidia's SLI or AMD's CrossFireX, it's easy to add a second graphics card later (see page 114 for a walkthrough). Just ensure your PSU is sufficiently powerful, and offers enough power connectors for the two cards.

Good cooling is essential if a high-performance CPU is not to overheat. The cheap Intel CPU cooler often fitted by UK vendors simply won't do. Expect to find large heatsinks and several fans.

Liquid-cooling systems offer reduced fan noise and greater cooling capacity than airflow alone. Meanwhile, the dust filters attached to a computer's fans can help to reduce the incoming debris that clogs up games machines and can otherwise cause them to run even hotter and louder.

Gamers like their systems to look the part, but the case needs to be practical. Internal cable management aids airflow, and fan controllers let you reduce noise or boost cooling as necessary.

## Peripherals

Look for a monitor that's large, clear and offers a fast response time. Twisted nematic (TN) panels offer the fastest response times, but in-plane switching (IPS) panels are now sufficiently fast and provide much better colour reproduction. Their wider viewing angles will benefit other (non-gaming) users of the PC, too. Console gamers may want a display that has multiple HDMI inputs so they can hook it up to their PC and switch between the two.

The keyboard and mouse you use can make a huge difference to your gaming performance. An enthusiast system should come with peripherals designed for gaming. You may benefit from the improved responsiveness of wired rather than wireless devices. Look for high-resolution mice, and keyboards with programmable keys and backlighting.

High-grade mechanical switches in keyboards have a better 'feel' and provide longer life than cheap membrane switches. Some draw attention to the W, A, S, D keys with a different colour or texture.

A gaming soundcard can provide a more immersive experience by adding multiple sound effects, with improved audio fidelity and reduced noise. Also consider a gaming headset with a built-in mic.

## Warranty

Warranty terms are crucial when it comes to PCs pushed to maximum performance. The longer the better, but also look for parts-and-labour cover rather than labour-only deals.



Photography by Dominik Tomaszewski

## ARBICO ELITE 4670 OCX

**£829** inc VAT • [arbico.co.uk](http://arbico.co.uk) • [tinyurl.com/pvbel2g](http://tinyurl.com/pvbel2g)

Arbico's low-cost system offers great value for money. At less than half the price of the most expensive system here, this PC is sold without a monitor, keyboard or mouse. Factor in the cost of those peripherals, though, and you've still got a great deal.

Processing power has not been sacrificed to meet this low price. This system features the same Intel Core i5-4670K processor, overclocked to a speedy 4.4GHz, as most of the competition.

Of course, at this price you can't have everything, and this model provides 'only' 8GB of memory in comparison to the 16GB of its rivals. Furthermore, the Arbico is the only PC here to rely on air- rather than liquid cooling for its overclocked CPU.

The 500W PSU is the lowest-specified on test, while the CIT Jupiter system case lacks front-facing USB 3.0 ports. Things are also rather untidy inside: cables have been tied together, but there are many dangling inside the case.

A factory-overclocked Radeon HD 7870 graphics card has been put to good use. As you might expect, framerates are somewhat lower than those of the more expensive competition. You'll be able to get satisfying action from any game, but with quality settings pushed to the maximum we saw this PC dip below 50fps where others could maintain a super-smooth 60fps.

Overall system performance was also rather disappointing, given the fast overclock of the Core i5. A PCMark 7 score of 5,762 points is a good result, but it's some way off the competition and defeated

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



even by systems running non-overclocked versions of the same chip. The best score in this test was 7,045 points.

**VERDICT:** The Arbico Elite 4670 OCX is an attractive proposition for the gamer on a budget, especially if they already have decent peripherals. The overall specification is great for the money and gaming performance is good, but the PC underperformed in our general application tests. Depending on your needs, we'd recommend spending a little more if you can afford to do so.

## CHILLBLAST FUSION UZI

**£1,249** inc VAT • [chillblast.com](http://chillblast.com) • [tinyurl.com/p58mmmg](http://tinyurl.com/p58mmmg)

Clad in a bright blue plastic case, the Chillblast Fusion Uzi stands out from the crowd. It's the only small-form-factor PC in this group, but one of the biggest 'small' PCs we've seen: the Uzi offers enough internal space for some serious gaming components.

The flexible plastic outer shell raises the PC off the desk, producing a somewhat bouncy, side-to-side movement when touched. However, it never feels in danger of falling over.

Inside, the PC is densely packed. There's clear access to the drive bays, but the twin fans of the huge factory-overclocked GTX 770 graphics card almost entirely obscure the rest of the internals.

The components you can't see include a 2TB hard drive and a speedy 120GB Samsung 840 EVO SSD. The Chillblast delivered the best storage performance of the group, although both Mesh and Wired2Fire offer larger-capacity flash storage.

An Intel Core i5-4670K processor has been overclocked to 4.4GHz, and powered the Uzi to the best PCMark 7 score in this group: a staggering 7,045 points. This is a higher score than even Mesh's Core i7-based system, although the latter won out on gaming.

The processor is fitted with a Corsair H55 sealed liquid-cooling unit. Despite having the smallest system case, the Fusion Uzi ran cooler than any other overclocked PC in this group test.

Neither do the size restraints cause the Fusion Uzi to fall short in terms of connectivity, with a total of six USB 3.0 ports. Chillblast has even found room for a Blu-ray drive.

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

**PC ADVISOR**  
BEST BUY



An excellent 23.6in Iiyama IPS flatscreen is supplied, along with a high-resolution Gigabyte M6800 mouse and Force K3 gaming keyboard. The latter features multikey rollover, spill-resistant keys and enhanced W, A, S, D and arrow keys.

**VERDICT:** At £1,249 the Fusion Uzi is a seriously impressive PC. Its small size makes it easy to lug to LAN parties, but demands no compromises in cooling or performance. Its high-quality display, gaming peripherals and striking appearance are sure to turn heads.



**COMPUTER PLANET ND 3000****£1,100** inc VAT • [computerplanet.co.uk](http://computerplanet.co.uk) • [tinyurl.com/mnbxxhf](http://tinyurl.com/mnbxxhf)

Computer Planet's offerings include a range of bespoke and customisable PC systems, but this model comes from its 'Next Day' range, which is available for immediate delivery.

Our review system was customised to include an Intel Core i5-4670K quad-core processor, but here runs at its stock speed of 3.4GHz. Turbo Boost enables it to achieve 3.8GHz when required.

That it didn't score the best result in PCMark 7 therefore came as little surprise, although its 6,550 points wasn't too far behind that of the 4.2GHz PC Specialist Vanquish GT1. And it beat the Arbico.

The Corsair H60 sealed liquid-cooling unit and 650W PSU are more than up to the job if you feel comfortable in overclocking the processor yourself, but you should upgrade the motherboard before you do so. The budget Gigabyte board used here is a business model that doesn't allow overclocking.

Gaming grunt is provided by an nVidia GeForce GTX 770. It also runs at its stock speeds, but was able to produce framerates close to those of the overclocked systems in our tests.

The up side of running components at their stock speeds is reduced power consumption. This PC consumed up to 150W less power at full tilt than the most power-hungry systems here.

Interestingly, this PC comes with a 23in AOC monitor that incorporates a 30-pin (old-style) iPhone dock and has speakers built into its base. An advertised response time of 2ms should enable smear-free gaming.

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

**MOST POWER EFFICIENT**

A Logitech MK260 wireless keyboard and mouse set is also thrown in, but this is hardly a gaming combo - we'd recommend a decent wired pair instead.

**VERDICT:** This is a good-value system that delivers middle-of-the-road performance. Although it features an unlocked processor, with a great cooling system and power supply, the low-cost motherboard limits the PC to stock speeds. Its one-year warranty is disappointing, but you do get a free copy of Tom Clancy's Splinter Cell: Blacklist.

**MESH ELITE GAMER PCA****£1,499** inc VAT • [meshcomputers.com](http://meshcomputers.com) • [tinyurl.com/LtLbz9](http://tinyurl.com/LtLbz9)

This imposing PC comes in an expensive-looking system case. Like the entrance to an exclusive club, its plain black door does a good job of concealing the coloured lights and mayhem within. This is the PC for Elite gamers with great taste in magazines.

Just inside the door we find a Blu-ray player and a handy memory-card reader, but we need to delve deeper inside the case to find the real action. Here it's all posh slide-out drive caddies, neat cable management and modular PSU connections.

Taking pride of place atop the MSI motherboard sits a factory-overclocked nVidia GeForce GTX 770, bathed in a soft blue glow. Thanks to the use of quiet fans throughout, noise is kept to a minimum.

This PC is made from considerably higher-quality components than budget models, which adds to the cost. However, if you're something of a tinkerer, you'll find the extra room inside to your liking. The spec is already high, though, featuring 16GB of memory, a 2TB hard drive and a capacious 250GB Samsung 840 SSD.

Also adding to the cost is a Core i7 processor. The i7-4770K offers a slightly higher clock speed than the i5-4760K, and doubles the number of processing threads for improved multitasking capability.

This chip has been overclocked to an impressive-sounding 4.6GHz giving the system a noticeable boost in overall computing power. Although this performance is measurable in several subtests within the PCMark 7 suite, the overall score was adversely affected by an unexpectedly low result in the Entertainment subtest.

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



The supplied 24in monitor's TN panel is suited to fast-paced gaming, but it lacks the colour fidelity and wide viewing angles of IPS displays. Also supplied is a Microsoft Wireless Bluetooth Desktop 3000 keyboard and mouse, which is better suited to general use.

**VERDICT:** This PC is a little pricey, but it comes with a gaming motherboard, it oozes quality, and it features the best processor of the group. But while it offers plenty of raw computing power, its gaming results aren't a noticeable step up from less expensive PCs.

## PC SPECIALIST VANQUISH GT1

**£1,279 inc VAT** • [pcspecialist.co.uk](http://pcspecialist.co.uk) • [tinyurl.com/pL5eupw](http://tinyurl.com/pL5eupw)

PC Specialist's mid-priced Vanquish GT1 is a sensibly designed gaming machine. Rather than throwing in high-end parts that will perform well in benchmarks but hit you in the wallet, the Vanquish simply provides a great all-round gaming experience.

While the competition has gone as far as 4.4GHz, PC Specialist has pushed its i5-4670K chip to a more conservative 4.2GHz. The Vanquish recorded a still-fast 6,763-point score in PCMark 7, and the liquid-cooling system and 650W PSU will allow further overclocking.

A Palit-branded GeForce GTX 770 graphics card runs at stock speeds. It's a little slower than the factory-overclocked models found elsewhere, but we doubt you'll notice the difference.

The PC Specialist is specified with a 120GB Kingston SSD and a 2TB hard drive, plus 16GB of memory. It's also the only system here to feature a dedicated soundcard.

The Isku keyboard and Kova mouse are gaming devices. The former features blue illuminated keys and programmable macros, while the latter offers 3200dpi resolution and lighting effects.

The PC is housed in a transparent system case, allowing you to gaze proudly upon the tidy cable management, modular power supply connections and slide-out drive caddies. At the top is a handy SATA dock, plus a fan-speed control switch.



**PC ADVISOR**  
RECOMMENDED



PC Specialist has opted for a delicious-looking 23.6in AOC IPS monitor, featuring great colour reproduction, wide viewing angles and four video inputs. No Blu-ray drive is included, however.

**VERDICT:** This PC offers a great balance of performance and features at a sensible price, and will allow further overclocking if required. It also comes with peripherals and a sound card designed for gaming.

	ARBICO £829 inc VAT ★★★★☆	CHILLBLAST £1,249 inc VAT ★★★★★ PC ADVISOR BEST BUY	COMPUTER PLANET £1,100 inc VAT ★★★★☆
Product name	Elite 4670 OCX	Fusion Uzi	ND 3000
Processor	3.4GHz Intel Core i5-4670K (@4.4GHz)	3.4GHz Intel Core i5-4670K (@4.4GHz)	3.4GHz Intel Core i5-4670K
CPU cooler	Xigmatek Gaia II (120mm fan)	Corsair H55 Liquid Cooler	Corsair H60 Liquid Cooler
RAM	8GB (2x 4GB) Corsair 1600MHz DDR3	16GB 1600MHz DDR3	8GB Crucial 1600MHz DDR3
Storage	128GB SanDisk SSD + 1TB HDD	120GB Samsung SSD + 2TB HDD	120GB Corsair SSD + 1TB HDD
Power supply	500W Xigmatek	750W Corsair	650W Corsair
Motherboard	MSI Z87-G41 PC Mate	Gigabyte Z87N-Wi-Fi	Gigabyte GA-B85M-D3H
Operating system	Windows 8 64-bit (Windows 7 optional)	Windows 8 64-bit (Windows 7 optional)	Windows 8 64-bit
Display	Not supplied	23.6in Iiyama X2377HDS IPS	23in AOC
Graphics	MSI Radeon HD 7870, 2GB VRAM	MSI nVidia GeForce GTX 770, 2GB VRAM	Gainward nVidia GeForce GTX 770, 2GB VRAM
Sound	Onboard	Onboard	Onboard
Connectivity	Gigabit ethernet	2x gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet
Ports	2x USB 3.0, 6x USB 2.0, 2x PS/2	6x USB 3.0, 2x USB 2.0, S/PDIF	3x USB 3.0, 5x USB 2.0, PS/2
Optical drive	Lite-On BD-ROM/DVD±RW	Pioneer BD-ROM/DVD±RW	Samsung 24x DVD±RW
Case	CIT Jupiter ATX	BitFenix Prodigy Blue	Cooler Master K-350
Keyboard & mouse	Not supplied	Gigabyte M6800 mouse, Force K3 keyboard	Logitech MK260
Other	N/A	Optional family software pack	Tom Clancy's Splinter Cell: Blacklist
Warranty	2-year return-to-base (1-year parts)	2-year collect-and-return	1-year collect-and-return
<b>PERFORMANCE</b>			
PCMark 7 Overall	5,762	7,045	6,550
Games score (fps) <sup>1</sup>	94/50, N/A, 251/87/21	118/64, 70 (1080p), 300/143/37	122/66, 186/68, 284/146/37
Power consumption <sup>2</sup>	53/400W	52/310W	46/250W

<sup>1</sup>Games tested: Alien vs Predator 720p/1080p, Max; Final Fantasy XIV 720p Med/1080p Max; Sniper Elite V2 Low/720p/1080p, Med <sup>2</sup>Measured when idle and under load respectively



**WIRED2FIRE DIABLO PREDATOR Z87****£1,699** inc VAT • [wired2fire.co.uk](http://wired2fire.co.uk) • [tinyurl.com/nduhd3L](http://tinyurl.com/nduhd3L)

If you're feeling a bit flush, you could splash out on the fearsome Diablo Predator Z87 from Wired2Fire. At £1,699 it's twice the price of the Arbico (although it is sold with peripherals), but well worth the money as the fastest gaming system of the bunch.

With an Intel Core i5-4670K overclocked to 4.4GHz, paired with a beefy liquid cooler, 16GB of memory, a 1TB hard drive and 240GB SSD, the Predator is more than a match for the competition in general computing tasks. It turned in 6,974 points in PCMark 7.

This specification also forms a strong foundation for the PC's secret weapon: a nVidia GTX 780 graphics card, featuring 50 percent more memory and considerably more processing power than the GTX 770 cards found in most of its rivals. The Wired2Fire came out well ahead in our gaming tests.

The PC is housed in a Corsair C70 gaming case. Our sample was supplied in black; it's also available in a white or military green.

Two hinged handles are fixed to the top of the case, making it easier to pick up and lug around. Four latches hold in place the tinted transparent side panel and allow quick access to the insides.

You'll control your games using the Gigabyte K3 gaming keyboard and M6980X gaming mouse, the former featuring water-resistant keys. You'll view them on the blisteringly fast AOC G2460PQU

**PC ADVISOR**  
RECOMMENDED

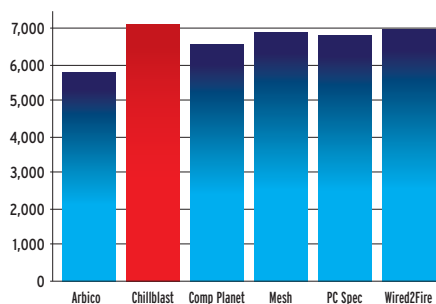
monitor, with its 24in panel claiming a 144Hz refresh rate and 1ms response time for the smoothest blur-free graphics. It's only a shame that a Blu-ray drive is not also included.

**VERDICT:** The Diablo Predator is expensive, but it's also the king of the gaming benchmarks. It's built into a dedicated gaming case and comes with a proper gaming monitor and input peripherals to match.

<b>MESH</b> <b>£1,499 inc VAT</b> ★★★★★	<b>PC SPECIALIST</b> <b>£1,279 inc VAT</b> ★★★★★	<b>WIRED2FIRE</b> <b>£1,699 inc VAT</b> ★★★★★
<b>Elite Gamer PCA</b>	<b>Vanquish GT1</b>	<b>Diablo Predator Z87</b>
3.5GHz Intel Core i7-4770K (@4.6GHz)	3.4GHz Intel Core i5-4670K (@4.2GHz)	3.4GHz Intel Core i5-4670K (@4.4GHz)
Corsair H60 Liquid Cooler	Corsair H60 Liquid Cooler	Corsair H100 Liquid Cooler
16GB (2x 8GB) 1866MHz DDR3	16GB Kingston 1600MHz DDR3	16GB 1600MHz DDR3
250GB Samsung SSD + 2TB HDD	120GB Kingston SSD + 2TB HDD	240GB Corsair SSD + 1TB HDD
850W X-Viper	650W Corsair	650W Corsair
MSI Z87-GD65 Gaming	Asus Z87-K	Gigabyte Z87-D3HP
Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit
24in Iiyama ProLite E2473HS	23.6in AOC i2369vm IPS	24in AOC G2460PQU
MSI nVidia GeForce GTX 770, 2GB VRAM	Palit nVidia GeForce GTX 770, 2GB VRAM	nVidia GeForce GTX 780, 3GB VRAM
Onboard	Asus Xonar DG	Onboard
Killer Ethernet 2200	Gigabit ethernet	Gigabit ethernet
4x USB 3.0, 2x USB 2.0, PS/2, card reader	3x USB 3.0, 6x USB 2.0, 2x PS/2	8x USB 3.0, 2x USB 2.0, 2x DVI, HDMI, DisplayPort
Pioneer BD-RE/DVD ± RW	Lite-On DVD ± RW	DVD ± RW
Fractal Design Define R4 Black Pearl	InWin GT1	Corsair C70 Black (also in military green or white)
Microsoft Wireless Bluetooth Desktop 3000	Roccat Isku, Roccat Kova	Gigabyte K3, Gigabyte M6980X
None	None	2x SP120 static pressure fans, 1x AP120 high-airflow fan
3-year 'Gold' (2-year parts, 3-year labour)	3-year collect-and-return	3-year return-to-base (2-year parts, 3-year labour)
6,899	6,763	6,974
121/65, 162/69, 291/140/38	120/65, 117/73, 307/145/37	165/87, 209/96, 315/180/44
73/325W	70/315W	60/403W

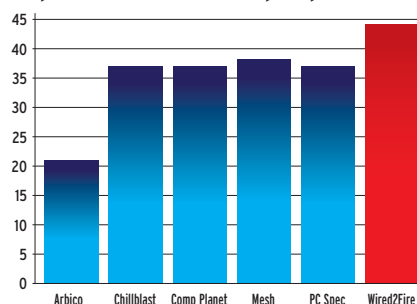
## OVERALL SYSTEM PERFORMANCE

PCMark 7 Overall (points)



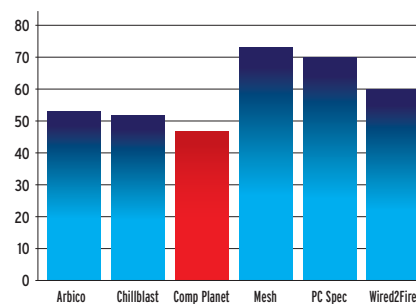
## GRAPHICS PERFORMANCE

Sniper Elite 2, 1080p (fps)



## POWER EFFICIENCY

Idle power consumption (watts)



## Conclusion

Arbico's low-cost Elite 4670 OCX is a very capable PC, although you'll need to supply your own monitor, keyboard and mouse, and possibly dial down the quality settings to keep gameplay smooth.

At the other end of the scale, Wired2Fire's Diablo Predator Z87 provides everything you'll need bar a Blu-ray player, including a class-leading nVidia GeForce GTX 780 graphics card. This component alone is enough to beat into submission the competition and earn Wired2Fire our recommendation, although it does add around £200 to the price when compared to the cheaper GTX 770 model.

In between these two systems are several interesting options. At £1,100, Computer Planet's ND 3000 offers great value. It offers a good set of components, but the motherboard's budget B85 chipset prevents the unlocked Core i5 processor from being overclocked. Not that overclocking will make your Windows games play faster, mind.

Mesh's Elite Gamer PCA offers unusually decent build quality and very good performance, but we can't help thinking that the money spent on its Core i7 processor could have been put to better use elsewhere.

At £1,249, Chillblast's Fusion Uzi is the least expensive system to provide a full set

of peripherals, top-end gaming performance and a motherboard worthy of its unlocked Core i5-4670K processor. It also comes in a unique and attractive small-form-factor case, which can be more easily transported to gaming events.

For only £30 more, PC Specialist's more traditional-looking Vanquish GT1 delivers slightly better gaming results and incorporates a gaming sound card, although general application performance is lower.

The Chillblast edges out the PC Specialist to win our Best Buy award with its Blu-ray drive, additional USB 3.0 ports, integrated Wi-Fi and lower power consumption.

## How we test

## Application performance

We test each PC for performance, measuring its speed in everyday computing tasks and its ability to play games.

For this group test we used PCMark 7, an industry-recognised test suite that uses 25 different workloads to measure areas such as storage, computation, image and video manipulation, web browsing and gaming.

An overall score in the high 6,000s is excellent for an overclocked gaming system.

## Gaming performance

We've used three games to evaluate graphics performance. We run our tests at 1280x720- and 1920x1080 pixels at various detail settings.

Framerates are recorded using the following games and quality settings:

Final Fantasy XIV: 1280x720, Medium quality; 1920x1080, Maximum quality.

Alien vs Predator: 1280x720, all settings at Maximum quality; 1920x1080, all settings at Maximum quality.

Sniper Elite V2: All options set to Medium quality, advanced shadows off, Supersampling off; all options set to Ultra quality, Advanced shadows - high,

4x Supersampling. We've also added a test run at the lowest possible quality to allow comparison with non-gaming systems.

## Power consumption torture testing

We measure the power consumption of each PC base unit (excluding peripherals) when idle and again while running at its performance limit.

During the idle test the PCs hard drives are still spinning and the power-management features are not enabled.

For the full-load torture test, we run Prime 95 to force all CPU processing threads to maximum utilisation and stress system memory. At the same time we run the Geeks3D Furmark benchmark to stress any installed graphics cards. We leave these tests running for 10 minutes, then record the system's power consumption and the CPU temperature reached.

## Overclocking

Because gamers demand the best performance from their hardware, we allow vendors to overclock PCs in this category.

We require that any tweaked component is designed for overclocking, and that the PC vendor offers a comprehensive warranty to put things right in the event that the overclocking overstresses your PC.

## Subjective assessment

We pay close attention to the physical characteristics of each PC, its noise output and its build quality, delving inside the case and taking note of the quality of components used, cabling and airflow.

Good-quality peripherals are also important, and where they are supplied we note the ergonomics of the keyboard and mouse. Ordinary wireless keyboard and mouse combos are frowned upon in this category, whereas fast, responsive peripherals will impress.

## Support

Differences in warranty terms can impact our scoring. Long warranties are sought after, but we also look at the terms and conditions - specifically, whether faulty PCs must be returned to the vendor at your cost and if both parts and labour are included. ☒



## Batman GTX 770

- Intel Core i5 4670
- Gigabyte Z87-HD3 Motherboard
- Windows 8 (64-bit)
- Corsair 8GB Vengeance 1600Mhz RAM
- NVIDIA GeForce GTX 770 4GB
- Plextor M5S 128GB SSD
- 1TB S-ATAIII HDD
- Coolermaster CM 690 III
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- Corsair 650W PSU

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- Plextor 256GB M5S SSD
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- Corsair Carbide 300R Windowed
- Corsair GS 700W PSU

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# HDTVs

Steve May rounds up a selection of the latest and greatest 39- to 42in HDTVs

**I**f you keep up with the TV news, you'll have seen that OLED and 4K sets are on their way, with several big names - Sony, Samsung and LG - also experimenting with curved screens.

However, these technologies are still some years away from becoming affordable for those on an average salary, and few people have a living room that won't be dominated by a 65in set.

We've kept things rather more down to earth in our round-up of 39- to 42in TVs. Each offers a full-HD resolution and various 'smart' features.

Most are also available in larger sizes, but beware that there's no guarantee image and sound quality will match that of the sets we reviewed. If possible, always arrange a test viewing before spending your cash.

## 3D playback

Five of the TVs here are 3D-ready. Whether you want to watch programmes in 3D is academic; stereoscopy has become a standard feature on virtually all big-brand TVs of this size.

Two types of 3D tech are seen in consumer electronics: active shutter and passive polarisation.

Both offer 3D playback from supporting Blu-rays and satellite and terrestrial broadcasts, but active shutter offers better picture quality and is able to present full-HD images. However, the 'shuttering' glasses required to enjoy the effect are expensive, prone to flicker and, in the case of LCD TVs, nearly always display crosstalk (double images).

Passive 3D (also known as Cinema 3D and Easy 3D) is a cheaper alternative, with the necessary glasses often handed out free to spectators of the latest 3D blockbusters. It delivers only half the horizontal resolution of the standard image, making diagonal and curvy object edges appear jagged.

Note that not all 3D-ready TVs are supplied with 3D glasses; those that are often come with only one pair. Be sure to factor in the price of additional specs - up to £80 each - unless you intend your 3D experience to be a solitary one.

## Internet connectivity

With BBC iPlayer and YouTube now almost ubiquitous on Smart TVs, people increasingly expect to be able to get online via the telly in their living room. Having

experienced catch-up content on a TV, you'll never want to return to streaming programmes on a laptop's tiny screen.

Many of today's TVs offer movie-rental services, but you should check what content is on offer if this will form an important part of your buying decision. Premium movie operators, such as Acetrax and Sony Movies Unlimited, tend to have a wider choice of new movies than LoveFilm, while Netflix doesn't offer many new films.

Wi-Fi connectivity isn't always a given, especially on cheaper models, so be sure to check if you run a wireless home network or intend to site the TV in a place that is difficult to reach with an ethernet cable. Some screens now offer Wi-Fi Direct or WiDi technology - handy if you want a simple hook-up for a phone or tablet - that doesn't impose itself on your main network resources.

Modern TV sets are able to play a range of video and audio files, but the results can vary dramatically between brands - a potential dealbreaker if you have a hard drive filled with MKV files. In general, media playback via USB offers the widest compatibility.









## LG 42LA690V

**£699** inc VAT • [uk.lge.com](http://uk.lge.com) • [tinyurl.com/my9kbkt](http://tinyurl.com/my9kbkt)

Proof that you no longer have to dig deep to own the latest TV tech, the 42in LG 42LA690V offers internet TV, 3D and seamless smartphone integration for £699. Throw in impressive build quality and you might wonder what is the incentive to spend more.

The LG feels reassuringly substantial out of the box. With a super-narrow bezel, stylish aluminium trim and sweeping matt-finish stand, it's also easy on the eye.

Connections include a trio of HDMI, one of which supports MHL for Android smartphones, three USBs, ethernet, SCART, component and composite video. Mobile connectivity is bolstered by Miracast. There is also NFC and Wi-Fi.

It comes with two controllers, a traditional IR zapper and the latest iteration of LG's Magic Remote, which offers a handy cursor that simplifies navigating the online Smart portal and web browser.

The set also ships with four pairs of 3D glasses and two pairs of Dual Play specs, used to simultaneously display split-screen games. In addition to a Freeview HD tuner, DVB-S2 (Freesat) is optional.

SmartShare file playback is comprehensive. All key video codecs and containers are accessible from both USB device or networked NAS, while MP3s play with sleeve art.

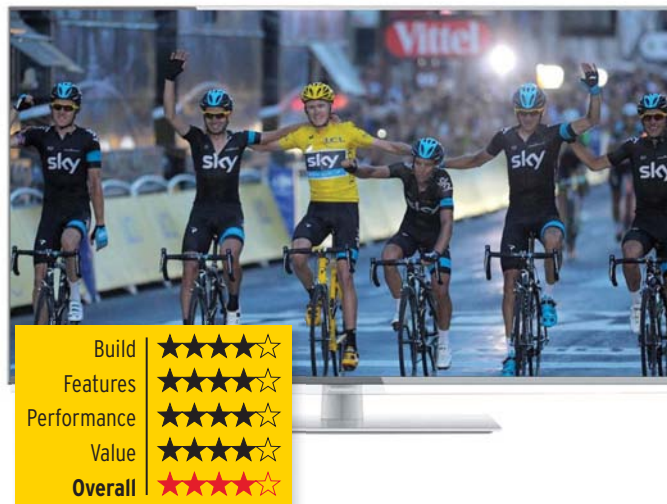
The set's Smart TV portal offers plenty of IPTV diversions, alongside dedicated a Game world and 3D World silos. There's also Skype (webcam required), Facebook and Twitter.

Disappointingly, the programme guide is a stock Freeview offering that lacks both picture-in-picture and channel audio. You can, however, record on to an external USB hard drive.

HD image quality looks good, but the panel lacks effective high-speed picture processing, which reduces motion clarity. Regardless of which TruMotion setting you engage, the definition drops when things kick off. The LG offers a glassy, smoothness to movement.

LG earns kudos for its audio performance. Much of the set's acoustic energy sounds to be dispensed in the low- to mid-range, between 100- and 500Hz, and there's little shortfall in volume. A supplemental woofer on the rear renders dialogue clear and rounded.

**VERDICT:** With good looks and a strong feature set, the LG is decidedly modernistic. Images are dynamic and colour-rich, while ease of use is high. The only caveat is poor motion resolution: a real deal-breaker.



## PANASONIC TX-L39E6

**£529** inc VAT • [panasonic.co.uk](http://panasonic.co.uk) • [tinyurl.com/c34yuuf](http://tinyurl.com/c34yuuf)

Panasonic's TX-L39E6 is a 39in LCD TV that provides access to the firm's recently refurbished Smart TV portal. But the enticingly affordable E6 series doesn't sport the high-quality IPS panel found further up the range, and it's two- rather than three-dimensional. It's available in five screen sizes spanning 32- to 50in.

The design is ace. The set has an ultra-thin grey/silver bezel with a trendy translucent lip. It's also slim at just 37mm thick. Black and white finishes are available.

Connections include three HDMI, ethernet, SCART, component AV-in and an optical audio output. There's also a CI port and USB media reader, but no SD slot. Wi-Fi is built-in, too.

While Panasonic may be using a journeyman panel with the E6, that doesn't mean it's a dud. Indeed, contrast is extremely good and the screen delivers seriously broody blacks, although these are rather sensitive to off-angle viewing. While this set lacks the picture-processing brawn seen on pimped-up Panasonics, images are crisp and vibrant. If the set does have an Achilles' heel it's with limited motion resolution - there's nothing above 850 lines when measured at 6.5ppf (pixels per frame), but at this size that's not a problem.

Sonically, the set is thin but functional, although we found one anomaly with the optical output. We would expect to be able to route out Dolby Digital 5.1 from connected HDMI sources, but we could get only stereo from the Panasonic. This would be an issue if you planned to drive surround sound from the TV's audio output.

The TX-L39E6 debut's Panasonic's new My Home Screen interface. This is dramatically different from the old-style Viera Connect interface, offering a choice of three preset designs (with an emphasis on lifestyle, info or TV content) as well as the option to configure your own, which is simply a case of selecting your preferred apps and streaming services on to an empty grid. As far as personalised TV goes, it's the most advanced out there.

Multimedia file playback support is excellent from USB, covering all key codecs and containers, although across a home network MKV files aren't recognised.

**VERDICT:** The Panasonic TX-L39E6 is a great smart TV for the money. It looks beautiful, delivers sharp, high-contrast HD images and boasts an extremely sophisticated interface and a decent selection of IPTV.



## PHILIPS 42PFL6188S

**£999** inc VAT • [philips.co.uk](http://philips.co.uk) • [tinyurl.com/kbpvgox](http://tinyurl.com/kbpvgox)

Philips doesn't hide its lights under a bushel; instead, it bolts them to the back of its TVs and calls them Ambilight. Still very much a signature technology of Philips, Ambilight sets this often byzantine brand apart. Once you've lived with those pools of multicoloured light it can be difficult to migrate to less flashy alternatives.

Cosmetically, this screen is a winner. With edge-to-edge glass and the narrowest of wraparound bezels, the TV appears triumphantly futuristic. Even the wire-frame stand looks ace – although it proved a fiddly nuisance to assemble. And there's the rub with Philips TVs: they're always more complicated than you might imagine.

Fine-tuning the picture is certainly a challenge. The set's Pixel Precise HD bouquet comprises all manner of processing, from Perfect Natural Motion and Clear LCD to Backlight Enhancement.

Menu settings are a matter of taste, but we found increasing the image sharpness was an invitation to ugly edge-enhancement.

While this set's HD imagery is natively sharp, the Natural Motion settings invoke some level of motion artefacting. Minimum is the only sensible option, but it also comes with that high-frame sheen to movement which, while great on sport, looks distracting for movies.

Black level performance is good, with clear shadow detail retained; the Philips' backlight uniformity is also impressive.

Connectivity includes four HDMI, component, SCART via an adaptor, optical audio out, ethernet and a trio of USB inputs. The set also has integrated Wi-Fi and either a Freeview HD or DVB-S2 tuner.

While the set is physically flamboyant, the user interface is surprisingly pedestrian, with a basic EPG and text-heavy menus. Philips' Smart portal is also somewhat lacklustre. Streaming services are primarily limited to BBC iPlayer, Acetrax, YouTube, Blinkbox, Viewster and iConcerts. Bizarrely, the set has an astonishingly high quota of adult material on tap.

The 42PFL6188S offers passive rather than active 3D, and comes with four pairs of glasses. The system works well enough, offering tangible stereoscopy without any significant loss of brightness. The set also boasts an effective stereo sound system.

**VERDICT:** Fashionistas will love this TV. It's a designer thinscreen that's keenly priced and ostensibly well specified. But the lightweight portal content may be a turn-off, and image quality is an acquired taste.



## SAMSUNG UE40F6800

**£729** inc VAT • [samsung.com/uk](http://samsung.com/uk) • [tinyurl.com/msbcx69](http://tinyurl.com/msbcx69)

Samsung's 40in UE40F6800 is aimed squarely at the red-hot smart TV mainstream. Featuring a host of internet TV services, this model also offers 3D, Freeview HD and Freesat HD.

Samsung's design team has in the past been rightly lauded, but with this set it's been caught napping. The wraparound translucent beading is a lazy design affectation that does little to enhance the panel itself, while overall build quality feels cheap and plasticky. The widely spaced pedestal feet give the set an inelegant appearance.

Connectivity is less contentious. There are four HDMI, three USB, SCART, component/composite, a digital optical output and ethernet. Wi-Fi is also built-in, and the screen comes with two remotes – a standard IR zapper and snazzy touchpad alternative.

The UE40F6800 sports Samsung's new user interface, which presents a fistful of icons to help navigate the packed content portal. There's a full hand of TV catch-up providers, plus streaming services including YouTube, LoveFilm, Netflix, KnowHowMovies, Blinkbox and more. Dedicated silos store 3D content and casual games.

This TV offers extensive file support. It copes with all the popular types, and doesn't bat an eyelid over obscure files such as DXD.

Picture quality is excellent. HD images are bright and vibrant, while black levels are Bournville smooth, with plenty of shadow detail. This set also does a great job on motion picture resolution.

For movies we'd advise turning off the brand's proprietary Motion Plus image processing. Even with this disengaged, clarity is held at a subjective high of 850 lines (measured at 6.5ppf).

Off-angle viewing is limited. You have to stray only moderately off-axis to experience a significant drop in colour and contrast.

The Samsung offers active 3D. While the two pairs of supplied RF glasses need to be snapped together, this faff is rewarded with excellent resolution and inconsequential levels of crosstalk.

The set's audio performance is also impressive, given that the screen is just 47mm thick and employs downward-firing speakers. A chunky 2x 10W amplifier contributes weight and volume.

**VERDICT:** While the Samsung is unlikely to win any design awards, there's no doubting its overall performance. Images are fast and crisp, 3D is detailed and bright, and the set features best-in-class IPTV and has unbeatable multimedia file support.





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

**PC ADVISOR**  
RECOMMENDED

## SONY KDL-40W905A

**£1,299** inc VAT • [sony.co.uk](http://sony.co.uk) • [tinyurl.com/kzmlpnf](http://tinyurl.com/kzmlpnf)

The 40in KDL-40W905A is Sony's first Triluminos full-HD smart TV. Based on quantum-dot technology, Triluminos LED edge-lighting extends a television's colour gamut for richer, deeper hues.

The Sony looks spectacular, too. With an aluminium hairline-finish bezel and diamond-cut edging, the design is unapologetically opulent. A chromed loop pedestal adds polish.

Connections include four HDMI, SCART, component, a trio of USBs, an optical digital audio output and ethernet. There's Wi-Fi, too.

There's a choice of either a Freeview HD or DVB-S2 satellite tuner. Two remote controls are supplied: a standard IR job and a simplified Bluetooth zapper that cunningly contains an NFC chip.

The screen's picture prowess owes much to Sony's X-Reality Pro processing engine, which keeps details crisp and makes textures more convincing. The black level performance is outstanding, and backlight uniformity is good.

The set sports the XR 800Hz iteration of Sony's Motionflow process. Unlike rival image-interpolation techniques, this doesn't introduce a swathe of unwanted motion artefacts.

The extended colour gamut makes the screen particularly suitable to X.V.Color sources, but it doesn't need them to deliver bold, exciting colours. Even with regular Blu-rays and HD content the reds are more sanguine and greens more fulsome than is the norm on an LED-backlit LCD TV. This TV's colour character is closer to what you might expect of a plasma.

Sony has reworked its user interface. The XrossMediaBar has been retired in favour of a cleaner menu tree with graphical flourishes. It's intuitive, offering quick access to TV, applications, connected devices and settings. There's a wide range of IPTV, too.

Regardless of whether you're playing files from USB media or across a LAN, the set will play all popular codecs and containers.

Two pairs of active shutter glasses are supplied. Full-HD 3D images appear clean and bright, with only occasional crosstalk.

Audio performance is above average, thanks to a long-duct speaker system for meaningful mid-range.

**VERDICT:** While Sony hasn't quite kept pace with its rivals' feature innovations, it's stolen a march on image quality. This screen sets a new benchmark for motion clarity and colour performance.



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

## TOSHIBA 40L7355

**£503** inc VAT • [toshiba.co.uk](http://toshiba.co.uk) • [tinyurl.com/m3f4h9z](http://tinyurl.com/m3f4h9z)

Toshiba's 40in 40L7355 offers very good value, combining internet TV functionality with 3D at a price that undercuts all its rivals in this round-up. The larger models in Toshiba's line-up come with a fancier wire-frame pedestal, but have the same feature set.

The 40L7355 is well specified for the cash. There are four HDMI, plus SCART, component/composite AV, VGA, digital audio out and ethernet. Wi-Fi is built in, with WiDi support. There are also two USB ports, with external HDD recording functionality.

Cloud TV is Toshiba's new online portal. It's sluggish, suggesting the set may be underpowered, but an improvement over the previous Toshiba Places. Streaming services include Netflix, BBC iPlayer, Blinkbox, YouTube, Viewster, Dailymotion, iConcerts, Knowhow movies, Vimeo, Woomi and Livesport TV. There is also a web browser, plus Skype (for which a webcam is required).

The home page is dominated by a central Twitter window and live TV feed. The Twitter client uses a proprietary algorithm to deliver tweets about trending TV shows. This means at times it will be blank, and at others it may be filled with expletives or spoilers.

Media playback from USB is solid, with most content and containers playable. We had no problems with our test suite of files. Across a network from a NAS the set was less confident, and it failed to play any audio files at all.

Overall image clarity is high, with great delineation from the set's onboard Freeview HD tuner, and accomplished motion resolution.

Rated 200 AMR by Toshiba, the panel is surprisingly fast, even without ClearScan high-framerate trickery. You can boost motion resolution from a native 900 lines to a full 1080 by using one of the ClearScan modes. We recommend the Standard setting, as this eliminates horizontal panning judder but doesn't penalise with heavy motion artefacts. For sport and TV it's excellent.

Black level performance is good for this class of screen, and backlight uniformity is acceptable. Colours aren't overcooked, either.

The set's active shutter 3D system works well enough, albeit with minor crosstalk. For such a slim set, audio is also robust.

**VERDICT:** When it comes to sheer value, the 40L7355 is difficult to knock. It's a trim telly offering good AV performance for the cash. We weren't keen on Toshiba's Cloud TV portal, though.



298X4QJAB

## Double the screen, double the excitement

### The UltraWide 21:9 display with Multiview

Take your viewing experience to the limit with the UltraWide 298X4QJAB display with Multiview. Connect and view two different sources at same time in picture-by-picture or picture-in-picture mode. Follow the game while checking email or watch a movie while chatting on social media – you can access nearly any device with the HDMI, DVI and DisplayPort connections. The sleek Ultra Narrow Bezel maximizes your viewing area with a touch of style. No matter what you're doing, you'll be impressed by the ultra-high 2560 × 1080 resolution and IPS panel that delivers true-to-life colors and unbelievable 178-degree viewing angles.



**PHILIPS**

Philips Displays are available from the following Distributor partners:



**Business Direct**

**SCAN**  
computers

**MISCO.co.uk**

**Insight**





## How we test

All the HDTVs in this group test were challenged with a barrage of industry-grade test images, comprising an assortment of patterns and charts. Particular emphasis was placed on motion resolution, black levels and greyscale.

All 1080p screens deliver perfect full-HD resolution with static images, but show their true colours when motion is introduced. Screens with limited motion resolution produce characteristic 'now the image is sharp/now the image is blurred' discrepancies, often within the same frame. This trait is particularly irritating when

watching fast-moving sports. Our tests considered how much clarity was lost when high-resolution test patterns travelled at 6.5ppf, and the impact of fast-refresh technologies.

We also assessed the TV sets with real-world content, via their onboard tuners and Blu-ray movies. 3D performance was principally assessed with *Tangled*, *Resident Evil: Apocalypse* and *Monsters vs Aliens*. Helping to divine 2D performance were *Monsters* and *Drive*.

File-playback tests comprised a motley collection of audio and video clips, played both from USB and a DLNA-capable NAS.

	<b>LG</b> <b>£699 inc VAT</b> 	<b>PANASONIC</b> <b>£529 inc VAT</b> 	<b>PHILIPS</b> <b>£999 inc VAT</b> 	
Model name	<b>42LA690V</b>	<b>TX-L39E6</b>	<b>42PFL6188S</b>	
Product code	42LA690V	TX-L39E6	42PFL6188S	
Screen	42in (1920x1080)	39in (1920x1080)	42in (1920x1080)	
3D	Passive	N/A	Passive	
Specified dynamic contrast ratio	Not specified	Not specified	500,000:1	
Brightness	Not specified	Not specified	400cd/m <sup>2</sup>	
Speakers	2x 12W	2x 10W	2x 12W	
Tuner	Freeview HD (Satellite DVB-S2 optional)	Freeview HD	Freeview HD (Satellite DVB-S2 optional)	
EPG	Seven-day	Not specified	Eight-day	
Inputs	3x HDMI, component, composite, SCART	3x HDMI, component, composite, SCART	4x HDMI, component, SCART	
Outputs	Digital optical audio, headphone jack	Digital optical audio, headphone jack	Digital optical audio, headphone jack	
Networking	Ethernet, Wi-Fi	Ethernet, Wi-Fi	Ethernet, Wi-Fi	
Ports & slots	3x USB 2.0, CI	2x USB 2.0, CI	3x USB 3.0, CI	
Dimensions	951x564x35mm	879x519x49mm	953x562x32.5mm	
Weight	12.2kg	11kg	12.5kg	
Warranty	1 year	1 year	1 year	

Prices correct at press time

## Conclusion

You won't be disappointed with any of the TVs in our group test, but two in particular deserve a place on your short list.

The first is the exceptional Sony KDL-40W905A. Just when we thought there was nothing more manufacturers could do to improve on a 1080p image, Sony adds a Triluminos filter. When you see the KDL-40W905A beside a 'normal' HDTV your jaw will drop.

Colours are simply fantastic, so if image quality is your number-one priority, we have no hesitation in recommending the Sony, even at its steep price of £1,299.

For those with a thinner wallet, Samsung's UE40F6800 should appeal. It isn't the best-looking smart TV we've seen, but it's a great choice. As well as excellent image quality, it has a brilliant set of features including both Freeview HD- and Freesat HD tuners, lots of inputs and outputs, Wi-Fi, a class-leading internet portal and unbeatable local file support for playing videos.

However, viewing angles are narrow, so choose this set only if you sit directly in front of your TV. Those sitting to the sides will see much reduced contrast and colour saturation. ☒

<b>SAMSUNG</b> <b>£729 inc VAT</b>  <b>PC ADVISOR</b> <b>RECOMMENDED</b>		<b>SONY</b> <b>£1,299 inc VAT</b>  <b>PC ADVISOR</b> <b>RECOMMENDED</b>		<b>TOSHIBA</b> <b>£503 inc VAT</b> 	
<b>UE40F6800</b>		<b>KDL-40W905A</b>		<b>40L7355</b>	
UE40F6800		KDL-40W905A		40L7355	
40in (1920x1080)		40in (1920x1080)		40in (1920x1080)	
Active shutter		Active shutter		Active shutter	
Not specified		Over 1 million		5,000:1 (native)	
Not specified		Not specified		300cd/m <sup>2</sup>	
2x 10W		2x 10W		2x 10W	
Freeview HD, Freesat HD		Freeview HD (Satellite DVB-S2 optional)		Freeview HD	
Seven-day		Seven-day		Seven-day	
4x HDMI, component, composite, SCART		4x HDMI, component, SCART		4x HDMI, component, composite, SCART, VGA	
Digital optical audio, headphone jack		Digital audio coaxial, headphone jack		Digital audio coaxial, headphone jack	
Ethernet, Wi-Fi		Ethernet, Wi-Fi		Ethernet, Wi-Fi	
3x USB 2.0, CI		3x USB 2.0, CI		2x USB 2.0, CI slot	
950x544x47mm		920x541x61mm		922x600x182mm	
9.1kg		12.3kg		12kg	
1 year		1 year		1 year	



# Add Windows 8's best features to Windows 7

Windows 8 does more than introduce live tiles and gesture control. It delivers many nuts-and-bolts improvements - and the good news is that you can get them all in Windows 7 with a little work. Chris Hoffman explains

**I**t's too bad that Windows 8's Modern user interface is so contentious, because the new operating system is hands-down the best version of Windows Microsoft has ever released.

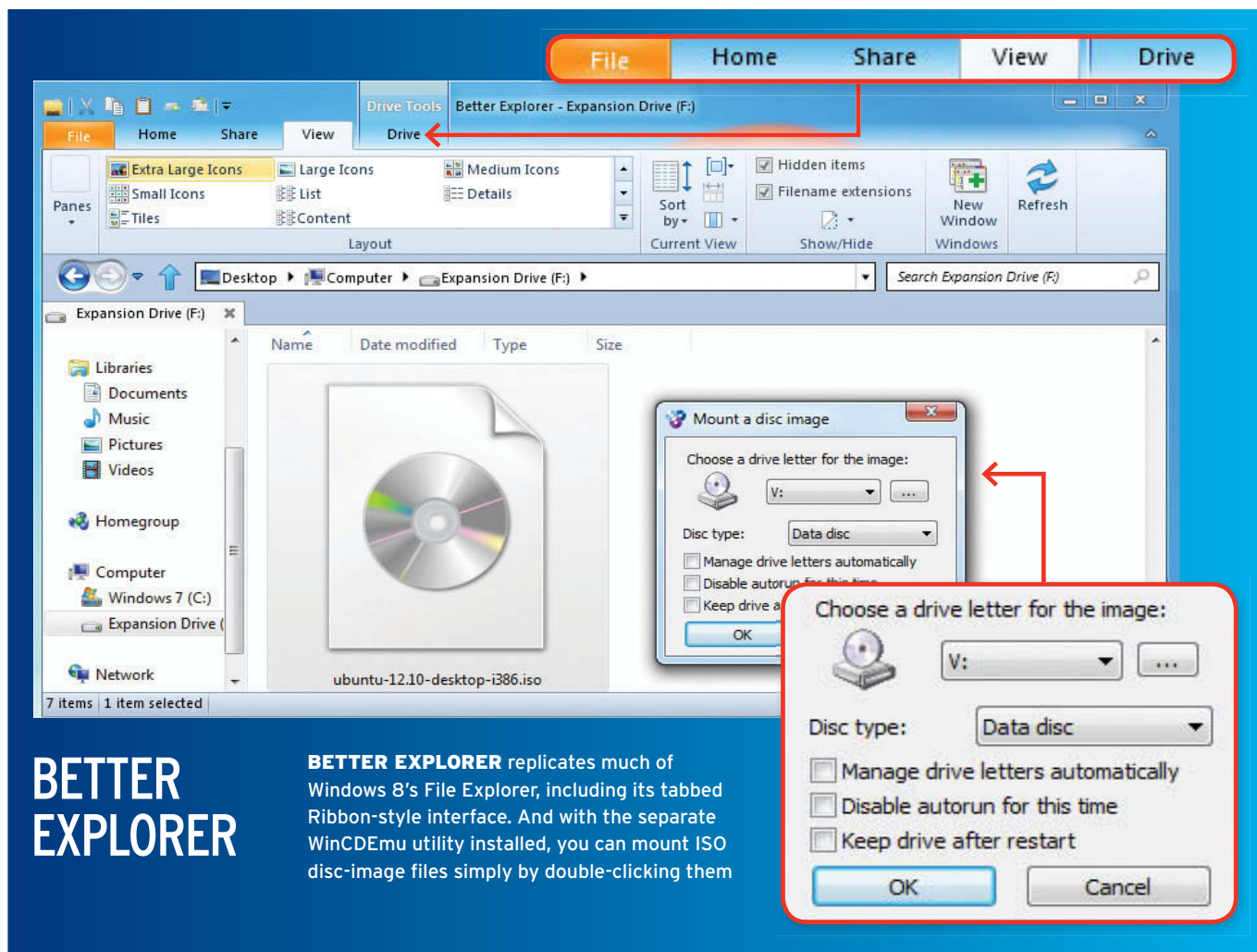
Plenty of tile- and touch-averse desktop PC users would love to add the nuts-and-bolts improvements that Microsoft introduced with Windows 8 to their trusty Windows 7 systems. And the good news is that to a surprisingly large extent you can. Many of Windows 8's best under-the-hood improvements can be used in Windows 7 with the help of a few apps.





ILLUSTRATION BY TAYLOR CALLERY





### Better file copying and moving

Windows 8's file-copy dialog box may be its biggest desktop improvement. It brings all the operating system's copying and moving processes into a single window, tosses in a pause button, deals with file conflicts more intelligently than did its predecessor, and is just plain faster than before.

By comparison, the file copier built into Windows 7 isn't very good. In fact, in his introduction to Windows 8's file-copying tweaks, former Windows president Steven Sinofsky wrote that "most people do not have a great tool for high-volume copy jobs", which reflects the fact that few Windows 7 users have a third-party file-copying tool installed on their systems.

You can improve file copying and moving on your Windows 7 system without upgrading to Windows 8 by installing TeraCopy ([tinyurl.com/pmdq7xb](http://tinyurl.com/pmdq7xb)). Not only does this utility speed up some file transfers, but it also permits you to pause transfers, a convenient improvement over Windows 7's functionality.

That's not the only useful trick up TeraCopy's sleeve, however. Rather than halting transfers when an error occurs, the program skips over problematic data and displays troubled files for your perusal at the end of a mass data migration.

Even better, TeraCopy offers Windows shell integration, so you can completely replace Windows Explorer's normal copy, paste and move functions with TeraCopy's excellent alternatives.

### An improved Windows Explorer

Five years after its debut in Office 2007, the Ribbon interface continues to be a polarising feature. Still, you can find a lot to like about File Explorer, as the Ribbonised version of the traditional Windows Explorer interface has been dubbed in Windows 8.

For one thing, the Ribbon provides easier access to less-often-used functions, such as the one for toggling the display of hidden files. Windows 8's File Explorer also restores the Up button, which both Windows Vista and

Windows 7 lack, giving you an easy, one-click way to go up a directory.

The new File Explorer even allows you to mount ISO disc-image files by double-clicking them, a great feature that eliminates the need for third-party ISO-mounting software.

If you want to spiff up Windows 7's Windows Explorer with a Ribbon and an Up button, your best option is Better Explorer ([bexplorer.codeplex.com](http://bexplorer.codeplex.com)). This utility packs in more functionality than does Windows 8's File Explorer, thanks to its ability to display multiple open folders in tabs at the top of the window. This upgrade makes wrangling files a breeze compared to Windows' usual multi-window madness.

Interested? Just pin Better Explorer to your taskbar, and forget that Windows 7's default Windows Explorer even exists. To use TeraCopy with Better Explorer, you'll first have to venture into Better Explorer's options and enable the 'Allow third-party file operation replacements' option on the Shell screen.

You could also install WinCDEmu ([wincdemu.sysprogs.org](http://wincdemu.sysprogs.org)) if you want to mimic Windows 8's ISO-mounting ways. It's a simple program that allows you to easily mount ISO files and other types of disc images just by double-clicking them. You'll find no faster, easier way to access digital copies of physical discs.

### A more powerful Task Manager

Windows 8's Task Manager is the most powerful task manager ever included with Windows, and it comes stuffed with stellar features and enhancements, such as the ability to restart explorer.exe with one click, a vastly improved performance-monitoring tab, and a new tool for managing your startup programs.

Microsoft should have added that last feature to Windows a decade ago.

You won't find a program that exactly mirrors Windows 8's myriad task manager tweaks. But for an advanced task manager packed with powerful features, try Process Explorer ([tinyurl.com/38bfsq](http://tinyurl.com/38bfsq)). It's a bit more complicated than Windows 7's Task Manager, although in many ways it's also easier to use.

Process Explorer shows processes in a tree view so that you can see how they're related to one another. This view comes in handy if, say, you ever want to determine which Google Chrome process launched the 50 other Chrome processes that are currently running on your PC.

If you find that you prefer Process Explorer after giving it a whirl, you can

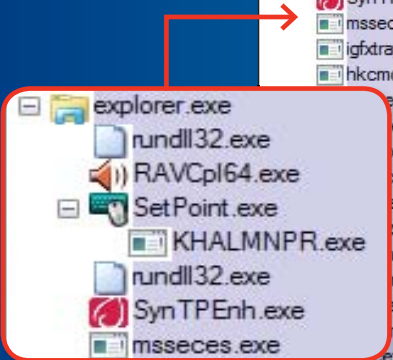
make it your default task manager by opening its Options menu and selecting 'Replace Task Manager'.

To manage startup programs you have a couple of choices, beginning with the ever-useful CCleaner ([tinyurl.com/ajxuxc8](http://tinyurl.com/ajxuxc8)). If you regularly read our *Helproom* reader Q&A, you probably already have this utility installed on your machine. You'll find the startup manager under Tools, Startup.

If CCleaner isn't enough for you, try Microsoft's own Autoruns utility. It's the most comprehensive way to view and manage programs that automatically start at bootup. Autoruns ([tinyurl.com/5q9od9](http://tinyurl.com/5q9od9)) is more complicated to use than the default tool built into Windows 8's Task Manager, but it also shows many more granular entries.

## PROCESS EXPLORER

The tree view in **PROCESS EXPLORER** lets you see the interrelationships of your PC's various processes

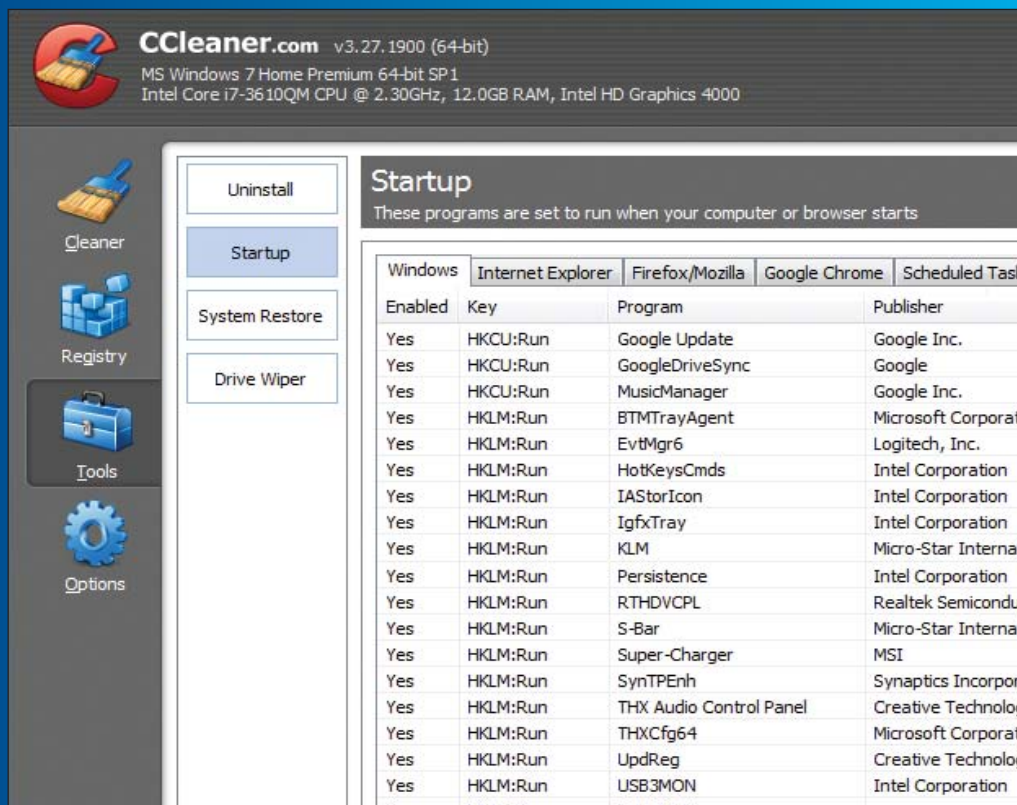


File	Options	View	Process	Find	Users	Help
Process						
			PID	CPU	Private Bytes	Working Set
lsmd.exe			828		3,424 K	3,032 K
csrss.exe			756	0.05	4,704 K	80,196 K
winlogon.exe			888		4,840 K	4,080 K
explorer.exe			2700	0.03	90,664 K	96,652 K
rundll32.exe			2248		4,892 K	5,088 K
RAVCpl64.exe			2236		10,752 K	6,016 K
SetPoint.exe			2228	0.04	42,720 K	16,428 K
KHALMNPR.exe			3208	< 0.01	10,548 K	9,832 K
rundll32.exe			2516		8,396 K	5,040 K
SynTPEnh.exe			2728	< 0.01	11,712 K	9,884 K
msseces.exe			2932		8,052 K	8,888 K
igfxtray.exe			2908		5,928 K	6,536 K
hkcmd.exe			2936		5,048 K	5,032 K
rs.exe			2920		6,656 K	8,724 K
edrivesync.exe			2312		1,820 K	932 K
ogledrivesync.exe			3660	0.01	79,376 K	66,632 K
Manager.exe			3196	0.01	14,416 K	15,464 K
exe			3840		1,400 K	1,292 K
erhost64.exe			3912		2,392 K	1,372 K
.exe			7940	0.12	54,448 K	47,804 K
nap64.exe			11008		31,544 K	43,912 K
aintDotNet.exe			12476	< 0.01	84,672 K	79,920 K
Explorer.exe			11552		141,200 K	65,580 K
exp.exe			11624		2,620 K	7,876 K
PROCEXP64.exe			11696	0.29	19,984 K	31,492 K
GoogleCrashHandler.exe			1592		2,260 K	1,224 K
GoogleCrashHandler64.exe			1656		3,068 K	660 K



## CCLEANER

Besides clearing away accumulations of junk files and other digital detritus, **CCLEANER** provides a tool for managing which programs run at startup



### Integrated antivirus protection

Microsoft finally took some responsibility for security in Windows 8, and bundled with the operating system an antivirus program dubbed Windows Defender. Despite the different name, however, Windows Defender is in essence just the default Windows Firewall paired with Microsoft Security Essentials ([tinyurl.com/9dv5nws](http://tinyurl.com/9dv5nws)), which is freely available as a Windows 7 download.

Security Essentials sports the same interface as Windows Defender, but it also delivers the same solid yet unspectacular virus protection. Why not check out the antivirus field and explore your options if you have to download a program anyway?

### Performance enhancements

Windows 8 boots much, much faster than does Windows 7. Microsoft achieved this extraordinary level of acceleration by putting Windows 8 in a sort of hybrid state where the base kernel session is hibernating, as opposed to undergoing a full shutdown.

So, if you want Windows 7 to boot up faster, just use your computer's hibernation option rather than turning it off. Or leave it in sleep mode when you're not using it: sleep mode draws only a small amount of power, and your computer will resume in a second or two whenever you're ready to begin work again.

If that's still not fast enough for you, consider buying a solid-state drive. Since upgrade copies of Windows 8 cost anywhere from £99 (for the base version) to £189 (for Windows 8 Pro), it's likely that you can upgrade your computer to a blazing-fast SSD for less than you'd pay to pick up a copy of Windows 8.

SSDs offer tremendous performance improvements over those old-fashioned platters of spinning rust (also known as mechanical hard-disk drives) in transfer times, access times and startup times.

It's not as if Windows 8 is much faster in real-world use, anyway. You may see some battery-life improvements if you're using a laptop, and the desktop may feel

a tad snappier - when the Start screen isn't swallowing it whole and getting in the way, that is - but benchmarks have shown that PC games play at about the same speed on Windows 7 and Windows 8.

Although Windows 8 may be a bit less RAM-dependent than Windows 7, if you run into memory problems in Windows 7 you should buy more RAM. Memory is cheap these days - far cheaper than is Windows 8. You can get 8GB of memory, which is more than enough for the average PC user, for less than £50 online. A standard 4GB kit costs about £30.

And with that, you have outfitted your Windows 7 PC with many of the vaunted nuts-and-bolts improvements introduced in Windows 8, only without all the glittering live tiles. If you're in the mood for continued tinkering, check out *How to Get Windows 8 Features Now* ([tinyurl.com/qaxe6gw](http://tinyurl.com/qaxe6gw)), which details programs that can mirror some of Windows 8's aesthetic changes, such as improved multiple-monitor support and the aforementioned live tiles. ☒



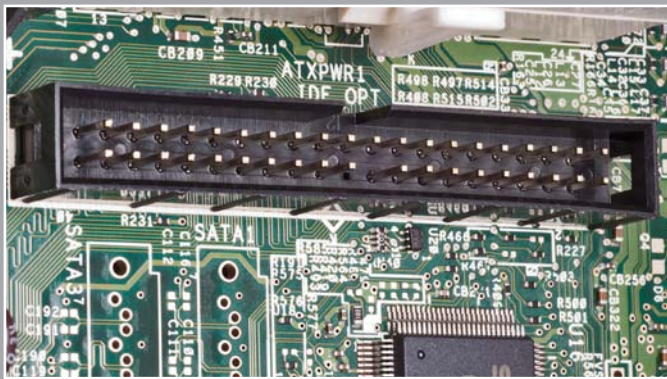
# 12

## PC technologies that need to disappear

Legacy hardware often outstays its welcome. These 12 components, ports and devices have lingered far beyond their time, writes Michael Brown

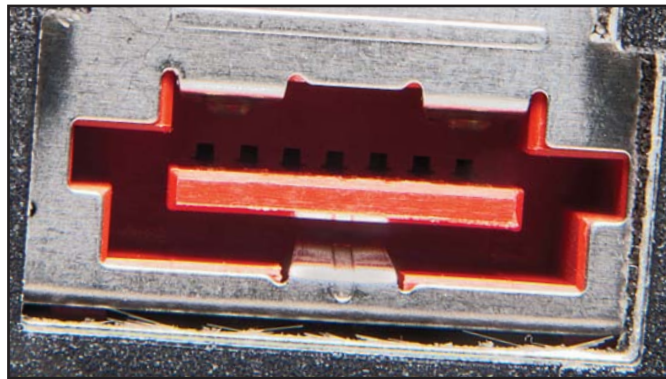
**S**ome technology hangs on long after it's needed. Time marches on, but some PC technologies don't know when they've worn out their welcome. While we applaud motherboard manufacturers for helping us extend the lives of our hardware, we also realise that we're paying for many components that we'll never, ever use. So we've rounded up a dozen legacy technologies that no longer serve much of a purpose. Begone, obsolete tech!





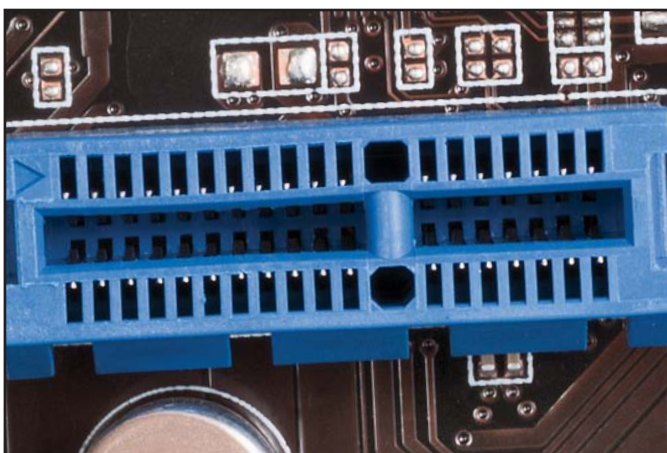
## PATA

PATA (Parallel Advanced Technology Attachment), also known as IDE (Integrated Device Electronics), is so old that you might never have heard of it. Designed as an interface for mechanical hard drives and optical drives in 1986, it was superseded by Serial ATA (SATA) more than 10 years ago. So why is it still making appearances today?



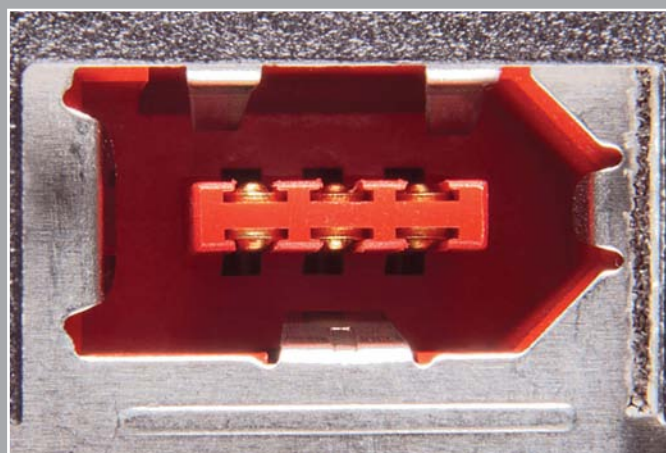
## eSATA

SATA delivers the highest speed with storage devices inside the PC, so why not use the same standard outside the PC? The problem with eSATA is that the cable doesn't carry power to the external device. Internal SATA relies on two cables: one for power; one for data. Since eSATA never caught on with consumers, and now we have USB 3.0 and Thunderbolt, it's time to oust eSATA.



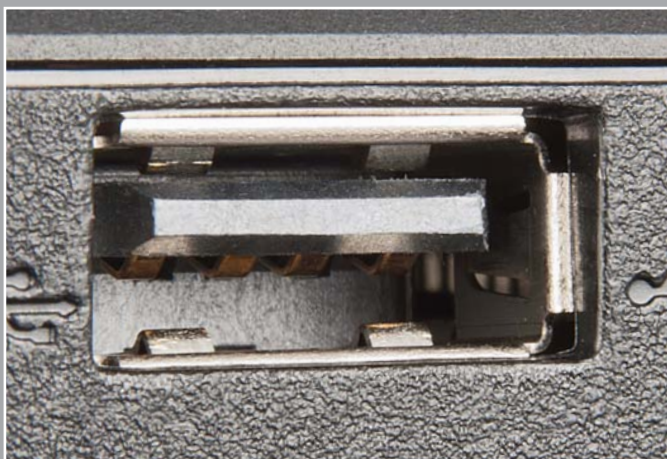
## PCIe x1 slots

We need multilane PCIe slots for video cards and other advanced peripherals. Single-lane PCIe slots are about as useful as nipples on Batman's suit. Go away!



## FireWire (IEEE 1394)

Apple designed this serial bus, but you can find it on most PCs too. Despite being a high-performance technology, it never really caught on, and the majority of external drives use USB. Excise it!



## USB 2.0

USB 2.0 was the bee's knees – at least until USB 3.0 came along. USB 3.0 delivers higher speeds and more electrical power to attached devices. So who needs USB 2.0? Let's get rid of it!



## Memory card reader

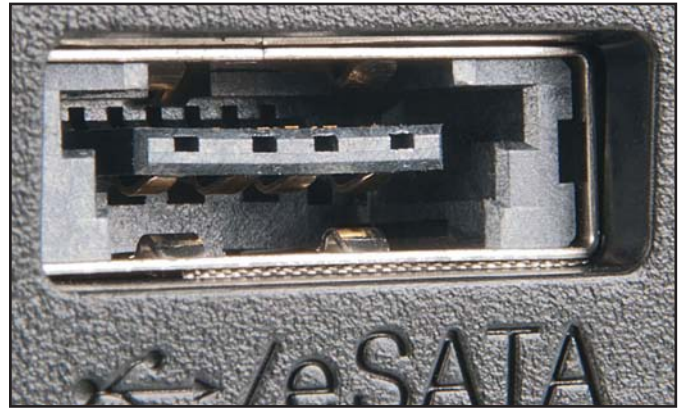
When was the last time you used anything other than an SD card? Everything uses SD these days, whether in full-size or microSD formats. We no longer need multcard readers that support Compact Flash, xD, Memory Stick and other obsolete formats.





## Optical drives

How will you rip DVD and Blu-ray movies, and your favourite CDs, without an optical drive? Who the heck still does that? Embrace the digital revolution! You can find plenty of online sources for both HD movies and music these days. And the last time we bought a game on disc was 2009's *Fear*. Dump the disc drive!



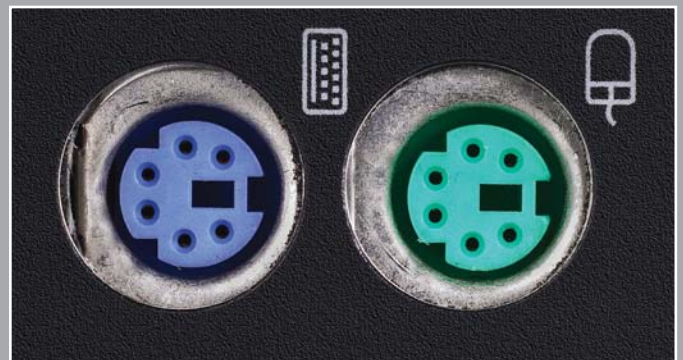
## eSATA/USB 2.0 combo port

To save room on the I/O panel, many motherboards feature ports that combine eSATA and USB 2.0. Their function changes depending on which cable the user plugs in. We applaud the innovation but, thanks to USB 3.0 and Thunderbolt, people no longer need these combo ports.



## Analogue surround sound

Be honest: when was the last time you contemplated connecting an analogue surround-sound speaker system to your PC? The industry tried to make the process easier for users with wireless surround speakers, but even they gave up on the concept. If you connect speakers to your computer at all, you're most likely going to choose a 2.1-channel system, so all you really need is a stereo output. And if you really want surround sound, buy speakers with an optical input.



## PS/2

IBM introduced this mouse and keyboard connector in 1987 with its line of PS/2 PCs. Since the ports were not designed to be hot-swappable, plugging a mouse or keyboard into a powered-up PS/2 port carries the risk of damaging your motherboard. Today, most mice and keyboards connect via USB, so why are PS/2 ports still so common? Because some companies disable the USB ports on their employees' PCs so that the staff can't smuggle out sensitive data.



## VGA

Yes, we know that corporate road warriors remain wedded to the precious VGA port. But why make the rest of us suffer for it? Surely the corporate world has made enough profit over the past five years to be able to afford to upgrade its boardrooms with new technology.



## DVI

Being digital is no longer enough - especially when you need a second type of digital interface and cable (that is, dual-link) to support the native resolution of a 30in display. Give us DisplayPort (with multistreaming, so we can daisy-chain several monitors). ☒



# Online privacy

A VPN for your PC, tablet or phone will boost security by encrypting and anonymising your internet activity. Roland Waddilove explains



**A** virtual private network (VPN) is useful and, some would argue, essential facility if you travel with a laptop, tablet or smartphone, whether you're a private or business user. As ever, free and paid-for options are available. Here we look at what a VPN is and what it does; turn to page 110 for our guide to getting started with the free version of Hotspot Shield.

A VPN securely connects two PCs over the internet. A VPN client is installed on one computer, which connects to a VPN server on another. All information exchanged between the two is encrypted to evade prying eyes.

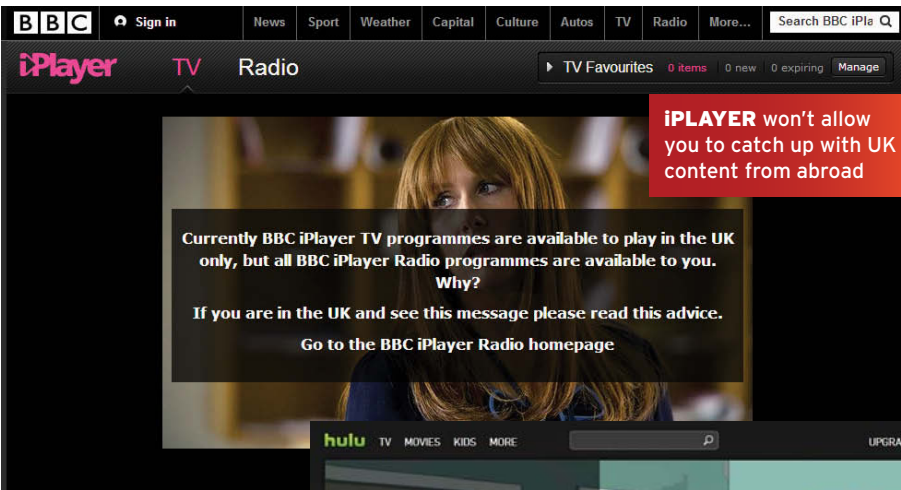
One use of this technology is to extend a private network across the internet to another location. For example, a business can enable remote workers to connect to the company network as though they were sat in the office. The encrypted network traffic is routed across the web from the user to the company. A company that has multiple offices can use a VPN to connect them, making it appear to employees as though there is only one network.

VPNs aren't just for businesses, though. The secure connection can also be used to allow you to browse the web anonymously. And anyone who wants to protect their privacy online should use a VPN.

At all times when you surf the web, someone somewhere is tracking your activity, whether that's your service provider, advertisers, webmasters or even malicious software. ISPs, for example, monitor your internet usage and may restrict the bandwidth if they detect that you are indulging in certain activities. P2P file sharing and BitTorrent traffic is speed-limited for instance. And the websites you visit will see your IP address and location, what browser and operating system you're using, your screen resolution, ISP and more.

To see what information you reveal online, head to stayinvisible.com. If the results disturb you, a VPN can stop these sites spying on you by hiding data that could be used to identify you.

If you use a laptop, tablet or smartphone at a public Wi-Fi hotspot, your activities could be monitored and private information collected. Online shopping and banking may



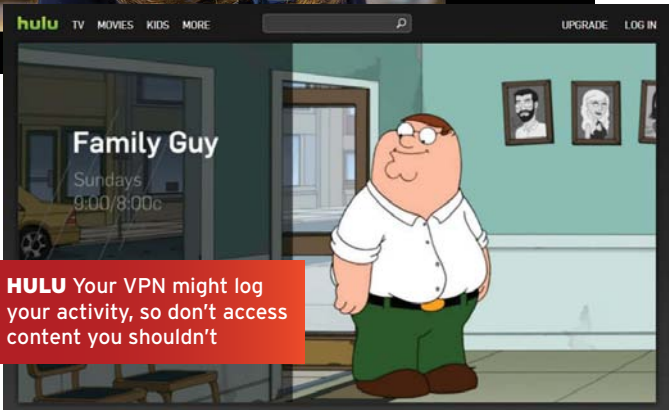
not be safe because of the open nature of the network, and any one of those people around you could be a hacker. A VPN boosts security because eavesdroppers are unable to make sense of your encrypted communications.

If you have ever tried to watch live or catch-up TV services such as BBC iPlayer from abroad, you will have been disappointed to discover that this isn't possible. Such services demand that you are in the UK, and it doesn't matter that you are a BBC licence payer and a UK resident. The solution is to use a VPN, which can mask your location and thereby unlock country restrictions.

**How do VPNs work?**

VPNs make use of a client and a server. A client program is run on your own PC, tablet or smartphone, which connects to a server to establish a secure and private link. When you enter a URL into your browser's address bar the request is redirected to the VPN server. The server requests the page from the site and sends it to your screen.

If the website tries to work out who you are and where you live, it queries the computer that requested the web page - but that was the VPN server, not you. If the server is located in the US and has a US IP address for example, the website sees the



request coming from a US resident. Similarly, if you are in the US and connect to a UK VPN server, websites will think you are located in the UK. In other words, your location will appear to the website as whatever country in which the VPN server is running.

Communications between the server and your computer are encrypted, so someone spying on you wouldn't know which websites you access and can't see private information such as passwords, usernames, bank or shopping details. A VPN can be turned on and off as and when you need it.

**Free vs paid VPNs**

Many VPN servers are available, but the best ones require a monthly subscription. The free alternatives tend to attract a lot of users, which means they can be slow; some are also ad-supported, or place limitations on the speed of the connection, your time online or amount of data transferred.

When choosing a paid VPN service, check in which countries it operates servers. If you want to appear to be Australian for example, you need a VPN that has servers in Australia.

Note that some VPNs may have bandwidth limits. Typically this is linked to the subscription price.

To ensure your security you'll also want to use a VPN that doesn't store logs. Some provide virus and spyware protection, too.

Check whether mobile apps are available: your phone and tablet are also vulnerable. Also check what protocols are supported, for example VoIP and BitTorrent. ☒

**Popular VPN services**

JustFreeVPN	Free	justfreevpn.com
Hotspot Shield (see page 110)	Free	hotspotshield.com
VPNBook	Free	vpnbook.com
Free VPN Access	Free	freevpnaccess.com
Private Internet Access	£26/year	privateinternetaccess.com
Pure VPN	£32/year	purevpn.com
Strong VPN	£35/year	strongvpn.com
Boxpn	£45/year	boxpn.com
Internet Anonym VPN	£79/year	steganos.com/uk



# Clean your PC, and tablet

When was the last time you cleaned your keyboard or disinfected your smartphone? Jim Martin explains how to safely sanitise all your gadgets

**T**he build-up of dirt, grease and germs on your tech kit is probably something you prefer not to think about, but it's important to clean your stuff regularly. The commonly quoted example is that the average keyboard and smartphone can have 10 times more bacteria than a toilet seat, which is pretty shocking.

The reason, of course, is that we all clean our toilets with germ-killing bleach on a regular basis. But our computers and gadgets are rarely – if ever – shown a J-cloth. Unless you are super-disciplined and always wash your hands before you pick up your iPhone or touch your laptop, you'll be covering them with germs.

And you can't rely on your own hygiene. If you let your kids or friends use your tablet or PC, they'll probably leave a ton of bacteria all over your kit. There are even people who use their smartphone on the loo. Is it a wonder that they get sick?

As well as invisible germs, there's the all-too-visible grime that blights keyboards, screens and any other surface that gets touched. If you keep your smartphone in your pocket, the ports and connectors are probably filled with dust and other detritus that isn't just unsightly, but might cause problems when you try to charge or sync your device.

When cleaning a **LAPTOP'S DISPLAY**, make sure you don't let drops run down into the casing at the bottom

So how do you go about cleaning all your kit?

Let's start with the humble PC, then move on to laptops, smartphones and tablets.



When cleaning a keyboard **DON'T DRENCH IT** with liquid or you risk destroying it

Photography by Dominik Tomaszewski

# smartphone

There's a wide range of products available to help you keep your **DEVICE CLEAN**, including these from Muc-Off, Whoosh! and Moshi

## How to clean a PC or laptop

As well as the PC tower, you should also clean your mouse, keyboard and monitor on a regular basis. The PC's main enemy is dust, and fans quickly become covered in dirt and fluff if you keep your computer under a desk. It's an even bigger problem if you have laminate or hard flooring instead of carpet.

Some PC cases have removable filters that are easier to clean than fans, but a quick vacuum of both (without removing the case) might be enough to eliminate most of the dust. Make sure your PC is turned off, naturally. Be careful not to hold your Hoover over a fan for too long, since spinning it too fast could damage it. You can insert a pencil between the blades to prevent them turning if you like.

If you're feeling more adventurous, you can remove the case's side panel (and even take out the fans) and clean them with a damp cloth. Make sure you check the CPU and graphics card fans while you're in there. Don't touch any of the other components inside the PC, though.

To clean those, invest in a can of compressed air to blast the dust off circuit boards and the internal panels. Try not to blow dust inside the power supply, and don't disassemble a power supply to clean it. You can then gently vacuum the PC's bottom tray to get rid of the dust.

You can clean the outside of your PC using a damp cloth. If you want to try a detergent such as washing up liquid, or an anti-bacterial cleaner, test it on a small area first to make sure it won't damage metal or plastic.

To remove dust from ports at the front or back, use compressed air rather than a brush. Any static electricity could damage your PC.

## Keyboards

PC keyboards are relatively easy to clean. Disconnect yours and turn it upside down over a bin or a surface that's

easy to wipe clean.

Give it a few taps and be prepared for biscuit crumbs, bits of crisp, eye lashes and other undesirable things to fall out.

As with the PC base unit, use a damp cloth to wipe dust and dirt off. Anti-bacterial sprays shouldn't damage plastic keys, but always test them on a small area first. Don't drench the keyboard with liquid or you risk destroying it. Instead, spray the cleaner onto your cloth - not directly onto the keyboard.

If you want to spend some money to get the job done, try Moshi's Complete Cleaning Kit, which includes a reversible 'TeraGlove', a combined brush and micro-fibre tip 'pen', and a spray bottle which you fill with water. It costs £15 from Apple ([tinyurl.com/njefmp2](http://tinyurl.com/njefmp2)) and helps remove dust and grime between keys, while the glove is great for cleaning screens.

Laptop keyboards aren't quite as simple to clean as PC versions. First, turn the computer off and remove the battery if possible. With the screen fully open, turn the laptop upside down and gently tap the dust and dirt into a bin or onto a surface.

If there's a problem with an individual key, perhaps because a large crumb is under it, you might be able to carefully prise off the key with your fingernail. Most laptop keys

clip on, but never force a key or you risk breaking the clips or scissor mechanism.

## Mice

Gone are the days of the ball-mouse - all use an optical sensor of some description now.

Dust and dirt can easily build up over the sensor and cause tracking problems, so use a damp cloth to clean the entire bottom surface of your mouse.

The top is where you'll leave grease and germs, so it's wise to use an anti-bacterial spray. As before, check on an inconspicuous area first and spray onto the cloth, not the mouse.

If you don't want to risk any damage to your PC, keyboard or mouse, use a cleaner that's been designed for electronic equipment, such as Muc-Off Device and Screen Cleaner (£3, [tinyurl.com/o5ubvjx](http://tinyurl.com/o5ubvjx)).

## Screens

You can use Muc-Off, or simply a damp cloth, to clean most PC screens (and TVs too), whether they have a matt or glossy finish. You can spray directly on to a display, but don't let drops run down into the casing at the bottom.

A micro-fibre cloth is ideal for cleaning a screen as it helps to avoid streaks and is effective at removing dust and fingerprints. Use a damp micro-fibre cloth if marks are hard to shift, but be careful not to press hard on a PC screen as you can easily damage the LCD panel.

The rest of the monitor can be cleaned the same way as a PC tower or mouse, using an anti-bacterial spray if you prefer. As ever, don't spray any liquids directly onto the casing, as it could damage the electronics inside.





## How to clean a tablet or smartphone

Touchscreens tend to be the most frequently cleaned component, since an accumulation of fingerprints obscures the image and feels nasty. However, it's crucial to use the correct cleaning products in order to avoid damaging your delicate device.

Most touchscreens these days have an oleophobic coating - literally 'oil fear' - which allows them to repel fingerprints. Such coatings aren't amazingly successful, but they are easily damaged by harsh cleaning agents such as ammonia, alcohol and other solvents.

For this reason, all you need to remove grease and dirt from your screen is a micro-fibre cloth. You can pick these up in a supermarket or online for next to nothing. Micro-fibre cloths are better than other material because the tiny, split fibres lift the dirt and retain it, as well as absorbing liquid. This means they don't leave lint on your screen, or simply spread the dirt around. You can dampen a micro-fibre cloth with water if the screen is particularly dirty.

When cleaning, use a circular motion rather than linear to give an even finish and avoid the risk of long scratches if a large piece of dirt gets caught up in the cloth. You'll find that a micro-fibre cloth will also effectively clean the rest of your device, including metal and plastic parts.

For ports and connectors, use a dry brush - a small paint brush is ideal - to gently remove dirt. Don't use a can of compressed air, as the force is likely to damage the delicate components.

If grime is stuck in the speaker or microphone grilles, it can be tricky to remove. You could try using your vacuum cleaner, but use caution. Another technique is to use a pin to clear individual holes in the grille.

## Sanitising

There are many cleaning kits available for smartphones and tablets, but they tend to be over-priced for what they are. Some include a miniscule amount of liquid and a small micro-fibre cloth; others provide the spray bottle, and you provide the water (such as Moshi's kit mentioned earlier).

What you should look for is a cleaner that will kill germs but is free from alcohol and ammonia. Examples include Whoosh! Screen Shine (£7.99 for a 30ml spray bottle and micro-fibre cloth, [tinyurl.com/nfs4nk7](http://tinyurl.com/nfs4nk7)), Eco Moist (£6.49 for a 50ml bottle and a



Pop your device into the Germix **UV STERILIZER** and it will kill bacteria without any chemicals

that's large enough for smartphones and tablets with up to 7in screens (search for the Germix UV Sterilizer). Larger versions cost proportionately more.

## Cases

Most people protect their smartphone and tablet using a case, so it's worth bearing in mind that you should clean this as well as your device. If it's made from plastic, you should be able to clean it with a standard kitchen or bathroom disinfectant spray.

Some plastic cases (and screen protectors, for that matter) have an antimicrobial coating, and while its effectiveness is questionable, it's certain to be a better choice than a case with fabric on it. Fabric is difficult to clean and disinfect, and will also harbour bacteria. Our advice is to avoid such cases. ☒



micro-fibre cloth, [tinyurl.com/o6wblqx](http://tinyurl.com/o6wblqx)) and Muc-Off's Device and Screen Cleaner, which cost around £7 for a 250ml bottle, but is also available in 'Rescue' kits that include a cloth.

Alternatively, you could buy a UV steriliser. These tend to be used for cleaning beauty or pet-grooming products, but can equally clean your smartphone, tablet or other small gadget. You simply pop your device in the drawer, leave it for 20 to 30 minutes each side and the UV light will kill all bacteria and viruses without any chemicals or liquids.

These aren't as popular in the UK as in the US, but it's still possible to buy a steriliser from eBay for around £35

When cleaning a smartphone avoid using liquids and instead use a **MICRO-FIBRE CLOTH** like this one from Whoosh!





# IS YOUR PC MAKING YOU ILL?

Although using a PC can take its toll on your health, most of the risks can easily be prevented. Mike Bedford provides some guidance to keep you healthy while you work on your PC.

**F**ew things in life are without their risks and using high-tech equipment is no different. In particular, there's potential for our PCs, tablets and smartphones to cause illness or injury. To worry about these risks, though, or even to cut back on using our computing equipment and thereby miss out on the benefits they offer, would be a gross overreaction. The fact is that, for most of us, these adverse effects on our health can be avoided by taking sensible precautions. Here we'll take a look at potential issues and provide guidance on how to prevent mishap. >>



Our emphasis will be exclusively on physical health and safety issues. In particular, we won't be thinking of behavioural issues such as decreased attention span, compulsive behaviour, aggression and the reduction of social skills; all of which some researchers have attributed to certain uses of electronic equipment. While we wouldn't want to suggest these concerns are all unfounded, the evidence isn't nearly as compelling as it is for physical conditions, and our aim here is to provide a practical guide rather than engaging in speculation.

## Eyesight issues

The good news is that most experts believe using a computer, even for protracted periods of time, won't harm your eyes permanently. However, an estimated 50 to 90 percent of computer users report adverse side effects including blurred vision, eye irritation, and headaches. Medical practitioners think this is caused by the repetitive actions such as scanning the screen and repeatedly changing our focus from the screen to documents on the desk. While much the same applies to working with books and paper documents, using a screen is worse because of the possibility of glare, flicker, and poor contrast. Fortunately, most of these issues can be prevented.

Cutting down glare is a comparatively easy matter of positioning your display to prevent direct light falling onto it, perhaps most commonly from a nearby window. Because LCD monitors tend to be less reflective than old CRT displays, this is less of a problem than it once was, but if you do have a CRT monitor, consider replacing it to help your eyesight. In addition to reduced glare, it'll also cut down on flicker, which is another cause of eyestrain.

It's not always possible to position your monitor to avoid glare from artificial lights and these can also contribute to poor contrast. Commonly, lights are too bright for regular use of a computer. If this is the case, but your PC is in a room that you use for other purposes, too, it's worth installing a dimmer switch so you can turn lights down or, alternatively, use a desk lamp. Also, make sure your screen's brightness and contrast are adjusted for maximum comfort.

Rearranging your desk can help too, and this also applies to preventing upper limb injuries so look at our guidance on that topic later too. From an eyesight perspective, experts say the best position for your monitor is 500 to 700mm from your face and slightly below eye level. In addition, if you work from paper documents, place them in a document holder next to your screen so that you don't have to constantly change your focus.

Finally, a few behavioural changes are recommended. First of all, the 20-20-20 rule is often advocated. Every 20 minutes you should look at something at least 20 feet away for 20 seconds. Longer regular breaks, involving getting up from your desk and walking around, are also recommended, and this helps with upper limb disorders, too. Some experts also suggest that you should force yourself to blink on a regular basis as this will help keep your eyes



Photo: IKEA

Using a **DESK LAMP** could reduce the glare on your screen

from becoming too dry. And finally, don't forget to have regular eye tests and make sure you wear any glasses that you are prescribed.

## Upper limb disorders

These involve damage to the muscles, nerves and tendons in the hand, wrists, arms, shoulders and spine. Symptoms include pain, numbness, aching, tiredness and tingling. Included here is repetitive strain injury (RSI) that affects the wrists. To a large extent these problems can be prevented by correctly configuring your work environment and taking care to ensure good posture and working practices.

The correct choice of desk and chair are particularly important, and while there are official guidelines in terms of the height of the desk, a good guide is whether it feels comfortable. Even in the home, a proper desk and either an office chair or a chair that promotes good posture is recommended. Note that the so-called 'workstations' that are often targeted at home computer users often aren't deep enough to house the display and keyboard and still have enough space to rest your arms. Space might be at a premium but many people find it's good to have sufficient space to rest your wrists between bouts of typing, although you shouldn't be tempted to do so while you are typing. If, on the other hand, you have plenty of desk space, don't push your screen and keyboard so far back that you have to lean forward to read the display.

As with eye-related complaints, taking regular breaks is important, but to avoid upper limb disorders it would be a good idea to use these breaks to stretch and exercise the affected areas. If you think you might have contracted RSI, be sure to visit your doctor to get it checked out. And finally, if you consider you're particularly at risk or have been diagnosed with RSI, one option is to minimise the use of a keyboard or mouse by using voice recognition software.

## Skin complaints

It might not be up there with eyesight and upper limb disorders, but some people have reported skin complaints associated with computer use. These include dry skin, itching and rashes to the neck, face or hands. Because this is a less common issue than the ones we've already considered, less research has been carried out into its cause. However, it seems probable that it's due to a drying of the air or electrostatic discharge caused by computing equipment, that some people are particularly sensitive to.

One source of electrostatic discharge, namely the CRT monitor, is now largely obsolete but laser printers also cause static effects. If you find you're sensitive, therefore, consider turning it off when it's not in use, positioning it further away from you or swapping to an inkjet. Dry



**AVOID GLARE** and adjust your monitor's settings for comfort



If you're concerned about a possible risk, moving your **ACCESS POINT** a few metres further away will make a big difference to signal strength

air results from anything that causes heat and this includes just about any electrical equipment, not just computers. Again, turn stuff off when you don't anticipate using it for a while, if the weather permits open a window, and perhaps invest in a humidifier.

## Exposure to RF

In looking at radio signals from mobile phones and their associated base stations, colloquially referred to as masts, and from Wi-Fi access points, we should start out by saying that we don't believe there are any serious health risks. However, because this is such a common concern, and worry can be a risk in itself, we feel compelled to look at the issues, and suggest how you can reduce the risk, if you're still concerned.

Studies by eminent scientists suggest that there's very little risk associated with the exposure to low-level radio signals at the frequencies used for mobile phone networks and Wi-Fi. However, it's very hard to prove that something doesn't happen with 100 percent certainty, so if you are more convinced by "anti-mast" protesters, it's likely that you won't be persuaded by these studies. Even so, some undeniable facts about radio signals might cause you to divert the target of your concern and also give some pointers on how to reduce the risk, should such a risk exist.

The strength of a radio signal decreases with the square of the distance to its source - this is called an inverse square relationship. In plain English, if you double the distance between you and the transmitter, then the signal strength drops to a quarter. If you increase the distance from one to 100m, the signal becomes 10,000 times

weaker, and so on. Action groups have suggested that some cancer clusters have been caused by living within 1km of a base station, and it's commonly suggested that base stations should not be located closer than 100m from schools. However, that inverse square law shows that any such concern is misplaced. Compared to a base station at 100m, let alone 1km, a mobile phone is 5,000 times closer to your brain while you're making a call. The signal strength, therefore, will be about a million times greater when we take into account the higher power of a base station. This means that the risk of being 100m from a base station is equivalent to using a mobile phone for less than a tenth of a second per day. Clearly, reducing your use of a handset is going to make a much bigger difference than protesting about the positioning of base stations.

The inverse square law also gives some guidance on reducing any possible risk from exposure to a Wi-Fi access point. Positioning it some distance from people would be a good idea and, because of the inverse square law, a modest change can make a big difference.

## Portable devices

With pundits suggesting that the era of the PC is coming to an end, it might be tempting to consider replacing your PC with a tablet. However, before giving up on desktop PCs entirely, in favour of portable alternatives, it would be wise to consider the health implications. While laptops and tablets serve an important role when we're out and about, they're not nearly as ergonomic for use at home or in the office.

Even at home, because they're portable, we often use laptops and tablets while sitting watching TV, on a kitchen worktop, or even in bed. Having read our advice on positioning PCs to avoid eyestrain and upper limb disorders, it will be clear that this is just asking for trouble. While there will always be occasions when you'll want to do a five-minute job wherever you happen to be, for protracted use you really ought to take your portable device to a room with a desk that's been designed with computer use in mind. In addition, it would be an excellent idea to use a laptop for long periods of time only when it's connected to an external monitor, keyboard and mouse. ☑



Don't allow mobile devices to lead you into **BAD HABITS**



Make sure there's **PLENTY OF SPACE** around your desk





# Extend your laptop's battery life



Most laptops don't last too long once you unplug them from the mains. Some don't even have removable batteries, so swapping the empty one for a fully charged spare isn't an option. Jim Martin shares his top tips for squeezing out some extra juice



**L**aptops are great tools for working on the go but, once the battery has drained, you'll be reliant on a mains power source to get anything done. Follow our tips for extending battery life and your laptop will last longer between charges. These tips apply to any laptop, although we've focused on Windows here.

### Dim the screen

By far the biggest power drain on most laptops is the screen - or, to be more specific, the screen's backlight. This is what enables you to see the colours on an LCD, and some laptops have power-sapping fluorescent backlights. More modern laptops have LED backlights, but even these consume a fair amount of juice.

Simply reducing the screen brightness can add 30 minutes or more to your battery life. If your laptop has dedicated hotkeys for adjusting brightness then use these. Typically, you'll hold the Fn key and press one of the function keys in the top row, or one of the cursor keys labelled with a sun symbol.

If not, press and hold Windows, X. This will open the Mobility Center in which you can change the brightness.

### Change the power settings

By default, your laptop might be set to use Windows' Balanced setting rather than power-efficient Power Saver option. To rectify this you should open the Control Panel, search for Power Options, then check which Power Plan is selected.

In general terms, what you're looking to do is ensure that the operating system does its utmost to save power where possible. This means turning off the screen after a short period of inactivity, such as when

**Change the POWER SETTINGS to extend laptop battery life**

you're making a coffee, and turning off the hard drive or even going to sleep if nothing appears to be happening.

Delve into the advanced power settings and you can tweak things to your liking, specifying when the system is allowed to hibernate and which components should use their maximum power-saving profiles (including, on some laptops, the graphics card and Wi-Fi adaptor).

### Disable Wi-Fi and Bluetooth

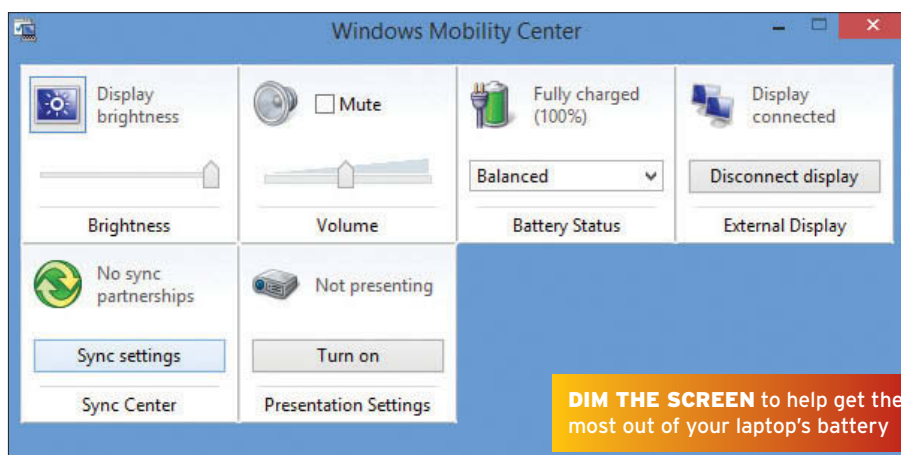
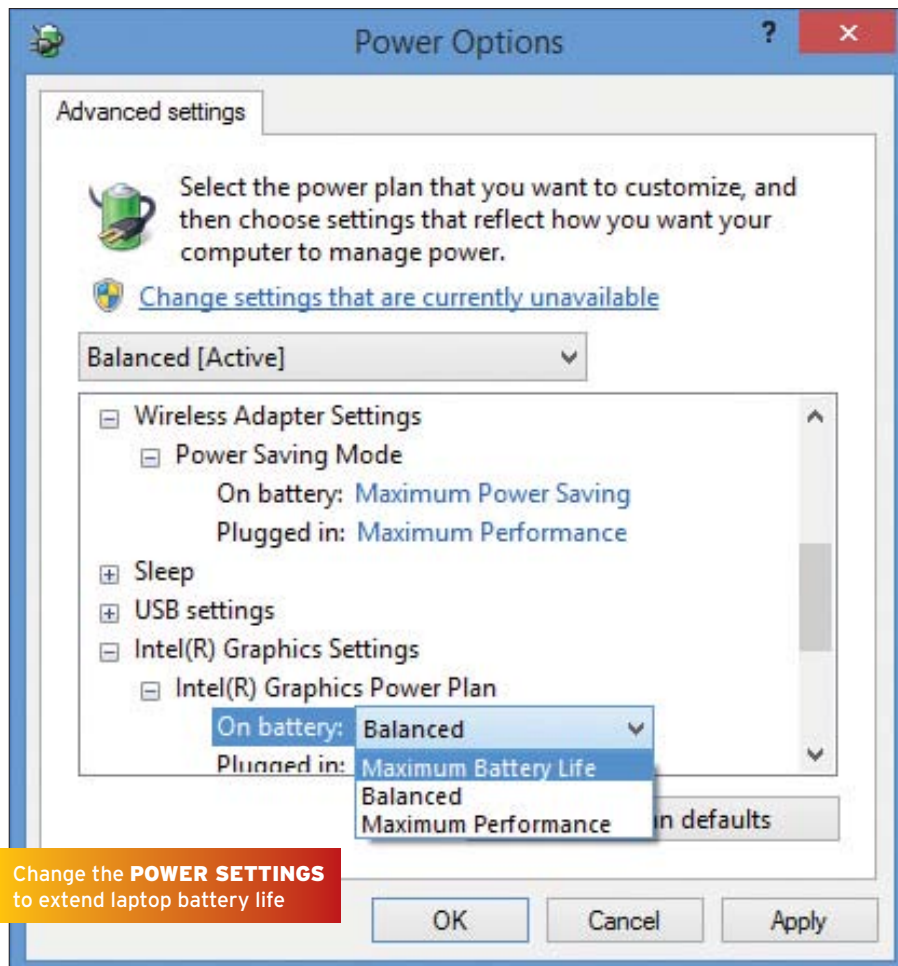
Disable Wi-Fi and Bluetooth when you're not using them. Both radios can use a fair amount of power, so it makes sense to turn them off when you're on battery power. Most laptops have a switch or key combination to disable Wi-Fi, but Bluetooth can be trickier.

Some manufacturers provide a utility (often obvious in the Start menu) for enabling or disabling Bluetooth; if in doubt, you can head to the Device Manager in the Control Panel, scroll down the list of hardware until you find the Bluetooth adaptor, then right-click it and choose Disable. (Double-clicking on this when disabled will re-enable it.)

### Don't leave your laptop on charge

Lithium-ion batteries are relatively clever in that they can't be overcharged, but it's not good for the long-term health of your battery to leave your laptop always plugged in to the mains. Some manufacturers, including Sony and Lenovo, provide a utility that prevents the battery from fully charging.

This helps to prevent battery degradation and means you can leave the laptop always connected to the mains. When you want to



use your laptop on battery power and get maximum battery life, disable the limiter and allow the laptop to charge to 100 percent.

### Remove unnecessary peripherals

Leaving a disc in your DVD drive is a sure way to reduce battery life, as it might spin up whenever you launch Windows Explorer or access the Save dialog in an app.

Any USB accessories you leave connected, including portable hard disks and USB webcams, will also draw power - disconnect them if they're not needed.

### Get a second battery

Spare batteries are available for many laptops, and you might even find that your model can accept a higher capacity than was originally supplied. Say your battery is a 'six-cell' unit. Swapping this for a 'nine-cell' should give a third extra running time.

Other laptops, including some Dell models, allow you to remove the DVD drive and install a second battery in its place. DVDs are so last year in any case.

Installing a **SOLID-STATE DRIVE** should prove beneficial to runtime



### Upgrade to an SSD

Mechanical hard disks, which are still common in laptops, require a fair few watts to spin their platters. An SSD uses less power as it has no moving parts.

You won't see a huge improvement in battery life, but it will speed up your laptop. See our guide to fitting an SSD at [tinyurl.com/pwby3yv](http://tinyurl.com/pwby3yv).

Alternatively, buy a universal laptop battery that comes with a variety of tips to fit just about any laptop. You simply charge it up, choose the appropriate tip and connect it to your laptop's power socket when the internal battery runs low. The external battery charges the internal battery or, if you remove the internal battery, powers the laptop directly.

### Switch to internal graphics

If your laptop has an AMD or nVidia graphics chip, there's a good chance it will also have integrated graphics (usually Intel). In theory, it should be set up so the powerful graphics chip is used only when playing games or running demanding applications.

As with Bluetooth and Wi-Fi, manufacturers sometimes offer a utility that

“

**Contrary to popular belief, laptop batteries are consumables - just like printer ink**

”

### Buy a new battery

Contrary to popular belief, laptop batteries are consumables - just like printer ink. Batteries aren't designed to last the lifetime of the laptop and, if you check the small print on the warranty statement, you'll probably find that the battery isn't covered, or is guaranteed for a shorter period than the laptop itself.

Batteries degrade over time, and after several years of hard use you'll probably find the battery has only 50 percent of its original capacity remaining. Clearly, then, the laptop will last only half the time away from the mains.

While some laptops don't have user-replaceable batteries, most do. You can buy third-party replacements for considerably less than the cost of the original part from your laptop manufacturer.

lets you manually switch between graphics chips. You may have to reboot, but most designs allow you to switch on the fly.

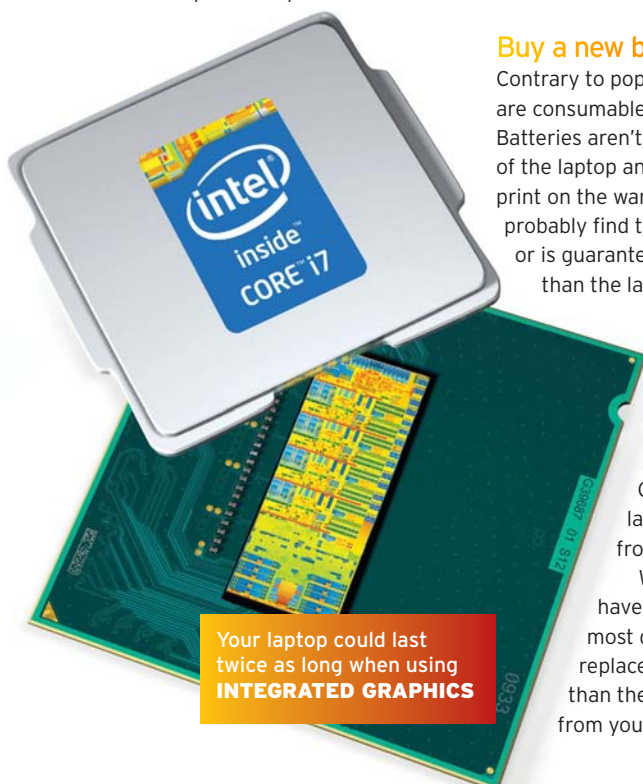
We've seen such laptops last twice as long on battery power when the integrated graphics chips is used instead of the nVidia or AMD chip.

### Manage your memory

If you're the sort who has 10 or even 20 tabs open in your browser, you'll benefit from longer battery life by culling those tabs. The same goes for running lots of apps at once.

When you run lots of programs, or have open lots of photos in an editor, you'll use up all the free system memory. Anything extra has to be 'paged' to the hard disk which, as we've said, is a mechanical device in many laptops.

This not only slows down your computer, but also decreases battery life. One quick fix is to install more memory in your laptop, but keeping the bare minimum of programs and tabs open is another way. ☒



Your laptop could last twice as long when using **INTEGRATED GRAPHICS**



# How to edit PDFs

Ronald Waddilove explains how you can add annotations and edit PDF files

**A**dobe invented the PDF file format to solve a problem: how to view and print documents if the user didn't have the original software or fonts. Acrobat packaged documents into special .pdf files. The company then made Acrobat Reader (now known as Adobe Reader) free to download and use, so people could open, read and print the files, though, you needed the expensive Acrobat Professional to create and edit them.

In 2008 Adobe made the PDF file format an open standard and since then there's been an explosion of PDF-related software. However, while many programs can save documents in PDF format, few can edit them directly. What if you receive a document in PDF form and need to change it? Or you might save a file as a PDF but lose the original (editable) document through a disk or human error? In all these situations you need a PDF editor.

Some editors let you load and annotate PDF documents. The original content can't be changed, but you can insert notes and comments, use a highlighter pen, strike through text, delete pages, fill out forms, and so on. Many of these 'editors' are free and some are really good, but they don't let you edit the original content.

Suppose you want to change the text in a PDF? There are a few tools that can do this, but they are less common. Here are some tools that are considerably cheaper than the £450 Adobe charges for Acrobat XI Pro.

## Edit a PDF for free: online tools

A number of online services can be used, such as CutePDF Editor ([cutepdf-editor.com](http://cutepdf-editor.com)). All you need is a web browser and the Adobe Flash plug-in. The editing facilities are limited and not all PDFs will load, but if the document is relatively plain and all you need are basic facilities, then it's worth trying.

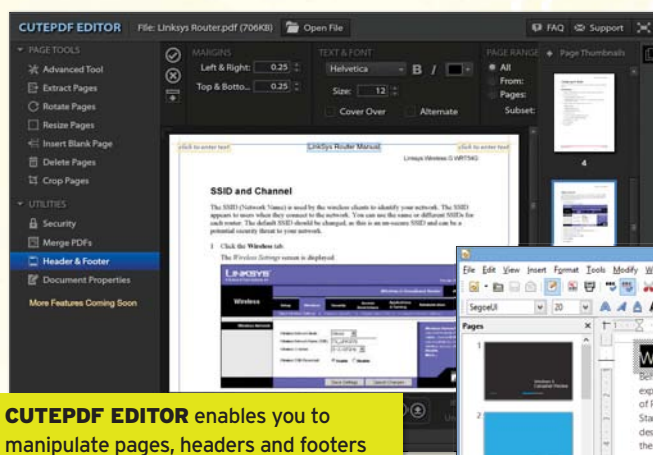
It's essentially a page editor - you can delete pages, rearrange their order, insert blank ones, crop and resize them. The only editing features are the ability to add your own page headers and footers, such as titles, dates, page numbers, and so on.

PDF To Word ([pdftoword.com](http://pdftoword.com)) does just what the name says. You select a file, upload it to the site and it emails you the Word document a minute or two later. The advantage of this is that you can use Word or another word processor to edit the text and resave the document as a PDF (many word processors can save in PDF).

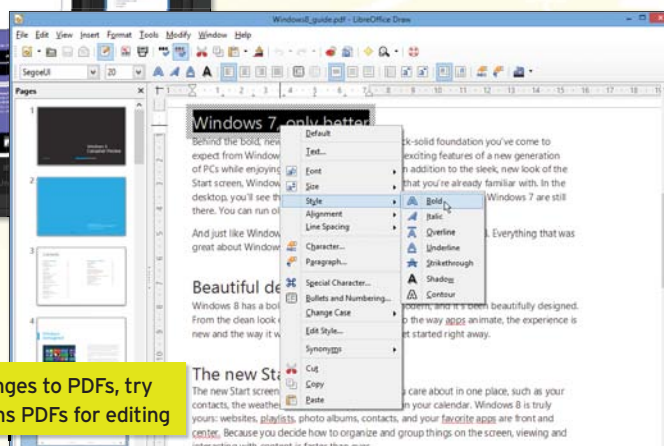
There's also a PDF to Excel service ([pdftoexcelonline.com](http://pdftoexcelonline.com)). The file is emailed to you, which you can then load it into Excel for editing. The results weren't as good, though.

## Freeware tools

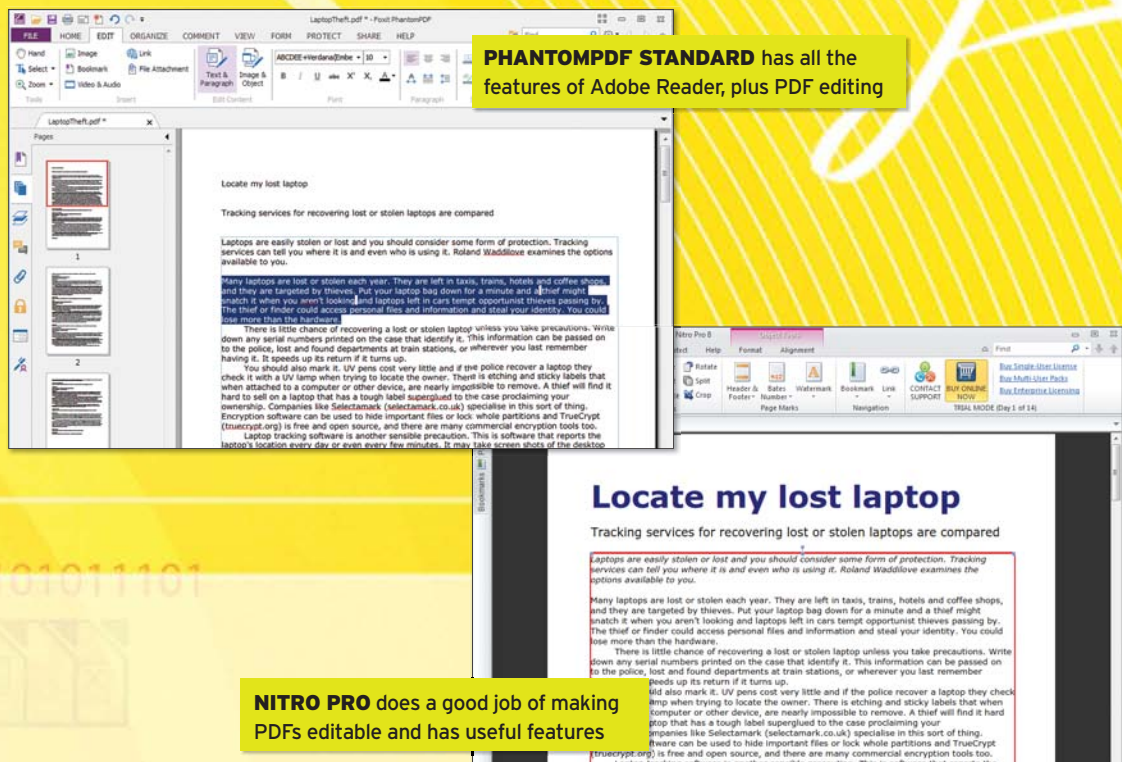
Foxit Reader ([foxitsoftware.com](http://foxitsoftware.com)) is a lightweight alternative to Adobe Reader. It does more than just display PDFs, though, and it has a wide range of powerful tools. You can't edit the contents, but text can be struck through with a line and replaced by a pop-up note. You can also insert sticky notes, attach files to pages, click anywhere



For making minor changes to PDFs, try **LIBREOFFICE**. It opens PDFs for editing







and add text, add text boxes, draw with a pencil, add rectangles, lines, arrows, polygons and clouds, and add stamps like Approved, Rejected, Draft, and so on. It's great if you have to comment and annotate PDFs.

PDF-XChange Viewer (download it from [tracker-software.com](http://tracker-software.com)) offers an almost identical set of features to Foxit Reader and is useful for annotating PDFs. PDFCool Free Studio ([iconcool.com](http://iconcool.com)) is buggy and can quit with an error message, but when it works it has some useful features. For example, it can extract the text and images from a PDF, which you can then edit elsewhere, such as in a Word document. Text can be typed onto the page and there are some basic drawing functions like lines, circles and rectangles. It's not as good as Foxit Reader, though.

LibreOffice ([libreoffice.org](http://libreoffice.org)), the free Office alternative, is worth considering if you want to edit the text in a PDF file. It loads PDFs and it can cope with very large documents with hundreds of pages. The only snag is that each line of text is a text box, which makes it awkward to edit large amounts of text.

## Pro tools

Many suppliers of free PDF tools have 'professional' products which you have to pay for. Foxit offers PhantomPDF Standard (\$80) and Business (\$116), and Advanced PDF Editor (\$89). The Standard edition has all the facilities of the free Reader, plus editing capabilities. It's possible to edit paragraphs and sometimes whole pages

of text, although it doesn't flow like a word processor document, which is irritating. PDFs can be saved as Word and Excel documents, and .rtf and .txt files, though.

Nitro PDF ([nitropdf.com](http://nitropdf.com)) has a free Nitro Reader and also Nitro Pro (about £77), which enables you to edit text, images, pages and documents. You can also annotate them with sticky notes, drawing tools, stamps and so on. Pages can be inserted and deleted, PDFs can be split, watermarks added, and headers and footers inserted. Nitro Pro isn't cheap, but if you want to edit the contents of PDFs it's easier using this than in PhantomPDF. Nitro Pro isn't perfect, but it comes close and you can easily change the text, styles, fonts, colours, and so on.

Microsoft Office 2013 does a reasonable job of both writing and reading PDF files. It's particularly good at opening Office files saved as PDFs and they can be edited and saved as Word files or PDFs again. Like the other pro tools, it isn't perfect, but you do get an editable Word document.

## Conclusion

After trying many free and commercial tools it's clear that PDFs aren't designed for editing and even the best tools aren't perfect. PDFs can be annotated with free tools and even split, merged and have pages inserted or deleted. However, even the professional tools run into problems when it comes to editing the text and images. Microsoft Word and Nitro Pro are your best bets. ☐



## Versatile and Powerful NAS



DS1513+



DS1813+



### Superior Performance

Read and write speeds of 350 MB / sec and 202 MB / sec respectively. With dual core CPU and upgradable RAM, the DS1513 + / DS1813 + is ideal for the implementation of essential business functions and the most intensive applications, such as data encryption and video transcoding.

### Advanced Business Applications

Complete integration with Windows® ADS and LDAP environments. Backups via iSCSI LUN helps make the best use of the storage space and offers the highest performance during backups.

### High Reliability

Passive cooling for processor to prevent from fan failure. Redundant system fans provide continuous availability. Other fail-proof designs include multiple LAN ports and hot-swappable hard drives.

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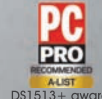
Distributed by



Synology apps available on



Accolades for Synology



JIM  
MARTIN**Tech  
Help**

## Expert advice

We realise that not everyone is a Windows expert, and even something as simple as transferring photos from your camera to your PC or laptop can present a challenge. You can find out our preferred method on page 117.

A more advanced project is upgrading your computer's graphics card. On page 114 we show you step-by-step how to install a new graphics card and get the power you need to play the latest 3D games.

Staying anonymous online has many advantages, not least of which is to prevent anyone (including advertisers) tracking where you go on the web. A good way to surf under the radar is to install VPN software, and you'll find a detailed guide on page 110.

PCs and laptops can clog up with dust, and fans can fail. We show you how to keep an eye on your processor temperature and get early warning of any problems using the free Speedfan utility on page 116.

Finally, for a bit of fun, you can turn a song on your iPhone or Android smartphone into a ringtone. Everything you need to know is on page 118.

## Index

Helproom.....	104
Anonymous browsing.....	110
Easier scheduling.....	112
Upgrade your graphics card .....	114
Check your CPU temp.....	116
Transfer photos from camera ...	117
Use an MP3 as a ringtone .....	118



112



116



118

## QUICK TIP: SHARE FILES OVER DROPBOX WITHOUT SIGNING UP

A nifty web-based utility - Dbinbox - enables people to share files with Dropbox users without having to create their own account. Think of it like email for Dropbox.

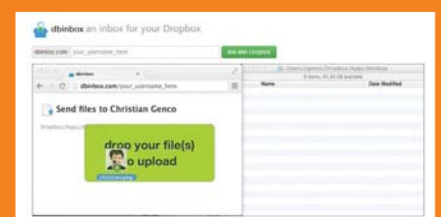
Simply head to [dbinbox.com](http://dbinbox.com) and enter a username, then click 'Link with your Dropbox'. You'll have to give Dbinbox permission, after which you'll find a Dbinbox folder inside your Apps folder.

Now just hand out your custom Dbinbox link. When someone uses it,

he or she can drag and drop files right to the browser window or use a file selector. There's even an option to send a message (which gets delivered as a text file), a nice touch.

For a little added security, Dbinbox lets you create an access code you can require users to enter before sending files your way.

This is a great service that overcomes one of Dropbox's hassles. There's no



charge to use Dbinbox, although the developer does accept Bitcoin donations should you wish to make one. ☒



PAUL  
MONCKTON



## YOUR QUESTIONS ANSWERED

# Expert computing advice

We tackle readers' hardware and software conundrums

### UPSIDE-DOWN VIDEO

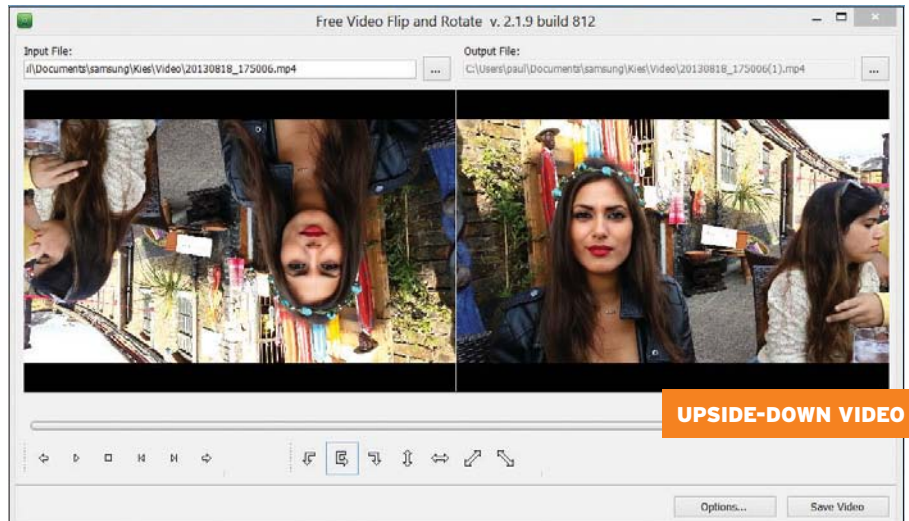
**Q** Why do most of the videos I shoot with my Samsung Galaxy S III come out upside down? Is there any way I can prevent this from happening?

This occurs when the record button is on the left while you're holding the Galaxy S3 horizontally to shoot in landscape format. When gripping the device this way around you're effectively shooting upside down, though, the phone's onscreen display automatically rotates the picture so it looks the correct way up. However, when you copy video over to a PC via USB they can play back upside down.

An easy way to deal with this is to use a utility to rotate the video for you on your PC. We've successfully used DVDVideoSoft's free Video Flip and Rotate ([tinyurl.com/ncm4avz](http://tinyurl.com/ncm4avz)). If you install it, make sure to do a custom installation and uncheck any of the toolbars and other unwanted options it will otherwise install by default.

### TWEETDECK IS BROKEN

**Q** I've been using TweetDeck on my Android phone, but recently it stopped working and won't download any tweets. Can you help?



The reason why it's stopped working is that Twitter has discontinued its iPhone, Android and Adobe AIR-based apps. TweetDeck will focus instead on web-based versions. So nothing is broken on your phone, it's because TweetDeck was permanently "turned off" on 25 July 2013.

There are many alternative Twitter apps available for Android, as a quick search of the Google Play Store will reveal. The official Twitter app is an obvious, but very basic,

option. Also take a look at Plume, which comes in free and premium versions, or Falcon Pro for a fully-featured paid-for app.

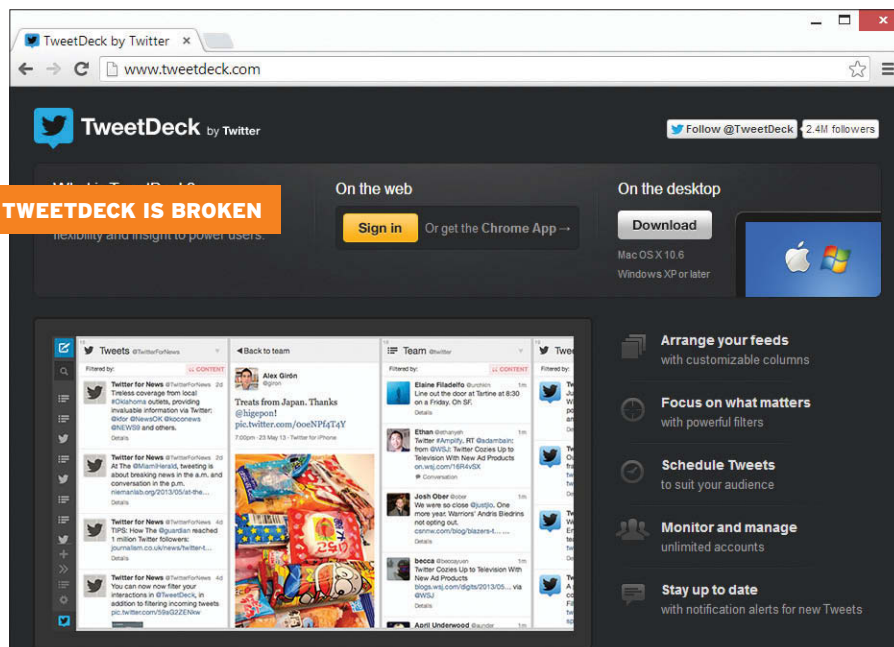
### UPGRADING TO WINDOWS 7

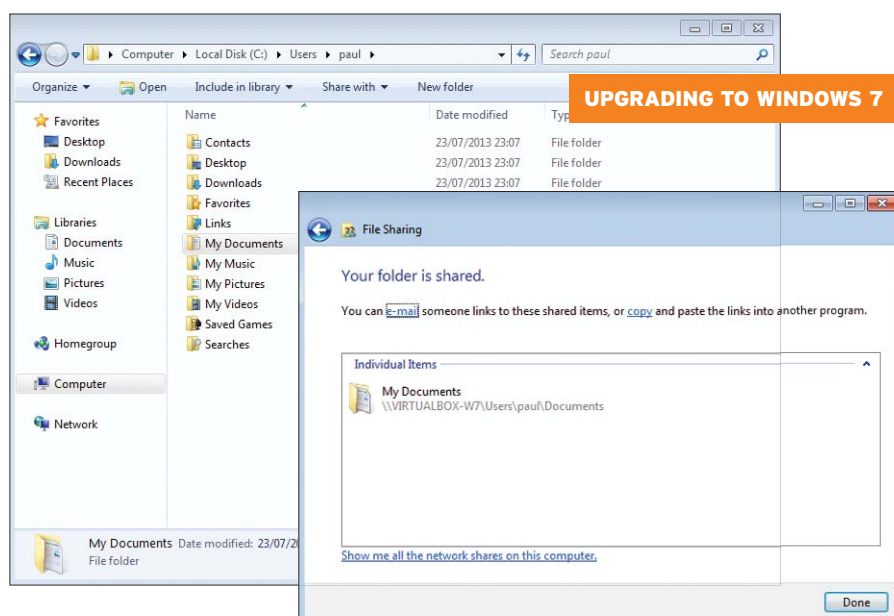
**Q** I have a six-year-old desktop PC and laptop, both running Windows XP, on my home wireless network. The latter needs replacing and I would like to purchase a new one with Windows 7 installed. Will a laptop with Microsoft's latest operating system be compatible with my existing Windows XP desktop computer through the wireless network?

Yes it will. XP doesn't support some of the newer Windows 7 features, such as HomeGroups, but you'll still be able to connect them and share all the usual things such as files and printers. Just make sure that you use the old sharing method rather than a HomeGroup and everything should work just as before.

### ANTI-VIRUS SOFTWARE

**Q** I use Trend Micro as my anti-virus application, and when I attempted to install System Mechanic, which is on your current disc+, I was directed to exit my anti-virus software. When I did close it, I was asked to uninstall the program. Does this mean that Trend Micro is unable to run alongside System Mechanic?





Many programs, especially those that perform low-level modifications such as System Mechanic, ask you to disable anti-virus software during the installation process. This is to prevent Trend Micro from getting in the way and attempting to

stop the new application from making changes to your system.

However, disabling or exiting the software isn't the same thing as uninstalling it completely. All you need to do is temporarily turn off Trend Micro during the installation

of System Mechanic and then re-enable it. If you've already uninstalled your anti-virus software, we suggest you re-install it after installing System Mechanic so you remain protected against malware.

## MALWAREBYTES

**Q** I've been a *PC Advisor* subscriber for many years and still find it the best PC magazine in the UK. However, just occasionally I find that the advice given in the *Helproom* isn't as useful as it could be, and I came across one such instance in the October 2013 edition.

Under the heading *Spam, Spam, Spam* ([tinyurl.com/qdux6sh](http://tinyurl.com/qdux6sh)) I thought the reader was given good advice. Although I've used my own tried and tested anti-virus firewall and anti-spyware software for many years, I was particularly keen to try the suggested Malwarebytes free software, with a view to buying the full version if it was as good as claimed.

When I downloaded it and ran the setup program, the result was not what I expected. It tried to install extra apps, toolbars and search engines,

Continues >>

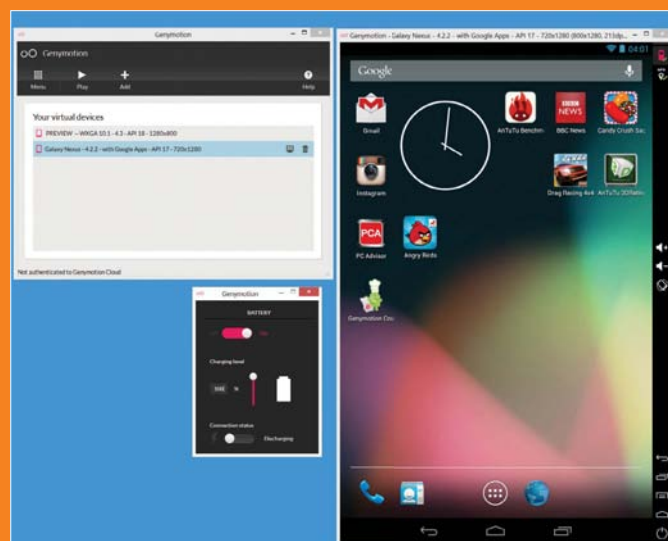
# RUN ANDROID APPS ON A PC USING GENYMOTION

There are various methods of running Android apps on a PC, but these can be tricky to set up, and vary greatly in the levels of performance and compatibility provided. Genymotion is relatively simple to install and provides pre-packaged Android installations that you can download and run on your PC or Mac.

To download Genymotion, you'll first need to sign up at [www.genymotion.com](http://www.genymotion.com). Once you've validated your email address and signed in, you can elect to download a version for Windows with VirtualBox included, or an option for Windows, Mac OS X, Ubuntu or Debian, which will require you to have VirtualBox already installed.

Once you've installed the software, sign in with your Genymotion credentials and then select from a list of virtual Android devices with varying hardware configurations and versions of the Android operating system. Your device will then automatically download.

All that remains for you to do is click the Play button and start it up. You can then sign in to your new device with your Google account, and download and run any apps you wish.







resetting my own preferred items in the process. Then at the end I found that Malwarebytes hadn't installed, even though no error message was given. There was just no sign of it on my PC.

I cleaned up all the extra items installed by the setup program and tried again, this time unclicking any options to install other software, and so on. The result was the same, no Malwarebytes but still some unwanted toolbars, and the default home page in Internet Explorer – even though I had tried to exclude these.

As an IT professional of almost 30 years and a regular user of every version of Windows from 3.1 onwards, both at home and in the office, I was unable to get round these problems. I certainly won't be trying Malwarebytes again, but I wonder if the advice given in the Helproom has always been tested before publication. There may have been changes in the installation procedures for some software that did not exist previously when last looked at by the Helproom team.

Looking at your description, it appears that what you have downloaded is likely to be a fake version of Malwarebytes. Either that or the download site has confused you into downloading the wrong file.

All too often, sites that host the files for download are littered with ads. Advertisers make these ads look like download buttons to confuse you into thinking you need to click it to get the software you came for.

In fact, they'll download an entirely different program to the one you wanted.

In many cases, the real download button is placed some way down the page, requiring scrolling to reach it. Or it may be a simple link, which isn't as prominent as a large graphical button. This can result in you downloading not Malwarebytes, but something rather less useful or perhaps even harmful.

It's also not uncommon for malware to masquerade as anti-malware software in an attempt to trick you into installing it. Default installation options that include various unwanted toolbars and other programs are commonly found tacked on to this sort of download.

When downloading any software, but particularly anti-malware applications, make sure to go to the original software developer's website rather than to a third-party site. Don't Google "malwarebytes" and click on any of the results. Go directly to [www.malwarebytes.org](http://www.malwarebytes.org) by typing it into your browser's address bar. Once on the Malwarebytes site, click on the Free Version Download button. This will take you to an external site. Click the Download Now button to go to the actual download page. Now wait. Don't click on any other download buttons. Your download should start by itself and the filename should be something like 'mbam-setup-1.75.0.1300.exe'.

During our installation of this file, there were no unwanted toolbars, applications or search engines offered for installation, and a Malwarebytes application icon was placed on the desktop. This is what leads us to believe that the software you downloaded was not the genuine article.

If you're brave enough to try again, and you follow the instructions above, you

should find Malwarebytes runs correctly without installing any unwelcome extras.

## LEGACY INSTALLATIONS OF XP

**Q** I've read that Microsoft will withdraw support for Windows XP Service Pack 3 in July 2014. What does this mean and how can I prepare for it?

I assume Microsoft will no longer plug any loopholes and not issue any further maintenance updates. I don't see this as a problem as XP is now very mature.

However, I need to retain Win XP/SP3 on at least one machine for applications that won't install or run Windows 7 or Windows 8. Also, from time to time I wipe the XP disk clean and re-install it to keep XP streamlined and clutter free.

For the reinstall, how will I get all the updates issued since SP3 was released?

Will Microsoft issue a final release, for example, Service Pack 4? Will existing updates still be available for download, and for how long?

The withdrawal of support for Windows XP means that Microsoft will no longer be producing any security updates for the operating system or fixing any bugs. It also means you won't be able to get any help or technical support on a free or paid-for basis.

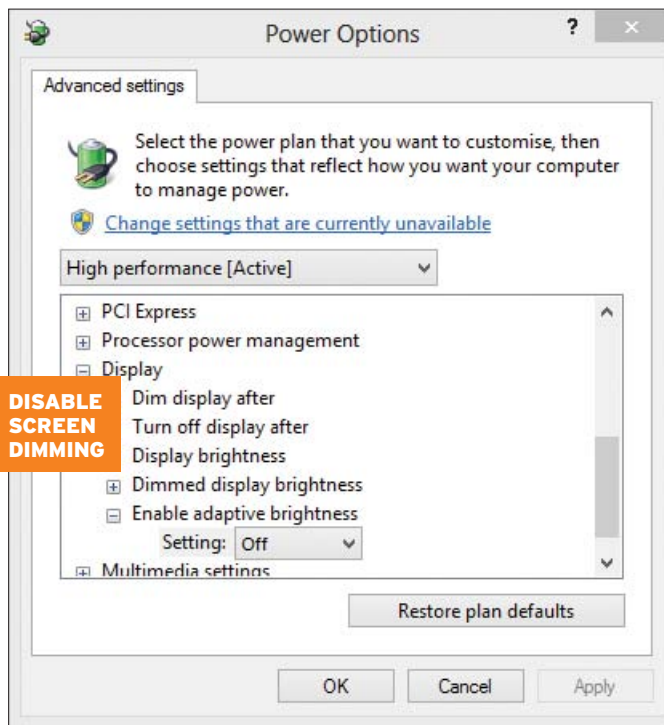
Being 12 years old, XP is indeed mature, but this doesn't mean it's protected against future exploits. Any exploits found in newer versions of Windows are likely to be tested to see whether they can also be adapted to attack XP, and if they're successful there'll be no help from Microsoft.

There may be other ways of preventing the exploit, but you'll be relying on third parties to find them. Furthermore, it's possible there are those holding back exploits they have already found, so they can unleash them after Microsoft has stopped producing updates – effectively ensuring these yet-to-be-exploited vulnerabilities are never fixed.

The end of support for XP doesn't mean that activation servers will be turned off, so re-installing the operating system and activating it should remain possible indefinitely. It's also possible that Microsoft will disable the requirement to activate XP at all at some point after the end of support.

However, we would suggest making a full image backup of any of the PCs on which you want to be able to perform a clean re-installation of Windows XP. This will be faster than installing from scratch and all of the required updates will be in place without the need to download them again.

When performing your next clean re-installation, install all the available service packs and updates, and then create the image (also known as ghosting) using



software such as Acronis True Image. Create one for each different PC.

The end of support for XP doesn't mean that Windows Update will suddenly stop working either. It just means that no new updates will appear. Microsoft could decide to remove them at any time, of course.

If you'd rather not make an image of your hard disk, you can create a 'slipstream' installation CD for XP containing SP3 and any remaining updates published up until the end of support. This will prevent you having to install SP3 and then re-download all the subsequent updates each time you

re-install. The updates will be installed with Windows - the 'SP4' version you mention.

One way of doing this would be to download nLite from [www.nliteos.com](http://www.nliteos.com). This is a graphical utility that will let you create your own XP installation CD incorporating any service pack or updates you wish, so they will appear pre-installed when your installation disc is used. You can also add your own selection of extra drivers and apps if you want to save even more time.

is tucked away in the advanced power options and isn't easy to find.

Open the Control Panel and double-click Power Options. Find your currently selected power plan and click on the associated 'Change plan settings' link. Now, click on 'Change advanced power settings'. Scroll down to the option marked Display and click on the plus sign to expand the menu. Next, look for 'Enable adaptive brightness'. Click on the plus sign to expand the menu and make sure the setting is set to 'Off'. Finally, click the OK button and your screen won't dim any longer.

## FAULTY RAM

**Q** I've recently upgraded my PC's memory by adding an additional two sticks of memory of the same type as the two that were installed when I bought it. Unfortunately, my computer has started crashing a fair bit with the new memory installed.

I've tried reseating the memory and using different sticks in different slots, but I can't make my system run reliably and I'm now not sure which sticks of memory are the new ones. Is there a reliable way I can test my system to find out where the fault lies?

If you have a spare USB flash drive or a blank CD and plenty of time, you can perform a thorough test of your memory using Memtest86+ from [www.memtest.org](http://www.memtest.org).

This utility needs to boot from a DOS environment (hence the USB flash drive) and offers a simple menu-driven interface that will allow you to stress-test your RAM.

Continues >>

## DISABLE SCREEN DIMMING

**Q** I have a 27in iMac on which I occasionally need to run Windows 8. Under Mac OS X I've disabled the automatic screen dimming function, which really annoys me.

However, when I use Bootcamp to run the operating system, the automatic screen dimming comes back into effect. Is there a way to disable it in Windows?

Yes there is, and this will also work on PCs (usually laptops) fitted with ambient light sensors. The setting you're looking for

# TECH JARGON BUSTER

**PHABLET:** Bridging the gap between a large smartphone and a small tablet, a phablet combines the portability of the former with the large-screen usability of the latter. With screen sizes typically between five and seven inches, they are often just small enough to use as a phone, but provide a preferable screen size for multimedia viewing. Examples include the Samsung Galaxy Note II and Sony Xperia Z Ultra.

**WEB SCRAPING:** This is the automated collection of data from websites using an interface designed for human, rather than computer, interaction. It's typically used as a way of extracting unstructured data and importing it into a database for later use. Examples could be reading price or share

value information directly from a website, or posting queries to an online service and reading the results into an app. Steps are often taken to prevent the scraping of data by machines, so sometimes the most basic approach of copying and pasting by hand is the only solution.

**QR CODE:** A Quick Response or 'QR' Code is a type of two-dimensional barcode. Unlike the conventional barcodes found on items such as supermarket groceries, they can be read quickly by devices like cameras and have become popular when designed to be read by smartphones. Usage could be the encoding of a web URL or additional information stored in a code on a printed advertisement. Only scan QR codes you trust. Scammers can make

QR codes which link to fake websites that trick you into giving away personal details.

**CROWDFUNDING:** Crowdfunding is the funding of a project by taking a small contributions from a large number of people in return for some form of reward, such as equity in your venture. This approach is most easily facilitated through use of the internet, which can quickly bring together a large number of like-minded contributors. Popular sites include Kickstarter and Indiegogo.

**WHITE HAT:** This is internet slang for an ethical hacker, or a person who discovers security problems without exploiting them for criminal activity and with a view to improving existing security systems.



```

Memtest86+ 04.20 | Pass 3% #
Pentium M (0.09) 3146 MHz | Test 48% #####
L1 Cache: 32K 125825 MB/s | Test #3 [Moving inversions, 8 bit pattern]
L2 Cache: 6144K 51567 MB/s | Testing: 184K - 2048M 2048M
L3 Cache: None | Pattern: efefefef
Memory : 2048M 15419 MB/s |
Chipset : Intel i440FX

-----
WallTime  Cached  RsvdMem  MemMap  Cache  ECC  Test  Pass  Errors  ECC Errs
-----
0:00:12  2048M  0K  e820  on  off  Std  0  0

(ESC)Reboot (c)configuration (SP)scroll_lock (CR)scroll_unlock
  
```

**FAULTY  
RAM**

Follow the Download link at [memtest.org](http://memtest.org) and download either the Auto-installer for USB Key or the Pre-Compiled Bootable ISO, depending on which medium you're intending to use to boot your system.

To make a bootable CD from the .ISO file, use your favourite disc burning software. We've found Imgburn from [www.imgburn.com](http://www.imgburn.com) to work well.

If you want to make a bootable USB key, you'll need to unpack the auto-installer download and run the utility, selecting your blank USB flash drive. Note that all existing data on the drive will be erased while preparing it for use with Memtest86+.

Now boot up your PC using the disc you just created. The Memtest86+ software should load up and start running automatically. Now you just wait. The testing process will probably take a few hours, depending on how much RAM you have installed, so you may want to leave it running overnight.

Near the top of the screen, in the middle, it will display Test #x, where x is the number

of the test currently running. It's generally advised to leave the program running until this gets to around No.8.

If no errors are detected, the problem is probably unrelated to your memory chips. If errors are reported then you may have one or more faulty sticks of memory or possibly one or more faulty memory slots on your motherboard.

You will have to locate the source of the problem by a process of elimination. At this point it would be a good idea to mark your memory sticks in some way so they don't get mixed up again.

Start with the first memory slot and re-test each stick of memory in that slot one at a time, until you find one with errors. If more than one stick reports errors, try testing in a different memory slot.

Also check the specification of your memory modules and ensure that your PC's BIOS is configured correctly for your memory. It's wise to use matched memory sticks - those that all have exactly the same specifications and timings. ☒

For more PC help go to:  
[pcadvisor.co.uk/helproom](http://pcadvisor.co.uk/helproom)



**SEARCH THE  
PC ADVISOR FREE  
ONLINE HELPROOM**

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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## 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.

# THE WORLD'S GREATEST PC MAGAZINE

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# PC ADVISOR

Online • Print • Mobile • Digital



# Anonymous browsing



Someone could be spying on your online activity. Use a virtual private network to stay safe, secure and anonymous. Roland Waddilove shows you how

A virtual private network (VPN) can prevent others from spying on your online activity, which is particularly useful if you travel with a laptop, phone or tablet and access public Wi-Fi hotspots. The VPN encrypts any data exchanged over the web, which means that even if your communication is intercepted it will be protected from prying eyes.

A VPN can also be used to mask your location, which will enable you to, for example, watch UK catch-up TV services during a holiday or business trip abroad.

Many VPNs are available; in the following workshop we discuss two such services that offer both free and paid options.



**START**

We'll start with Hotspot Shield. Head to [hotspotshield.com](http://hotspotshield.com), then select either the free ad-supported version or the seven-day trial of Hotspot Shield's paid service. We recommend the free option - you can always upgrade later.



**4** Close the Hotspot Shield control panel and any open browser windows, then relaunch your browser. Hotspot Shield Free puts an advert at the top of the window, but clicking the 'X' in the top right corner removes it.



**5** The easiest way to test whether your VPN is working is to go to [browserspy.dk](http://browserspy.dk) and click the Geolocation link in the left panel. The website will display what it thinks is your current location - here clearly shown as somewhere south of LA, and not London, UK.



**8** If you are using the paid version of Hotspot Shield, you can specify a different virtual location. Click the Hotspot Shield icon in the taskbar to launch the program, then select your location from the list shown on the control panel.



**9** You might want to turn off Hotspot Shield (the free version can be slow) and use the web normally. Click the red Pause Protection button in the control panel and choose from 15 minutes, one hour or 'Until I ask to resume', which puts it in manual mode.



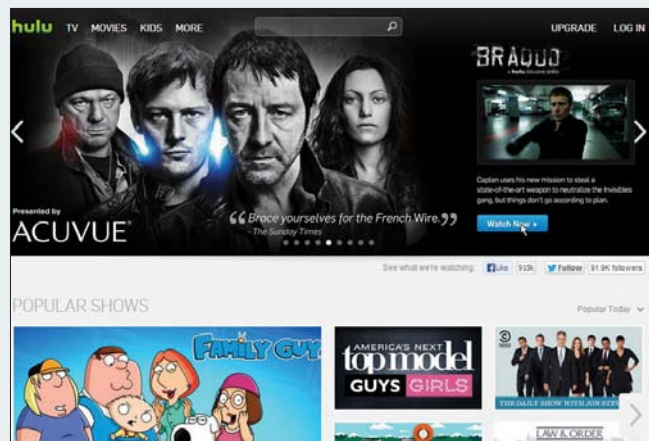
**2** Download and run the Hotspot Shield setup file. Following installation you can specify when the service should be activated. Our preference is the manual mode, allowing us to turn on and off Hotspot Shield when required.



**3** Upon launch Hotspot Shield will display the control panel. You can see at a glance that your PC is protected; note that your virtual location is in the US. A tally of your uploaded and downloaded data is also displayed here.

Test	Result
IP Address	68.68.96.226
Hostname	68.68.96.226
Country	US - United States
Region	City: Milpitas Postal Code: 95035 Latitude: 37.4404 Longitude: -121.8706
Long IP number	1145331938
Proxy	You're not using a proxy or it could not be detected. Not all p
Local IP address	Unable to detect due to: TypeError: Object # has no method
Show location on map	Using <a href="#">Google Map</a> , <a href="#">Yahoo Map</a>

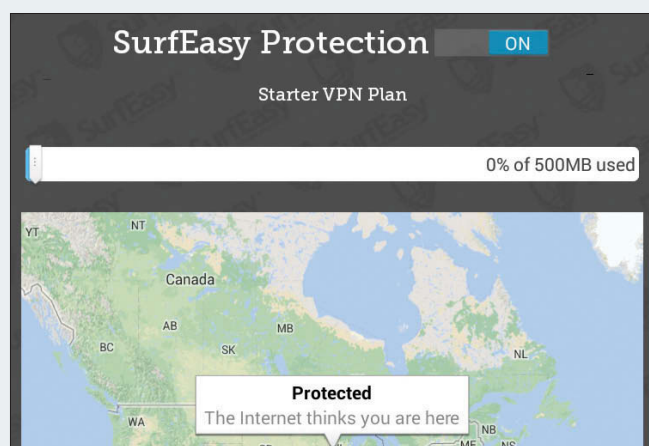
**6** Your location is implied by your computer's IP address, which is shown onscreen when you select IP address in the left panel. We know Hotspot Shield is working because the website thinks we are somewhere near San Francisco in Milpitas, US.



**7** No-one knows who or where we are. This is not an open invitation to access content you shouldn't, such as Hulu, but appearing to be a local can often result in the availability of extra web content, such as news and services.



**10** VPNs are not just for computers; you can secure your tablet or smartphone, too. SurfEasy VPN is a free Android app that lets you transmit over its network up to 500MB of data per month, with upgrades to paid plans should this prove insufficient.



**11** Install and launch the app, then create a free account. You can select a virtual location, then switch on the service. From this point on your browsing is anonymous, allowing you to access the web without anyone knowing who or where you are. ☒



# Arranging meetings is a doddle with Doodle

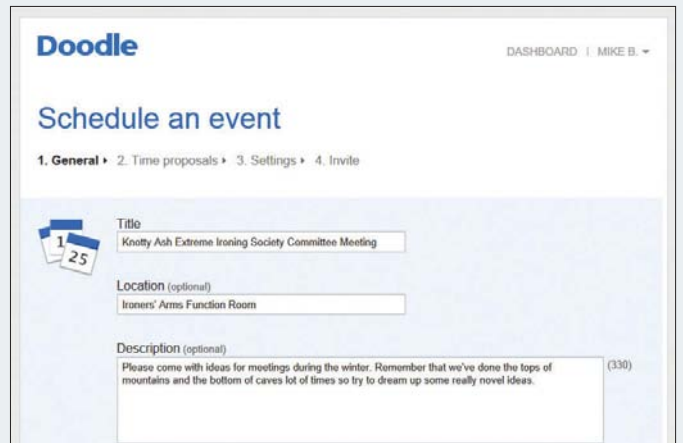
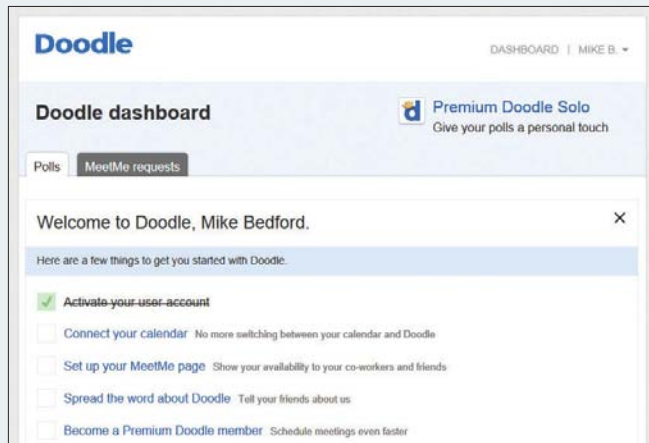


Finding a time when everyone's available to meet can be a nightmare. Here, Mike Bedford shows you how to cut out the hassle using an online tool called Doodle

Whether it's for work or play, getting together is often the best way. Yet if you're the one who organises meetings for your company, team or club, or you've ever arranged a party, you'll know how difficult it can be to find a time that suits everyone.

How many times, after sending and receiving countless emails, have you received a message from the one remaining participant telling you that the date favoured by everyone else is inconvenient? If you find yourself thinking there's got to be a better way, you're right, there is.

Doodle is an online utility for arranging meetings or social gatherings. Here's how to use it.

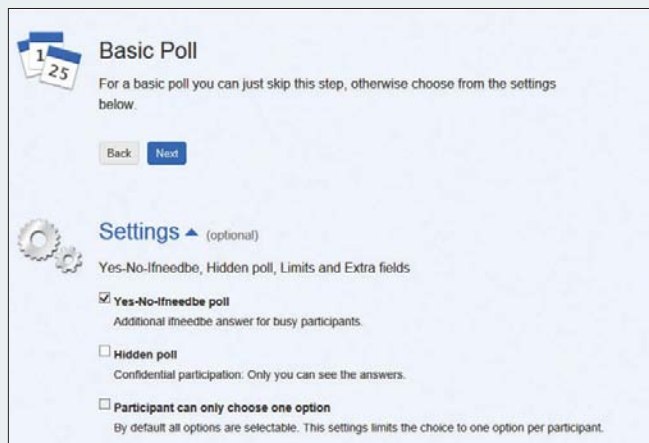


START

Head to [doodle.com](http://doodle.com) and sign up for a free account. You can organise a meeting without first registering, but you'll have to manually send links to your contacts rather than Doodle doing the job for you. Click the 'Schedule an event' button.

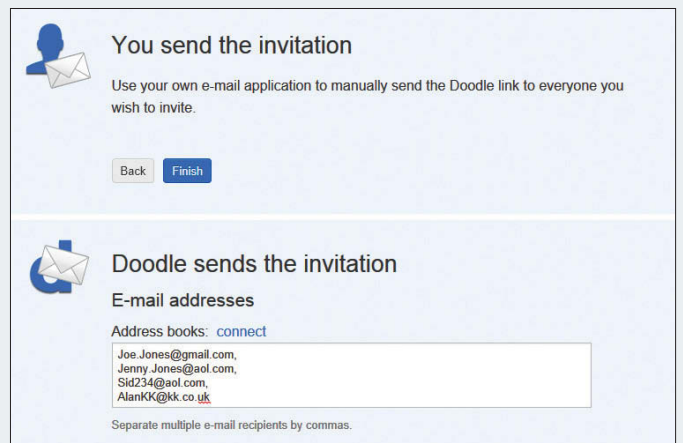
2

Provide a title for the meeting, your name and your email address. There are optional fields to enter a location and a description, and it pays to provide your contacts with as much information as possible. Click Next when you're done.



5

Click Settings to view the various available options, for example a poll in which respondents are unable to see other participants' answers. Select any that you want to apply to your meeting, then click Next.



6

Enter the email addresses of everyone you want to invite to the meeting under 'Doodle sends the invitation'. It's a good idea to also enable the option 'I would like to track whom I have invited and who is still missing...'. Click 'Send and finish'.

# USING DOODLE ON THE GO

Being away from home is no reason not to arrange a meeting, keep an eye on a meeting poll that you've initiated or respond to an invitation to attend a meeting organised by someone else. Doodle offers a dedicated iPhone and iPad app that provides a user-friendly front-end to the service, plus integration with your phone's calendar and contacts.

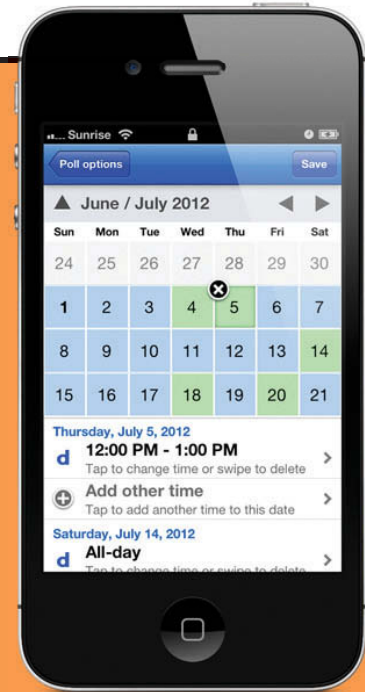
The app offers separate pages for poll creation,

administrative functions, viewing who's participated in a current poll, reviewing an overview of responses to date, and calendar integration. There's also a dashboard screen that provides summary details of your current polls.

Doodle doesn't offer an Android app, but the service is accessible on your phone or tablet via the company's mobile website, which is optimised for small screens.

You'll find that the mobile website operates in much the same way as the full desktop version, as described in our workshop below. This isn't to say that there aren't a few differences, but you'll soon get the hang of it.

Don't take our word for it, though: you can check out Doodle's mobile website from your desktop PC or laptop by entering [m.doodle.com](http://m.doodle.com) into your web browser.



## Days

Click on the dates you would like to choose.

Calendar view | Free text

SEPTEMBER 2013

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Selected dates:

- Tuesday, 10 September 2013
- Wednesday, 11 September 2013
- Tuesday, 17 September 2013
- Wednesday, 18 September 2013
- Tuesday, 24 September 2013
- Wednesday, 25 September 2013

Back Next

**3** Using the onscreen calendar, click on any dates you'd like to offer. Use the arrows in the blue bar at the top of the calendar to switch to a different month. Selected dates are highlighted green and listed to the right of the calendar. Click Next to move on.

## Times

Enter any number of time proposals for each day. If you do not enter an actual time span, the proposed date is shown as all-day.

Switch on time-zone support

	Time 1	Time 2	Time 3
Tue, 10/09/13	19:00 - 20:00	20:00 - 21:00	
Wed, 11/09/13	19:00 - 20:00		
Tue, 17/09/13	19:00 - 20:00	20:00 - 21:00	
Wed, 18/09/13	19:00 - 20:00		
Tue, 24/09/13	19:00 - 20:00	20:00 - 21:00	
Wed, 25/09/13	19:30 - 20:30		

Add further time slots  
Copy and paste first row

**4** Enter the times you are available for each date, and click 'Add further time slots' if the three time slots provided are insufficient. These are freeform boxes so you could enter, for example, '12:00', '09:00 - 11:00' or 'All day'. Click Next.

**Doodle**

Thanks Mike Bedford,  
your poll has been sent.

View poll

Premium Doodle  
Buy and activate reminders

### Auto-reminders

Find the final date even faster by letting Doodle automatically send reminder e-mails to missing participants. Only missing participants will be notified.

## Knotty Ash Extreme Ironing Society Committee Meeting

Edit your poll | 2 | 0 | 11 minutes ago

Where: Ironers' Arms Function Room

Please come with ideas for meetings during the winter. Remember that we've done the tops of mountains and the bottom of caves lot of times so try to dream up some really novel ideas.

Table view | Calendar view | Administration

Most popular date: several | Close poll

	September 2013 Tue 10	Wed 11	Tue 17	Wed 18	Tue 24	Wed 25
2 of 2 invitees	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	19:30 - 20:30
Who is missing?						
Joe Jones	✓	✓	✓	✓		✓
Jenny Jones	✓	✓				
Yes	2*	2*	1	1	2*	0
If needed	0	0	0	0	0	0
No	0	0	1	1	0	2

**7** Doodle will confirm that the poll request has been sent, and the specified recipients will receive an email with a link to provide their preferences; you'll get an email when each responds. You'll also receive an email with a link for you to view responses to date.

**8** Having followed the link in Step 7, select the Administration tab and choose Close. Select a date based on the responses, then click Save, Send. Each of your recipients will be notified of the meeting's time and date. ☒



# Upgrade your graphics



Turn your humble PC into a games machine at a fraction of the price of a next-gen console. Martyn Casserly explains how to fit a graphics card

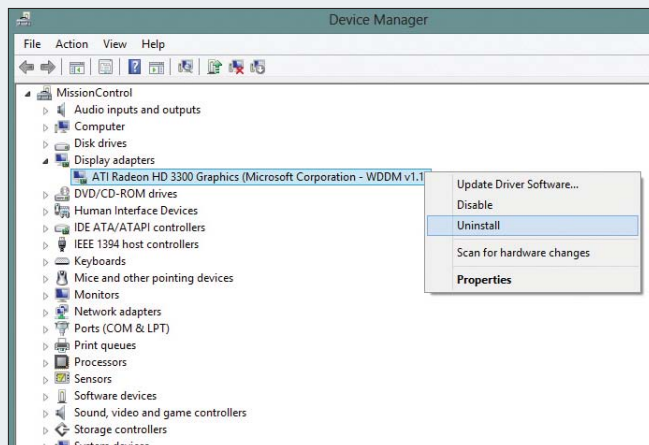
If you've ever wanted to play games on your PC, but found that it struggled with the demands of animating large battlefields or the rapid 3D rendering of driving games, there's a solution that's cheaper than buying a dedicated rig or one of the next-generation consoles. With much of the processing that games require now being handled by the graphics card, fitting one to your PC can have a potent effect on its gaming potential.

Here we explain to upgrade your graphics card for less than £150. Just be sure to first check that your motherboard has an available PCI Express slot, the case has enough room to fit a card, and your power supply that can handle the extra strain.



## START

Before you order anything, look inside your case to check whether your current PSU is capable of running a new graphics card. Remove the side panel and look at the 'Total continuous power' figure. It should be at least 400W, but preferably 500W.



**4** Once your card has arrived, uninstall the existing drivers on your PC to avoid any conflicts. Head to Control Panel, 'Uninstall a program', then find and uninstall your drivers. You can also 'uninstall' the Display adapters hardware in Device Manager.



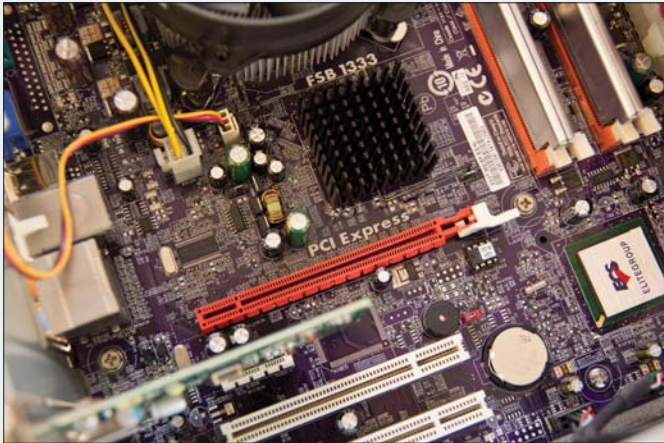
**5** Before you begin the installation you should ground yourself to discharge any static electricity. To do this you simply touch a nearby radiator or a metal part of the case while it's still plugged in. Next, turn off the PC and unplug it from the mains.



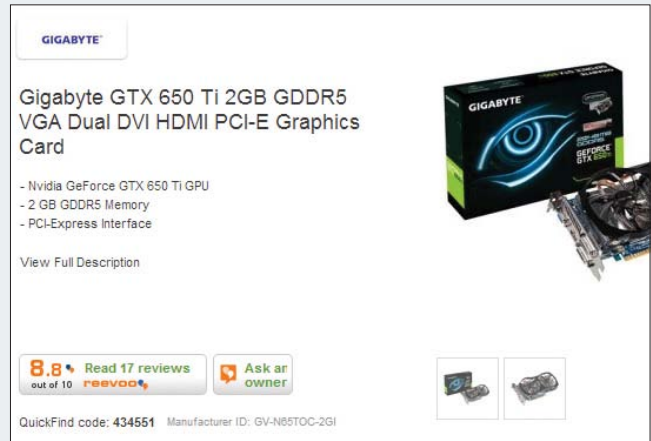
**8** Connect the power supply to the card via the relevant slots. If your PSU doesn't have the correct connector (usually a black, six-pin block marked PCI-E), check in the box for an adaptor that will hopefully have been supplied.



**9** Reconnect the PSU and re-fit the case's side panel. Power on your PC. Head to the graphics card manufacturer's website to download and install the latest drivers (those supplied on disc may be out of date). Reboot the PC if prompted. Now the fun can begin!



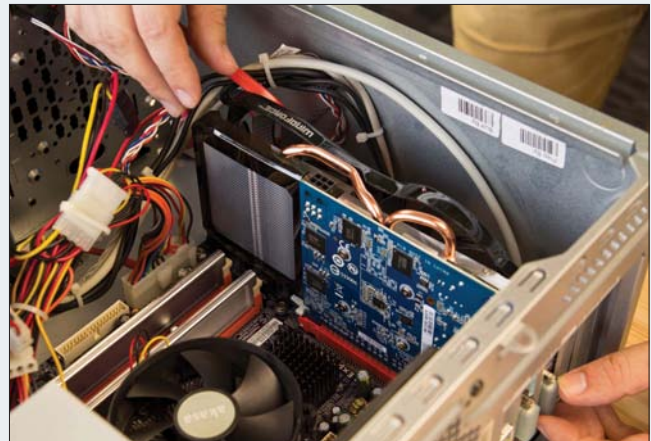
**2** PC cases come in many different sizes, so it's important to measure how much space you have inside. Also check that you have a free PCI Express slot. Graphics cards can be quite tall, so you might need two empty bays to accommodate one.



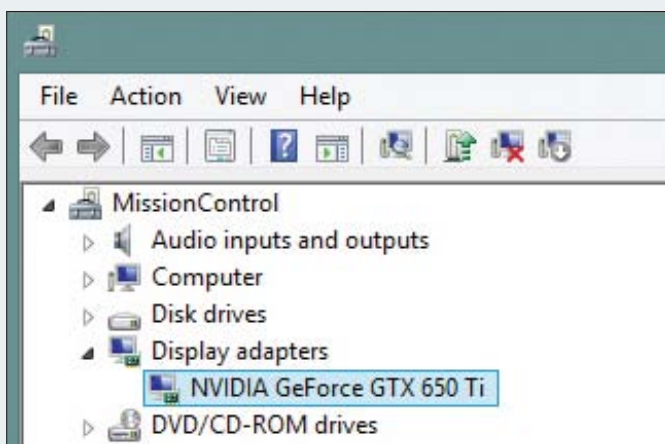
**3** You can now head to your retailer of choice and look for a suitable graphics card. Remember that if you want a more powerful card than your power supply allows you can always replace the PSU with a beefier unit.



**6** If your PC has an existing graphics card you'll need to remove it now. Many modern machines use integrated graphics, which can't be removed. If there is a card installed, remove the screw(s) and check for any plastic clips that hold it in place.



**7** Ensure the area around the empty slot is clear, then install the new card. Position it gently, first checking that nothing is blocking its path, then press down firmly on the top of the card to completely seat the connector in its slot.



**10** Quickly visit Control Panel, Device Manager, Display adapters and check that the graphics card appears with no warning signs that might indicate a problem. Then fire up your favourite game, ramp up the detail in the Settings menu, and enjoy.



**11** If you experience any stuttering you may need to lower the quality settings. Typically, lowering the anti-aliasing and shadow detail levels will improve framerates. Ideally, you should use your monitor's native resolution for the best quality. ☑



# Check your CPU temp

If your PC's fans are making more of a racket than usual or you want to check how much more efficient is your new CPU cooler than your old one, the free SpeedFan utility is your friend.

As well as allowing you to monitor your processor's temperature, it can also access your motherboard's other sensors so you can check the ambient temperature and perhaps more, such as hard disk temperature, depending on your motherboard.

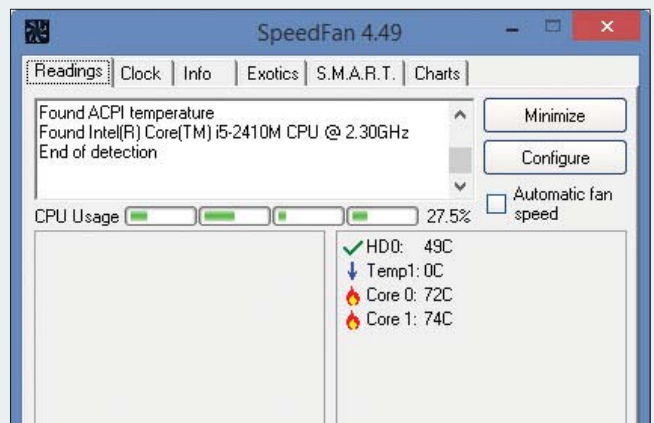
Given the name, it's no surprise that SpeedFan also allows you to monitor your computer's fan speeds. It works with all versions of Windows and is completely free.



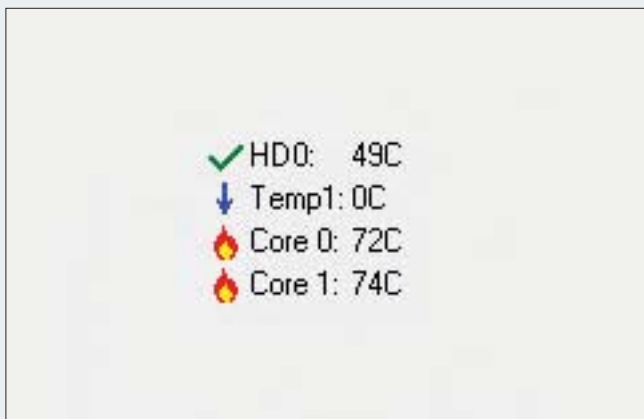
Jim Martin explains how to use the free SpeedFan utility to check the temperature of your processor and other system components, plus monitor fan speeds



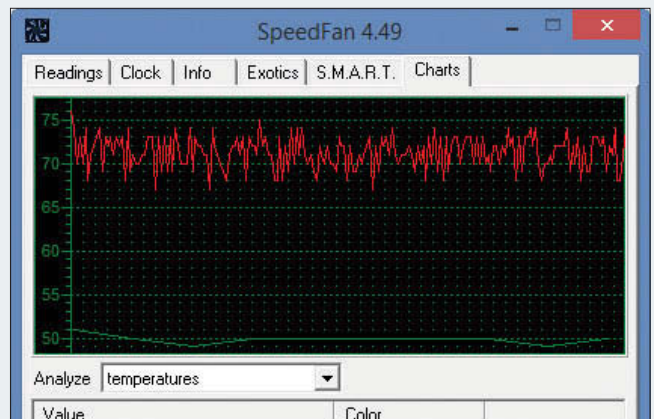
**1** Download SpeedFan from [almico.com/speedfan.php](http://almico.com/speedfan.php). Click the Download link in the top menu (not the advert), then choose SpeedFan 4.49. Run the executable file that is automatically downloaded to your machine.



**2** Run SpeedFan. The utility will automatically detect your hardware, then display any temperature measurements it has made. The first tab (Readings) will show all detected temperatures on the right.



**3** Our test laptop's fans had been running at full speed, and the temperatures for Core 0 and Core 1 (the two physical cores) are higher than ideal at over 70°C. SpeedFan indicates this with a flame symbol, and temperatures that are normal with a tick.



**4** You can monitor temperatures over time using the Charts tab. Click on the S.M.A.R.T tab to see information on your hard disk(s), including graphs for 'fitness' and 'performance'. It's also possible to run in-depth tests on each disk.

**5** If your CPU temperature is running on the hot side you'll need to investigate why. First, establish whether it's a cooling problem, such as failed fans, excessive dust in the filters or fans or some other object blocking airflow to the processor.

You can also use Windows' Task Manager to identify whether a particular application is thrashing the processor. Press Ctrl, Shift, Esc and choose the Processes tab, then click the CPU column. Right-click a process to get the option to end it. ☒

# Transfer your photos

Thanks to digital cameras, we can now take as many photos and videos as we like. Until the memory card fills up, that is. Of course, you can transfer the pictures on to your computer at any time, and here we'll explain everything you need to do. There are two main ways to copy these. One involves using the USB cable that



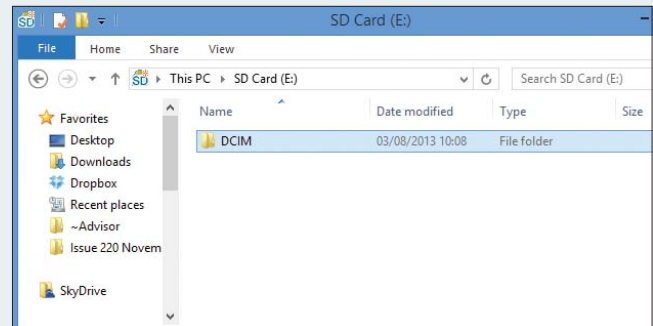
How do you copy pictures and video from your camera's memory card to your laptop? Jim Martin walks you through what you need to do

came with your camera to connect it to a laptop. The second is to remove the memory card from your camera and insert it into your laptop's card reader. Virtually all cameras use 'SD' cards, and we haven't seen a laptop in a long time that doesn't have a slot that accepts this type of memory card.

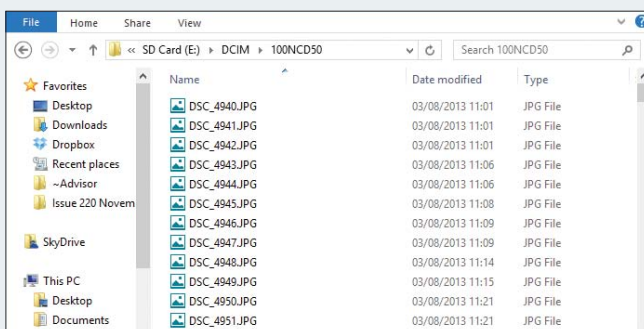


**START**

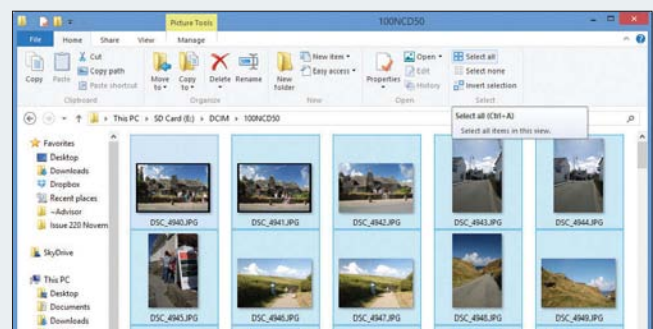
Insert your camera's memory card into your laptop. Push in the SD card until you hear a click. Windows should display a message asking what you want to do with the card. This is the AutoPlay menu. Choose Open folder to view files.



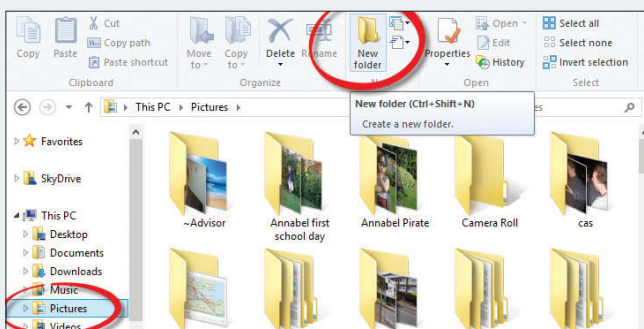
**2** A new Explorer window will open and you'll see at least one folder called DCIM. This is where your photos are stored. Double-click this and you'll see folder. If there are multiple folders, check each one to see which ones contain images.



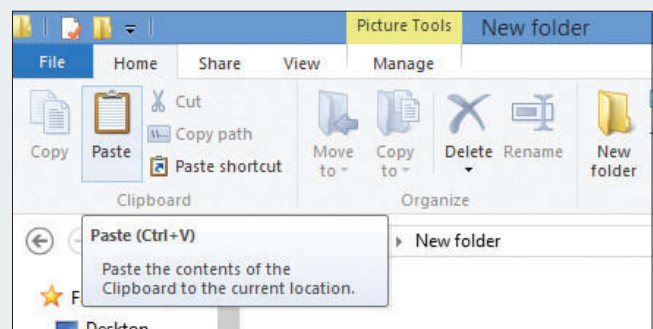
**3** To see thumbnails of photos in Windows 8 (as here), click the View tab and choose Large icons to see thumbnails. You can also enable the preview pane (the option is on the lefthand side of the View tab) to display a large version of a photo when you click it.



**4** Choose the photos you want to copy. The easiest way is to select them all by clicking on the Home tab and then Select all on the right-hand side. Next, click the Copy icon on the lefthand side of the ribbon (or Ctrl, C).



**5** Click on Pictures under This PC and click New Folder. If you don't have Windows 8, press Ctrl, Shift, N together to create a new folder, or right-click in some empty space in the Pictures folder and select New, then from the next menu, Folder.



**6** Type a name for your new folder, press Enter and then double-click on the folder to open it. From the Home tab, choose Paste (or Ctrl, V). The photos will be copied into the new folder. ☑



# Create an iPhone ringtone from any track

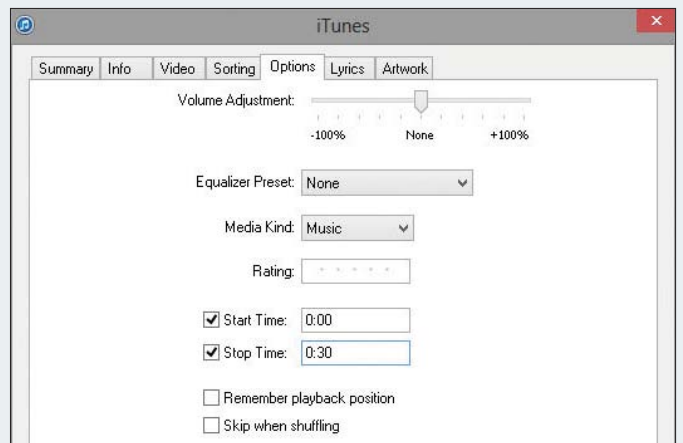
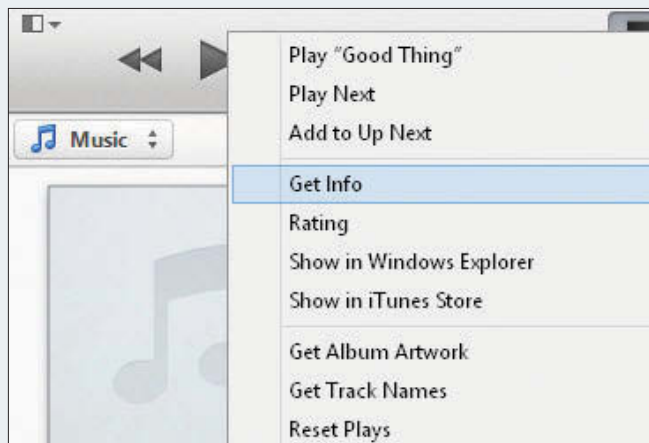


Bored of the standard iPhone ringtones and text-message alerts? Jim Martin explains how to turn any song you own into a tone on your iPhone

There are many apps that allow you to create ringtones or text-message and email notification tones on your iPhone. However, none is able to save the resulting files in your list of ringtones. Instead, you have to save them to your computer and sync with iTunes to get them working on your iPhone.

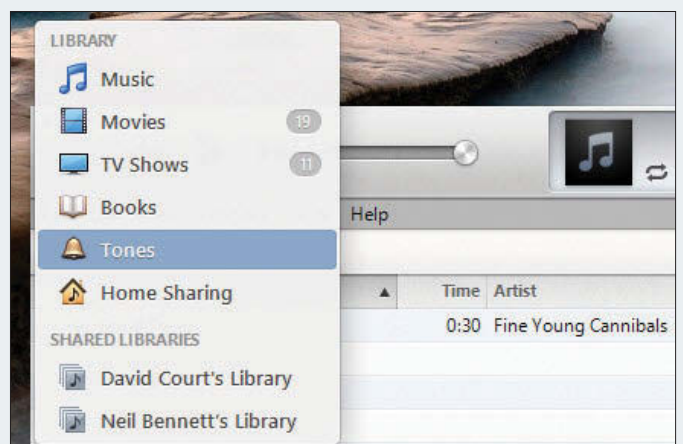
The exception to this rule is Garageband, which can create and save ringtones on an iPhone without needing a computer.

In the following workshop we explain how to make a ringtone in iTunes, then sync your iPhone to import the tone. We've used iTunes 11.0 here, but the process is similar in older versions. Let's get started.



**1** Launch iTunes on your PC. Choose a song that would make a good ringtone - not too quiet, and not too embarrassing when it's belted out at full volume in public. From the Library right-click the track and choose Get info.

**2** Open the Options tab and tick the boxes next to Start Time and Stop Time. Enter times at which you want the ringtone to start and stop. You will have to listen to the track and note where it should begin; the stop time must be within 30 seconds. Click Ok.



**5** Right-click the ringtone and select 'Show in Windows Explorer', then right-click the file in Explorer and choose Rename. Change the extension from .m4a to .m4r. Click Yes when asked whether you want to change the extension.

**6** Double-click the file to add it to your iTunes library (or use iTunes' 'Add file to library' menu option). Next, launch iTunes and click the drop-down arrow to select the Tones section of your library. You'll find your ringtone here.

# CREATE AN ANDROID RINGTONE WITH RINGTONE MAKER

It's easy to set any song stored on your Android phone as a ringtone - you simply open the phone's Music app, tap and hold on a track and choose Set as, Phone ringtone (or similar). But the chances are you actually want that song's chorus as your ringtone, and not the first 30 seconds.

There's no audio editor built into Android, but plenty of free third-party apps are available that do the job. Simply open Google Play and search for 'ringtone maker'. We downloaded the free Ringtone Maker from Big Bang; select it in the search results and choose Install, Open.

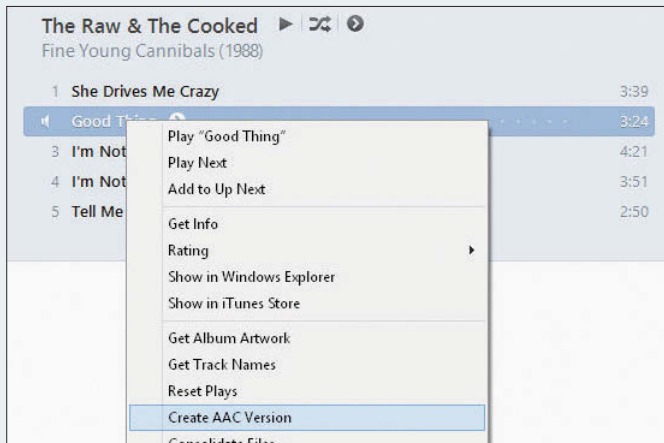
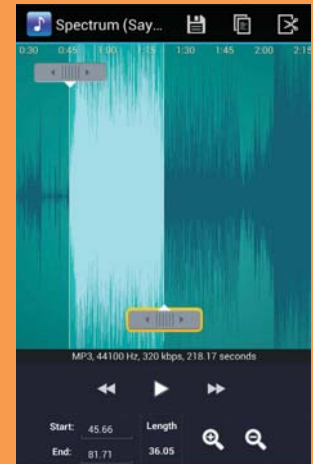
Ringtone Maker will open to display a list of any tracks on your device. If you are wanting to use an MP3 file stored in Google Music or another cloud service, you'll first need to download it to

a PC and transfer it to your device. Tap on the green arrow beside a track and choose Edit. The track will open in the Editor, displayed on a scrollable waveform timeline.

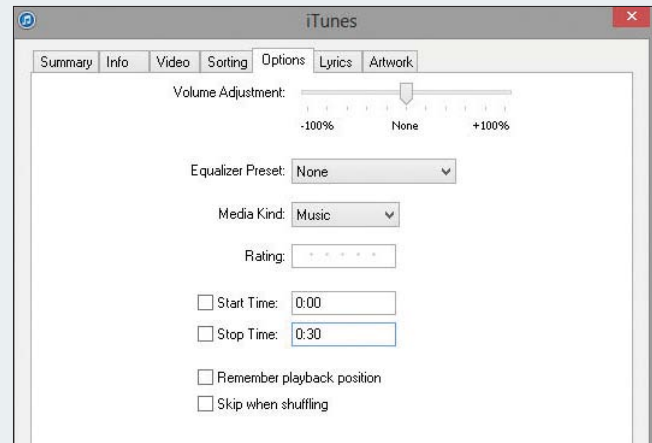
Tap and drag the Start and End time sliders so the section of the track you want to use is highlighted. Confirm you have the right portion by pressing the Play button below, and use the zoom in and -out buttons to aid fine-tuning.

Once you are happy with your selection tap the Save icon. You can choose to save the clipped audio as a ringtone, alarm, notification or music. Hit Ringtone, give it a name, then press Save. Ringtone Maker will offer to make it your default ringtone, or go to Settings, Sound, Ringtones and select it from there.

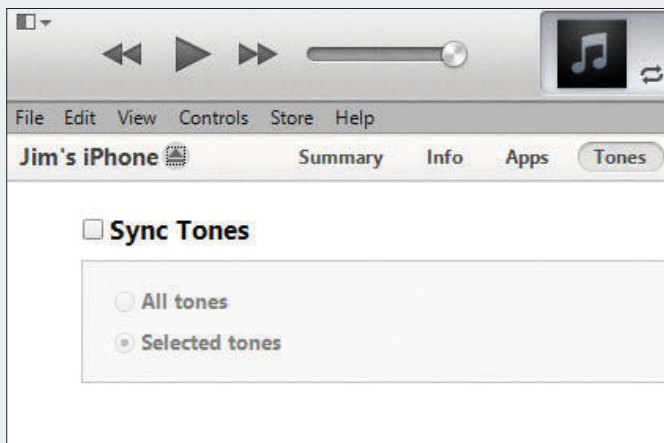
*Marie Brewis*



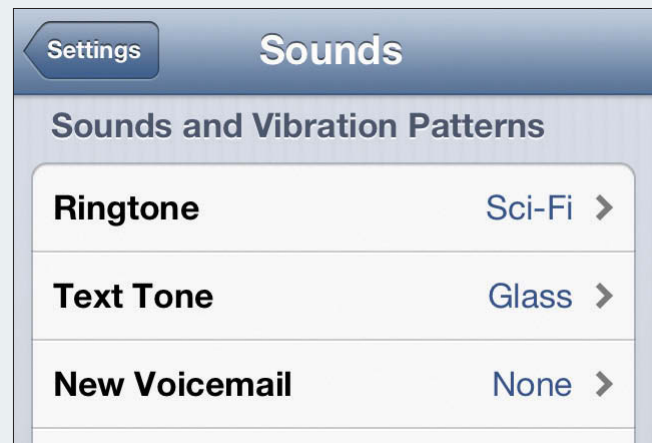
**3** Right-click the track again, but this time select 'Create AAC version'. iTunes will convert the song to a format your iPhone will accept as a ringtone. This will appear as a duplicate track, but you'll be able to differentiate between the two by their length.



**4** Right-click the original track, choose Get info and select the Options tab. Remove the ticks you placed beside the Start Time and Stop Time fields. This is necessary should you ever want to enjoy the full version of the track again.



**7** Connect your phone to your PC and click on iPhone when it appears in iTunes. Make sure Tones is set to sync with your phone. If you choose 'Selected tones' rather than 'All tones', make sure you tick all those you want to appear on your iPhone.



**8** When the sync has finished, pick up your iPhone and tap Settings, Sounds, Ringtone. You can now select your new ringtone. It should appear at the top of the list, above the default iPhone Ringtones. ☑



LETITIA  
AUSTIN



ONLINE  
REGISTRATION  
REQUIRED

## Magix Video easy SE

SPECIAL EDITION AVAILABLE ONLY ON THE DISC+

### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 221\Magix Video easy and open the file

### Online registration required:

follow the links during installation before 3 Dec 2013

### System requirements

Windows XP/Vista/7

Don't let your precious video recordings collect dust on your shelves. With Magix Video easy SE you can easily edit your movies, add transitions, text and background music, and even enhance image and sound quality. Even beginners will be able to create breathtaking films with the help of Video easy's simple three-step wizard.

The wizard will help you get started and walk you through all the important steps involved in creating a video. Simple instructions with large graphical icons are provided at each step of the process, from connecting the video camera to recording videos.

You can connect your camera to your PC and transfer your recordings to the program, then, simply save, edit, burn or upload your recordings to the web. ☒

# VIDEO EASY<sup>SE</sup>

MAGIX

Probably the easiest video editing program in the world.



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# Auslogics BoostSpeed 6

FULL PROGRAM (THREE-MONTH LICENCE) AVAILABLE ONLY ON THE DISC+

ONLINE  
REGISTRATION  
REQUIRED

## Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 221\Auslogics BoostSpeed 6 and open the file

**Online registration required:** follow the links during installation before 3 Dec 2013

## System requirements

Windows XP/Vista/7/8;  
512MB RAM; 60MB  
drive space

Auslogics BoostSpeed is your one-stop computer-maintenance and -optimisation tool, providing you with everything you need to keep your computer running fast and smooth. With BoostSpeed 6 you'll be able to repair, defragment and optimise your system, remove junk files, speed up your internet connection, find duplicates, recover accidentally deleted files and protect your privacy.

**ONE-CLICK SCAN:** removes junk files, defragments disks and repairs Registry errors with just a couple of mouse clicks.

## OVER 15 MAJOR TOOLS:

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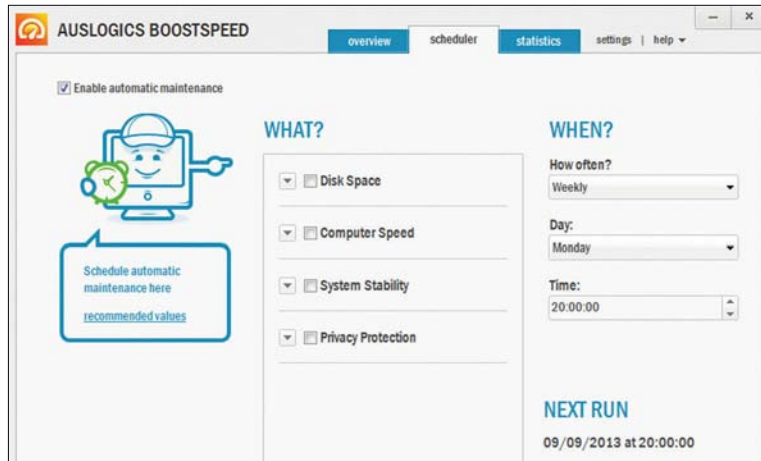
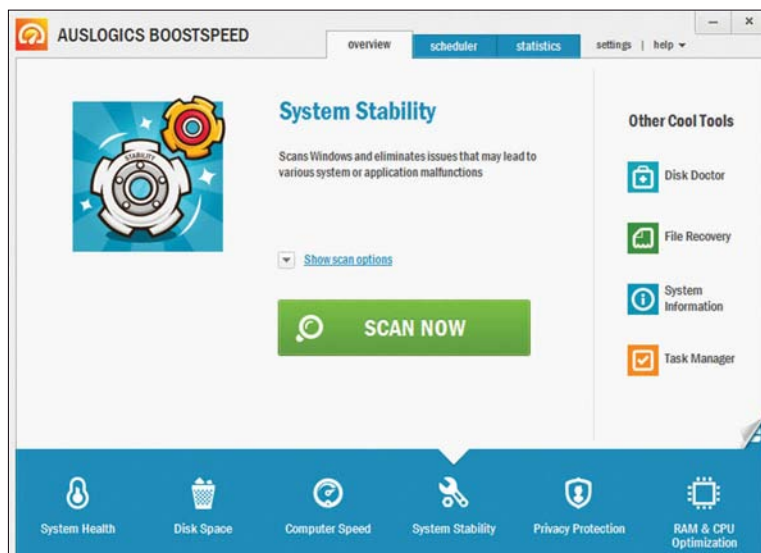
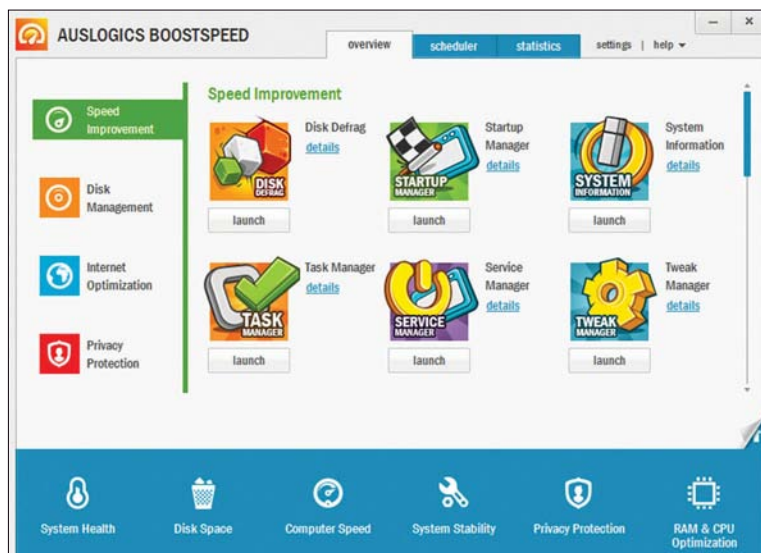
**SYSTEM ADVISOR:** Analyses your system and provides a detailed diagnosis with advice on how to speed up your computer.

**FILE RECOVERY:** Recovers accidentally deleted files or those damaged by spyware and computer viruses.

**DISK CLEANER:** Scans your hard drives for useless files that waste disk space and slow down your computer.

**DISK DOCTOR:** Recovers data from unreadable sectors and monitors your hard-drive health.

Plus much more... 





# Abelssoft MyKeyFinder

## FULL PROGRAM

ONLINE  
REGISTRATION  
REQUIRED

### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 221\Abelssoft MyKeyFinder and open the file

**Online registration required:** follow the links during installation before 3 Dec 2013


### System requirements

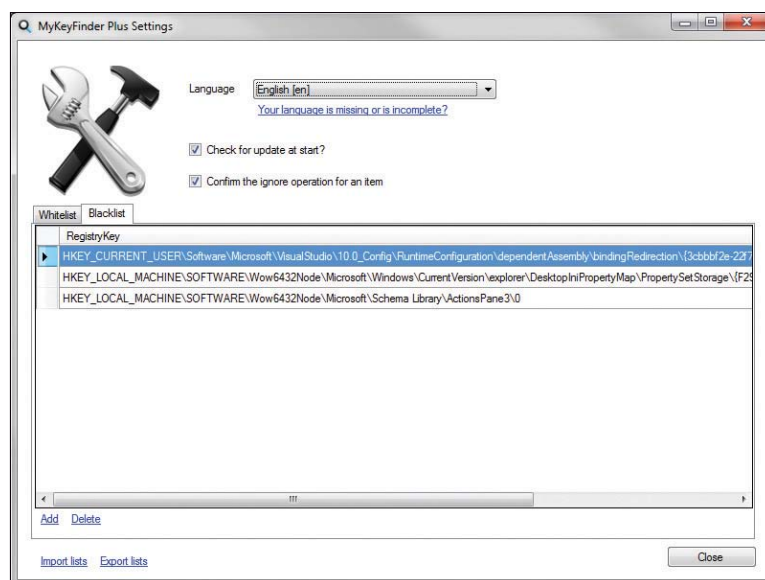
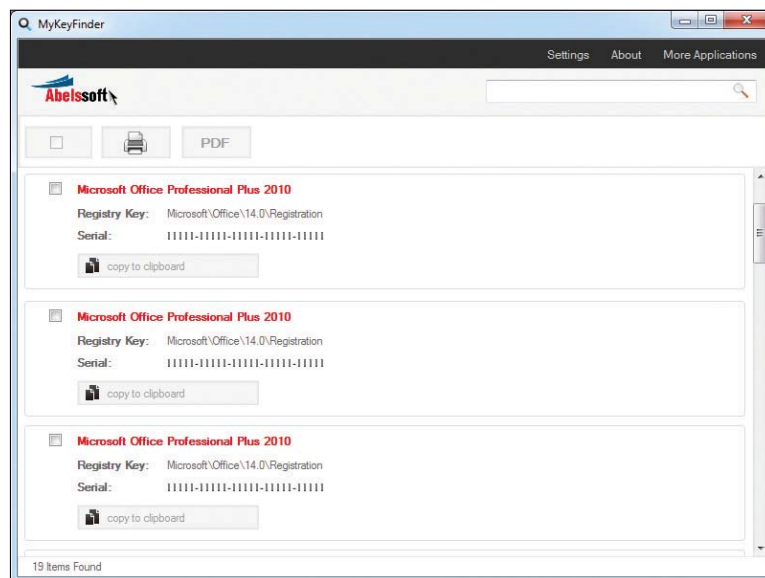
1.5GHz processor;  
Windows XP/Vista/7/8;  
512MB RAM; 10MB  
drive space; .Net  
Framework 2.0

Lost a serial number? MyKeyFinder will find it for you. Did you forget to write down a serial number or simply lose the bit of paper on which it was written? MyKeyFinder can find all your serial numbers in just a single mouse click.

- **Serial numbers restored:** MyKeyFinder will scan the Windows Registry and provide a list of serial numbers within a couple of minutes
- **Various export options:** Need to print your serial numbers? Export the results to PDF, copy them to the clipboard or print them out
- **No duplicates:** MyKeyFinder will filter and remove any old, invalid or duplicate serial numbers

MyKeyFinder also contains white- and blacklists that can help to improve its performance and prevent false positives. If Abelssoft MyKeyFinder does not find a particular serial number, simply add it to the whitelist and the software will search for it on its next run.

The Plus version contains regular signature updates for this list. 



## DISC INSTRUCTIONS

Place disc in drive. Open the file 'Click here to begin.pdf' for extra information.

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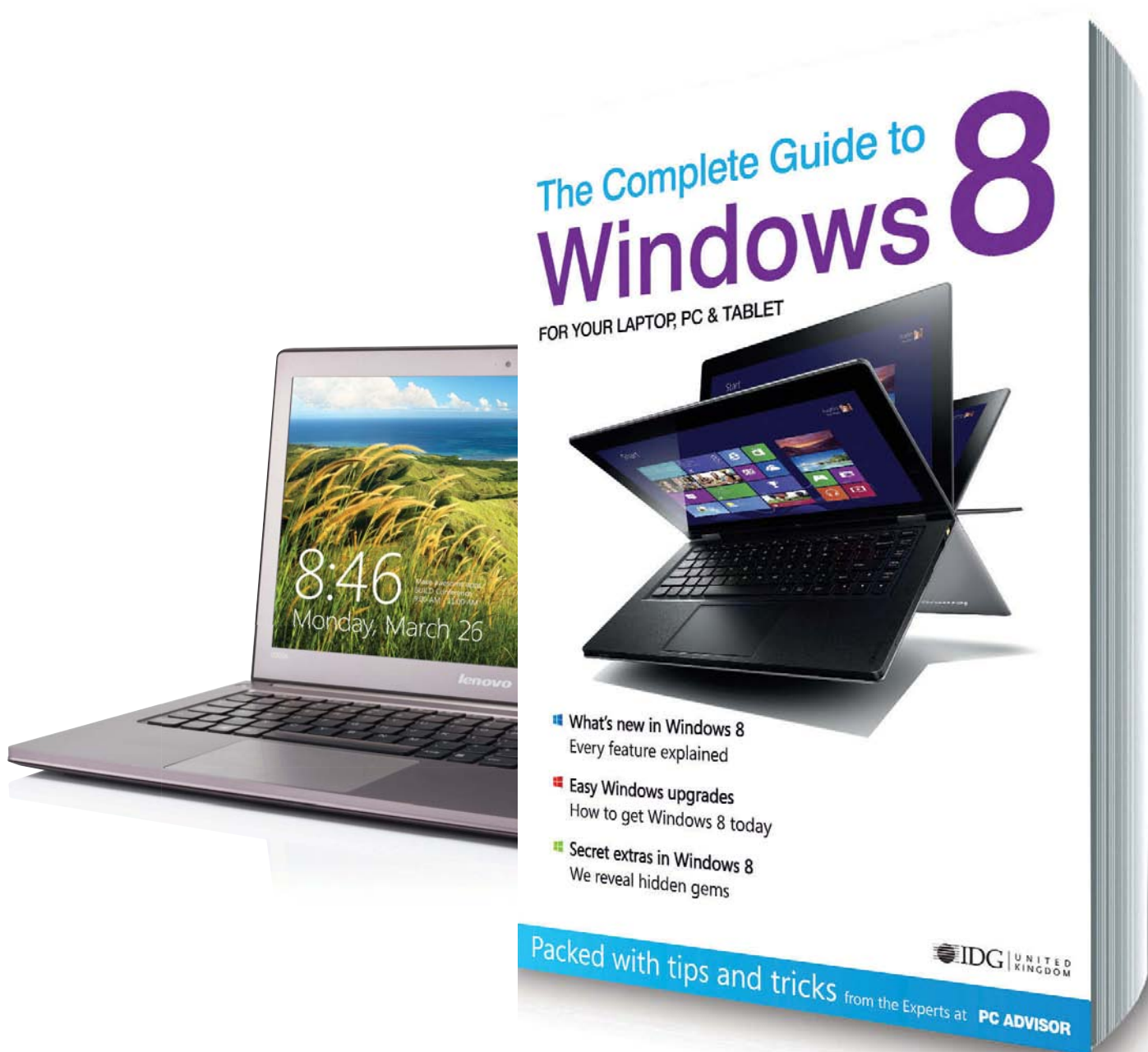
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Flat-panel displays

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## Index

Ultraportable laptops.....	128
Sub-£500 laptops.....	129
£501-£1,000 laptops .....	130
£1,001+ laptops .....	131
Tablets.....	132
Smartphones.....	132
All-in-one PCs.....	133
Business PCs .....	134
Family PCs.....	135
Mini PCs.....	136
Security software .....	139
Printers.....	140
Blu-ray drives .....	141
Wireless routers.....	141
USB drives .....	142
NAS drives .....	142
Projectors.....	143
Solid-state drives.....	143
Graphics cards.....	144
Flat-panel displays .....	145



## Ultraportable laptops



	Apple MacBook Air 13in	Apple MacBook Pro 13in Retina	Apple MacBook Air 11in	Sony Vaio Pro	Lenovo ThinkPad X1 Carbon
Price	£949 inc VAT	£1,449 inc VAT	£849 inc VAT	£1,039 inc VAT	£1,600 inc VAT
Website	Apple.com/uk	Apple.com/uk	Apple.com/uk	Sony.co.uk	Lenovo.com/uk
Build rating	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★★
Features rating	★★★★☆	★★★★★	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	1.3GHz Intel Core i5-4250U	2.6GHz Intel Core i5-3230M	1.3GHz Intel Core i3-5250U	1.8GHz Intel Core i7-4500U	1.8GHz Intel Core i5-3427U
RAM	4GB DDR3L	8GB DDR3L	4GB LPDDR3	4GB DDR3	4GB DDR3L
Storage	128GB SSD	256GB SSD	128GB SSD	128GB SSD	180GB SSD
Screen size	13.3in glossy (anti-glare)	13.3in glossy (anti-glare)	11.6in glossy (anti-glare)	13.3in glossy touchscreen	14in matt touchscreen
Screen resolution	1440x900	2560x1600	1366x768	1920x1080	1600x900
Graphics	Intel HD Graphics 5000	Intel HD Graphics 4000	Intel HD Graphics 5000	Intel HD Graphics 4400	Intel HD Graphics 4000
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n/ac	802.11b/g/n	802.11b/g/n
Ethernet	Optional	Gigabit with adaptor	Optional	None	100Mbps with USB adaptor
Bluetooth	✓	✓	✓	✓	✓ (optional)
USB	2x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 3.0	1x USB 3.0, 1x USB 2.0
FireWire	x	x	x	x	x
Thunderbolt	✓	✓ (2)	✓	x	x
DisplayPort	✓	✓	✓	x	✓
HDMI	x	✓	x	✓	x
DVI	x	x	x	x	x
VGA	x	x	x	✓	x
eSATA	x	x	x	x	x
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam, multitouch trackpad, backlit keyboard	HD webcam, multitouch trackpad, backlit keyboard	HD webcam, multitouch trackpad, backlit keyboard	None	HD webcam, multitouch trackpad, fingerprint reader
Operating system	Mac OS X 10.8 Mountain Lion	Mac OS X 10.8 Mountain Lion	Mac OS X 10.8 Mountain Lion	Windows 8 64-bit	Windows 8 Pro
Bundled software	iLife 11	iLife 11	iLife 11	None	None
Fear (Max detail)	Not tested	29fps	N/A	N/A	Not tested
Battery	54Wh lithium-polymer	74Wh lithium-ion	38Wh lithium-polymer	Not specified	45Wh lithium-ion
Battery life	12 hrs 57 mins	8 hrs 44 mins	8 hrs 56 mins	6 hrs 20 mins	5 hrs
PC Mark 7 score	4602	4596	4080	4575	4783
Dimensions	325x227x4-17.5mm	313x219x19mm	300x192x17mm	322x216x17.2mm	331x226x22mm
Weight	1.35kg	1.64kg	1.08kg	1.06kg	1.54kg
Warranty	1-year return-to-base	1-year return-to-base	1-year return-to-base	2-year return-to-base	1-year return-to-base
Verdict	<ul style="list-style-type: none"> <li>Haswell processor</li> <li>802.11ac Wi-Fi support</li> <li>Stunning battery life</li> <li>Unsurpassed build</li> <li>Good performance</li> </ul>	<ul style="list-style-type: none"> <li>Big price cut and slightly more speed</li> <li>Strong performance</li> <li>Fantastic battery life</li> <li>Limited future expansion</li> </ul>	<ul style="list-style-type: none"> <li>Elegant lightweight design</li> <li>Good performance</li> <li>Strong on games</li> <li>11.6in screen rather small</li> <li>Very decent battery life</li> </ul>	<ul style="list-style-type: none"> <li>Strong Haswell processor</li> <li>Significantly lighter than the MacBook Air</li> <li>Wi-Fi dongle turns it into a five-device hotspot</li> </ul>	<ul style="list-style-type: none"> <li>Stylish casing</li> <li>Good performance</li> <li>Display not the most colourful</li> <li>Rather expensive</li> </ul>
FULL REVIEW	<a href="http://tinyurl.com/knxwz3">TINYURL.COM/KNXWZ3</a>	<a href="http://tinyurl.com/bqbsqoc">TINYURL.COM/BQBSQOC</a>	<a href="http://tinyurl.com/k64zpkb">TINYURL.COM/K64ZPKB</a>	<a href="http://tinyurl.com/ortteba">TINYURL.COM/ORTTEBA</a>	<a href="http://tinyurl.com/ctduyoo">TINYURL.COM/CTDUYOO</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 Slekbooks), 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 means a smaller, often non-removable battery. Expect six-plus hours of life.

There's no room for an optical drive, but you can always connect an external USB version.

**READ MORE:** [TINYURL.COM/CEAEHZ](http://tinyurl.com/ceahez)

Sub-£500 laptops					
	 1 PC ADVISOR BEST BUY	 2	 3	 4	 5
	Dell Inspiron 14z	Lenovo Z580	HP Pavilion 14	Compaq CQ58-300sa	Acer Aspire V3-571
Price	£459 inc VAT	£499 inc VAT	£320 inc VAT	£239 inc VAT	£465 inc VAT
Website	Dell.co.uk	Saveonlaptops.co.uk	Saveonlaptops.co.uk	Saveonlaptops.co.uk	Acer.co.uk
Build rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Features rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Performance rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Value rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Overall rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Processor	1.9GHz Intel Core i3-3227U	2.6GHz Intel Core i5-3230M	1.8GHz Intel Core i3-3217U	1.4GHz AMD E1-1200	2.5GHz Intel Core i5-3210M
RAM	4GB DDR3	8GB DDR3	4GB DDR3	2GB DDR3	8GB DDR3
Storage	500GB HDD + 8GB SSD	1TB HDD	320GB HDD + 32GB SSD	320GB HDD	750GB HDD
Screen size	14in glossy	15.6in glossy	14in glossy	15.6in glossy	15.6in glossy
Screen resolution	1366x768	1366x768	1366x768	1366x768	1366x768
Graphics	Intel HD Graphics 4000	Intel HD 4000/GT 635M	Intel HD Graphics 4000	AMD Radeon HD 7310	Intel HD Graphics 3000
Video memory	N/A	2GB	N/A	N/A	N/A
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11a/b/g/n
Ethernet	10/100	10/100	10/100	10/100	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 1x USB 2.0	3x USB 3.0	1x USB 3.0, 2x USB 2.0
FireWire	x	x	x	x	x
Thunderbolt	x	x	x	x	x
DisplayPort	x	x	x	x	x
HDMI	✓	✓	✓	✓	✓
DVI	x	x	x	x	x
VGA	x	✓	x	✓	✓
eSATA	x	x	x	x	x
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	8x DVD ±RW	8x DVD ±RW	N/A	8x DVD ±RW	8x DVD ±RW
Extras	Webcam	Webcam	Webcam	Webcam	Webcam
Operating system	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit	Windows 7 Home Prem 64-bit
Bundled software	None	None	None	None	Microsoft Office Starter
Stalker (720p)	22fps	56fps	23fps	9fps	Not tested
Battery	44Wh lithium-ion	48Wh lithium-ion	37Wh lithium-ion	47Wh lithium-ion	48Wh lithium-ion
Battery life	5 hrs 10 mins	4 hrs 45 mins	4 hrs	4 hrs 45 mins	5 hrs 18 mins
PCMark 7 score	3486	2765	2547	1094	123 WorldBench 6 points
Dimensions	347x240x21mm	376x250x33mm	347x238x21mm	376x247x33mm	380x253x33mm
Weight	1.9kg	2.65kg	1.8kg	2.3kg	2.6kg
Warranty	1-year return-to-base	1-year return-to-base	1-year return-to-base	1-year return-to-base	1-year collect-and-return
Verdict	<ul style="list-style-type: none"> <li>• Clear 14in screen</li> <li>• Portable, despite DVD drive</li> <li>• Solid build, firm keyboard</li> <li>• Trackpad a little small</li> <li>• Good battery life</li> </ul>	<ul style="list-style-type: none"> <li>• Attractive design, and good choice of colours</li> <li>• Comfortable keyboard</li> <li>• Good performance</li> <li>• Screen could be brighter</li> </ul>	<ul style="list-style-type: none"> <li>• Good performance</li> <li>• 32GB SSD</li> <li>• Modest gaming capabilities</li> <li>• Sharp 14in screen</li> <li>• Decent speakers</li> </ul>	<ul style="list-style-type: none"> <li>• Extremely low price</li> <li>• Modest performance</li> <li>• Poor for gaming</li> <li>• Keyboard firm, but rattles</li> <li>• Respectable battery life</li> </ul>	<ul style="list-style-type: none"> <li>• Strong general performance</li> <li>• Excellent trackpad, keyboard</li> <li>• Reflective screen</li> <li>• Decent battery life</li> <li>• Some stock @ Laptopsdirect</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/LV5BLHU">TINYURL.COM/LV5BLHU</a>	<a href="http://TINYURL.COM/MAYG5MS">TINYURL.COM/MAYG5MS</a>	<a href="http://TINYURL.COM/L4TSYE7">TINYURL.COM/L4TSYE7</a>	<a href="http://TINYURL.COM/MT67W8X">TINYURL.COM/MT67W8X</a>	<a href="http://TINYURL.COM/CQKL4PD">TINYURL.COM/CQKL4PD</a>

## » Buying advice



## Sub-£500 laptops

Budget laptops are quick enough for most people, but economies are often made in build quality.

At the top end of the category you should find a highly capable Intel Core i-series processor. This will probably be a second-gen Sandy Bridge chip (ix-2xxx part number), but look out for a newer Ivy Bridge model (ix-3xxx).

Windows 7 and 8 run on 2GB of RAM, but 4GB or more is useful.

Hard disks are the norm at this price, with 250GB enough for most people. If you're a video hoarder look for 500GB or more.

Wi-Fi is standard, but Bluetooth is not a given at the price.

The bodywork and display are the main areas in which costs are cut. Expect creaky plastic bodies,

bendy frames and faux-metal paint jobs. Keyboards and trackpads are also likely to feel cheap and erratic.

Gloss screens hide inferior image quality. Colours are vivid, but the contrast may be poor. Check the visibility at an angle.

Some laptop manufacturers scrimp on the battery. Look for a rating of 48Wh or more.

**READ MORE:** [TINYURL.COM/CA9EXZ6](http://TINYURL.COM/CA9EXZ6)



£501-£1,000 laptops		1	2	3	4	5
		Chillblast Genesis Mini	MSI CX61	Scan 3XS LG155	Lenovo IdeaPad Z500 Touch	PC Specialist Optimus IV
Price		£699 inc VAT	£699 inc VAT	£909 inc VAT	£750 inc VAT	£968 inc VAT
Website		Chillblast.com	Saveonlaptops.co.uk	3xs.scan.co.uk	Lenovo.com/uk	Pcspecialist.co.uk
Build rating		★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating		★★★★☆	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating		★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating		★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating		★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor		2.6GHz Intel Core i5-3230M	2.2GHz Intel Core i7-4702MQ	2.4GHz Intel Core i7-4700MQ	2.2GHz Intel Core i7-3632QM	2.4GHz Intel Core i7-3630QM
RAM		8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage		1TB hybrid HDD	1TB HDD	1TB HDD hybrid	1TB HDD	1TB HDD + 120GB SSD
Screen size		11.6in matt	15.6in matt	15.6in	15.6in glossy touchscreen	17.3in matt
Screen resolution		1366x768	1920x1080	1920x1080	1366x768	1920x1080
Graphics		GT 650M/Intel HD 4000	GT 740M/Intel HD 4600	GTX 765M/Intel HD 4600	Intel HD 4000/GT 740M	GTX 660M, Intel HD 4000
Video memory		2GB	2GB	2GB	2GB	2GB (660M)
Wireless		802.11a/b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet		Gigabit	Gigabit	Gigabit	10/100	Gigabit
Bluetooth		✓	✓	✓	✓	✓
USB		2x USB 3.0, 1x USB 2.0	2x USB 3.0, 1x USB 2.0	2x USB 3.0, 2x USB 2.0	1x USB 3.0, 2x USB 2.0	3x USB 3.0, 1x USB 2.0
FireWire		x	x	x	x	x
Thunderbolt		x	x	x	x	x
DisplayPort		x	x	x	x	x
HDMI		✓	✓	✓	✓	✓
DVI		x	x	x	x	x
VGA		✓	✓	✓	✓	✓
eSATA		x	x	✓	x	✓
Media card slot		✓	✓	✓	✓	✓
Audio		Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive		N/A	BD-ROM	8x DVD ± RW	8x DVD ± RW	4x BD-ROM
Extras		Webcam	Webcam	Webcam	Webcam	Webcam
Operating system		Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit	Windows 8 Standard 64-bit
Bundled software		None	None	None	None	None
Stalker scores		Not tested	58/39fps	68/62fps	Not tested	Not tested
Battery		48Wh lithium-ion	49Wh lithium-ion	77Wh lithium-ion	48Wh lithium-ion	76.9Wh lithium-ion
Battery life		4 hrs 45 mins	3 hrs 5 mins	4 hrs	4 hrs	2 hrs 55 mins
PCMark 7 score		4557	3241	4700	3011	4572
Dimensions		287x207x37mm	383x249x38mm	374x250x43mm	370x255x30mm	405x270x50mm
Weight		1.8kg	2.4kg	2.7kg	2.7kg	3.3kg
Warranty		2-year collect-and-return	1-year return-to-base	2-year return-to-base	1-year return-to-base	3-year RTB (1-year parts)
Verdict		<ul style="list-style-type: none"> <li>• Not quite an Ultrabook</li> <li>• Small but good-quality screen</li> <li>• Decent gaming speed</li> <li>• Hybrid HDD/SSD</li> <li>• No optical drive</li> </ul>	<ul style="list-style-type: none"> <li>• Haswell processor</li> <li>• Low price</li> <li>• 15.6in matt screen is particularly good</li> <li>• Blu-ray drive</li> </ul>	<ul style="list-style-type: none"> <li>• Strong gaming performance</li> <li>• Good all-round speed</li> <li>• Comfortable keyboard</li> <li>• Decent battery life</li> <li>• A little hefty and inelegant</li> </ul>	<ul style="list-style-type: none"> <li>• Ordinary overall speed</li> <li>• Decent gaming potential</li> <li>• Touchscreen</li> <li>• Display not full-HD</li> <li>• Not the lightest 15in laptop</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent performance despite the price hike</li> <li>• Massive 17.3in screen</li> <li>• Blu-ray drive</li> <li>• Battery life not great</li> </ul>
FULL REVIEW		TINYURL.COM/C8E6MTK	TINYURL.COM/NXLB4E7	TINYURL.COM/KYSYQ GK	TINYURL.COM/NXRQO2Q	TINYURL.COM/ABQB6QP

## >> 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 rather than 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  PC ADVISOR GOLD	2  PC ADVISOR RECOMMENDED	3 	4 	5 
	Apple MacBook Pro Retina	Dell Precision M4700	Chillblast Genesis 8970	Alienware 17	Schenker XMG A523
Price	£1,799 inc VAT	£3,542 inc VAT	£1,258 inc VAT	£2,284 inc VAT	£1,056 inc VAT
Website	Apple.com/uk	Dell.co.uk	Chillblast.com	Alienware.co.uk	Mysn.co.uk
Build rating	★★★★★	★★★★★	★★★★☆	★★★★★	★★★★★
Features rating	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★☆	★★★★★	★★★★☆	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.4GHz Intel Core i7-3630QM	2.9GHz Intel Core i7-3920XM	2.7GHz Intel Core i7-4800QM	2.8GHz Intel Core i7-4900MQ	2.4GHz Intel Core i7-4700MQ
RAM	8GB DDR3L	8GB DDR3	8GB DDR3	16GB DDR3	8GB DDR3
Storage	256GB SSD	512GB SSD	Hybrid 1TB HDD/8GB SSD	750GB HDD + 256GB SSD	500GB HDD + 256GB SSD
Screen size	15.4in gloss	15.6in matt	15.6in gloss	17.3in matt	15.6in matt
Screen resolution	2880x1800	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	nVidia 650M, Intel HD 4000	AMD FirePro M4000	AMD Radeon HD 8970M	GTX 780M/Intel HD 4600	GTX 765M/Intel HD 4600
Video memory	1GB	1GB	2GB	4GB	2GB
Wireless	802.11a/b/g/n	802.11a/b/g/n	802.11b/g/n	802.11b/g/n/ac	802.11b/g/n
Ethernet	Via adaptor only	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✗	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 1x USB 2.0	4x USB 3.0	3x USB 3.0, 1x USB 2.0
FireWire	✗	✓	✗	✗	✗
Thunderbolt	✓ (2)	✗	✗	✗	✗
DisplayPort	✓	✗	✓	✓	✗
HDMI	✓	✓	✓	✓	✓
DVI	✗	✗	✓	✗	✗
VGA	✗	✗	✗	✗	✓
eSATA	✗	✓	✓	✗	✓
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, Toslink out	Headphone jack, mic	Headphone jack, mic	Headphone jack, dual mics	Headphone jack, S/PDIF
Optical drive	N/A	N/A	6x BD-ROM/DVD ± RW	BD-ROM	8x DVD ± RW
Extras	HD webcam, multitouch trackpad, backlit keyboard	HD webcam	Webcam	HD webcam	HD webcam
Operating system	Mac OS X 10.7.4 Lion	Windows 7 Ultimate 64-bit	Windows 7 Home Prem 64-bit	Windows 7/8 64-bit	Windows 8 64-bit
Bundled software	iLife 11	None	None	CyberLink Media Essentials	None
Stalker scores	Not tested	93.4fps/not tested	Not tested	129/119fps	69/63fps
Battery	99Wh lithium-polymer	97Wh lithium-ion	76.9Wh lithium-ion	86Wh lithium-ion	77Wh lithium-polymer
Battery life	Not tested	6 hours	Not tested	4 hrs 15 mins	4 hrs 30 mins
PCMark7 score	Not tested	5300	Not tested	6332	6135
Dimensions	359x247x18mm	376x256x36.5mm	376x256x43mm	410x295x50mm	374x250x42mm
Weight	2kg	2.87kg	3.3kg	4.15kg	2.88kg
Warranty	1-year return-to-base	3-year NBD	2-year collect-and-return	1-year return-to-base	2-year return-to-base
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>• Incredibly powerful</li> <li>• Heavy-duty graphics</li> <li>• Stunning performance</li> <li>• Expensive</li> <li>• Large and heavy</li> </ul>	<ul style="list-style-type: none"> <li>• Slightly higher price covers upgrade to Haswell processor, 8970M graphics, and a 1TB hard drive</li> <li>• Strong overall performance</li> </ul>	<ul style="list-style-type: none"> <li>• Mouthwatering specs give astonishing gaming speed</li> <li>• Large 17.3in screen</li> <li>• Expensive</li> <li>• Heavy, but well built</li> </ul>	<ul style="list-style-type: none"> <li>• Many configurations on site</li> <li>• Excellent performance</li> <li>• Well priced</li> <li>• Unimpressive plastic chassis</li> <li>• Heavy</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/7YGC3KJ">TINYURL.COM/7YGC3KJ</a>	<a href="http://TINYURL.COM/KC4UNLQ">TINYURL.COM/KC4UNLQ</a>	<a href="http://TINYURL.COM/9WTG6MP">TINYURL.COM/9WTG6MP</a>	<a href="http://TINYURL.COM/KS5LNFx">TINYURL.COM/KS5LNFx</a>	<a href="http://TINYURL.COM/PH8AYXJ">TINYURL.COM/PH8AYXJ</a>

## » 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)



Tablets	1  PC ADVISOR GOLD	2  PC ADVISOR GOLD	3  PC ADVISOR GOLD	4  PC ADVISOR RECOMMENDED	5  PC ADVISOR RECOMMENDED
	Apple iPad 4	Google Nexus 7 by Asus	Apple iPad mini	Google Nexus 10 by Samsung	Amazon Kindle Fire HD
Price	£399 inc VAT	£160 inc VAT	£269 inc VAT	£319 inc VAT	£159 inc VAT
Website	Apple.com/uk	Play.google.com	Apple.com/uk	Play.google.com	Amazon.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Apple iOS 6.0.1	Google Android 4.1 Jelly Bean	Apple iOS 6.0.1	Google Android 4.2 Jelly Bean	Amazon (based on Android 4.0)
Screen size/resolution	9.7in/2048x1536	7in/1280x800	7.9in/1024x768	10.1in/2560x1600	7in/1280x800
Storage/media card slot	16GB/none	16GB/none	16GB/none	16GB/none	16GB/none
Connectivity	802.11a/b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4, NFC	802.11b/g/n, Bluetooth 4
Processor	1.3GHz Apple A6X	1.3GHz nVidia Tegra 3	1GHz Apple A5	1.7GHz Cortex A-15	1.2GHz TI OMAP 4460
RAM	1GB	1GB	512MB	2GB	752MB
Claimed battery life	10 hrs	10 hrs	10 hrs	9 hrs	8 hrs
Cameras (front/rear)	1.2/5Mp	1.2Mp/none	1.2/5Mp	1.9/5Mp	1.3Mp/none
Dimensions	241x186x9.4mm	120x199x11mm	135x200x7.2mm	264x178x8.9mm	137x193x10.3mm
Weight	652g	336g	308g	603g	395g
Warranty	1 year	1 year	1 year	1 year	1 year
Verdict	<ul style="list-style-type: none"> <li>• Twice as fast as iPad 3</li> <li>• Superb graphics</li> <li>• Breathtaking display</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>• Impressive battery life</li> </ul>	<ul style="list-style-type: none"> <li>• 7.9in screen large for a mini</li> <li>• Vibrant but not Retina screen</li> <li>• Decent performance</li> <li>• Very good cameras</li> </ul>	<ul style="list-style-type: none"> <li>• Fastest tablet overall</li> <li>• Highest screen resolution</li> <li>• Excellent value</li> <li>• Can't match iPad on build</li> </ul>	<ul style="list-style-type: none"> <li>• Slick, intuitive OS</li> <li>• Vast content available</li> <li>• Excellent value</li> <li>• 8.9in version costs £229</li> </ul>
FULL REVIEW	TINYURL.COM/CRSTDSK	TINYURL.COM/CGBA439	TINYURL.COM/CLJWUVS	TINYURL.COM/ARL2KDG	TINYURL.COM/CH6CLNZ

Smartphones	1  PC ADVISOR GOLD	2  PC ADVISOR GOLD	3  PC ADVISOR GOLD	4  PC ADVISOR GOLD	5  PC ADVISOR RECOMMENDED
	Sony Xperia Z	Apple iPhone 5s	HTC One	Apple iPhone 5c	Samsung Galaxy S4
Price	£450 inc VAT	£549 inc VAT	£450 inc VAT	£469 inc VAT	£550 inc VAT
Website	Sonymobile.com	Apple.com/uk	Htc.com/uk	Apple.com/uk	Samsung.com/uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.1 Jelly Bean	Apple iOS 7.0	Android 4.1 Jelly Bean	Apple iOS 7.0	Android 4.2 Jelly Bean
Processor	1.5GHz Snapdragon S4 Pro	1.3GHz Apple A7	1.7GHz Snapdragon 600	1GHz Apple A6	1.9GHz Snapdragon 600
Storage/media card	16GB/microSDHC	16GB/none	32GB/none	16GB/none	16GB/microSDXC
Screen size/resolution	5in/1920x1080	4in/640x1136	4.7in/1920x1080	4in/640x1136	5in/1920x1080
Input method	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch
Connectivity	4G, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi	4G, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi	4G, Bluetooth, Wi-Fi
Battery life (talk/standby)	11 hrs/550 hrs	10 hrs/250 hrs	Not specified	10 hrs/250 hrs	Not specified
Camera	13Mp, 1080p video	8Mp, 1080p video	4Mp, 1080p video	8Mp, 1080p video	13Mp, 1080p video
GPS	GPS, Glonass	A-GPS, Glonass	GPS, Glonass	A-GPS, Glonass	GPS, Glonass
Dimensions, Weight	71x79x139mm, 146g	59x124x7.6mm, 112g	68x9.3x137mm, 143g	59x124x9mm, 132g	136.6x69.8x7.9mm, 130g
Warranty	2 years	1 year	2 years	1 year	2 years
Verdict	<ul style="list-style-type: none"> <li>• 443ppi full-HD screen</li> <li>• Fast performance</li> <li>• Dust- and waterproof</li> <li>• Very good 13Mp camera</li> </ul>	<ul style="list-style-type: none"> <li>• Very fast performance</li> <li>• Superb 4in screen</li> <li>• Beautifully balanced weight</li> <li>• Fingerprint reader</li> </ul>	<ul style="list-style-type: none"> <li>• Fastest smartphone yet</li> <li>• 468ppi full-HD screen</li> <li>• UltraPixel camera</li> <li>• Great sound quality</li> </ul>	<ul style="list-style-type: none"> <li>• Fast performance</li> <li>• Superb 4in screen</li> <li>• Mid-range price</li> <li>• Range of colour options</li> </ul>	<ul style="list-style-type: none"> <li>• Performance record holder</li> <li>• Interesting software features</li> <li>• Impressive 441ppi screen</li> <li>• Plastic build quality</li> </ul>
FULL REVIEW	TINYURL.COM/CXDR829	TINYURL.COM/MZ8JHLF	TINYURL.COM/CE76X3T	TINYURL.COM/KN23JD8	TINYURL.COM/CA5P7LF

## >> 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)

All-in-one PCs	1 	2 	3 	4 	5 
	Dell XPS 2720	Apple iMac 27in (Late 2012)	Medion Akoya P2002	Chillblast Fusion AIO Ultima	MSI Wind Top AE2712G
Price	£1,749 inc VAT	£1,699 inc VAT	£449 inc VAT	£1,199 inc VAT	£1199 inc VAT
Website	Dell.co.uk	Apple.com/uk	Medion.com/gb	Chillblast.com	Uk.msi.com
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.1GHz Intel Core i7-4770S	3.2GHz Intel Core i5-3470	3.3GHz Intel Core i3-3220	3.1GHz Intel Core i7-3770S	2.9GHz Intel Core i5-3470S
RAM	16GB DDR3	8GB DDR3	4GB DDR3	16GB DDR3	4GB DDR3
Storage capacity	2TB HDD + 32GB SSD	1TB HDD	1TB HDD	1TB HDD + 120GB SSD	1TB HDD
Screen	27in IPS touchscreen	27in IPS	23.6in TN	21.5in IPS touchscreen	27in TN touchscreen
Screen resolution	2560x1440	2560x1440	1920x1080	1920x1080	1920x1080
Graphics card	nVidia GeForce GT 750M	nVidia GeForce GTX 675MX	Intel HD Graphics 2500	Intel HD Graphics 4000	nVidia GeForce GT 630M
Video memory	2GB	1GB	N/A	N/A	2GB
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	✓	✓	✓	✓	✓
Bluetooth	✓	✓	✗	✓	✓
USB	6x USB 3.0	4x USB 3.0	2x USB 3.0, 4x USB 2.0	4x USB 3.0, 2x USB 2.0	2x USB 3.0, 4x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✓	✓ (x2)	✗	✗	✗
HDMI	✓	✗	✓	✓	✓
Media card slot	✓	✓	✓	✓	✓
Max disc speeds	BD-ROM/DVD±RW	None	DVD±R	BD-ROM/DVD±RW	BD-ROM/DVD±RW
Extras	2.1Mp webcam, wireless keyboard and mouse	1.3Mp webcam, wireless keyboard and mouse	Wireless keyboard and mouse, CyberLink software	Webcam, Microsoft Wireless Desktop 3000	2Mp webcam, DVB-T TV tuner, Wireless keyboard and mouse
Operating system	Windows 8	Mac OS X 10.8 Mountain Lion	Windows 8	Windows 8	Windows 8
Power consumption	54W (idle), 220W (load)	53W (idle), 243W (load)	34W (idle), 92W (load)	32W (idle), 119W (load)	44W (idle), 110W (load)
Sniper 2 Elite (High)	6fps	12fps	5fps	5fps	5fps
Sniper 2 Elite (Low)	94fps	197fps	16fps	28fps	17fps
PCMark 7 score	6091	4141	3298	5195	3138
Dimensions	492x664x72mm	650x203x516mm	580x196x430-460mm	338x541x61mm	672x483x66mm
Weight	16kg	9.5kg	10.3kg	9kg	13kg
Warranty	1-year next-day in-home	1-year return-to-base	1-year return-to-base	2-year collect-and-return	2-year collect-and-return
Verdict	<ul style="list-style-type: none"> <li>Screen offers stunning array of colours</li> <li>Great general performance</li> <li>Solid, but not amazing gaming framerates</li> <li>Quite heavy</li> <li>Next-day in-home support</li> </ul>	<ul style="list-style-type: none"> <li>Still svelte and cool-looking</li> <li>Decent performance</li> <li>Class-leading gaming</li> <li>Stunning display</li> <li>No touchscreen</li> </ul>	<ul style="list-style-type: none"> <li>Low price</li> <li>Decent performance for the money</li> <li>Built-in TV tuner</li> <li>Lacks SSD and Blu-ray</li> <li>No touchscreen</li> </ul>	<ul style="list-style-type: none"> <li>Good-looking and well built</li> <li>Blistering Windows performance</li> <li>Disappointing gaming</li> <li>IPS panel offers inferior colour fidelity to iMac and Dell</li> <li>Many of the ports are difficult to reach</li> </ul>	<ul style="list-style-type: none"> <li>Low price for a 27in all-in-one PC</li> <li>Fully featured all-in-one with TV tuner and Blu-ray</li> <li>Lacklustre gaming</li> <li>Disappointing performance</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/KWZ4KLL">TINYURL.COM/KWZ4KLL</a>	<a href="http://TINYURL.COM/A95Q9VY">TINYURL.COM/A95Q9VY</a>	<a href="http://TINYURL.COM/MEVSJ9D">TINYURL.COM/MEVSJ9D</a>	<a href="http://TINYURL.COM/LQ4U8FW">TINYURL.COM/LQ4U8FW</a>	<a href="http://TINYURL.COM/MUGFKQ7">TINYURL.COM/MUGFKQ7</a>

## >> Buying advice



### All-in-one PCs

All-in-one PCs build into a large (21- to 27in) monitor which contains all the components they require to run, making them an excellent and stylish solution for saving space.

However, with limited internal space for cooling, all-in-one machines tend to include less powerful components than traditional desktops. Expect to

find integrated or laptop graphics processors and mobile CPUs inside.

All-in-ones aren't usually easy to upgrade, but many are pre-packed with Wi-Fi, Bluetooth, speakers and even Blu-ray players.

Touchscreen displays are likely to become more desirable once Windows 8 is released. If you buy one now, ensure the image quality hasn't been compromised and that


it's sufficiently responsive to touch.

The quality of the supplied keyboard and mouse (usually wireless) is critical. TV tuners and HDMI ports are welcome additions.

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.

**READ MORE:** [TINYURL.COM/87VW5KJ](http://TINYURL.COM/87VW5KJ)



Business PCs					
	1 <b>PC ADVISOR</b> RECOMMENDED	2	3	4	5
	Aria Gladiator N200-3220M	Chillblast Fusion Opal	Wired2Fire Business Accelerate	Dino PC Synergy 4430	Eclipse Precision A856F85
Price	£509 inc VAT	£549 inc VAT	£689 inc VAT	£569 inc VAT	£519 inc VAT
Website	Aria.co.uk	Chillblast.com	Wired2fire.co.uk	Dinopc.com	Eclipsecomputers.com
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.3GHz Intel Core i3-3220	3.2GHz Intel Core i5-4570	3.4GHz Intel Core i5-4670	3GHz Intel Core i5-4430	3.6GHz AMD Trinity A8-5600K
RAM	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage capacity	500GB HDD + 80GB SSD	1TB HDD	120GB SSD	1TB HDD	1TB HDD
Motherboard	Gigabyte GA-B75M-D3H	Asus B85M-G	ASRock B85M-HDS	Gigabyte GA-H87M-HD3	Asus F2A85-M LE
CPU cooler	Arctic Cooling Alpine 11 Quiet	Standard Intel cooler	Standard Intel cooler	Standard Intel cooler	Standard AMD cooler
Power supply	Corsair 430W	CiT 500W	Xigmatek 400W	CiT 500W	Alpine 600W
Screen	21.5in AOC E2260SWDA	23.6in Iiyama X2377	2x 21.5in AOC E2260SWDA	23in Iiyama XB2380HS-B1	23in AOC i2369Vm
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	Intel HD Graphics 2500	Intel HD Graphics 4600	Intel HD Graphics 4600	Intel HD Graphics 4600	Integrated
Video memory	N/A	N/A	N/A	N/A	N/A
USB	2x USB 3.0, 4x USB 2.0	3x USB 3.0, 6x USB 2.0	2x USB 3.0, 8x USB 2.0	4x USB 3.0, 4x USB 2.0	4x USB 3.0, 4x USB 2.0
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	Not specified	Not specified	Not specified	Not specified	Not specified
Case	Cooler Master N200	CiT Fortress	In-Win Em040	CiT Templar	K2 Gamer
Keyboard	Microsoft Desktop 400 keyboard and mouse (wired)	Cherry J82-16001 keyboard, M-5450 mouse (wired)	Gigabyte K6800 keyboard, M6800 mouse (wired)	Logitech K120 keyboard, B110 mouse (wired)	Microsoft Optical Desktop 800 (wired)
Optical drive	24x DVD±RW	24x DVD±RW	DVD±RW	Samsung DVD±RW	Samsung DVD±RW
Operating system	Windows 7 Home Prem 64-bit	Windows 8 Professional	Windows 7 Pro 64-bit	Windows 7 Home Prem 64-bit	Windows 8 Professional
Bundled software	None	None	None	None	None
PCMark7 overall score	3524	4257	5667	3458	2349
Power consumption	27/69W	47/124W	37/135W	37/115W	34/145W
Warranty	1-year return-to-base, phone support	2-year collect-and-return, phone support	2-year return-to-base, phone support	3-year return-to-base (2-year parts), phone support	1-year return-to-base, phone support
Verdict	<ul style="list-style-type: none"> <li>• Exceptional value for money</li> <li>• Sticks with older Ivy Bridge processor technology</li> <li>• Not the best performance</li> <li>• SSD, Wi-Fi connectivity and memory card included</li> <li>• Only a one-year return-to-base warranty</li> </ul>	<ul style="list-style-type: none"> <li>• Haswell processor</li> <li>• Impressive Iiyama IPS flat-panel</li> <li>• No SSD</li> <li>• No cable management under the lid</li> <li>• Warranty is collect-and-return rather than return-to-base</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive Haswell processor technology, but the fastest PC here</li> <li>• 120GB SSD</li> <li>• Logitech keyboard flamboyant for office use, but comfortable</li> <li>• Two flat-panels included for improved productivity - could save money by specifying just one</li> </ul>	<ul style="list-style-type: none"> <li>• Not the fastest system here</li> <li>• No SSD, but hard drive has a generous 1TB capacity</li> <li>• High-quality Iiyama IPS flat-panel</li> <li>• Detailed warranty</li> <li>• Windows 7 ideal for business use</li> <li>• No cable management under the lid</li> </ul>	<ul style="list-style-type: none"> <li>• Sluggish performance</li> <li>• 1TB hard drive, but no SSD</li> <li>• Pleasing AOC monitor with excellent IPS technology</li> <li>• Gamer case inappropriate for office environments</li> <li>• Warranty just one year</li> </ul>
FULL REVIEW	TINYURL.COM/OSW55A8	TINYURL.COM/KGGE98T	TINYURL.COM/PCSKWVS	TINYURL.COM/PF8LUXD	TINYURL.COM/MQFWJ3R

## » Buying advice



### Business PCs






Provided you have sufficient RAM (at least 2GB, 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.

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.

Family PCs	 <b>1</b> <b>PC ADVISOR</b> BEST BUY	 <b>2</b> <b>PC ADVISOR</b> RECOMMENDED	 <b>3</b>	 <b>4</b>	 <b>5</b>
	Chillblast Fusion Commando	Quiet PC Serenity Home Value	Dino PC Raging Lizard	CyberPower Ultra Scylla SE III	Computer Planet F2000 Family
Price	£799 inc VAT	£696 inc VAT	£899 inc VAT	£699 inc VAT	£930 inc VAT
Website	Chillblast.com	Quietpc.com	Dinopc.com	Cyberpowersystem.co.uk	Computerplanet.co.uk
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.2GHz Intel Core i5-4570	2.9GHz Intel Core i5-3475S	3.2GHz Intel Core i5-4570	4.2GHz AMD FX 4350	3.4GHz Intel Core i5-3570
RAM	16GB DDR3	16GB DDR3	16GB DDR3	8GB DDR3	8GB DDR3
Storage capacity	1TB HDD + 120GB SSD	500GB HDD hybrid	1TB HDD + 128GB SSD	2TB HDD	2TB HDD + 120GB SSD
Motherboard	Asus B85M-G	Gigabyte GA-H61M-USB3V	Gigabyte GA-Z87M-HD3	Asus M5A78L-M/USB3	Gigabyte B75M-D3H
CPU cooler	Arctic Cooling Freezer 7 Pro	Standard Intel cooler	Standard Intel cooler	Standard AMD cooler	Arctic Cooling Freezer 7 Pro
Power supply	CIT 600W	Zalman ZM450-GS 450W	Corsair VS450 450W	Cooler Master 500W	Cooler Master 600W
Screen	23in Iiyama X2377	Not supplied	23in AOC i2369Vm	24in BenQ GL2450E	23.6in Iiyama X2377
Screen resolution	1920x1080	N/A	1920x1080	1920x1080	1920x1080
Graphics card	Zotac nVidia GeForce GTX 650 Ti	Intel HD Graphics 4000	Gigabyte nVidia GeForce GTX 650 Ti	MSI AMD Radeon HD 7770	Gainward nVidia GeForce GTX 660
Wireless	802.11b/g/n, gigabit ethernet	802.11b/g/n, gigabit ethernet	802.11b/g/n, gigabit ethernet	802.11b/g/n, gigabit ethernet	802.11b/g/n, gigabit ethernet
USB	3x USB 3.0, 6x USB 2.0	2x USB 3.0, 6x USB 2.0	6x USB 3.0, 2x USB 2.0	2x USB 3.0, 6x USB 2.0	2x USB 3.0, 7x USB 2.0
Media card slot	x	x	✓	✓	✓
Sound card	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	2x Logitech LS220	None	None	None	None
Case	Cooler Master Force 500	Zalman ZM-T1	Xigmatek Asgard 382	Cooler Master Elite 430	Cooler Master Elite 335U
Keyboard	Logitech MK260 wireless combo	Gigabyte GK-KM7580 wireless combo	Logitech MK260 wireless combo	Logitech MK330 wireless combo	Logitech MK260 wireless combo
Optical drive	LG BD-ROM/DVD ±RW	Sony DVD ±RW	Lite-On BD-ROM, Samsung DVD ±RW	Lite-On BD-ROM/DVD ±RW	TSSTcorp 24x DVD ±RW
Operating system	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit
Bundled software	None	None	None	None	None
Sniper (Low/Med/Ultra)	147, 59, 14fps	26, 7, 5fps	154, 62, 14fps	130, 43, 9fps	205, 59, 15fps
Alien vs Predator (720p/1080p)	52, 27fps	8, 5fps	53, 27fps	47, 24fps	77, 41fps
PCMark 7	6177	4464	6282	2957	6134
Warranty	2-year collect-and-return	2-year collect-and-return	3-year return-to-base	3-year return-to-base	2-year return-to-base
Verdict	<ul style="list-style-type: none"> <li>• Strong performance</li> <li>• Good GTX 650 graphics</li> <li>• Great 23.6in Iiyama IPS screen</li> <li>• Wi-Fi only through USB adaptor</li> <li>• Temperature and noise kept low</li> </ul>	<ul style="list-style-type: none"> <li>• Near-silent operation</li> <li>• Good power for the money</li> <li>• Strong RAM complement</li> <li>• Limited gaming power</li> <li>• Hard drive capacity a little stingy</li> </ul>	<ul style="list-style-type: none"> <li>• Best performance here</li> <li>• Good gaming potential</li> <li>• Stylish AOC IPS monitor</li> <li>• Strong components</li> <li>• Not cheap</li> </ul>	<ul style="list-style-type: none"> <li>• Pedestrian performance in our benchmarks</li> <li>• Solid gaming scores</li> <li>• No SSD</li> <li>• Large screen lacks colour fidelity and decent viewing angles</li> <li>• High-quality Logitech MK330 keyboard and mouse combo</li> </ul>	<ul style="list-style-type: none"> <li>• Most expensive of the systems here</li> <li>• Powerful performance</li> <li>• GTX 660 the best card here</li> <li>• Strong storage options</li> <li>• No Blu-ray drive</li> </ul>
FULL REVIEW	<a href="http://tinyurl.com/kf6g3t7">TINYURL.COM/KF6G3T7</a>	<a href="http://tinyurl.com/kpe3bad">TINYURL.COM/KPE3BAD</a>	<a href="http://tinyurl.com/ragliz">TINYURL.COM/RAGLIZ</a>	<a href="http://tinyurl.com/qht5x2h">TINYURL.COM/QHT5X2H</a>	<a href="http://tinyurl.com/newwq4u">TINYURL.COM/NEWWQ4U</a>

## » 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 Skyping, watching films and listening to music, decent speakers and a webcam are essential.

**READ MORE:** [TINYURL.COM/BL4UREB](http://tinyurl.com/bl4ureb)



Mini PCs	 1 <b>PC ADVISOR</b> BEST BUY	 2 <b>PC ADVISOR</b> RECOMMENDED	 3 <b>PC ADVISOR</b> RECOMMENDED	 4	 5
	Zotac Nano XS AD13 Plus	Apple Mac mini	Sapphire Edge VS8	Chillblast Fusion NUC	Tinygreen PC Intense PC Pro
Price	£300 inc VAT	£959 inc VAT	£277 inc VAT	£549 inc VAT	£791 inc VAT
Website	Zotac.com	Apple.com/uk	Sapphiretech.com	Chillblast.com	Tinygreenpc.com
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★☆	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	1.7GHz AMD E2-1800	2.6GHz Intel Core i7-3270QM	1.6GHz AMD A8-4555M	1.8GHz Intel Core i3-3217U	1.7GHz Intel Core i7-3517UE
CPU cooler	Custom heatsink and fan	Custom fan	Custom heatsink and fan	Custom Intel semi-active	Passive heatsink
RAM	2GB DDR3	4GB 1600MHz DDR3	4GB 1333MHz DDR3	8GB 1333MHz DDR3	8GB 1600MHz DDR3
Storage capacity	64GB mSATA SSD	1TB HDD + 128GB SSD	500GB 5400rpm HDD	128GB Intel 525 Series SSD	500GB 5400rpm HDD
Power supply	External	Internal	External	External	External
Motherboard	AMD Hudson-1, AMD K14	Custom Intel HM77	AMD Hudson-3, AMD K15.1	Intel QS77 Express chipset	Intel QM77 chipset
Operating system	None	OS X 10.8 Mountain Lion	None	Windows 8 64-bit	Windows 7 Professional
Graphics	AMD Radeon HD 7340	Intel HD Graphics 4000	AMD Radeon HD 7600G	Intel HD Graphics 4000	Intel HD Graphics 4000
Sound	Onboard	Onboard, built-in speakers	Onboard	Onboard	Onboard
Connectivity	802.11b/g/n USB adaptor, gigabit ethernet	802.11a/b/g/n, gigabit ethernet, Bluetooth	802.11b/g/n, gigabit ethernet, Bluetooth	802.11b/g/n, Bluetooth	802.11b/g/n, 2x gigabit ethernet, Bluetooth
Ports	2x USB 3.0, 2x USB 2.0, eSATA/USB 2.0, HDMI, S/PDIF, mic	4x USB 3.0, HDMI, Thunderbolt, FireWire 800, line-in/out	2x USB 3.0, 4x USB 2.0, HDMI, Mini DisplayPort, S/PDIF, line-in/out	3x USB 2.0, HDMI, Thunderbolt	2x USB 3.0, 4x USB 2.0, 2x eSATA, HDMI, DisplayPort, S/PDIF, ultra-mini RS232
Card reader	SD	SDXC	SD	None	None
Other	Remote control, Vesa mount	Apple iLife, HDMI-to-DVI adaptor, IR	HDMI, S/PDIF cables, HDMI-to-DVI adaptor, Vesa mount	Chillblast Free Software pack, Vesa mount	None
Dimensions	106x106x37mm	197x197x26mm	183x198x32mm	117x112x39mm	190x160x40mm
Weight	Not specified	1.3kg	660g	1kg	750g
PC Mark Overall	1985	3286	1150	3993	2628
Aliens vs Predator (fps) <sup>1</sup>	5/5	8/5	11/6	7/5	7/5
Power consumption <sup>2</sup>	7.5W/23.5W	12.5W (6W in OS X)/75W	13W/33.3W	9W/19.5W	12W/35W
Warranty	2-year return-to-base	1-year return-to-base	2-year return-to-base	2-year collect-and-return	2-year return-to-base
Verdict	<ul style="list-style-type: none"> <li>• Tiny size</li> <li>• Good performance for the dimensions</li> <li>• Generous number of ports and connectors</li> <li>• Only 64GB of storage</li> </ul>	<ul style="list-style-type: none"> <li>• Superlative build and quality</li> <li>• Strong speed</li> <li>• Plenty of storage</li> <li>• Fairly power hungry</li> </ul>	<ul style="list-style-type: none"> <li>• Low price</li> <li>• Sluggish general performance, but very fast at games</li> <li>• No operating system preinstalled</li> </ul>	<ul style="list-style-type: none"> <li>• 128GB SSD drive is blisteringly fast, but low in capacity</li> <li>• Stunning overall speed</li> <li>• No USB 3.0, ethernet or card reader</li> </ul>	<ul style="list-style-type: none"> <li>• Fanless design means quiet operation</li> <li>• Good performance</li> <li>• Interchangeable expansion modules</li> <li>• Not cheap</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/CQ7N7S8">TINYURL.COM/CQ7N7S8</a>	<a href="http://TINYURL.COM/C62LTOH">TINYURL.COM/C62LTOH</a>	<a href="http://TINYURL.COM/BO8JSXJ">TINYURL.COM/BO8JSXJ</a>	<a href="http://TINYURL.COM/CRD3BQR">TINYURL.COM/CRD3BQR</a>	<a href="http://TINYURL.COM/CM3U8GS">TINYURL.COM/CM3U8GS</a>

<sup>1</sup> Alien Vs Predator tested at 720p and 1080p, High Quality respectively <sup>2</sup>Measured when idle and under load respectively

## >> Buying advice



## Mini PCs

Mini PCs look good, fit into the smallest of spaces, and usually offer cooler, quieter operation and lower power consumption than their desktop counterparts.

However, there are a few down sides. For example, a mini PC doesn't have enough internal space for a discrete graphics card or a desktop (3.5in) hard drive. All

other upgrades and expansion will usually be achieved externally.

With this in mind, pay particular attention to the connectivity options. If you want to hook up external storage, look for USB 3.0 ports. For connecting the PC to a standard LCD monitor you can use HDMI. If you have an external music system with digital inputs you may also want an S/PDIF

connector on your mini PC.

Mini PCs typically ship without a keyboard or mouse, and often come without an OS. Remember to factor in the cost of these items.

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**READ MORE:** [TINYURL.COM/D29Y0NN](http://TINYURL.COM/D29Y0NN)

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120GB Samsung 840 series SSD  
2000GB SATA III 7200rpm Hard Disk  
24x DVD-RW Drive  
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AWARDS

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\*\* World's fastest PC as tested by PC Pro Magazine - <http://www.pcpro.co.uk/reviews/desktops/371152/chillblast-fusion-photo-oc-iv>

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# TIME TO GO DIGITAL



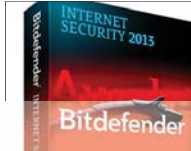

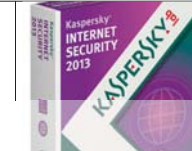


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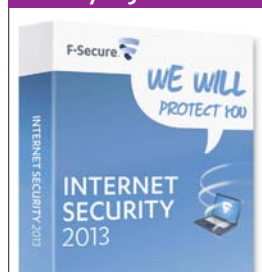


Internet security suites					
	F-Secure Internet Security	Norton Internet Security	Bitdefender Internet Security	Trend Micro Titanium IS	Kaspersky Internet Security
Annual price	£39 inc VAT	£49 inc VAT	£44 inc VAT	£59 inc VAT	£49 inc VAT
Licence terms	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year
Website	F-secure.com	Uk.norton.com	Bitdefender.co.uk	Trendmicro.co.uk	Kaspersky.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Signature-based detection	99%	99.8%	98.8%	100%	98.1%
Malware blocking (full)	100%	100%	100%	100%	94.4%
Malware blocking (partial)	0%	0%	0%	0%	0%
Clean-up of malware	90%	60%	90%	80%	80%
On-demand scan speed	76 secs	79 secs	121 secs	110 secs	70 secs
On-access scan speed	230 secs	175 secs	341 secs	341 secs	368 secs
Interface design	Very good	Superior	Very good	Very good	Very good
Verdict	<ul style="list-style-type: none"> <li>• Good value for money</li> <li>• Great scores in most tests</li> <li>• User-friendly interface</li> <li>• Fast scan speed</li> </ul>	<ul style="list-style-type: none"> <li>• Real-world attack scores bode well for its efficacy</li> <li>• Consumes few resources</li> <li>• Polished, simple interface</li> </ul>	<ul style="list-style-type: none"> <li>• Good value for money</li> <li>• Exceptional in some tests</li> <li>• Can slow startup</li> <li>• MyBitDefender a nice touch</li> </ul>	<ul style="list-style-type: none"> <li>• Brilliant performer</li> <li>• Scan times a little low</li> <li>• More guidance required</li> <li>• Expensive</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent at cleaning up infections; not so hot on detection</li> <li>• Impacts system speed</li> </ul>
FULL REVIEW	<a href="http://tinyurl.com/CKKPBWF">TINYURL.COM/CKKPBWF</a>	<a href="http://tinyurl.com/8U7W6OA">TINYURL.COM/8U7W6OA</a>	<a href="http://tinyurl.com/CAFEHS7">TINYURL.COM/CAFEHS7</a>	<a href="http://tinyurl.com/CRZZ73Z">TINYURL.COM/CRZZ73Z</a>	<a href="http://tinyurl.com/BRY3CTZ">TINYURL.COM/BRY3CTZ</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%	97.5%	99.4%	95.7%	98.4%
Malware blocking (full)	96%	68%	84%	88%	88%
Malware blocking (partial)	0%	20%	4%	4%	8%
Clean-up of active malware	80%	80%	80%	80%	80%
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 you get what you pay for.

**READ MORE:** [TINYURL.COM/7NR8FSM](http://tinyurl.com/7NR8FSM)



Sub-£150 printers	    				
	1 <b>PC ADVISOR</b> GOLD	2 <b>PC ADVISOR</b> BEST BUY	3 <b>PC ADVISOR</b>	4 <b>PC ADVISOR</b> RECOMMENDED	5 <b>PC ADVISOR</b>
	Samsung ML-2955DW	Oki C110	Pantum P2050	HP Photosmart 7520	Epson Expression XP-605
Price	£108 inc VAT	£126 inc VAT	£49 inc VAT	£130 inc VAT	£90 inc VAT
Website	Samsung.com/uk	Oki.co.uk	Pantum.com	Hp.com/uk	Epson.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Technology	Mono laser	Colour laser	Mono laser	Colour inkjet	Colour inkjet
Max print resolution	1200x1200	1200x600	1200x600	9600x2400	5760x1440
Actual print speed	B=22.2ppm	B=15.8ppm C=2.5ppm	B=15.8ppm	B=17.6ppm C=7.9ppm	B=11ppm C=4ppm
Scan/fax facilities	None	None	None	1200x2400 scans	1200x2400 scans
Supported interfaces	USB 2.0, 802.11b/g/n, ethernet	USB 2.0	USB 2.0	USB 2.0, 802.11b/g/n, HP ePrint	USB 2.0, 802.11b/g/n
Cost per page	B=2.7p	B=3.6p C=5p	B=2.4p	B=2.4p C=4.8p	B=3p C=6p
Media card/auto duplex	✓✓	✗✗	✗✗	✓✓	✓✓
Input capacity	251 sheets	100 sheets	150 sheets + manual	125 sheets + 20 tray + 25 ADF	120 sheets + 20 photo
Dimensions	348x338x197mm	396x380x275mm	380x260x236mm	454x551x220mm	390x341x138mm
Weight	7.2kg	14.4kg	6.1kg	8.6kg	7.1kg
Warranty	1 year	3 years	1 year	1 year	1 year
Verdict	<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>• Good-value colour laser</li> <li>• Performs better than an equivalent inkjet</li> <li>• No duplex mode</li> </ul>	<ul style="list-style-type: none"> <li>• Now available for just £45</li> <li>• Decent design</li> <li>• No fancy features</li> <li>• Solid running costs</li> </ul>	<ul style="list-style-type: none"> <li>• Nice 4.3in touchscreen</li> <li>• Separate photo/ADF trays</li> <li>• Good speed for an Inkjet</li> <li>• Competitive running costs</li> </ul>	<ul style="list-style-type: none"> <li>• Impressively sharp output</li> <li>• Intuitive 2.5in touchscreen</li> <li>• Numerous features</li> <li>• Auto-duplex a little slow</li> </ul>
FULL REVIEW	TINYURL.COM/CCLSZDM	TINYURL.COM/YLNO5RV	TINYURL.COM/C764SZ2	TINYURL.COM/98G9XTE	TINYURL.COM/CZ6TXZS

£151+ printers	    				
	1 <b>PC ADVISOR</b> BEST BUY	2 <b>PC ADVISOR</b> GOLD	3 <b>PC ADVISOR</b> RECOMMENDED	4 <b>PC ADVISOR</b> RECOMMENDED	5 <b>PC ADVISOR</b>
	Kyocera Mita FS-1320D	HP OfficeJet Pro X551dw	Canon i-Sensys LBP7780Cx	Lomond EvoJet 2 Office	Xerox ColorQube 8700
Price	£175 inc VAT	£450 inc VAT	£440 inc VAT	£50-£150 per month	£2,028 inc VAT
Website	Kyoceramita.co.uk	Hp.com/uk	Canon.co.uk	Lomond.com	Xerox.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Technology	Mono laser	Colour inkjet	Colour laser	Colour laser	Colour laser
Max print resolution	1200x1200	2400x2400	9600x600	1600x1600	600x600
Actual print speed	B=26.1ppm	B=42.9ppm C=15.8ppm	B=23.2pp C=16.7ppm	B=41.4ppm C=23.1ppm	B=30ppm C=30ppm
Scan/fax facilities	None	None	None	None	600dpi scans
Supported interfaces	USB 2.0	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet	USB 2.0, ethernet	USB 2.0, gigabit ethernet
Cost per page	B=1.4p	B=1p C=4.3p	B=1.3p C=7.5p	Variable	B=1.4p C=8p
Media card/auto duplex	✓✓	✗✓	✗✓	✗✗	✗✓
Input capacity	250 sheets	500 + 50 sheet	500 + 100 sheets	250 + 20 sheets	525 + 100 sheets
Dimensions	375x393x250mm	517x399x414mm	517x530x401mm	542x455x265mm	605x595x615mm
Weight	12kg	17.1kg	31kg	12.8kg	46.5kg
Warranty	2 years	1 year	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>• Capable of immense speed</li> <li>• Potential 1050 sheets input</li> <li>• Very cheap running costs</li> <li>• Text not the darkest</li> </ul>	<ul style="list-style-type: none"> <li>• Immense 1100-sheet capacity</li> <li>• Auto-duplex at 19.9ppm</li> <li>• Excellent colour depth</li> <li>• Secure Print</li> </ul>	<ul style="list-style-type: none"> <li>• Monthly payment plans rather than outright purchase</li> <li>• Stunning speed</li> <li>• No auto-duplex</li> </ul>	<ul style="list-style-type: none"> <li>• High price tag</li> <li>• Good running costs</li> <li>• Extensive paper handling</li> <li>• Large model weighs 46.5kg</li> </ul>
FULL REVIEW	TINYURL.COM/6GG9UKV	TINYURL.COM/CZ05P65	TINYURL.COM/CCAPAJF	TINYURL.COM/CLQAQ5V	TINYURL.COM/ARCLM4J

GLOSSARY: • B: mono • C: colour • ppm: pages per minute

## >> 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 instore 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
	<b>Pioneer BDR-208EBK Retail</b>	<b>Pioneer BDR-208DBK OEM</b>	<b>LG BH16NS40</b>	<b>LG BP40NS20</b>	<b>Lite-On IHES112-115</b>
Price	<b>£66 inc VAT</b>	<b>£64 inc VAT</b>	<b>£74 inc VAT</b>	<b>£90 inc VAT</b>	<b>£54 inc VAT</b>
Website	Pioneer.eu/uk	Pioneer.eu/uk	Uk.lge.com	Uk.lge.com	Liteonit.eu
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Blu-ray speeds	15x -R, 14x -R DL, 2x -RE, 12x -ROM	15x -R, 14x -R DL, 2x -RE, 12x -ROM	16x -R, 12x -R DL, 12x -RE, 12x -ROM	6x -R, 6x -R DL, 2x -RE, 6x -ROM	12x -ROM
DVD speeds	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 16x -ROM	16x ±R, 8x ±R DL, 6x -RW, 8x +RW, 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	8x ±R, 8x ±R DL, 6x -RW, 8x +RW, 8x -ROM
Max storage	128GB	50GB	50GB	100GB	8.5GB
Interface type	SATA (internal)	SATA (internal)	SATA (internal)	USB 2.0 (external)	SATA (internal)
Label technology	None	None	LightScribe	None	None
Software	ArcSoft TotalMedia Extreme	None	CyberLink Blu-ray Suite	PowerDVD, PowerProducer	None
Dimensions	148x180x42mm	148x180x42mm	146x170x41mm	160x153x22mm	158x145x22mm
Weight	740g	740g	749g	380g	700g
Warranty	1 year	1 year	1 year	1 year	2 years
Verdict	<ul style="list-style-type: none"> <li>• Retail pack includes software</li> <li>• Supports 128GB BD-XL media</li> <li>• Very well priced</li> <li>• Matches 208DBK on speed</li> </ul>	<ul style="list-style-type: none"> <li>• OEM only - no software</li> <li>• Great performance on BD-R</li> <li>• Doesn't support BD-XL</li> <li>• 208EBK offers better value</li> </ul>	<ul style="list-style-type: none"> <li>• Pioneer offers faster BD-R</li> <li>• Good RE speed</li> <li>• Doesn't support BD-XL</li> <li>• Comes with software</li> </ul>	<ul style="list-style-type: none"> <li>• Attractive external model</li> <li>• Maxes out at 6x BD-R (most media is only 6x)</li> <li>• Supports triple-layer BD-R</li> </ul>	<ul style="list-style-type: none"> <li>• Playback only</li> <li>• No software included with many bundles</li> <li>• Pioneer's offer better value</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/LD47X7K">TINYURL.COM/LD47X7K</a>	<a href="http://TINYURL.COM/LD47X7K">TINYURL.COM/LD47X7K</a>	<a href="http://TINYURL.COM/8YTUJEF">TINYURL.COM/8YTUJEF</a>	<a href="http://TINYURL.COM/BS8UAF">TINYURL.COM/BS8UAF</a>	<a href="http://TINYURL.COM/8SYECMW">TINYURL.COM/8SYECMW</a>

Wireless routers					
	1 	2	3 	4 	5
	<b>Apple AirPort Express</b>	<b>D-Link Cloud Router N600</b>	<b>Cisco Linksys EA6500</b>	<b>Asus RT-AC66U</b>	<b>WD My Net AC1300</b>
Price	<b>£79 inc VAT</b>	<b>£60 inc VAT</b>	<b>£157 inc VAT</b>	<b>£168 inc VAT</b>	<b>£139 inc VAT</b>
Website	Apple.com/uk	Dlink.com	Linksysbycisco.com	Uk.asus.com	Wdc.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Standards supported	802.11a/b/g/n	802.11a/b/g/n	802.11b/g/n/ac	802.11b/g/n/ac	802.11a/b/g/n/ac
Frequency modes	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz	2.4GHz/5GHz	2.4GHz/5GHz (concurrent)
128/256bit WEP/WPA2	✓ x ✓	✓ x ✓	✓ x ✓	✓ x ✓	✓ x ✓
ADSL Modem/Guest NW	x ✓	x ✓	x ✓	x ✓	x ✓
Parental cont./mobile app	✓ ✓	✓ ✓	✓ ✓	✓ ✓	x ✓
Firewall	NAT/SPI	NAT/SPI	NAT/SPI	NAT/SPI	NAT/SPI
Ports	10/100 WAN, 10/100 LAN, USB	Gig WAN, 4x gig LAN, USB	Gig WAN, 4x gig LAN, 2x USB	Gig WAN, 4x gig LAN, 2x USB	Gig WAN, 4x gig LAN, 2x USB
Average power use	Not tested	Not tested	10.2W	9W	Not tested
Throughput (near, far, ac)	94Mb/s, n/a, n/a	142Mb/s, 115Mb/s, n/a	266Mb/s, 195Mb/s, 471Mb/s	270Mb/s, 199Mb/s, 457Mb/s	290Mb/s, 220Mb/s, 425Mb/s
Dimensions, weight	98x98x23mm, 240g	111x93x145mm, 330g	256x184x40mm, 500g	207x149x36mm, 450kg	169x36x230mm, 440g
Warranty	1 year	1 year	2 years	2 years	1 year
Verdict	<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>• Cloud features</li> <li>• Parental controls</li> <li>• Interesting looks</li> <li>• Up slightly in price</li> </ul>	<ul style="list-style-type: none"> <li>• Stunning performance</li> <li>• Excellent interface</li> <li>• Strong QoS</li> <li>• 802.11ac isn't cheap</li> </ul>	<ul style="list-style-type: none"> <li>• Decent value</li> <li>• Versatile antennae</li> <li>• Great for file-hosting and media streaming</li> </ul>	<ul style="list-style-type: none"> <li>• Performance holds up well over longer distances</li> <li>• Well designed user interface</li> <li>• Average USB performance</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/6LH6OOS">TINYURL.COM/6LH6OOS</a>	<a href="http://TINYURL.COM/9LGFF8Y">TINYURL.COM/9LGFF8Y</a>	<a href="http://TINYURL.COM/AWYOPYX">TINYURL.COM/AWYOPYX</a>	<a href="http://TINYURL.COM/BU79W64">TINYURL.COM/BU79W64</a>	<a href="http://TINYURL.COM/LZOS9KO">TINYURL.COM/LZOS9KO</a>

## >> 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
	<b>PC ADVISOR</b> RECOMMENDED	<b>PC ADVISOR</b> RECOMMENDED		<b>PC ADVISOR</b> GOLD	
	<b>Axtremex Micro SSD</b>	<b>WD My Passport Edge for Mac</b>	<b>G-Technology G-Drive Pro</b>	<b>G-Tech G-Raid Thunderbolt</b>	<b>Toshiba Stor.E Basics</b>
Price	£130 inc VAT	£70 inc VAT	£250 inc VAT	£599 inc VAT	£100 inc VAT
Website	Axtremex.com	Wdc.com/en	G-technology.com	G-technology.com	Toshiba.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity tested	32GB	500GB	4TB	8TB	2TB
Capacity range	32GB to 256GB	500GB	2TB to 4TB	4TB to 8TB	320GB to 2TB
Disk size	2.5in	2.5in	3.5in	3.5in	2.5in
Spin speed	N/A	5400rpm	7200rpm	7200rpm	5400rpm
Transfer speed	400GB/s	94MB/s (USB 3.0)	N/A	329MB/s	94MB/s (USB 3.0)
Encryption	None	Password protection	None	None	None
Other interfaces	None	None	FireWire 800	None	none
Software	Axtremex utilities	WD utilities	None	None	None
Dimensions	73x38x10mm	112x83x11mm	235x130x46mm	235x130x85mm	119x79x21mm
Weight	58g	164g	1.35kg	2.3kg	215g
Warranty	1 year	3 years	3 years	3 years	1 year
Verdict	<ul style="list-style-type: none"> <li>• Stunning performance</li> <li>• Requires USAP-enabled USB 3.0 ports for the best performance</li> </ul>	<ul style="list-style-type: none"> <li>• Not just for Macs</li> <li>• Password protection</li> <li>• Faultless build quality</li> <li>• Great value</li> </ul>	<ul style="list-style-type: none"> <li>• 120Mb/s average real-world performance</li> <li>• Clearly audible</li> <li>• Suits both PCs and Macs</li> </ul>	<ul style="list-style-type: none"> <li>• Fast Thunderbolt interface</li> <li>• Real-world speed can exceed 200MB/s</li> <li>• Pricey, but huge capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Good value for money</li> <li>• Unashamedly simple</li> <li>• No backup or encryption</li> <li>• Slow speed</li> </ul>
FULL REVIEW	TINYURL.COM/KTRDXUH	TINYURL.COM/BMG7SW9	TINYURL.COM/NV7F32F	TINYURL.COM/CXEF6MH	TINYURL.COM/LBHC8EL

NAS drives	    				
	1	2	3	4	5
	<b>PC ADVISOR</b> RECOMMENDED	<b>PC ADVISOR</b> RECOMMENDED	<b>PC ADVISOR</b> BEST BUY		<b>PC ADVISOR</b> RECOMMENDED
	<b>Synology DS413j</b>	<b>Synology DS413</b>	<b>Synology DS412+</b>	<b>Qnap TS-1079 Pro</b>	<b>Zyxel NSA325</b>
Price	£270 inc VAT (diskless)	£415 inc VAT (diskless)	£455 inc VAT (diskless)	£2,279 inc VAT (diskless)	£85 inc VAT (diskless)
Website	Synology.com	Synology.com	Synology.com	Qnap.com	Zyxel.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Drive bays	4	4	4	10	2
Processor	1.6GHz Marvell mv6282	1067MHz Freescale P1022 dc	2.13GHz Intel Atom D2700	3.3GHz Intel Core i3-2120	1.6GHz processor
Memory	512MB DDR3	1GB DDR3	1GB DDR3	2GB DDR3	512MB DDR2
Remote access	✓	✓	✓	✓	✓
eSATA	x	✓	✓	✓	x
USB port	2x USB 2.0	2x USB 3.0, 1x USB 2.0	2x USB 3.0, 1x USB 2.0	2x USB 3.0, 4x USB 2.0	2x USB 2.0
Raid options	0/1/5/6/10/JBOD	0/1/5/5+s/6/10/JBOD	0/1/5/5+s/6/10/JBOD	0/1/5/5+hs/6/6+hs/10/10+hs/JBOD	0/1/JBOD
Software	DSM 4.1	DSM 4.1	DSM 4.1	Qnap QBack, MyCloudNAS	zPilot
Dimensions	184x168x230mm	165x203x233mm	165x203x233mm	218x327x321mm	108x205x147mm
Weight	2kg	2kg	2kg	9.8kg	1.8kg
Warranty	2 years	2 years	2 years	2 years	1 year
Verdict	<ul style="list-style-type: none"> <li>• Much cheaper than DS413</li> <li>• Aimed at small-office and home users</li> <li>• No USB 3.0 or eSATA</li> </ul>	<ul style="list-style-type: none"> <li>• More powerful than DS413j, but less so than DS412+</li> <li>• Versatile, friendly interface</li> <li>• Cloud Station indispensable</li> </ul>	<ul style="list-style-type: none"> <li>• Brilliant read/write performance eclipses the DS413 models</li> <li>• Attractive and intuitive</li> </ul>	<ul style="list-style-type: none"> <li>• Up to 10 bays</li> <li>• Very powerful processor</li> <li>• Fast performance</li> <li>• Strong specifications</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>
FULL REVIEW	TINYURL.COM/PL8XM8S	TINYURL.COM/B562XW3	TINYURL.COM/6UUL4DE	TINYURL.COM/PAAYD4Y	TINYURL.COM/7B9EPW8

## » 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 connected to a network via a 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.

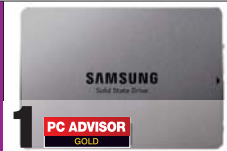




To augment data integrity, access speed, capacity, or all

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	    				
	1	2	3 <small>PC ADVISOR RECOMMENDED</small>	4	5
	Epson EB-1945W	BenQ W1070	ViewSonic PJD7820HD	Vivitek Qumi Q2	Dell M900HD
Price	£1,310 inc VAT	£671 inc VAT	£650 inc VAT	£350 inc VAT	£754 inc VAT
Website	Epson.co.uk	Benq.co.uk	Viewsoniceurope.com/uk	Vivitek.co.uk	Dell.co.uk
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Projection technology	3LCD	DLP	DLP	DLP	DLP
Resolution (pixels)	1280x800	1920x1080	1920x1080	1280x800	1280x800
Brightness <sup>1</sup> , Contrast	4200, 3000:1	2000, 10000:1	3000, 15000:1	300, 2500:1	900, 700:1
Image size	280in	235in	300in	30-90in	80in
Supported aspect ratios	16:10, 16:9, 4:3	16:9	16:9, 4:3	16:10, 16:9, 4:3	16:10, 16:9, 4:3
Noise levels (dB)	37 (29 eco)	33 (30 eco)	35 (29 eco)	32 (28 eco)	38 (34 eco)
Connections	VGA, HDMI, DP, CM, USB, ET	VGA, HDMI, CM, USB	VGA, HDMI, CM, USB	VGA, HDMI, USB	HDMI, USB, WiDi
Lamp/lamp life	Not supplied/2500 hrs	240W/6000 hrs	Not supplied/5000 hrs	LED/30000 hrs	LED/30000 hrs
Dimensions	377x271x108mm	312x244x109mm	268x221x84mm	162x102x32mm	232x164x43mm
Weight	3.9kg	2.65kg	2.1kg	635g	1.59kg
Warranty	5 years	2 years	3 years	3 years	1 year
Verdict	<ul style="list-style-type: none"> <li>Incredibly easy to find optimum image quality</li> <li>Strong spec and quality</li> <li>Not particularly portable</li> </ul>	<ul style="list-style-type: none"> <li>Good home cinema output</li> <li>Short-throw lens creates big picture</li> <li>Very good SmartEco option</li> </ul>	<ul style="list-style-type: none"> <li>3000 ANSI lumens</li> <li>Short-throw lens</li> <li>Good colour depth</li> <li>3D option</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>Wonderfully petite, portable</li> <li>WiDi and Miracast for wireless/portable devices</li> <li>Will struggle in light offices</li> </ul>
FULL REVIEW	<a href="http://tinyurl.com/CP95P7G">TINYURL.COM/CP95P7G</a>	<a href="http://tinyurl.com/LXADR7Q">TINYURL.COM/LXADR7Q</a>	<a href="http://tinyurl.com/D2H04CV">TINYURL.COM/D2H04CV</a>	<a href="http://tinyurl.com/3TXMWPK">TINYURL.COM/3TXMWPK</a>	<a href="http://tinyurl.com/MAXQRG3">TINYURL.COM/MAXQRG3</a>

<sup>1</sup>Ansi lumens GLOSSARY: • CM: component • CP: composite • ET: ethernet • SV: S-Video

Solid-state drives	    				
	1 <small>PC ADVISOR GOLD</small>	2 <small>PC ADVISOR RECOMMENDED</small>	3 <small>PC ADVISOR RECOMMENDED</small>	4 <small>PC ADVISOR RECOMMENDED</small>	5 <small>PC ADVISOR RECOMMENDED</small>
	Samsung 840 EVO	Plextor M5 Pro	Crucial M500	Samsung 840 Pro	Corsair Neutron GTX
Price	£410 inc VAT	£174 inc VAT	£299 inc VAT	£367 inc VAT	£190 inc VAT
Website	samsung.com/uk	Plextor.com	Crucial.com/uk	Samsung.com/uk	Corsair.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity tested	750GB	256GB	480GB	512GB	240GB
Price per GB	55p	68p	62p	72p	79p
Memory cache	1GB LPDDR2	512MB DDR3	512MB DDR3	512MB LPDDR2	256MB DDR2
Controller	Samsung MEX (3-core ARM)	Marvell 88SS9187	Marvell 88SS9187	Samsung MDX (3-core ARM)	Link_A_Media LM87800
Encryption	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit	None
Flash	Samsung 19nm Toggle NAND	Toshiba Toggle NAND	Micron 20nm MLC NAND	Samsung 21nm Toggle NAND	Samsung/Tosh Toggle NAND
Firmware updated via	SSD Magician for Windows	ISO boot disc	ISO boot disc	SSD Magician for Windows	SSD Toolbox for Windows
ATTO peak sequential	R: 554MB/s; W: 537MB/s	R: 547MB/s; W: 457MB/s	R: 539MB/s; W: 433MB/s	R: 562MB/s; W: 519MB/s	R: 557MB/s; W: 511MB/s
CDM peak IOPS	104k (read)	103.3k (read)	89.8k (read)	103.8k (read)	92.8k (read)
AS SSD (points)	1141	1124	1038	1094	1057
Warranty	5 years	5 years	3 years	5 years	5 years
Verdict	<ul style="list-style-type: none"> <li>Lightning performance</li> <li>840 Pro is slightly faster</li> <li>Great value for money</li> <li>Good longevity</li> </ul>	<ul style="list-style-type: none"> <li>High performance figures</li> <li>Nowhere near the value per gigabyte of the EVO</li> <li>Very durable</li> </ul>	<ul style="list-style-type: none"> <li>Best value of all SSDs here</li> <li>Good security</li> <li>Decent speed</li> <li>Multiple OS support</li> </ul>	<ul style="list-style-type: none"> <li>Impressive speed</li> <li>Three-core ARM processor</li> <li>Limited platform support</li> <li>Bluetooth issues on test</li> </ul>	<ul style="list-style-type: none"> <li>Strong write performance</li> <li>Nice weight and warranty</li> <li>Choice of models available</li> <li>Unusual choice of controller</li> </ul>
FULL REVIEW	<a href="http://tinyurl.com/L5EDQOY">TINYURL.COM/L5EDQOY</a>	<a href="http://tinyurl.com/PTYGG27">TINYURL.COM/PTYGG27</a>	<a href="http://tinyurl.com/M2NCSMJ">TINYURL.COM/M2NCSMJ</a>	<a href="http://tinyurl.com/OU4LEJG">TINYURL.COM/OU4LEJG</a>	<a href="http://tinyurl.com/KV954FC">TINYURL.COM/KV954FC</a>

## » Buying advice



## Projectors

Projectors designed for home use don't tend to be as bright as office models - anything offering fewer than 1000 ANSI lumens will be usable only in a dark room. And don't forget that the brightness drops as the image size increases.

The cheapest home-cinema models offer a 720p resolution, but you'll notice the extra detail

of 1080p when watching Blu-ray films on a large screen.

If you can't place the projector square-on to the screen, look for a model with lens shift. Keystone correction is a cheaper alternative, altering the image digitally, but degrading quality in the process.

A zoom function offers more flexibility over how far from the






screen you can site the projector.

If it's to go in a small room, get a short-throw model that produces a large image over a short distance.

DLP projectors offer better contrast and punchier colours than LCD models, but can suffer from the distracting and sometimes nauseating 'rainbow effect'.

**READ MORE:** [TINYURL.COM/6MTMWJX](http://tinyurl.com/6MTMWJX)



Sub-£150 graphics cards	    				
	1	2	3	4	5
	MSI GTX 650 Ti OC Boost	Sapphire HD 7770	HIS HD 7790	MSI GeForce GTX 650	Sapphire Radeon HD 7750
Price	£147 inc VAT	£96 inc VAT	£116 inc VAT	£85 inc VAT	£80 inc VAT
Website	Uk.msi.com	Sapphiretech.com	Hisdigital.com	Uk.msi.com	Sapphiretech.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Graphics processor	nVidia GTX 650 Ti Boost	AMD Radeon HD 7770	AMD Radeon HD 7790	nVidia GeForce GTX 650	AMD Radeon HD 7750
Installed RAM	2GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5
Memory interface	192-bit	128-bit	128-bit	128-bit	128-bit
Core/memory clock	1033MHz/1502MHz	1GHz/1125MHz	1075GHz/1.6GHz	1071MHz/1250MHz	800MHz/1125MHz
Ramdac	400MHz	400MHz	400MHz	400MHz	400MHz
Stream processors	768	640	896	384	512
Power connectors	1x 6-pin	1x 6-pin	1x 6-pin	1x 6-pin	None
Interface	PCI Express	PCI Express	PCI Express	PCI Express	PCI Express
DirectX	11	11.1	11	11	11
Digital interface	2x DVI, HDMI, DisplayPort	DVI, HDMI, Mini DisplayPort	2x DVI, HDMI, DisplayPort	2x DVI, Mini HDMI	DVI, HDMI, DisplayPort
Warranty	3 years	3 years	3 years	3 years	2 years
Verdict	<ul style="list-style-type: none"> <li>Fantastic performance</li> <li>192-bit memory interface</li> <li>Boost clock to 1098MHz</li> <li>Fairly quiet for the power</li> </ul>	<ul style="list-style-type: none"> <li>Faster than 650 and 7750</li> <li>Decent value for money</li> <li>Plenty of stream processors</li> <li>Low sound levels</li> </ul>	<ul style="list-style-type: none"> <li>650 Ti Boost much faster</li> <li>Becoming better value</li> <li>Only 128-bit memory</li> <li>Low noise</li> </ul>	<ul style="list-style-type: none"> <li>Marginally slower than 7770</li> <li>Superb overclocking</li> <li>Very different to 650 Ti</li> <li>MSI version has second fan</li> </ul>	<ul style="list-style-type: none"> <li>Cheapest card in the chart</li> <li>Low specs include 800MHz core clock</li> <li>Lacks power in some games</li> </ul>
FULL REVIEW	TINYURL.COM/DYE3OW8	TINYURL.COM/BWJ7BL9	TINYURL.COM/BPRUYS5	TINYURL.COM/AKT2XOM	TINYURL.COM/7ZB5OE3

£151+ graphics cards	    				
	1	2	3	4	5
	MSI GeForce GTX 760 OC	MSI GTX 660 Ti	Asus GeForce GTX 770 2GB	XFX 7970 3GB GDDR5	Asus GeForce GTX 780 3GB
Price	£200 inc VAT	£175 inc VAT	£340 inc VAT	£270 inc VAT	£570 inc VAT
Website	Uk.msi.com	Uk.msi.com	Uk.asus.com	Xfxforce.com	Uk.asus.com
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Graphics processor	nVidia GeForce GTX 760	nVidia GeForce GTX 660 Ti	nVidia GeForce GTX 770	AMD Radeon HD 7970	nVidia GeForce GTX 780
Installed RAM	2GB GDDR5	2GB GDDR5	2GB GDDR5	3GB GDDR5	3GB GDDR5
Memory interface	256-bit	192-bit	256-bit	284-bit	384-bit
Core/memory clock	1006MHz/1502MHz	941MHz/6008MHz	1058MHz/1752MHz	925MHz/1375MHz	863MHz/1502MHz
Ramdac	400MHz	400MHz	400MHz	400MHz	400MHz
Stream processors	1152	1344	1536	2048	2304
Power connectors	1x 6-pin, 1x 8-pin	2x 6-pin	1x 6-pin, 1x 8-pin	1x 6-pin, 1x 8-pin	1x 6-pin, 1x 8-pin
Interface	PCI Express	PCI Express	PCI Express	PCI Express	PCI Express
DirectX	11	11	11	11.1	11
Digital interface	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini DisplayPort	2x DVI, HDMI, DisplayPort
Warranty	2 years	2 years	3 years	2 years	3 years
Verdict	<ul style="list-style-type: none"> <li>Performance in a different league to sub-£250 cards</li> <li>Not many stream processors or texture units</li> </ul>	<ul style="list-style-type: none"> <li>Sub-£175 price pushes it back into the competition</li> <li>Can't compete with 760, but quieter and uses less power</li> </ul>	<ul style="list-style-type: none"> <li>660 Ti and 760 offer better value for money</li> <li>Good price/performance</li> <li>Vast 22GB/s memory</li> </ul>	<ul style="list-style-type: none"> <li>Performance barely superior to cheaper 760</li> <li>3GB of RAM</li> <li>Look out for price drops</li> </ul>	<ul style="list-style-type: none"> <li>Removes the Titan's Compute capabilities</li> <li>Very expensive</li> <li>Best choice for gaming</li> </ul>
FULL REVIEW	TINYURL.COM/OPSNB5K	TINYURL.COM/D5BV2NG	TINYURL.COM/OAG6277	TINYURL.COM/6UZRVXC	TINYURL.COM/PN43VTL

## >> 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 256-bit interface lets through twice as much data as a 128-bit 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.

READ MORE: [TINYURL.COM/7BPUHQE](http://tinyurl.com/7BPUHQE)

Sub-£200 flat-panels	1	2	3	4	5
					
	<b>ViewSonic VP2365-LED</b>	<b>BenQ GW2750HM</b>	<b>Hanns-G HL249DPB</b>	<b>ViewSonic VX2460H-LED</b>	<b>AOC i2353Fh</b>
Price	£172 inc VAT	£190 inc VAT	£116 inc VAT	£157 inc VAT	£192 inc VAT
Website	Viewsoniceurope.com/uk	Benq.co.uk	Hannsg.com	Viewsoniceurope.com/uk	Aoc.co.uk
Overall rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Screen size	23in	27in	23.6in	23.6in	23in
Panel type	In-plane switching	Vertical alignment	Twisted nematic	Twisted nematic	In-plane switching 3D
Native resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Pixel pitch	0.27mm	0.31mm	0.27mm	0.27mm	0.27mm
Brightness	238cd/m²	313cd/m²	247cd/m²	250cd/m²	225cd/m²
Static contrast ratio	681:1	1530:1	740:1	710:1	666:1
Response time	6ms	6ms	5ms	5ms	5ms
Ports	DVI	HDMI, DVI, VGA	DVI	2x HDMI	2x HDMI, VGA
Dimensions	548x433x250mm	654x489x191mm	563x211x403mm	581x447x194mm	550x388x188mm
Weight	5.4kg	5.6kg	3.8kg	3.5kg	5.6kg
Warranty	3 years	3 years	3 years	3 years	3 years
Verdict	<ul style="list-style-type: none"> <li>• Better value than ever</li> <li>• Great quality</li> <li>• Good viewing angles</li> <li>• DVI port only</li> </ul>	<ul style="list-style-type: none"> <li>• Supplies now dwindling</li> <li>• Massive 27in screen</li> <li>• VA panel is excellent</li> <li>• Colour accuracy not perfect</li> </ul>	<ul style="list-style-type: none"> <li>• 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>• Slim and stylish looks</li> <li>• Good range of inputs</li> <li>• One of the better examples of TN technology</li> </ul>	<ul style="list-style-type: none"> <li>• Big price hike</li> <li>• Wide viewing angles</li> <li>• Attractive, slimline design</li> <li>• No DVI connection</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/5WMJLR9">TINYURL.COM/5WMJLR9</a>	<a href="http://TINYURL.COM/BQKT65S">TINYURL.COM/BQKT65S</a>	<a href="http://TINYURL.COM/C95859A">TINYURL.COM/C95859A</a>	<a href="http://TINYURL.COM/CSQ2H7P">TINYURL.COM/CSQ2H7P</a>	<a href="http://TINYURL.COM/7TWLB2A">TINYURL.COM/7TWLB2A</a>

£200+ flat-panels	1	2	3	4	5
					
	<b>Dell S2440L</b>	<b>LG 29EA93</b>	<b>Asus PA248Q</b>	<b>ViewSonic VP2765-LED</b>	<b>AOC I2757Fm</b>
Price	£201 inc VAT	£395 inc VAT	£315 inc VAT	£273 inc VAT	£230 inc VAT
Website	Dell.co.uk	Uk.lge.com	Asus.com/uk	Viewsoniceurope.com/uk	Aoc.co.uk
Overall rating	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
Screen size	24in	29in	24in	27in	27in
Panel type	Vertical alignment	In-plane switching	In-plane switching	Advanced MVA	In-plane switching
Native resolution	1920x1080	2560x1080	1920x1200	1920x1080	1920x1080
Pixel pitch	0.28mm	0.26mm	0.27mm	0.31mm	0.31mm
Brightness	239cd/m²	300cd/m²	201cd/m²	1,200cd/m²	237cd/m²
Static contrast ratio	1200:1	560:1	630:1	378:1	660:1
Response time	6ms	5ms	6ms	25ms	5ms
Ports	HDMI, VGA	3x USB 3.0, 2x HDMI, DVI, DP	4x USB, HDMI, DVI, DP, VGA	DVI, DP	2x HDMI, VGA
Dimensions	568x191x418mm	700x209x387mm	557x416x235mm	642x365x474-608mm	622x449x130mm
Weight	3.6kg	5.2kg	6.4kg	8.5kg	5.7kg
Warranty	3 years	2 years	3 years	3 years	3 years
Verdict	<ul style="list-style-type: none"> <li>• Premium build quality</li> <li>• Very good VA panel</li> <li>• Excellent contrast ratio</li> <li>• Calibrate for best results</li> </ul>	<ul style="list-style-type: none"> <li>• 21:9 ultra widescreen</li> <li>• Very accurate colours</li> <li>• Hardware calibration support</li> <li>• Three-port USB 3.0 hub</li> </ul>	<ul style="list-style-type: none"> <li>• For graphics professionals</li> <li>• Good control over image</li> <li>• Very accurate colour</li> <li>• 16:10 display ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Now at a great price</li> <li>• Large 27in display</li> <li>• Low resolution for size</li> <li>• Slow response for games</li> </ul>	<ul style="list-style-type: none"> <li>• Nice 27in IPS panel</li> <li>• Versatile viewing angles</li> <li>• MHL Android hook-up</li> <li>• Last few remaining</li> </ul>
FULL REVIEW	<a href="http://TINYURL.COM/CXWJLJM">TINYURL.COM/CXWJLJM</a>	<a href="http://TINYURL.COM/CTR7AAW">TINYURL.COM/CTR7AAW</a>	<a href="http://TINYURL.COM/CPYX7MQ">TINYURL.COM/CPYX7MQ</a>	<a href="http://TINYURL.COM/86T3PFM">TINYURL.COM/86T3PFM</a>	<a href="http://TINYURL.COM/C53K8KP">TINYURL.COM/C53K8KP</a>

## >> 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 but 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.

**READ MORE:** [TINYURL.COM/6RMBVR6](http://TINYURL.COM/6RMBVR6)



MATT EGAN



## Why E Ink might help win the battery battle

**O**n page 16 Martyn Casserly argues that specifications no longer matter. He suggests that personal computing devices are as fast as they need to be. I agree: for me, the most important battle ground to be fought by phones, tablets and laptops is that of battery life.

After all, there is more computational power in my smartphone than there was in the PC I bought five years ago. It does everything I need. Unfortunately, it doesn't do it for too long when I'm away from the mains.

It's a problem that we all accept, but we shouldn't. Why can't my laptop, tablet or smartphone last all day?



To date the solution has been to build larger-capacity batteries. But portability is as much about being small, thin and light as it is about working for a while on the go. When smartphones measure 7mm in thickness, there's not much room for a big battery.

There are other ways to tackle the issue. Intel's Haswell processors are marketed not for additional power, but for the fact they can make your laptop run for seven hours. Intel has made improvements as much by reducing the load software places on hardware as by improving the silicon. Judiciously and quickly shutting down processes that don't need to run so that less power is required can get you a long way.

But perhaps not all the way to a laptop that can run all week. Yet there are gadgets with battery life measured in weeks. E-readers.

Recently I met with E Ink, which makes the displays in most e-readers, including the Amazon Kindle. It was keen to promote E Ink for a range of other devices, including smartphones and laptops. Think about it: the full-HD, retina-busting screens we take for granted are power sinks. How many of the things you do require such a display? Web browsing, watching movies, looking at photos: yes. Replying to emails, editing documents, making calls: no.

Recently we've seen a few dual-screen devices, and the odd case that bundles in an E Ink display to otherwise full-colour and -resolution gadgets. It is an idea worth exploring. If you could check email, texts, Twitter and Facebook without it, wouldn't you mostly leave the screen dormant? Imagine how much battery life you'd save.

Battery life is the next big battle ground for portable computers. And E Ink displays may have a big part to play in the route to victory. ☒

## Next issue

ISSUE 222 ON SALE 6 NOVEMBER 2013

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If a poor Wi-Fi signal is driving you mad, it's time to upgrade your router. The latest models offer whole-house coverage and faster speeds.

### For your eyes only

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### Everything you need to know about crowd funding

We explain the Kickstarter phenomenon, and look at some great products that wouldn't have been made without private investors like you.

### What happens to data when you die?

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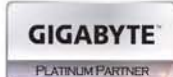
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