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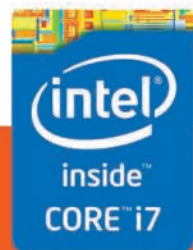
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# Nothing to hide

## Will free services destroy your life? Probably not

**P**lenty of people get their knickers in a twist over online privacy, while others (myself included) are considerably more laid back. Data collection may be a cybercrime in some people's eyes, but it's usually pretty easy to prevent if you care about such things.

Most people don't bother to read the T&Cs when installing software or signing up to online services - they're often long and indecipherable. Even if you don't like Google, Facebook or Apple's privacy policies, your only choice is not to use those services, cutting off your nose to spite your face.

A prime example is when you first turn on your new iPhone or Android smartphone. If you refuse to accept the terms you'll have to return the handset. Good luck getting a refund on that basis.

Handing over access to our personal details is very often the price of free. Email, social networks and cloud storage are typically be free to use in monetary terms but, depending on the privacy policy, you could be paying in kind. You've probably agreed to let the service store your personal details, track you online and access any content you store or post.

While I'd prefer these companies to pay me to use their services in exchange for this valuable information, I'm still financially better off than if I were paying other services that guarantee my privacy (few of which do).

The other factor that can't be ignored is convenience. When I sign into Google Chrome on a new computer, for example, it knows my usernames and passwords, displays my bookmarks and offers up my browsing history and list of frequently visited sites. That's not ideal from a privacy viewpoint, but it's brilliantly convenient. One Google account logs me into everything from Gmail to YouTube and Maps.

If I had anything to hide, I'd steer well clear of Google et al, but what's the worst they can do with my data? Display relevant adverts that I might actually want to click on? Ouch.

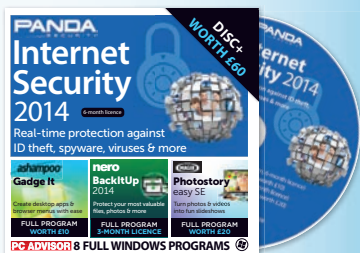
Privacy is a highly personal issue and everyone has their own opinion. The important thing is that everyone understands exactly what happens to their personal information before agreeing to a service's T&Cs. ☒

## NEWS & ANALYSIS

- 10 Latest technology news
- 14 What is Heartbleed?
- 16 25 years of the web
- 18 Innovator's Dilemma
- 19 Mobiles hit tech ceiling
- 20 Ads will ruin wearables
- 22 The internet
- 24 Faster isn't always best
- 25 Media firms encourage 4K
- 26 3D printer price drop
- 27 Gaming PCs vs consoles
- 28 Public Wi-Fi gets a boost
- 29 Fastest 64-bit mobile chip
- 30 AMD 'Mullins' tablet chip
- 31 10-year battery revealed

## REGULARS & OFFERS

- 5 Welcome
- 32 New Products
- 121 Cover Disc+



124 Subscribe

146 Outbox

Subscribe to PC Advisor and  
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SEE PAGE 124

## FEATURES & GROUP TESTS

### BUDGET LAPTOPS



66

- 66 Budget laptops
- 74 Low-cost monitors
- 82 The plastic revolution
- 85 Can a phone or tablet replace your doctor?
- 88 Best free video editors
- 93 New features in Windows 8.1
- 98 Future of Windows

## REVIEWS

### TEST CENTRE

45

### HARDWARE

- 38 Alienware 18
- 39 Toshiba Portege R30-A-14K
- 40 Toshiba W30T-A-101
- 41 Lenovo IdeaPad Yoga 2 (11in)
- 42 Computer Planet GX 760 Gamer
- 43 Gladiator Firestorm OC
- 44 HTC One M8
- 45 Samsung Galaxy S5
- 46 Nokia Lumia 1320
- 47 Asus PA279Q
- 48 MSI Radeon R9 270 Gaming Edition
- 48 AVM FritzBox 7490
- 49 Optoma W316
- 50 Samsung UE65HU8500
- 51 Philips Screeneo HDP 1590TV

### APPS

- 52 iPhone photography apps
- 54 Spritz
- 54 Cartoon HD
- 56 Find an iOS app for anything

### SOFTWARE

- 58 Ubuntu 14.04 LTS
- 59 BioShock Infinite: Burial At Sea - Episode 2
- 60 Avanquest Fix-It Utilities Pro 15
- 60 Microworld eScan Total Security Suite 14
- 61 Nuance Power PDF Advanced
- 62 Titanfall



### BUSINESS

- 63 Dell Precision M6800
- 64 Brother MFC-J870DW
- 65 Epson WorkForce DS-30
- 65 Kyocera Ecosys P6030cdn

### BUDGET LAPTOPS

- 68 Advent Tacto
- 68 HP Pavilion 15 TouchSmart
- 69 Lenovo Flex 15D
- 69 Packard Bell EasyNote TE69
- 70 Samsung Ativ Book 9 Lite
- 70 Toshiba Satellite C55D-A-13U

### LOW-COST MONITORS

- 76 AOC i2369Vm
- 76 Asus VX239H-W
- 77 BenQ GL2450
- 77 HP Envy 23
- 78 Philips 234E5
- 78 ViewSonic VX2452MH



**BEST CLOUD STORAGE**



74

**BEST FREE EMAIL SERVICES**



85

**RUN ANDROID ON A PC**



88

**BROWSER SUPERPOWERS**



98

**HOW TO**

**Tech Help**

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

**104 Helproom**

**109 Edit images online**



**112 Solve printer problems**

**114 Build a streaming system**



**116 Recondition an SSD**

**117 Set up an email group**



**118 Get more from Word**

**119 Find drivers in Windows**

**ON THE COVER**

66



121

74

93

98

**TEST CENTRE**

**TOP 5 CHARTS: BUYER'S GUIDE**

- 127 Ultraportable laptops
- 128 Sub-£500 laptops
- 129 £501-£1,000 laptops
- 130 £1,001+ laptops
- 131 Tablets
- 132 Smartphones
- 133 Gaming PCs
- 134 Mini PCs
- 135 All-in-one PCs
- 136 Office PCs
- 138 Family PCs
- 139 Security software
- 140 Blu-ray drives
- 140 Wireless routers
- 141 Printers
- 142 USB & NAS drives
- 143 Projectors
- 143 Solid-state drives
- 144 Graphics cards
- 145 Flat-panel displays



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# UPDATES TO WINDOWS AND WINDOWS PHONE UNVEILED

Microsoft takes the wraps off Windows 8.1 and Windows Phone 8.1 at its Build developer conference

At its annual Build developer conference Microsoft took the wraps off new versions of its Windows and Windows Phone operating systems.

Microsoft gave the first proper look at the Windows 8.1 Update and Windows Phone 8.1. The former was released on 8 April as a free update.

"The Windows 8.1 Update delivers a collection of refinements designed to give people a more familiar and convenient experience across touch-, keyboard- and mouse inputs. It also brings improvements for business customers, accelerates opportunities for developers, and enables device makers to offer lower-cost devices," said Microsoft.

The update brings a fresh round of tweaks, with Microsoft returning more of the features it removed from Windows 7. The OS is now easier to use, giving more prominence to commonly used features.

Improved integration between the desktop and Start Screen lets you pin to the taskbar Modern UI apps, while apps themselves feature an 'X' close button. There's also more customisation options for the Start Screen.

Windows 8.1 Update allows hardware partners to build lower-cost devices with only 1GB RAM and 16GB of storage. Microsoft will also give Windows free to hardware partners who wish to install it on devices with 9in or smaller screens.

"We really want to get this platform out there. We want to remove all the friction between you and creating these devices," said Terry Myerson, corporate vice president of the operating systems group.

The move reveals the sense of urgency Microsoft feels regarding Windows' weak position against iOS and Android in the smartphone- and tablet markets.

Microsoft also detailed a new version of its mobile operating system, Windows



Phone 8.1. Joe Belfiore, corporate vice president of the operating systems group, confirmed that Windows Phone 8.1 will launch this summer as a free update, arriving first on new devices such as the Nokia Lumia 930 and Lumia 635. A developer preview is available now.

In common with iOS and Android, Windows Phone 8.1 now includes a

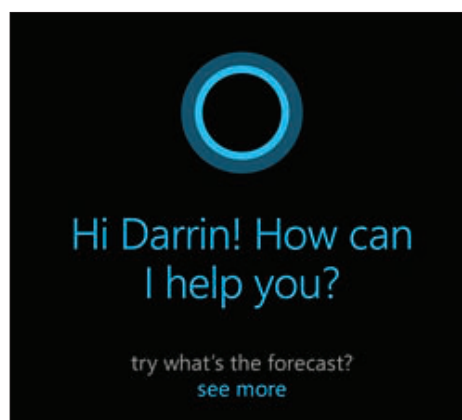
voice-activated digital assistant known as Cortana - a nod to the hugely successful Halo gaming franchise. Cortana will first appear in beta, hitting the smartphone scene three years after Siri was launched on the iPhone 4S with iOS 5 and two years after Google Now for Android 4.1 smartphones launched in 2012.

Belfiore argues that Cortana is better than Siri, calling it the "first truly personal digital assistant who learns about me and the people that matter to me most".

Another feature seen in Android and now making its way to Windows Phone is a drop-down notification bar. The Action Center offers notifications and lets users control Wi-Fi, Bluetooth and other settings.

There is also a Word Flow keyboard with swipe-style typing, plus an improved calendar with integrated weather and more customisation options.

Learn more about the new features in Windows 8.1 and Windows Phone 8.1 in our feature on page 93.





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## 64-BIT ANDROID COMING TO A STOCKING NEAR YOU

Google's mobile operating system will catch up with Apple a year after the iPhone 5s

ARM has revealed that it expects Android smartphones with 64-bit processors to arrive in time for Christmas.

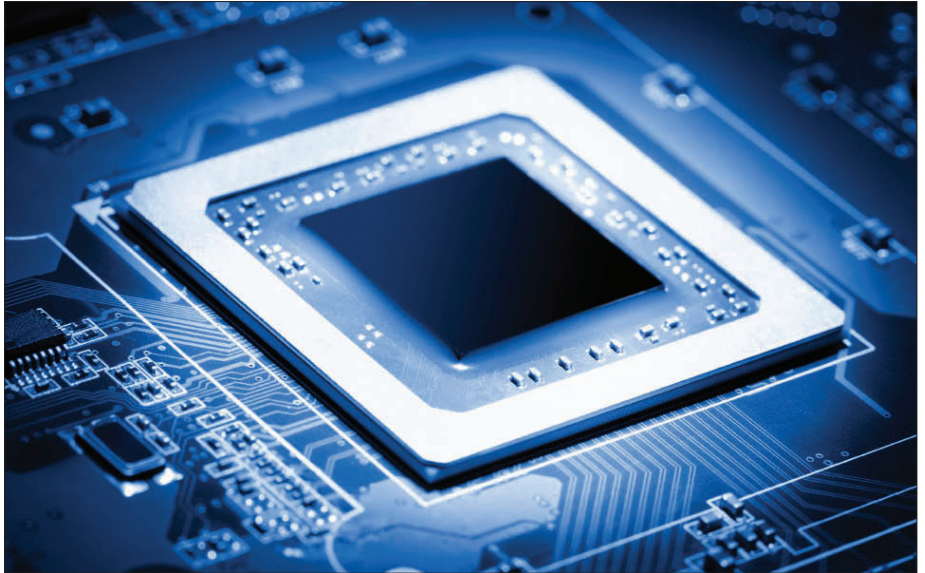
The iPhone 5s launched last year with a 64-bit processor, but Android smartphones have yet to follow Apple's lead. This year's flagship smartphones, including the Samsung Galaxy S5, HTC One M8 and Sony Xperia Z2, all run on 32-bit chips.

Tom Lantzsch, ARM's executive vice president of corporate strategy, said: "We believe the capability will be there for 64-bit phones and tablets by Christmas."

"We've seen a big uptick in demand for mobile 64-bit products. We've seen this with our Cortex A53, a high-performance 64-bit mobile processor," added Lantzsch. "We've been surprised at the pace that 64-bit is now becoming mobile-centric. Qualcomm, MediaTek and Marvell are examples of public 64-bit disclosures."

Qualcomm is planning to launch its 64-bit Snapdragon 808 and 810 processors early next year.

It is unclear when a 64-bit version of Android will be released, but we wouldn't be surprised to see it arrive on a new Nexus



smartphone or tablet in the latter quarter of the year. There are plenty of rumours surrounding the Nexus 6, Nexus 8 and Nexus 10 2. We could hear more details from Google at its I/O conference.

While apps also need to be written that take advantage of 64-bit processors, ARM

says the 64-bit chips will benefit existing 32-bit software. "Even existing 32-bit code will run more efficiently on ARM's 64-bit v8-A architecture than on native 32-bit ARM architecture," said Lantzsch. He added that the new processors will also improve battery life, responsiveness and features.

## Office for iPad turns Apple's tablet into a proper PC

Microsoft offers its suite of word-processing, spreadsheet and presentation apps free to iPad users



Microsoft is offering its Office suite of productivity apps free to iPad users for reading and presenting documents. An Office 365 subscription is required to add the ability to create and edit documents in Word, PowerPoint and Excel, however.

"Microsoft is focused on delivering the cloud to everyone, on every device. It's a unique approach that centres on people - enabling the devices you love to work with the services you love, and in a way that works for IT and developers," said Satya Nadella, Microsoft's CEO.

Office for iPad is available on Apple tablets running iOS 7 or later. A free Office Mobile app is also available for iPhone users.

For those who also want to create and edit documents in Word, Excel and PowerPoint, Office 365 subscriptions start at £7.99 per month or £79 per year.

Business users will also require an Office 365 subscription, with prices from £3.30 per user, per month for a Small Business package, up to £9.80 for the Midsize Business subscription.

Microsoft said the Office for iPad apps have been "built from the ground up" with touch control and the iPad's native functionality in mind.

"Documents look like the originals, thanks to support for charts, animations, SmartArt graphics and shapes," said Microsoft.

Microsoft says that Office 365 is the firm's fastest-growing product ever. It believes its success is down to "the ability to move between devices, share subscription benefits with household members with an Office 365 Home subscription, and have constant access to important Office documents online".



## Netflix to introduce price increase

Netflix will increase its subscription fees in the coming months. In a note to shareholders it said it will bump up prices by a dollar or two for new customers, while keeping existing subscribers at the same level for a 'generous period'. The additional income will be used to improve the service.

**MORE:** [tinyurl.com/ohpf8av](http://tinyurl.com/ohpf8av)



## iPlayer downloads for (almost) all Android devices

The BBC has extended its iPlayer download feature to almost all Android phones and tablets. Any device running Android 4.0 or later can download content for offline viewing.

**MORE:** [tinyurl.com/qj6znpd](http://tinyurl.com/qj6znpd)

## Sonos adds Play Music streaming

Reinforcing the company's commitment to improving its service, Sonos has struck a deal with Google to offer Play Music over its popular wireless hi-fi system. Users can now stream content from within the Sonos and Google Play Music apps.

**MORE:** [tinyurl.com/o2joyws](http://tinyurl.com/o2joyws)

# QUAD-HD SCREENS COMING TO SMARTPHONES

LG set to trump current flagship devices with super-resolution display

With 4K (also known as Ultra-HD) TVs already available to buy, LG has made claims that we will see similar technology arrive in the smartphone market later this year.

At Mercedes-Benz World in Weybridge LG showed off its latest curved-screen OLED TV and 4K sets, which will soon go on sale below £2,000. It said we might not have to wait long before we see a phone with a similarly super-high resolution.

Speaking at the showcase event, Andrew Coughlin, head of mobile at LG UK, confirmed to *PC Advisor* that we should expect see a Quad-HD smartphone in the second half of 2014.

It seems likely that LG will be the first to incorporate such technology in its devices since its LG Display department announced a 5.5in Quad-HD panel last August, around the time LG launched the G2 smartphone.

This year's flagship smartphones, including the Samsung Galaxy S5, HTC One M8 and Sony Xperia Z2, each feature full-HD screens, so a



Quad-HD could help latecomer the LG G3 stand out when it arrives this summer.

Whether we need Quad-HD resolution on a smartphone is debatable, but it will benefit video recording and playback. Several smartphones are already able to record 4K video, while services such as Netflix are launching 4K streaming.

Samsung is also rumoured to be working on a Quad-HD device, possibly the Galaxy Note 4.

## Glastonbury Festival to get its own 4G network

Mobile operator offers a dedicated app and free mobile device charging



EE has confirmed that it will provide a 4G mobile network at June's Glastonbury Festival.

The mobile operator has been named as the music festival's 'official technology partner' for the second year running. EE will deploy a bespoke 4G network to cover the huge site at Worthy Farm in Somerset.

EE will also offer free phone-charging points and create the official Glastonbury 2014 app, which will be available to download in June. The app will include performance-scheduling tools, an interactive map and social integration.

Spencer McHugh, brand director at EE, said: "Last year at Glastonbury we saw a huge increase in photo- and video uploads on our network as people shared their magical festival moments. By providing super-fast 4G at the festival alongside the launch of our new charging solution, the EE Festival Power Bar, we will make sure all those at the UK's best-loved festival can stay connected and share content more easily and quicker than ever before."

The operator will also trial the EE Festival Power Bar, a £20 portable charging pack. Empty packs can be swapped for a full pack at the EE Exchange Cabin. ☑



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# What is Heartbleed?

A new vulnerability at the heart of internet encryption could have far reaching implications

**T**he Heartbleed bug has made headlines around the world after it was discovered that two thirds of the internet is potentially vulnerable. The erroneous code has exposed encryption keys to would-be hackers, meaning our sensitive data can be stolen.

On 7 April an urgent warning was released by the OpenSSL project detailing a dangerous bug called Heartbleed. News of the vulnerability spread like wildfire, as it potentially affected the encryption software used by up to two thirds of servers on the internet, with serious implications for user data security. Large sites such as Yahoo, Flickr, DuckDuckGo, Eventbrite and imgur were revealed to be at risk, while countless smaller portals, alongside email and instant-messaging services, had also been exposed by the problematic code.

Worse, the vulnerability has existed for nearly two years, yet because it leaves no trace there is no way of telling whether Heartbleed has already been exploited.

As reports of the bug proliferated across the web and spilled into mainstream media, users were confused as to whether they should immediately change their passwords or wait until each site had tackled the problem, else their new passwords would also be vulnerable.

Security researcher Ivan Ristic produced a simple web page where concerned users could test to see whether a particular site had been compromised, while Mashable contacted the major social-media and email providers to see whether they had been affected by Heartbleed. Facebook, Google, Instagram, Tumblr and Pinterest revealed that they had applied fixing patches before news broke, but had not found any signs of data being stolen.

The general advice, though, was that users should change their passwords on these sites just to be sure. Tumblr even posted a message on its blog encouraging exactly that. "This might be a good day to call in sick and take some time to change your passwords everywhere," the blog stated, "especially your high-security services such as email, file storage, and banking, which may have been compromised."

The Canadian government even took its e-filing tax service offline during one of the busiest times of the year in response.

"As a preventative measure, the CRA has temporarily shut down public access to our online services to safeguard the integrity of the information we hold," the Canada Revenue Agency said in a statement.

## Should you panic?

The main problem with the bug is that it was contained in the OpenSSL cryptographic software library, which is the most popular form of security protocols used on the web. This meant that the very code implemented to ensure communications remain secure and private could actually be the biggest threat to these goals.

When you connect to a secure website or service a private connection is established between your browser and the web server. To signify this you will see a padlock icon and 'https://' in your browser's address bar.

This connection is validated by a certificate issued by the server that lets your browser know that a site is what it claims to be. Data transferred between the two is then encrypted via SSL or TLS, which use a mixture of public-, private- and symmetric keys to ensure that only your computer and the web server can decrypt the sensitive information. Once the session ends the keys are discarded, and created new the next time you log in.

At least, that's how it should work. A modification in the OpenSSL code called Heartbeat left a hole in this supposedly secure process. Using a simple technique it is possible for hackers to download packets of data from previous secure sessions on servers running the code. This could include personal information and, more importantly, the keys used to protect it.

"An attacker can grab 64K of memory from a server," said security expert Bruce Schneier. "The attack leaves no trace, and can be done multiple times to grab a random 64K of memory. This means that anything in memory - SSL private keys, user keys, anything - is vulnerable. And you have to assume that it is all compromised. All of it. 'Catastrophic' is the right word. On the scale of 1 to 10, this is an 11."

Steve Gibson, co-host of the Security Now podcast, said: "It is a bidirectional exploit. If the client had this then something you've connected to could come and get memory from you as well."

The bug was initially discovered by Finnish security company Codenomicon, with Google engineer Neel Mehta also credited. While testing a new variant of its Safeguard software, engineers at Codenomicon found worrying errors relating to OpenSSL. To further explore the bug the engineers decided to hack their own site.

"We have tested some of our own services from an attacker's perspective," the company revealed. "We attacked ourselves from outside, without leaving a trace. Without using any privileged information or credentials we were able to steal the secret keys used for our X.509 certificates, usernames and passwords, instant messages, emails and business-critical documents and communication."

"These are the crown jewels," said the company. "The encryption keys themselves. Leaked secret keys allow the attacker to decrypt any past- and future traffic to the protected services and to impersonate the service at will. Any protection given by the encryption and the signatures in the X.509 certificates can be bypassed. Recovery from this leak requires patching the vulnerability, revocation of the compromised keys and reissuing and redistributing new keys. Even then, any traffic intercepted in the past remains vulnerable to decryption."

In this post-Snowden world, some commentators began to wonder whether this erroneous code, along with the high-profile GoToFail bug recently found in Apple software, might not be a mistake at all.

"It's probable that every target has had its private keys extracted by multiple intelligence agencies. The real question is whether or not someone deliberately inserted this bug into OpenSSL, and has had two years of unfettered access to everything," said Schneier.

How much damage the Heartbleed bug has caused is almost impossible to gauge. We can't change what has already happened, but you should at very least change your passwords and, while you're at it, enable two-step verification wherever possible. ☒

MARTYN  
CASSERLY



# 25 years of the world wide web

**O**n 12 March 1989 a 34 year-old Englishman wrote the rather drably entitled paper *Information Management: A Proposal*. He laid out the principles for a system that would allow people to access information across the globe, and then share with others who were doing the same. This would become the backbone of the internet as we know it today: the world wide web.

This man was Sir Tim Berners-Lee, an employee at CERN, Europe's largest internet node at the time. He saw that the tools required to make his dream a reality already existed.

"Most of the technology involved in the web," he explains, "such as the hypertext, the internet and multifont text objects, had all been designed already. I just had to put them together. It was a step of generalising, going to a higher level of abstraction, thinking about all the documentation systems out there as being possibly part of a larger imaginary documentation system."

While the terms 'internet' and 'world wide web' have become interchangeable over the years, they are not one and the same. While the internet is the hardware structure of the network (servers, cables, routers and so on), the world wide web is a software level that sits on top, enabling website data to be linked and transmitted via HTTP, a language specifically built for the task.

The pages themselves are in essence documents formatted in HTML, which are then rendered by browsers to give us the experience we have today. As the technology has matured,

and connection speeds have increased, we've seen a marked development in the visual styling and dynamic behaviour of the web, which is a world away from the text-heavy approach of the early 90s. But when Berners-Lee first envisioned the data-connected world, it was in a time in which documents and research papers were kept in digital silos.

"The internet already existed, in that you could send email, but there were no websites," says Berner-Lee. "There was no HTTP, there was no HTML, there was no space or things you could click through, and it began because I was frustrated that it didn't exist. I imagined a system where you could just click from one to the other, and that was so compelling that I decided that I wanted to build it."

He wrote the code for HTTP and HTML, then created the first ever browser - WorldWideWeb - to show how it would work. A browser with no websites to visit is of little use, so the first website was built at CERN in 1991 and released to the public in 1993. It was incredibly basic, but did the job of demonstrating the internet's potential.

Now, as the world wide web celebrates its 25th anniversary, the idea of not being able to go online to find out pretty much anything you need to know seems archaic (see how our own editors would cope without the web on page 22). An estimated 2.5 billion people use the web, and there are in the region of 500 million websites.

Whole economies are based online, with Google, one of the most valuable companies in the world, existing almost entirely on





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**The internet already existed, in that you could send email, but there were no websites, no HTTP, no HTML. It began because I was frustrated that it didn't exist**

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the world wide web. Entertainment is moving toward on-demand, streaming-style convenience, while education is now freely available to anyone with an internet connection and the desire to learn.

### **For the greater good**

With the whole world benefitting from Berners-Lee's innovation, you might think that the father of the web would now be a very rich man, but he doesn't make any money through licensing or patents. CERN holds the rights to the technologies involved, but following some persuasion from Berners-Lee and Robert Cailliau (another significant figure in its development), it charges no royalties for the code.

"If I had tried to demand fees... there would be no world wide web," announced Berners-Lee in 2004 during his acceptance speech for the first Millennium Technology Prize. "There would be lots of small webs." There was some recompense, though, as the prize he was accepting at the time was a cheque for \$1.2m.

A quarter of a century may have passed, but Berners-Lee is still a significant figure in the development of the web. His work with the World Wide Web Consortium continues to refine and expand the inner mechanics of the internet, and he has been a vocal spokesman for the future of his creation.


"Now, 25 years on, web users are realising they need human rights on the web," he says. "We need independence of the web for democracy, we need independence of the web to be able to support

the press, we need independence of the web in general. It's becoming very important to sort out all that."

The internet is no longer a fledgling idea, but a mainstay of modern culture - and one that has quickly infiltrated so many aspects of life. With this importance has come significant challenges.

Recent revelations of the widespread and nefarious surveillance techniques used by the NSA and GCHQ has shaken confidence in its ability to protect privacy, while the rising reports of criminal activity and hacker attacks look set to increase as we go forward.

The next quarter-century will see technological changes in ways we can't easily imagine, but at its heart the web will remain a means for people to communicate and share.

"Key decisions on the governance and future of the internet are looming, and it's vital for all of us to speak up for the web's future, says Berners-Lee. "How can we ensure that the 60 percent around the world who are not connected get online fast? How can we make sure that the web supports all languages and cultures, not just the dominant ones? How do we build consensus around open standards to link the coming Internet of Things? Will we allow others to package and restrict our online experience, or will we protect the magic of the open web and the power it gives us to say, discover and create anything? How can we build systems of checks and balances to hold the groups that can spy on the net accountable to the public? These are some of my questions - what are yours?" 

MATT EGAN



# Microsoft, XP and the reverse Innovator's Dilemma

Microsoft failed to change its model when the going was good. And now XP users will not be persuaded to change



**Y**ou may or may not have heard of the *Innovator's Dilemma*. You may even pretend to have read the book when trying to impress at dinner parties. But for those of you denied access to business books that use US spellings of the word 'dilemma', allow me to give you a precis...

The *Innovator's Dilemma* is a book in which author Clayton Christensen argues that when a company is making a lot of money selling a product or service its customers like, it is difficult for that company to innovate and release radically new products for fear of killing off that revenue stream too early. This means established corporates are always at a disadvantage when competing with startups that have only their innovative skills, and nothing to lose.

You don't have to look too far in the world of tech to find examples. BlackBerry customers loved their hardware qwerty keyboards, so RIM (as was) avoided bringing out touchscreen handsets until the iPhone had killed its market. If only it had gone through the process of transitioning its users to touchscreens it may still be a viable concern today. But that would have meant disrupting a market in which it was killing the opposition.

There are plenty of others: Microsoft was reluctant to change the Office model when it made so much money from selling lifelong licences to business users, and then Google Docs stole a march. And Sony tried so hard to hold back digital music downloads when it was raking it in selling CDs that it squandered the unique position of owning both content and tech by foisting on an unwilling world products such as MiniDisc.

But on a bigger canvas still sits Microsoft and its Windows operating system. Trapped in a vicious spiral caused by its own success in squeezing the life out of its rivals.

## The Redmond dilemma

Throughout the 90s and the early years of this century Microsoft had a brilliant business model. It created the software on

which most of the world's PCs ran. And it made money from selling licences for that software. No hardware manufacturing risk, and a guaranteed returning customer every two years when a PC became unusable and the customer bought a new one. New Windows releases offered compelling new features so that even when a customer didn't feel compelled to buy a new PC, they may simply purchase the new OS.

In *Innovator's Dilemma* terms, at some point when Microsoft was riding high it should have recognised that this model wouldn't last forever, and looked for new products with alternative revenue streams. (Actually, Microsoft did - it was pushing tablet PCs and smartphones for a long time before Apple, it's just that its products were pretty poor. Things are better now.)

Instead Windows sales are now declining for a variety of reasons. For one thing PCs and laptops are built to last a lot longer than once they were. The PC that was powerful enough to run Office and surf the web in 2008 is likely to be powerful enough today. Plus, in a time of economic downturn, consumers are more wary about shelling out for something new. Smartphones and tablets have replaced some PC and laptop use, and now that connected computers 'just work' there aren't that many compelling new features to persuade you to upgrade.

Then there's Windows 8. Windows 8 is many things - fast, stable and secure to name just a few. But it is also an obvious and clumsy attempt to move Windows users to touchscreens, and to tie users into a Microsoft world that links mobile, desktop and home-entertainment via the Xbox. The trouble is that those are important for Microsoft's future development, but not for consumers. Moreover, Windows 8 is an expensive upgrade.

## Et tu, XP

The big problem for Microsoft is a kind of reverse *Innovator's Dilemma*. The products it had in 2003 - Windows XP and Office

2003 - are still fit for purpose. And they remain more popular than their immediate replacements. But if people keep using XP and Office 2003 Microsoft won't profit.

Microsoft recently ended active support for XP. It was perfectly entitled to do so. The last new XP systems were sold seven years ago, and you won't find many products that come with a seven-year warranty. Microsoft has also actively trailed the end date since it launched Windows Vista, and it's not as though XP suddenly stopped working.

Microsoft has, of course, used this opportunity to try to persuade recalcitrant XP users to upgrade to Windows 8.

There are, we believe, around 400 million users of XP - around 28 percent of the entire personal computer market. These are people who have been able to 'upgrade' for seven years, and have not done so. It is unlikely that many will be bullied into upgrading now.

They've seen the bloated and unfinished Vista come and go, with no new features that caught their fancy. Windows 7 (a more stable Vista) is now an ex-OS. And still XP users see no reasons to upgrade.

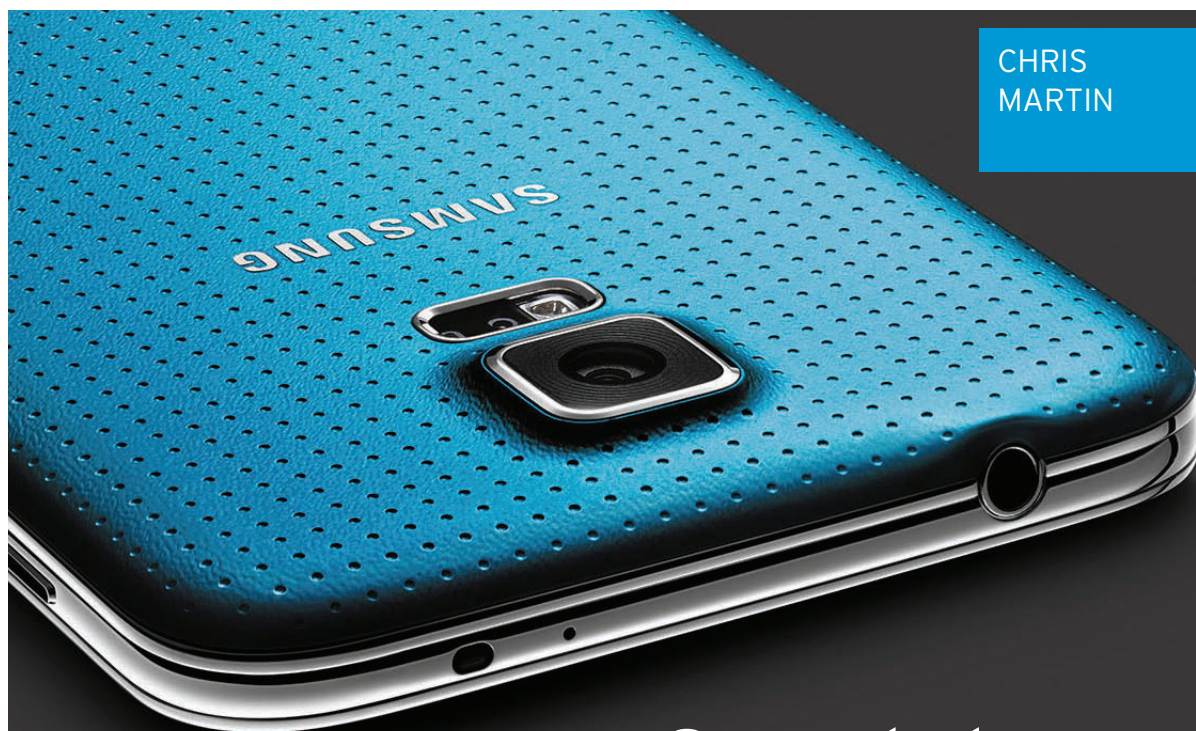
## Reverse Innovator's Dilemma ironies

Irony number one is that Windows 8 does offer useful new features such as baked-in security, and the lean code will likely offer new life to XP-era hardware. If you can run Windows 8 I recommend that you upgrade.

Irony number two is that Microsoft forced through 'innovation' in the form of new products in order to keep making money. And it would have been better making continual, small, incremental upgrades that were free or low cost. Rather like Apple does now.

Unfortunately for Microsoft, unlike Apple, it doesn't make money from hardware - and it's that business model on which it failed to innovate when it was riding high. Microsoft could care less, it has in Xbox, Windows, Office and Windows Phone a solid portfolio of products from which it will continue to draw huge profits. But the days of Microsoft domination are gone - possibly for good. ☒



CHRIS  
MARTIN

# Smartphones hit the technology ceiling

Why sitting out this generation of flagship won't leave you wanting

**I**t's only the middle of May and already we've seen a number of flagship smartphone launches. This is usually cause for celebration, but so far I've been slightly underwhelmed. Have manufacturers hit a ceiling with mobile technology?

When the HTC One (M8) went on sale some clever PR meant it generated a lot of hype. But the Samsung Galaxy S5 and Sony Xperia Z2 went on sale within days of the HTC; and once the hype dies down it will not only struggle to stand out in the shadow of products from technology giants Sony and Samsung, but it will struggle to stand out against its predecessor.

The HTC One M8 isn't alone in this regard. What's interesting is that none of these devices is noticeably different from its predecessor. There's very little difference in appearance, and no particularly noteworthy new features (at least none that will persuade you to part with upwards of £500).

The worst offender is the Xperia Z2, which has superseded the Z1 after just a few short months and is barely any different. It has a slightly bigger screen, a slightly better processor and the ability to record and output 4K video.

Moving on to the Galaxy S5, Samsung has matched Apple's iPhone 5s with a

fingerprint scanner and one-upped it with a heart-rate sensor. Okay, it's a first for a smartphone, but it's more of a gimmick than a revolutionary feature. The S5 is also dust- and water-resistant; sorry, Samsung, we've seen it all before.

HTC has taken its popular 2013 flagship smartphone and adopted the fine-tuning approach with minor improvements all round. Its unique selling point is the Duo Camera, which lets you change the focus point after a photo has been captured. It's a decent innovation but, unless you use it on the right photo, it's shown up for what it is: a poor imitation of a Lytro camera.

What's most disappointing is the lack of progress in displays. All these smartphones have the same full-HD resolution as last year's models: what happened to the promise of Quad-HD or 4K? And with the iPhone 5s packing a 64-bit chip, it's a shame to see these Android flagships sticking with 32-bit processors in 2014.

What gives? Is this it for smartphones in 2014? Reader, patience is a virtue.

The smartphone market moves so quickly that although it might appear that nothing much is happening, there's more to come. Smartphones seem to be emulating Intel's 'tick-tock' cycle, which sees its chips get a new microarchitecture and a die


shrink in alternate releases. This is most evident in iPhones, with Apple launching a new design, and following it up the next year with an 'S' model.

And let's not get ahead of ourselves: it's still early in the year and there are a couple of handsets in the works that could buck the trend.

Chief among these is the LG G3, which follows the brilliant G2 that still tops our smartphone chart. This could well be the first handset with a 4K display - and that's more than just a hunch. The firm's display arm showed off a Quad-HD screen for mobile devices last August, around the time the G2 was announced.

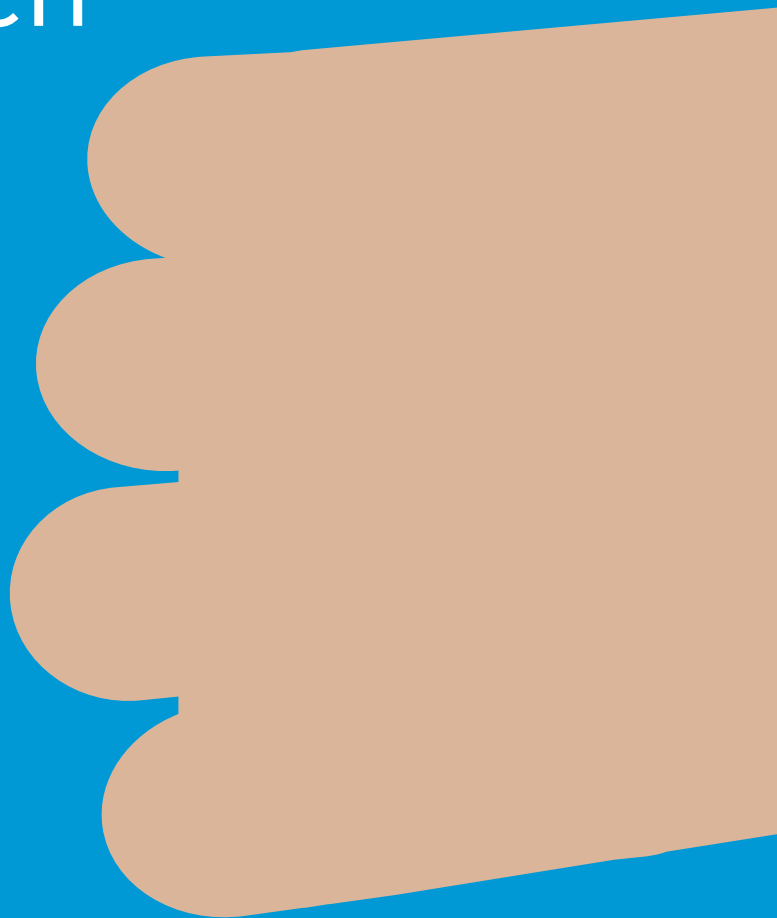
The LG G3 is rumoured to launch in the coming months, which should be plenty of time to get that panel into a handset. Whether we need 4K on a smartphone is another matter.

The other big launch is the iPhone 6, which is likely to be announced in September. I'm expecting great things from Apple here - rumours of a larger screen are surely the tip of the iceberg.

If you've got a 2013 flagship smartphone and are eager to upgrade, you might do better to wait until 2015. Let's hope LG and/or Apple can bring us some real excitement this year. 

# Wearable tech is crying out for Apple's philosophy

Whether it's plotting an iWatch or a Google Glass-style headset, Apple could think different by respecting user privacy



**T**he advertising industry has a long tradition of co-opting any cultural trend or tech innovation that attracts a significant following, and along the way draining whatever made it good in the first place.

Long before a middle-aged Johnny Rotten accepted Country Life's buttery dollars, the punk look and sound had been deployed wherever a commercial needed a 15-second shorthand for teenage rebellion. And devotees of skating, surfing, gaming, hacking and even videos of musicians dancing on treadmills will be familiar with the same awful feeling – that the thing you love has just been systematically ruined to get someone else to buy car insurance.

There's a good chance that the next target is wearable tech, which stands for nearly everything that advertising agencies most admire: wealth; status; youth and innovation; exclusivity (at least in the case of Google Glass, which remains available to members of the pilot programme only); and,

most importantly, the capacity to capture vast quantities of consumer data.

Yet it's hard to be sure of wearables' future because one of the biggest players has yet to even join the game. We are still awaiting Apple's take on the concept; whether (as is most commonly supposed) that will take the form of a smartwatch – the

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**Could we end up in a world like *Minority Report*? That's up to us**

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long-foretold iWatch – or a headset, or even a ring, it seems unlikely that Cupertino will be able to keep its hands off wearables for long.

But if so, it will be interesting to see how Apple differentiates itself in a market that is filling up rapidly. In the case of the iPhone, famously, the company's bosses sat

down and groused to one another about everything they disliked about their mobiles, then set out to fix it all. It's almost become an Apple trademark: the flawed, immature market, the brainstorm, and finally the market-changing product. But it hasn't happened for a while. And if the iWatch truly is the next project, the question is this: what is it about wearables that needs fixing?

One clue to that will be provided by the next few steps taken by Google's Glass headset – a stunning and potentially landmark product that nevertheless offers possibilities that are thrilling (to advertisers) and ominous (to the rest of us). Its ability to sense not only where you are, but what you're looking at, combined with knowledge of your buying habits and control of a screen you carry around on your face all day long, makes it pretty much the technology that an advertiser would build if given unlimited resources and time.

An early example of the way Google Glass could host advertising





DAVID PRICE



has been offered by Blippar, a clever image-recognition app that spots coded pictures – on billboards or newspapers, for instance – and turns them into augmented reality video, adverts or whatever the original coder wishes. Look at a film poster with your Glass headset on, for instance, and it might automatically play you the trailer.

And smartwatches aren't far behind on advertisers' wishlists, as Todd Wasserman recently warned on the website Mashable. Smartwatches – watches generally – are much more intimate than smartphones, and more integrated into our lives; they're literally on our bodies at all times. Which makes advertising on this format far more difficult to ignore.

Passed a branch of Banana Republic? Perhaps Banana Republic would like to remind you about a sale it's running. Oh, did you post about your running times on Twitter? Perhaps the Banana Republic has some nice running gear in which you might be interested. (*PC Advisor* is not


receiving a stipend from Banana Republic. We just enjoy typing and saying the words 'Banana Republic'.)

As often with technological advances, sci-fi got there first; the film usually referenced in these discussions is *Minority Report*, with its unctuous virtual shop assistants that pop up when you walk into the Gap and offer items similar to previous purchases. (On the other hand, an acquaintance suggests to me that a closer analogue may be found in Terry Gilliam's far more recent *Zero Theorem*, which depicts hypertargeted advertising as the unreliable mess we all secretly suspect it may become.)

Could we end up in a world like *Minority Report*? The thing is, unlike in most of cinema's dystopias, that's up to us – the market will go where users lead it. If nobody uses Blippar, Blippar will die out. But the evidence suggests, sadly, that most of us would happily sign up to the most intrusive of targeted advertising if it's presented to us as a way to get something for free.

The key thing for tomorrow's wearable-tech advertisers to consider is intrusiveness. Wearable tech is personal, intimate; anything that is overtly advertising intruding into the user's relationship with the device runs the risk of appearing crass.

As Wasserman observes, smartwatch notifications need to be trimmed back to the bare minimum; they aren't like smartphone alerts, which are relatively easy to ignore. If you keep tapping your users on the wrist, asking for their attention, you're headed for trouble.

But the most crucial influence on where wearables are heading could come from a company that hasn't even announced a wearable tech product. While Google has pioneered as a provider of free services funded by harvested user data, Apple has continued to focus on the premium user experience; and a wearable device might be the perfect platform to showcase why Apple's approach is still relevant. 

# The internet: what happens if the web stops working

We asked 10 of our best technology journalists to imagine what would happen if the internet stopped working tomorrow

**A** Imagine if the internet stopped working tomorrow. Think what life would be like if a virus, terrorism, the army or just plain incompetence meant whoever controls the big switch (well, it's ICANN) had to hit their giant off button permanently. We asked 10 journalists to conceive a world without the web, email and social media. Would they be scared or liberated, bored, lost or finding new ways to experience the real world?

## The end of easy knowledge

**Jim Martin**

The ability to find any information within a few seconds and for free is something we all (well, those of us in the first world at any rate) take for granted. Whether it's a recipe for microwave chocolate cake, the current exchange rate, weather forecast, or a how to video explaining how to fit new brake pads to your Peugeot 206, it's all there.

For that umbilical cord of knowledge to be cut would be the most devastating thing for me. More devastating than not having a mobile phone.

It's easy to forget what it was like before the internet. Just as everyone wonders how they managed before they had a smartphone in their pocket, a mass internet switch-off would see a return to traipsing down to the local library to find an out-of-date encyclopaedia. Magazine sales would rise, and we'd see a return of the tome-like issues of the 1990s - replete with catalogues of things to buy.

## The end of shopping from home

**Chris Martin**

If I didn't have the internet I would have to go shopping. The thought of walking around a busy shopping centre with people trying to hand you leaflets or make you go paintballing makes me shudder.

I don't suffer from claustrophobia, but I don't enjoy crowded spaces. If there was no internet I would have to frequent shops that are even busier than usual, thanks to the disappearance of online retailers.

The choice available on the internet is brilliant, and the ability to quickly compare prices and deals between retailers just can't be matched on the high street. You can do your shopping with a mug of tea in your hand and the telly on, and then all your stuff is delivered to your door. Bliss.

## The end of wide knowledge

**Karen Haslam**

Without the web we wouldn't be so easily able to access the ideas and experiences of our contemporaries, which is useful in helping us to form our own opinions.

Then again, we weren't incapable of independent thought before the web arrived, and the ability to share our thoughts on any matter isn't always a good thing.

## The end of managed expectations

**Ashleigh Allsopp**

When I stop and think what the world would be like without the internet, I get a weird mix of emotions. At first, horror. I'd lose my job,

I wouldn't be able to keep in touch with my far away friends via Facebook and FaceTime, and I wouldn't be able to keep up with what's happening in the world.

Second, excitement. Life would be so much more unexpected. You'd never know what's around the corner. You'd make more effort to meet up with friends face to face. The world would seem like a significantly smaller place, and there would be so much more to discover and explore.

With no job, no blogs to read, YouTube videos to watch and social networks on which to chat, I'd have more time for road trips (although I'd probably get lost without the internet-dependent mapping feature on my smartphone).

For a week or two, life without the internet would be a wonderful thing: I'd feel free as a bird. But the novelty would soon wear off, and I'd miss all the things I love about the internet - particularly how it helps me connect with millions of people I'd probably never have met otherwise, and how it makes everyday tasks such as shopping, booking appointments and finding out information so much easier.

## The end of staying in touch

**Marie Brewis**

With a twin brother on what seems like the other side of the world (or at least what might as well be, given the air fares to Canada), I wouldn't only miss the internet if it were gone, but I'd miss him, too. And that goes for other long-lost relatives, cousins



who have grown up and had their own families, aunts and uncles now enjoying the retired life, old school friends and even those people with whom you simply wish you had more time in the day in which to talk to them.

I haven't seen Will (pictured below, with me) since December 2012, and it will be another year until I see him again. In the flesh, that is. Thanks to Skype and FaceTime I can speak to him over a video call; WhatsApp lets me text him whenever I want a chat (even if I later realise it's 4am in Vancouver); and Facebook lets us share photos and keep up to date with what's going on in each other's lives. All for free.

So while my brother might not be here in the flesh, the internet means he is always around when I need him.

## The end of the world Andrew Harrison

If the internet stopped working, the civilised world as we now know it would end. Most of the civil infrastructure of society that supports modern life is dependent on data carried by the internet backbone. Without the web, life as we know it would fall apart.

The National Grid, the gas and water utilities, are dependent on internet-facing SCADA systems to control the network. The internet was designed to be exceptionally resilient to multiple points of failure. Decision makers have relied on that robustness, so imagine what would happen if mission-critical systems built upon a 'bomb-proof' internet disappeared.

If the internet goes down for 30 seconds, we're left bemused and a little confused. If it was switched off for an hour, confusion would turn to fear. Panic buying would start, and shops would run out of food and essential supplies. Fuel pumps would run dry. The financial markets would collapse within days. Currency would dive bomb.

By the time it had stopped working for a week, turn to any of several classic sources

to see what could happen: *The Day of the Triffids*, *Survivors*, *28 Days Later*, or insert your own post-apocalyptic scenario here.

We're reliant on obtaining our daily news from the internet (if not entirely so, provided we still have nationwide radio and television broadcasts). Without clear information about what's happening, panic spreads.

Want to get in touch with a friend or family member? Landline telephones might initially work, assuming your exchange isn't routed over IP. But many people now don't even have a regular landline and rely on their mobile (which may demand an internet trunk between cell towers) or Skype, FaceTime et al – all are gone now. Nearly all person-to-person comms are gone.

More than just email and Skype and Facetwitting would vanish with no internet. With our near-total reliance on the internet to provide knowledge, we'd rue letting the bookshops and libraries close down. How to rebuild society without mankind's store of written knowledge? Life would get feudal, nasty, brutish and, probably, quite short.

## The end of being social Simon Jary

It's not that I was anti-social before the internet, but I'm in closer touch with friends and family today than I was seven- or eight years ago. No Internet = no social media.

I joined Facebook and Twitter in 2007, and have used both services almost every day since. I use Google+, LinkedIn and Foursquare a little less.

No social media might mean you lose followers, but it wouldn't mean you lose all your friends. It's a good bet, however, that you quickly fall out of touch with most of them. I'm now in touch with old school- and university pals who I hadn't talked to since I was in shorts. Some live on the other side of the world, and I wouldn't have found them without social networks. I keep in touch with colleagues and contacts who have since become friends. Without social media we'd not have stayed in contact, and some of them wouldn't have met my family (in real life) or stayed over on holiday.

Facebook gets a bad press for invading and exploiting our privacy, but most of that is scare-mongering and paranoia. Keeping people in contact and sharing our news and passions is, for me, one of the internet's greatest achievements.

## The end of porn David Price

We're all avoiding stating the obvious: the porn industry – and its many enthusiasts – would probably be more affected by an internet blackout than anyone else.

The web did two things for pornography: it made it almost universally accessible, and

it made it hypertargeted. And it would be a massive shock to many to return to the pornographic conventions of the early 1990s.

For the young, porn would again be difficult to source. Would 13-year-olds be able to forage in the woods for discarded magazines, as their fathers did before them, or have those skills been lost forever? Even those legally entitled to adult publications would have to regain the courage needed to purchase them from stern, matronly shop assistants with their mouths pursed in disapproval.

And what would happen to the middle-aged onanists with laboriously honed specialist interests? It's doubtful that the analogue print and video industries could possibly cater to the 10,000 variations on a theme that would be demanded, and the world's tastes would slowly funnel back toward the lowest common denominator.

## What end? Grace Rasmus

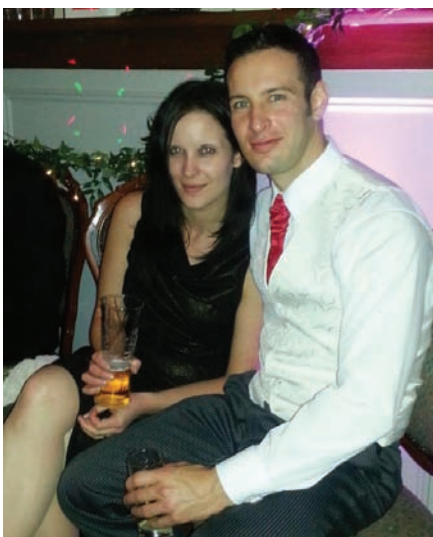
As an American temporarily living in London, I never bothered to switch my mobile data package to a UK-friendly plan – and, boy, do I regret it. I have kept my iPhone permanently in Airplane Mode for the past few months to minimise roaming charges, leaving me desperately reliant on the off-chance that I might be able to pick up a free Wi-Fi signal from a local McDonalds if I stand really close to the front door.

I never realised how much I used the data on my iPhone until it stopped being an option. Now it's all I can think about. Lost in an unfamiliar area? Man, Google Maps would be really helpful right now. Want to know which pub in the area is best before committing to one? Too bad I can't quickly check Yelp, so I guess I'll have to wing it. Trying to meet up with a friend? Well, I can't use iMessage, and my clunky emergency phone would cost me £1.50 to send a silly text, so hopefully she'll telepathically get my message to meet me at Sainsbury's.

I was born in 1993, so I literally can't remember what life was like before the internet. I'm already struggling with the lack of internet access on a temporary basis – I have Wi-Fi in my flat. If the internet disappeared completely, I would feel helpless, and suddenly very aware of the fact that I'm not home with my friends and family in the States.

## The end of this story Neil Bennett

You wouldn't be able to read this, because *PC Advisor* is delivered to its printers, Wyndeham Roche, via the internet. Our website is also dependent on the internet, so we'd all be out of jobs. ☒



# Technology should help us work better, not faster



**Neil Bennett** has found a big flaw in tech parables that tell us faster is always better

**W**e've all heard the story of the schoolboy who got detention for using technology in an innovative way. There are various versions of the tale, but the core remains the same: a class is asked to jot down their latest homework assignment, which is written on the board. One boy instead walks to the front of the class, pulls out his smartphone, takes a snap of the assignment, then returns to his seat. He is then given detention for his impudence of not directly following the teacher's orders, despite having accomplished the task much faster and more easily than the rest of the class.

This story is a parable powered by core beliefs that permeate how we think about education: our kids are ahead of our teachers both in terms of their understanding of technology and their imagination about how they use it. Oh, and tech is a boy's thing - in the many, many times I've heard and read this story, it's never a girl who gets up to take the photo.

## Faster isn't always best

Another underlying belief that this plays to - and an incorrect one - is that technology making a task faster and easier is always a good thing. By snapping his homework assignment, we believe the boy is able to spend more time studying. If only the teacher had emailed the homework to the

class, then he or she would have additional precious minutes to help the children get better grades and be more successful in life. By not embracing new technology, the teacher is holding back the children.

However, this just isn't true. As a teacher recently pointed out to me, the act of writing down a homework assignment is good for students. In writing down the assignment their brain must process and begin to interpret what it is they are likely to do. Later on, they're more likely to not only remember the task, but the context of the lesson in which it was given to them.

It's not that technology is inappropriate here - arguably the students should write down their assignment brief using a laptop or tablet, to which anyone who has ever had to deal with a soaked paper homework diary will attest - but that we're looking only at the surface of a 'problem' rather than the underlying issues. And that we believe faster is always better.

What we need to learn is how technology can assist in our classrooms - or our offices, or even our homes - to assess the tasks we want to achieve and work out how to do them better, not just faster. ☒





# Digital media industry ramps up support for 4k

Vendors such as Cisco, Sony, Red Digital Cinema and Panasonic are opening the door to live broadcasts, says **Mikael Ricknäs**

**P**roducts for creating and distributing 4K content, including cameras that will open the door for live sports and music events, were a hot trend at April's National Association of Broadcasters Show.

With the broadcast industry onboard, wider distribution of 4K (3840x2160) content is much closer to reality.

## Steps to a 4K future

The first step is to record high-resolution content. At NAB Panasonic showed the new VariCam 35 (pictured), which can shoot movies, commercials, TV series and live events in 4K, according to the company.

The camera has a new 35mm sensor for 4096x2160-pixel image capture and stores content on up to four memory card slots, including two that are compatible with the ExpressP2 cards. It allows for recording and storing 4K video at up to 120fps. The camera will ship by the end of the year, with pricing to be announced.

The ability to capture live content is also important to open the door for 4K sports content. Sony and Cisco Systems demonstrated live streaming at the show, using the Sony F55 camera and Cisco's Videoscape AnyRes platform.

Meanwhile, Red Digital Cinema announced its 4K Broadcast Module for streaming live and uncompressed video footage at 60fps. The module is compatible with Red's Epic Dragon and Scarlet Dragon cameras. It, too,

will ship later this year, priced at \$6,950 (around £4,112).

Red Digital Cinema also announced a development kit that will let programmers create applications for smartphones, tablets and laptops that can start and stop a recording, with control features such as shutter speed and white balance on the company's cameras. It also launched the Redlink Bridge module to enable communications between devices and the company's cameras.

Sony unveiled the Alpha 7S camera with interchangeable lenses and a 12.2Mp sensor. What sets the product apart from the competition is its ability to use the entire width of a full-frame image sensor when shooting in 4K, according to Sony. Pricing and availability will be announced at a future date.



## Beyond hardware


But the growing support for 4K video is about much more than cameras. Adobe Systems is previewing a compatible version of its Primetime that will be available this year. The platform can be used to deliver live and on-demand video content to smartphones, tablets, TVs, media players and game consoles.

Vendors such as G-Technology, Huawei's enterprise unit and Promise Technology announced storage systems at NAB, while Tektronix demonstrated products for monitoring quality.

## HEVC is the key

The HEVC, or H.265, video-compression algorithm is a key part of making 4K file sizes and bandwidth use more manageable. To help accelerate the development and adoption of the technology, Canadian company Vantrix announced the creation of an open-source version of the H.265 encoder, calling it the F265 project.

The company is already seeing impressive compression results, but there is plenty of room for improving real-time performance and expanding the feature set, it said. The project site is in the process of being finalized and those interested can sign up to be notified when it goes live.

The NAB Show, held in Las Vegas, was expected to attract 93,000 attendees from 156 countries. 

# 3D printer price drops could lure home users

3D printer prices have fallen to less than £300, writes [Agam Shah](#), but basic models can print only limited objects and colours

**3**D printer prices are dropping into a range that could appeal to home users. A handful of units priced at less than £300 were shown at the Inside 3D Printing trade show recently in New York. They can print small objects in limited colours, but prices of more advanced home models are dropping as well, opening up the market to a wider audience.

Printing a 3D model involves taking a filament-like plastic and discharging it through a nozzle on a substrate to make parts, and it's been used to make a range of items, including smartphone cases, toys and even a space probe. It allows for the faster and less expensive production of parts for such items, and designing and prototyping the parts becomes easier, explained 3D Systems CEO Avi Reichental during a keynote at the conference this week.

"We are observing companies are under increased pressure to deliver products faster," he said. "For the price of one unit, I can make millions of units [with a 3D printer]."

The prices of 3D printers are falling at a fast rate, helped by technological advancements, the expiration of certain patents and increasing competition, revealed Tim Shepherd, senior analyst at Canalys Research. "It is possible today to get

low-end, relatively basic printers for several hundred dollars, where in the past they started in the thousands-of-dollars range," he said.

Canalys expects the 3D printer market to grow rapidly in the coming years, with sales of printers, materials and services reaching £2.2 billion this year, compared to £1.4bn last year, and hitting £9.5bn by 2018.

Growth will be fuelled when companies such as HP enter the 3D printing market, Canalys argued. MakerBot and 3D Systems are the most widely recognised 3D printing companies today.

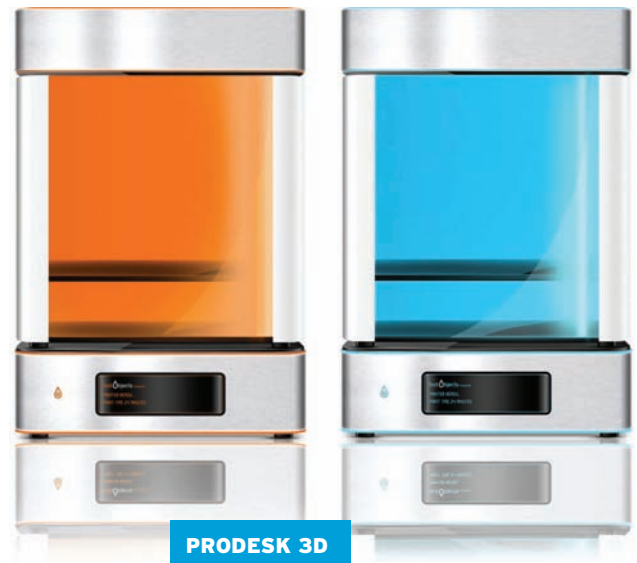
XYZPrinting is making a play for the home with its \$499 (£295) da Vinci 1.0, which was shown at the show. It has a single nozzle, meaning that it produces single-colour items. The printer can make items measuring 200x200x200mm.

The printer is for home users, hobbyists, students involved in science projects and teachers "who want to decorate their classrooms," explained Phair Tsai, a marketing specialist at XYZPrinting.

Advanced 3D printers supporting larger objects and more filaments are also dropping in price. The price of the X Objects' Up Plus has dropped to \$1,500 (£887), compared to \$4,000 (£2,367) when it was introduced three years ago, said Brian Quan, president of X Objects.

"I wouldn't be surprised if it goes down even further in the next three months," Quan said.

BotObjects' ProDesk3D is priced higher at \$3,249 (£1,922), but it's full-colour. It has five colour cartridges that allow users to blend colours when printing plastic objects. According to Mike Duma, chief technology officer and co-founder of BotObjects, the ProDesk3D is a "prosumer" device, for home or office use. "We



PRODESK 3D

continue - as with all the other 3D printer manufacturers - on the path to improve the product and the design, and making the... assembly more efficient," he revealed.

Home 3D printers have so far been used chiefly by hobbyists and early technology adopters. Inventors or entrepreneurs have been among the buyers of the \$1,299 (£768) 3D Systems Cube Easy Plug sold by 3D Heights. Company president Jerry Castanos is sceptical about 3D printers for everyday home use, though. "I see it in the business side. Entrepreneurs, small business, a guy with his own storefront," he argued. "We had a few people in our neighbourhood buy them to resell items on Amazon."

Home users of 3D printers have largely been hobbyists and early technology adopters, explained Shepherd, noting that there is a learning curve involved.

"These will really become 'products for home use' when not only the devices themselves become more affordable and easy to set up and use, but when greater numbers of consumers have been educated - whether adults or children - to use computer-aided design software to produce designs to print," he said.

Service and maintenance issues also add to the costs of 3D printers, and support packages are necessary, said Quan of X Objects. The filament is inexpensive, costing about £29 or less for a kilogram, which is good enough to 3D print 350 chess pieces.

"You're going to see the technology dropping a lot, but it's never going to be as simple as a printer, because the printer has gone through years of development," Quan explained. ☒



DA VINCI 1.0



# Why PCs are still better for gaming than consoles

**Chris Martin** loves his consoles, but says PCs still pwn when it comes to gaming (whatever that means)

**C**onsoles including the PS4, Xbox One and Wii U are making their respective waves in the gaming market, but PCs are still much better for getting that headshot, beating the boss or setting fastest lap time.

Every few years we get a new raft of gaming consoles, and these days it's Microsoft vs Sony vs Nintendo with the Xbox One, PS4 and Wii U. In many ways they're great bits of kit, but long live the PC because it still pwns the lot on numerous levels.

## Upgradability

The so called next-gen consoles are powerful, with the PS4 and Xbox One wielding almost identical and respectful hardware line-ups. But you can't upgrade a certain piece as time, and more importantly, technology moves on. With a PC, you have the freedom of easily swapping parts when new and better ones come along; whether that's a CPU, memory module, graphics card or something else. I haven't upgraded my rig in a good couple of years but it's still flying.

## Flexibility

Consoles have some great apps with which to access content such as Netflix or BBC iPlayer, but it's always a case of being limited to what's on offer - there are always going to be apps you want but can't get.

Is this the case if you're gaming on a PC? No. Open your web browser and the possibilities are endless. What the heck, why



not get a second monitor and watch the latest episode of *Game of Thrones* while you game? Yes, consoles have web browsers, but they're still slow, clunky and frustratingly difficult to use with a controller.

## Xbox One and PS4 consoles

What's more is that you don't get charged for the privilege of accessing this content. Consoles may be cheaper than a decent gaming rig, but who wants to pay an annual fee for Xbox Live Gold or PlayStation Plus - £40 per year. In Microsoft's example, you'll need to pay just to play online multiplayer.

If you're not gaming or watching catch-up TV on your PC, then there's plenty more it can do. You don't need me to tell you that you can get your work done, edit photos and video and check your email.

Ninety nine percent of the time, I prefer gaming with a mouse and

keyboard, but if you're not like me, PCs still have the option of alternatives with a massive range of third-party peripherals and accessories. They're typically cheaper than their console counterparts, too.

Who can be bothered to change a disc these days and let's add another couple of word into the mix: backwards compatibility.

## Cheaper games

Not only can you pretty much guarantee that a game is going to be released on PC - cross-platform launches will rarely leave out Windows - but the games are also a great deal cheaper.

Games have gradually got more expensive over the years and we've reached a point where buying a game on launch day or shortly afterwards means you're bank balance is going to take a £50 hit. Of course, some are cheaper, but we're talking big titles that you'll want to get your hands on as soon as they are released.

For example, *Watch\_Dogs*, which is set to be a hit for Ubisoft is £47 on consoles and a comparatively cheap £30 for PC gamers. Another example is *Wolfenstein: The New Order* which is £26 on PC, but you'll have to pay £37 for old consoles and £47 for next-gen.

Furthermore, some games are as much as half price or better on PC against consoles with the freshly launched *Lego The Hobbit* a prime example. It's £37 on Xbox One but just £16 on PC. I could go on but hopefully I've made the point.

Not only are the games cheaper, but there are many great games which are free to play including titles such as *Team Fortress 2* and *Heroes of Newerth*.

I own multiple consoles and while I love them (I can't wait to get *Mario Kart 8*), the PC just still can't be beaten overall. ☒



# Public Wi-Fi speeds boosted by antenna technology

Smartphones such as the HTC One M8, Samsung Galaxy S5 and the Z2 from Sony are already prepared to take advantage of MU-MIMO. Mikael Ricknas reports

Qualcomm has chipsets on the way that use new antenna technology to boost Wi-Fi download speeds in crowded spaces where lots of people are competing for bandwidth.

The growing popularity of Wi-Fi has hurt performance as more devices try to use public access points, according to Todd Antes, vice president at Qualcomm Atheros, the division responsible for the development.

"Many of us have had the experience when you're in an airport, for example, and literally a hundred people or more are vying for Wi-Fi connectivity through a single access point. In some cases you can be limited to mere kilobits of throughput, if not disconnected," he said.

The problem is that access points or wireless routers use short time slots to communicate with only one user at a time, and as more users get connected the network can get overloaded. MU-MIMO (multi user-multiple-input multiple-output) will help change that by letting networks transmit data to many users simultaneously.

"In our case the network can talk to three clients at a time, so effectively it has a two- to three times capacity improvement," Antes revealed.

Both access points and client devices will need to be updated to use MU-MIMO, so it

won't be until the middle of next year that the technology is available to most users.

Qualcomm has also announced radios for network equipment that can send three- or four data streams, as well as chipsets for mobile devices and consumer electronics with up to two streams. The number of streams decides the maximum theoretical speed, and two streams are capable of transmitting more than 600Mb/s, according to the company.

A version of MU-MIMO that can receive one stream is already integrated with Qualcomm's Snapdragon 801 processor, which powers smartphones including the HTC One M8 (see page 44), Samsung's Galaxy S5 (see page 45) and the Xperia Z2 from Sony. For the feature to work it needs to be activated with a software update. The forthcoming Snapdragon 805 processor has the same functionality.

"We want to give our OEMs confidence that there will be at least one vendor in the market

that is rolling out solutions for both ends of the link," Antes said.

The company expects the first home networking equipment with one of its chipsets to arrive at the end of 2014 or during the first quarter of next year. Enterprise equipment will arrive in the middle of 2015 at the earliest.

Qualcomm isn't the only company working on radios that can handle MU-MIMO. The tech has such a great promise that no chip manufacturer can afford to ignore it.

Quantenna has already started shipping its first chip, which Asus is using in its RT-AC87U wireless router. If the router has functioning MU-MIMO, it should

be compatible with Snapdragon 801 devices, according to Qualcomm. Quantenna didn't immediately reply to questions to confirm this.

Until the Wi-Fi Alliance begins conducting interoperability tests there is no guarantee that routers and clients from different vendors will be compatible. That process is expected to start late this year or in the beginning of 2015, Antes said. ☒

HTC ONE M8





# Qualcomm adds fastest ever 64-bit Snapdragon mobile chip

Qualcomm's fastest Snapdragon 810 chip supports 4K video, LPDDR4 memory, and will be in mobile devices in the first half of next year.  
**Agam Shah** reports



**Q**ualcomm is getting high on 64-bit chips with its fastest ever Snapdragon processor, which will render 4K video, support LTE Advanced and could run the 64-bit Android OS.

The new Snapdragon 810 is the company's "highest performing" mobile chip for smartphones and tablets, Qualcomm said. Mobile devices with the 64-bit chip will ship in the first half of next year, and be faster and more power-efficient. Snapdragon chips are used in handsets with Android and Windows Phone operating systems, which are not yet available in 64-bit form.

The Snapdragon 810 is loaded with the latest communication and graphics technologies from Qualcomm. The graphics processor can render 4K (3840x2160) video at 30fps, and 1080p video at 120fps. The chip also has an integrated modem that supports LTE and its emerging successor LTE-Advanced.

The 810 also is among the first mobile chips to support the latest low-power LPDDR4 memory, which will allow programs to run faster while consuming less power. This will be beneficial, especially for tablets, as 64-bit chips allow mobile devices to have more than 4GB of memory, which is the limit for current 32-bit chips.

The quad-core chip has a mix of high-power ARM Cortex-A57 CPU cores for demanding tasks and low-power A53 CPU cores for mundane tasks such as taking

calls, text messaging and MP3 playback. The multiple cores ensure more power-efficient use of the chip, which helps to extend battery life of mobile devices.

The company also introduced a Snapdragon 808 six-core 64-bit chip. The chips will be among the first made using the latest 20nm manufacturing process, which is an advance on the 28nm process used to make today's Snapdragon.

## 64-bit Android OS

Qualcomm now has to wait for Google to release a 64-bit version of Android for ARM-based mobile devices. Intel has already shown mobile devices running 64-bit Android with its Merrifield chip, but most mobile products today run on ARM processors. Qualcomm licenses Snapdragon processor architecture and designs from ARM.

Work for 64-bit Android is already underway, and applications such as the Chrome browser are already being developed for the OS. Google has not officially commented on when 64-bit Android will be released, but industry observers believe it could be announced at the Google I/O conference in late June.


Qualcomm spokesman Jon Carvill declined to comment on support for 64-bit Android. But he did reveal that the chips are "further evidence of our commitment to deliver top-to-bottom mobile 64-bit leadership across product tiers".

Qualcomm's chips are used in some of the world's top smartphones, including Samsung's Galaxy S5 (reviewed on page 45). A Qualcomm executive in October last year called Apple's A7, the world's first 64-bit mobile chip, a "marketing gimmick", but the company has moved on and now has five 64-bit chips coming to medium- and premium-priced smartphones and tablets. But no 64-bit Android phones are yet available, and Apple remains the only firm selling a 64-bit handset with its iPhone 5s.

## Performance

The 810 supports HDMI 1.4 for 4K video output, and the Adreno 430 graphics processor is 30 percent faster on graphics performance and 20 percent more power efficient than the older Adreno 420 GPU. The graphics processor will support 55Mp sensors, Qualcomm said. Other chip features include 802.11ac Wi-Fi with built-in technology for faster wireless data transfers, Bluetooth 4.1 and a processing core for location services.

The six-core Snapdragon 808 is a notch down on performance compared to the 810, and also has fewer features. The 808 supports LTE-Advanced, but can support displays with up to 2560x1600 pixels. It will support LPDDR3 memory. The chip has two Cortex-A57 CPUs and four Cortex-A53 cores.

The chips will ship out to device makers for testing in the second half of this year. 

# Researchers reveal 10-year battery

Get ready for a decade of battery life, says **Agam Shah**

**R**esearchers have designed a battery that could keep wearable- and healthcare devices running for 10 or more years without a recharge.

The design, based on the lithium carbon fluoride (CFx) chemical formula, could also lead to safer batteries. A prototype battery based on the formula has been tested by researchers at the US Department of Energy's Oak Ridge National Laboratory.

CFx batteries can be as small as coins, and could last for years in low-power fitness trackers or wearable devices with sensors, said researcher Chengdu Liang.

"The battery is not going to be recharged. It's for one-time use," Liang said.

## Applications

Wearable devices typically transmit small bursts of information and don't demand much energy, which can prolong life of the CFx battery. The battery could be desirable for sensors and human implants such as pacemakers, which are difficult to recharge or replace, Liang said.

The prototype CFx battery in its current form is not intended for use in computers and mobile devices, which consume more energy than sensors and rely on regular recharges, Liang said.

"This study is proof-of-concept research, but we have been contacted by a private company interested in commercialising the battery. It could become a reality in a few

years, depending on the commercialisation timeline," Liang said.

Today's batteries do not last very long and some are considered unsafe. PC makers Sony and Lenovo recently reported cases of lithium-ion batteries causing laptops to overheat and burst into flames.

Research for new batteries using zinc-air and lithium-air technology is underway. Some alternative batteries such as those using silver-zinc are considered too expensive. The promise of fuel cells is catching on with car makers.

The CFx chemical formula for batteries isn't new. Special batteries based on the formula are apparently sold by companies such as Contour Energy for use by the military in drones, night-vision goggles and other electronics. Those batteries are available in different sizes.

But according to existing research from the US Army, the CFx chemical formula is "known to have one of the highest theoretical energy capacities compared to other popular lithium cell chemistries."

"It is based on the old theory and with the new design," Liang said. "This is a big breakthrough."

During an experiment, ORNL researchers developed and tested a CFx battery, but used a solid electrolyte to add energy capacity. Current lithium-ion batteries have electrodes in the form of a positive cathode and a negative anode, and electrolytes in between

so charged lithium ions can move around. When charging a battery, lithium ions move from a cathode to an anode for storage. In discharge, the lithium ions move from the anode to the cathode, and out to the device.

The new CFx battery design has a multipurpose electrolyte of solid lithium thiophosphate that can be an ion conductor and also serve as a cathode. The electrolyte can carry charge and hold ions, which helps boost the energy capacity of the battery. The prototype CFx battery has a solid electrolyte, while conventional batteries have liquid electrolytes, Liang said.

"You have an electrolyte that not only does its own job, it provides the function of the cathode," Liang said. "You can also store energy in the electrolyte."

The dual-functioning electrolyte could lead to new battery designs, and new batteries could be on the market in a few years, Liang said. He wasn't able to determine the cost of making such batteries.

"I have no idea of mass production and how much it's going to cost for each battery. All the material we use here is abundant," Liang said.

ORNL researchers worked for three-to four years on this battery technology and are researching new solid electrolyte materials, Liang said.

ORNL, which is based in Oak Ridge, Tennessee, is managed by University of Tennessee, Battelle. ☒





# AMD puts faith in 'Mullins' chip for tablets

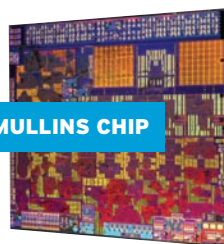
AMD releases a new tablet chip called 'Mullins' and a laptop chip called 'Beema', which are based on the Puma+ architecture. **Agam Shah** reports

**A**MD hopes its latest 'Mullins' tablet processor will find acceptance after three failed predecessors and a handful of unsuccessful devices.

AMD's three new Mullins chips, identified by their Micro suffix, are targeted at low-power laptops and detachable-screen models. AMD has also announced new laptop chips codenamed 'Beema'.

Tablets will be faster, have better graphics and deliver longer battery life with Mullins, AMD said. It claims the chips offer two times better graphics and performance-per-watt compared to their predecessors. Power consumption has been slashed to 4.5W or less, while older chips consumed at least 8W.

Beema, like Mullins, is based on the Puma+ microarchitecture, which is an improved version of the Jaguar core. Beema consumes a maximum of 15W of power, 10W less than its predecessor. The chip boasts incremental CPU speed- and graphics improvements.



**AMD MULLINS CHIP**

AMD said that tablets, laptops and hybrids based on the new chips will start shipping during the second half of this year.

Mullins is critical for AMD's attempts to stay afloat in a challenging tablet market currently dominated by ARM. The previous chip, 'Temash', is not in any tablet today, and its predecessors, the 'Hondo' and 'Z-01' tablet chips, appeared in only a handful of ultimately unsuccessful devices.

AMD rival Intel had success with the 'Bay Trail' chip and older 'Atom' chips in tablets, which totalled 5 million in shipments during the first quarter of 2014. AMD's new chips can outperform Bay Trail, and even some of Intel's 'Haswell' Core processors, said Kevin

Lensing, senior director of mobility solutions at AMD.

Intel is projecting tablet chip shipments of 40 million by the end of this year, and is providing subsidies to tablet makers for using its x86 chips. AMD can't afford to sell low-cost tablets as it can't fight

Intel on margins, and has said it is willing to forgo low-end unit shipments in favour of profit margins.

Mullins will go in Windows tablets and hybrids, but not in models costing less than \$200 (around £118), Lensing said.


In comparison, tablets based on ARM and Intel's x86 Atom processors start at under £100. Tablets with Mullins could be priced under £300 in some cases, but the goal is to provide performance tablets with strong graphics capabilities.

No battery life estimates for devices running on the Mullins and Beema chips have been provided. Lensing said the battery life could vary depending on the screen size and other features in laptops and tablets.

The previous chips were good on performance and battery life, and Temash came out at a time when Windows 8 was not being heavily accepted in tablets. But the market is yet to evolve, and there will be growth in Windows tablets, hybrids and laptops. There are no current plans to bring native Android support to x86 chips such as Mullins, Lensing added.

AMD has cranked up clock speeds in Mullins and Beema, which have better power-management features than previous chips. The clock speeds can scale up quickly when performance is needed. AMD has cut down on components, and there is a better balance of power and performance.

The integrated graphics cores have better video streaming, bandwidth management, upscaling and filtering features. The chips have the latest GCN cores, which are variants of technology used in Radeon GPUs.

Beema and Mullins also have an on-chip security layer to protect computer systems from being compromised. 

## The new Mullins chips include:

- 2.2GHz quad-core A10 Micro-6700T R6, 4.5W, 2MB of cache, 500MHz GPU clock speed
- 1.6GHz quad-core A4 Micro-6400T R3, 4.5W, 2MB of cache, 350MHz GPU clock speed
- 1.4GHz dual-core E1 Micro-6200T R2, 3.95W, 1MB of cache, 300MHz GPU clock speed

## The Beema chips include:

- 2.4GHz quad-core A6-6310 R4, 15W, 2MB of cache, 800MHz GPU clock speed
- 1.8GHz quad-core A4-6210 R3, 15W, 2MB of cache, 600MHz GPU clock speed
- 1.5GHz quad-core E2-6110 R2, 15W, 2MB of cache, 500MHz GPU clock speed
- 1.35GHz dual-core E1-6010 R2, 10W, 1MB of cache, 350MHz GPU clock speed

All the chips have 128 graphics cores and support DDR3 memory. Pricing on the chips was not provided by the company.



### **Nokia Lumia 930**

#### **Smartphone**

The Lumia 930 is Nokia's latest flagship smartphone. It ships with Windows Phone 8.1, which brings new features including a proper notification centre and Cortana, Microsoft's Siri rival. The handset has an aluminium frame, a 5in screen and a 20Mp PureView camera.

**£550 inc VAT**  
[nokia.com/gb-en](http://nokia.com/gb-en)



CHRIS  
MARTIN**LG G Watch <<****Smartwatch**

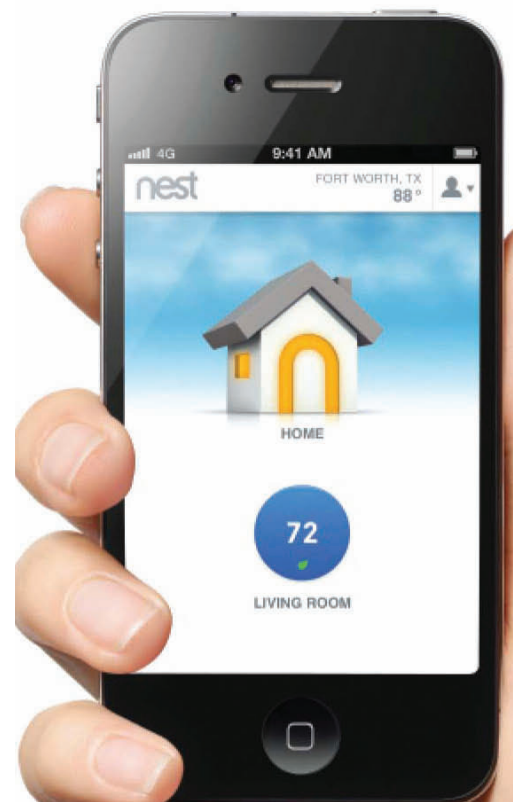
LG has confirmed that its G Watch will be the first smartwatch to launch running Android Wear, a custom version of Android designed for wearable devices. The dust- and water-resistant G Watch will be available in 'Stealth Black' and 'Champagne Gold'. It will also feature an always-on screen.

**£180 inc VAT**  
**lg.com/uk**

**>> Google Nest****Smart thermostat**

Google has finally brought its Nest Learning Thermostat to the UK, just in time for summer. Nevertheless, the gadget can programme itself, or you can remotely adjust the heating using your smartphone or tablet.

**£179 inc VAT**  
**play.google.com**



## >> Lytro Illum

### Camera

Lytro's follow-up light-field camera is the Illum, which looks more like a traditional camera. It uses a 40-megapixel light-field sensor, a zoom lens and a constant f/2.0 aperture to capture multiple-dimensional images. Intelligent software lets you tweak the tilt, focus, perspective and depth of field after a shot has been taken.

€1,599 (£950)

lytro.com



## << Withings Pulse 02

### Activity tracker

The latest version of Withings' Pulse activity tracker includes a strap that allows it to be worn as a watch. More interesting is its ability to measure via an optical lens your blood oxygen level - a first for wearables. There's also an updated Health Mate app with real-time coaching.

£99 inc VAT

withings.com

## >> Oppo PM-1

### Headphones

Blu-ray-player specialist Oppo has turned its talents to headphones, applying an unusual planar-magnetic technology to create sound. The system promises lower distortion and better phase accuracy, with closer fidelity to the original sound. At 395g they are relatively light compared to previous PM headphones, and sensitive enough to be driven by an iPhone.

£1,099 inc VAT

oppo-bluray.co.uk







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## >> Samsung Galaxy Ace Style

### Smartphone

Samsung hopes to take on king of the budget smartphones, the Motorola Moto G, with its Galaxy Ace Style. Samsung's latest affordable phone runs Android 4.4 KitKat and has a 4in screen. A microSD card slot lets you expand the internal storage.

£150 inc VAT

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



## House of Marley One Foundation <

### Wireless speaker

Arriving in time for festival season is House of Marley's One Foundation wireless speaker. It's made from solid oak, combining four large drivers with two tweeters. Plenty of ports and Bluetooth connectivity let you hook up a device. There's support for AptX, too.

£799 inc VAT

[thehouseofmarley.co.uk](http://thehouseofmarley.co.uk)



## Martian Notifier <<

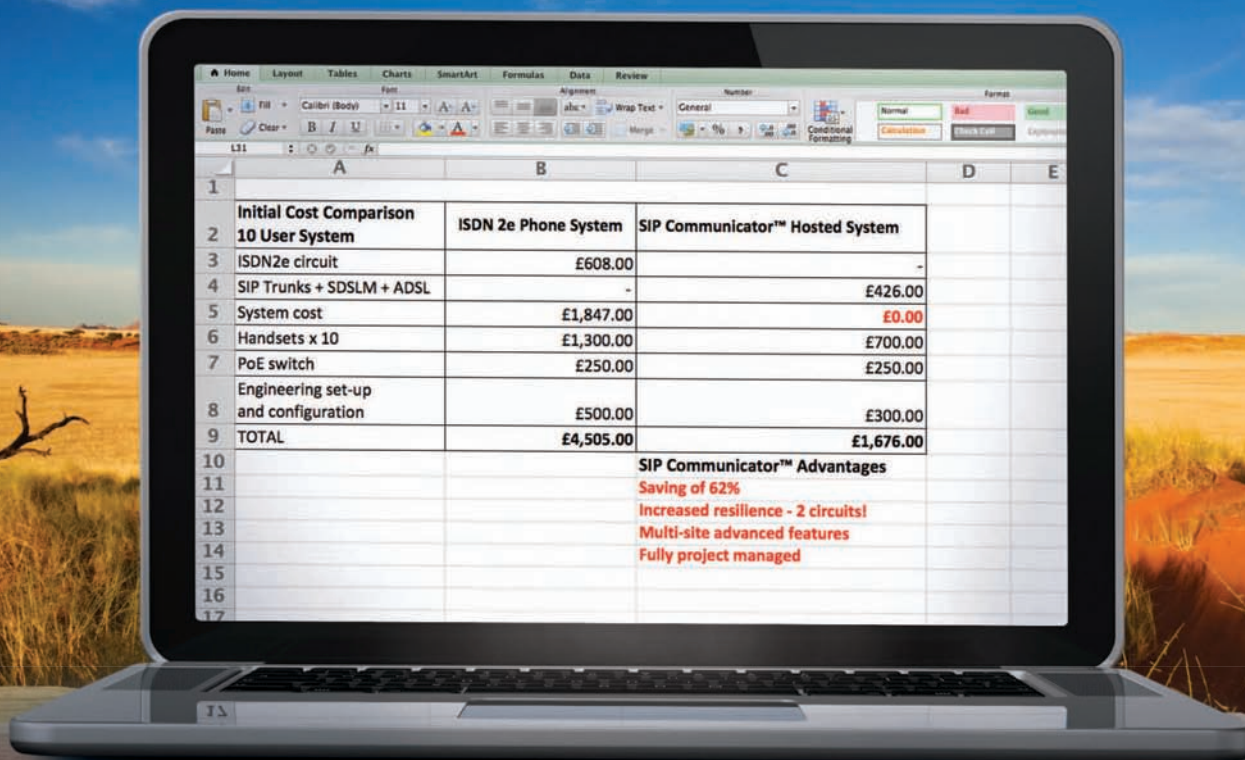
### Smartwatch

If you want a smartwatch that still looks like a regular watch then take a look at the Martian Notifier. The wearable device is compatible with both iOS- and Android devices, and it won't break the bank. Notifications are subtly displayed on a small OLED screen integrated into the watch face.

\$129 (£76) inc VAT

[martianwatches.com](http://martianwatches.com) ☒





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**£3,080** inc VAT

**Contact**

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

**Read more**

■ [tinyurl.com/q69qyp5](http://tinyurl.com/q69qyp5)

**Specification**

18.4in (1920x1080) gloss LCD; 2.7GHz Intel i7-4800MQ (3.7GHz Turboboost); Intel HD Graphics 4600 integrated graphics and 2x nVidia GeForce GTX 780M (4GB); Windows 8 (64-bit); 16GB dual-channel DDR3L; 256GB solid-state drive and 1TB hard drive (5400rpm); 802.11b/g/n/ac; Bluetooth 4.0; gigabit ethernet; 1x HDMI 1.4; 1x Mini DisplayPort; 4x USB 3.0; SDXC card slot; 2Mp webcam; 1x headphone, 1x speaker out, 1x mic socket; 86Wh lithium-ion battery; 457x328x57.5mm; 5.5kg

Build: ★★★★★

Features: ★★★★★☆

Performance: ★★★★★

Value: ★★★★★☆



## LAPTOP

### Alienware 18

Alienware is planning an update for its 17in gaming laptop that includes the new nVidia GeForce 800M series graphics cards. But even 2014's latest graphics processor is unlikely to match the 3D gaming performance of the dual GPUs housed within this behemoth.

There aren't many companies that still make laptops of this size, so the 18.4in display alone makes the Alienware 18 stand out from the crowd. The resolution is just 1920x1080 pixels, although at this price you could argue that it ought to match the 2880x1800 resolution of the Apple's MacBook Pro with Retina display ([tinyurl.com/q6zv3n](http://tinyurl.com/q6zv3n)).

However, 1920x1080 is good for games and watching high-definition films with the built-in Blu-ray drive. The overall quality is excellent, too; images are bright, sharp and colourful, with viewing angles that just won't quit.

Gamers are unlikely to complain about any lack of touch-controls, but we were a little disappointed to see that the screen has a glossy coating that throws off glare and reflection in broad daylight. Contrast this with the Alienware 17 ([tinyurl.com/ks5Lnfx](http://tinyurl.com/ks5Lnfx)), which has a decent glare-reducing matt finish. Perhaps Alienware assumes that you'll spend all your gaming time in a darkened room and have your meals biked in from the local pizza parlour.

The disadvantage of such a large screen is that the Alienware 18 is unavoidably big, but it's also heavy. It measures 57.5mm thick when folded flat - that's three Ultrabooks piled on top of each other - and weighs in at a whopping 5.5kg.

Mind you, one advantage of this size and weight is that the built-in



speakers manage to pack a decent bass punch, which works really well for blowing stuff up in games or just listening to some music between fragging sessions.

The keyboard is roomy and comfortable, and firm enough to take a pounding in the heat of battle. Like most laptops with 16:9 widescreen displays, it also has room for a full-size numeric keypad as well as an extra set of macro keys located on the far-left of the keyboard.

The trackpad is rather small, given the amount of space available - just 100x55mm - but most people will plug in a mouse to play games, so that's not a problem.

There are also four USB 3.0 ports available, so you've got plenty of scope for plugging in a mouse and other peripherals. It includes gigabit ethernet to minimise lag during your gaming sessions, and both HDMI and Mini DisplayPort interfaces in case you need an even larger screen.

There are three standard configurations available for the Alienware 18, starting at £2,000 with an Intel Core i7-4700MQ processor. We tested one of the mid-range models that includes a quad-core Core i7-4800MQ running at 2.7GHz with 16GB memory, 1TB hard drive and 256GB solid-state boot drive. That configuration would normally cost £2,650 with dual AMD Radeon M290X graphics cards, but our review unit was further customised with instead a pair of nVidia GeForce GTX 780M cards with 4GB of video memory. That took the price right to £3,080.

That may be too expensive for most people, but well-heeled gamers won't be disappointed with the results. A score of 6100 points when running the general-purpose PCMark 7 is impressive - but irrelevant since

that particular test doesn't really benefit from the dual-GPU setup.

The Alienware 18 felt fast in general use, though, and the SSD allowed it to boot in just 10 seconds when using the Windows 8 'fast-start' (restore from hibernation) option. In use, Windows programs would launch almost instantly.

When it comes to gaming, it breezed to 202fps in our Stalker test at 1920x1080 resolution - compared to 23fps for the integrated HD 4600 on the laptop's Core i7 processor.

We then switched to the more demanding Batman: Arkham City. That game's auto-detect default settings ran it at 1600x900 with DirectX 11 and all graphics options set to 'High', where it produced an average framerate score of 62fps.

We then turned the resolution up to native 1920x1080, and set every single graphics option to maximum - including 32x anti-aliasing - and the Alienware 18 still managed a full 53fps. Not only is that the best 3D performance we've ever seen for this game, but those high settings added a vivid clarity to the game's graphics that we'd never really appreciated before.

The dual-GPU set up kills batteries, though. In fact, it didn't even last long enough to install Batman from its two DVDs when on battery power alone. However, switching to the integrated Intel HD 4600 did allow us to get exactly four hours of streaming video.

## Verdict

It's big, heavy and expensive - and at this price the display could offer better-than-HD resolution. However, the dual GPUs of the Alienware 18 really do provide the strongest performance we've yet seen from a gaming laptop. **Cliff Joseph**





**£900** inc VAT**Contact**■ [toshiba.co.uk](http://toshiba.co.uk)**Read more**■ [tinyurl.com/k9y86qs](http://tinyurl.com/k9y86qs)**Specification**

13.3in (1366x768) matt TN display; 2.4GHz Intel i3-4000M; Windows 8.1 (64-bit); 4GB DDR3; 500GB hard drive (7200rpm); Intel HD Graphics 4600; 1x HDMI 1.4; 1x VGA; 802.11b/g/n/ac; Bluetooth 4.0; gigabit ethernet; 3x USB 3.0; SDXC card slot; 2Mp webcam; headphone/mic socket; 66Wh lithium-ion battery; 316x227x27mm; 1.5kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**LAPTOP****Toshiba Portégé R30-A-14K**

Toshiba tends to take its time when it comes to new fads such as Ultrabooks, or even updating its laptops with the latest Haswell processors. True to form, its Portégé R30-A-14K is an unassuming laptop, with a modest specification and little in the way of eye-catching features.

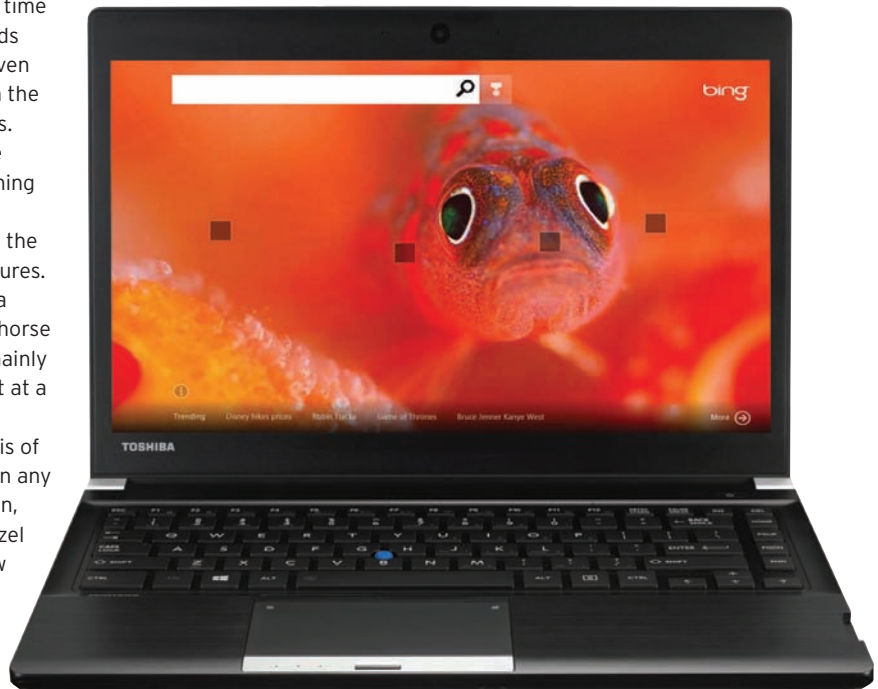
Even so, it can make a sturdy and reliable workhorse laptop that will appeal mainly to business users – albeit at a rather high price.

The matt-black chassis of the R30 isn't going to win any awards for elegant design, and the chunky black bezel running above and below the 13.3in screen looks distinctly old-fashioned when compared to the thinner surrounds found on more elegant laptop designs.

The chassis is made out of magnesium, with a shock-resistant 'reinforced honeycomb' internal structure that's designed withstand knocks. An internal accelerometer can lock the hard disk to prevent damage in case you accidentally drop the laptop.

The R30 is a very chunky 27mm thick, and is certainly no Ultrabook, although you do get an internal DVD drive in that fat frame. Despite this, Toshiba has managed to keep the weight down to just 1.5kg, which is light enough to carry around all day without shoulder ache. There are lighter laptops that don't include a DVD drive – the 13in MacBook Air ([tinyurl.com/mLLqLzj](http://tinyurl.com/mLLqLzj)), for example, weighs in at 1.35kg – but if you need an optical drive, then the Portégé R30 is one of the lightest options currently available.

Connectivity is good, too, with HDMI and VGA video interfaces, along with gigabit ethernet for office networks and three USB 3.0 ports.



The keyboard feels firm and comfortable, and includes both a trackpad and a separate pointer.

The 13.3in screen is something of a mixed bag, though. The lack of touch controls won't worry too many people, and we were pleased to see that the display's matt finish does a good job of reducing glare and reflection.

However, the 1366x768-pixel resolution is somewhat low in a laptop costing £900, and while the image is bright and colourful when viewed from directly in front, we found that the viewing angles were limited.

The speakers aren't particularly loud, which means that the R30 won't be suitable for even close-up presentations until you connect it to a decent screen and loudspeakers.

**Performance**

This is relatively modest for a laptop in this price range. Our review unit was priced at £900, with an Intel Core i3 dual-core processor running at 2.4GHz, 4GB memory and 500GB hard drive. That combination produced a score of just 2660 points when running the PCMark 7 benchmark test. That suggests that it would be adequate for web browsing and running Microsoft


Office, though, at this price you'd be entitled to expect a solid-state drive to enhance performance.

The Core i3's integrated HD 4600 provides limited graphics performance, too, just scraping 25fps when running our Stalker test at the lower 1280x720 resolution. There is another R30 model that includes an Intel Core i5 processor, which should lift overall performance, but that takes the price to well over £1,200.

Battery life is good, though; despite Toshiba's website carelessly listing it at both six-and-a-half hours and nine hours on different pages. In fact, the R30 managed eight hours (484 minutes) in our streaming video test, so careful use may indeed allow it to stretch to nine hours.

The battery is easily replaceable, too, as you can just press a couple of buttons on the base of the laptop to pop the pack out, so you can guard against downtime by taking a spare with you.

**Verdict**

The Toshiba Portégé R30-A-14K's low-res TN display is disappointing in a laptop costing £900. However, the laptop's relatively lightweight design and long-lasting battery ensure that it could earn its keep when on the move.  **Cliff Joseph**



£549 inc VAT

Contact

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

Read more

■ [tinyurl.com/q9x89kq](http://tinyurl.com/q9x89kq)

Specification

1.5GHz Intel i3-4020Y; Intel HD 4200 integrated graphics; Windows 8 (64-bit); 4GB DDR3L SDRAM; 500GB hard drive (5400rpm); detachable 13.3in touch-sensitive IPS display with 1366x768 resolution; 802.11b/g/n; Bluetooth 4.0; 1x Micro HDMI 1.4; 1x USB 3.0, 1x Micro-USB 2.0; 1x microSD; 720p webcam + mice; 2x 2-cell lithium-ion battery; tablet - 331x215x14mm, 1.1kg; keyboard - 331x230x10.6mm, 1.2kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



LAPTOP

## Toshiba W30T-A-101

Toshiba's W30T-A-101 is an odd device. It's a smartly designed and affordable convertible that can function as either a laptop or tablet. Unfortunately, its size and weight prove to be a hindrance in both modes.

It makes a good first impression, with an aluminium keyboard and 13.3in screen panel that look smart and feel very sturdy. It has the same detachable design as HP's more expensive Spectre X2, which allows you to separate the screen from the keyboard, so you can use the screen as a self-contained tablet. It also borrows HP's smart idea of including separate batteries in both the keyboard and screen sections in order to provide longer battery life.

However, we got a shock when we picked it up. Toshiba states that the combined weight of the keyboard and screen in laptop mode is 2.1kg, but we weighed it at 2.3kg - 1.2kg for the keyboard and 1.1kg for the tablet. It also measures a full 24.6mm thick, which is the sort of size and weight you'd normally expect from a bulky 15in laptop. We had trouble trying to lift it with one hand, and certainly wouldn't be very keen on carrying it around all day long.

That's a shame, since the W30T has some attractive features when used as a laptop. The 1366x768 resolution is disappointing, but the IPS panel is bright enough to provide good all-round viewing angles

and will work well for web browsing and streaming video. The speakers in the keyboard section also produce a loud and full sound, so you can listen to some music or even give an impromptu business presentation without needing headphones or external speakers.

Connectivity isn't a great strength, though. There's just a single USB 3.0 port on the keyboard section, while the screen/tablet includes Micro-USB 2.0, Micro HDMI and microSD, which means that you'll probably need to buy suitable adaptors or cables for those.

Performance is also relatively modest when compared to more conventional laptops in this price range. The W30T is listed at £699 on Toshiba's website and includes a Haswell i3-4020Y running at just 1.5GHz, along with 4GB of memory and 500GB hard disk. That entry-level processor doesn't include a TurboBoost option to enhance performance, and along with the ageing 5400rpm hard drive produced a score of just 2300 points when running the PCMark 7 benchtest. To be fair, that's still perfectly adequate for

web browsing, streaming video and running Microsoft Office, and its integrated

HD 4200 graphics even managed a playable 28fps when running our Stalker test at 1280x720 resolution. It won't be


able to handle the latest 3D action games,

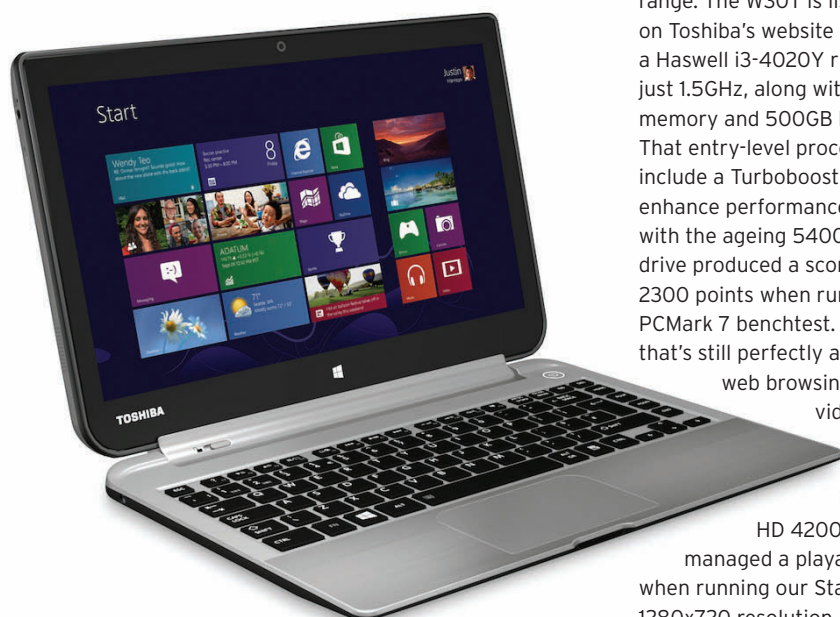
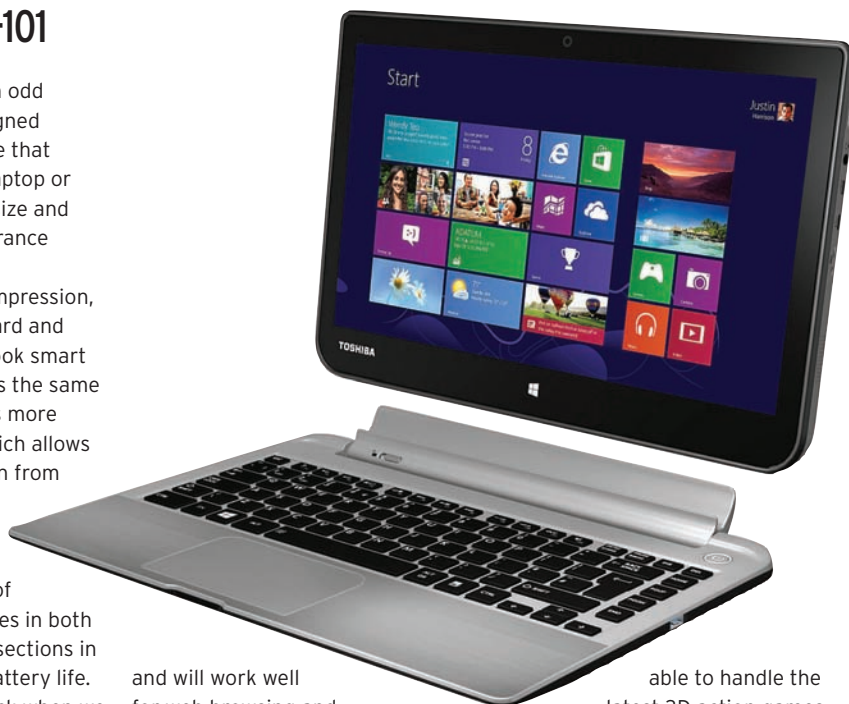
but tablet games such as Angry Birds will run well and will benefit from the large screen.

However, the size of the screen is something of a mixed blessing in tablet mode. The image quality is good, but when you remove the screen from the keyboard you find that the 13.3in tablet weighs 1.1kg and measures 14mm thick. It's too big and heavy to hold comfortably while you browse the web or watch some streaming video, and we often found ourselves slotting it back into the keyboard just to support the screen while we ran the BBC iPlayer.

Thankfully, the twin batteries do at least work well. Toshiba quotes battery life of three hours, 15 minutes for the tablet, with another two-and-a-half hours when joined with the keyboard again. In fact, the tablet alone lasted for three hours, 45 minutes when streaming the iPlayer, and gained another three hours in laptop mode. Lighter use should let you last closer to eight hours, which is respectable when compared to similarly priced laptops.

### Verdict

The W30T does have its strong points, including an attractive screen and good battery life. However, its size and weight in both tablet and laptop modes is a clear weakness, and the device will struggle to compete against the many slimmer, lighter laptops and tablets that are now available.  **Cliff Joseph**





**£500** inc VAT**Contact**

■ [lenovo.com/uk/en/](http://lenovo.com/uk/en/)  
 ■ [Read more](#)  
 ■ [tinyurl.com/mtwn8rl](http://tinyurl.com/mtwn8rl)

**Specification**

2.16GHz Intel i3-4005U;  
 Intel HD integrated  
 graphics; Windows 8 (64-  
 bit); 4GB DDR3L SDRAM;  
 500GB hard drive  
 (5400rpm); 11.6in touch-  
 sensitive IPS display with  
 1366x768 resolution;  
 802.11b/g/n; Bluetooth 4.0;  
 1x Micro HDMI 1.4; 1x USB  
 3.0, 1x USB 2.0; SDXC/MMC  
 card slot; 720p webcam  
 and microphone; 34Wh  
 lithium-ion battery;  
 298x206.5x17.2mm; 2.2kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**LAPTOP****Lenovo IdeaPad Yoga 2 (11-inch)**

Calling this the Yoga 2 seems like something of a misnomer, given that Lenovo has already released about a dozen different Yoga laptops of various sizes and configurations. However, this 11.6in model stands out from its flexible brethren by virtue of a £500 price tag that makes it the most affordable Yoga yet.

Like all the Yoga laptops, this is a slimline laptop with a convertible 'flip and fold' design that allows you to fold the screen back through a full 360 degrees. You can fold it part of the way back and then flip it over so that it stands up like an 'A'-shaped tent, which works well if you want to run presentations or just lean back and watch some streaming video. Alternatively, you can wrap the screen right around so that it folds back up against the keyboard and turns into an 11in tablet.

It weighs 1.35kg - not the 1.56kg that Lenovo rather carelessly lists on its website - and you can easily pick it up with one hand when it's in laptop configuration. It measures just 17.2mm when folded flat, so works well as a lightweight Ultrabook that you can carry around with you all day long.

The weight distribution is different when you switch into tablet mode, though, and the size and weight of the screen mean you either need to rest it on your lap or use the tent option to prop it up on its own. The build quality is also very good for a laptop costing just £500, with firm backing for the screen panel and a sturdy, comfortable keyboard with Lenovo's trademark moulded 'accutype' keys.

The screen is also a pleasant surprise. The Yoga 2 can't match the outstanding 3200x1200 resolution of its more expensive big brother - the 13in Yoga 2 Pro ([tinyurl.com/p2araxa](http://tinyurl.com/p2araxa)) - and is limited



to a more pedestrian 1366x768. However, it does still use an IPS panel and while it's not the brightest we've ever seen the viewing angles do come close to a full 180 degrees. It's certainly one of the best screens we've seen on a laptop costing £500, and it's hard to fault the screen and build quality at this price. Even the speakers are respectable - there's not much bass, but the sound is full and detailed and the volume levels are loud enough to be heard above the din in a crowded coffee shop.


Inevitably, though, there are compromises involved in producing such an affordable laptop. It's not well connected, with just one USB 3.0 port, one USB 2.0, SD card reader and HDMI interface. However, it's the performance of the Yoga 2 that may give you pause for thought.

Rather than the Intel Core processors used by most other Yoga models, the Yoga 2 is equipped with a humble Pentium processor. The Pentium N3520 used here is a quad-core chip with 2.16GHz clock-speed, but it's no match even for an entry-level Core i3 processor and manages to produce a score of 1968 points when running the general-purpose PCMark 7 benchmark. The 5400rpm hard drive isn't much help either, and the Yoga 2 takes several seconds to wake from sleep, and 20 seconds to boot even when using

the Windows 8 'fast start' option. To be fair, the Yoga 2 is perfectly adequate for basic tasks such as web browsing, streaming video or word processing. The 4GB of memory and 500GB hard drive will also allow you to run a wide variety of apps, as well as storing plenty of music, photos and videos. However, it will struggle with tasks such as video-editing or preparing video-based presentations. It couldn't even install our Stalker gaming test, so 3D games are off the agenda.

On the bright side, the Pentium processor is more power-efficient than we'd expected. Lenovo quotes a battery life of 'up to six hours', but the Yoga 2 lasted for a full six hours, 20 minutes when streaming video off the BBC iPlayer, and you could stretch that to around seven hours if you're not using Wi-Fi all the time. There are many Haswell laptops that can manage eight to 10 hours with little difficulty, but the Yoga 2 still provides respectable battery life for a laptop in this price range.

**Verdict**

In some respects the Yoga 2 is a bargain, as it provides good screen quality, battery life and lightweight design at a competitive price. Performance is below-par, although it will still handle routine web browsing, streaming video and word processing.  **Cliff Joseph**



**£983** inc VAT**Contact**■ [computerplant.co.uk](http://computerplant.co.uk)**Read more**■ [tinyurl.com/mjzks7g](http://tinyurl.com/mjzks7g)**Specification**

3.4GHz Intel Core i5-4670K; Corsair Hydro Series H60 2013 (Advanced Liquid Cooling); 8GB DDR3 1600MHz; 120GB Kingston V300S37A SSD; 2TB Seagate hard disk (7200rpm); Corsair 450W PSU; Gigabyte GA-Z87N-WIFI motherboard; Windows 8.1 (64-bit); Zotac GeForce GTX 760 (2GB) 993 (1059 Boost)/6008; on-board sound; 2x gigabit ethernet, 802.11b/g/n; 6x USB 3.0, 2x USB 2.0; 2x DVI, 3x HDMI, 1x DP; 6x audio; Fractal Design Node 304 case; 16GB USB drive; 3-year return-to-base warranty

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**GAMING PC****Computer Planet GX 760 Gamer**

The Computer Planet GX 760 may not be the most devastating gaming PC on the market, but it's one of the more affordable. It also benefits from a form that almost redefines the compact computer.

Much of the credit for the latter goes to the superlative case, a Fractal Design Node 304 that's tiny yet devastatingly effective. With a footprint of just 250x374mm, and a height that barely touches the 210mm mark, this is a truly compact little machine.

But where once 'small' meant 'shocking specifications' - shockingly bad, that is - that's not true for the Node 304. Yes, Computer Planet has jettisoned the optical drive - if you want to work with DVD or Blu-ray media, you'll need to invest in an external USB model - and the lack of a reset button (or any buttons at all bar a power switch) takes some getting used to. But the rest of the Node is breathtaking.

The noise levels are tiny, and yet the case is very well aired, with plenty of ventilation where it matters. You probably won't want to block up the airflow by filling this case with the full complement of six drives, but Computer Planet has gone for the rather tidier but effective pairing of a 2TB Seagate disk with a 120GB Kingston V300S37A SSD drive. This makes



for fast plus copious quantities of storage space.

The Node 304 isn't the tidiest of cases internally, but the strings of cables can't really be helped in a case this size. The lid isn't the easiest to get on or off, but otherwise we're very satisfied with the cleverly designed layout.

One small limitation is the modular PSU. A Corsair 450W power supply has been included here. This doesn't offer immense capacity for graphics card upgrades, but is more than fine for powering the Zotac GeForce GTX 760 already installed by Computer Planet.

The nVidia GTX 760 is relatively modest, and doesn't offer the same framerates as many of the Compact Gaming PCs from our recent group test. Nonetheless, the framerates

from real-world tests were highly playable.

We saw 103fps in AvP, for instance, a proficient figure at 720p. Even at 1080p, 54fps remains a viable proposition. And in Sniper Elite V2, it managed a high of 261fps at 720p with detail settings at Low. Detail bumped up and 119fps was still possible. Only at 1080p, and with all settings pushed to max, did it falter, with an average framerate of 29fps.

The Computer Planet doesn't have the same base specs as many of the last group test models. The Intel Core i5-4670K is run at factory speeds, a

sensible choice when you're trying to make a PC lounge-friendly, and while the memory comes from the esteemed Corsair stable, there is just 8GB of it. Fear not, though, that's ample of any gaming.

These slight constrictions may account for the slightly lower PCMark 7 score of 5508 points. Such restraint does help create a system that's low on power, though. Drawing just 53W while idling, the system never consumed more than 271W, even when subjected to fierce games and the FurMark test.

The motherboard is a fine Gigabyte GA-Z87N-WIFI version, that allows for two gigabit ethernet connections, and has built-in Wi-Fi. The latter, though, didn't seem to work well for us, and we ended up using a USB adaptor to forge an internet connection. We don't know whether this was down to a system/motherboard fault or not.

**Verdict**

The Fractal Design Node 304 case was a big hit when it appeared in the Mesh Elite Mini Gaming PC ([tinyurl.com/pwcacv2](http://tinyurl.com/pwcacv2)). And it's another hit here, even if more modestly clothed. If it's the last word in gaming power that you hanker after, this machine isn't for you. However, it offers capable framerates, and does so while putting out little noise or drawing much power, and itself consumes little space. As an overall system for people who like to play games in comfort, this Computer Planet machine stands out. **Robin Morris**





**£695 inc VAT****Contact**■ [gladiatorpc.co.uk](http://gladiatorpc.co.uk)

Read more

■ [tinyurl.com/pkdv2ng](http://tinyurl.com/pkdv2ng)**Specification**

3.4GHz Intel Core i5-4670K @4.2GHz; Be Quiet Dark Rock 3 CPU cooler; 8GB DDR3 1600MHz; 2TB Toshiba DT01ACA hard disk (7200rpm); Corsair CX500M 500W PSU; MSI Z87M gaming motherboard; Windows 8.1 (64-bit); MSI nVidia GeForce GTX 750 Ti Gaming (2GB) 1085 (1163 Boost)/5400; on-board sound; 1x low-lag ethernet; 8x USB 3.0, 4x USB 2.0; 2x eSATA, 1x DVI, 1x HDMI, 1x D-Sub; 6x audio; 24x Lite-on iHAS124 DVD+RW; Aerocool Dead Silence (DS) Cube Window Red case; 4-year return-to-base warranty

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**GAMING PC****Gladiator Firestorm OC**

If you're of the opinion that gaming systems need to be brash, and the brasher the better, then you'll like the striking red panels of the Gladiator Firestorm OC.

It uses an Aerocool Dead Silence Cube Window case to enclose the machine's innards. The case is cuboid in shape, with squat dimensions that should appeal to those looking to fill a smaller space in their living room or den.

It's not without its drawbacks, though. The case is confined, and there isn't much in the way of vents for air to circulate properly, so temperatures can get warm.

The case comes with a choice of lids. Gladiator has opted for a nicely ventilated mesh panel, but if you want to extend that eye-catching colour-scheme, you can replace the mesh with a solid red lid – albeit at the risk of increasing the temperature inside the case.

But the Cube Window case has other virtues. It's lovely and quiet, and we also liked the way the motherboard is placed horizontally across the middle of the case, splitting the Cube into a bottom floor and a top floor.

The 'top floor' has plenty of room for the sizeable Be Quiet CPU cooler, and the layout means that the motherboard won't have a huge and weighty cooler hanging down from it. Gladiator has got around the



potential shortage of drive bays by having the main optical drive, a 24-speed Lite-on DVD+RW unit, tucked away in the top corner. This leaves plenty of space in front of the graphics card, should you want to replace it with a longer version.

The Firestorm didn't reap the fastest benchmark results. Indeed, many of the components look rather modest when placed alongside the relative powerhouses that dominated our recent Compact Gaming PCs group test.

The Intel Core i5-4670K is a decent start, and here it's pushed from its default 3.4GHz to a rather more eye-raising 4.2GHz. The memory is from the high-calibre Corsair Ballistix Sport range, and there's 8GB of it. Gladiator skipped on the opportunity to install an SSD drive, and this is perhaps the biggest factor in the relatively low PCMark 7 score of 5124 points.

The graphics card is also reasonably low when compared to the 770s and better than proliferate. The nVidia GeForce 750 Ti is a new card that offers very good frame rates for the price. That asking price, however, is rather paltry in comparison. Assuredly, you can play games on this PC, but you may not want to stretch to high detail levels at expansive resolutions.

It remained playable in Sniper Elite V2 at 720p, hitting 194.1fps at


low quality settings, and 81.6fps with greater detail added. Only at 1080p, with settings pushed to the max, did it falter, tumbling to an unusable 18.6fps.

The Firestorm, though, is about price and low impact. While its power consumption was a reasonably substantial 70W when idling, it never went much beyond this, even when pushed to the limit.

In gaming, it hit a maximum of 166W, and was far more often found in the region of 130- to 140W. This is an astonishingly low power draw, and is testament to the case and the power-light graphics card.

There are also some nice touches that can enhance your gaming experience. The Sound Blaster Cinema audio is a notch above the standard onboard sound, and the Killer E2200 ethernet port is cleverly designed to minimise online lag, letting you get in that last shot before your opponent.

**Verdict**

While it lacks the petit dimensions of the Computer Planet GX 760, for instance, this Gladiator PC is still reasonably compact. It doesn't have the fancy hardware of some compact PCs, but it can make a good job of games, and has more than enough firepower for everyday tasks.  **Robin Morris**



**£550** inc VAT

**Contact**

■ [htc.com/uk](http://htc.com/uk)

**Read more**

■ [tinyurl.com/ngbwxy9](http://tinyurl.com/ngbwxy9)

**Specification**

5in, Full HD 1080p, 441ppi; Qualcomm Snapdragon 801, quad-core, 2.3GHz; Android 4.4 KitKat with HTC Sense 6.0, HTC BlinkFeed; 16GB, available capacity around 10GB; microSD (up to 128GB); 2GB DDR2 RAM; Internal GPS antenna + GLONASS, Digital compass; 3.5mm stereo audio jack; NFC; Bluetooth 4.0 with aptX; dual-band Wi-Fi up to 11ac; Micro-USB 2.0 (5-pin) port with mobile HD video link (MHL); Infrared; HTC BoomSound - Dual front stereo speakers; HTC UltraPixel Duo Camera; 5Mp front camera with wide-angle lens; 146.4x70.6x9.4mm; 160g

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★



**SMARTPHONE**

## HTC One M8

HTC is back with the One M8, its new flagship smartphone for 2014. Once again, the Taiwanese firm has used a unibody aluminium design, though, this time the metal wraps around to the front rather than having a plastic strip around the edge. The corners are also more rounded. It also has a brushed look and has been treated to a glossy finish.

A larger screen means that the phone is taller and wider than its predecessor, but it didn't feel too large in our hand. Weighing 160g, it's one of the heaviest smartphones currently available, yet with that reassuringly heavy feel to it.

The M8 is available in three colours - Metal Grey, Arctic Silver and Amber Gold - a line-up that's reminiscent of Apple's iPhone 5s ([tinyurl.com/mz8jhlF](http://tinyurl.com/mz8jhlF)).

### Cameras

The back of the device is home to what HTC calls the Duo Camera - two lenses. The primary camera is the same Ultrapixel offering found on the M7. According to HTC, the ImageChip 2 means the camera can shoot faster and capture sharper images, and that was certainly true in our preliminary tests.

At 4Mp, there isn't as much detail in photos compared to the M8's rivals, but because its pixels are bigger, it's better suited to low-light situations. The second camera is there to capture depth information. Metadata is attached to the photo taken with the main lens.

The Duo Camera worked pretty well in our tests, although it's difficult not to cover the second lens with your finger. A message will pop up onscreen to warn you if this happens. Tapping the refocus button means the background goes out of focus making your subject stand out more.

Rather than genuinely altering the focus of the image, it uses the depth information to know which objects should be in or out of focus. Unfortunately, it means edge detection has to be used to blur objects and close scrutiny reveals it



can't deal well with hair. However, with the right image, it does a fine job.

The M8 can also record video in full HD. Unfortunately, video quality is unimpressive. There's no stabilisation and footage wasn't as sharp or detailed as we'd have liked, and not a patch on the Samsung Galaxy S5's (opposite) video quality.

On the front is a 5Mp camera with a wide-angle lens.

### Display

HTC has expanded the screen size from 4.7- to 5in. The resolution, as with Google-based rivals, remains at 1920x1080. The larger size means a dip in pixel density to 441ppi, but you're unlikely to notice. The phone may be bigger, but HTC has done a good job of making it feel the same.

The display is crisp, vibrant and looks stunning, with improved contrast ratio and viewing angles. We liked its silky gloss finish which, more than other phones, lets your finger glide across its surface.

Other specifications include NFC, 11ac dual-band Wi-Fi, Bluetooth 4.0 with aptX and an infrared transmitter. There's support for 4G LTE networks; and like the iPhone 5s needs a nano-SIM. There's no wireless charging, but that's true of most similar smartphones.

The M8 uses Android 4.4.2 KitKat - the current latest version from Google. Its Sense 6.0 interface introduces some new features. Navigation buttons, for example, are onscreen like many other Android smartphones. The move means that there are three buttons instead of two. A dedicated button for accessing the recent apps screens makes things easier.

As with the Google Nexus 5, the M8 gets KitKat's full-screen 'immersive mode'. Certain apps, including the web browser, can use the full 5in display, although we had to delve into settings to switch it on.

HTC uses LG's KockON feature to wake the display with a double tap. Motion Launch Gestures take it further. Swiping left, for example, opens the widget panel, while moving right takes you straight to BlinkFeed - HTC's newsfeed feature. Swiping upwards unlocks the device, and you can launch the camera app by holding the phone in landscape orientation and then pressing a volume button. We found these gestures just the kind of handy features that make life easier.

There are other minor tweaks, but customisation has been improved with the ability to select different theme. In a similar way to other phones that use themes, a wallpaper is tied in with a particular colour, which is then used throughout that software - the settings menu, for example.

The battery has been increased in capacity and HTC says the M8 will last up to 40 percent longer than the M7. The battery isn't removable, but this isn't too surprising.

In real-world use, it lasted roughly 24 hours, with average use of phone calls, texts, web browsing, gaming and YouTube videos. The One M8 has an 'Extreme Power Saving mode' that the firm reckons will let the handset last 'up to 30 hours' from 10 percent charge. You're limited to phone calls, texts, emails and calendar and calculator apps. We tried enabling it with nine percent battery remaining and there was still some charge 24 hours later, albeit with minimal use.

### Verdict

The HTC One M8 looks and feels gorgeous and with important upgrades including an innovative camera. This is a very desirable smartphone. **Chris Martin**



**£549** inc VAT**Contact**■ [samsung.com/uk](http://samsung.com/uk)**Read more**■ [tinyurl.com/kdvctst](http://tinyurl.com/kdvctst)**Specification**

5.1in Full HD Super AMOLED (1920x1080) display, 432ppi; 2.5GHz quad-core Qualcomm Snapdragon 801; Adreno 330; Android 4.4.2 (KitKat) with TouchWiz; 16Mp phase detection autofocus with LED flash, up to 4K video; 2Mp camera, Full HD recording at 30fps; Wi-Fi 802.11 a/b/g/n/ac (MIMO), GPS/GLONASS, NFC, Bluetooth 4.0 (LE), Infrared (Remote Control), 4G LTE (Cat 4); 16/32GB internal, microSD slot (up to 128GB), 2GB RAM; 2800mAh removable battery; 73x142x8.1mm, 145g

Build: ★★★★★☆

Features: ★★★★★★

Performance: ★★★★★☆

Value: ★★★★★☆

**SMARTPHONE****Samsung Galaxy S5**

The Galaxy S5 retains the same Samsung look as the company's other phones and not much has changed compared to previous generations, which is a shame because it warrants its own style as Samsung's flagship phone.

It also doesn't feel like a premium smartphone in the hand. A 'perforated' rear cover supposedly makes it feel more natural, but we don't see the benefit here.

Samsung has stuck with a physical home button with touch-sensitive counterparts either side. Instead of the previously used menu, we now have recent apps. The physical button is fine and houses the fingerprint scanner, but the other two are hard to reach.

We've hit a point where flagship smartphones offer excellent performance, so we weren't surprised to find the S5 nippy in day-to-day performance, though it's not flawless. For example, there's a delay between pressing the power or home button and the lockscreen appearing, and when hitting the recent apps button.

The S5 is available in either 16- or 32GB capacities. A microSD card supporting up to 64GB is almost a given nowadays, but it can take double that at 128GB. It's a good job there are plenty of storage options because a lot of the S5's internal storage is used up before you've even downloaded an app. Our 16GB unit has just under 10GB available, which is less than average.

The 5.1in display is only marginally larger than the Galaxy S4's ([tinyurl.com/ca5p7Lf](http://tinyurl.com/ca5p7Lf)), and if you were expecting a high resolution screen, you'll be disappointed.

Nevertheless, it looks brilliant. Of course, it's still Super AMOLED as you would expect from Samsung, so colours are vivid and pop out at you and contrast is good, too.

The Galaxy S5's fingerprint scanner is built into the home button, but you have to swipe your finger across it. You can register up to

three fingerprints and need to set a backup password because there's a five-attempt limit on using your paws to unlock the device.

In general, the fingerprint scanner is accurate, but swiping is awkward to do one-handed. Unless you hold it with one hand and use your other hand to swipe, you'll quickly hit the attempt limit.

Wireless connectivity is all pretty up to date, with 11ac Wi-Fi (MIMO), NFC, Bluetooth 4.0, an infrared transmitter, and the latest 4G technology. Samsung also includes Cat 4 LTE supporting eight bands, and a download booster that uses your Wi-Fi connection combine with mobile data to give you a theoretical max download speed of 400Mb/s.

The rear camera has a decent 16Mp sensor (3Mp more than the Galaxy S4) and it has a few new features to boot. Super-fast autofocus means you can take a photo in 0.3 seconds, according to Samsung. The problem is that the camera app takes a few seconds to load in the first place, so you may well miss the moment when whipping out your S5.

Image quality is good, though, and the extra resolution compared to the myriad of 8Mp smartphone cameras is certainly noticeable once you start cropping photos.

Videos are also decent. We didn't tested the 4k mode, but Full HD videos were sharp and detailed.

You can use the HDR mode in both photos and videos, and results are good. It's nice that the live preview shows what a photo will look like in HDR mode instead of having to review the shot after taking it.

On the front is a 2Mp camera that can record 1080p video.

At first glance and going by the main homescreen, Samsung hasn't done much to the software despite it being Android 4.4 KitKat. However, things have tweaked here and there. Round icons grace the drop-down notification bar and settings menu is huge but you can hide and expand each section.

As we mentioned earlier, the notification bar has an optional brightness slider and you can customise which quick settings are displayed. You can also switch on app recommendations which




will suggest apps when you, for example, plug headphones in.

New features include a Kid's mode that allows the own to restrict the content and play time of a younger users. The interface is fun, colourful and the child can't exit back to the main phone without knowing the PIN number.

Samsung continues to offer a removable battery, which will please some users, and its capacity has increased compared to the Galaxy S4. It's now has a 2800mAh battery inside, and although that's certainly not the biggest we've seen, it's about how you use and manage this power that matters.

We were impressed by the battery life. After a full working day of use and testing we had two-thirds remaining. The smartphone should last most users two days, which is a good result even if we do want more from battery technology.

**Verdict**

Things haven't changed much from the Galaxy S4 but Samsung, as usual, has packed the Galaxy S5 with features.  **Chris Martin**



**£235** inc VAT**Contact**■ [nokia.com/gb-en](http://nokia.com/gb-en)**Read more**■ [tinyurl.com/Lcw7fay](http://tinyurl.com/Lcw7fay)**Specification**

6in (1280x720) multitouch display, TrueColor (24-bit/16m colours), 16:9, 245ppi, ClearBlack, IPS LCD; 1.7GHz Qualcomm Snapdragon S4 (dual-core ARM); 1GB RAM; 8GB onboard flash storage, microSDXC card slot; Windows Phone 8; ambient light sensor, accelerometer, proximity sensor, magnetometer; micro-SIM; Micro-USB (USB 2.0); 3.5mm audio connector; Bluetooth 4.0; 802.11 b/g/n; 5Mp main camera with 1080p video capture, front-facing webcam; 12.9Wh (3.8 V/3400 mAh) fixed lithium-ion battery; 164x86x9.8mm; 220g

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**SMARTPHONE****Nokia Lumia 1320**

Windows Phones from Nokia offer a genuine alternative to iPhones and Androids, especially if you are new to smartphones and so not already wedded to one or the other of the bigger platforms. Into that mix comes the Lumia 1320. It's at the top of the size scale, with a 6in display similar in screen acreage to the top-of-the-line Lumia 1520 ([tinyurl.com/kggbbox](http://tinyurl.com/kggbbox)). But it's significantly cheaper, at a mid-range £238 if you buy it SIM-free; or £13/month on contract. As such it is a big phone aimed at the new smartphone user. Offering a full feature set, but second-tier spec.

It's a chunky phone, the front of which is principally made up of the glass screen. This is solid and scratch resistant. At 9.8mm at its thinnest point and 220g on the scales, the 1320 is not the smallest nor sleekest handset around, but for this size of screen, and at this price, it's well-designed and solidly-built.

Around the sides, you'll find on/off switch, volume controls and the dedicated camera button. At the top is a 3.5mm jack, and at the bottom is the Micro-USB port.

The Lumia 1320 has a huge, 6in display. Unlike high-end smartphones this is 'only' a 720p screen, 1280x720-pixel to be precise. Compare that with more expensive but similarly-sized Lumia 1520 and you start to see where cost savings have been made. The 1520 has a pixel density of 367ppi, whereas this Lumia 1320 tops out at 245ppi.

Colours are crisp and bright, and viewing angles are good, too. The only real down sides to that lack of true HD are apparent when viewing text documents, in which smaller letters start to look a little furry. This is a shame as the size of display and Windows Phone's Office credentials make the 1320 a good potential office workhorse.

Guess what? This smartphone is, well, a phone. And you'll enjoy using the Lumia 1320 as such. Windows Phone's phone app is a big bold phone icon on the home screen. Tap it and you can make a call by hitting one of your recent calls, bringing up the keypad or calling a contact.

The Contacts app in Windows Phone 8 is called People. Contacts stored on your SIM will appear here.



Sign in with a webmail account and your contacts should be imported from there, too (although our Gmail contacts were conspicuous by their absence). People will also pull in contacts from Facebook and Twitter, and generally does a good job of matching them.

Contacts integrate well with the phone app. And in our tests over the Three network in central London calls sounded clear at both ends.

It's also a good messaging device. The Mail app places all of your emails from multiple accounts including Gmail, Yahoo, Outlook.com into one single app. If you have an email account, you'll be able to set it up. If it's a webmail account such as the ones mentioned above, it will simply be a case of putting in your email address and password.

**Messaging**

Messages are handily grouped in conversations, as in Gmail. If you've never experienced this, it may sound odd, but once you've seen email grouped in this way you'll never want to go back.

The Messaging app defaults to showing SMS and MMS messages via your cellular character. If you use IM (or want to use IM), you can set up an account that displays messages in here. This will, of course, save you money by sending text messages over your Wi-Fi connection rather than using up paid-for texts.

As a Windows Phone, the Lumia 1320 uses Microsoft Internet Explorer. This is arguably the best of the native Windows mobile web browsers, which is just as well given that outside of the major apps, the Windows App store remains a little bare compared to Android or iOS.

Internet Explorer 10 has all the features you'd expect in a mobile web browser: tabs, favourites and built-in web page sharing are there. Setting Favourites and using and erasing your web history is easy, too.

When it comes to the camera, it has a 5Mp camera with none of the high-end 'PureView' features more readily associated with Nokia snappers. There's a dedicated camera shutter key that acts as a shortcut to the camera, so you won't miss that all important shot.

Images are solid rather than spectacular, but they are by no means terrible. Framing and focusing shots is simple, and general detail levels are good. We occasionally found some images flat and washed out, though.

A secondary camera around the front captures 640x480-pixel images, and offers video recording, still image capture and video calling.

A look at the spec-sheet might lead you to think that the Lumia 1320 is a slow dog of a phone. It runs a dual-core Qualcomm Snapdragon S4 at 1.7GHz, which looks mid-range against quad-core competition. In fact, the mid-range Nokia runs Windows Phone 8 in a fast and responsive manner. We experienced no lag when using this smartphone, and apps launched quickly, too.

An area where the Lumia 1320 shines is battery life. We found we could get two full days of general use out of the Nokia, without having to charge. And that's without engaging power-saving mode.

**Verdict**

With 'okay' performance and a good but not great screen, the Nokia Lumia 1320 still offers good value for money. **✉ Matt Egan**



**£670** inc VAT**Contact**■ [asus.com/uk](http://asus.com/uk)**Read more**■ [tinyurl.com/nr8rdq6](http://tinyurl.com/nr8rdq6)**Specification**

27in LCD monitor;  
2560x1440 native  
resolution; QuickFit  
alignment grid; picture-in-  
picture mode; 90-degree  
swivel, 20-degree pivot; 7  
preset modes; 1 x DVI  
input; 1x HDMI input; 1x  
DisplayPort; 6x USB 3.0  
ports; stereo speakers  
with 3W amplifier;  
641x560x240mm  
(with stand)

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆

**LCD MONITOR****Asus ProArt PA279Q**

Asus now has its sights firmly set on the high-end display market. Not content with being one of the first companies to offer a 4K monitor, the 31.5in PQ321Q, Asus has new professional displays promising colour accuracy at a range of other screen sizes. The ProArt PA279Q is the company's latest 27in screen.

It uses a matt anti-glare 10-bit IPS panel with a wide-colour gamut, quoted as factory calibrated for a delta E figure of less than 2. As with other high-end displays, such as the NEC P242W ([tinyurl.com/ne9hgbz](http://tinyurl.com/ne9hgbz)), it uses a recent LG advanced high-performance IPS (AH-IPS) panel, with a native WQHD 16:9 resolution of 2560x1440 pixels.

This translates to a dot pitch of 0.233mm, and a pixels-per-inch density of 108ppi. The listed response time of 6ms suggests it should be fine for gamers, as well as graphics professionals.

The screen can swivel 90 degrees, to be used vertically if desired; in fact, the PA279Q arrives boxed in that orientation. It can also tilt forward up to 20 degrees.

Avoiding a touch-sensitive display control system, Asus has instead provided six physical buttons on the right and a small joystick to navigate through menus.

Pushing the joystick inwards brings up the QuickFit alignment grid, providing a useful overlay for lining up graphics, entirely independent of whatever software you're running. With repeated presses, you can switch between guides, including centimetres, inches, screen regions and A4.

There's also a resizable picture-in-picture (PIP) mode to display two different inputs onscreen at once, with the second input in a corner of the screen. You can opt for picture-by-picture, with the two inputs next to each other, too.

On the back, there's one HDMI port, one DVI socket and two DisplayPort connectors, although only one of the latter is an input, the other used as a pass-through. Multi-stream transport (MST) for high-resolution DisplayPort connections can be switched on in the menu.

There's a USB 3.0 upstream port to connect to your computer, which enables six USB 3.0 ports on the



monitor itself, one of which is specified as a battery charging port. And topping off the list is a '9-in-1' card reader, which supports both SD and Sony MemoryStick cards.

There's a set of built-in stereo speakers, which handle audio carried over HDMI and DisplayPort. Unfortunately, these sound tinny and crackle whenever loud bass passes through them.

Using the Standard preset, with the PA279Q uncalibrated out of the box, and brightness and contrast settings at their defaults, the Asus looked slightly saturated, especially at the red end of the spectrum. For accurate colour representation, the sRGB and Adobe RGB presets were a much better choice.

There are plenty of menu options to adjust the image, but many are disabled in different display modes. With the sRGB or AdobeRGB presets, for example, the only control you can adjust is the brightness, with settings such as white point, contrast and gamma already preset, so greyed out.

The PA279Q has six colour sliders for hue and saturation, to alter red, green, blue, cyan, magenta and yellow levels, but only when changing a user preset. If you spend time fiddling with the controls, you can subtly adjust the image quality to your preference.

In testing, we left these controls alone, since we used a calibration tool that only required us to adjust

the brightness. We left the display on its Standard Preset, then ran all the Datacolor advanced tests.

Asus says the PA279Q has 100 percent sRGB coverage and 99 percent Adobe RGB. We measured 98 percent Adobe RGB coverage, along with 95 percent NTSC, an excellent result that rivals displays that cost a lot more.


At full brightness, we recorded 390cd/m<sup>2</sup>, which is slightly more than the specified 350cd/m<sup>2</sup>.

Contrast ratio was lower, though, at 640:1, which is a good figure, and significantly better than a typical consumer display, if not as high as more expensive monitors, but.

Luminance in the middle and lower sections was also good, with a maximum difference below five percent. At the top, it varied slightly more, though, with a difference in brightness of 21.4 percent in the central section, which is more reminiscent of a consumer display.

At 100 percent brightness, we measured 57W, which is roughly double the power consumption of a 24in 1080p consumer display. Set to 120cd/m<sup>2</sup>, the power consumption dropped to 31.5W. More troubling, in standby mode, it still drew 26.2W, more than smaller panels consume when turned on.

**Verdict**

Given the Asus PA279Q's quality, anyone that needs great image quality should give it serious consideration.  **Orestis Bastounis**

## GRAPHICS CARD

# MSI Radeon R9 270 Gaming Edition

£138 inc VAT

### Contact

■ [uk.msi.com](http://uk.msi.com)

### Read more

■ [tinyurl.com/mce7353](http://tinyurl.com/mce7353)

### System requirements

AMD Radeon R9 270; 2GB GDDR5; 900MHz core clock (975MHz Boost); 1.4GHz memory clock (5.6GHz DDR effective); 256-bit memory interface; 1280 stream processors; 80 texture units; 32 ROP units; PCIe interface; DirectX 11.2; 2x DVI, 1x HDMI; 1x DP; 1x 6-pin PSU connectors needed; 3-year warranty

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



We've looked at a number of cards from AMD's new range of Radeon chips, but so far we've confined ourselves to the 'X' versions of these products. However, almost every X has a cheaper version in existence.

This 270 sits somewhere in-between the 260X and the 270X in terms of price and performance. Crucially, that allows the X-less 270 to inhabit those fertile lands lying in the shade of our £150 cut-off point that separates the regular from the high-end cards in our charts. Hitting a sweet price tag of £138, there's significant breathing space between this and the £160 270X.

So the 270 is very much a slimmed down version of the 270X. Both are built around the same GPU. Even in the 270X, we noted that this wasn't the very latest in technology. What both products offer, though, is plenty of performance for a modest power output.

Where the 270 mainly differs from its bigger brother is in its clock speeds. Whereas the MSI 270X had a core clock of 1030MHz, with a boost mode pushing it up to a fleet-footed maximum of 1120MHz, the 270 makes do with core and boost figures of 900MHz and 975MHz respectively. It mirrors the 270X's 1280 stream processors and 80 texture units, though, adding up to a texture fill rate of 78GTps. That's a



decent gallop behind the 270X's figure of 89.6GT/s, but comfortably outdistances the 260X's 65.8GT/s or the GTX 650 Ti's 66GT/s.

Memory bandwidth is identical, too, with the 270 matching not just the 25-bit interface, but also the 1.4GHz (5.6GHz effective with the quadrupling effect of DDR RAM) memory clock of the 270X, adding up to a confident bandwidth figure of 179.2GB/s. That's in a different class to the 260X's 104GB/s, for instance, and hints that this is a card that really can put clear water between itself and the cheaper competition in the sub-£150 arena.

There is 2GB of memory provided - absolutely right for a sub-£150 card as most people won't be using these for startlingly high resolutions, or multi-screen gaming.

Another lovely bonus with the 270 concerns the light power requirements. Whereas the 270X needs a pair of six-pin power connectors, the 270 asks for just one. Its 150W TDP is very modest, and in testing, it typically fell 24W below the 270X under normal load.

We were impressed with the 270X's performance, but for the most part, the 270 keeps comfortably within reach.

On BioShock, for instance, the 270X achieved frame rates of 64.4- and 38.9fps at resolutions of 1900x1200 and 2560x1600 respectively. The 270's figures of 62.3- and 37fps were only marginally behind. The 260X, in contrast, was some way back, on 56.4- and 34.3fps.

## Verdict

As a perfectly poised consumer gaming card, the 270 is, well, perfect. Robin Morris

## PROJECTOR

# Optoma W316

£486 inc VAT

### Contact

■ [optoma.co.uk](http://optoma.co.uk)

### Read more

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

### System requirements

DLP technology; 1280x800 resolution

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



Many of today's business- and education projectors try to be slim and svelte, blending beautifully into the background, even if their hardware capabilities may fall considerably short of impressing.

The Optoma W316, though, is not cut from the same cloth. Its bulky and somewhat inelegant exterior is dominated by the large lens, creating an effect that appears to have fallen out of a 1990s timewarp. However, while its form is less than sensational, its function excels given the modest sub-£500 price tag.

First up is that brightness rating, and 3400 ANSI lumens means your presentations and lessons will look splendid, even in rooms where

there's plenty of light leaking in. If you can dim the lights, it obviously adds to the image quality, but this is certainly a model that can work very competently in daylight.

DLP models tend to have decent contrast ratios, although we suspect the Optoma's 15,000:1 advertised contrast ratio is on the generous side. But while the figure may be exaggerated, this model still offers good colour depth. Detailed video would benefit from better skin tones, but the bright shades are bright, and the clarity of image means that presentations will look glorious.

You don't get full-HD resolution support, with the W316 topping out at a native 1280x800 pixels. This,

though, isn't intended for use with high-res video, and the levels of detail will be more than enough for most computer projects.

The Dynamic mode makes a good job of adjusting each frame to suit the content, offering consistently good quality under almost any conditions, while also conserving energy. The onboard speakers are adequate, offering sound that's punchy. As with many of these projectors, the audio is adequate for business/school use, if hardly up to reproducing sonic excellence.

The lovely little white remote control is a cinch to use, and it allows you to access exactly the same menu options as from the



## WIRELESS ROUTER

## AVM FRITZ!Box 7490

**£245** inc VAT**Contact**■ [avm.de/en](http://avm.de/en)**Read more**■ [tinyurl.com/muafbhp](http://tinyurl.com/muafbhp)**System requirements**

802.11ac wireless router;  
2.4/5GHz; 3x internal  
antennas; 2x USB 3.0;  
128-bit WEP, WPA2; WPS;  
NAS server; IPv6; HD  
Telephony; 4x gigabit  
ethernet LAN; ADSL 2+;  
VDSL; ISDN; DECT base  
station for six phones; 4x  
answering machine;  
Media Server; 9.3W  
average power  
consumption;  
245x174x45mm; 476g

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



To call the FRITZ!Box 7490 a router is probably to do it a disservice. With so many features packed into this box, you could call it a digital hub for a small business.

To start with the basics, it's a wireless router that uses the latest draft specification 802.11ac, with a complete 3x3 MIMO antennas setup. And if you plug an external storage drive into one of its two USB 3.0 ports, it serves as a basic network-attached storage drive. These ports also support network printing.

The NAS facility supports the SMB network system, the networking protocol that Microsoft uses to access networked file systems. AFP (for Apple systems) is not included, although this shouldn't be a problem for Mac users, as OS X not only supports SMB shares but will soon make it the default. You can also access your local network behind this router from the internet, using FRITZ!Apps.

The standout feature of this system is its telephony functions. You can plug the 7490 into your phone system and use it to pick up faxes, answer calls (with four answering machines) and block specific outgoing or incoming numbers. It also includes its own DECT base station for up to six cordless telephones. HD telephony is supported, using better-quality



audio codecs, although the network and the other side need to support this too.

The router's interface is easy to use and provides network reporting features that usually require specialist software. For example, when setting up your wireless network for either 2.4- or 5GHz bands, it will show you how many networks are on each channel and even associated interference. This helps you to set your wireless network to a channel that's better removed from neighbours, resulting in potentially faster speeds. When connected to the internet, it will graphically show the router's throughput charted against time.

We tested the FRITZ!Box's wireless performance by connecting a laptop via the unit's gigabit LAN ethernet, to set up a TCP server with iPerf. The destination system was another laptop running iPerf TCP in client mode, connected to a TP-Link Archer C7 wireless 802.11ac router in bridge mode. We used the Archer C7 as a 3x3 MIMO dongle for the laptop.


We arranged three test setups. First, at 1m to determine maximum

throughput, then at 7m to show performance at a normal range and finally 10m where the client setup was around a corner, direct line of sight blocked by a concrete wall.

At closer range using 11ac, the maximum throughput was 330Mb/s, which is faster than any 11n router. Using 11n on the 2.4GHz band, the speed was 130Mb/s, which is on a par with a decent 11n router.

At the middle range, the maximum throughput was 320Mb/s on 5GHz 11ac, similar to the 1m result. Using 2.4GHz 11n, the transfer speed was a useful 120Mb/s, again on par with other 11n high-performance routers. The final setup at 10m indoors returned 125Mb/s using 11ac, and 109Mb/s with 11n. Given the screening effect of walls restricting the signal these final numbers are still very good.

**Verdict**

The FRITZ!Box 7490 is a hugely flexible and fast router that provides a host of features that are easy to use.  **John Taylor**



main control panel. That gives you access to a slew of useful options, including edge masks and in-depth individual colour settings.

The ports and connectors include three D-Subs (one VGA-Out, plus two VGA-In/YPbPr connectors), an HDMI connector, and mini-USB.

The Optoma can also turn its hand to 3D. You will need extra equipment,

such as glasses (available for £65 each), but it's nice to see most projectors now offering the option.

No wireless facilities are built in, although you can add Optoma's wireless dongle for an extra £130, which will let you project wirelessly from laptops, PCs and mobile devices. The cost may seem high compared to the price of the product itself, but such an addition could increase the convenience of this model.


The projector also comes with a carry bag. We did find its zip to be too short, though, and getting the projector in and out wasn't quite as easy as it should be. That may seem a trivial point, but it's hard to show your most sophisticated side to

clients when you're simultaneously wrestling with the case.

The projector can be turned off quickly (we recorded eight seconds), and can even be switched back on again almost instantly, should you somehow turn it off by accident.

Specified lamp life is very good, and with care, the Optoma may stretch to 10,000 hours. At 29dB, it's the right side of the 30dB noise mark, making it discreet to use.

**Verdict**

It's large and ungainly, and the resolution support isn't particularly high. In most other respects, though, the Optoma W316 is remarkable for its price.  **Robin Morris**

**£3,999** inc VAT**Contact**■ [samsung.com/uk](http://samsung.com/uk)**Read more**■ [tinyurl.com/k4mk95z](http://tinyurl.com/k4mk95z)**Specification**

65in LCD TV; 3840x2160 pixels; 2x Freeview HD, 2x Freesat tuner; 7-day EPG; stereo speakers with 2x 10W amplifier; 4x HDMI 2.0, 1x SCART, 1x component (YPbPr)/composite; stereo phono audio input; digital optical audio output; 3.5mm headphone jack; 10/100 ethernet, 802.11ac Wi-Fi built-in/Wi-Fi Direct; screen mirroring; 2x USB 2.0, 1x USB 3.0; HEVC decoder; 84W specified power consumption; 234W measured power consumption (100 percent red field); 1451x848x111mm (without stand); 26.8kg

Build: ★★★★★☆

Features: ★★★★★★

Performance: ★★★★★★

Value: ★★★★★☆

**4K TV****Samsung UE65HU8500**

Samsung is hailing the launch of its 65in curved flagship 4K TV as nothing less than the dawn of a new era of TV. The UE65HU8500 is certainly remarkable, and not just because of its unconventional Pringle-shaped panel. The set also boasts an integrated HEVC decoder, making it also the first 4K panel to support Netflix Ultra HD.

If this particular second-generation Ultra HD set doesn't quite fit the bill, it's also available as the 55in UE55HU8500 and 78in UE78HU8500. All three come packed with oodles of functionality, including the latest iterations of the brand's so-so gesture- and voice-control tech.

Interestingly, the HU8500 adopts a modular design. As 4K standards are far from cast in stone, Samsung has coupled the screen to an external Smart Evolution One Connect tuner box. It's here that all sources connect, including aerial and twin satellite feeds.

Input options comprise four HDMI (with 2.0 support for high frame-rate 4K and MHL 3.0 for mobile devices), three USB (one up-to-date as USB 3.0), Ethernet, component video via an adaptor, optical digital audio output and CI slot.

The unit also features high-speed 802.11ac Wi-Fi. The Smart Evolution box connects to the panel using a single, thick umbilical. No separate power supply is required.

A pebble-shaped Bluetooth cursor remote is supplied alongside the standard IR zapper. It's very similar to LG's Magic Remote, and supposedly makes browsing easier, although the need to call up a virtual onscreen keyboard for general menu inspection is a bit of a faff. Using it is something of an acquired discipline.

Samsung has made some minor changes to its Smart portal for 2014, adding a casual games slate plus split-screen Multi-View feature. You can also do more with the twin tuners this year, including watch non-tuner content (streaming media, Blu-ray, and so on) while recording two channels. With an eye on the World Cup, the brand has also updated its Soccer preset, which now auto-records match highlights onto an external USB HDD, triggered by crowd noise.



Image quality, both with full-HD and 4K content, is stunning. The HU8500 offers dynamic, punchy contrast and vibrant colour fidelity. While upscaling is arguably not quite as refined and convincing as that seen on Sony 4K screens, all 1080p content clearly benefits from the panel's lack of visible pixel structure. Images appear smooth and photographic.

Triumphantly, the HU8500 really comes into its own with 4K content. Currently, Netflix is streaming *House of Cards* Season 2 in Ultra HD, along with a selection of travelogues. You'll need a fast fibre broadband connection to enjoy them though, given it pours forth at 15.6Mb/s.

After watching Kevin Spacey cavort around Capitol Hill in 2160p, regular hi-def looks positively blurry. The screen also plays back YouTube 4K content, but here compression artefacts are generally rife, even if high-detail clips can be impressive.

Any benefit that the curved screen brings is debatable though. Samsung maintains that the curvature creates a more panoramic, cinematic viewing experience. Which is true if you sit close (less than 2m). However, there's also an obvious viewing sweet spot; sit off to the side and the screen geometry appears to contract.

Additionally, any onscreen EPG, be it the set's own Smart portal or the Planner on a Sky box just looks warped and wonky. The curved affectation should be considered a design and style novelty more than a performance benefit.

The set Active Shutter 3D support, with two pairs of glasses supplied, and while this suffers from mild crosstalk double imaging, dimensional imaging is bright and immersive.

Motion handling is potentially excellent, provided you pick the right interpolation setting. Our preferred mix is the Motion Plus Custom mode with Blur reduction set to between eight to 10, and Judder Reduction set to zero.

Audio performance is good, plumped by a welcome mid-range presence, however, there's not an over abundance of volume.

**Verdict**

Overall, the HU8500 can be considered a head-turner of a TV. Although we are not entirely convinced by the value of the curve, we will concede it looks pretty cool. Picture performance is excellent, particularly with native 4K content streamed via Netflix. Once you've enjoyed UHD it's difficult to go back. **Steve May**



**£1,500** inc VAT**Contact**■ [philips.co.uk](http://philips.co.uk)**Read more**■ [tinyurl.com/pptog74](http://tinyurl.com/pptog74)**Specification**

LED DLP Ultra Short Throw projector; 1280x800 resolution, 720p; 3x HDMI; composite video; 3x USB; phono stereo; Ethernet; PC VGA; Optical digital output; 12V trigger; Active Shutter 3D with one pairs of 3D glasses supplied; keystone correction; 26W built-in audio; SD card reader; Wi-Fi; Bluetooth; Miracast; 150W power consumption; 339x287x148mm; 5kg

Build: ★★★★★

Features: ★★★★★

Performance: ★★★★★

Value: ★★★★★

**PROJECTOR****Philips Screeneo HDP 1590TV**

Ultra-short throw projectors are a staple of the education- and corporate video markets. Yet they've so far failed to make an impact with home users. Will that change with the launch of the Philips Screeneo? Certainly from a design and usability point of view, this compact DLP projector is a uniquely attractive big-screen proposition.

The key benefit of any ultra-short throw projector is that you can create a large image in a compact area with minimal effort. The projector needs only be placed between 10- and 4cm from the wall to cast an image 50- to 100in across. A small shuffle from the wall is enough to double the image size. You don't have to worry about walking in front of any projected image or having a room big enough to create a big-screen experience.

Consequently, installing the Screeneo is a breeze. There's some keystone correction offered to square up the image, but by and large, the setup is plug and play. You can also ceiling mount the Screeneo if required. If you don't actually have a convenient white wall to project on to, there is electronic wall colour correction available for yellow, pink, green and blue hues. Floral wallpapers though are a bust.

In terms of design, the Screeneo owes more to a Bluetooth sound system than a projector. The lens arrangement is angled from the top of the body, while the front of the unit is all speakers. Rear-placed connections comprise two HDMI, a digital audio output, two USB, a pair of stereo phono inputs, ethernet, VGA connector and 12 V trigger.



Hidden beneath the front-facing Philips logo is an additional HDMI input, plus SD card reader, USB, headphone jack and manual focus wheel. The projector supports Bluetooth streaming and has integrated Wi-Fi.

The main user interface mimics that found on Philips TVs, as does the feature roster: there's an integrated TV tuner, connected app portal and media playback facilities. The Screeneo will unwrap files from both USB stick and across a LAN and offers extensive compatibility, including MKV, MPEG, AVI and MOV. You can also mirror Google smartphone content using Miracast.

Importantly, the Screeneo's LED light engine runs cool, so you don't get the fan-heater effect common to other small projectors. This is reassuring if it's going to be used around children and pets. The light source is also largely maintenance free – Philips quotes 30,000 hours lamp life. General operating noise is specified at a reassuringly low 26dB.

Although not overly bright, the Screeneo performs well in moderate levels of ambient light, and in a fully dark room it's positively dynamic.

Image resolution is limited to 720p (1280x800). While the projector comes with an integrated DVB tuner, this is defiantly standard-def. Consequently, tuner images blown large look decidedly coarse. Still, when fed HD, be it Sky HD or from a Blu-ray player,


things improve immeasurably. HD sources look crisp from a distance. Black level performance is acceptable but not outstanding.

Although not sharp enough to satisfy serious home-cinema fans, the Screeneo offers a great social experience. It's ideal for projecting general TV and sport in non-mission critical viewing spaces (large kitchens seem a natural), and looks great with 720p-era games consoles. An integrated carry handle makes it easy to transport around the house.

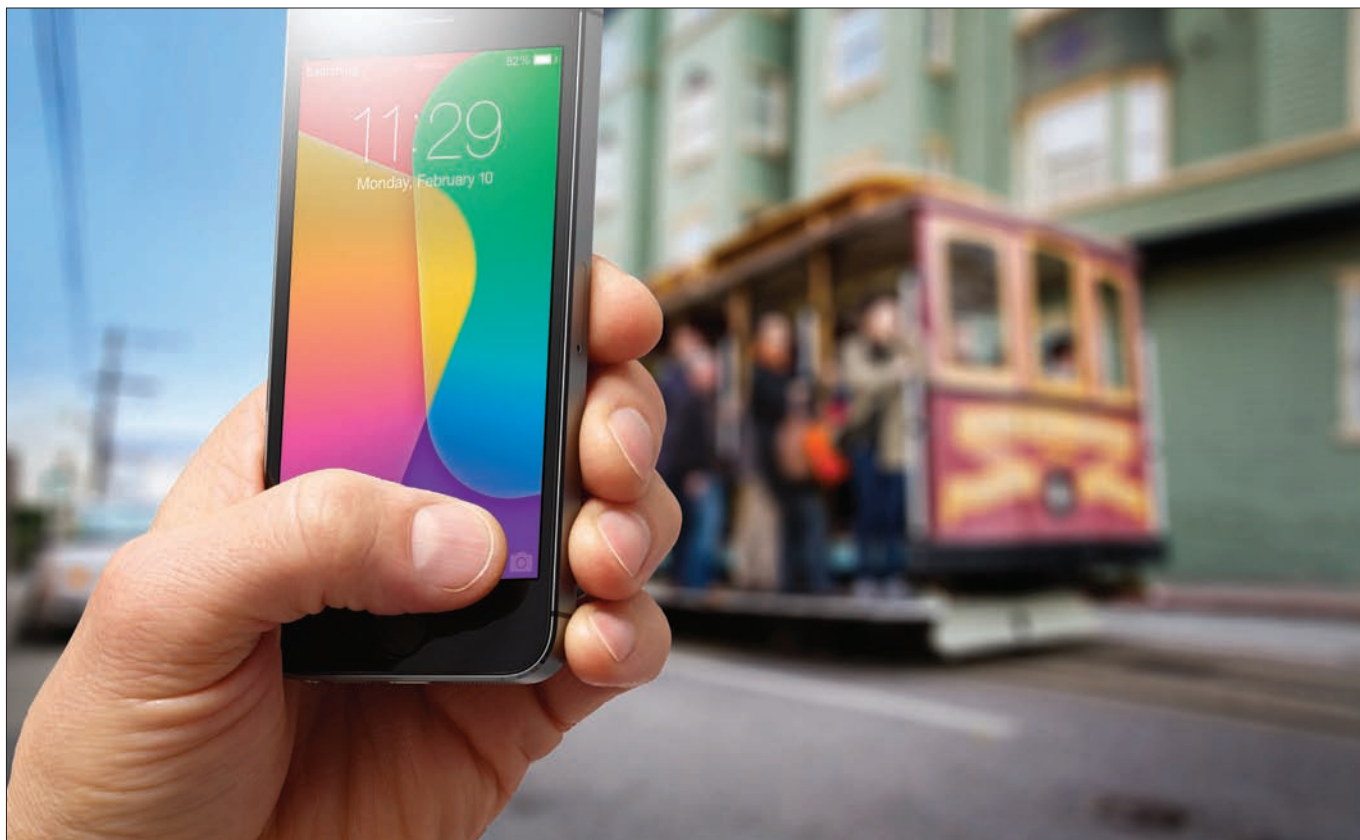
The projector is 3D capable and ships with a single pair of lightweight Active Shutter specs. 3D depth is rather good, with only minimal crosstalk evident.

The onboard audio system is rated at a loud 26W. Used for Bluetooth streaming, it's a rival for a basic wireless audio speaker. The HDP1590 runs on a version of the Android OS and comes preloaded with YouTube, a web browser and Office.

**Verdict**

It may not push the boundaries in terms of visual performance, but the Ultra Short Throw Screeneo is a lot of fun. Perfect for kids bedrooms, sporting events and large-walled living spaces, its huge images are easy to enjoy. The standard-definition Freeview TV tuner, though, is a misstep. No one wants to see grotty SD blown up to 100in across. While there is a version of the Screeneo sans tuner, what we would actually like is a Freeview HD upgrade. That would make this a very tantalising product indeed.  **Steve May**





# Improve your iPhone photos

Jim Martin reveals a selection of the best apps for enhancing photos taken on an iPhone

If you own an iPhone, the chances are that you use it to take a lot of photos. After all, it's always with you and, from the iPhone 4 onward, the main camera is capable of some great-quality images. It's also easy to share those photos on Facebook, Twitter and via email or iMessage, though there's usually room for improvement before you hit that send button. Ranging from basic edits such as cropping and rotating to removing unwanted objects, everything is possible if you have the right app. Although Apple offers its own apps there's a huge range of alternatives from third-party developers. Here we share a selection of our favourites, which allow you to improve your photos as well as getting creative with effects and borders. You won't even need to spend any money, as most are free.

**iOS 7 Photos (free):** This is likely to be the app you use most. It's where you can view all the photos and videos you've taken as well as those in your Photo Stream, including shots taken on other Apple devices. When you select a particular image, you can perform basic edits such as cropping, rotating and a one-tap auto fix. There are also some Instagram-style filters and red-eye reduction. But that's it. For many this is all they need, but for others the inability to increase saturation, edit certain parts of the image and add other effects will mean that Apple's app isn't good enough.

**SnapSeed (free):** We've used SnapSeed for a few years now, and it's still the photo editor to beat as far as we're concerned. Not only is it free, but it's also very easy to use on the iPhone's small screen and – at the same time – very powerful.

You can import images from your Photo Library or take a new image. It has all the basic tools you'd expect but the real power lies

in the editing mechanism. This involves swiping up and down to choose an adjustment, such as saturation, contrast and so on, and then swiping left and right to increase or decrease the effect.

SnapSeed also lets you perform local edits with its Selective Adjust tool. You can pinch to set the radius for the area you want to adjust, then choose from brightness, saturation and contrast. And you can add multiple editing points, and reset, move or delete each one. The app also includes effects and filters such as HDR, tilt-shift, vignette, retro and monochrome. With each, you can adjust their







intensity and other aspects. Finally, you can add borders and share your images to all popular photo-sharing sites, as well as saving the image to your camera roll.

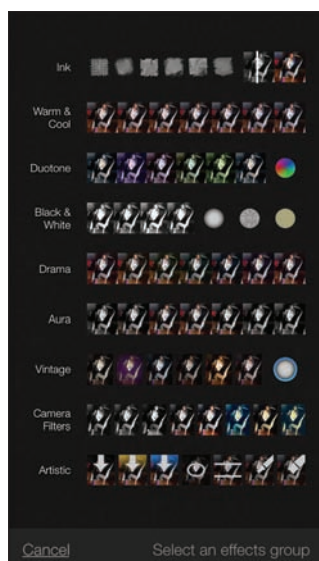
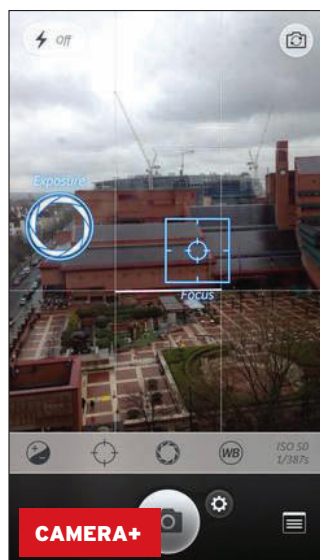
**iPhoto (free for iPhone 5c and 5s):** iPhoto is now free if you have an iPhone 5c or 5s, and costs £2.99 if you don't. It had an overhaul for iOS 7 and offers many of the tools found in SnapSeed.

One area where it's more powerful is local editing. There are several brushes, such as sharpen, soften and repair, which aren't present in SnapSeed. The repair brush works like the spot healing brush in Photoshop, but the results are mixed. It's hard, for example, to remove overhead power lines from a photo, but it works well on small blemishes. And there's no clone brush, which is a real shame.

iPhoto is a little confusing to use and its filters - while plentiful - can't be modified. Images can be shared back to the camera roll or to popular sites such as Facebook. Even if you own an iPhone 5s or 5c, both SnapSeed and Camera+ are better photo apps.

**Camera+ (£1.49):** One way to improve your iPhone photos is to ditch the built-in camera app and install something better. Camera+ is the one you want, and you won't regret spending £1.49.

It improves on Apple's Camera app in almost every way, offering separate focus and exposure points, an exposure compensation slider, shooting modes to help you get the best quality in different situations, and a stabiliser function to get the sharpest shots



possible. There's also a self-timer, ideal if you want to be in the photo; a level indicator, which works like a spirit level; and a burst shooting mode that lets you take lots of photos in quick succession.

Better still Camera+ has full editing capabilities, which it calls Lightbox. You can crop and straighten images, and add filters and frames. Our favourite filter is Clarity, which intelligently 'fixes' your photo, bringing out all the detail. It's a little like HDR but with no motion blur. One particularly handy feature is the ability to save to your camera roll only the shots you're happy with, which helps keep things nice and neat. You can also access previously taken photos from your camera roll and edit them in Camera+.

The only niggle is that you're stuck with Apple's camera app from the lock screen, so you'll have to get into the habit of unlocking your iPhone and then launching the app. Also bear in mind that you can't shoot panoramas or videos in Camera+, so use the lock screen to access Apple's app for those.

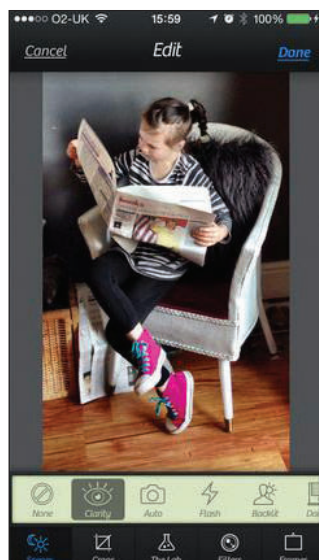
**Instagram (free):** Arguably the app that kickstarted a slew of filter-toting copies, Instagram is basically a social network that's all about photos that look like they were taken on a 1980s Polaroid instant camera. You'll need to register for an Instagram account but, once you've done so, you can use the app to take photos, which are then shared on Instagram's website. You can see what various filters will look like in your scene before taking the photo, though they can also be applied post-shot.

You don't have to share your photo on Instagram - it can equally be uploaded to Facebook, Twitter or Tumblr, or not at all.

**Manga-Camera (free):** For a bit of fun, try Manga-Camera. This free app lets you choose from 20 different comic book frames and then take a photo of your friend(s) in silly poses. It isn't possible to add a frame to an existing image, so you'll need to use the app to take the photo. Once taken, you can save the image to your camera roll or share it on Facebook or Twitter.

**Photosynth (free):** Like Manga-Camera, Photosynth is a bit different to your usual camera app. Using it, you can create full 360-degree panoramas, side to side and up and down. The result is a virtual 3D scene that you can then share via Facebook or view in the Photosynth app.

When taking the photos, onscreen guides help you line up the next shot, which is taken automatically when you're in the right position. The best results come from using a tripod, rather than holding your iPhone at arms' length, but it's still possible to get a seamless panorama if you're careful.



# Read faster and smarter with Spritz app

David Court looks at Spritz, an app that will help you read up to 1,000 words per minute

It's not surprising that an app which claims to allow its users to read at 1,000 words per minute has attracted attention – especially when we tell you the average reading speed is 220 words per minute.

While there are other apps on the market that claim to help you to read faster, Spritz is a little different. According to the company's CEO Frank Waldman, it uses Rapid Serial Visual Presentation, which places a lot of emphasis on the positioning of each word and highlighting the recommended 'focus letter' to give the reader the best chance of processing each word. He also says that Spritz has an algorithm built into the app that decides how long each word should be displayed onscreen.

Reading at great speed sounds fine, especially if you're trying to cram for an exam, but will you retain the information you're reading? According to Waldman, Spritz is equal to that of traditional left-to-right reading. Indeed, the company claims that it will allow you to remember more of the text.

The app will initially appear on only the Samsung Galaxy S5 smartphone and Galaxy Gear 2 smartwatch. However, Waldman says the company is in talks with Google, Yahoo and Amazon.



There's no official release date for the Spritz app on devices other than the S5 and Gear 2 but, given the amount of attention the app has received even prior to its launch, it would be madness for the German tech company not to strike while the iron is hot.

## The hidden cost of downloading a free app

If an app seems to be too good to be true, it probably is, says Chris Martin

Over Christmas an app called Cartoon HD began causing a stir, and was quickly pulled from Apple's App Store. Now a plethora of copycat apps have launched. So what is it, and is it safe to use?

The app made waves because it offered users free access to cartoons and full-length feature films, including new releases such as *Despicable Me 2*. Unsurprisingly, Apple banned the app for infringing copyright. Whether it was doing anything malicious is unclear, but it's likely that copycat apps will want to cash in on the hype. This means you should be very careful when installing and using such apps.

If you search the Google Play store for 'Cartoon HD', many Android apps appear in the results fighting for your attention. Descriptions will no doubt state that an app is legitimate and collecting content from YouTube and websites in the public domain – but just because they say this it doesn't make it true.

User reviews and ratings will, of course, make the app look appealing. However, these are probably fake, or written by those who don't know what they're talking about.

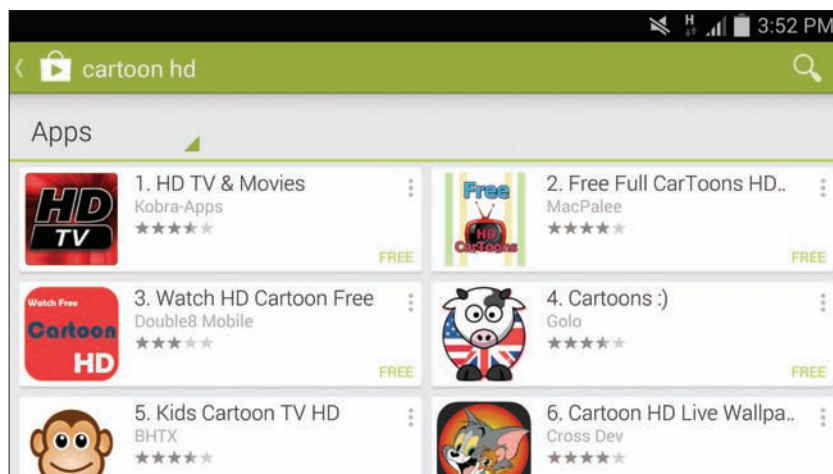
Many of these apps will be cashing in by way of adverts – if you don't mind viewing ads, then that's fine and everything could well be above board. They might also want in-app payments for content – also fine, if handled responsibly. As a rule of thumb, never enter your banking details into an app – only pay for in-app items via the Google Play store.

More mischievous developers might try to collect your personal data, which they can sell on for profit. Before you click to install an app from Google Play, a pop-up window will show you what permissions are required before you continue. Read these carefully before you take the plunge

– they can be a giveaway as to what's really going on. Apps will typically require network access (to stream the content) and the ability to stop your screen turning off. However, a video-streaming app that wants to read your web history and find accounts on your device is somewhat more suspicious.

Tony Anscombe, senior security evangelist at AVG says: "It's important that people read the permissions approval process before simply clicking 'Yes', and regularly check the settings and T&Cs of apps to see what data is being held or what can be accessed by the service provider. A little common sense goes a long way when approving these permissions – after all, does that flashlight app really need access to your contacts?"

The bottom line is that if you're not sure about the legitimacy of an app, don't download it. If something smells fishy, don't ignore it: the app is probably too good to be true.





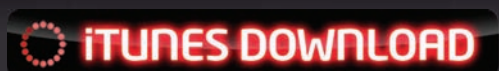
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## PC ADVISOR



# Find an iOS app for anything

Philip Michaels reveals the best apps for doing whatever you want on an iPad, iPhone or iPod touch



Whether you're the proud owner of an iPad Air, iPad mini or iPhone, great apps abound for your iOS device. Here are our top picks.

## iPad Air and iPad mini apps

I've surveyed my colleagues for their favourite iPad apps, and picked the ones that are best for certain tasks. Whether you see your iPad as a productivity tool, a gaming device or a family resource, we've selected the right app for you.

**WRITE:** The iPad can be a powerful productivity tool, especially when loaded with the right apps. Power users who work with text can turn to Editorial (£2.99; [tinyurl.com/oux7byj](http://tinyurl.com/oux7byj)). Its customisation features let you bend the interface and the extended keyboard to your will. The app also makes it simple to assemble customised workflows to automate functions such as converting text.

While workflow support may be its standout feature, Editorial also offers niceties such as Markdown and HTML previews, powerful search features and an integrated web browser.

**TAKE NOTES:** The compact iPad is perfect for scribbling notes, and Notability (£1.99; [tinyurl.com/qcv68re](http://tinyurl.com/qcv68re)) perpetually ranks among the top-selling iPad productivity apps. It lets you type or write notes, giving you options for changing colour and style. A nifty recording feature lets you capture audio for a meeting or lecture; when you play back that audio, tapping a section of your notes takes you to that part of the recording. Notability offers great search tools, and you'll never lose an important file as it syncs with cloud-based services such as Dropbox and Google Drive.

**READ COMICS:** The iPad is an appealing device for people who enjoy comic books. Recent hardware changes have only improved matters. Artwork pops on the screen, and the lightweight tablet truly lends itself to extended reading sessions. On the iPad mini Retina you get crisper text and sharper art. So what comic reader should you choose? Comics (free; [tinyurl.com/d2hu9m2](http://tinyurl.com/d2hu9m2)) provides a smooth interface and an easy-to-navigate storefront for purchasing issues.

**ENTERTAIN SMALL KIDS:** If you're a parent, that iPad Air or iPad mini won't remain your sole property for long, so you might as well make sure it has a few apps your kids can enjoy. I can't say enough nice things about Toca Boca's apps. They're like digital playsets, fostering your children's imagination. Almost all its offerings would be fine additions to your iPad, but I'll single out Toca Hair Salon 2 (£1.99; [tinyurl.com/mvx2eh6](http://tinyurl.com/mvx2eh6)), in which you use an array of scissors, curling irons and other tools to give assorted cartoon characters unique coiffures. If you're having a bad hair day yourself, Toca Hair Salon Me (£1.99; [tinyurl.com/oe5ww7a](http://tinyurl.com/oe5ww7a)) lets you snap a photo with the iPad's camera and then start styling.

**ENGAGE BIG KIDS:** Children in the upper years of primary school may have outgrown Toca Boca, but they'll enjoy the colourful Barefoot World Atlas (£2.99; [tinyurl.com/nqz5prw](http://tinyurl.com/nqz5prw)). This digital version of the book of the same name takes full advantage of your iPad's touch interface, with a spinnable, interactive globe. Tap any country or any animated point of interest to learn more about it. Up-to-the-minute information includes the country's current temperature and how far away it is. Not many apps put the whole world in your hands; Barefoot World Atlas does so with a pleasing look.

**SEE THE STARS:** If you often gaze up at the night sky and wonder what's blinking back at you – star, planet or satellite? – equip yourself with Star Walk HD (£1.99; [tinyurl.com/oj6b9nw](http://tinyurl.com/oj6b9nw)), a beautifully designed astronomy app. Star Walk takes advantage of your iPad's accelerometer and location awareness to help you identify the heavenly bodies immediately above you. Just tilt your iPad to the heavens, and Star Walk displays planets, stars and constellations based on their orientation relative to you.

**LEARN ABOUT ENDANGERED ANIMALS:** There's a reason WWF Together (free; [tinyurl.com/m2c38rz](http://tinyurl.com/m2c38rz)) gets showered with awards. This beautifully designed interactive app contains a wealth of information assembled by the World Wildlife Fund. You'll find detailed stories of 16 endangered species, with interactive elements (drag around a dot to see how cowbirds follow bison, for example).



A spinning globe lets you locate and learn about endangered species around the world.

**COOK A MEAL:** Turn to How to Cook Everything (£6.99; [tinyurl.com/mvzsfjn](http://tinyurl.com/mvzsfjn)) – a digitised version of Mark Bittman's reference book for home chefs – for expert instruction on the fundamentals of cooking, with illustrations that pop on your iPad's screen. It's easy to jump from recipes to techniques to kitchen basics. Ingredients tabs show you recipe variations, explain how to use relevant kitchen tools, and offer a window for your own notations. Other features, such as the ability to print recipes so you won't have to touch your new iPad with sticky hands, make this a must-have for home cooks with four-star dreams.

**PLAY A GAME:** Sometimes you just want to have fun. For a diversion that stimulates the ol' brain, try The Room Two (£1.99; [tinyurl.com/m9ymaso](http://tinyurl.com/m9ymaso)), a sequel to last year's well-regarded puzzle game. This version has the same spooky ambience, along with puzzles that use pinching, zooming and other touch gestures to great effect. It offers hours of mysteries to unravel.

**DRIVE REALLY FAST:** The iPad's built-in accelerometer makes it a great platform for racing games – just tilt your tablet to steer, and you can make like Mario Andretti. The Real Racing franchise has been in the winner's circle for much of its time on the iOS platform, and Real Racing 3 (free; [tinyurl.com/q8pkw94](http://tinyurl.com/q8pkw94)) delivers racing thrills to your iPad. The game's payment model – it's free to download, but you have to make micropayments to speed up your progress – is not without its critics, and that's a shame because the gameplay is terrific. My advice: download the free version and give it a spin. If you find the requests for payments intrusive, you can still grab Real Racing 2 HD for £4.99.

## iPhone apps

The following nine recommendations cover a broad spectrum of the things you can do with your iPhone.

**PROTECT YOUR PASSWORDS:** Although password security may not set your heart racing, one of your very first iPhone downloads should be 1Password (£12; [tinyurl.com/mowvn9f](http://tinyurl.com/mowvn9f)). This app has to compete in a world of £1.99 downloads, but it creates strong, unique passwords that keep the bad guys out of your business. All you have to remember is a single master password. You can secure website logins, banking information, credit cards and notes. The app syncs data across iOS devices; spring for the desktop version (£34), and you can keep data synched there, too.

**WATCH MOVIES:** I enjoy watching old movies; what I enjoy even more is watching them while I descend into a second-screen wormhole to look up which actors appeared in what other films. The mobile version of IMDb Movies & TV (free; [tinyurl.com/pttd2bf](http://tinyurl.com/pttd2bf)) puts the movie reference site's extensive database in the palm of my hand. Mobile users will also appreciate the ability to look up movie showtimes.

**KEEP ACTIVE:** Your iPhone can track your every movement, as long as you augment its location-tracking ability with an app such as Moves (£1.99; [tinyurl.com/mn9qtet](http://tinyurl.com/mn9qtet)). The app tracks your steps and distance travelled, tapping into your iPhone's location and directional sensors to determine when you're sitting, walking, running, biking or travelling in some other way. It also provides a map of where you've been, how long you were there and what you were doing, making it not only a useful fitness tracker but also a log of your commute and daily activities. All that

monitoring can drain battery life, but the latest version of Moves offers iOS 7 users a battery-saving mode.

**LOOK UP STUFF:** While you could call Terminology 3 (£1.99; [tinyurl.com/kecdeyz](http://tinyurl.com/kecdeyz)) a dictionary app, that undersells what it can do. Yes, you can look up words and get definitions, along with synonyms, related terms and other details. But you can also use custom actions to extend your searches to other resources – Wikipedia, say – or to other apps that offer integration with Terminology. It's a reference tool for novices as well as power users.


**CHECK THE WEATHER:** If you want your forecasts in a more detailed and pleasing format than iOS 7's Weather app offers, try Weather Line (£1.99; [tinyurl.com/oh8dbg3](http://tinyurl.com/oh8dbg3)), which gives temperature, conditions and precipitation data in 36-hour, seven-day and 12-month time frames. It shows temperature data in graph form and throws in a severe-weather warning feature, plus details such as humidity, wind and 'feels like' temperature.

**TAKE PICTURES:** Want an alternative to Instagram for editing and sharing photos? VSCO Cam (free; [tinyurl.com/Le8okt8](http://tinyurl.com/Le8okt8)) offers its own take on photo filters or 'presets'. The free mobile image editor comes with 10 presets, which you can augment by purchasing more through an in-app store. Apply a preset, make adjustments and compare your edit to the original with a helpful before-and-after view. Tools for adjusting an image's temperature, contrast, exposure and rotation are similarly easy to apply.

The app displays your photos in a lovely view, and provides built-in sharing links to a number of social-media sites, including Instagram.

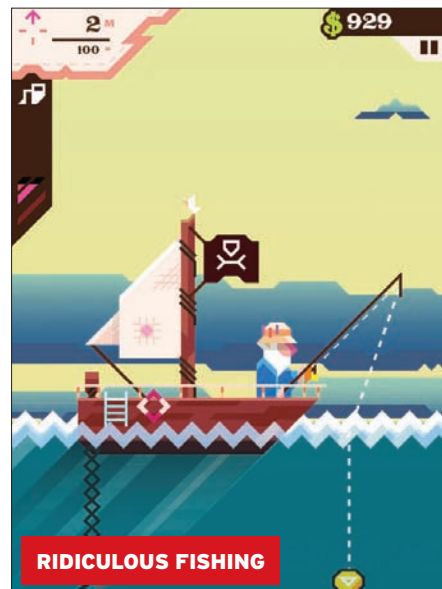
**GRAB A BITE TO EAT:** It's easy to find nearby restaurants with an iPhone. Finding those that cook up something you want to eat is another matter. LocalEats (69p; [tinyurl.com/mewuvud](http://tinyurl.com/mewuvud)) offers curated search results, with a Nearby Search button on its launch screen that finds top-rated places within a close radius; you can filter the results or jump directly to Maps for directions. A directory of cities makes LocalEats a good download for road warriors.

**SAVE THE DATE:** The Fantastical 2 calendaring utility (£2.49; [tinyurl.com/moc7wfs](http://tinyurl.com/moc7wfs)) is miles ahead of Apple's Calendar. A five-day view with a scrolling list of forthcoming events lets you see your schedule at a glance. Natural-language support means you can speak to create a calendar event or reminder. Include a location with your event, and Fantastical 2 adds a map.

**BLOW OFF STEAM:** Ridiculous Fishing (£1.99; [tinyurl.com/cuxfuzu](http://tinyurl.com/cuxfuzu)) is a great casual game. First reel in as many mystical deep-sea creatures as possible, then blast them all to kingdom come with whatever weapon you have on hand. With each fish you knock out, you earn money to expand your arsenal. It's a fun diversion. 



TOCA HAIR SALON ME



RIDICULOUS FISHING

## OPERATING SYSTEM

## Ubuntu 14.04 LTS

Free

## Contact

■ [ubuntu.com](http://ubuntu.com)

## Read more

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

## System requirements

700MHz processor; 512MB

RAM; 5GB drive space;

1024 x 768 display

## PC ADVISOR

GOLD

Usability: ★★★★★

Features: ★★★★★



This latest update to Ubuntu is a landmark release. That's not just a way of saying that it marks a turning point for the popular Linux operating system, for this is a Long Term Support edition. As such, it will be supported by developer Canonical for a full five years, making it particularly attractive for businesses and organisations that need a stable platform to roll out for their end users.

The timing is good, coming just as Microsoft has abandoned Windows XP and stopped supplying any more essential security patches. For many users - home and professional alike - this capable Linux OS could prove the much-needed replacement.

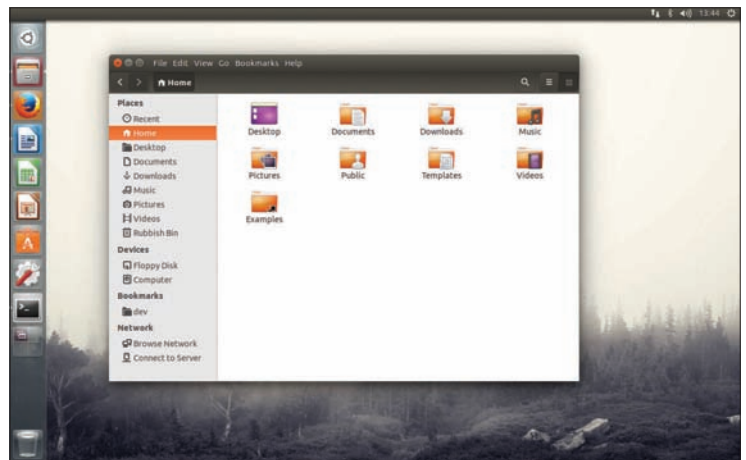
Codenamed Trusty Tahr, after the goat-like hooved and horny mammal, Ubuntu 14.04 LTS is built around Linux Kernel 3.13.0-24. It's not the bleeding edge in the Linux world but selected for trouble-free solidity.

More disappointing for followers of this shiniest of Linuxes is the continued absence of Canonical's planned embrace of a whole new graphics interface, known as Mir, which would provide a common API for graphical displays across a range of computing devices. Like most modern computer operating systems, Ubuntu has an eye on mobile computing and will soon be more publicly ported to a variety of mobile devices such as tablets and smartphones. But that significant step away from tried-and-tested Xorg graphics was not fit for a prime-time LTS edition that instead demands bulletproof operation.

Ubuntu 14.04 LTS is superficially little different in its interface to the divisive 11.04 release of three years ago, which saw the introduction of a whole new desktop interface named Unity. In part, we'd wager through an element of familiarity, but ably assisted by an overall level of polish added in every iteration since Natty Narwhal, the new 14.04 edition positively squeaks with refinement.

There's no denying that Ubuntu has taken cues from Mac OS X. The Unity overlay majors with an application launcher dock to enable easy access to most-used programs.

New features in Trusty include an option to put application drop-down

Ubuntu 14.04 refines a winning formula in this evolving **LINUX INTERFACE**

menus into every floating window; cleanly hidden until you mouse over the top. This works well, still enabling you to drag the window even with your cursor placed on any text items there.

The layout of System Settings, very like OS X's System Preferences and all the better for it, is unchanged since last autumn's Saucy Salamander release. It's not new for 14.04, but we still appreciate true regionalisation that means when you select UK English as your interface language, the receptacle for disposing of unwanted files is named Rubbish Bin and not Trash.

Again not new here but a sign of added attention to detail, changing the desktop wallpaper also changes the colour of the translucent side dock to match. Sadly, we can't see a way to change the default orange found in window close buttons, folder icons and highlight colours.

The Finder-like file and folder explorer can be bookmarked with favourite directory locations, which appear in the useful sidebar. Choices for displaying files and folders are still limited to icon view and a single list view, but Canonical hasn't gone as far as including the power user's popular column view option.

Ubuntu still has its dirty privacy secret tucked away within the system-wide search function, though. You bring up the search field by pressing the Super key (Cmd on a Mac; Windows key on a Windows PC) and start to type in an application's name to open any file or folder you

seek on your computer's drive. The problem is your search terms are also sent to Amazon, Twitter and other third parties, data-mined and referenced to your IP address, with 'useful' online results returned when you're just looking for some local report or document. Thankfully, it can be switched off by visiting System Settings/Security & Privacy/Search and sliding the toggle for online searching to Off.

As with Apple's Spotlight and Windows Search, it is an asset for experienced users who can touch type and know the exact name of things they seek. Newcomers may yet benefit from a traditional hierarchical layout to dig down into applications and settings though.

If you have a decent resolution monitor like 2560x1600 or even 4k, or simply want to install on a Retina-class Mac, a brand new display scaling option in System Settings/Display could be just the ticket.

Similar to the resolution scaling option in Windows, a slider control enables you to increase the size of desktop and window graphics. Like Windows though, some programs' elements do not scale correctly so you may yet need your reading glasses to get by.

**Verdict**

For anyone used to or simply envious of the Mac's OS X interface, using Ubuntu 14.04 LTS is a breeze. Its interface is clean, accessible and silky smooth in operation.

✉ **Andrew Harrison**



## GAME

## BioShock Infinite: Burial At Sea - Episode 2

**£11** inc VAT**Contact**■ [2kgamesinternational.com](http://2kgamesinternational.com)**Read more**■ [tinyurl.com/ke7t9jw](http://tinyurl.com/ke7t9jw)**System requirements**

Windows Vista Service Pack 2 32-bit; Intel Core 2 DUO 2.4GHz, AMD Athlon X2 2.7GHz; 2GB hard disk space; 20GB free; DirectX10 Compatible ATI Radeon HD 3870, nVidia 8800 GT, Intel HD 3000 Integrated Graphics Video; 512MB; DirectX Compatible

**PC ADVISOR****RECOMMENDED**

After seven years of questions, seven years of mystery, seven years of building some of video games' most iconic worlds, it all comes to an end. The BioShock series will inevitably continue in some form from another studio, but its original creators have stepped down and disbanded, leaving this final, extensive piece of single-player DLC for BioShock Infinite to finish up their story of two impossible cities.

For the most part, Burial At Sea Episode 2 is set in Rapture, the underwater, Big Daddy-inhabited fallen utopia from the original BioShock ([tinyurl.com/Lmbju9z](http://tinyurl.com/Lmbju9z)), but it intertwines with BioShock Infinite's ([tinyurl.com/cf5rpud](http://tinyurl.com/cf5rpud)) similarly corrupted city in the sky, Columbia. In a change of pace for both games, you don't play as a brawny man with a gun, but rather former supporting character Elizabeth, who despite having the option of guns is more suited to stealth. This too is a change for the traditionally all guns blazing BioShock series, which to date had little truck with hiding and sneaking.

It turns out to be a great fit, at least in the more horror-tinged Rapture sections. The underwater city's remaining inhabitants are mutated and monstrous, whereas Columbia's are simply human, so there is a natural inclination to avoid them and their psychotic



jabbering. The new stealth systems are rudimentary compared to out and out stealth games, and enemies' abilities to spot you is a bit all over the place, but it works, it makes thematic sense and ups the tension.

The option to not take life (clubbing someone into unconsciousness with a surprise Skyhook attack might still be pretty brutal, but at least it's not fatal) is particularly welcome, and even overdue, given this is a series whose stories have extensively explored morality and consequence.

**New powers**

New Plasmid powers support playing stealthily - a limited x-ray vision mode, temporary invisibility, one that causes alerted enemies to forget they've seen you... Burial At Sea 2 is remarkably ambitious for mere DLC, but it's bittersweet that these great and very natural-feelings additions to the BioShock formula arrive for just the three to four hours of this list hurrah.


The other major purpose of Burial At Sea 2 is to provide an absolute ending for BioShock Infinite, and to tie it into the original BioShock, despite its being set in a different time period and version of reality. Little can be said in this regard without honking great spoilers, but suffice it to say it's a mixed bag. When the story reveals tragic similarities between Columbia and Rapture's strange creatures and conscience-free leaders, it can be very powerful, but when it reveals overt links and co-dependencies, it can feel forced and unnecessary.

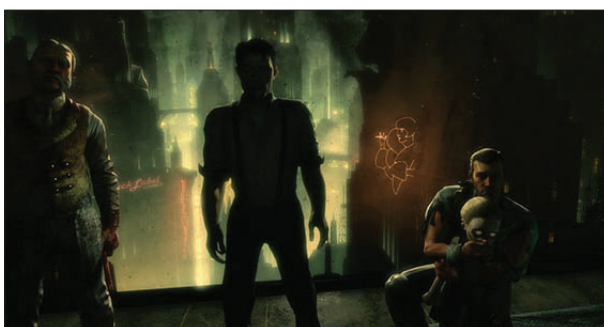
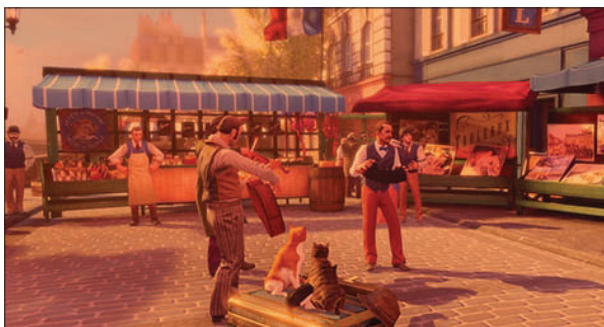
There's also an ill-judged attempt to retroactively justify one of the more controversial events of BioShock Infinite, which sadly comes across as trying to shoot down criticism after the fact rather than at all convincing.

It's an odd thing, it really is. There's a clear aspect of trying to close every door, so that whoever next might be handed the BioShock franchise is shut out from using anything in the series so far, and to some degree it feels artificial, trying to forcibly insert links and answers where none were needed. The late-game dive into cut scene-led drama and exposition also means that the exciting new stealth stuff is abandoned just as it really starts to sing too.

It's without doubt a worthwhile and often fantastic experience, though. As well as introducing a whole new way to play BioShock, this is uncommonly beautiful, packed with amazing sights and tiny, smart details. While it adds both highs and lows to BioShock's legacy, Burial At Sea Episode 2 most certainly goes far beyond what we're used to seeing from DLC.

**Verdict**

BioShock Infinite: Burial At Sea - Episode 2 gets a bit carried away in terms of narrative, but the new stealth options are a beautiful addition. This is incredibly ambitious as far as DLC goes, and while it might not reach the heights of the original game, it certainly ends the series as we know it on a relatively high note.  **Alec Meer**



## PC MAINTENANCE SUITE

# Avanquest Fix-It Utilities Pro 15

£35 inc VAT

### Contact

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

### Read more

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

### System requirements

Windows XP/Vista/7/8

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★



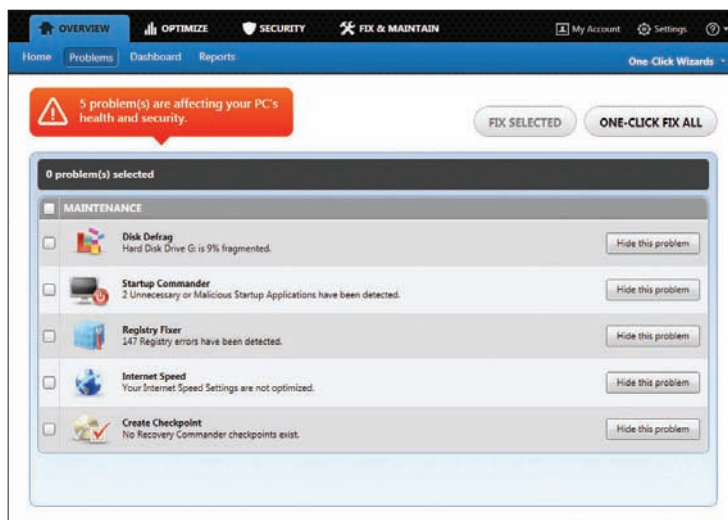
Fix-It Utilities is probably the best-known of all Windows PC maintenance and tune-up utilities. Originally created by VCom, now a subsidiary of Avanquest, the latest version of Fix-It Utilities Pro 15 includes protection and security services, with remote control of computers via an online dashboard.

If the suite spots existing anti-virus software while it's installed, it leaves it alone and doesn't install its own. This approach includes Microsoft Security Essentials (MSE), rather than offering to replace it as some other Windows security software offers to do.

We manually removed MSE from our PC in order to try Avanquest's anti-virus interface, but repeatedly saw a CRC error on installing Fix-It. We couldn't get the software to run with its AV component intact, even after repeated attempts.

The core of the program is still a suite of utilities that are aimed at speeding and securing up to five PCs. They're divided into three categories: Optimize, Security and Fix & Maintain. All three can be approached via their own one-click fix buttons and there's a separate one in the Overview tab that takes all thought out of the process.

If you want to be a bit more selective in your tuning, Optimize and Fix & Maintain include over 20



The **ONE-CLICK FIX ALL** button lets you quickly rectify any problems

routines between them, for things such as defragmentation, Registry cleaning, and space and data recovery. You can use them in any combination to address the parts of a system that might be out of sorts.

Some of these applets are very detailed in their own right and you may need in-depth knowledge to use them sensibly and safely. For example, the Windows Optimizer offers over 150 options under headings such as startup, networking and Internet Explorer.

The key new features are mainly aimed at the more cloud-centred environment we live in. There's a new online dashboard where, once you've set up an account, you

can view all your PCs and devices covered by the licence.

Avanquest claims that the AV scan times have been improved, although we weren't able to test this. Nor do we know if the anti-malware component of the software can stop malware. In other respects, the mix of housekeeping and performance improvements remains similar to previous versions.

## Verdict

Assuming the AV installation problem can be fixed, Fix-It Utilities might be a good way to protect your PCs from the threats and system slow-downs often seen as Windows machines age. **✗ Simon Williams**

## INTERNET SECURITY SUITE

# Microworld eScan Total Security Suite 14

£80 inc VAT

### Contact

■ [escanav.com](http://escanav.com)

### Read more

■ [tinyurl.com/oac73qg](http://tinyurl.com/oac73qg)

### System requirements

Windows XP, SP2 (32-bit)/ Vista/7/8 both 32-/64-bit, 1GB disk space

Usability: ★★★★★

Features: ★★★★★

Value: ★★★★★



The newly designed interface of eScan Total Security Suite 14 shows what it has to offer in a clear, easy-to-understand window. There are nine main panels, each of which, when clicked, leads to a setting and info overlay. At the bottom there are separate links for scan and update, and to a series of utilities.

The nine main panels offer AV scanning for files and mail, web protection and privacy control, a two-way firewall, anti-spam options, endpoint security (cleaning USB drives, and so on), and identity and cloud protection. The last of these uses data collected from customers and holds in the cloud for quick identification of zero-day threats.

Modules missing from the list include file backup and PC tuneup, though, the separate Tools pane offers specific applets for Registry cleaning, disk defragmentation and scanning for application vulnerabilities. There's also a rescue mode available, by burning a dedicated disk from an ISO image.

The scan module is flexible, enabling scans of the memory and Registry, your whole computer, USB devices and CDs/DVDs, as well as offering a fully customisable scan. A scheduler is provided and you can set up multiple different regimes for different types of scan.

Web protection puts up red, orange and green icon icons against

sites thrown up in Google searches, based on a database of customer experiences. It was hard to find one that wasn't green, but that's often the case with this kind of signalling.

It's just as well that the program's design is largely self-explanatory, as the help system is online and dumps you at an initial page, wherever in the suite you call it from. It would be much better if it determined the context of the help request.

There are two schools of thought to the targeting of files to be included in an AV scan. When we scanned our 50GB basket of files, we discovered eScan Total Security Suite 14 is definitely in the 'scan as few as you can' school. It examined



## PDF CONVERTER AND EDITOR

## Nuance Power PDF Advanced

**£140** inc VAT**Contact**■ [nuance.co.uk](http://nuance.co.uk)**Read more**■ [tinyurl.com/ngakh75](http://tinyurl.com/ngakh75)**System requirements**

Windows 7/8; 1 GB  
memory; 700MB drive  
space; Intel Pentium 4 or  
equivalent processor

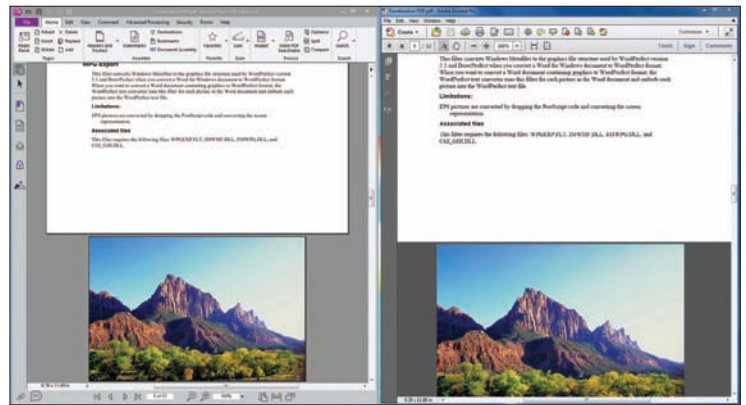
Nuance's Power PDF Advanced is aimed at the business market - from home office to enterprise - and caters for those who need to archive a lot of electronic documents.

If you've used Adobe Acrobat, you'll know that its interface is styled to be similar to Photoshop and Illustrator. This makes a lot of sense if your target audience is graphic designers, but in a small business, people are likely to be more used to the Microsoft's Office ribbon, and this is what Power PDF Advanced has adopted.

The ribbon can make it a lot easier to do certain things within the program. For example, to scan a document for optical character recognition (OCR) and turn it from an image PDF to a searchable one is a single button in the Home tab of the ribbon - just one click.

The OCR engine produced good results in our tests, as long as the original documents were in fair-to-good condition. Once you're working with a searchable PDF, Power PDF's search facilities include Look Like Search, which includes ready-made templates for credit-card numbers, dates, emails and phone numbers, as well as scope for creating custom ones. This can be very useful for extracting data from multiple files.

Working in batch mode and automating file conversion to



Nuance's **PDF CONVERTER** offers the same options as Adobe's Acrobat Pro

PDF is not as comprehensive as in Acrobat Pro, which has more operations available for its batch scripts. Power PDF Advanced partly compensates by offering a 'watch folder'. Designate a folder and any files copied into it will automatically be converted to PDF.


We tested the software by trying to compile a PDF from a variety of different files, including a Microsoft Word document, a JPEG photo, other PDFs and a brochure produced in Microsoft Publisher. We were pleasantly surprised when Power PDF got to the Publisher file, opened Publisher, loaded the document, printed it to PDF and added it to the combined PDF we were building.

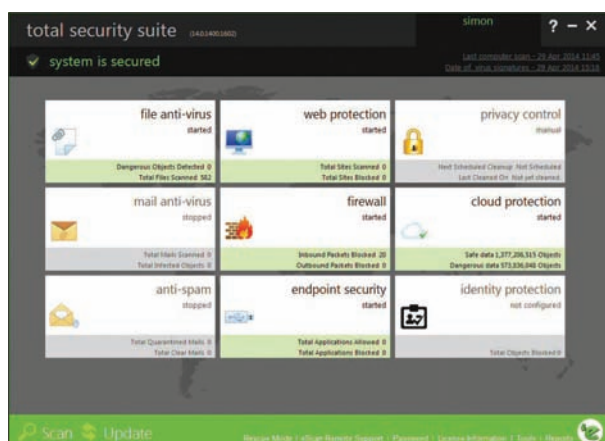
Document compilation and adjustment is made simple by the use of drag-and-drop thumbnails. You can mix and match documents,

photos, spreadsheets and graphics of different sizes into the same PDF Package, the older standard, or PDF Portfolio, the new.

Conversion can be carried out well in both directions and the software supports Microsoft Word, Excel, PowerPoint and also WordPerfect, without the need to run those applications to convert. If you are running them, Power PDF Advanced tabs are added to the ribbons of all the main applications, so you can convert in situ.

**Verdict**

In many ways, Power PDF Advanced matches Acrobat Pro feature-for-feature. When you add in the fact that it's over £50 cheaper than Adobe's offering, it has to be a contender for anybody seeking a PDF tool.  **Simon Williams**



Escan's **REDESIGNED INTERFACE** gives quick access to the suite's options

just 8,761 files and took 17 minutes, four seconds to do so. This makes it one of the shortest scans of any IS suite we've reviewed, though, it has a scan rate of 8.6 files/s.


A repeat scan was even quicker, at 14 minutes, 30 seconds, though, it still looked at the same number of files. Our test PC took just five seconds longer to copy a 1GB file with a background scan running than without one, so just a five percent resource hit.

The German testing site AV-Test ([av-test.org](http://av-test.org)) saw a rather bigger drop in its more extensive Performance tests. It measured a four-second slowing, giving the eScan suite a score in that category of 4/6. This was the one place that the suite dropped a point, though.

In the Protection category, it didn't miss a single infected file, zero-day or established, scoring

a perfect 6/6. Under the Usability heading, which looks at false positives thrown up by the software, it gave just 2 through all testing, which wasn't enough to cost it any points, with a perfect 6/6 in that section, too. That's 50 percent better than the average for the whole group it tested.

**Verdict**

Since Microworld produces software for OS X and Android, as well as for Windows PCs, it would be good to have cross-platform support in this suite, but given the asking price for a three-PC licence, it's still very good value. It's no-nonsense interface is also refreshing.  **Simon Williams**

## GAME

## Titanfall

**£37** inc VAT**Contact**■ [titanfall.com](http://titanfall.com)**Read more**■ [tinyurl.com/o6wp9r7](http://tinyurl.com/o6wp9r7)**System requirements**

Windows 7, 8; 2.8GHz  
 AMD Athlon X2 or 2.4GHz  
 Intel Core 2 Duo; 4GB  
 RAM; 512MB VRAM; AMD  
 Radeon HD 4770 or  
 nVidia GeForce 8800GT

**PC ADVISOR**  
**RECOMMENDED**



Despite looking from afar like a design-by-committee attempt to seize as much of Call of Duty's territory as possible, the much-hyped multiplayer shooter Titanfall turns out to be big on smarts and charm. It's from the one-time creators of the aforementioned COD, accessible without being dumbed down, and dramatic where other shooters are shallow.

Here's the setup: humanity's at war with itself, using building-sized robosuits known as Titans to wage their colossal battles. There is a backstory and even an attempt at a plot in a rather misjudged 'mission' structure to play through before you're given the keys to the whole castle. But whatever the good intentions there, whenever that stuff arises, it feels like a dull distraction from the order of the day. That order is pitched, high-speed battle between infantry and walking tanks.

The great surprise is that being on foot, 'just a human with a gun', turns out to be far more exhilarating than being inside a Titan, with its armoured hull and devastating weaponry. This is because Titanfall gets the importance of movement to shooters in a way that few others do - being on foot, you have an agility and freedom that the otherwise impressive Titans do not.

Being in a Titan tends to last longer and your kill count may be higher, but it doesn't have the



same drama of being a mere soldier scampering around the feet of warring giants. A spot of wall-running here, double-jumping there, and leaping across rooftops here on to the back of an unsuspecting Titan.

All told, it's a world away from the standard sprinting and ladder-climbing that typifies the genre, and means the focus of the quick, tense battles is more on positioning than it is on who can move a targeting reticule over the guy's face first.

Added to that are a couple of other factors that lower barriers to entry and thus allow less experienced players to achieve something and gain in ability, rather than face defeat after miserable defeat until they understandably don't want to return.

There's a pistol that automatically locks on after a few seconds, there are AI-controlled grunts to farm for practice and experience points, and there's a chance at the end of a battle your team has lost to get to the chopper and escape in a photo finish.

Glory even in defeat - and that, really, is where Titanfall most excels. No matter how well or poorly the scoreboards might say you've performed, in the heat of the moment it always feels like you're doing something incredible.

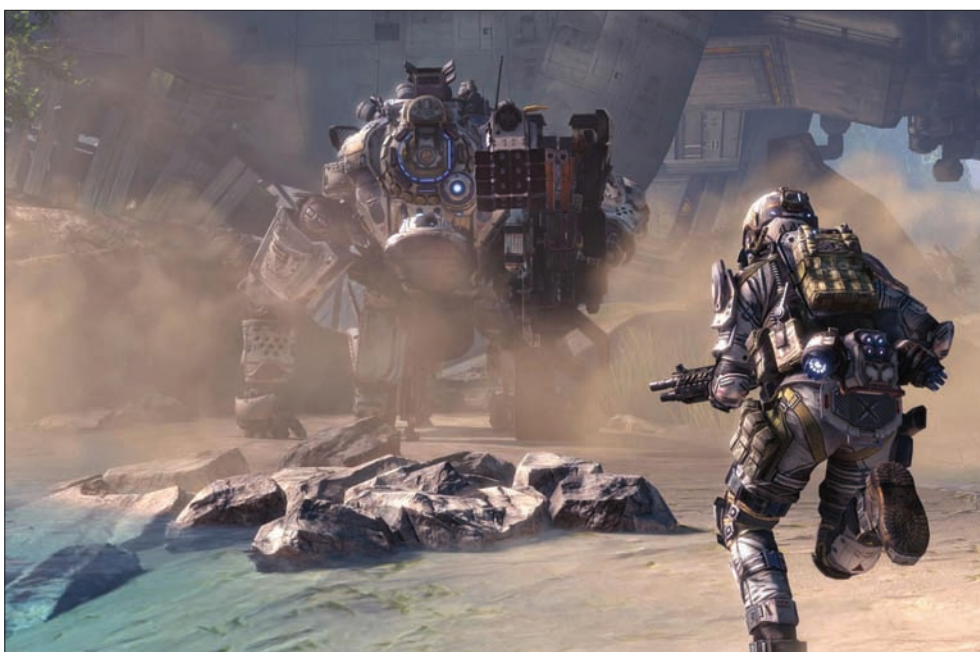
Where it all threatens to fall apart is that the base game quickly feels rather small. Titanfall makes no bones about the fact that a long course of paid downloadable content is planned, but even so it feels like just the starter course. The one real cure is a £20 'season pass' for future map packs, weapons and Titan variants - which means that the game's community will be split into the haves and have nots.

Time will tell if corporate greed has harmed Titanfall, but right now there's just enough to make it worth the purchase price. While it's built from familiar parts, it feels like a slick and ambitious, much-needed step forward for multiplayer shooters, which have for so long been defined by Call of Duty.

**Verdict**

Thrilling, accessible, and with more focus on responsive movement and agility than straightforward shooting, Titanfall is a shot in the arm for what was threatening to become a stale genre. ☒

**Alec Meer**





**£1,795** ex VAT  
**£2,154** inc VAT

#### Contact

■ [dell.co.uk](http://dell.co.uk)  
■ [Read more](http://tinyurl.com/mhbr3ku)  
■ [tinyurl.com/mhbr3ku](http://tinyurl.com/mhbr3ku)

#### Specification

17.3in (1920x1080) matt TN display; Windows 7 Pro 64-bit; 2.7GHz Intel Core i7-4800MQ (3.7GHz Turbo); nVidia Quadro K3100M with 4GB GDDR5 RAM & Intel HD Graphics 4600; 16GB DDR3L RAM; 750GB 2.5in SATA HDD (7200rpm); 8x DVD+RW, removable, tray-load; gigabit ethernet; 802.11ac 2.2 MIMO; Bluetooth 4.0; 4x USB 3.0, 1x eSATA/USB 2.0; DisplayPort, HDMI, VGA; 80x45mm trackpad; headphone and mic-in minijacks; bezel webcam; 97Wh removable battery; 416x275x34-38.4mm; 3858g, plus 1010g mains adaptor

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



## MOBILE WORKSTATION

# Dell Precision M6800

Let's get the physical shock and awe out of the way first. Weighing close to 4kg, you'll certainly notice the Precision M6800 if it's resting on your lap. And while battery life as measured in the lab wasn't entirely tragic at around four hours, if you have pretensions of travelling with the M6800, you'll need to pack, a flattened brick of a mains adaptor the size of a paperback, itself tipping the scales at another kilo.

By comparison with state-of-the-art computing, the new Apple Mac Pro desktop workstation packs many times the computing performance of any professional notebook, and similarly weighs 5kg.

What the Precision M6800 offers, though, is a self-contained computing platform with keyboard, display and trackpad (and trackpoint stick), all in a flat-packable form 'just' 38mm thick.

The chassis is gun-metal coloured, but mostly plastic to the touch. So while it looks seriously sturdy, we'd expect paint to rub or chip from the plastic frame after some use. Like Windows laptops of yore it has a tiny trackpad just 80x45mm, but with three discrete buttons below that work smoothly.

To the right of the Qwerty keyboard is a separate numberpad, and the action of these slightly dished and rubbery keys could be described as spongy. In full typing flow, the sound is somewhat muted rather than clackety, and we found the overall feel a little soft.

Thanks to the power of expansion docks and hubs, many laptops can supplement their limited range of built-in ports, but if you need to keep it all aboard, the Precision M6800 will have most jobs covered. There are four USB 3.0 sockets, two each side, plus a combined eSATA/USB 2.0 to the rear. Also at the back is a gigabit ethernet port, VGA D-Sub and HDMI. Missing in action for video professionals are FireWire and Thunderbolt.

To the laptop's left side is a tray-load DVD drive for reading and writing optical discs, coupled with a 54mm ExpressCard slot and SD card reader. A narrow slit here will also accept smart cards.



On the right side is a full-size DisplayPort connector and spare bay slot with various expansion possibilities, plus a slide switch to turn off the 11ac Wi-Fi adaptor. This shows some more cost-cutting, with a 2x2 mini-PCI card used in place of a full-spec 3x3 solution.

Several configurations for internal components are offered. All variants take the same processor, a 2.7GHz Intel Core i7-4800MQ, and a matt full-HD display, and can be configured with a choice of graphics processor, memory, storage and support contracts.

Currently, £1,389 plus delivery and VAT buys you an M6800 with AMD FirePro M6100 graphics, 8GB system memory and 500GB hard disk supplemented with 8GB of flash. Our test sample was the top-spec model with nVidia Quadro K3100M graphics, 16GB memory and 750GB hard disk, which is priced at £1765 plus shipping and VAT - or £2154 inclusive.

Like most current Windows computers designed for professional use, they have the more popular Microsoft Windows 7 Professional 64-bit operating system preinstalled.

## Display

As a mobile workstation, display quality is critical, especially for graphic design and CAD work that requires accurate representation of images. Dell doesn't list what screen technology is used for this matt anti-glare screen in the M6800's specifications, so we sought to clarify through the company's PR agency. It found a

Dell spokesman, who said that the M6800 uses IPS technology.

Our lab measurements recorded 99 percent coverage of sRGB gamut and 77 percent AdobeRGB. Contrast ratio was disappointingly low at between 490:1 and 520:1, at 25 percent and full brightness respectively. The maximum level was also relatively low at 240cd/m<sup>2</sup>, although most professionals will not be needing to exceed 200cd/m<sup>2</sup> unless working outside.

Luminance variation across the panel was very poor. At a typical 50 percent brightness level, the top third of the screen was up to 28 percent brighter than the bottom.

Viewing-angle clarity was mixed. When viewed from the sides or top, it was possible to see the screen image clearly, up to around 45 degrees off-axis before blacks started to invert to light grey. But viewed from below, the screen image quickly became 'negatived' with colours entirely inverted.

Further investigation revealed the panel to be an LG twisted-nematic (TN) LCD with product code LGD02DA. Dell, however, maintains it's fitted with an IPS panel.

The main processor is a solid choice, one of Intel's last Haswell generation chips from 2013 based on a 22nm process, a quad-core part with Hyper Threading and Turbo Mode up to 3.7GHz for one core.

This processor incorporates an Intel HD Graphics 4600 graphics GPU, too, and Optimus switching allows this to be used instead of the high-power Quadro card, saving energy and reducing fan noise.

In the Geekbench 3 test, which measures raw processor- and memory performance, the M6800 was rated very highly with 3641 points for a single core and 13,493 in multi-core mode.

PCMark 7 gave a more lukewarm overall rating of 3556 points. This suite of tests rates responsiveness of a Windows PC, and has marked down system speed for the Dell because of its slow hard disk – a 7200rpm 2.5in SATA drive. You can, however, opt for hybrid drives for this laptop, or even fit an mSATA

SSD to regain lost ground.

In Cinebench 11.5, the M6800 scored 1.62 and 7.26 points for single- and multi-core modes, while v15 of the rendering benchmark hit 145 and 670 points respectively – superb scores for a portable workstation.

Leveraging the nVidia Quadro graphics fully, the Precision M6800 also romped in with the fastest OpenGL framerates we've seen for this class of computer, averaging 82.7- and 87.9fps for versions 11.5 and 15 of Maxon's test.

Obviously not aimed at gamers per se, we couldn't resist trying some Windows games on this graphics-packing portable.

In Stalker: Call of Pripyat and running at native 1920x1080 resolution, the game averaged 92fps at Ultra settings.

The more challenging Tomb Raider 2013 saw lower figures, starting with a 60fps average at default Normal detail. Raising quality to Ultra meant an average of 33fps, while Ultimate quality – which includes TessFX hair rendering – dropped the framerate to 19fps.

In our standard battery runtime test – looped MPEG-4 full-HD video played over Wi-Fi with screen at 120cd/m<sup>2</sup> – the M6800 with its 97Wh removable battery lasted four

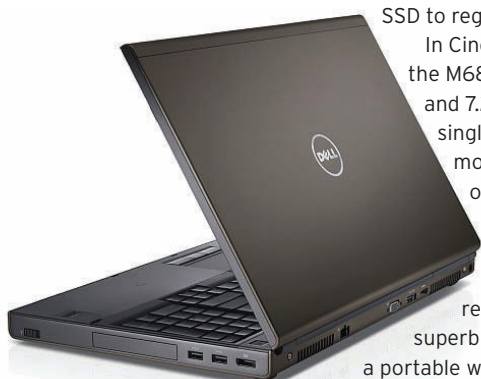
hours, 13 minutes. That's poor by the standards of some Haswell-based notebooks that can run for eight- to 12 hours, but an unusually decent result when compared to other Windows workstation laptops that normally have battery life measured in minutes rather than hours.

In use, the M6800 remained relatively quiet even with fans running, which were pitched lower than many laptops' fans. More annoying could be the intermittent nature of the noise – using the default 'Dell' power plan and the laptop left idle on the desk, the fan would periodically whirr up for a few seconds every minute in an annoying and disconcerting fashion.

## Verdict

For the Dell Precision M6800's given audience, and the price, we'd expect a display with better performance. The main and graphics processor are well judged, though, and the complete package forms a serviceable choice.

✉ **Andrew Harrison**



£145 ex VAT  
£174 inc VAT

### Contact

■ [brother.co.uk](http://brother.co.uk)  
Read more  
■ [tinyurl.com/m52v29r](http://tinyurl.com/m52v29r)

### Specification

Colour multifunction inkjet printer; 128MB standard memory; 6000x1200dpi max printing resolution; 33ppm specified speed; NFC printing and scanning; 150-sheet standard input capacity; 20-sheet ADF; single sheet A3 printing; 10/100 ethernet, Wi-Fi 802.11b/g/n, USB 2.0; 410x374x180mm; 9.5kg

Build: ★★★★★☆

Features: ★★★★★☆

Performance: ★★★★★☆

Value: ★★★★★☆



## COLOUR ALL-IN-ONE INKJET PRINTER

### Brother MFC-J870DW

The MFC-J870DW is the first inkjet to enable Near Field Communication (NFC). The advantage of this is that you don't need a wireless connection for a device to 'speak' to the printer as it relies on the same short-range transmission as contactless payment via a mobile. The NFC facility is, however, just there to help set up a wireless connection over Wi-Fi.

Once initiated, sending a photo to the Brother took four minutes to produce a 10x15cm print. The same was true when the same size image was printed via the SD card slot, USB port and conventional wireless Wi-Fi transmission from an iPhone. This was in marked contrast to using PC software and a wireless link, which managed to run off an identical picture in 55 seconds.

In most other respects, the printer's features are commendable. It offers the full multifunction set of print, copy, scan and fax, and has an excellent colour touchscreen display panel that's easy to follow, brightly lit, tilting and mode-sensitive, so just

relevant information appears on the display.

As this machine is aimed at low-volume users, there's a modest 150-sheet input tray in the base, although this is supplemented with a 20-sheet photo tray above.

Built into the lid of the scanner is a fold-out 20-sheet ADF for quick copying, but unlike the main input tray, the ADF doesn't allow for duplex printing. When you lift up the scanner lid, a DVD/CD/BD holder is cunningly concealed underneath, and this can then be lifted out and inserted into the front of the MFC-J870DW for direct printing.

Connections include USB 2.0, ethernet and Wi-Fi 802.11b/g/n, and you can print and scan to a range of cloud services.

Four print cartridges slot in on the front right, and if you opt for the high-volume set (600 pages each rather than the basic 300), then your printing costs result in



3.9p per page for black, and 2.5p for each colour print.

Speed and quality with this inkjet are variable. We've seen how print speeds for photos using memory cards and mobiles were desperately slow. Draft black text documents could manage 18ppm at a pinch, with normal quality black and colour documents arriving at 11ppm and duplex versions of the same at 5ppm. Standard paper black ink documents were generally solid, but occasional banding issues were evident in colour images.

## Verdict

The Brother MFC-J870DW has a host of excellent features, though, its NFC capability will be of limited appeal.

✉ **Martyn Clayden**



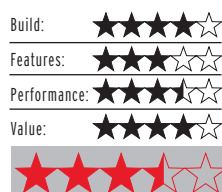
**£105** ex VAT  
**£126** inc VAT

#### Contact

■ [epson.co.uk](http://epson.co.uk)  
Read more  
■ [tinyurl.com/k75ehmd](http://tinyurl.com/k75ehmd)

#### Specification

Sheet-fed portable A4 scanner; 600dpi maximum resolution; 16-bit colour; simplex-only operation; manual single-sheet feed; USB 2.0; carry case; 276x50x36.5mm; 325g



### SHEET-FED SCANNER

## Epson WorkForce DS-30

While flatbed scanners can be picked up for next to nothing, sheet-fed scanners tend to be pricey, typically starting at several hundred pounds. The DS-30 is, however, rather cheaper. So what's missing, and is such a model really an improvement on a more traditional flatbed?

The big advantage of sheet-feds is that they have a built-in automatic document feeder (ADF), allowing them to gobble up large bundles of documents at a time, spitting them out again a few minutes later after first, converting them into a shiny searchable PDF file, or set of images.

The DS-30 doesn't do that, though. It restricts the user to manual-feed only, so you'll have to insert documents one page at a time. You'll also have to do without the duplex facilities that many of these devices have, as it can scan just one side at a time - if you want to convert a double-sided sheet, you'll need to feed it in twice. It stretches to A4, although there are no facilities to handle A3 and larger.




Where the DS-30 wins out is through portability. It weighs just 325g, and its modest dimensions and ability to draw power entirely from the USB port. For those needing to scan while on the road, the DS-30 is an excellent choice. A neat carrying case is even included.

Once you've got past the single-sheet simplex limitations, the DS-30 is a very handy little gadget. It's fast to install, taking just five- to 10 minutes to set up in Windows.

The healthy bundle includes Epson's elegant Scan driver, letting you effortlessly pick from a range of quality settings and features. Proficient business card printing is handled by Presto BizCard 5, and the ever-reliable ABBYY FineReader 9.0 Spring is there to facilitate highly accurate OCR - the Epson was even able to make a good job of our demanding dictionary page test.

The WorkForce DS-30 isn't particularly fast, requiring 13 seconds for 200dpi A4 output, 16 seconds for 300dpi, and 53 seconds for output at the top resolution of 600dpi. However, we were very satisfied with the scan quality. Particularly at 30dpi and beyond, colours were brimming with life, while characters are defined with clarity and sharpness. This may be a budget scanner in many respects, but the quality is strong.

### Verdict

The DS-30 is severely limited by its lack of an ADF and by its simplex-only scanning. However, if what you need is an ultra-light and portable model that can perform good quality scans using a wide variety of media, then it makes a lot of sense, especially if you're snapping it up for £100.  **Robin Morris**

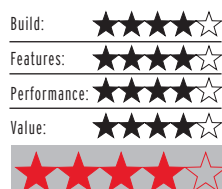
**£649** ex VAT  
**£779** inc VAT

#### Contact

■ [kyocera.co.uk](http://kyocera.co.uk)  
Read more  
■ [tinyurl.com/n4mcyLf](http://tinyurl.com/n4mcyLf)

#### Specification

Colour laser printer; 512MB standard memory; 9600x600dpi max printing resolution; 667MHz processor; 30ppm specified speed; auto duplex printing; 650-sheet standard input capacity; 2150-sheet maximum input capacity; gigabit ethernet, USB 2.0, optional wireless LAN interface (802.11b/g/n); 345x518x480mm; 29.5kg



### COLOUR LASER PRINTER

## Kyocera Ecosys P6030cdn

If you have a growing business with network printing needs and relatively high volumes of paperwork, then the Ecosys P6030cdn is worth considering.

The paper feed and the control panel are located on the shorter side of the machine, allowing you to slot it more effectively between other office units. It certainly feels sturdy enough at a solid 29.5kg, while still measuring a comparatively slim 345x518x480mm.

It's also unusual to find the operation panel placed high up on the top panel overlooking the output area, yet this will make navigating through the menus of the two-line, 21-character LCD a lot simpler.

As with most Kyocera printers, the actual controls are kept basic (just eight keys and three indicators), while the menu range is extensive.

Not all the design features are so user-friendly, though. Its USB 2.0 port, for example, has been tucked away in the back left corner of the base, making it about as inaccessible

as it gets. Similarly, Kyocera came up with a sensible idea to have a window in the input tray where the paper type can be displayed using a rotating dial. What it neglected to add in the manual is that this dial has to be lifted each time it's repositioned, which makes manoeuvring awkward.

On the other hand, you can stack up to four 500-sheet paper trays under the printer (at an extra £215 each) and when this is added to the 150-sheet multipurpose tray that folds down from the front, you have a total capacity of 2150 sheets.

The four toner cartridges slot in snugly from above and a side panel pops out to reveal the well sculpted niche for the waste toner box. Eco savings abound thanks to duplex printing as standard, low power and sleep modes, plus low ink costs. These work out to be around 1.16p per page for black, and 1.67p for colour at current prices.


Speed and print quality are not compromised. Duplex pages were



appearing at a rate of 20ppm and single sheets at 27ppm.

Black print documents showed no obvious signs of feathering or fracturing and colour images were generally clear and vibrant, although there was a noticeable bias to the red end of the spectrum.

### Verdict

Kyocera's P6030cdn combines volume, speed and quality with cost-saving features and plenty of extras. Only minor design flaws let it down.  **Martyn Clayden**

# BUDGET LAPTOPS



As [Cliff Joseph](#) discovers here, buying a 'budget' laptop doesn't mean you have to compromise on style, performance or battery life. He puts six of the latest offerings through their paces

**S**lowly but surely, the design and features of budget laptops are starting to reflect the wider changes that have taken place in the PC industry over the past year or so.

We were a little disappointed to find that performance has not improved noticeably since our last round-up of budget laptops but, in contrast, battery life has improved significantly and four to five hours is now quite common even amongst the cheapest laptops, with some of the better models even nudging six hours.

Last year's arrival of Windows 8 has also had an effect, and touchscreen controls are now commonplace rather than only found on the most expensive models. In fact, you can now get a touchscreen laptop for as little as £269 in the form of the Advent

Tacto. But while touchscreen controls can be a nice bonus, it's more important to ensure that basic screen quality is up to scratch. Many of the laptops reviewed here suffer from restricted viewing angles, so it's a good idea to check a prospective purchase's display in a shop before you buy.

The choice of processor is still important, of course, and our tests suggest that the low-cost AMD processors used in many budget laptops such as the Lenovo Flex 15D and the Toshiba Satellite C55D provide slower performance than Intel's Core i3 and i5 processors. Often, much slower. They'll handle basic tasks such as web browsing, streaming video and word processing well enough, but will struggle with more demanding tasks such as photo- or video-editing.





Photography by Dominik Tomaszewski

But processor performance isn't the only factor to worry about. Thankfully, all the laptops reviewed here include at least 4GB of memory - a good starting point to run Windows 8 efficiently. However, most budget laptops still rely on conventional hard disks - and these disks are the single biggest bottleneck to overall performance. There are some exceptions, though, such as Samsung's Ativ Book 9 Lite, which uses a higher-speed solid-state drive in conjunction with an AMD processor for decent results.

All these laptops are intentionally pared down in various ways and built with low-cost components in order to hit a particular price point. But it's also possible to pick up some bargains when older models come down in price. The HP Pavilion 15 TouchSmart is actually a

middle-order laptop that recently had a £200 price cut by its maker to £529. Not only does it include an up-to-date Intel Core i5 processor that provides strong performance and battery life, but it even manages to include an nVidia GeForce GT 740M graphics processor. It's still not a gaming rig, but it can handle casual action gaming that brings most of its low-cost rivals to their knees.

Performance is easy to measure, but there are other, less tangible design features that are also worth considering. Most budget laptops use 15.6in screen panels and tend to tip the scales at well over 2kg. But if portability is more important to you there are still sleek, slimline designs such as the Samsung Ativ Book 9 Lite available if you hunt around.



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

## ADVENT TACTO

**£270** inc VAT • [adventcomputers.co.uk](http://adventcomputers.co.uk) • [tinyurl.com/m73brl7](http://tinyurl.com/m73brl7)

Advent is the brand name used on budget PCs made specially for the Dixons stores group, which includes PC World and Currys. The Tacto certainly looks to be good value for money, as it manages to offer respectable screen quality and entry-level performance for just £270.

It's solidly built for such an affordable device, with a sturdy case and good, firm screen panel. It's a little heavy for a laptop with an 11.6in screen, weighing almost 1.5kg and measuring 25mm thick, but that's light enough to carry around without too much trouble.

Screen quality is often a weakness with budget laptops, but the Tacto performed surprisingly well. Its 1366x768 resolution is only to be expected at this price, but the screen is bright enough to provide good horizontal viewing angles, and you can move around a bit while watching some streaming video. The vertical viewing angle is more limited, and the screen darkens as soon as you start to tilt it backwards, but we've seen worse on laptops costing £500. And while we're not convinced that touchscreens are particularly useful on laptops, the inclusion of one may be a welcome bonus at this price.

Unfortunately, the Tacto's three USB ports are all USB 2.0 rather than the very useful USB 3.0. The speakers are also rather feeble – they were barely audible when listening to the news on BBC iPlayer even at maximum volume, so you'll need to carry around some headphones if you want to listen to some music or the dialogue of a film. The keyboard feels a bit cramped too – with a key pitch of just 17mm – so it won't be ideal for less nimble-fingered users.

Performance is inevitably quite restricted, with the Tacto's 1.6GHz Intel Celeron processor managing an overall score of just 2064 points when running the general-purpose PCMark 7 benchmarks. But again, we've seen worse scores from other budget laptops costing £100 more than the Tacto, and its 4GB of memory and 500GB hard disk will allow it to carry out most basic computing tasks perfectly well.

Battery life is respectable, too. The spec sheet for the Tacto lists it at 'up to three hours', but we got a full four hours (240 minutes) when looping video in our usual HD video test.

**VERDICT:** You can't expect too much from a laptop costing less than £300, but the Advent Tacto manages to get the basics right. Its performance, screen quality and battery life rival those of more expensive laptops, so it's a great choice if you're on a tight budget.



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

**PC ADVISOR**  
BEST BUY

## HP PAVILION 15 TOUCHSMART

**£529** inc VAT • [hp.com/uk](http://hp.com/uk) • [tinyurl.com/l2jaxh7](http://tinyurl.com/l2jaxh7)

The Pavilion 15 TouchSmart isn't the most portable of laptops – we weighed it at 2.6kg and it measures 24.7mm thick. That's heavy even for a 15.6in screen model with built-in DVD drive, so the HP may be better-suited to spending more of its time at home or in the office.

It's well equipped for both work and entertainment, though. The 1366x768 resolution of the touch-sensitive screen would be below par if the Pavilion still cost £700, but it's more acceptable on a £530 budget. And the bright, colourful screen provides good all-round viewing angles. It'll work well for watching streaming video, and the DVD drive means you'll be able to plough through the latest *Game of Thrones* box set without having to wait for it to appear on Netflix.

The speakers lack bass and sound tinny, but they're fairly loud so you can watch a film or listen to some music without needing to use headphones or external speakers. However, it's a bit odd that the Pavilion doesn't include Bluetooth, so if you want to use a set of Bluetooth speakers you'll need to buy a separate adaptor.

If you need to get some work done, you'll find that the keyboard is firm and comfortable, and there's also a numeric keyboard for number-crunching in the office. The HP can handle a wide range of applications, thanks to an Intel Core i5 processor running at 1.6GHz, 8GB of memory and 750GB of hard disk space. That combination helped the Pavilion record a score of 2874 points when running the PCMark 7 benchmark – which is as good as you'll get from a laptop with a hard drive. It'll be able to handle web browsing and Microsoft Office, as well as more demanding tasks such as video-editing.

The Pavilion 15 TouchSmart can even turn its hand to some 3D gaming, thanks to the inclusion of an nVidia GeForce GT 740M graphics card. You're not going to get a serious gaming laptop for £529, but the Pavilion managed a comfortable 50fps when running our Stalker gaming test, which is perfectly adequate for the occasional spot of casual gaming. Battery life is good, too, as the Haswell-generation Core i5 processor assisted this laptop to reach five hours, 45 minutes in our streaming video tests.

**VERDICT:** The size and weight of the Pavilion 15 TouchSmart suggest it's intended as a desktop replacement system. However, its all-round performance, combined with an attractive screen and optical drive ensure that the HP will appeal to most users on a tight budget.





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

## LENOVO FLEX 15D

**£500 inc VAT** • [lenovo.com/uk](http://lenovo.com/uk) • [tinyurl.com/l5c6no7](http://tinyurl.com/l5c6no7)

The Flex is an admirable attempt to adapt the convertible design of Lenovo's Yoga Ultrabooks to make a bendy laptop at a more affordable price point. It lets you fold the screen back through about 300 degrees, to form an A-shaped tent that acts as a stand for the screen while you sit back and watch some video. That doesn't strike us as a huge selling point, but the touchscreen comes in handy as it allows you to control music or video playback with a quick tap on the glass with your finger.

The Flex is quite neatly designed for a budget 15in laptop. There's no optical drive, and it weighs 2.3kg and measures 24.7mm thick – that's about average for a 15in model. We wouldn't want to carry it around in a backpack all day, but it's a handy design if you want a large-screen laptop you can easily carry from room to room at home.

Build quality is good, with a sturdy plastic casing and a large, comfortable keyboard and trackpad. The 1366x768 resolution is more acceptable in a laptop at this price, and the large screen works well for watching streaming video when it's in tent mode. But while the image is bright and colourful when viewed from directly in front, the viewing angles are limited. The speakers lack bass, but they're loud enough to listen to music videos on YouTube without needing headphones.

Performance is disappointing, though. The Flex is equipped with a quad-core AMD A6-5200 processor with 2GHz clock speed, and a healthy 8GB of memory. That sounds an attractive specification, but the sluggish 5400rpm hard drive proved to be a real weakness, and the Lenovo could only achieve a score of 1750 points when running the general-purpose PCMark 7 benchmark. We noticed the poor disk performance in other areas, too. The Flex woke from standby in 12 seconds using the Windows 8 'fast-start' option – but there was sometimes a noticeable pause and a few seconds of cursor-spinning when we tried to launch programs. Battery life is also not great – we saw four hours of streaming video in our tests, which makes Lenovo's claim of 'up to nine hours' look rather mendacious.

**VERDICT:** The Lenovo Flex's folding design is handy for watching video, and the limited battery life is less a major weakness for a large laptop that will stay at home. However, the overall performance is weak even for a budget laptop, so it can only be recommended for basic tasks.



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

## PACKARD BELL EASYNOTE TE69

**£375 inc VAT** • [packardbell.co.uk](http://packardbell.co.uk) • [tinyurl.com/kqu6jk9](http://tinyurl.com/kqu6jk9)

Packard Bell, a sub-brand of Acer, is concentrated on the low-cost end of the market. Other models in the TE69 range use old Pentium and AMD processors. This newer model has an Intel Core series processor – one of 2012's Ivy Bridge generation of Core i3, rather than a current Haswell chip. Used here, though, it makes for a respectable entry-level laptop at a competitive price.

Packard Bell doesn't sell direct, so you'll need to scout around on the web or in your local high-street shops to find the best deal on an EasyNote TE69. We found this version on sale for around £375 with its Core i3 running at 1.8GHz, 6GB of memory and a 750GB hard disk. That processor and memory aren't bad for an entry-level laptop, although it still won't feel especially quick – the use of a hard drive meant that the TE69 only managed a modest 2360 points when running our general-purpose PCMark 7 benchmark.

To be fair, that's in line with many similarly-priced laptops, and the TE69 felt reasonably smooth and responsive during our tests. It resumed in 12 seconds when using the Windows 8 fast-start standby option, and woke from sleep in just a couple of seconds. It will be able to handle routine web browsing and running a word processor.

Build quality is reasonable for a low-cost laptop. The shiny plastic chassis looks a bit cheap and cheerful, but is sturdy enough to cope with the occasional bump. The keyboard panel flexes more than we might have liked, but the keys move well and feel firm enough for some high-speed typing. We also liked the large, roomy trackpad. A weight of 2.3kg means that the TE69 isn't as portable as some, but that weight's not bad for a 15in laptop with a built-in DVD drive.

There are signs of cost-cutting elsewhere, though. We don't mind the absence of a touch-sensitive screen and the 1366x768 resolution is hard to escape for budget laptops. However, viewing angles are limited, so you'd need to look at the screen from almost directly in front to ensure readability. The speakers also leave room for improvement, producing a thin, tinny sound that lacks volume. Battery life was also poor, at just three-and-a-half hours of streaming video.

**VERDICT:** The EasyNote TE69 looks and performs like a low-cost laptop. Its performance and screen quality are merely adequate. However, it can still handle routine web browsing and running most office tasks well, and it's not a bad choice if your budget is limited.



## SAMSUNG ATIV BOOK 9 LITE

**£499** inc VAT • [samsung.com/uk](http://samsung.com/uk) • [tinyurl.com/mlf57p3](http://tinyurl.com/mlf57p3)

Samsung's Book 9 Lite has been around for a while now, and its original £600 price tag has now been cut to £499 on a number of websites. It's not a top performer, but at that price it's one of the slimmest and most elegant budget laptops currently available.

Available in either black or white, the 13.3in Book 9 Lite measures just 17.4mm thick, which puts it very much in Ultrabook territory. In fact, its tapered, slimline design shows that Samsung was once again 'inspired' by Apple's design, this time the MacBook Air. It's much heavier than the Air, though, at 1.6kg, but is still slim and light enough to pick up with one hand and slip into a backpack. The build quality is very good – the casing feels plasticky, but should be sturdy enough to withstand the occasional bump, and provides good support for the screen panel and a firm, comfortable keyboard.

Viewed from directly in front, the 1366x768 display appears bright and colourful. However, the viewing angles are severely limited – particularly horizontally, and the image darkens noticeably as soon as you tilt the screen back by a few degrees. Even so, it's not the worst screen we've seen on a budget laptop. The speakers do their bit, too, producing a clearer, fuller sound than many low-cost rivals.

Performance is a mixed bag, though. Samsung is coy about the processor, referring to it only as a 'quad-core processor'. Closer examination reveals this to be an AMD A6-1450 running at 1.4GHz. The Book 9 Lite is equipped with 4GB of memory and an SSD that provides 128GB of solid-state storage. The latter adds enough of a performance boost to achieve a score of 2200 points when running the PCMark 7 benchtest, despite the slow CPU.

That's very much an entry-level performance figure, but the solid-state drive helps transform the Book 9 Lite into a laptop that feels quite snappy and responsive. It wakes from sleep with barely a pause to gather its thoughts, and responds smoothly to the touchscreen controls. That processor is also power-efficient, and the Book 9 Lite lasted for a full six-and-a-half hours when streaming video from BBC iPlayer – an outstanding performance for a laptop for this price.

**VERDICT:** The Samsung Book 9 Lite certainly has its flaws, however, its performance is rescued by that solid-state drive, while its attractive slimline design and impressive battery life are unmatched by just about any other laptop in this price range.



## TOSHIBA SATELLITE C55D-A-13U

**£399** inc VAT • [toshiba.co.uk](http://toshiba.co.uk) • [tinyurl.com/k7rqw99](http://tinyurl.com/k7rqw99)

If you're looking for a large-screen laptop for use at home, but can't stretch to £500, then the Toshiba Satellite C55D-A-13U may do the job for a highly competitive £399. There's actually more than a dozen different models in the C55D range, with Toshiba hopping randomly between AMD and Intel processors both old and new. This particular model we tested hit its £399 price with an AMD A6-5200 running at 2GHz, saving some budget for 8GB of memory and a 1TB hard drive.

That amount of memory and storage mean that the Satellite C55D should handle a range of applications, as well as providing plenty of storage for your music, photos and videos.

The AMD processor may be a quad-core model but isn't particularly fast. Overall laptop responsiveness isn't helped by the sluggish hard drive either. This Toshiba could only manage a score of 1725 points when running the PCMark 7 benchtest. That's a low, slow score, even by the standards of budget laptops.

The Windows 8 'fast-start' option did allow it to resume into the main Start screen in just under 15 seconds, but there's another five to 10 seconds of cursor spinning before the laptop gets going, and we noticed pauses when launching programs. To be fair, the C55D could handle basic web browsing once it got going – but you'd need to be very patient if you wanted to try photo- or video-editing.

Build quality is good, and a weight of 2.3kg is fine for a 15in laptop. The chunky 65Wh battery pack managed a very respectable five-and-a-half hours of streaming video, so it could keep you entertained on a long flight, or plugged into speakers at a barbeque. External speakers or headphones are advised though, as the tinny internal speakers buzz like a bumble-bee and are actually quite annoying.

The 15.6in screen is something of a mixed bag. The 1366x768 resolution is acceptable at this price, and the screen – although glossy and reflective – is bright enough to provide wide horizontal viewing angles. However, the vertical viewing angle is limited, and we needed to tilt it at just the right angle to get a viewable picture.

**VERDICT:** The C55D is clearly an entry-level laptop that offers basic levels of performance and image quality. Battery life was surprisingly good, and the ability to store plenty of music and video on its terabyte hard disk means that it could work as a low-cost entertainment system around the home.



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# PC ADVISOR

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## Conclusion

If you're on a really tight budget, the Advent Tacto provides a usable entry-level laptop for just £270. Its performance may be modest but it can handle web browsing and other simple tasks without problems, and the quality of the 11.6in screen proved a pleasant surprise given that low price tag. The four-hour battery life could be better, but a weight of just under 1.5kg ensures that it's both portable and productive.

But if you can stretch right up to £500, then it's Samsung's Ativ Book 9 Lite that wins our Recommended award for the best ultraportable budget laptop. Its AMD processor isn't a great performer, but it's rescued by the inclusion of a speedy solid-state drive that boosts overall performance to more respectable levels. It's a little

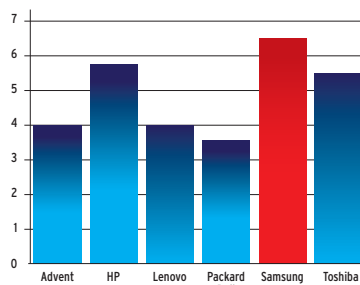
heavier than many ultraportables, but 1.6kg is still no hardship to carry around. We really like its slimline design, too, but the real clincher is the six-and-a-half-hour battery, which left most of its low-cost rivals trailing in its wake.

Ultimately, though, for sheer value-for-money it's HP's Pavilion 15 TouchSmart that wins hands-down. It's pretty heavy, but packs a mid-range Intel Core i5 processor and nVidia graphics to good advantage; it only made it into this group test thanks to a recent price cut. If you're looking for a capable all-round laptop that can handle everything from web browsing to video-editing, then the Pavilion 15 TouchSmart is our clear choice for Best Buy. ☒

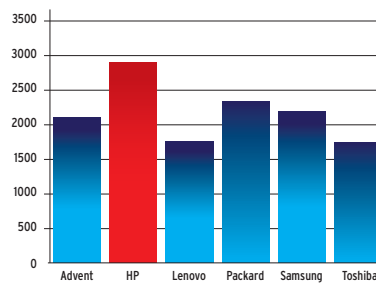
	<b>ADVENT</b> <b>£270 inc VAT (£225 ex VAT)</b> 	<b>HP</b> <b>£529 inc VAT (£440 ex VAT)</b>  <b>PC ADVISOR</b> <b>BEST BUY</b>	<b>LENOVO</b> <b>£500 inc VAT (£416 ex VAT)</b> 	
Model	<b>Tacto</b>	<b>Pavilion 15 TouchSmart</b>	<b>Flex 15D</b>	
Product code	64727	n232sa	N/A	
Display	11.6in (1366x768, 135ppi) gloss TN LCD	15.6in (1366x768, 100ppi) gloss TN LCD	15.6in (1366x768, 100ppi) gloss TN LCD	
Operating system	Windows 8.1 (64-bit)	Windows 8.1 (64-bit)	Windows 8.1 (64-bit)	
Processor	1.6GHz Intel Celeron 1017U (dual-core)	1.6GHz Intel Core i5-4200U (dual-core, 2.6GHz Turbo)	AMD A6-5200 (quad-core)	
Graphics	Intel HD (integrated)	Intel HD Graphics 4400/nVidia GeForce GT740M (2GB)	AMD Radeon HD 8400 (integrated)	
Storage	500GB HDD, 5400rpm	750GB, 5400rpm	1TB, 5400rpm	
Memory	4GB DDR3	8GB DDR3L	8GB DDR3L	
Ethernet	Gigabit ethernet	10/100	10/100	
Optical drive	No	Super-Multi DVD	No	
Video out	HDMI 1.4, VGA	HDMI 1.4	HDMI 1.4	
Wi-Fi	802.11b/g/n	802.11b/g/n	802.11b/g/n	
Bluetooth	Bluetooth 4.0	No	Bluetooth 4.0	
Webcam	0.9Mp	0.9Mp	0.9Mp	
Speakers	Stereo	Stereo	Stereo	
Audio in	Built-in mic	Built-in mic	Built-in mic	
Audio out	3.5mm line-out	3.5mm line-out	3.5mm line-out	
USB	3x USB 2.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 2x USB 2.0	
Other ports	Kensington lock slot	Kensington lock slot	No	
Card slot	SDXC	SDXC	SDXC	
Trackpad	90x55mm, buttonless, multi-touch	110x65mm, two-button, multi-touch	105x70mm, two-button, multi-touch	
Other software	No	No	No	
Power adaptor	40W mains adaptor	65W mains adaptor	45W mains adaptor	
Battery	40Wh lithium-ion, non-removable	41Wh lithium-ion, removable	32Wh lithium-ion, removable	
Dimensions	300x200x25mm	386x258x24.7mm	381x273x22.2mm	
Weight	1.45kg	2.5kg	2.3kg	
PCMark 7 score	2064	2874	1750	
Battery life	4 hrs	5 hrs, 45 mins	4 hrs	
Stalker	15.2fps	56.5fps	20.5fps	



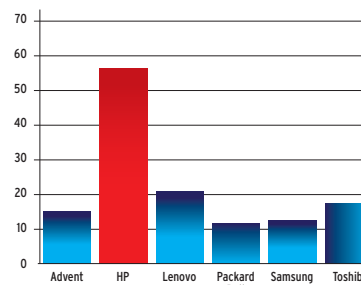
Battery life (hours)



PCMark 7 score (points)



Stalker, 720p (fps)

**PACKARD BELL**  
£375 inc VAT (£312 ex VAT)**EasyNote TE69**

NX.C2REK.002

15.6in (1366x768, 100ppi) gloss TN LCD

Windows 8.1 (64-bit)

1.8GHz Intel Core i3-3217U (dual-core)

Intel HD Graphics 4000 (integrated)

750GB, 5400rpm

6GB DDR3L

10/100

Super-Multi DVD

HDMI 1.4, VGA

802.11b/g/n

Bluetooth 4.0

0.9Mp

Stereo

Built-in mic

3.5mm line-out

1x USB 3.0, 2x USB 2.0

Kensington lock slot

SDXC

105x80mm, two-button, multi-touch

No

65W mains adaptor

37Wh lithium-ion, removable

382x256x25mm

2.3kg

2360

3 hrs, 30 mins

12fps

**SAMSUNG**  
£499 inc VAT (£415 ex VAT)**Ativ Book 9 Lite**

NP915S3GI

13.3in (1366x768, 115ppi) gloss TN LCD

Windows 8.1 (64-bit)

1.4GHz AMD A6-1450 (quad-core)

AMD Radeon HD 8250 (integrated)

128GB SSD

4GB DDR3L

Gigabit ethernet (via bundled adaptor)

No

Micro-HDMI, Micro-VGA

802.11b/g/n

Bluetooth 4.0

0.9Mp

Stereo

Built-in mic

3.5mm line-out

1x USB 3.0, 1x USB 2.0

Kensington lock slot

SDXC

100x70mm, buttonless, multi-touch

Samsung SideSync

40W mains adaptor

30Wh lithium-ion, removable

324x224x17.4mm

1.6kg

2200

6 hrs, 30 mins

13fps

**TOSHIBA**  
£399 inc VAT (£332 ex VAT)**Satellite C55D-A-13U**

PSCGWE-01N00XEN

15.6in (1366x768, 100ppi) gloss TN LCD

Windows 8.1 (64-bit)

2GHz AMD A6-5200 (quad-core)

AMD Radeon HD 8400 (integrated)

1TB, 5400rpm

8GB DDR3

10/100

Super-Multi DVD

HDMI 1.4, VGA

802.11b/g/n

Bluetooth 4.0

0.9Mp

Stereo

Built-in mic, line-in

3.5mm line-out

1x USB 3.0, 2x USB 2.0

Kensington lock slot

SDXC

85x60mm, two-button, multi-touch

No

65W mains adaptor

48Wh lithium-ion, removable

380x242x33.3mm

2.3kg

1725

5 hrs, 30 mins

17.2fps

# LOW-COST

Now is a great time to buy a new monitor – you can get a stylish display that delivers impressive images without spending a fortune. **Paul Monckton** looks at six of the best

**I**f you haven't treated yourself to a new monitor in a while, then now is the perfect time to do so. Great image quality is available at affordable prices, while monitors are slimmer and lighter than ever before. Here we've picked six impressive displays, all of which are available for under £200, with most closer to just £100. They offer a variety of features to suit every need whether you're working on spreadsheets, gaming or looking for an all-round multimedia experience.

## Design and ergonomics

All the displays reviewed here are roughly the same size, with most measuring 23in along the diagonal. At a similar size are the 23.6in and a 24in models from ViewSonic and BenQ. Other sizes are, of course, available, so you can adjust your purchase to suit both your pocket and the size of your desk.

With the size nailed down, you'll then need to think about what you really want from your monitor. It may be that all you care about is looks. Thankfully, most modern displays are a great deal better looking than older models, with a greater design emphasis on lifestyle and fitting in with your home décor. In many cases, that thick surrounding bezel has been removed in favour of a tidy, nearly frameless design and modern backlight technology allows for much slimmer, neater displays. This is also handy if you want a multi-monitor setup, where the gaps between the displays will be as thin as possible. Some models, such as those reviewed here from Asus and Philips are available in either black or white finishes, which can make a dramatic difference to the look of your worktop.

Being budget displays, all of the monitors in this group feature basic tilting stands, although the degree of tilt available does vary. You'll also have to do without expensive options such as USB hubs or card readers.

## Image quality and panel technologies

More important to many is the performance of the display itself, and perhaps the biggest deciding factor here will be your choice of panel technology – and it boils down to twisted-nematic (TN) panels versus everything else.

A TN panel costs less to make and can produce some decent performance results in terms of contrast ratio and the super-fast response times craved by serious gamers. They are, however, let down by very restricted viewing angles, which means the brightness and colour of the picture can appear to shift if not viewed straight

on. Any movement of your head is likely to make this apparent. All the non-TN panels in this round-up use in-plane switching (IPS) panels, which typically offer a vastly superior viewing experience and are better suited to general-purpose use. An IPS or better screen is a must for any serious photo- or video-editing.

## Inputs

The monitors reviewed here all offer at least two inputs, and this will determine what sort of equipment you can hook up to your monitor. All of them support the ageing VGA connector, which should be avoided if at all possible, and supplement it with a digital input or two (or three).

Multiple inputs allow you to connect more than one device at a time and switch between them using the monitor's control buttons – you may want to connect your laptop and a gaming console or a Blu-ray player without having to unplug cables each time.

The most useful connector on monitors of this type is either DisplayPort or HDMI, as they combine digital picture information with digital audio – allowing you to connect up both sound and vision with a single cable. DisplayPort is becoming more common on both Macs and Windows PCs, although you're less likely to find such a connector on home AV equipment.

The DVI connector provides a high-quality digital video input, but typically doesn't carry sound. With the right cables and adaptors, all three digital connectors can be used interchangeably in most cases, at least for video. If you have an Android phone or tablet, look for an HDMI port with MHL support, which allows you to hook it up to your big screen while simultaneously charging the device.

## Audio

For casual listening and system alerts, it can be useful to have built-in speakers. Don't expect good sound quality, though. More useful is a headphone socket that will allow you to listen to sound coming in via the HDMI port.

## Resolution

All the monitors in this group test offer the standard 'full HD' resolution of 1920x1080 pixels, which offers a good balance of detail and readability at this size, while delivering the maximum image detail from HD sources such as Blu-ray discs. This 16:9 widescreen aspect ratio is better suited to watching film and television, but 16:10 and 4:3 designed for PC use are harder to find today.



# MONITORS



Photography by Dominik Tomaszewski



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

**PC ADVISOR**  
BEST BUY

## AOC i2369Vm

**£130 inc VAT** • [aoc-europe.com/en](http://aoc-europe.com/en) • [tinyurl.com/ooefypr](http://tinyurl.com/ooefypr)

If you're looking for a low-cost, high-quality monitor, then you need look no further than AOC's superb i2369Vm. At just £130, it's one of the least expensive displays in our group test, yet offers a level of style, build quality, features and performance that belies its price.

This 23in display has a slim, 'frameless' design finished with metallic details and a brushed aluminium-style texture. Of course, at this price it's actually made from plastic, but the overall look is highly convincing and could most certainly be described as 'premium' rather than 'budget'.

To the rear we find the largest selection of inputs of any display in the group test: VGA and DisplayPort connectors are complemented by a pair of HDMI inputs, one of which also supports MHL for connection to an Android device. There's also an analogue PC audio input and a headphone jack should you prefer this option over the built-in speakers.

Below the standard VESA 75 mounting point, an IEC power cable plugs directly into the back of the display, so there's no external power supply box to lose. If you pushed us to find a fault with this monitor, it would be that the headphone socket is at the back of the screen, rather than at the side. Control and setup of the i2369Vm is achieved via a row of physical push-buttons that access a very large onscreen menu, which stretches along the bottom of the screen. It's both clear and easy to use.

Performance-wise, the i2369Vm is excellent. Its IPS panel ensures great colour reproduction and wide viewing angles, but this display outperforms all others by some considerable margin - it achieved the highest measured contrast ratio of any of the IPS displays in this group test. More importantly, this was the only display to come factory precalibrated, requiring almost no correction during the calibration process. You can just plug in this monitor and start work, knowing that you're getting the very best picture straight out of the box. The display is backed by a full three-year warranty.

**VERDICT:** The AOC i2369Vm is an excellent low-cost 23in monitor. It's well built, offers a sleek frameless design and delivers superb picture quality straight out of the box that can't be matched by any other display in this group test. It also offers the widest range of inputs and comes with a decent warranty.



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

## ASUS VX239H-W

**£170 inc VAT** • [asus.com/uk](http://asus.com/uk) • [tinyurl.com/pzpxp32](http://tinyurl.com/pzpxp32)

The bright white casing of the Asus VX239H-W - which is also available in black - lets this display stand out from the crowd. Combined with its frameless design and ultra-thin bezel this is sure to brighten up any desktop, offering a lifestyle-oriented design that's a huge visible improvement over the dark, chunky pieces of IT equipment you may be more familiar with.

Connection options are flexible with two HDMI ports, both of which also offer MHL, in addition to a standard VGA connector. The use of an external power supply here helps keep the display panel as slim as possible from top to bottom, despite the inclusion of a pair of stereo speakers, which can be driven via the HDMI inputs or the analogue PC audio connector. A headphone jack is also provided for personal listening.

No VESA mount is provided on this display, so you won't be able to attach it to a monitor arm or wall mount.

Uniquely, the VX239H-W has touch-sensitive controls. These take the form of a row of raised bumps below the legends at the bottom right of the frame and are surely intended to evoke a premium feel. In use, however, we found them to be somewhat fiddly and would have preferred the feedback of a positive click. That may have avoided many of the accidental and incorrect inputs we encountered while using this display.

It's a 23in model featuring an IPS panel that delivers the wide viewing angles and great colour reproduction you would expect from the technology.

The Asus VX239H-W performed well in our tests, with decent contrast and solid colour reproduction, but wasn't quite up to the standard of the AOC i2369Vm, which delivered better overall uniformity and more accurate tone response.

The main drawback of this monitor has to be the price. It looks good and performs well, but you can get equal or better performance while spending significantly less than the £170 it currently costs.

**VERDICT:** The striking white finish of the Asus VX239H-W may appeal to many, especially if you'd like to use it in a kitchen or against a white wall. Its slim casing is solidly constructed and offers unique touch-sensitive controls. Image quality is also among the best on offer, but the price is rather high for its performance.





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

**PC ADVISOR**  
RECOMMENDED

## BENQ GL2450

**£105 inc VAT** • [benq.co.uk](http://benq.co.uk) • [tinyurl.com/ooupfue](http://tinyurl.com/ooupfue)

BenQ's GL2450 is a decent, no-nonsense monitor at an affordable price. Based on an old-school design aesthetic, its black-picture-frame-on-a-stand look features a thick raised bezel incorporating a column of physical control buttons down the right hand side.

Although a multimedia version of the display is also available, this model's stripped-down feature set offers no audio capability at all and is the only monitor in the group not to offer an HDMI port, so you'll need an adaptor if your PC doesn't offer VGA or DVI outputs. Connectors to this display plug in vertically, upwards from the bottom, making switching cables a little more tedious than with the horizontally mounted connections found elsewhere. But it provides a tidier appearance from the rear if you want to use the display on a reception desk or similar environment.

Its 24in diagonal makes it physically the largest display of the group and thereby gives it slightly larger pixels. The use of a low-cost TN panel means rather restricted viewing angles which are immediately apparent as soon as you tilt the monitor or move your head off axis – perhaps the reason for the display's rather restricted range of adjustment which offers only a minimal amount of forward or backward tilt.

The use of a TN panel does come with a huge cost saving – you can pick up a GL2450 for a little over £100, which is great if your work involves putting together spreadsheets rather than graphics.

The display will also appeal to gamers, who may appreciate the slightly larger screen and the super-fast 2ms advertised response time. This display also incorporates a flicker-free backlight that's designed to reduce eye strain over longer periods of use.

Other than the obvious handicap of its restricted viewing angles, the GL2450 performed well in our tests. It was the brightest display overall and offered good contrast performance. It also had punchy, vivid colour thanks to its 99 percent coverage of the sRGB gamut – outperforming all challengers in this regard.

**VERDICT:** The BenQ GL2450 is the cheapest monitor in this group test by some considerable margin. It has a cheaper TN panel with restricted viewing angles and offers no audio support. However, it has, just, the largest screen size, a fast response time, solid build-quality and excellent value for money if all you need is a basic display.



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

## HP ENVY 23

**£190 inc VAT** • [hp.com/uk](http://hp.com/uk) • [tinyurl.com/Lqnx29h](http://tinyurl.com/Lqnx29h)

Aiming for a more expensive, premium feel, HP's Envy 23 is a very tidy-looking 23in panel, with an ultra-slim frame and a glossy edge-to-edge glass front.

Featuring an IPS panel, HP's monitor has wide viewing angles, though, it fails to match the picture performance of some of its rivals. The contrast performance was especially poor and a rather low maximum brightness of only 185cd/m<sup>2</sup> was achieved. Although this is fine for close-up desktop work, it's less useful for watching multimedia content from across the room, especially on a sunny day. With a measured 94 percent of the sRGB gamut covered, this display also produced the least impressive-looking colours.

Multimedia inputs are well catered for, with the legacy VGA port supplemented by a pair of HDMI inputs, both of which offer MHL for the connection and charging of Android devices. A row of physical buttons provides access to the menu system, which is simple and easy to navigate and avoids too many complicated options or gimmicks you're unlikely to need.

Although it has no built-in speakers, the Envy 23 will take audio input from HDMI as well as an analogue PC audio connector, and output it through a handy side-mounted headphone socket, branded with the Beats Audio logo.

The Beats Audio system makes an audible difference to the headphone output, delivering a punchier sound with a noticeable bass boost. Whether or not you'll like this effect is, however, another matter and down to personal taste.

The lack of speakers and the use of an external power supply allows for the display to be kept exceedingly slim from top to bottom, although no attempt has been made to hide the monitor's unashamedly plastic construction.

At £190, the Envy 23 is the most expensive display in our group test and in our opinion doesn't offer enough to justify the price, given its lacklustre image quality and mediocre feature set.

**VERDICT:** As the most expensive monitor in this round-up, the HP Envy 23 offers a great-looking specification but ultimately had disappointing image quality, although it's the only display to feature glossy edge-to-edge glass. No speakers are included, but a Beats Audio-branded headphone socket is included.



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

**PC ADVISOR**  
RECOMMENDED

## PHILIPS 234E5

**£140 inc VAT** • [philips.co.uk](http://philips.co.uk) • [tinyurl.com/kLyLw4v](http://tinyurl.com/kLyLw4v)

The Philips 234E5 is a smart, frameless 23in monitor with a slim profile, versatile connectivity and built-in audio. Our review model, the 234E5QDAB/00, is finished in black and includes optional multimedia capabilities - white versions are also available with and without multimedia support.

Externally, the display is built to a very high quality, with a premium look and feel, featuring brushed metal-style plastic details, although it has a much less plasticky appearance than some competing products. It sits atop a short stand with a round base, and also features a VESA 100 mount for alternative mounting options. It's powered by an external power supply that enables the monitor to keep its slim figure despite the inclusion of a pair of stereo speakers. These can be driven via the HDMI/MHL port or analogue PC audio input. Other input options include classic analogue VGA and a standard DVI-D port.

The monitor is operated by physical push button controls tucked away under the front bezel. In addition to the standard monitor controls, you'll find options in the menu such as Philip's automatic SmartImage image enhancement function. All options are clearly labelled and easy to access.

The IPS panel in the 234E5 is the key to its commendable image quality, featuring characteristically wide viewing angles and faithful colour reproduction. Our tests revealed its image to be highly accurate and very close to the stellar performance of the AOC i2369Vm - perhaps unsurprising as they were made by the same company. Unfortunately, the Philips display fell down somewhat when it came to its brightness and contrast figures, which were poor enough to be considered disappointing.

The two monitors are also close in price, so whether or not you prefer the Philips over the AOC will come down to style-based decisions and whether you'd prefer DVI over a second HDMI connector and DisplayPort. The two-year warranty is also 50 percent shorter than the three years you get from AOC, Asus and BenQ.

**VERDICT:** The Philips 235E5 is a promising monitor let down by poor contrast performance. Otherwise, it's a very smart-looking display with excellent colour reproduction and great connectivity options made available at a very competitive price.



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

## VIEWSONIC VX2452MH

**£145 inc VAT** • [viewsoniceurope.com/uk](http://viewsoniceurope.com/uk) • [tinyurl.com/mcfy6uc](http://tinyurl.com/mcfy6uc)

ViewSonic's VX2452mh is a 23.6in display incorporating a fast TN-based panel, flexible input options and multimedia support.

Of the monitors in this group test, it's most similar to BenQ's low-cost GL2450. Both are built to a traditional design, with a relatively thick, raised bezel surrounding the panel, although the ViewSonic's is noticeably thinner and incorporates some subtle design touches such as a transparent strip along the bottom of the display which glows blue with the light emitted from the power indicator.

It also adds a number of useful features not found on the less expensive display. A trio of inputs is supplied including VGA, DVI-D and HDMI, which is important if you want to connect external devices such as games consoles which provide audio. You'll then hear these through the monitor's built-in stereo speakers or the supplied headphone jack.

Although the VX2452mh suffers from the restricted viewing angles inherent in all TN displays, it performed very well in our tests, delivering the best overall contrast by a considerable margin as well as accurate colour. Additionally, the Game Mode preset brightens up dark scenes and shadows to make it easier to spot lurking enemies.

The ViewSonic also incorporates a constant LED backlight which, using similar technology to that of the BenQ GL2450, doesn't flicker as the display is dimmed, ostensibly reducing eye fatigue and allowing you to use the monitor for longer periods without strain.

It's bright and punchy and promises a fast 2ms response time, which would suit fast-paced gaming for those who won't compromise on speed in order to gain the many benefits of an IPS-based display.

The biggest drawback to the VX2452mh is the price. At £40 more than BenQ's GL2450 you're really going to have to want in-monitor audio and HDMI to justify the price difference. It's more expensive than two very fine 23in IPS panels in this group, and the extra 0.6in you get from the ViewSonic display won't offset the improved picture quality of IPS. Unless you really value response time over viewing angles, this may not be the obvious choice.

**VERDICT:** The VX2452mh performs well for a TN monitor and offers flexible input options, including HDMI, along with built-in speakers. However, at £145 it's hard to justify the price in the face of excellent less expensive options.



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## Conclusion

The six monitors here have a range of prices and features to suit everyone. Although there's a big difference in quality between the TN displays and those featuring IPS panels, all of them offer quality good enough for general use. However, unless you specifically want a fast response time for gaming, we would always recommend going for an IPS panel if you can afford it.

That said, it's a TN panel that first caught our attention in the form of BenQ's GL2450. This holds back on the design features, and cuts out all audio support, but delivers a solid performance for just over £100. At 24in, it also offers a slightly larger display with bright, punchy colours and comes with a three-year warranty.

If you want to go down the TN route, ViewSonic's VX2452mh adds a little style, as well as HDMI support and full audio capabilities. It performs well, but it's much more expensive than BenQ's offering.

The remaining four displays all offer modern 'frameless' bezels that are considerably easier on the eye and cut down on the overall

size of the display. They also feature IPS panels with superior overall quality and much wider viewing angles.

If you favour a glossy screen, then HP's Envy 23 is your option here. It's a competent display with a premium feel, but unfortunately, its performance is outclassed by monitors costing much less. We liked the build quality and the white finish of the Asus VX239H-W and its performance overall is better than the HP Envy 23, but we weren't so keen on its fiddly touch-sensitive controls and relatively high price tag. The Philips 234E5 is also available in white, but our black review model was a strong contender due to its competitive pricing and flexible inputs. It's kept slim by off-loading its power supply as an external brick, but still finds room for a pair of speakers.

However, best of all was the AOC i2369Vm, which seems to offer the best of everything, and all at an extremely competitive price. It delivers superb value for money without compromising picture quality, style or features and is therefore our Best Buy.

	<b>AOC</b> <b>£130 inc VAT, £108 ex VAT</b>  <b>PC ADVISOR</b> <b>BEST BUY</b>	<b>ASUS</b> <b>£170 inc VAT, £141 ex VAT</b> 	<b>BENQ</b> <b>£105 inc VAT, £87 ex VAT</b>  <b>PC ADVISOR</b> <b>RECOMMENDED</b>
Product name	<b>i2369Vm</b>	<b>VX239H-W</b>	<b>GL2450</b>
Screen size	23in	23in	24in
Panel technology	IPS	AH-IPS	TN
Aspect ratio	16:9	16:9	16:9
Screen finish	Matt	Matt	Matt
Native resolution	1920x1080	1920x1080	1920x1080
Pixel density (ppi)	96	96	92
Contrast ratio <sup>1</sup>	630	560	610
Brightness (cd/m <sup>2</sup> ) <sup>1</sup>	220	197	261
sRGB gamut <sup>1</sup>	96%	96%	99%
Adobe RGB gamut <sup>1</sup>	75%	75%	77%
Colour accuracy average (delta-E) <sup>1</sup>	0.92	1.13	1.57
Stand	Tilt -3/21 degrees	Tilt -5/20 degrees	Tilt -5/15 degrees
Video Inputs	VGA, HDMI, HDMI/MHL, Display port	VGA, 2x HDMI/MHL	VGA, DVI-D
USB	No	No	No
Speakers, amp	Mono, headphone jack	Stereo, headphone jack	None
Other features	Internal PSU	External PSU	Internal PSU
Dimensions	531x398x204mm	532x390x210mm	579x436x179mm

<sup>1</sup>Measured performance




## How we test

We evaluate monitor performance using a combination of objective measurements and subjective assessments.

We use a Datacolor Spyder 4 calibrator to set up and test each monitor. This device measures the brightness of the display as well as the accuracy of the colours reproduced.

By viewing a variety of test material, we can determine such factors as the sharpness of text and the natural appearance of skin tones. We also look for undesirable features such as "banding" in areas which should appear smoothly shaded and missing or stuck pixels. We also check for any smearing or ghosting of moving images.

Next, we take a look at the build quality and ergonomics of each display. Checking the adjustability of the stand, accessibility of controls and connectors and the ease of use of the onscreen menu system. If there are speakers included we'll also give them a listen. 



<b>HP</b> <b>£190 inc VAT, £158 ex VAT</b> 	<b>PHILIPS</b> <b>£140 inc VAT, £116 ex VAT</b>  <b>PC ADVISOR</b> RECOMMENDED	<b>VIEWSONIC</b> <b>£145 inc VAT, £120 ex VAT</b> 
<b>ENVY 23</b>	<b>234E5QDAB/00</b>	<b>VX2452mh</b>
23in	23in	23.6in
IPS	AH-IPS	TN
16:9	16:9	16:9
Gloss	Matt	Matt
1920x1080	1920x1080	1920x1080
96	96	94
130	210	840
185	187	255
94%	96%	97%
73%	74%	75%
0.94	0.89	0.87
Tilt -5/25 degrees	Tilt -5/20 degrees	Tilt -0/20 degrees
VGA, 2x HDMI/MHL	VGA,DVI-D, HDMI/MHL	VGA,DVI-D, HDMI
No	No	No
None	Stereo, headphone jack	Stereo, headphone jack
External PSU	External PSU	Internal PSU
632x405x174mm	532x414x213mm	559x432x223mm

# The plastic revolution

Plastics might seem unlikely materials for building electrical circuits, but recent breakthroughs have made this possible. **Mike Bedford** looks at the advantages and questions whether plastic tech might one day rival silicon

**P**lastics work well as electrical insulators, so one might think their application in electronic circuits would be limited. However, scientists have been able to alter the composition of some plastics so that they may behave as conductors or semi-conductors. In contrast to their silicon counterparts, this means circuits can be created that are tough and flexible. Rollable displays and other such futuristic tech are quite possible with these materials.

There are other benefits, too. For example, circuits are much cheaper and easier to manufacture when they are made from plastic rather than silicon.

Does this mean an age of truly ubiquitous intelligence could be just around the corner? Here we look at what's made plastic circuits possible, the exciting products that might result, and when you'll be able to get your hands on some of this revolutionary gear.

## A case of mobility

An electrical current involves the flow of electrons. Materials that allow electrons to flow freely are good electrical conductors; those that do not are insulators. How freely current can flow depends on how tightly bound are the electrons to the atoms.

Where there is a bit of wiggle room between the two, as is the case with many metals, the electrons are free to move and pass an electrical current. Where they are all squashed in together - as is usually the case with plastics - or shared between atoms to form chemical bonds, current cannot flow.

Plastics are polymers, which means they have very large molecules (groups of atoms) that are repeated in a sequence. Polythene, for example, is short for poly-ethylene, which means the molecule is composed of multiple groups of ethylene. Ethylene has the chemical formula  $C_2H_4$  and is a gas; when it's polymerised, it is a solid with the formula  $(C_2H_4)_nH_2$  (where  $n$  is a very large number). All the electrons are closely associated with the carbon or hydrogen atoms or are in the strong chemical bonds between adjacent carbon atoms, or between the carbon and hydrogen atoms. As a result, polythene is a good insulator.

Those few plastics that are electrical conductors have the unique property of mobile electrons. Typically the molecules contain long strings of alternating single- and double bonds between the carbon atoms in the so-called molecular backbone. In reality, though, such alternating bonds are only one way of viewing the situation. Some of the electrons in these bonds are 'delocalised', free to move from atom to atom along the

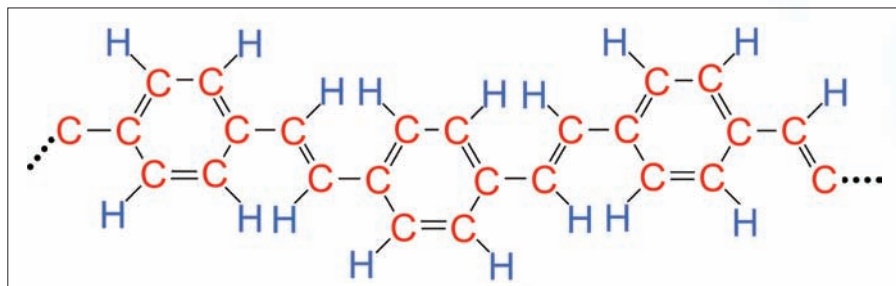
backbone. What's more, because polymers contain huge molecules, those electrons are able to move a considerable distance as is required for electrical conduction.

A classic example is polyphenylene vinylene. As you can see in the diagram (below) of its molecular structure, polyphenylene vinylene has a long string of alternating single- and double bonds that allow electrical conduction.

The availability of conducting polymers means plastics could be used to connect components in the same way that do the copper tracks on most electronic circuit boards. However, to produce active electronic components, such as the transistors in micro chips, another element is needed: semi-conduction.

Without getting bogged down in scientific jargon, suffice to say it is possible for plastics

**MOLECULE:** The alternating single and double bonds in polyphenylene vinylene allow this plastic to conduct





to be altered to behave as semiconductors. So, if we also add in good old-fashioned plastics, between the various formulations we now have all the essential elements – conductors, semiconductors and insulators – that are required to build electronic circuits.

### The plastic advantage

Recent advances in polymer chemistry might have made it possible to create electronic circuits purely out of plastic but, given that we already have copper and silicon, it's pertinent to ask why anyone would want to do so. There are several potential benefits.

First is price. While it would be wrong to consider silicon a rare element – after all, many rocks contain silicon, as does sand – extracting the silicon from its ore and purifying it to the extent required for semiconductor manufacturing is an expensive process. Plastics, on the other hand, are cheap to make.

More significant is the reduced cost of turning the raw material into a working circuit. Creating a silicon chip is a hugely complicated and expensive multi-stage process involving deposition, etching, ion implantation and multiple other steps that demand high-tech equipment. Because plastics can be dissolved in an organic solvent, a polymer circuit can be created using a technique similar to inkjet printing.

Second is plastic's ability to be both tough and flexible. Without a doubt, today's handheld electronic gear is far more durable than it was only a few years ago. Even so,



**OLED TV:** OLEDs are starting to appear in high-performance TVs such as this one from Samsung

dropping your new smartphone on a concrete floor isn't a good idea: you could easily destroy its screen. Plastics, on the other hand, are virtually indestructible – a fact which, when coupled with the super-low price, will surely result in innovative applications.

### Organic LEDs

One of the first applications of plastics in real-world active electronic components is the OLED (organic LED), one variant of which relies on polymers.

Most of today's screens are based on LCD technology, in which liquid crystals are made transparent to allow a backlight to shine through. Some LCDs are referred to as LED displays, but LEDs are used in these screens only to produce the backlight. It is possible, though, to use only OLEDs – one per pixel – to generate the image.

OLED screens are easier to view in bright light, provide an exceptionally good contrast ratio for really black blacks, and they're starting to appear in consumer electronics gear such as the televisions.

Despite the fact OLEDs themselves are flexible, the display material has to be paired with a layer of thin film transistors (TFTs) to turn on

**FLEXIBLE:** Plastic Logic's displays are totally flexible





and off each pixel. The TFT layer is based on silicon technology, and therefore relatively inflexible and not immune from damage.

That's about to change. Cambridge-based Plastic Logic has developed the technology for producing an all-plastic TFT backplane. It can be bonded to a display layer based on either the coloured OLED or monochrome electrophoretic (for example Kindle-type e-paper) technology.

Early applications have benefited from the virtually indestructible nature of these all-plastic displays. For example, the tech has been used to display timetables at bus stops in Germany and in other public transport applications. Closer to home, PopSlate and PocketBook have produced smartphone cases that feature an e-paper-based secondary display.

Whether there will be a market for the rollable display remains to be seen.



**PROCESSOR:** Plastic processors might be slow compared to the silicon equivalent, but their super-low price will open up entirely new applications (Photo Imec)

**PUBLIC TRANSPORT:** One of the first applications of tough plastic displays is in public transport

However, Plastic Logic believes plastic displays will set free wearable electronics (see *The road ahead*, right).

### The plastic processor

While the display is for now the most advanced area of all-plastic electronics, if polymer is to go mainstream it will also be necessary to produce processors from this most unlikely of materials. Progress is being made here, too.

The challenge has been taken up by Dutch researcher Imec, which has already demonstrated the world's first plastic microprocessor. According to the company, while it's possible to produce bottom-end silicon processors for as little as £1, this is about as low as it's feasible to go.

It seems possible that a plastic processor could be manufactured for a tenth of this amount, though, and this could open up a host of new applications. There has been talk, for example, of intelligent packaging for food that can detect when the contents are no longer safe to eat, or a cereal box that could work out the nutritional value of a serving.

However, while it's still early days, it seems unlikely that the technology will ever give us the £10 tablets and smartphones for which

we might be hoping. This is evident from the prototype plastic processor.

For a start, while mainstream processors operate on data in chunks of 64 bits, this plastic processor has an 8-bit architecture that is reminiscent of the chips of the 80s. Second, it can execute instructions at a rate of only six per second, which is many millions or billions of times slower than silicon's latest and greatest. And finally, despite this rather pedestrian performance, the circuit measures a huge 2cm<sup>2</sup>. Nevertheless, when we bear in mind the phenomenal performance advances made in silicon chips over the decades, it would be a brave person who wrote off the possibility of high-performance plastic chips at some point in the future.

### The road ahead

For its intended applications the lacklustre performance of the plastic processor will not be a showstopper, although it'll be some time before the full potential of this ultra-cheap, almost indestructible source of intelligence

**WEARABLE:** According to Plastic Logic, wearable electronics will be a major beneficiary of plastic circuits



will become clear. However, Plastic Logic's reference to wearable electronics hints at a much more imminent application of polymer electronics.

Wearable electronics is already here in the form of activity trackers smartwatches and Google Glass smartglasses. But according to some industry spectators, these form only the tip of a very large iceberg; the onset of plastic electronics could be a major enabler.

Wearables were considered a top trend at January's Consumer Electronics Show in Las Vegas. With products ranging from electronic fashion accessories through fitness devices and add-on displays, interfaces and cameras, ubiquitous intelligence really does seem to be coming of age. ☒





# Can your phone or tablet replace your doctor?

Medical apps and mobile devices are placing the future of healthcare in the palm of our hands, writes Martyn Casserly

**T**he past few years has seen a huge growth in the health and fitness market for mobile devices. Activity trackers such as the Nike FuelBand, Fitbit Flex, and Jawbone Up will monitor your physical activity across the day, or even while you sleep. Diet logging apps including MyFitnessPal will help you control the amount of calories you eat, and some fitness apps can even turn your daily run into a frantic escape from a zombie hoard, which is pretty good motivation on a cold December morning. This is all very useful, but how far can it really go in terms of our well-being? Can our mobile devices become more than just a way to monitor our lives? Could they end up saving them?

Dr Larry Smarr is a hugely respected American computer scientist, who helped popularise the use of high speed networks before the internet. For the past few years he has been involved in an experiment where he monitors nearly every aspect of his life – weight, calories, activity, sleep, urine, saliva, blood and even his stools. This may sound excessive, and for most people it certainly would be, but by using technology to accurately record such a comprehensive range data about himself he was able to spot tiny changes in his body, which led to a remarkable discovery. Before any observable symptoms appeared, he was able to diagnose that he was suffering from the early stages of Crohn's disease.

"In a world in which you can see what you're doing to yourself as you go along," Dr Smarr told the BBC's *Horizon* program. "The hope is that people will take more personal responsibility for themselves, in keeping themselves healthy. So, it's almost like we're at day zero of a whole new world of medicine, and what will come out the other end is a far healthier society that's focused on wellness rather than trying to fix sickness when it's way too late."

He may well have all the advantages of a complete medical lab behind him, but the principle he asserts, one where devices can help us notice trends before they become serious, is a very real possibility today. With smartphones and tablets now a maturing technology some innovative manufacturers are starting to realise this potential that they hold in terms of healthcare. AliveCor is a San Francisco-based company that has designed and built a mobile accessory that's far more



By monitoring his own health data, **DR LARRY SMARR** was able to diagnose that he was suffering from the early stages of Crohn's disease

useful than Will.i.am's gold plated iPhone case, and is considerably cheaper, too.

The Heart Rate Monitor case (£169) for iPhone and Android allows users to monitor their heart rate via a slim protective cover that adds little bulk to the handset. "We built the device to provide immediate access to ECG rhythm data for patients and healthcare providers," explains Euan Thompson, AliveCor's president and CEO. "The AliveCor Heart Monitor provides people with suspected or diagnosed heart conditions, and those at risk of heart conditions, the ability to track their heart health anytime, anywhere, at an affordable cost."

At first glance, the case looks similar to many on the market; in that it's black, offers a moderate amount of protection, and has gaps for all the ports. The one main difference is found on the back, where two silver bumps house the device's sensors. "By pressing the fingertips of both hands on the electrodes," reveals Euan, "an ECG is easily recorded in approximately 30 seconds."

The readings are then displayed on the corresponding AliveECG app, giving users the ability to record the patterns over time to build up a detailed picture of their heart. This might sound like navel gazing to some, but when you consider the fact that heart disease is by far the biggest killer of men in the UK, being able to see any irregular behaviour ahead of time could be a literal life saver.



The **HEART RATE MONITOR CASE** lets iPhone and Android users monitor their pulse, without adding too much bulk

"As healthcare continues to evolve, we believe mobile health will transition into the standard of care," says Thompson. "Mobile health devices have the potential to enable data driven healthcare that will, in effect, be able to help predict and prevent known or unknown adverse health conditions. It will not only impact the practice of medicine, but the way medical research is done."

This sentiment is also held by Azoi, an Indian company with its own iPhone case (and stand alone module for Android users), which can measure not only your heart rate but also blood pressure, blood oxygen, temperature, and (via an included peripheral) the capacity of your lungs. The Wello (£120) is an impressive piece of technology, which utilises built-in sensors in a similar fashion to the AliveCor case. Its extended range of functions also means that it could prove useful in building up a wider mosaic of your health related data, something that would have been next to impossible without access to advanced medical equipment only a few years ago.

"Thanks to developments in technology," states Azoi CEO Hamish Patel, "health monitoring can now be incorporated within everyday products - this is key as it makes it much less intimidating. Indeed, mobile computing is driving a profound shift in healthcare - empowering people to better understand and better manage their own health by making better lifestyle decisions. Judging by the demand we've seen for the product since launch, it is clear to us that this shift is already underway."

The big players in the industry would also agree. Qualcomm, usually known for providing the majority of chips inside mobile phones, is investing substantial amounts in the areas of mobile healthcare. In 2012, it launched the Tricorder X Prize, a global competition where independent teams are challenged to build a handheld device capable of diagnosing 15 key diseases, plus various health indicators, through noninvasive means. As the name suggests, this is based on the magical medical device that Dr McCoy used to wield on *Star Trek*, with Qualcomm even having Brent Spiner, who played Commander Data in *Star Trek: The Next Generation*, help launch the competition. While the dream of this technology may have originated in the realm of science fiction, the \$10 million prize, not to mention the \$25,000 cost of entry for teams, shows that the Tricorder, at least in some form, may be a very imminent creation.

The idea of medical devices, perhaps incorporated into our phones, is tangible and realistic in the next few years. With their emergence, though, comes the question: how will people actually use them? After all, if you don't know what you're looking for how will you ever spot an emerging illnesses? Then there's the more worrying issue that many people already resist the need to visit their GP even when they feel ill, so what potential harm could a device of your own bring with it?

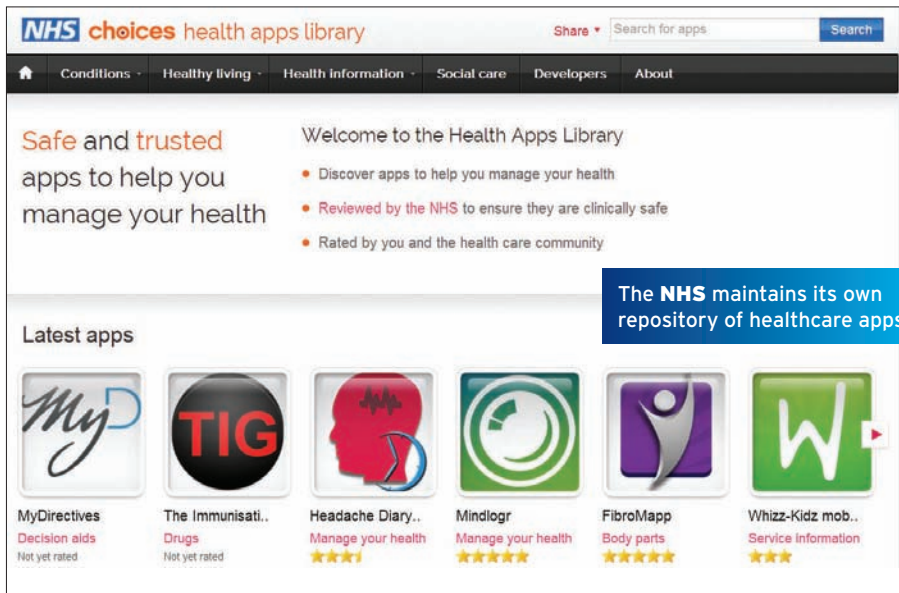
"We simply don't know," says Dr Margaret McCartney, long-time GP and contributor to the *British Medical Journal*. "The fear is that the wrong people do and don't get medical attention. Instead, people's information is a false positive or they get false reassurance. Time and again we assume that more information is better for us when the truth is more complex and counter-intuitive."

"The big problem is the lack of direct evidence of benefit. It's fairly easy to generate large amounts of data from the



The **WELLO** uses various built-in sensors to build up a picture of your health





human body – it's far harder to know what it means (what's normal/abnormal) and whether there are effective interventions based on that data, which will do more good than harm. It would be absolutely possible to do Randomised controlled trials, but at present the growth of the self-monitoring industry has not been matched by quality research."

This growth can be seen in a report issued by the Parliamentary Office of Science and Technology, which found that over 40,000 health-related apps are available on the iTunes store alone. It found that these ranged from "simple provision of health information, such as the NHS symptom checker app, to tracking the locations and severity of asthma attacks through a Bluetooth peripheral attached to an inhaler".

In response to this overwhelming choice, the NHS has set up its own repository of apps at [apps.nhs.uk](http://apps.nhs.uk), where those listed have been approved by the organisation.

"Apps can only become part of the library," explains Inderjit Singh, head of enterprise architecture at NHS England, to E-Health Insider, "if they have gone through a review process that looks at the information governance, the clinical safety and the potential clinical risks."

While apps and devices that diagnose symptoms and provide advice on treatment may still be a little out of reach, using them alongside existing medical services as complementary therapy is already beginning. Indeed, it might also go a long way to helping the current workload on the NHS. One such app is Vitrucare, by Dynamic Health Systems, which helps people with long term illnesses manage their condition.

"Seventy percent of the NHS cost is on people with long term conditions – that's £80 billion per year," explains Dr Richard Pope, Clinical Director at DHS. "About 60

percent of a GP's time is spent managing the care of people with long-term illness. So it's a huge problem, and it's growing like Topsy because of the change in the structure of the population and the fact that nobody takes enough exercise."

VitruCare is a web-based service that monitors data recorded by patients with existing conditions, and helps them set and achieve goals that will improve their health. "It dovetails in with the clinical service and eases the burden on that service, and gives the patient a much more immediate response than they might otherwise be able to get," explains Dr Pope. "What we do is if somebody puts in results that we think are outside an appropriate range of self care, then they get a warning."

Because the system has been designed by medical professionals, is focused on

specific areas of care and has been set up via an in-depth consultation-style process, it enables the program to have more precision in its delivery.

"People who are managing long-term illness are, in many ways, acting like athletes," reveals Dr Pope. "In other words, they have to watch their diet, they have to take a series of steps – instead of training it might be medication – they have to monitor what they're doing... it's like an athlete, it's the same sort of thing. So if you wrap an electronic coach around the person you can actually help them really substantially to achieve the sort of things that are important to them."

There can be no doubt that the collection of data about our bodies and behaviours can be a strong weapon against illness, as long as it is shared with medical professionals who know how to interpret it correctly.

Visiting your GP with more information than 'I feel a bit off' could be the difference between a long, drawn out diagnosis and a quick solution to your malady. As mobile devices grow in power and popularity we face a new phase of health that will look very different to what we have had up until now.

Then there's the threat of legal complaints brought by customers who have missed vital indicators and now want recompense. It's a perilous road to walk, and it's no surprise that all the companies we spoke to took the same line when it came to the legal position of their products.

"We're trying to help people manage their health more effectively and make better lifestyle choices," says Azoi's CEO. "We're not a replacement for medical care. We have been very careful to make sure that people understand that." ☒



**VITRUCARE** dovetails with NHS services to allow patients to monitor their own health







[illegible]

July 2014 [www.pcadvisor.co.uk/features](http://www.pcadvisor.co.uk/features) 89

## Avidemux



[avidemux.org](http://avidemux.org)

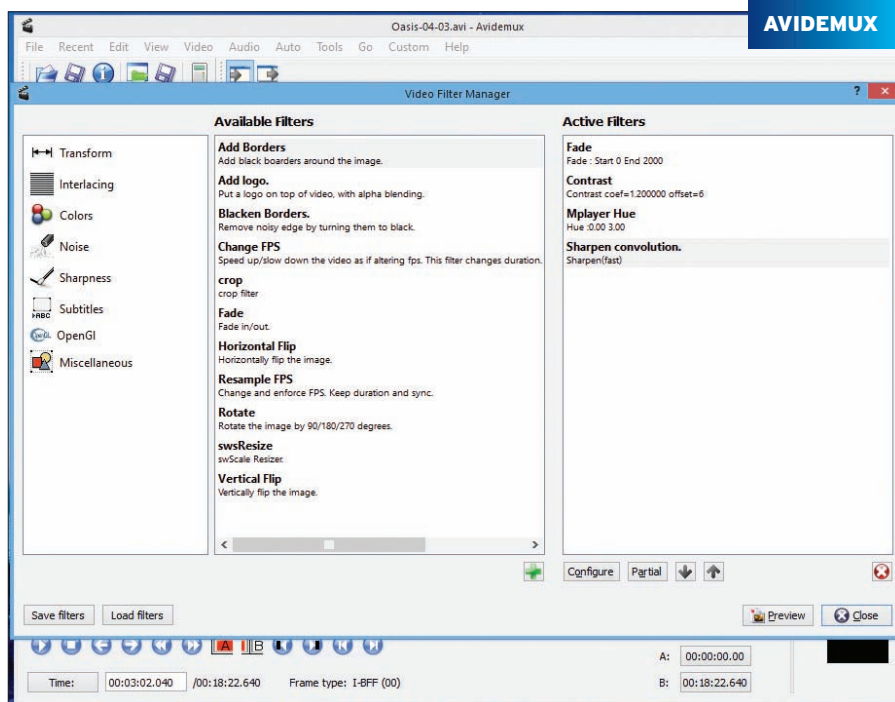
Avidemux is a specialised video-editing tool rather than a general movie maker. Only one video clip at a time can be loaded into the app, so it isn't possible to create a movie by stitching together scenes from several sources. Avidemux is best used as a tool to prepare clips for use by another movie editor.

After loading a video clip the start- and end points can be altered. There's a preview window, plus a wheel control that is used for moving forward and back through the video; you can step through it frame by frame. Avidemux also lets you add an audio track to your video.

Avidemux is best at manipulating output. There are eight categories of filters and numerous items within each. Among the options you'll find the ability to add borders and a logo with alpha blending, change the framerate, crop, fade in and out, rotate, flip and resize. You can also adjust the brightness and contrast, hue and saturation, reduce noise, sharpen edges and more.

If you had several clips of different sizes and framerates - perhaps they were captured using different cameras, camcorders and mobile phones over a period of time - Avidemux can ensure each follows the same sizing and framerate requirements. These can then be imported into a separate video editor to compile your movie. Useful presets include DVD, 720p, PSP and SVCD.

Despite some useful features, we received frequent error messages from Avidemux.



## Movie Maker



[bit.ly/1Ish6wj](http://bit.ly/1Ish6wj)

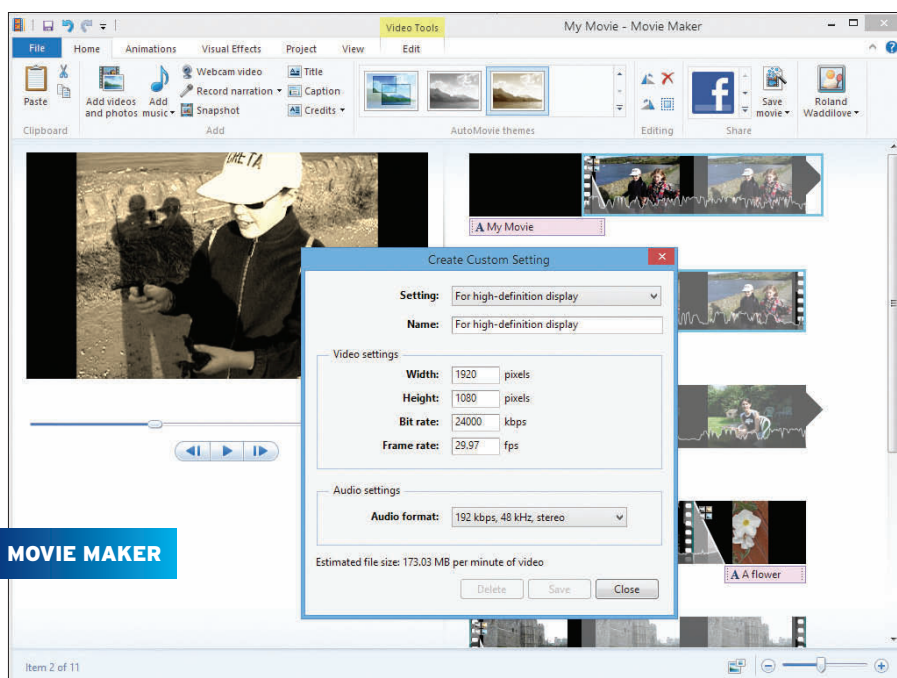
Windows Essentials is a collection of programs in Windows 7 and 8, one of which is Movie Maker. It will cover most people's needs in creating entertaining videos to share on the web or with friends and family.

A group of video clips can be loaded into Movie Maker and organised by dragging-and-dropping them into the order you want them to play. Photos can also be dragged-and-

dropped between the video clips, creating a Ken Burns effect. Video clips can be cut into smaller sections and these can also be dragged-and-dropped, then scenes can be trimmed by setting start- and end points. Visual effects, organised into groups such as artistic, cinematic, motions and fades, can also be applied to clips. Dull clips can be brightened and there is video stabilisation to remove camera shake.

Several project themes are available. Selecting one adds titles to the start, credits to the end and transitions between clips. You then simply edit the text placeholders, customise the transitions and so on to produce your video. You can even record and insert webcam footage, record narration, add music and captions, fade in and out the audio and more.

Movie Maker has an excellent range of preset output options for HD displays, computers, tablets, phones and the web. You can publish movies directly to YouTube, Facebook, Vimeo and more. It's a low-tech, easy-to-use, fun tool for short videos.



**MOVIE MAKER**

## Machete Video Editor Lite

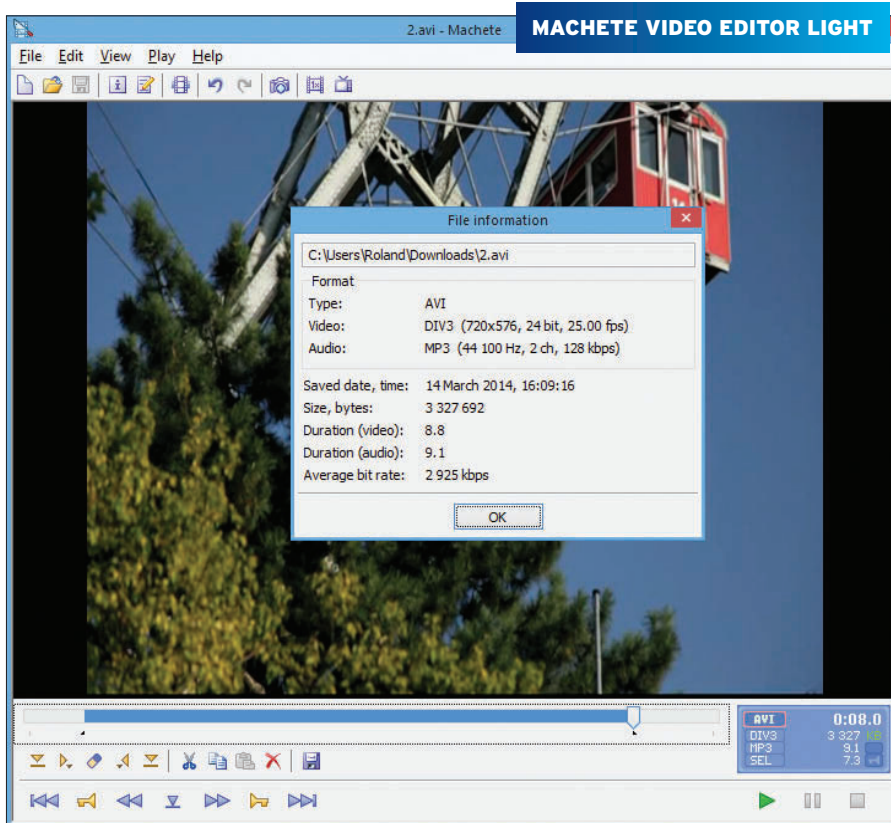


[machetesoft.com](http://machetesoft.com)

Compared to Movie Maker, Machete Video Editor Lite is limited; even the full program costing £18 can't compete with the other editors reviewed here. The Lite version does have some useful functions, though.

It can load a single AVI or WMV video clip for editing, and the program allows you to





select another video clip on the disk drive and insert it at the current point. This means you can extend the original clip by inserting other clips at any point within it, or you can attach a second clip to the end of your movie.

Having compiled your raw video footage you can set about editing it. The frame advance controls let you select a section, and cut, copy and paste functions work as expected, enabling you to trim the start- and end points of the movie, cut out any dull sections, rearrange scenes and then resave the whole lot to disk.

There is an option to remove the audio track, while the full version also lets you insert additional audio tracks – for example, you could add background music or record a voice-over and apply it to the movie.

Machete Video Editor Lite is quick and easy to use, but it lacks features.

## WeVideo



**wevideo.com**

WeVideo is an online video editor, so the obvious drawback is the necessity of uploading to the web very large video files. If you're compiling only short movies and have a decent broadband connection then it will do the job.

A free account WeVideo account takes two seconds to set up using your Facebook

login and provides 5GB of storage and 15 minutes of video a month at 480p resolution. Any number of movies can be edited, provided only 15 minutes is output.

Uploading video clips is straightforward, and you can also record a webcam's live feed. The interface has a familiar layout, with clips

on the left, a video player on the right and a timeline at the bottom. Clips can be dragged to the timeline to add them to a storyboard. Photos can be uploaded and inserted, too, and there is a Ken Burns effect.

A clip can be opened for editing, and the start- and end points can be trimmed. A Transform tool palette provides rotation, vertical- and horizontal flip, scaling and more. An Effects palette offers nine video effects, including sharpen, sepia, dream and more. The audio level can be adjusted and faded in or out. Audio files, such as music, can be uploaded and applied to the movie, too.

Around two dozen themes can be applied to a movie, including travel journal, white wedding, memories and classic. They can add effects to the whole video, titles to the start, and so on. When you have finished, the movie can be output to various social networks or stored online at the WeVideo site. It's great for Chromebook owners.

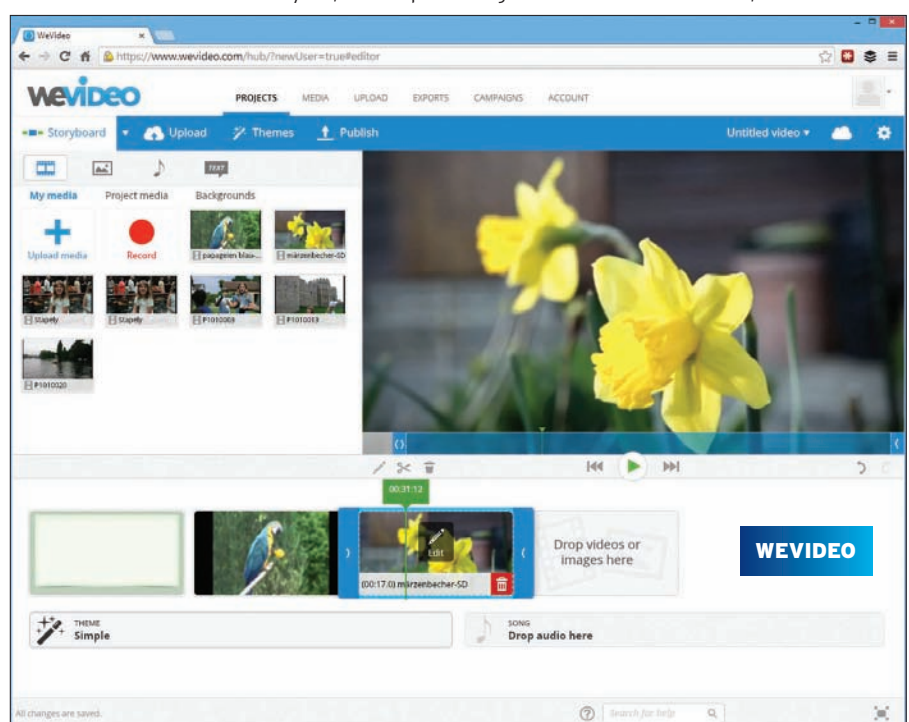
## Lightworks



**lwks.com**

Lightworks has been used to create several Hollywood movies, including *The Wolf of Wall Street*. Free and Pro versions are available, with only the output formats and a 720p resolution restriction to separate them.

You don't get project templates, scrolling titles and other fancy effects, though. Lightworks focuses on precision tools and clip handling. Videos are imported and organised into bins and racks, and rooms



are created with editing layouts. Video-clip handling is very database-like, with multiple views, searching, sorting, tagging and so on. It's designed to enable teams of editors using multiple workstations to create two-hour movies containing dozens of scenes and hundreds of clips. This would be impossible with the other video editors in our round-up.

The editing tools are very powerful and offer a finer degree of control than rival applications. Video- and audio tracks, of which there can be many, are independently edited. This means you can remove a section from the middle of a scene, leaving the audio and cut away to show something else, then return while the audio continues to play.

The flexibility afforded to you in joining scenes is excellent, and in and out points can be finely tuned in the timeline. There is a limited range of special effects such as transitions, but TV programmes and Hollywood movies rarely use anything other than fade from/to black.

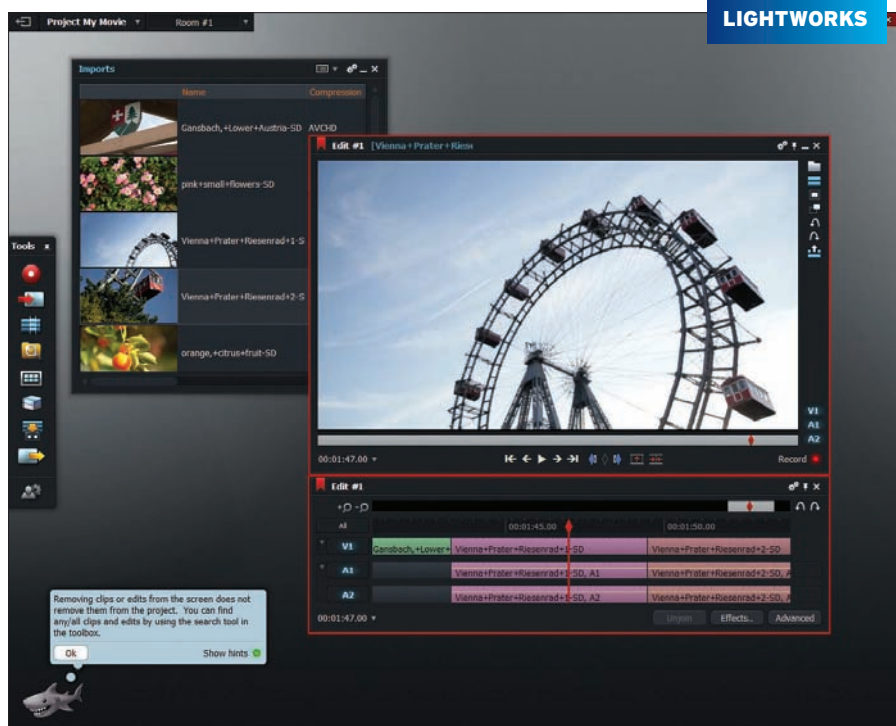
Lightworks is aimed at professional video editors and it is fascinating to use a tool employed by Oscar-winning Hollywood movie editors. It doesn't do a lot, but what it does do is brilliantly done.

## VSDC Free Video Editor



[videosoftdev.com](http://videosoftdev.com)

Of all the video editors on test, this one is the most difficult to use and it is initially rather confusing. It has a lot of features whose function is not obvious, but it's worth



persevering: VSDC is capable of some clever effects. In fact, the number of functions is a bit overwhelming at first.

In VSDC you create a project and this has a number of scenes. Each scene has a number of objects - video clips, photos and other items. You can apply various effects to the objects in a scene, and there are plenty to choose from. The brightness, contrast, hue, saturation and other attributes can be

adjusted, objects can be flipped, skewed, rotated and so on, and there are fire, water and plasma effects, and several transitions. Video clips can be trimmed and cut into smaller parts, and moved around. Plus there is a good range of audio effects.

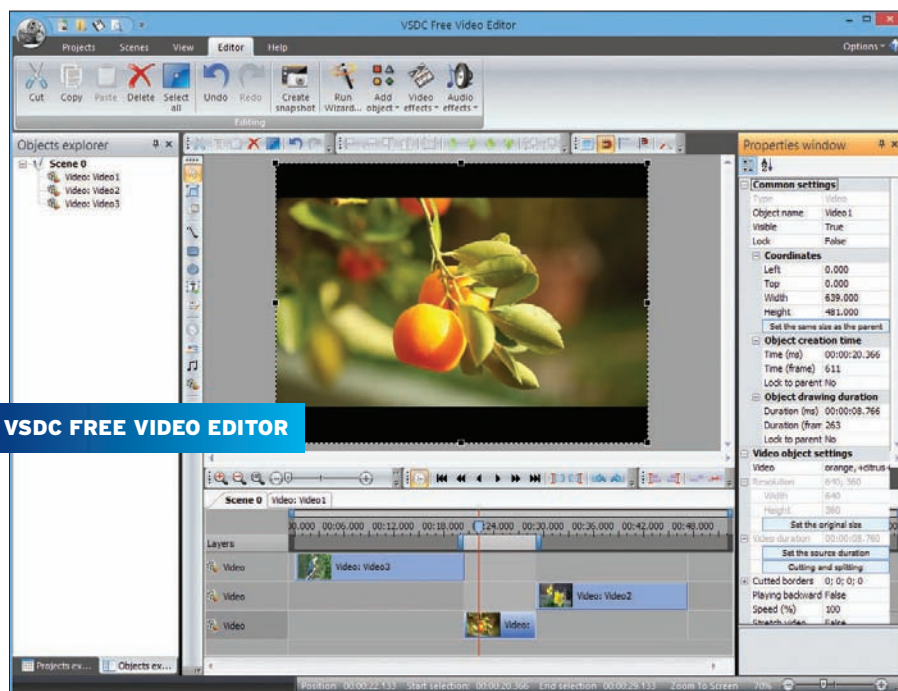
The editor is more like Movie Maker than Lightwave: the effects are numerous and flashy, but they lack the simplicity and precision of the pro-editing features in Lightwave. If you want to do things such as picture-in-picture, add speech bubbles with text, overlay lines, rectangles and ellipses, then VSDC is the tool for the job.

The range of output formats is excellent and there are presets for PC, DVD, iPod, Xbox, PlayStation, mobile phones and more. Videos can be output to DVD, VCD, AVI and MPG, too. VSDC will even burn CDs and DVDs.

VSDC is a worthy contender, with more features than its rivals in this round-up.

## Conclusion

We believe Lightworks and Movie Maker are the best two free video editors, but for entirely different reasons. Lightworks is geared toward the precise editing and cutting of clips and scenes as required by professional TV and movie editors, and it's ideal for long and complex editing jobs. Movie Maker is easy to use and has features for home users wanting to create fun movies for sharing online with family and friends. They are both free, so why choose? ☒



VSDC FREE VIDEO EDITOR





# New features in Windows 8.1

The free Windows 8.1 Update has arrived, and should be automatically installed on your PC. Jim Martin gives a guided tour of the new features

**A**t its Build 2014 conference, Microsoft announced the confusingly-named Windows 8.1 Update. It's the second significant upgrade since Windows 8 was launched back in 2012, and brings a fresh round of tweaks, just as 8.1 itself did, with Microsoft putting back more and more of the features it took out of Windows 7. The changes also mean the OS is easier and quicker to use, making commonly used features more prominent instead of being hidden away as per Microsoft's minimalist philosophy for Windows 8.

The update, which is to all intents and purposes a 'service pack', is free and may have already been installed on your computer if you haven't disabled automatic updates. In order to install the update manually, head to the Windows Store - there should be an app tile on the Start screen - and look for a message telling you an update is available.

### New feature highlights

So, what's new in Windows 8.1 Update? Two things you'll immediately notice the first time you look at the Start screen are a new power button and search icon in the top-right corner, to the right of your username and avatar. The power icon will appear only on some mobile devices such as laptops. Tablets won't get this as they already have a physical sleep/wake button. They do, however, get the new search icon.

With these displayed conveniently on the Start screen there's no need to bring up the Charms bar to access either feature. The power icon gives you the same options you'll find if you tap on Settings in the Charms bar, then Power: Sleep, Shut Down and Restart.

Of course, if you mainly use the traditional Windows desktop and avoid the Start screen, you can right-click on the Windows logo in the bottom left-hand corner to see the same options under the 'Shut down or sign out' sub menu.

The search icon makes this crucial function much more obvious. Previously, you either had to swipe in from the right-hand side or press Windows-C to display the Charms bar and the search option. An unintuitive but fast way to search is simply to start typing when the Start screen is displayed, as this brings up the search field and means that you don't have to click, tap or swipe at all.

Unlike the original Windows 8 search function, you can now use it to find apps in the Windows Store, as well as those already installed, files stored on your hard drive and web search results.

A minor extra addition to the Start screen is a PC Settings tile. Again, this is much more accessible than bringing up the Charms bar, clicking the Settings charm and then PC Settings. Previously, you could

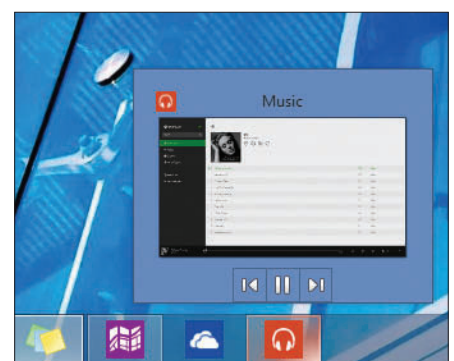


have added the tile manually, but most people didn't think to do so.

### Start screen tile customisation

The vast majority of us use a keyboard and mouse, and in Windows 8.1 Update you'll now get a familiar context menu when you right-click on a tile on the start screen. The menu lets you change the size, unpin it, uninstall the app or disable the 'live' part of a live tile.

If anything, this is a confusing change since no other Modern UI apps have gained

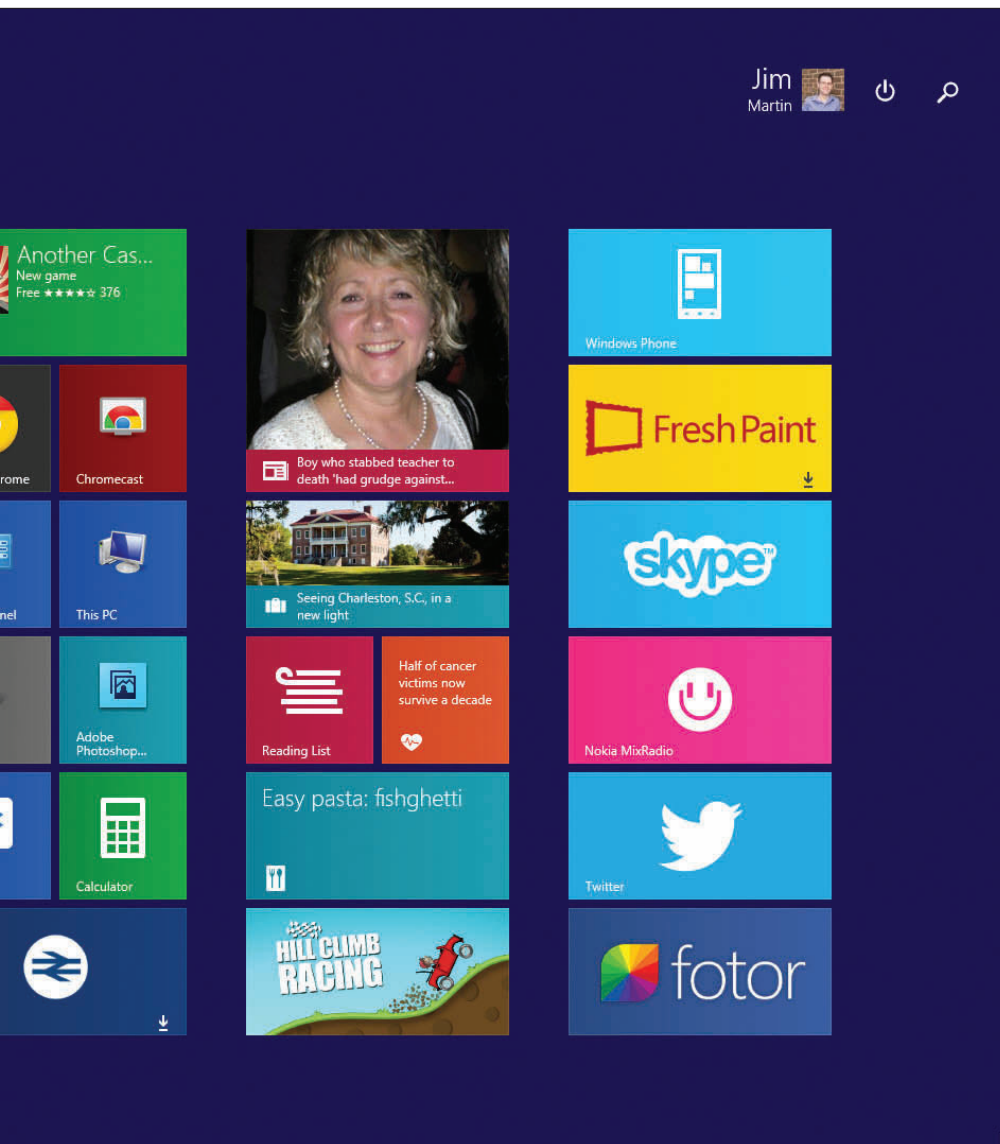


desktop-style context menus when you right-click. The good news is that you can drag and drop tiles with a mouse without first entering a 'customising mode', as you have to on a touchscreen Windows 8 device.

### New app notifications

In Windows 8, a new tile was added to the Start screen when you installed a new app. In 8.1, Microsoft stopped that and no new tiles were added - you had to go and find the new app and pin it to the Start screen yourself.





screen and find (or search for) the program in question. You'll see a thumbnail of the program - or multiple thumbnails for apps such as Internet Explorer 11, which support multiple windows - just as you do with desktop apps. Certain apps, such as Xbox Music, can also display playback controls.

Sadly, Modern UI apps still launch and run in full-screen mode. That's rumoured to be possible in Windows 9, which should launch in April 2015.

Subtly different from the ability to pin Modern UI apps on the taskbar is the option to display open Modern UI apps there. This means that they'll only appear when they're running, and has the side benefit of displaying the taskbar when Modern UI apps are open. It's a benefit because you can now more quickly switch directly to another application instead of first having to return to the desktop or toggling through programs using Alt-Tab or Windows-Tab.

### App title bar for Modern UI apps

One nod to those who still primarily use the traditional desktop (which is virtually everyone) is a new title bar that appears when you hover your mouse pointer over the top of the app. It has an 'x' at the right-hand side for closing the program, and an app icon on the left. When you click that, you get the option to snap the app left or right.

### PC Settings app

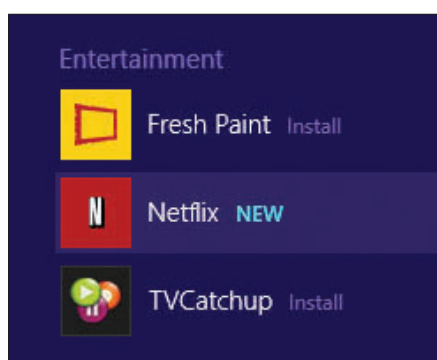
We moaned about the limited number of options in the PC Settings app in 8.1 and that's now been addressed. You can now see how much disk space is used by various things and also uninstall software. You get a link to the old-style Control Panel, too, something that was lacking in previous versions of Windows 8.

There are also other updates in PC Settings, making it generally much more useful. Have a play around with it and you'll spot the new features pretty quickly.

### Conclusion

As with Windows 8.1, getting the update is a no-brainer. There's nothing here, features-wise, that constitutes a reason not to upgrade, neither is there any financial reason, since it's free. In fact, now Microsoft has announced that there will be no more security updates for Windows 8.1 (to which you may not have updated yet), it's important you do update to Windows 8.1 Update.

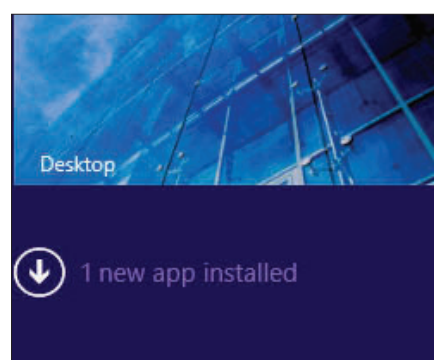
It's a shame Microsoft hasn't made the leap to Modern UI apps running in smaller windows on the desktop - that's coming in 2015 as we explain in our Future of Windows feature on page 98 - but the other changes are welcome. It's also good to see Microsoft making good on its promise of regular updates and listening to user feedback.



With 8.1 Update, we have another method: no new tiles are added automatically, but you get a notification pointing to the Apps screen. Click or tap it and you'll see the new app icons highlighted in the full apps list, so you can (more) easily find it. Whether the highlights are obvious will depend on your colour scheme, and how many apps you have.

### Apps screen tweak

A minor tweak is a new option to display more app tiles in the Apps screen. This is



better for desktop users with large, high-resolution monitors. Previously, the screen was designed mainly for touch operation (as you'd expect), but it meant that anyone using it with a keyboard and mouse saw too few apps simultaneously.

### Modern UI apps on the taskbar

This one's big: you can now pin Modern UI apps to your taskbar on the traditional desktop. This makes it faster to launch an application than having to bring up the Start

# New features in Windows Phone 8.1

**I**mmediately after announcing the Windows 8.1 Update, Microsoft revealed that a free update is on the way for all Windows Phone 8 smartphones.

The company's mobile operating system has a very similar interface to Windows 8, but has thus far failed to gain a solid foothold and begin to compete with Android and iOS. One of the main problems - as far as we're concerned - is the lack of apps.

Many of the big players can be found in the Windows Store, but UK-specific apps are often absent. Whether it's a catch-up TV service or an app for your bank, chances are there isn't yet one for Windows Phone.

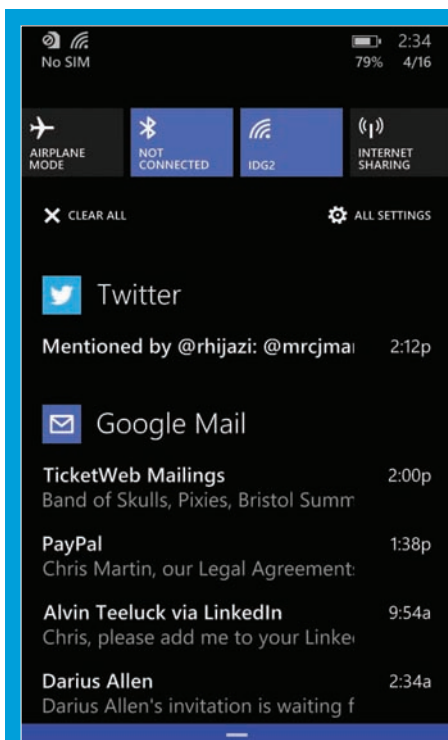
There's an awful lot to like about Windows Phone, though, and things are about to get much better with the update to version 8.1. It will add a much-needed notification centre, a Siri-like personal assistant and new home screen and lock screen options.



## When is it available?

First of all, it's important to note that the update will be free and will begin rolling out in the UK in "summer 2014," according to Microsoft. The exact date you'll be able

to get it will depend on your smartphone manufacturer. It will be available for all Windows Phone 8 devices, such as the Nokia Lumia 520. It won't apply to smartphones running Windows Phone 7, though.



## Action centre

Long overdue and repeatedly requested by users, Windows Phone finally gets a notification centre. Much like Android's, you swipe down from the top of the screen (even if the screen is locked) and you'll see notifications such as text messages, emails and notifications from apps. There's quick access to commonly used settings at the top, including Wi-Fi, Bluetooth, Airplane Mode and internet sharing - again much like Android and iOS's Control Center.



## Start screen

Last year, Windows Phones with a 5in or bigger screen received a third column of tiles on the home screen. With 8.1, that's now available to all smartphones, regardless of screen size. In Microsoft's quest to make WP the "most personal smartphone", you can now set a photo as a background on the Start screen. The live tiles become transparent and there's a parallax effect as you scroll up and down. (Non-live tiles remain opaque so obscure the wallpaper.)

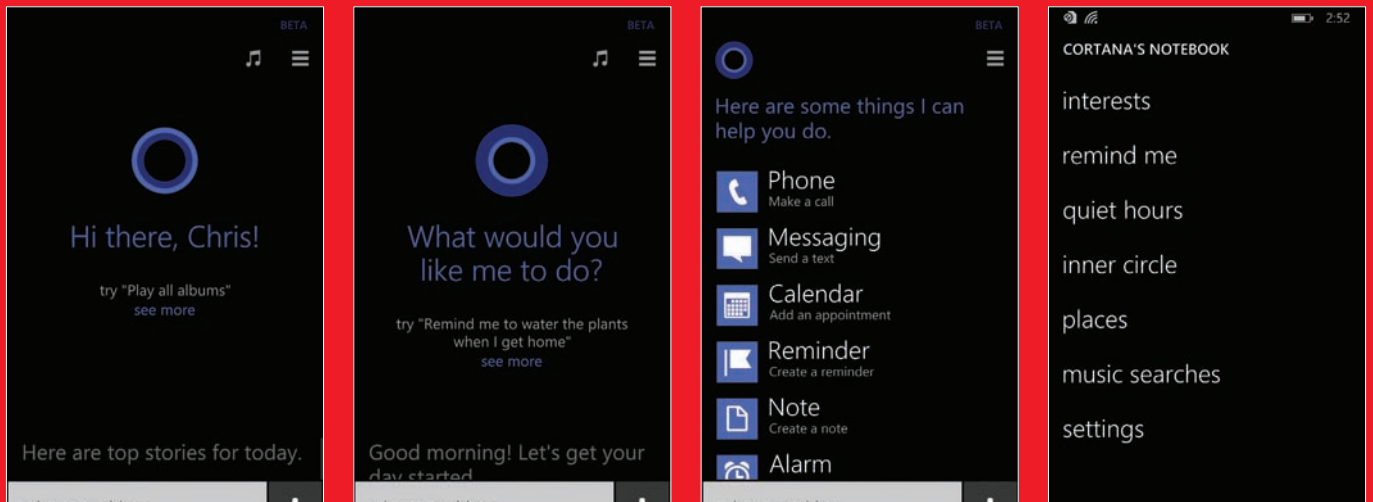


## Quiet Hours

There are, of course, times when you don't want to be disturbed and Quiet Hours is exactly like iOS's Do Not Disturb. You set the days and hours when you don't want any noise or notifications, and your Windows Phone 8.1 smartphone won't bother you.

You can create an 'inner circle' of friends and family who can 'break through' Quiet Hours, but you can also opt to allow anyone who calls twice within three minutes to also break through.





## Cortana

Although playing catch-up, Microsoft would appear to have leaptfrogged Apple with its new personal digital assistant, Cortana. Based on the AI character from Xbox game Halo and voiced by the same actress, Jen Taylor, Cortana works like Siri on the iPhone and iPad. You can also ask for things in natural language, rather than worrying about learning set phrases as you do with Siri.

It can set alarms, make calls and send texts, toggle settings on and off, give directions, play music and find local restaurants. It's also context-aware so, like Siri, you can follow one request

with another, such as "Find me the nearest pizza place" with "How long will it take to drive to the first place on the list".

You can set reminders, too, including when you arrive at a certain destination. For example, "remind me to pay my gas bill when I get home". Also, Cortana understands relationships, so you can say "remind me next time I speak to my brother to ask about the new car". The reminder will then pop up when you call, text or email that person.

If you're in a situation where you can't talk - because it's too noisy or quiet - you can simply type the request. Cortana won't

speak back to you, instead relaying the information on screen silently.

In the beta version, there's no support for sending emails. We're hoping this is remedied soon.

Cortana goes beyond Siri by keeping a detailed list of your likes and interests in a 'notebook' - akin to that of a human personal assistant. You can view what Cortana knows about you in the settings and edit it at any time. Some information it will know automatically, such as the times and locations of your meetings or forthcoming flights. Other information such as your family members or close friends

you'll have to program in, along with your interests.

Better still, Cortana gets Google Now-like capabilities, and can help you make sure you're not late for a meeting due to, say, heavy traffic.

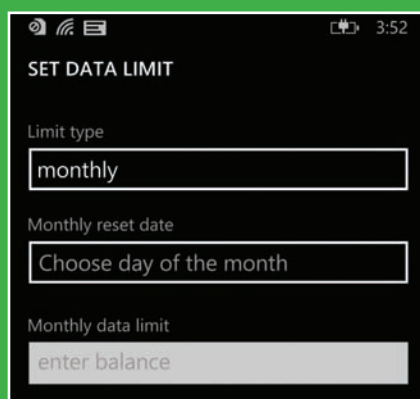
It can also work with third-party apps as well as core functions. We'll have to wait and see which apps build in Cortana support - for now, at least, Hulu is on the list for US owners.

The bad news for British Windows Phone owners is that the personal assistant won't be coming to the UK until "late 2014", so won't be included in the initial 8.1 update.

## Data, Wi-Fi and Storage Sense

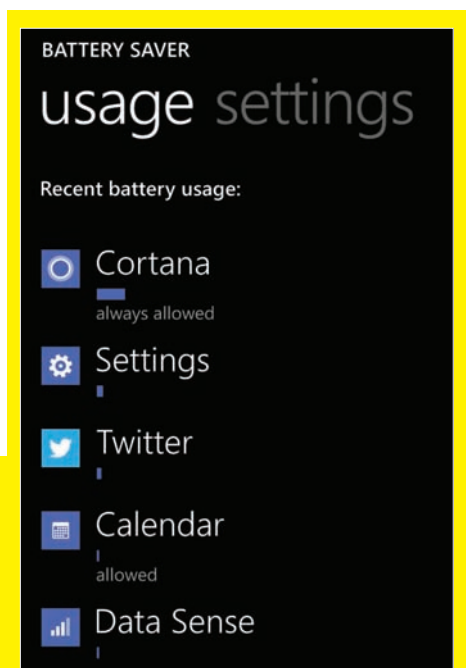
Windows Phone has always been good at helping you to stay on top of how much mobile data you're using, and Data Sense has been improved in WP 8.1. You can easily see how much of your allowance you've used, as well as which apps have eaten the most mobile data. As you approach your limit, mobile data will be limited and - where possible - Wi-Fi will be used instead. Unfortunately, Data Sense requires support from mobile operators and as of yet, no UK operators do (that we're aware of).

Wi-Fi Sense - another new feature - automatically connects you to 'good-quality, free' Wi-Fi hotspots. Plus, it will also let you connect to your Facebook, Skype and Outlook friends' secure Wi-Fi hotspots. Storage Sense completes the trio, making it easy to move content between the internal memory and SD card.



## Battery Saver

Battery Saver displays which apps are using battery power - helping you to know which ones to close when your battery is getting low. Microsoft says you can expect 24 hours' use even when there's 20 percent remaining. ☒



# Future OF Windows

If it's taken Microsoft more than a year to repair the damage caused by Windows 8, should we be hopeful for Windows 9 and beyond? David Bayon finds out

**C**oming a year after the shaky launch of Windows 8, Microsoft's first major update was more about coaxing the pitchforks out of the hands of the masses than it was about innovation and new features. Windows 8.1 duly arrived last October to patch the leakiest holes and bring back a Start button of sorts, but although it made for a better all-round experience, it also left lingering questions about the future.

Is Microsoft capable of perfecting an operating system that's equally at home on PC and tablet? Will the next big release - we'll call it Windows 9 for simplicity's sake - even have the traditional desktop at all? And was Windows 8 a necessary revolution as part of a carefully planned roadmap, or just Microsoft tripping over its laces in a dash to catch up with Apple and Google? Read on to find out.



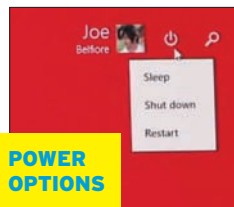


## Windows 8.1 Update

While Windows 8.1 addressed the biggest complaints, it wasn't exactly a reversal of Microsoft's touch-first approach. Sure, the familiar Start button returned, but not in the form most of us wanted - all it did was take you back into that childlike grid of app tiles that's built primarily for tablets or PCs with touchscreens. It's this element of Windows 8 that jars the most on the desktop, but there are signs that Microsoft is willing to concede some ground.

The awkwardly named Windows 8.1 Update arrived on 8 April with further concessions to keyboard and mouse users (see page 93). If no touchscreen is detected, Windows now boots directly into the desktop, and you can click the faux Start button to jump between interfaces. More of the Start screen is now mouse-friendly thanks to more useful right-click options, and it finally has an easily accessible power button in the top corner.

The taskbar - still incredibly useful for heavy desktop users - can now be accessed by hovering over the bottom edge of any app, and you can pin apps to it for easy access, just like full desktop applications. Part of the early confusion in Windows 8 lay in users accidentally firing up a full-screen app and having no idea how to get back to the desktop, which this tweak should make less likely - as will the inclusion of standard close and minimise buttons at the top of every app, again revealed by hovering the mouse pointer.



It makes it easier to treat full-screen apps as just another program to quickly and easily jump between, so it's a very welcome step forward, but it's hardly the revamp many users have been calling for and it will do little to convert the Windows 7 holdouts. So what about a more drastic reworking? What about Windows 9?

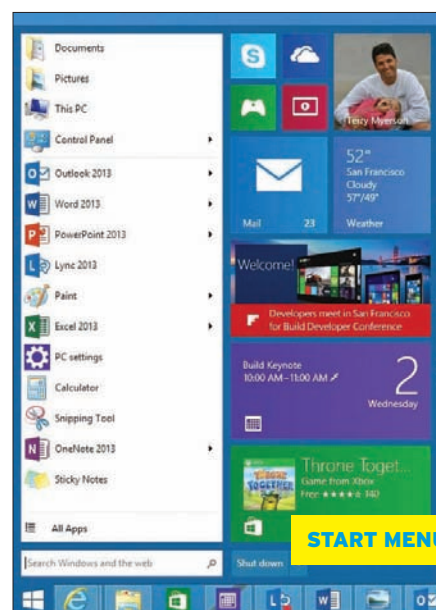
## Windows 8.2

Microsoft used its Build 2014 conference keynote to tease what's coming next. Don't get too excited: it's not Windows 9. But more tweaks are definitely in the pipeline.

The next release will move even further away from the touch-first approach, allowing users to run those full-screen apps in windowed mode on the desktop. It's a

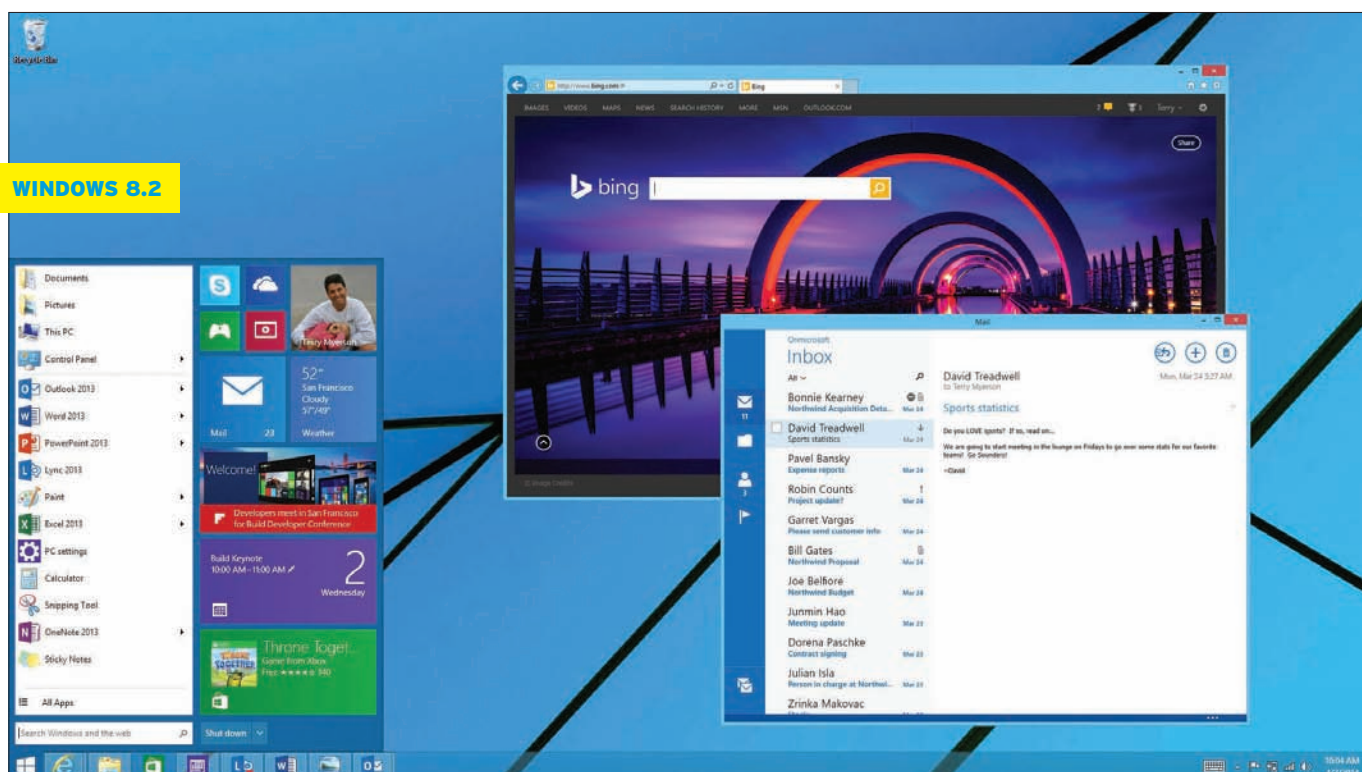
logical move, as anyone who's been forced to run full-screen apps on a 27in monitor will tell you, but it's also one nail in the coffin of that much-maligned Start screen. Combined with the reintroduction of the Start menu - which neatly

combines the Windows 7 text style with a Windows 8 tiled app section, like a mini Start screen - you almost have an admission from Microsoft that forcing people into a brash new interface was a colossal misstep.



Yet as Microsoft moves forward it's clear that Modern interface isn't going away, it's just becoming better integrated.

"We set out to do this in a thoughtful way," explains Terry Myerson, executive vice president of operating systems. "One where we could enable more productivity for customers working in desktop mode, while building smart bridges to the new modern user experience."





As Myerson reiterates, the important thing for Microsoft is driving users to try out the apps in the Windows Store, which many desktop users have largely ignored.

### App challenges

That quote highlights the issue Microsoft is still figuring out how to address: how does a company with little market share in smartphones and tablets develop an app store as popular and as lucrative as those of Apple and Google? If the company believed the solution was simply to force one on to desktop users and expect acceptance, that was quickly dispelled, and much of the past year has been spent figuring out a halfway-house approach that minimises the disruption to our daily routine.

Another announcement made at Build 2014 might help to solve that puzzle. "All of us want the same app experience across all devices," said David Treadwell, corporate vice president of operating systems, "yet today

continuing heavy investment in the cloud, it's an exciting prospect that no other platform can match. Even Apple has stopped short of merging software across iOS and OS X, despite a lot of speculation in recent years.

### Bumpy road map

Positive signs, then, but the issue for Microsoft right now isn't so much that it's still figuring out the best way to take advantage of the mobile future while retaining its huge desktop user base; it's more that the company has done so in a way that seems confused at best, and downright patronising to its longest-serving customers at worst.

Who knows if, internally at least, the long-term plan was to relegate the desktop to the background and build an all-touch future - it certainly looks as though Microsoft saw that as a possibility. Given the poor early Windows 8 take-up, and the since steady flow of desktop-focused revisions, it seems hugely unlikely that Microsoft will be so

Windows RT and Windows 8 - along with a third volume-licensed Enterprise version that's likely to double down on desktop features in a bid to win over businesses.

One intriguing possibility is that of streaming a desktop version to mobile devices from the cloud, perhaps to temporarily enable the more advanced features. Other than that, though, it's a sensible roster: Windows simply has too many users around the globe to risk tearing up the rulebook and starting over. Those hoping Windows 9 might be a drastic reimagining of the modern operating system will probably end up disappointed.

### Do we need Windows 10?

If we can't even say for sure what Windows 9 will do, there's little point in speculating beyond that - or is there? The most exciting platform of the near future might not come from Microsoft at all, although you can be sure its research and development teams



there's no easy way to create apps that work across all form factors." Microsoft's elegant solution is universal Windows apps.

Going a step further than an iOS app that can be bought once and used across iPhone and iPad, these universal apps will share around 90 percent of the same code across mobile devices, laptops and desktop PCs, and even the Xbox One console, allowing developers to build an experience that adapts to screen size and input method, and reaches a far greater potential audience.

When combined with the ability to run apps in a window, and with Microsoft's

bold and reckless in the future, particularly when you consider how many thousands of popular desktop applications would have to be recreated in app form.

No, the desktop is too entrenched to eliminate completely, which makes it more difficult to predict what form Windows 9 might take. Several inside sources have suggested it will arrive in spring 2015, and that it's currently codenamed Threshold. It's thought three versions are planned: one modern app-focused version built for consumer tablets and one traditional version that blends desktop and apps - much like

will have been glued to the news as Facebook spent \$2bn on virtual reality specialist Oculus. Previously viewed as a gaming company, Facebook's involvement raises the tantalising possibility of a whole new virtual reality platform that could change the way we interact with our computers.

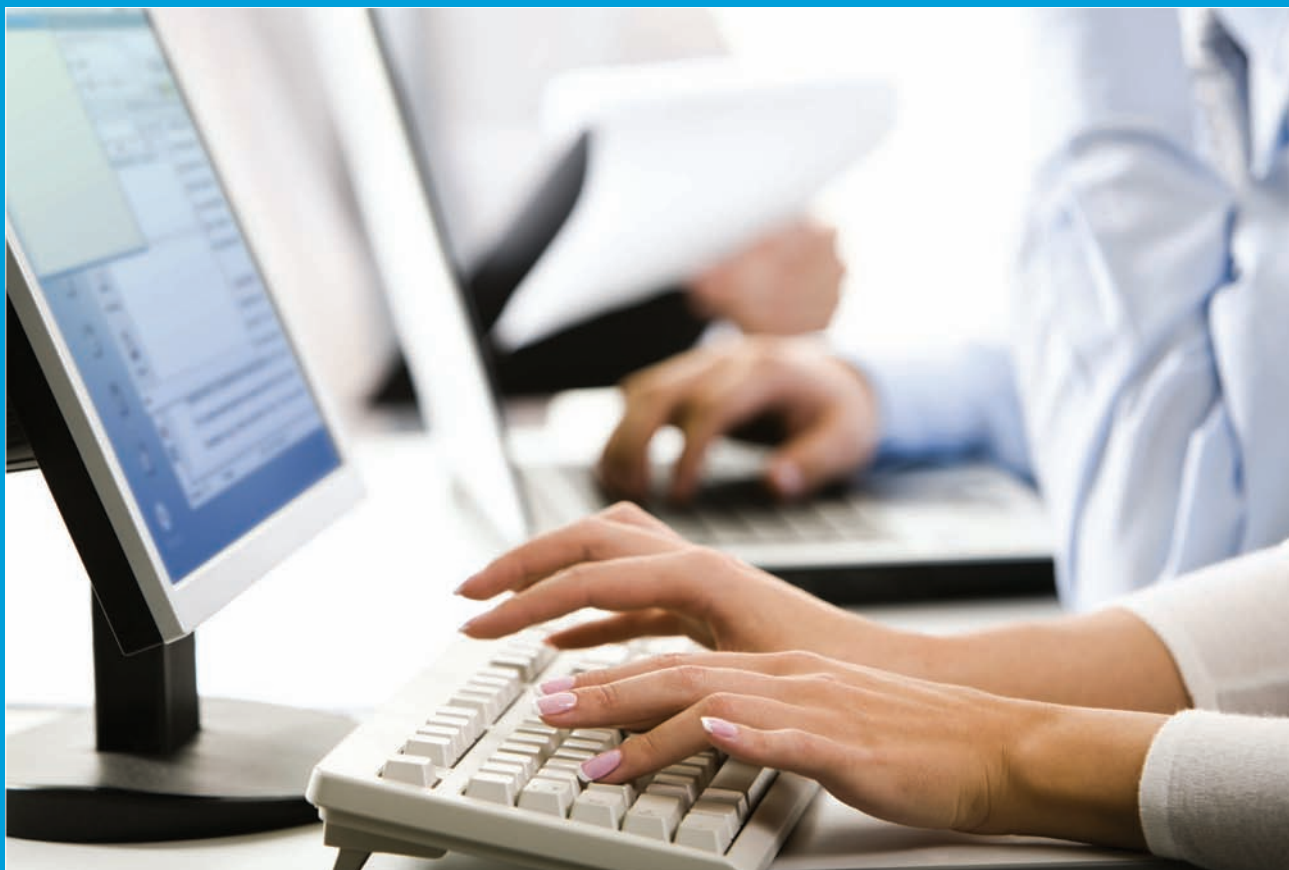
Never mind smartphone apps. Imagine making a call to a relative on the other side of the world, and being able to see them talk and gesture as if they were in the room with you. Or shopping for clothes by entering a virtual changing room and walking around yourself modelling a new outfit. The idea of being right there in the action of the next Battlefield game is hugely exciting, and the possibilities for innovation are endless. Perhaps what we're really hoping for isn't a new approach to Windows, but a new interface full stop.

As exciting as that sounds, we just can't see how a VR headset will make us more productive when typing an email or editing a macro in a spreadsheet, tasks that aren't going to go away in the near future. It looks as though there'll be plenty of room in this future for Windows 10 after all.



# Five features we want to see in Windows 9

Windows 9 may or may not arrive in 2015, but whatever does eventually emerge from Microsoft will need to address some key areas

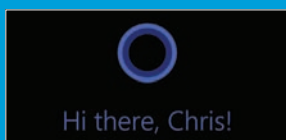


## 1 Price

Does it still make sense for users to buy Windows outright every few years? There's an argument that Microsoft should simply make its next OS freely available. A more likely scenario is a switch to offering updates as an ongoing subscription service, as has been done with Office 365.

## 2. Focus on business

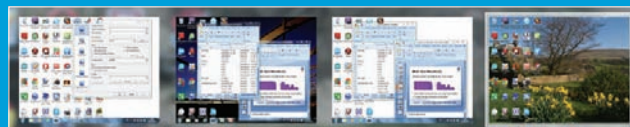
Such a change will perhaps be more palatable to businesses, which is another area that needs a lot of attention. If consumers struggled with the learning curve of Windows 8, that impact on productivity is magnified across a workforce. A stripped-down Windows 9 for business is vital - particularly with companies clinging on to the now-defunct Windows XP.



## 3. Voice recognition

Microsoft unveiled the new personal assistant - Cortana - for Windows Phone 8.1, and Xbox One users can talk to

their Kinect sensors. So how about full voice integration with Windows 9? All laptops have microphones these days, and we like the idea of donning a headset and using normal language to perform everyday asks.



## 4. Virtual desktops

Other long-awaited revisions would be welcome, including Linux-style virtual desktops, something you can do only with third-party software such as Dexpot.

## 5. Better awareness

We also want an overhaul of when and how Windows Update does its business and the ability to tell Windows it's installed on an SSD, so it can default non-vital files and applications to a larger data drive. ☑



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## YOUR QUESTIONS ANSWERED

# Expert computing advice

We tackle readers' hardware and software conundrums

### REMOTE CONTROL MONITOR

**Q** I use Microsoft's Remote Desktop application to connect to my laptop (running Windows 7) from my main Windows 8.1 PC and use it as though I were sitting in front of it. This is because my main PC has two full HD monitors attached and I like to use the extra screen space.

This worked fine with my old laptop, but since I replaced it, I can only make the session maximise to one screen. How can I make my remote connection use both of my PC monitors?

You can configure your remote desktop session to use all your local monitors. This isn't limited to just two and you can use a combination of screens in various orientations and with different resolutions.

To enable this option, click on 'Show Options' at the bottom of the initial Remote Desktop Connection dialog box and then select the Display tab. Underneath the display size slider, tick the box marked 'Use all my monitors for the remote session', which will automatically select full screen mode for you.

Now when you connect, all your local monitors should be utilised for the remote connection, and it will appear as though your local monitors were all attached simultaneously to the laptop.

There is, however, a catch - Microsoft has limited this multiscreen mode to certain versions of its operating system. While

Windows 7 Ultimate supports the multimonitor feature, Windows 7 Pro doesn't. Furthermore, both sides of the connection need to be running a supported operating system, which means Ultimate or Enterprise versions for Windows 7. Thankfully, Microsoft has included the feature in Windows 8 Pro, so you should find that if you update your laptop from Windows 7 Pro to 8 Pro, the feature will become available.

### WEB CONNECTION

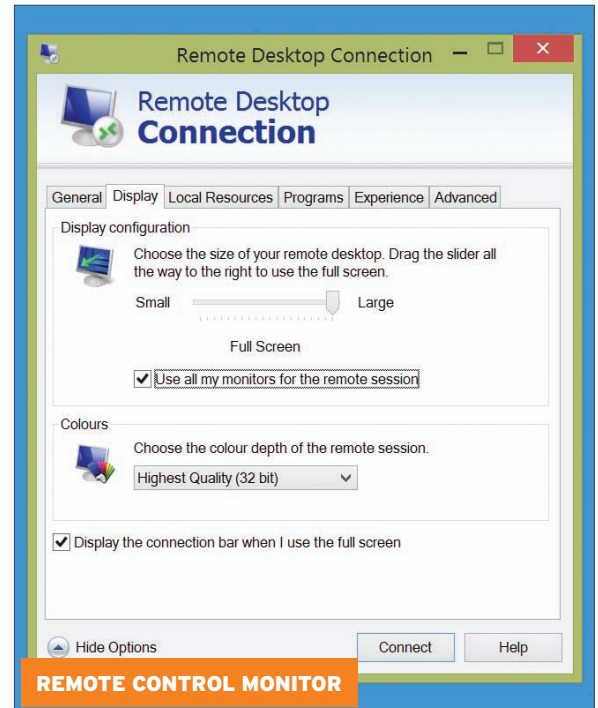
**Q** I have a new Windows 8.1 laptop, which I use plugged into a wired network for internet access. I would like to share this wired connection with my phone and tablet via Wi-Fi.

This used to be easy on my old Windows 7 laptop, where I could simply set up the connection using the new connection option in the Network and Sharing Center, but I can't find the option on Windows 8.1. Can you help?

The method of setting this up under Windows 8.1 is different, but still possible. If you want an easy life, you could download a freeware utility such as Virtual Router ([tinyurl.com/yLJcemu](http://tinyurl.com/yLJcemu)) to set it up for you, which will provide you with a dialog-driven interface to set up connection sharing for you.

Alternatively, you can use commands built in to Windows 8.1 to share the connection without the need for additional software. Open up a command prompt with Administrator access by typing **Windows+x** and then selecting Command Prompt (Admin).

In this window, you'll need to type the following command to create a hosted wireless network to which your other devices can connect:



```
netsh wlan set hostednetwork  
ssid=MYNETWORKNAME key=MYPASSWORD
```

Replace **MYNETWORKNAME** with the chosen name for your wireless network as it will appear to other devices when they scan for networks. You'll also need to substitute **MYPASSWORD** with your chosen password to join your network. It can't be blank as WPA2 encryption is enforced as part of the setup.

Next, start the network with the following command:

```
netsh wlan start hostednetwork
```

This should cause your new wireless network to become visible to your other devices, enabling them to connect using your specified password.

To enable these devices to access the internet connection on your laptop, you'll need to share it with your new wireless network. Go to the Windows control panel and click on Network and Sharing Center. Find the entry for your wired internet connection, click it and then click on the properties button near the bottom.

Select the Sharing tab and tick the box marked 'Allow other network users to connect through this computer's internet connection'. In the drop-down menu under







'Home networking connection', choose the name of the wireless connection you created earlier and click OK.

If you want to turn off your shared connection, you can open an Administrator command prompt and type: **netsh wlan stop hostednetwork**

## CHANGE A LAPTOP'S BATTERY

**Q** The battery life on my laptop seems to be much worse than it was originally. I've had it plugged into the mains and turned on all day and night pretty much since I bought it, but sometimes I do take it out with me and it does seem to be considerably worse than when I bought it. I know that the battery life will vary depending on what I run on it, but how can I tell

### whether it's a software issue or a problem with the battery?

Since Windows 8, there's been a battery usage and performance report built into the operating system. You can use this to measure the capacity of your battery compared to its 'design capacity', which is the capacity you should expect from a brand new battery of the type you're using. This capacity is usually rated in Watt Hours (Wh) and is a statistic we quote in all our laptop reviews. With use, the actual capacity of your battery in Wh will decline until it needs to be replaced.

The battery capacity history function, built into Windows 8, will compare your battery's actual capacity against the design capacity over a period of time, so you can

see how well it is performing. If the measured capacity has dropped significantly, it's probably time to buy a new battery.

It's also worth noting that leaving a laptop plugged in and turned on for extended periods can cause the battery to deteriorate more quickly. We'd actually recommend taking it out and putting it back in when you need it (allowing enough time to ensure it's fully charged).

To generate a battery report, open up a command prompt by pressing Windows+X and selecting 'command prompt'.

At the command prompt, type:  
**powercfg /batteryreport /output MYFOLDER\mybatteryreport.html**  
(Where **MYFOLDER** is the full path name to the folder where you would like to save the report.)

Continues >>

# CONNECT TO A PC USING WINDOWS REMOTE DESKTOP

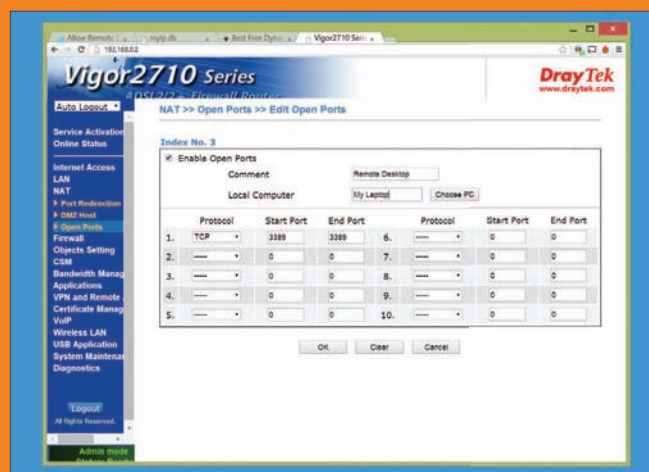
The Windows Remote Desktop feature is a great way of using a remote Windows PC as though you were sitting in front of it. While there are services you can sign up to, such as TeamViewer or LogMeIn, which provide excellent remote access solutions, the ability to be controlled remotely by Windows Remote Desktop has been built in to the Pro, Business, Ultimate and Enterprise editions of Microsoft's operating system since Windows XP, and doesn't require access to third-party servers.

On a local network, it's easy to connect to a remote PC - type its name or IP address into the Remote Desktop Connection box. But when you're trying to connect to your remote PC via the internet, things get a little more complicated.

First, make sure the Windows firewall isn't blocking Remote Desktop. You can check this by opening up the Windows Firewall section of the Control Panel and selecting Allow apps to communicate through Windows Firewall. Scroll down and make sure that there's a tick next to Remote Desktop.

Next, you'll need to make a few configuration changes to the router where the PC to which you wish to connect is located. This is usually done by connecting to the router via your web browser, using the IP address of your local gateway as the address. You can find this by opening a command prompt and typing **ipconfig**. This will also give you the IP address of the PC you need to connect to. Locate your router's port forwarding options and forward TCP port 3389 to the IP address of the PC to which you want to connect.

You need to know the external IP address of the PC to be accessed. To do this, open up a web browser on that PC and browse to a service such as [myip.dk](http://myip.dk). This will tell you the address



you need to type in to the Remote Desktop Connection dialog box when you want to connect to your PC via the internet. In many cases, this external IP address is subject to change. To avoid having to rediscover the address every time it changes, subscribe to a dynamic DNS service such as [no-ip.com](http://no-ip.com). This will give you a memorable domain name to which you can connect, and will keep track of any changes to your external IP address. Many routers have built-in support for dynamic DNS, so have a look in your manual and select one of the services supported by your router.

You should now be able to connect to your remote PC both from your local network and via the internet.

Now press Enter. This will create an HTML file called mybatteryreport.html, which you can read in your favourite browser. Note, this only works on devices fitted with a battery. Try it on a desktop computer and you'll just get an error message.

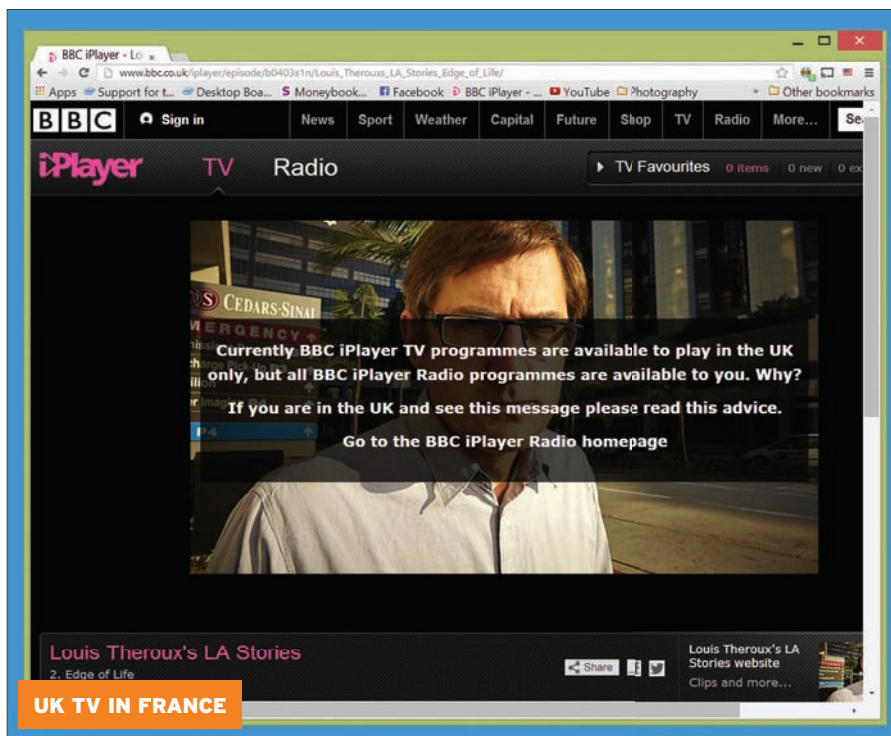
## UK TV IN FRANCE

**Q** As an ex-pat in France, I've been enjoying UK TV broadcasts via satellite. However, since replacing this with a dish with less range, I'm looking for a new method of receiving live UK television. The choice seems to be between buying a very large satellite dish or trying to find another method altogether. Would the Google Chromecast work or perhaps Sky Now TV? Millions of ex-pats await a solution.

The issue here is that several channels, including many from the BBC and Sky, have moved broadcasts to a new satellite, Astra 2E, with a much narrower range of coverage focused more tightly on the UK. This means many European viewers who were within range of the previous satellite, Astra 1N, can no longer receive the broadcasts.

Given enough effort, know-how and a degree of willingness to break the rules, there are ways to get around such restrictions when it comes to internet-based TV; however, the Google Chromecast alone will not solve your problem.

The Chromecast allows you to 'cast' content from your desktop or mobile device on to your TV or monitor over Wi-Fi, but you'll have to have access to the content from your home network in the first place.



Apps such as BBC iPlayer won't run in France without plenty of questionable network tinkering, so you won't be able to send its programs to a Chromecast.

Similarly, Sky's Now TV offering is set up to function in the UK only, so you won't be able to take out a subscription to the service and view the content from France. So if you're travelling away from the UK or moving away permanently, you'll need to find a different method of accessing UK TV.

If you have a family member or friend living in the UK, you could try talking them into

installing a Slingbox (slingbox.com) this would let you view TV content available to them remotely on your own television. Legally, this would have to be your own Slingbox connected only to services to which you yourself subscribe as sharing someone else's subscriptions in this way would violate licensing agreements.

You could also try an application such as Hola (hola.org), which offers many unblocking options for geo-blocked internet services and works on PCs and mobile devices. Alternatively, there are a variety of

online offerings for ex-pats wanting to access geo-blocked content. And a quick internet search will reveal many, although their legal status and picture quality are often questionable.

It's worth checking exactly how big a dish you would require to receive your favourite channels, as it may be smaller than you think. Much of France is still able to receive the BBC with a 1m dish and there have been reports that simply giving an existing dish a good clean has been enough.

## CONNECT MULTIPLE MONITORS

**Q** I would like to add an extra display to my laptop, which already has an external monitor attached. I've heard that it's possible to connect more than one monitor to a single DisplayPort connector by 'daisy chaining' them, but I can't find this feature on my existing display. Is there anything I can do, or will I need to replace my monitor?

It's still possible to connect multiple monitors, even without the daisy chaining feature, with a little extra hardware. First, your laptop will need to support DisplayPort in Multi-Stream Transport (MST) mode, if this is the case, then you can use a device such as Club 3D's (club-3d.com) MST Hub to 'split' a single DisplayPort connection on your laptop into three individual DisplayPort sockets, each of which can then have its own monitor attached.

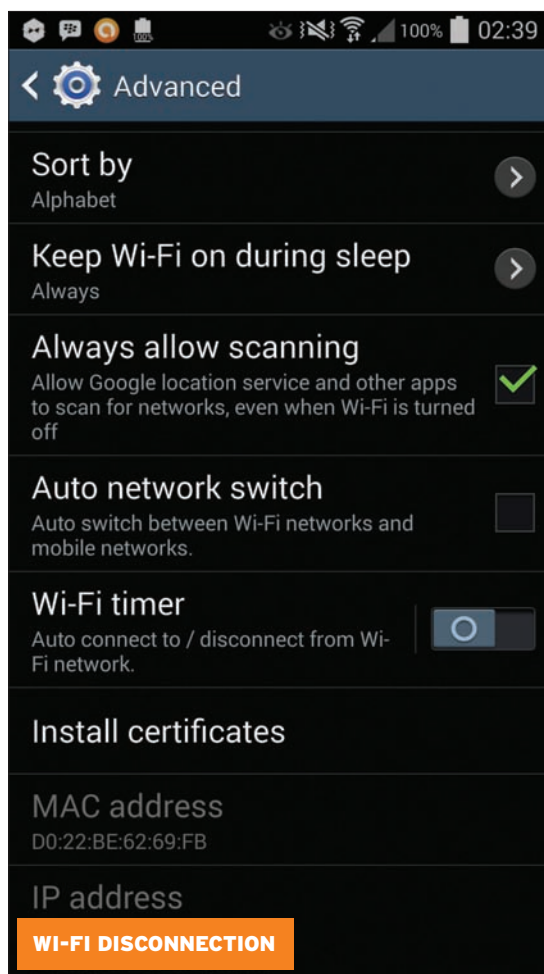
The advantage of this approach is that you'll be able to hook up your additional monitors with just a single cable connecting to your laptop.



## CONNECT MULTIPLE MONITORS







If your computer doesn't support MST, then you could use a device such as Matrox's DualHead2Go SE ([tinyurl.com/q7qf3ye](http://tinyurl.com/q7qf3ye)), which takes a single DisplayPort connection and splits it into a pair of DVI ports. This approach requires special

software to manage your displays as they will appear to your laptop as a single ultra-wide display rather than as individual displays which can be managed by Windows.

### WI-FI DISCONNECTION

**Q** I've used an Eye-Fi card to transfer photos from a camera to my phone as I take them, so I can upload them directly to Facebook and Instagram. This all worked flawlessly until I upgraded to a Samsung Galaxy Note 3.

Now, the transfer works as before, but the Wi-Fi link keeps disconnecting and reconnecting all the time, which really slows down transfers. Can you suggest what might be wrong here?

This is often caused when the phone decides that your Wi-Fi link isn't good enough and automatically goes looking for a better connection. This is based not only on signal strength, but also the stability of your internet connection. When your phone is connected to your camera, there is no internet connection at all, which causes the phone to reject the connection due to poor internet performance. This is based on the rather rash assumption that all Wi-Fi connections are to be used for connecting to the internet.

Thankfully, you can disable this feature quite easily by disabling an option in the advanced Wi-Fi settings on your phone.

Go to your phone's Settings, then select Connections, followed by Wi-Fi. Now enter the advanced menu by tapping your phone's menu button and selecting 'Advanced'. In this section, make sure 'Auto network switch' is turned off.

Other handsets may have slightly differently named options. Look for 'Check for internet service' or 'Avoid poor networks' and make sure that these are also disabled. The phone should no-longer unnecessarily drop the connection to your camera.

### MOVING PROGRAMS

**Q** I recently installed a solid-state drive to replace my existing hard drive, which I then decided to keep as a secondary storage drive. I've cloned the existing drive on the SSD, but it's much smaller than the HDD and there's now not much space left.

Can I move my installed programs over to the secondary hard drive by moving the program files folders, such as Program Files, Program Files (x86), and so on, onto the other drive? Can I just drag and drop them, and then replace my desktop shortcuts with new ones pointing to their new locations?

The short answer is no, you can't do this. Program installation on Windows is normally much more complicated than this. While there are some programs that can simply be run from any folder, the vast majority store important data about file locations in the Windows Registry and all of this information

Continues >>

## TECH JARGON BUSTER

**ANDROID WEAR:** This specialised version of the Android operating has been redesigned specifically for use in wearable technology such as smartwatches.

**CLEARTYPE:** ClearType is Microsoft's technology for improving the appearance of screen fonts on LCD displays. It uses subpixel rendering to reduce the appearance of jagged edges and increase apparent resolution, but introduces subtle levels of colour fringing to which some users are more sensitive than others. Windows includes a tuning application to adjust ClearType settings to match the user's preference.

**IGZO:** Indium gallium zinc oxide or IGZO, is a transparent semiconducting material

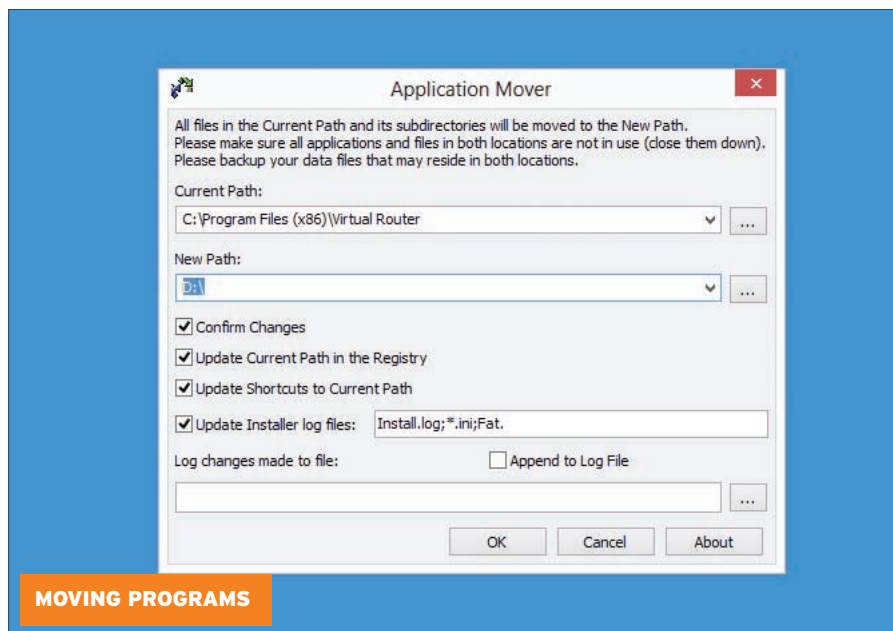
used in the production of transistors that drive LCD displays. IGZO transistors are more efficient and smaller than previous technologies, thereby allowing for lower power consumption and higher-resolutions in displays found in devices such as the iPad Air and 4K desktop monitors.

**MULTI-STREAM TRANSPORT** Version 1.2 of the DisplayPort display interface allows for a single physical DisplayPort connector to drive up to three individual monitors. This mode of operation is known as Multi-Stream Transport or MST. To use this mode, both the graphics adaptor and the display device must support the function. Alternatively, you can use an MST hub to split the multi-stream output from a DisplayPort 1.2 graphics card into

single-streams on individual connectors, each of which can supply a single monitor.

**SUBPIXEL:** Most digital colour displays create images from a grid of pixels, each of which can typically display any of a palette of around 16 million colours. Every pixel is constructed from three smaller elements, known as subpixels. These supply varying intensities of one of the primary colours red, green and blue which the eye blends together due to their small size.

**WEBRTC:** WebRTC or Web Real-Time Communication is a technology designed to enable multimedia communications from one web browser directly to another. Applications include file transfers, voice and video communications.



#### MOVING PROGRAMS

would also need to be updated to point to the new file locations once you have moved the program files over.

Unfortunately, Windows doesn't provide a function to relocate installed software for you. While you could painstakingly move all the relevant files and edit the Registry entries, the only guaranteed way of ending up with a fully working installation after the move is to uninstall your applications and then reinstall them on the secondary drive.

This will often involve selecting the Custom install option rather than the Express mode, which will then allow you to decide where you would like the software to be installed.

However this can become tedious very quickly, especially if you have a large number of applications to move. You'll probably have to reconfigure all the applications again, too, with all your preferences and settings. If you want to avoid this, you can try using a program moving utility such as Application Mover ([tinyurl.com/ojhgg3j](http://tinyurl.com/ojhgg3j)) or Steam Mover ([tinyurl.com/orbmqqwe](http://tinyurl.com/orbmqqwe)), which was originally designed for moving games installed using the Steam system, but works just as well for other applications, too.

As always, use these programs at your own risk and do make sure you have an up-to-date backup before you start. ☒

## CONTACT US



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Always back up your system before you make any changes, including software installations.

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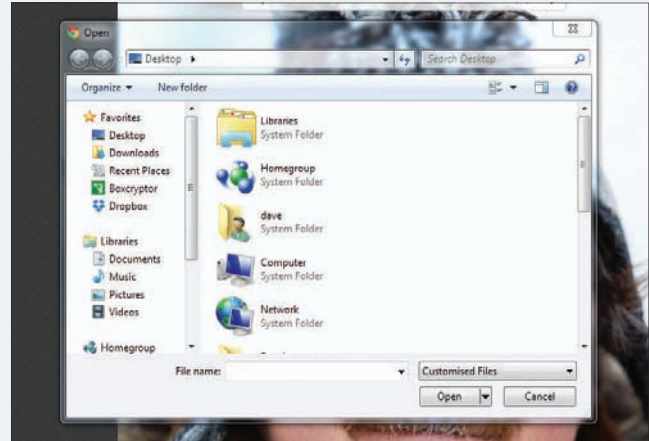
# Edit images online



PicMonkey lets you produce high-quality edited versions of your images right from your browser – no download required. Dave Stevenson explains how

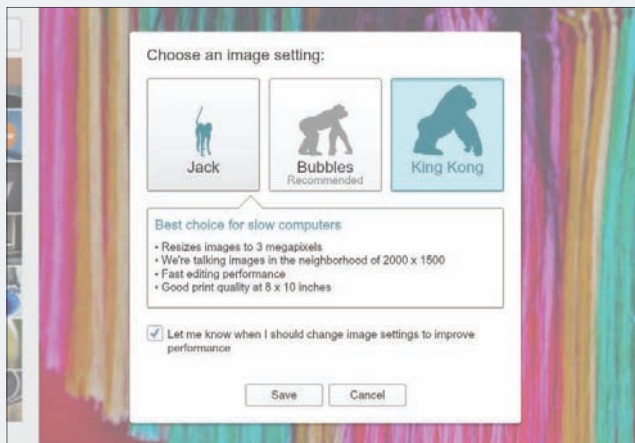
Photoshop might be the gold standard for editing images, but it has far more features than the average user needs. There's also the fact it will considerably lighten your wallet.

Fortunately, there are alternatives, and one of the best is PicMonkey ([picmonkey.com](http://picmonkey.com)). Not content with offering a great range of powerful image-editing tools in a user-friendly interface, it's free (albeit with ads), and browser-based. That means a lot of the computational legwork is done by PicMonkey's servers, allowing you to edit high-resolution images without needing a high-end PC or laptop. Plus, because it's web-based, you can access and edit shots on any PC.

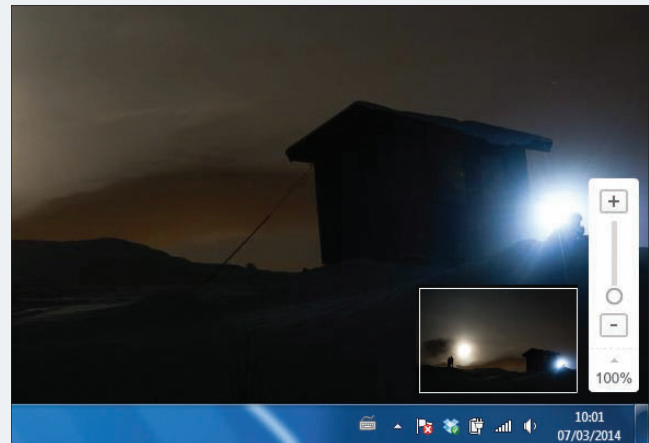


**START**

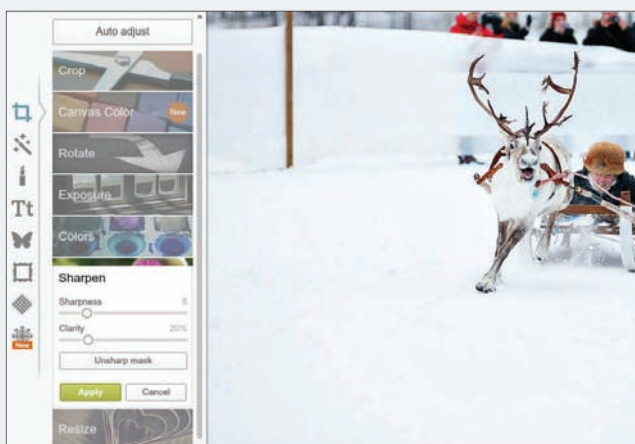
On the homepage, hover over the Edit icon at the top of the screen. A box appears underneath, giving you the option of loading an image from Facebook, Dropbox or Flickr; you can also choose an image stored on your PC.



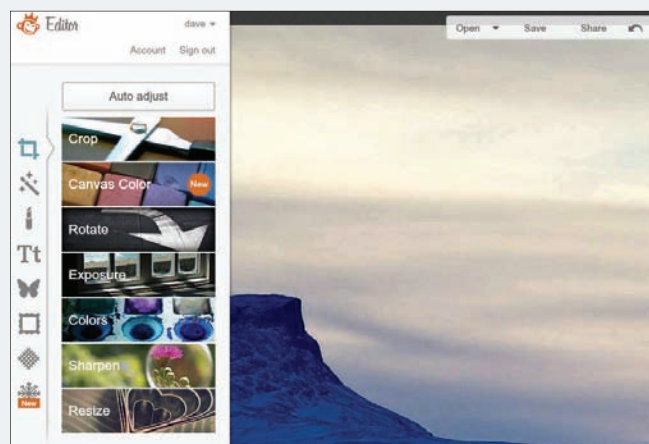
**2** The next screen you'll see is a big preview of your image, but for now we'll investigate the settings menu. From here, you can decide what resolution your image will have. The largest possible file is 4000x4000.



**3** The magnifying glass icon in the lower right-hand corner brings up a slider that lets you zoom in and out. You can also press Ctrl and + together to zoom in, or Ctrl and - to zoom out.

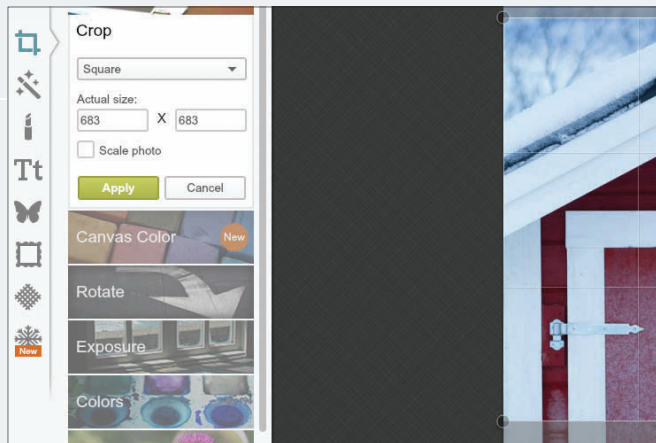


**4** Editing tools are in the left-hand toolbar. These are grouped: the first set of tools is for basic editing such as correcting exposure, adding sharpening or rotating your images. It's best to zoom in on your image before using sharpening.

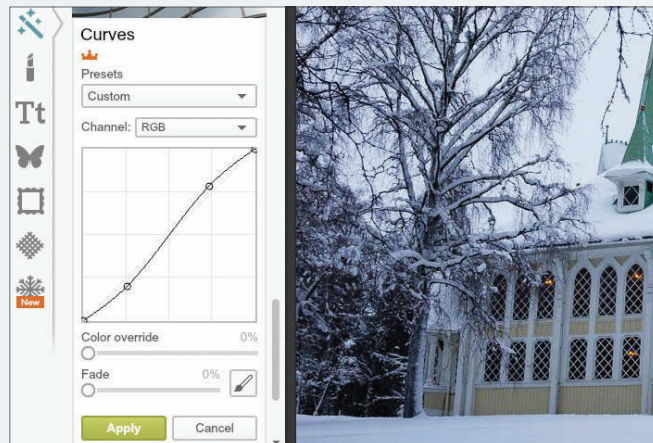


**5** If you're after an instant fix for your image, hit Auto adjust at the top. This boosts contrast and saturation in your images, and is perfect if you fancy some quick-fire photographic improvement with minimal effort.

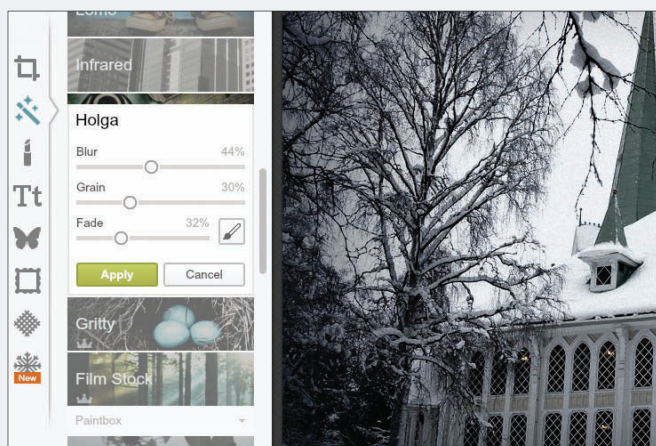




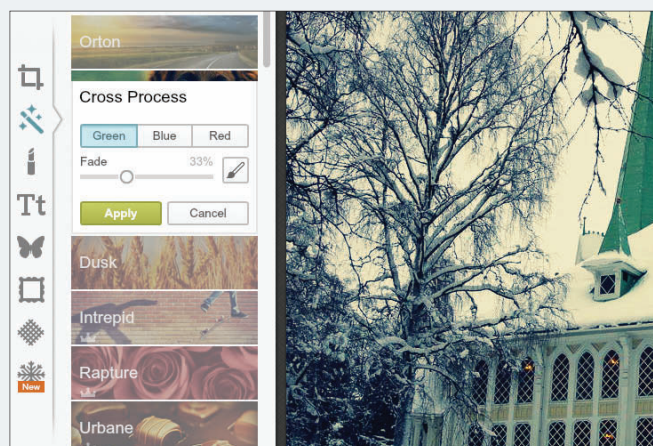
**6** To choose a new crop for an image, select Crop in the menu bar and click and drag any of the four corners to produce a new composition. You can lock the aspect ratio using the drop-down box at the top.



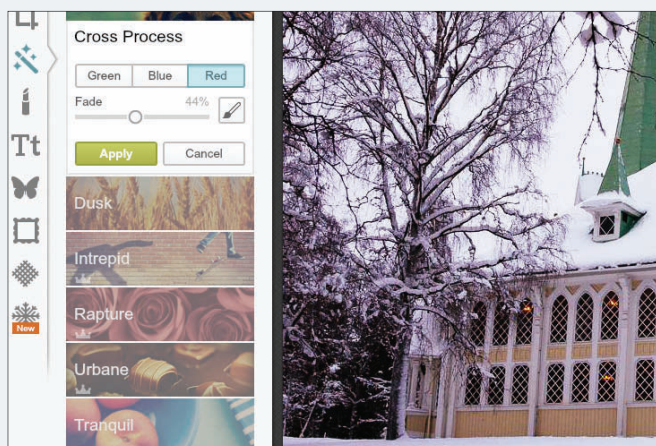
**7** A crown icon on a tool means the effect is reserved for PicMonkey's 'Royale' users. This premium version costs \$4.99 (£3) per month, or \$33 (£20) for the year. It also removes PicMonkey's adverts.



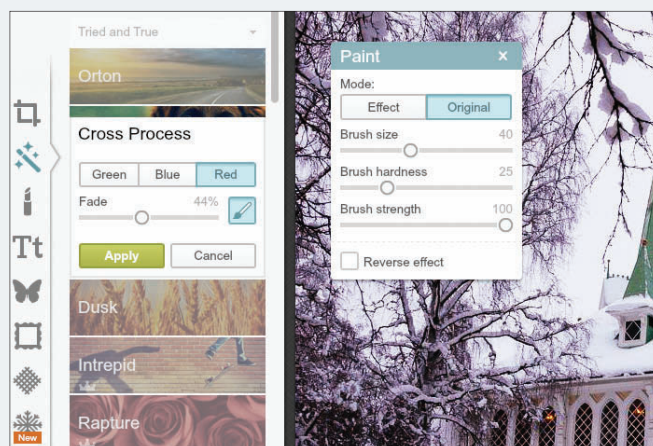
**8** The most interesting tools are in the Effects toolbar. This contains a host of one-click effects such as cross-processing, vignettes and HDR, as well as advanced settings that will be familiar to Photoshop users such as curves (which is only for paying users).



**9** Choose Cross Process. Cross processing is an artefact from film, and produces classic-looking images at the click of a mouse without resorting to hackneyed sepia effects. Clicking Cross Process will give you a live preview of how your image will look.

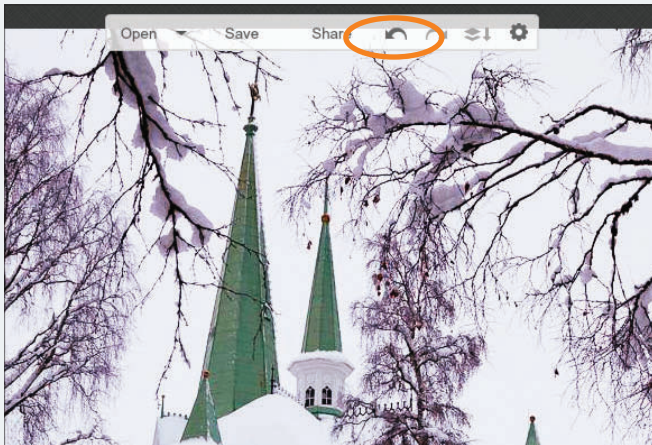


**10** Most of PicMonkey's tools can be modified. Here, the Fade slider adjusts the strength of the effect on the image - slide it to the right to reduce the effect and vice versa. You also get three popular colour treatments for cross-processing.

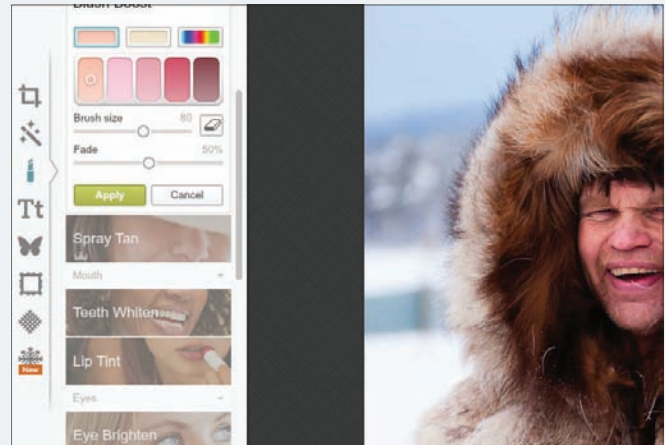


**11** The paintbrush icon lets you apply localised effects to your images, painting on your required settings rather than having an effect applied globally. Clicking on Effect or Original determines whether you're painting on your new effect or scrubbing it off.

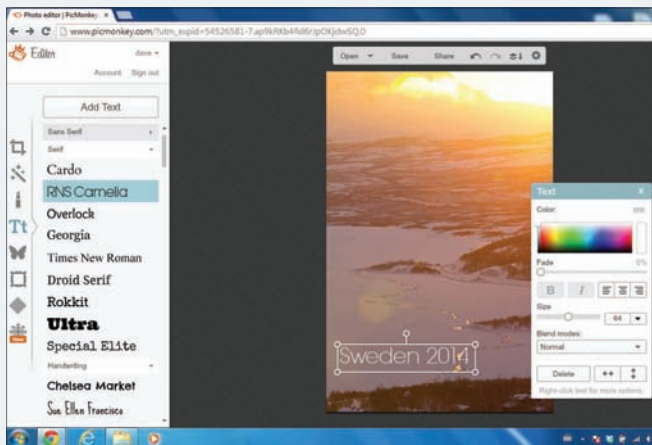




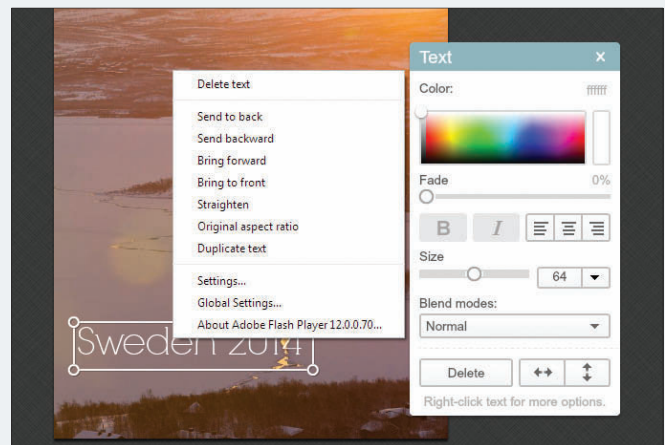
**12** If you change your mind over an edit, the toolbar above your image has an undo icon, but Windows' default keyboard shortcuts work, too, allowing you to hit Ctrl-Z to step backwards through your edits.



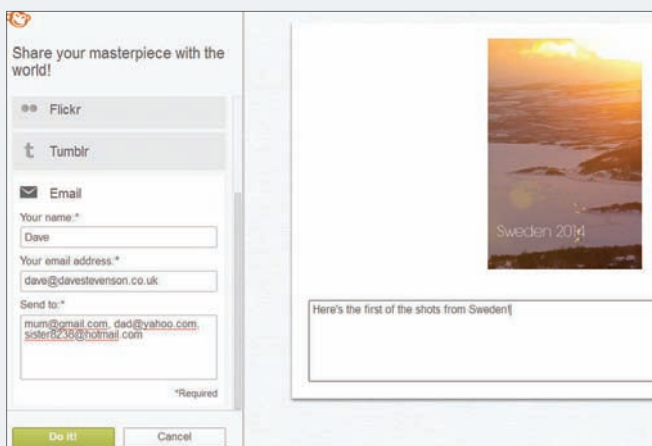
**13** Click the Touch Up icon (the small lipstick) for a range of tools designed for portraiture. Many options are merely standard tools but the descriptive nomenclature makes life easier; Eye Brighten, for example, adds local contrast and boosts exposure.



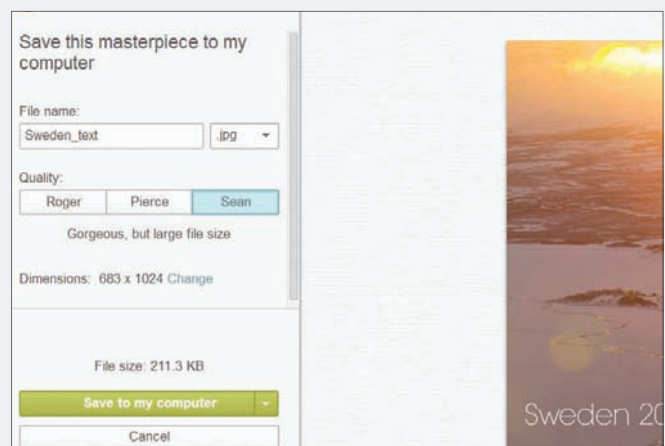
**14** PicMonkey has a range of fonts for text. Click the icon, choose a font and click Add Text. Clicking a corner of the box changes text size, and the handle at the top of the box manages rotation.



**15** Text, Overlays (the butterfly icon) and objects from the Themes menu are added as layers, and can be edited and moved until your image is saved. You can also right-click and choose which objects are on top using the 'Bring' and Send' options.



**16** You can export images to the usual social media sites. Click 'Share' at the top of the screen and you'll find links to connect your account, as well the option to email images complete with a caption or comment.



**17** Click Save at the top of the screen and you can save an image to your PC as a lossless PNG file or a compressed JPEG. If you opt for JPEG you can choose from three compression levels. ☐



## Ensure that your printer runs smoothly

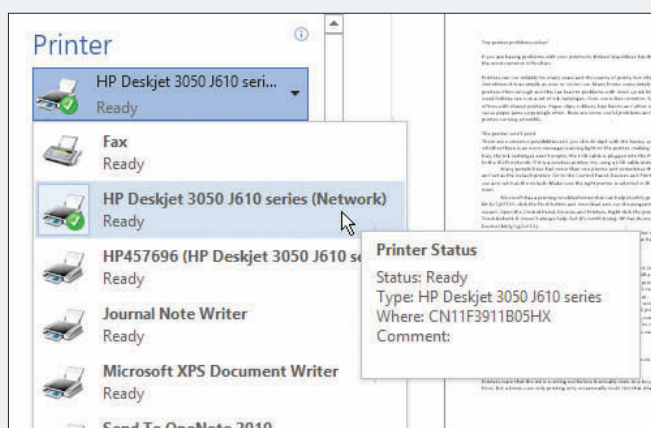


If you are having problems with your printing, Roland Waddilove has the solution. Here are solutions to some of the most common difficulties

Printers can run reliably for many years and thousands of prints, but often they don't. Why is this? Sometimes it can be as simple as over- or underuse. Many home users simply don't use their

inkjet printers often enough and this can lead to problems with dried up ink blocking the nozzles. Even a two-week holiday can ruin a set of ink cartridges. Overuse is a less common problem, but it can happen in busy offices with shared printers. Paper clips, erasers, hair bands and other objects fall into printers and cause paper jams surprisingly often.

Here are some common problems and useful solutions to ensure that your printer will run smoothly.



Make sure that the correct printer is **SET AS THE DEFAULT**

### THE PRINTER WON'T PRINT

There are numerous possibilities, so start with the basics, such as checking to see whether there's an error message/warning light on the printer, making sure that there's paper in the tray, the ink

cartridges aren't empty, the USB cable is plugged in or the printer is connected to the Wi-Fi network. If it's a wireless printer, try using a USB cable instead. Sometimes old printer drivers are still installed and set as the default printer. Open the Control Panel, Devices and Printers, right-click the correct printer and set it as the default. Make sure the correct printer is selected in the program from which you are printing.

Microsoft has a printing troubleshooter ([tinyurl.com/poqLk7h](http://tinyurl.com/poqLk7h)) that can help to identify problems. Click the Fix it button, download and run the program, then follow the steps in the wizard. You can also open the Control Panel, Devices and Printers, right-click the printer icon and select Troubleshoot. It doesn't always help, but it's worth trying. HP has an HP Print and Scan Doctor ([tinyurl.com/pa674kk](http://tinyurl.com/pa674kk)) to identify problems, while Canon has lots of great videos on its website ([tinyurl.com/p98ng92](http://tinyurl.com/p98ng92)) - click your printer model and then click the Troubleshooting videos link.

### I CAN'T PRINT FROM A MOBILE DEVICE

To print from an iPad, iPhone or iPod touch, the printer must be wireless and support AirPrint. The list of AirPrint printers is growing ([tinyurl.com/297b8ge](http://tinyurl.com/297b8ge)), but there are still a lot of printers, particularly older models, that don't support it. If you have an





A few printers support **GOOGLE CLOUD PRINT** directly

Apple Mac with a printer attached, you can turn it into an AirPrint printer using HandyPrint ([tinyurl.com/kdao4vm](http://tinyurl.com/kdao4vm)). Printer Pro (£4.99, [tinyurl.com/pvkfyxw](http://tinyurl.com/pvkfyxw)) is an app for iOS devices that enables them to print to many wireless printers or a wired one attached to a PC or Mac.

Some Samsung phones, tablets and printers are designed to work together and printing is straightforward. To print from any Android phone or tablet to any PC printer you can use Google Cloud Print. Install it on the mobile device from the Google Play store. Next, using Google Chrome on your PC, go to the menu, Settings, Advanced Settings and click Manage. You can then add the printer attached to the PC. Provided the PC and printer are switched on, you can print from the Android device.

### MY PRINTER TELLS ME TO REPLACE THE CARTRIDGE

Printers warn that the ink is running out before it actually does. In a busy office it might run dry in an hour, but a home user only printing only occasionally could find that it lasts another couple of months. Order new cartridges as soon as the message appears, but don't install them until it either stops printing or the colours fade.



**IGNORE MESSAGES** to replace cartridges and keep on printing

### THE WEB PAGE WON'T PRINT PROPERLY

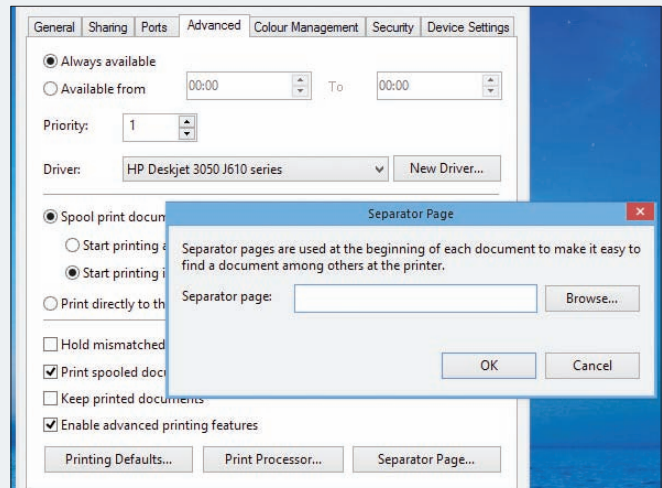
Web pages can be any size and they aren't limited by the width or height of the paper in your printer. They often aren't designed to be printed, which is why problems can occur. Always choose the Print Preview option in your browser so you can see what you'll get. You might not need all the pages, for example, if there are lots of comments or adverts, so use the option when printing to select the

pages to print, such as 2-4 to print pages 2 to 4. Choose landscape mode if the web page is very wide.

Internet Explorer offers a shrink-to-fit option that helps when pages are just a bit too big to fit on the page. Some pages, such as those with coupons, have a print button within the web page. Use that and not the print menu in the browser.

### A BLANK SHEET IS EJECTED EVERY TIME I PRINT

This is a useful feature in offices where a printer is shared among many people and it separates one print job from another. It's just irritating if you are the only user. Open Devices and Printers in the Control Panel, right-click the printer and select Printing



Do you need to have a **SEPARATOR PAGE** between print jobs?

Preferences. If you can't see an option to enable/disable separator pages, right-click the printer and select Properties or double-click it. With HP, for example, you double-click the icon, double-click Customise your printer, and then select the Advanced tab. There's a Separator button to configure the option.

### THE PAPER GETS STUCK IN THE PRINTER

When this continually happens, a small shred of paper may be stuck somewhere in the paper feed mechanism. Take the paper out of the tray, open all the flaps and look inside. You might need a torch to see the paper and long tweezers to reach it, which can sometimes be small and hard to see. Look underneath the printer because there may be an access panel that can be removed to examine and clean the paper feed mechanism. Old paper can absorb moisture, which makes it stick and then it is pulled through two or more sheets at a time. Keep it in a bag until it is needed.

### PRINTING IS POOR QUALITY

The nozzles on inkjet printer heads can become blocked causing horizontal streaks on prints and poor or wrong colours. Cleaning the print heads can solve the problem. The procedure varies from printer to printer and there may be an option on the printer control panel or in the printer software on the computer. You might need to look this up in the manual. With an HP inkjet, for example, there's a Start screen app for Windows 8 users and this has a Maintenance button. Click it and you can clean the print heads or align them. Head cleaning kits are available, although you should compare it to the cost of a new cartridge.

The type of paper affects the print quality and photocopier paper might not do. It's too absorbent and inkjet ink soaks into it like blotting paper. Buy good quality paper. ☒



## Build your own wireless streaming system



If you've got an old pair of speakers they needn't sit gathering dust. Chris Martin reveals how to turn any speakers into a wireless streaming system

You don't need to put those old speakers you've got on eBay; why not create a wireless streaming system out of them with a Sonos Connect:Amp (£399, [tinyurl.com/oper5gj](http://tinyurl.com/oper5gj))? If your speakers

are passive, or non-powered, then this is just the piece of kit you need. If they're powered, or active, or you have an amplifier already, then you just need the Connect (£279).

After you've followed our guide you'll be able to wirelessly stream music through your speakers from a wide range of sources. You can play music stored on your PC, iOS or Android device, scores of online radio services, Spotify if you have a premium account, and others such as Amazon Cloud Player.



**START**

Unbox your Sonos Connect:Amp and plug it into a power socket. You don't need to switch it on just yet.

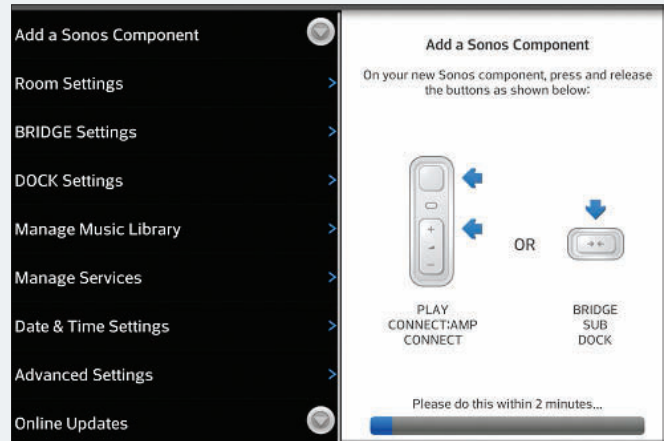


**2**

Place your speakers close enough to the Amp so you can connect them with cables. Turn the Amp on and add it to your Sonos system. Since we want things to be wireless, we've connected it to a Sonos Bridge (£39, [tinyurl.com/bmrmoqm](http://tinyurl.com/bmrmoqm)).



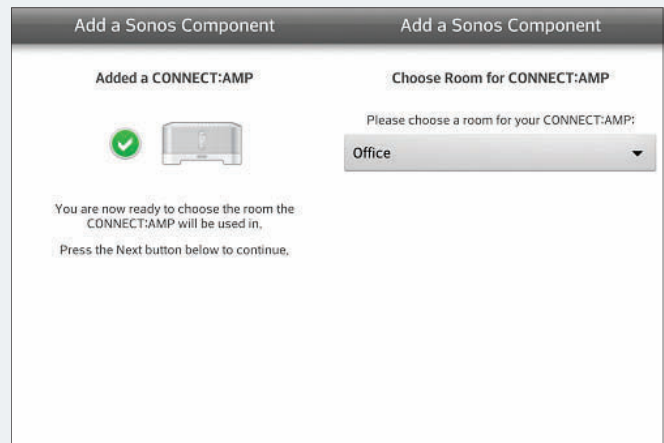
**3** Open the Sonos app on your PC, Mac, iPhone, iPad or Android device. We've used an Android smartphone for the following steps, so it could vary on other platforms.



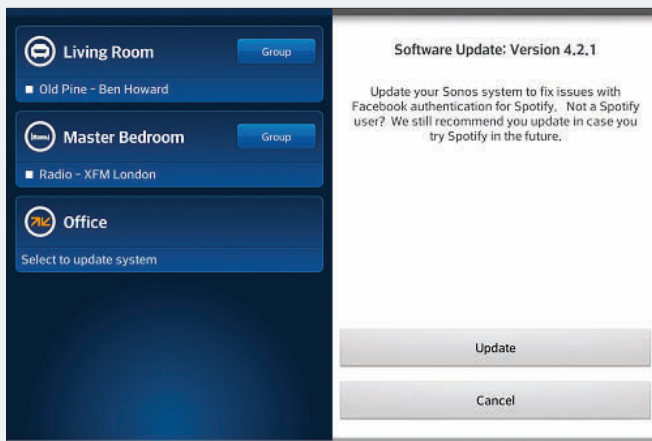
**4** Click the menu button and select 'Add a Sonos Component'.



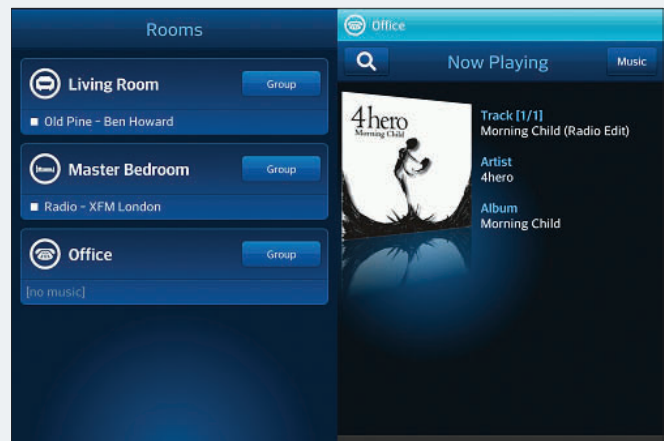
**5** Within two minutes, hit the volume up and mute button on your Connect:AMP. Note that newer models will come with a play/pause button instead of mute.



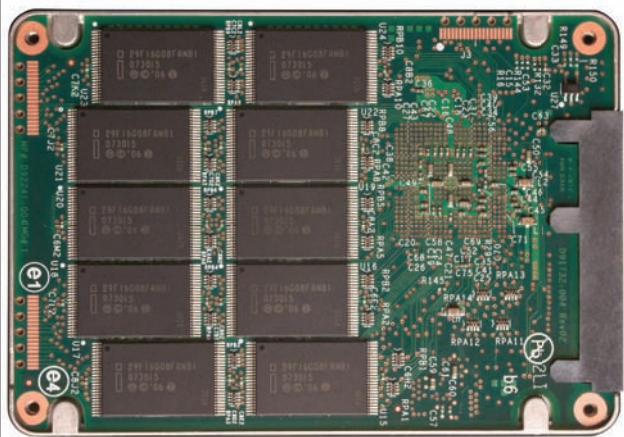
**6** You should get a confirmation that the Amp has been added. Next choose what room you want it to be called in the app.



**7** You may now need to perform a system update. If so, follow the onscreen instructions.



**8** Now your Connect:AMP is set up and up to date, you can start playing music. Click on a room and select some tunes. Note that online services such as Spotify and Amazon Cloud Player may need further setup. ☒



## Recondition an SSD



Back when mechanical hard drives were the norm, you could hand an old hard drive to a relative or friend as an upgrade, and call it a day. However, with today's solid-state drives, it's not so simple. Jon L. Jacobi explains how to recondition an SSD

The biggest issue when repurposing an SSD you've used for a long time stems from an inconvenient characteristic of NAND flash memory: previously written cells must be erased before they can accept new data. If the SSD is forced to reuse cells rather than use new ones in storing data, performance plummets.

To avoid this problem, modern SSDs use tricks, such as maintaining extra capacity that users can't touch, a technique known as over-provisioning. And the TRIM command tells an SSD when blocks of memory are no longer needed and can be consolidated and erased.

But not all garbage collection (as the erasing of used cells and consolidating of data is known) is created equal. It may not run constantly, and some older operating systems - notably Windows XP - don't support the TRIM command.

Windows 7 and 8 users needn't worry, though: a modern SSD's performance shouldn't degrade noticeably for years. But idle cells can add up to a big hit on SSD performance in several scenarios, such as using the drive extensively in a non-TRIM environment, nearly filling the drive and erasing large amounts of data, or simply repartitioning and reformatting the drive incorrectly. In fact, due to the absence of utilities that force complete garbage collection, there's only one way to return a heavily used SSD to pristine condition immediately: the ATA secure-erase command.

### SECURE ERASE TO THE RESCUE

Secure erase, a function built into every ATA-based hard drive and SSD since 2001, erases everything on the drive and marks the cells as empty. Once upon a time, you could invoke secure erase only via command-line utilities. But now, many SSD and hard-drive vendors provide a free utility - such as Ocz's ToolBox, Samsung's Magician, or Seagate's SeaTools - that includes a secure-erase capability.

Note that while the command is standard, many vendor utilities work only with their company's products. If your drive vendor doesn't provide a secure-erase option, you can use the DriveErase



utility found in Parted Magic ([tinyurl.com/n6Lgmoc](http://tinyurl.com/n6Lgmoc)). Don't use secure erase for routine maintenance of your SSD. If you're running Windows 7 or 8, skip it unless you need to wipe the drive. If you're running XP, perform a secure erase only if you notice a significant drop in write performance, usually evidenced by 'stalls' or moments when the computer seems to halt briefly when you save a file.

### REGAINING PEAK PERFORMANCE

First things first: if you have data on the SSD you'd like to retain, back it up. If you want to back up only some files, drag and drop them onto a flash drive or external hard drive, or use a backup program. If you have a working operating system that you want to keep, use an imaging program such as Acronis True Image ([tinyurl.com/q43xst2](http://tinyurl.com/q43xst2)) or R-Drive Image ([drive-image.com](http://drive-image.com)) that copies everything. Don't use Windows System Recovery unless you'll restore the data to the same drive; it won't restore to a smaller drive, and it sometimes hiccups even on a similar-size drive with plenty of room. Next, download your SSD vendor's drive utility or Parted Magic.

You should disconnect all other drives and boot from a flash drive to perform the erase procedure, to avoid accidentally overwriting the wrong drive. Parted Magic is a great option for this step, since it works as a bootable flash drive. If disconnecting your other hard drives is too much hassle, make sure that you have selected the correct drive to erase throughout this procedure. Secure erase is irrevocable.

Now run the secure-erase function. The method varies by program. By default some SSDs use the enhanced version of secure erase - which also deletes the drive's housekeeping data - but if an enhanced-erase option is available, you might want to use it.

The process should take a few minutes on a modern SSD. Once that's done, repartition and format the drive if you intend to copy data back to it. Parted Magic provides a full partition editor, but you can use Windows' own Drive Management utility (Control Panel > System and Security > Administrative Tools > Create and format hard disk partitions) to do the same task. Most commonly, you'll want to use the full capacity of the SSD in a single partition and format it as NTFS.

You're good to go. Dump any saved data back onto the drive and bask in the superb speeds of your good-as-new SSD. ☑





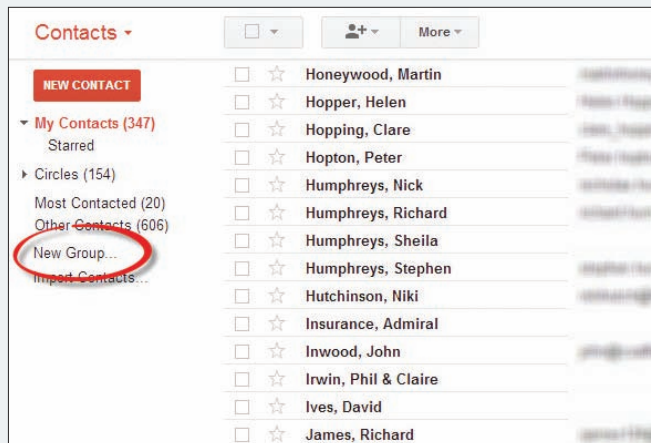
# Set up an email group



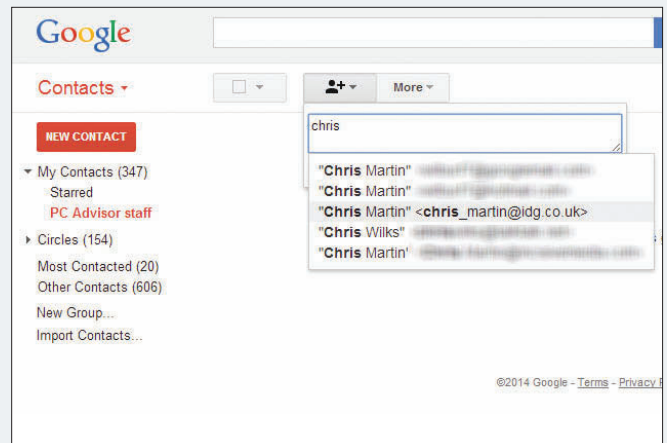
The process for creating an email group differs for each email service or app. Here, Jim Martin uses Gmail, but you can use almost any other email client

If you find your email program doesn't allow you to create contact groups, there may be a workaround. For example, you can't create groups on an iPhone or iPad, but you can do so via the iCloud website. You might also find that, while you can create a group of contacts (as with iCloud) you can't then select the group when sending an email. For small numbers of people, it might be faster to type the first few characters of their name and use your email application's auto-complete function to select their address.

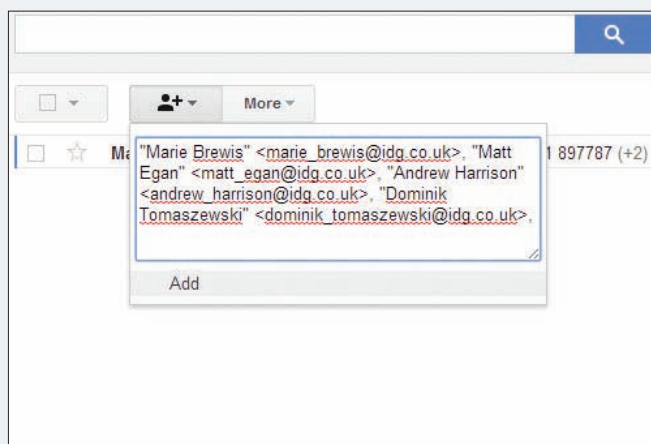
Note that when you need to email a large number of people regularly, this method is unworkable, as it takes too long and you might miss people off the list.



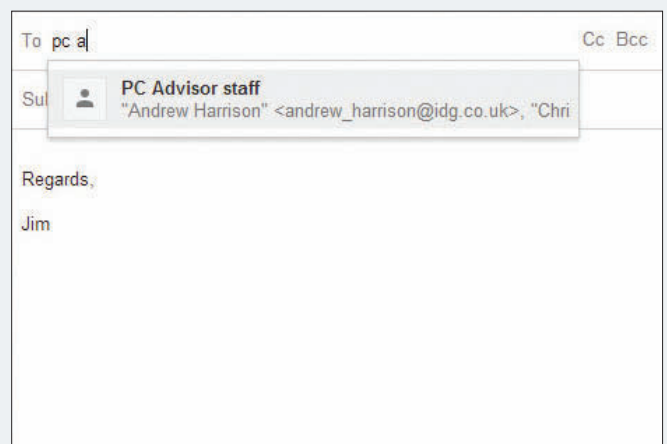
**START** In Gmail, click the Gmail drop-down menu and switch to Contacts. Now click the New group... link in the left-hand menu and enter a name for the group.




**2** The new group will appear under Contacts in the left-hand menu. Click on its name, then click the Add to group button (the head icon with a +). In the box, start typing a contact's name and then select the correct email address from the list.



**3** When you click on a contact's email address, you can begin typing the next person's name. When you've added everyone, click the Add button at the bottom of the box.



**4** Now use the drop-down menu to switch back from Contacts to Gmail and click the red Compose button. Type the first few letters of your group name and it should auto-complete. Click on it to add all the people in the group to the list of recipients. 

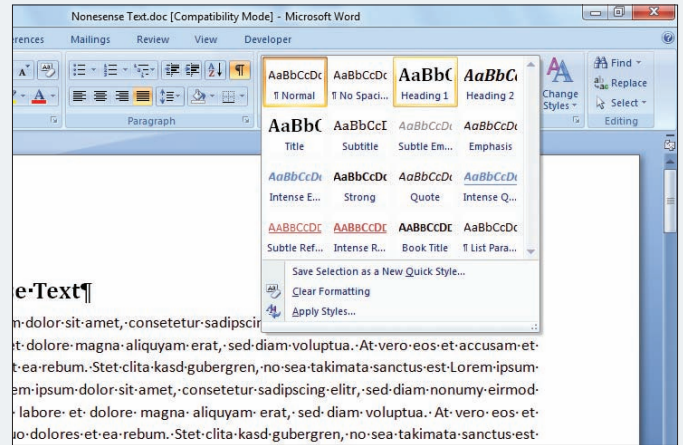
# Get more from Word



Most of us use Microsoft Word, but rarely make the most of this powerful word processor. Mike Bedford investigates its basic formatting options

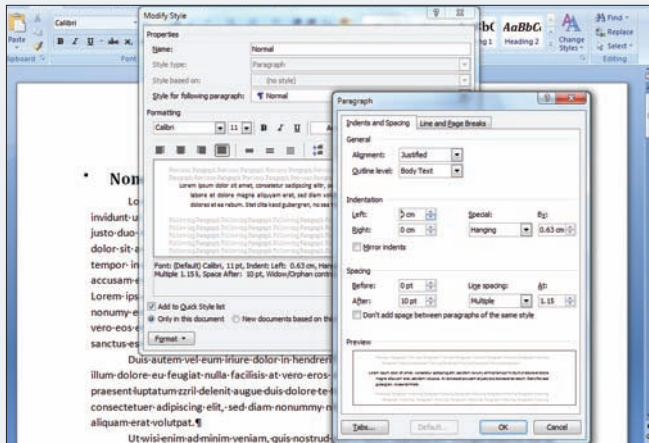
Microsoft Word is great when you're writing a letter or putting together a report, but it can do so much more. Indeed, with just a little extra effort, you can create more professional-looking documents. And since people are more likely to give their attention to documents that are visually attractive and easy to read, this has real benefits.

The first part of this tutorial explains how you can simplify your work process by using styles instead of individually formatting everything. We'll then show you how to give documents more visual appeal by adding columns, page breaks, headers and footers, and including frames and images.

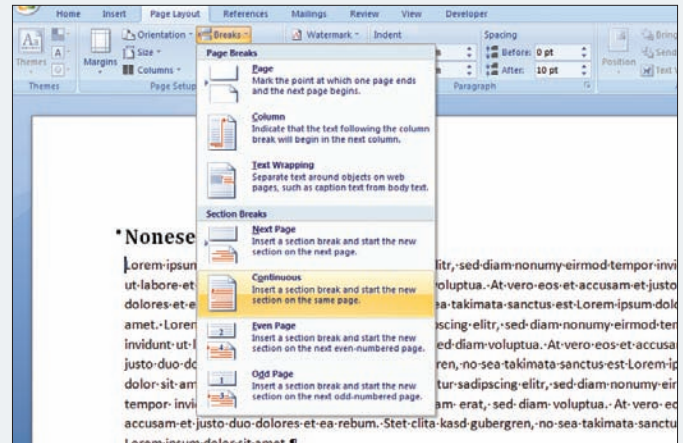


## START

Using styles makes it easier to format text than individually defining fonts, point sizes, and so on. Some styles are already set up for your use – click into any paragraph and then select the style, such as Normal or Heading 1, on the Home ribbon.



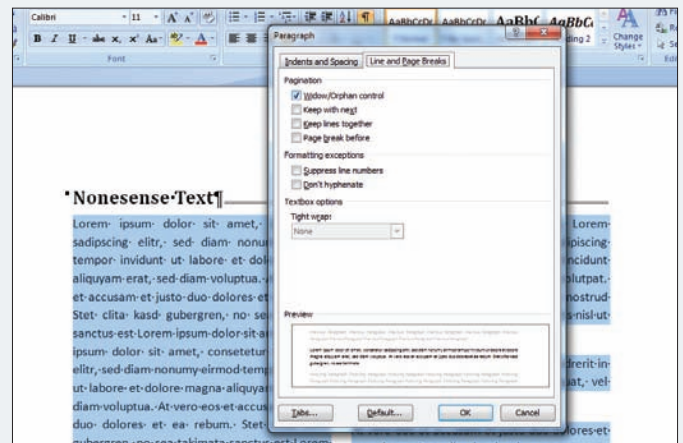
**2** You can also edit styles to better meet your needs. Right-click on a style on the Home ribbon and select Modify. Choose what you want to change from the Format menu, make the changes in the dialog box and then click OK.



**3** Newsletters look better when laid out in multiple columns. To allow the main title to span across the top, you'll have to divide your document into sections. After the main heading, select Breaks and then Continuous Section Break from the Page Layout ribbon.



**4** Click the cursor in the section you want to format, then click on Columns on the Page Layout ribbon and select the number of columns you want. If you want more control – for example, over the space between columns – choose More Columns.



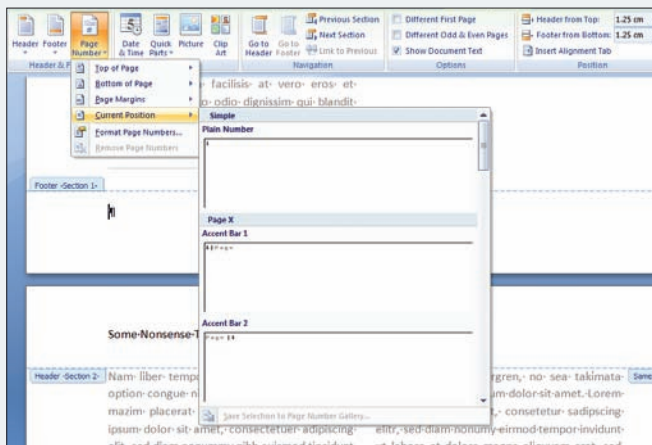
**5** Having the first line of a paragraph at the bottom or top of a page is unprofessional. To avoid this, select the Line and Page Breaks tab in the Paragraph dialog and select Widow/Orphan Control.



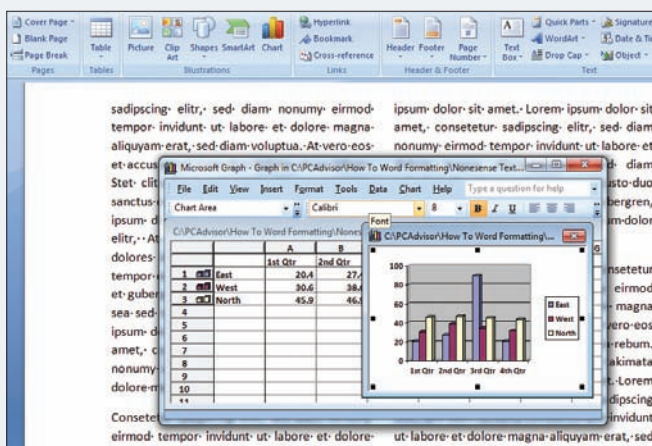
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Page Break

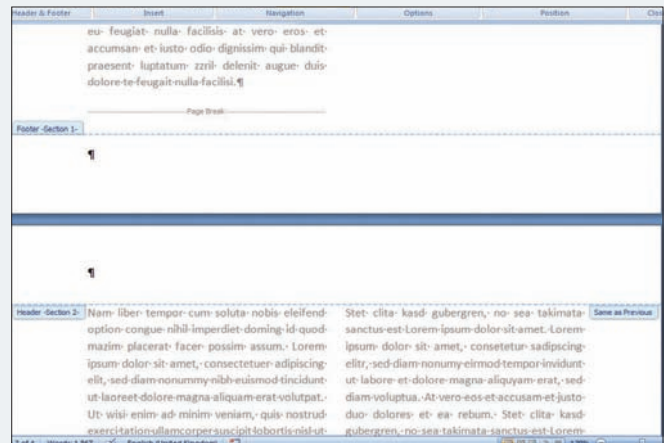
- 6** It's also possible to make your own page breaks in Word. Simply place the cursor where you want a new page to start, then press Enter while holding down the Ctrl key.



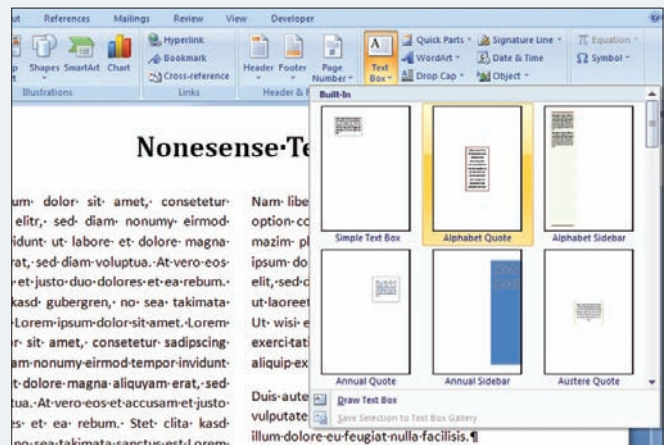
- 8** When a header or footer is selected, additional options will appear in a ribbon when you type in some text. Note the Page Number and the Date & Time buttons. When you're done, double-click in the main area of the page.



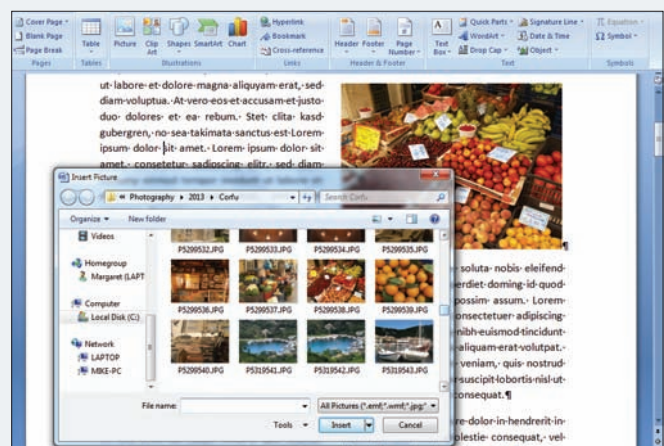
- 10** To include a simple chart without having to import it from Excel, click on the Chart icon on the Insert ribbon. A mini-spreadsheet will appear for you to edit and the resulting chart can be inserted in your document. Note the options in the ribbon.



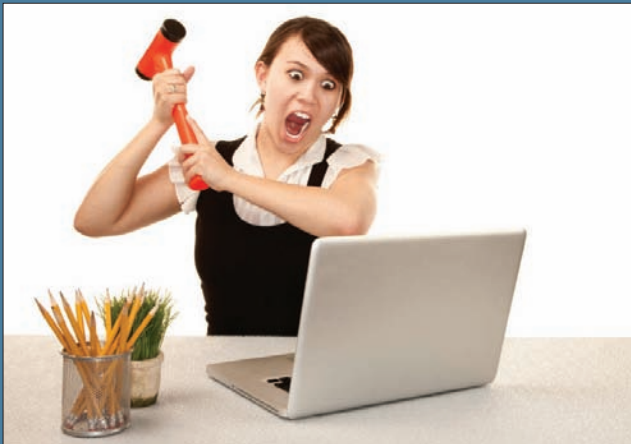
- 7** Headers and/or footers include some common information, often including a page number, at the top and/or bottom of every page in a document. To start, just double-click into the blank area at the top or bottom of a page.



- 9** A ruled off or shaded box can look particularly attractive, especially in multicolumn documents as they can span more than one column. Click on Text Box on the Insert ribbon, choose a format, drag it where you want and enter some text.



- 11** Similarly, you can insert a picture by clicking on the Picture icon on the Insert ribbon. Navigate to your picture and then click on Insert. Resize it size in the usual way and format it by right-clicking on it and selecting Format Picture.



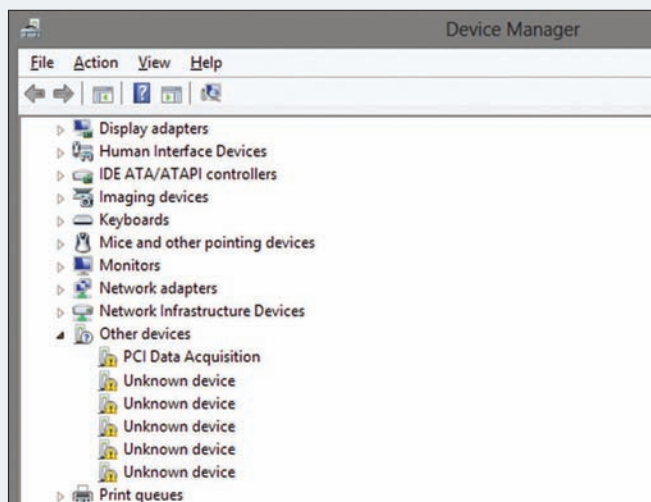
## Find drivers in Windows



If you're messing around with a new Windows installation, you're probably going to run into driver headaches. Marco Chiappetta explains what to do

Whether you're installing a fresh copy of Windows on a newly built rig or upgrading your machine to a new version of Microsoft's operating system, more often than not it will fail to properly identify all of the hardware connected to the system. Typically, it's a good idea to download drivers for all of the major components in a PC before you start installation, but inevitably a motherboard will have an obscure controller or the system will have a nondescript add-in card that Windows doesn't recognise.

People deal with driver problems in different ways. Some try to identify a component by perusing their motherboard's manual or specifications sheet. Others resort to pulling the computer apart and searching the web for the part numbers they see on chips or cards. You'll likely have some success using either of those methods, but there's a better way to identify unknown devices in Windows - and you won't have to whip out any tools to do it.

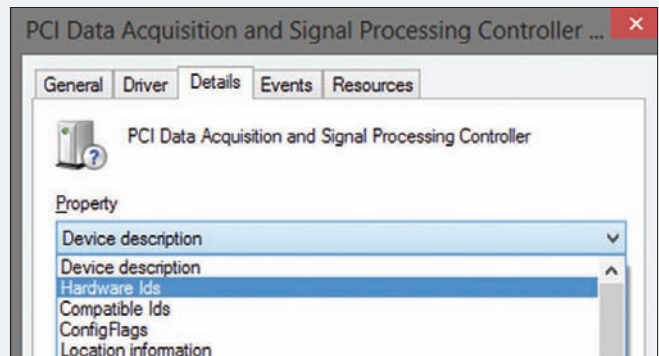


### DOING THE DETECTIVE WORK

If you've just installed Windows on your machine, and the Device Manager is loaded with 'Unknown devices' or 'Other devices' that are in an error state or have no drivers installed, don't worry.

You're only a few clicks away from ascertaining all the information you need to identify each device and download its drivers.

Windows will usually brand all of the unrecognised devices in the Device Manager screen with a black exclamation point on a yellow sign. If you're lucky, the device's name will be listed and you can simply conduct a web search for its drivers. Otherwise, the device will most likely have an 'Unknown device' label.

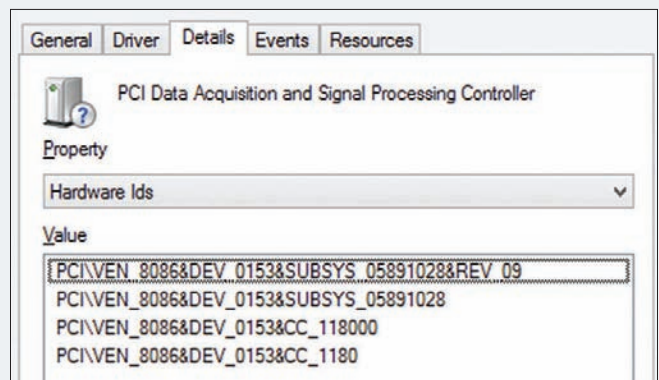


To find drivers for unrecognised hardware, first open Device Manager (a search from the Start menu or the Windows 8 Start screen brings it up), right-click the listing for the unknown device, select Properties from the context menu, and then click the Details tab at the top of the resulting window. On that tab, items in the Property drop-down menu will offer a wealth of information about the mysterious device, but it's the Hardware IDs that are most relevant to this discussion. Select Hardware IDs from the drop-down menu, and the Value field underneath will reveal a list of values. Consulting Google for one of the values listed in the window will usually yield the device's identity.

### IDENTIFYING THE SUSPECT

To search for drivers for a particular Hardware ID, first right-click the topmost value (typically the one with the longest string of characters) and choose Copy from the menu. Then paste that value into your favourite search engine. You'll have the best luck searching for a Hardware ID along with the OS version and "drivers" or "driver", plus "download".

For example, when installing Windows 8.1 on a Dell XPS 12 recently, we had a number of unknown devices listed in Device Manager, and PCI\VEN\_8086&DEV\_0153&SUBSYS\_05891028 was one of the Hardware IDs. So we searched for "PCI\VEN\_8086&DEV\_0153&SUBSYS\_05891028 Windows 8.1 driver download". One of the first results was for an Intel Dynamic Platform & Thermal Framework Driver. We downloaded and installed the driver, and it did the trick. This isn't rocket science, but being able to identify and find drivers for unknown devices in Windows can save a lot of time, especially if you're constantly upgrading or building systems. ☒





LETITIA  
AUSTIN

# Panda Internet Security 2014

FULL PROGRAM (SIX-MONTH LICENCE) AVAILABLE ONLY ON THE DISC+

## Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 228\ Panda Internet Security 2014 and open the file

## Online registration

**required:** follow the links during installation before 15 July 2014

## System requirements

300MHz processor; Windows XP/Vista/7/8; 128MB RAM (1GB recommended); 275MB drive space; Internet Explorer 6.0 or later

Panda Internet Security 2014 offers the most advanced protection against the dangers of the web.

- Protect your identity while browsing
- Protect your PC and networks against viruses and other threats
- Chat and use your email without worrying about online fraud or spam
- Back up your data in case you have problems with your PC

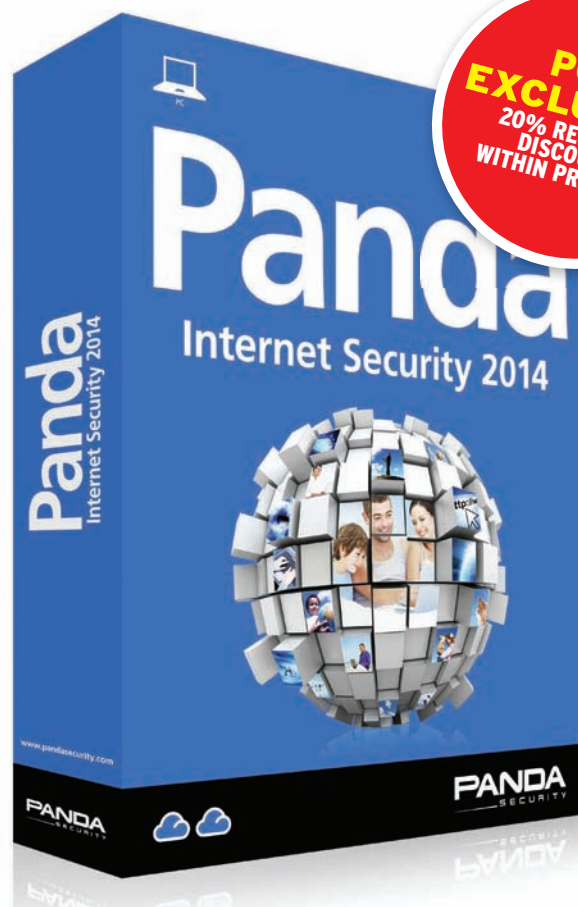
Start your computer in safe mode and disinfect it in emergency or critical situations. Share it with anybody you want and help them clean their PCs.

Panda Internet Security 2014 protects your family from inappropriate content. Shielding your documents and confidential data, so you can relax knowing that your private files are safe.

The software also protects you against online fraud, identity theft, phishing and other varieties of theft used by cybercriminals.

Enjoy a new, modern and intuitive user experience in line with that of the latest operating systems.

You don't have to be an expert - Panda Internet Security 2014 does everything for you: install it and forget about viruses and spyware. ☒



Visit our website for more software special offers: [pcadvisor.co.uk/special-offers](http://pcadvisor.co.uk/special-offers)

# Magix PhotoStory easy SE

## FULL PROGRAM

### Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 228\ Magix Photo Easy SE and open the file

**Online registration required:** follow the links during installation before 15 July 2014

### System requirements

1.83GHz processor; Windows XP/Vista/7/8; 512MB RAM; 1GB free disk space; integrated graphics; 1024x768 screen resolution; Blu-ray/DVD/CD writer; internet connection



Bring to life your memories! Whether it's photos from your holiday, pictures of friends and family, or snapshots of your favourite hobby, you can transform all your photos and video clips into incredible slideshows with text, music and spectacular effects - the easy way.

Anyone can make their own slideshow using Magix Photostory easy! A clear, easy-to-use interface, combined with unique wizards for automatic optimisation, effect design and dubbing, make it easier than ever before to create amazing slideshows. [✕](#)



# Ashampoo Gadge It

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

## Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 228\Ashampoo Gadge It and open the file


**Online registration required:** follow the links during installation before 15 July 2014

## System requirements

1.2GHz processor;  
Windows 8/7/Vista/XP;  
256MB RAM; 45MB disk  
space; 800x600 screen

Liven up your desktop! Ashampoo Gadge It enables you to create individual desktop applications (gadgets) and browser menus, even in Windows XP.

With a gadget you gain easier and quicker access to, for example, the folder with your favourite videos and a frequently visited website, or you can send emails directly from the desktop. The buttons in your gadgets can be linked to several functions.

Gadge It also lets you design individual gadgets, choosing between different buttons and adding your own pictures or background music. There truly is no limit to your creativity. 



# Nero BackItUp 2014

FULL PROGRAM (THREE-MONTH LICENCE) AVAILABLE ONLY ON THE DISC+

## Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 228\Nero BackItUp 2014 and open the file


**Online registration required:** head to [tinyurl.com/ksbg296](http://tinyurl.com/ksbg296) before 15 July 2014 using code: DTZB-DQRV-ZHBC

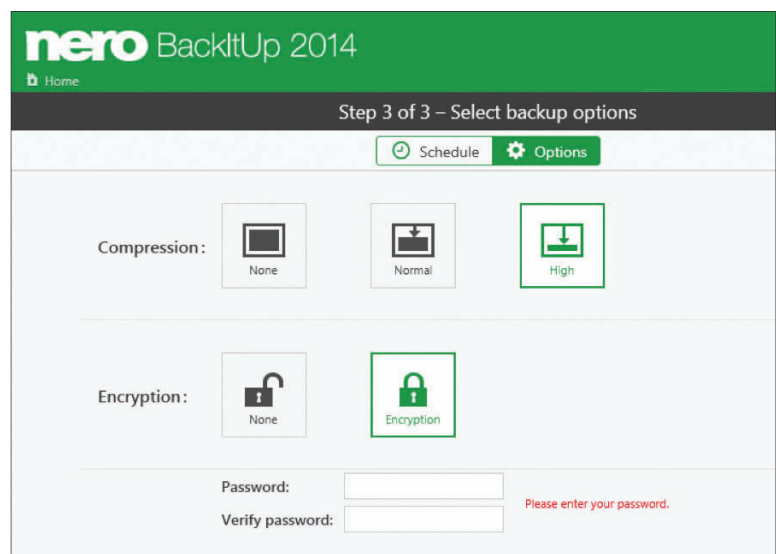
## System requirements

2GHz CPU; Windows XP+;  
1GB RAM; 1GB disk space

Nero BackItUp 2014 allows the backing up of your data to hard disks, external storage, DVDs or Blu-rays and even the cloud.

PC Advisor readers can take advantage of a 5PRO one-year licence that also gives you fully automated- and scheduled backups, compression and password protection for your local backups.

To unlock this offer head to [nerobackitup.com/code/pcadvisor](http://nerobackitup.com/code/pcadvisor) and create a free account. Install BackItUp from the cover disc, then launch the app and log in. Now download the Nero BackItUp apps from Google Play, iTunes or the Windows Store to start backing up your mobile devices. 



## DISC INSTRUCTIONS

Place disc in drive. Open the file 'Click here to begin.pdf' for extra information.

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- Get up to 50GB of FREE storage

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Speed up your PC or laptop with one click

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Reduce your printing costs Desktop publishing made easy

**ashampoo** **Burning Studio 2014** **DISC +** **WORTH £35** **FULL PROGRAM WORTH £15**

Everything you need to burn movies, music and data – fast and effectively.

Formats: CD, DVD & Blu-ray

**Abelssoft** **Drive Space Organizer 5** **FULL PROGRAM WORTH £15** **Abelssoft** **Converter4video 2014** **FULL PROGRAM WORTH £17**

Recycle storage on hard drives, NAS drives, memory cards & USB flash drives Convert videos to play on your smartphone and tablet

**updatestar** **Premium Edition 10** **DISC +** **WORTH £38**

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Ultraportable laptops



Sub-£500 laptops



£1,001+ laptops



Tablets



Smartphones



All-in-one PCs



Business PCs



Family PCs



Blu-ray drives



Wireless routers



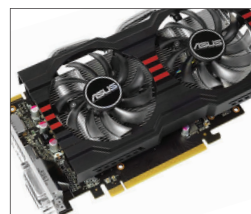
Printers



Projectors



Solid-state drives



Graphics cards



Flat-panel displays

## Index

Ultraportable laptops.....	127
Sub-£500 laptops.....	128
£501-£1,000 laptops.....	129
£1,001+ laptops.....	130
Tablets.....	131
Smartphones.....	132
Gaming PCs.....	133
Mini PCs.....	134
All-in-one PCs.....	135
Business PCs.....	136
Family PCs.....	138
Security software.....	139
Printers.....	140
Blu-ray drives.....	141
Wireless routers.....	141
USB & NAS drives.....	142
Solid-state drives.....	143
Projectors.....	143
Graphics cards.....	144
Flat-panel displays.....	145

## Prices

### Laptops

**Laptops up to £500**  
**£501 to £1,000**  
**£1,001 and over**

### Printers

**Printers under £150**  
**£151 and over**

### Graphics cards

**Graphics cards under £150**  
**£151 and over**

### Flat-panels

**Flat-panels under £200**  
**£201 and over**

Prices listed are those quoted by the distributor or manufacturer and include VAT. They are intended only as a guide and you may see products on sale for less or more than our quoted price.

If you're interested in purchasing one of the products reviewed here then please contact the manufacturer or supplier directly, mentioning both *PC Advisor* and the issue in which you saw the product. If it won't supply the product as reviewed, contact us at [jim\\_martin@idg.co.uk](mailto:jim_martin@idg.co.uk).


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Ultraportable laptops	    				
	1	2	3	4	5
	Apple MacBook Pro 13in Retina	Apple MacBook Air 13in	Apple MacBook Air 11in	HP EliteBook 840 G1	Dell XPS 12
Price	£1,499 inc VAT	£949 inc VAT	£849 inc VAT	£1,344 inc VAT	£1,234 inc VAT
Website	Apple.com/uk	Apple.com/uk	Apple.com/uk	Hp.com/uk	Dell.co.uk
Launch date	Feb 14	Sep 13	Nov 13	Apr 14	Jan 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2.6GHz Intel Core i5	1.3GHz Intel Core i5-4250U	1.3GHz Intel Core i3-5250U	2.1GHz Intel Core i7-4600U	1.8GHz Intel Core i7-4500U
RAM	8GB DDR3L	4GB DDR3L	4GB LPDDR3	8GB DDR3	8GB DDR3L
Storage	512GB SSD	128GB SSD	128GB SSD	500GB HDD	256GB SSD
Screen size	13.3in glossy (anti-glare)	13.3in glossy (anti-glare)	11.6in glossy (anti-glare)	14in matt	12.5in glossy touchscreen
Screen resolution	2560x1600	1440x900	1366x768	1920x1080	1920x1080
Graphics	Intel Iris Graphics	Intel HD Graphics 5000	Intel HD Graphics 5000	AMD Radeon HD 8750M	Intel HD Graphics 4400
Video memory	N/A	N/A	N/A	1GB	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11b/g/n	802.11b/g/n
Ethernet	Optional	Optional	Optional	Gigabit	None
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0	2x USB 3.0	4x USB 3.0	2x USB 3.0
FireWire	x	x	x	x	x
Thunderbolt	✓	✓	✓	x	x
DisplayPort	x	✓	✓	✓	✓
HDMI	✓	x	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	720p webcam	None
Operating system	Mac OS X 10.9 Mavericks	Mac OS X 10.9 Mavericks	Mac OS X 10.9 Mavericks	Windows 7 Pro 64bit	Windows 8 64-bit
Bundled software	iLife 11	iLife 11	iLife 11	None	None
Fear (Max detail)	Not tested	Not tested	Not tested	38fps (1080p)	27fps
Battery	71.8Wh lithium-polymer	54Wh lithium-polymer	38Wh lithium-polymer	50Wh lithium-ion	Not stated
Battery life	9 hrs 55 mins	12 hrs 57 mins	8 hrs 56 mins	6 hrs 25 mins	6 hrs 45 mins
PC Mark 7 score	Not tested	4602	4080	3100	5205
Dimensions	314x219x18mm	325x227x4-17.5mm	300x192x17mm	339x237x21mm	317x215x20mm
Weight	1.57kg	1.35kg	1.08kg	1.58kg	1.52kg
Warranty	1-year return-to-base	1-year return-to-base	1-year return-to-base	3-year return-to-base	1-year enhanced
FULL REVIEW	TINYURL.COM/M3TNC29	TINYURL.COM/KNXWZ3	TINYURL.COM/K64ZPKB	TINYURL.COM/L8HP79T	TINYURL.COM/QBAWLK

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Sub-£500 laptops	1	2	3	4	5
	Toshiba Satellite M50-A-11Q	Compaq CQ58-300sa	Asus X102BA	Lenovo G505s	Acer Aspire V5-122P
Price	£449 inc VAT	£240 inc VAT	£299 inc VAT	£400 inc VAT	£300 inc VAT
Website	Toshiba.co.uk	Saveonlaptops.co.uk	Asus.com/uk	Lenovo.com/uk	Acer.co.uk
Launch date	Feb 14	Nov 13	May 14	Nov 13	Apr 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	1.7GHz Intel Core i3-4005U	1.4GHz AMD E1-1200	1GHz AMD A4-1200	2.8GHz AMD A8-4500M	1GHz AMD A6-1450
RAM	8GB DDR3	2GB DDR3	4GB DDR3L	4GB DDR3	4GB DDR3
Storage	1TB HDD	320GB HDD	500GB HDD	1TB	500GB HDD
Screen size	15.6in glossy	15.6in glossy	10.1in glossy touchscreen	15.6in glossy	11.6in glossy touchscreen
Screen resolution	1366x768	1366x768	1366x768	1366x768	1366x768
Graphics	N/A	AMD Radeon HD 7310	AMD Radeon HD 8180	N/A	AMD Radeon HD 8250
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	10/100	10/100	Gigabit	None
Bluetooth	✓	✓	✓	✓	✗
USB	2x USB 3.0, 1x USB 2.0	3x USB 3.0	1x USB 3.0, 2x USB 2.0	1x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0
FireWire	✗	✗	✗	✗	✗
Thunderbolt	✗	✗	✗	✗	✗
DisplayPort	✗	✗	✗	✗	✗
HDMI	✓	✓	✓	✓	✗
DVI	✗	✗	✗	✗	✗
VGA	✓	✓	✓	✓	✓
eSATA	✗	✗	✗	✗	✗
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	None	8x DVD ± RW	None	8x DVD ± RW	None
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 64-bit
Bundled software	None	None	MS Office Home & Student	CyberLink Power2Go	none
Battery	4400mAh lithium-ion	47Wh lithium-ion	33Wh lithium-ion	41Wh lithium-ion	2640mAh lithium-ion
Battery life	7 hrs	4 hrs 45 mins	4 hrs 20 mins	3 hrs	3 hrs 35 mins
PC Mark 7 score	2511	1094	1100	2700	1300
Stalker (Low/High)	30fps (720p)	9fps (720p)	N/A	N/A	14fps (720p)
Dimensions	378x250x21mm	376x247x33mm	266x185x29mm	380x260x26mm	289x206x20mm
Weight	2.2kg	2.3kg	1.1kg	2.4kg	1.4kg
Warranty	1-year return-to-base	1-year return-to-base	1-year return-to-base	1-year return-to-base	1-year return-to-base
FULL REVIEW	TINYURL.COM/OTK6UZZ	TINYURL.COM/MT67W8X	TINYURL.COM/PLAUQCG	TINYURL.COM/QBAWKLC	TINYURL.COM/NKD2TAJ

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£501-£1,000 laptops					
	1 	2	3 	4	5
	Chillblast Defiant Mini 13	HP Pavilion TouchSmart 15	Dell Latitude 3440	PC Specialist Optimus V	Asus V550CA
Price	£899 inc VAT	£699 inc VAT	£576 inc VAT	£879 inc VAT	£570 inc VAT
Website	Chillblast.com	Hp.com/uk	Dell.co.uk	Pcspecialist.co.uk	Asus.com/uk
Launch date	Feb 14	May 14	Mar 14	Dec 13	Mar 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.4GHz Intel Core i7-4700MQ	1.6GHz Intel Core i5-4200U	1.6GHz Intel Core i5-4200U	2.4GHz Intel Core i7-4700MQ	1.8GHz Intel Core i5-3337U
RAM	8GB DDR3	8GB DDR3	4GB DDR3	8GB DDR3	6GB DDR3
Storage	1TB HDD	750GB HDD	500GB HDD	1TB hard drive + 120GB SSD	1TB HDD
Screen size	13.3in matt	15.6in glossy touchscreen	14in matt	17.3in	15.6in glossy touchscreen
Screen resolution	1920x1080	1366x768	1366x768	1920x1080	1366x768
Graphics	GTX 765M/Intel HD 4600	GT 740M/Intel HD 4400	Intel HD 4400	GTX 765M/Intel HD 4600	Intel HD 4000
Video memory	2GB	N/A	N/A	2GB	N/A
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	10/100	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 1x USB 2.0	2x USB 3.0, 1x USB 2.0	2x USB 3.0, 1x USB 2.0	3x USB 3.0, 1x USB 2.0	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	✓	✓	x	✓	✓
DVI	x	x	x	x	x
VGA	✓	✓	✓	✓	✓
eSATA	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	None	8x DVD±RW	8x DVD±RW	6x BD-ROM	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 8 64-bit
Bundled software	None	None	None	None	Asus utilities
Stalker (720p/1080p)	150/90fps	60fps (720)	24fps	Not tested	22fps
Battery	62Wh lithium-ion	41Wh lithium-ion	40Wh lithium-ion	76.9Wh lithium-ion	44Wh lithium-ion
Battery life	4 hrs	5 hrs 45 mins	5 hrs 50 mins	3 hrs 29 mins	3 hrs 25 mins
PCMark 7 score	4720	2860	2699	6099	2463
Dimensions	330x227x35mm	386x258x25mm	346x245x25mm	413x278x44mm	380x266x22mm
Weight	2.1kg	2.6kg	2kg	3.2kg	2.6kg
Warranty	1-year return-to-base	1-year return-to-base	1-year business	3-year return-to-base	1-year return-to-base
FULL REVIEW	<a href="http://tinyurl.com/pbZPA65">TINYURL.COM/PBZPA65</a>	<a href="http://tinyurl.com/L2JAXH7">TINYURL.COM/L2JAXH7</a>	<a href="http://tinyurl.com/KQG023P">TINYURL.COM/KQG023P</a>	<a href="http://tinyurl.com/Q5QRFJ2">TINYURL.COM/Q5QRFJ2</a>	<a href="http://tinyurl.com/NQALWLF">TINYURL.COM/NQALWLF</a>


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	Apple 15in MacBook Pro Retina	Toshiba Qosmio X70-A	Dell Precision M3800	Chillblast Messiah 17 GTX780M	Schenker XMG C703
Price	£1,699 inc VAT	£1,600 inc VAT	£1,926 inc VAT	£1,799 inc VAT	£1,253 inc VAT
Website	Apple.com/uk	Toshiba.co.uk	Dell.co.uk	Chillblast.com	Mysn.co.uk
Launch date	Mar 14	Mar 14	May 14	Dec 13	Apr 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	2GHz Intel Core i7-4750HQ	2.4GHz Intel Core i7-4700MQ	2.2GHz Intel Core i7-4702HQ	2.7GHz Intel Core i7-4800MQ	2.4GHz Intel Core i7-4700MQ
RAM	8GB DDR3	16GB DDR3	16GB DDR3	16GB DDR3	8GB DDR3
Storage	256GB SSD	1TB/256GB SSD hybrid	500GB + 256GB SSD	1TB + 250GB SSD	250GB SSD
Screen size	15.4in glossy (anti-glare)	17.3in glossy	15.6in glossy touchscreen	17.3in matt	17.3in matt
Screen resolution	2880x1800	1920x1080	3200x1880	1920x1080	1920x1080
Graphics	Intel Iris Pro	nVidia GeForce GTX 770M	nVidia Quadro K1100M	nVidia GeForce GTX 780M	nVidia GeForce GTX 765M
Video memory	128MB	3GB	2GB	4GB	2GB
Wireless	802.11a/b/n/ac, MIMO	802.11b/g/n, WiDi	802.11ac, MIMO	802.11b/g/n, WiDi	802.11b/g/n
Ethernet	Gigabit	Gigabit	None	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 1x USB 2.0	3x USB 3.0, 1x USB 2.0	4x USB 3.0
FireWire	✓	✗	✗	✗	✗
Thunderbolt	✓	✗	✗	✗	✗
DisplayPort	✓	✗	✓	✓	✓
HDMI	✓	✓	✓	✓	✓
DVI	✗	✗	✗	✗	✗
VGA	✗	✓	✗	✗	✗
eSATA	✗	✗	✗	✓	✓
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	BD-RE	N/A
Extras	Webcam	2Mp webcam	Webcam	2.1Mp webcam	2Mp webcam
Operating system	OS X Mavericks	Windows 8 64bit	Windows 8 64-bit	Windows 8 64-bit	Windows 8 64-bit
Bundled software	Apple iLife	None	None	None	None
Stalker (720p/1080p)	62/57fps (Batman)	50/43fps (Batman)	Not tested	64fps	96fps (1080p)
Battery	958Wh lithium-polymer	47Wh lithium-ion	61- or 91Wh lithium-ion	77Wh lithium-ion	58.8Wh lithium-ion
Battery life	8 hrs 14 mins	3 hrs 5 mins	2 hrs 58 mins	4 hrs 15 mins	3 hrs 35 mins
PCMark7 score	N/A	6164	Not tested	6316	6181
Dimensions	359x247x18mm	418x273x44mm	372x254x18mm	412x276x55mm	419x287x22mm
Weight	2.02kg	3.4kg	1.9kg	3.9kg	2.68kg
Warranty	1-year return-to-base	1-year European	1-year next business day	2-year collect-and-return	2-year collect-and-return
FULL REVIEW	<a href="http://tinyurl.com/k3qsd9y">TINYURL.COM/K3QSD9Y</a>	<a href="http://tinyurl.com/p5bd3gb">TINYURL.COM/P5BD3GB</a>	<a href="http://tinyurl.com/nthyu44">TINYURL.COM/NTHYU44</a>	<a href="http://tinyurl.com/pcjp94q">TINYURL.COM/PCJP94Q</a>	<a href="http://tinyurl.com/lz9zxvb">TINYURL.COM/LZ9ZXVB</a>



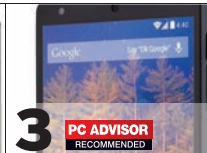


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Tablets					
					
	1	2	3	4	5
	PC ADVISOR GOLD	PC ADVISOR RECOMMENDED	PC ADVISOR RECOMMENDED	PC ADVISOR GOLD	PC ADVISOR RECOMMENDED
	Google Nexus 7 (2013)	Apple iPad Air	Sony Xperia Z2 Tablet	Apple iPad mini (1st gen)	Google Nexus 10 by Samsung
Price	£199 inc VAT	£399 inc VAT	£399 inc VAT	£249 inc VAT	£319 inc VAT
Website	Play.google.com	Apple.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Jul 13	Oct 13	Apr 14	Nov 12	Nov 12
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.3 Jelly Bean	Apple iOS 7	Android 4.4.2 KitKat	Apple iOS 7	Android 4.4 KitKat
Screen size/resolution	7in/1280x800	9.7in/2048x1536	10.1in/1920x1200	7.9in/1024x768	10.1in/2560x1600
Storage/media card slot	16GB/none	16GB/none	16GB/none	16GB/none	16GB/none
Connectivity	802.11b/g/n, Bluetooth 4	802.11a/b/g/n, Bluetooth 4	802.11b/g/n/ac, Bluetooth 4	802.11b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4, NFC
Processor	1.5GHz Snapdragon S4 Pro	Apple A7	2.3GHz Snapdragon 801	1GHz Apple A5	1.7GHz Cortex A-15
RAM	2GB	1GB	3GB	512MB	2GB
Claimed battery life	9 hrs	10 hrs	Not specified	10 hrs	9 hrs
Cameras (front/rear)	1.2/5Mp	1.2/5Mp	2.2/8.1Mp	1.2/5Mp	1.9/5Mp
Dimensions	114x200x8.7mm	169x240x7.5mm	266x172x6.4mm	135x200x7.2mm	178x264x8.9mm
Weight	299g	469g	439g	308g	603g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/QYUDY5C	TINYURL.COM/LSB84EE	TINYURL.COM/M8BZZUN	TINYURL.COM/CLJWUVS	TINYURL.COM/ARL2KDG

Tablets					
					
	6	7	8	9	10
	PC ADVISOR RECOMMENDED	PC ADVISOR RECOMMENDED	PC ADVISOR RECOMMENDED	PC ADVISOR RECOMMENDED	PC ADVISOR RECOMMENDED
	Sony Xperia Tablet Z	Advent Vega Tegra Note 7	LG G Pad 8.3	Lenovo Yoga Tablet 10	Tesco Hudl
Price	£339 inc VAT	£129 inc VAT	£199 inc VAT	£249 inc VAT	£119 inc VAT
Website	Sony.co.uk	Currys.co.uk	Lg.com/uk	Lenovo.com/uk	Tesco.com
Launch date	May 13	Nov 13	Feb 14	Jan 14	Sep 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.1 Jelly Bean	Android 4.3 Jelly Bean	Android 4.2 Jelly Bean	Android 4.2 Jelly Bean	Android 4.2 Jelly Bean
Screen size/resolution	10.1in/1920x1200	7in/1280x800	8.3in/1920x1200	10.1in/1280x800	7in/1440x900
Storage/media card slot	16GB/microSDXC	16GB/microSDHC	16GB/microSDHC	16GB/microSDXC	16GB/microSDHC
Connectivity	802.11a/b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4	802.11a/b/g/n, Bluetooth 4	802.11b/g/n, Bluetooth 4	802.11a/b/g/n, Bluetooth 4
Processor	1.5GHz SnapDragon S4 Pro	1.9GHz nVidia Tegra 4	1.5GHz Snapdragon 600	1.2GHz ARM Cortex-A7	1.5GHz quad-core A9
RAM	2GB	1GB	2GB	1GB	1GB
Claimed battery life	10 hrs	10 hrs	8.5 hrs (actual)	18 hrs	9 hrs
Cameras (front/rear)	2.2/8.1Mp	0.3/5Mp	1.3/5Mp	1.6/5Mp	2/3Mp
Dimensions	172x266x6.9mm	120x190x10mm	127x217x8.3mm	261x181x8.1mm	129x193x9.9mm
Weight	495g	320g	338g	605g	370g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/ODTP6B8	TINYURL.COM/PMCO4H4	TINYURL.COM/N80BC7N	TINYURL.COM/KLV5SDM	TINYURL.COM/MXHXVUK

**HEAD TO TINYURL.COM/KL2EV4G FOR OUR TABLET BUYING ADVICE**

Smartphones	    				
	1	2	3	4	5
	LG G2	HTC One (M8)	Google Nexus 5	Sony Xperia Z1 Compact	Sony Xperia Z1
Price	£329 inc VAT	£550 inc VAT	£299 inc VAT	£401 inc VAT	£430 inc VAT
Website	Lg.com/uk	Htc.com/uk	Play.google.com	Sonymobile.com	Sonymobile.com
Launch date	Sep 13	Apr 14	Oct 13	Jan 14	Jul 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Android 4.2 Jelly Bean	Android 4.4 KitKat	Android 4.4 KitKat	Android 4.3 Jelly Bean	Android 4.2 Jelly Bean
Processor	2.26GHz Snapdragon 800	2.3GHz Snapdragon 801	2.3GHz Snapdragon 800	2.2GHz Snapdragon 800	2.26GHz Snapdragon 800
Storage/media card slot	16GB/none	16GB/microSD	16GB/none	16GB/microSDXC	16GB/microSDXC
Screen size/resolution	5.2in/1920x1080	5in/1920x1080	4.95in/1920x1080	4.3in/1280x720	5in/1920x1080
Screen type	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch
Connectivity	4G, HSPA+, Bluetooth, Wi-Fi	Bluetooth, NFC, Wi-Fi ac	HSPA+, Bluetooth, Wi-Fi ac	4G, HSPA+, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi
Claimed battery life	Not specified	Not specified	17 hrs/300 hrs	18 hrs/670 hrs	14 hrs/880 hrs
Cameras (front/rear)	13Mp, 1080p video	5Mp, 1080p video	8Mp, 1080p video	20.7Mp, 1080p video	20.7Mp, 1080p video
GPS	A-GPS	A-GPS, Glonass	A-GPS	A-GPS	A-GPS
Dimensions, weight	71x139x9.4mm, 143g	146.4x70.6x9.4mm, 160g	69x138x8.9mm, 130g	127x64.9x9.5mm, 137g	144x74x8.5mm, 169g
Warranty	1 year	2 years	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PAFK4SZ	TINYURL.COM/NGBWXY9	TINYURL.COM/PAFK4SZ	TINYURL.COM/KAU7DYR	TINYURL.COM/NJPM4DE

Smartphones	    				
	6	7	8	9	10
	Apple iPhone 5s	Samsung Galaxy S5	Motorola Moto G	HTC One	Samsung Galaxy Note 3
Price	£549 inc VAT	£549 inc VAT	£129 inc VAT	£430 inc VAT	£445 inc VAT
Website	Apple.com/uk	Samsung.com/uk	Motorola.co.uk	Htc.com/uk	Samsung.com/uk
Launch date	Sep 13	Apr 14	Nov 13	Feb 13	Sep 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Platform	Apple iOS 7	Android 4.4.2 (KitKat)	Android 4.3 Jelly Bean	Android 4.2 Jelly Bean	Android 4.3 Jelly Bean
Processor	1.3GHz Apple A7	2.5GHz Snapdragon 801	1.2GHz Snapdragon 400	1.7GHz Snapdragon 600	2.3GHz Snapdragon
Storage/media card slot	16GB/none	32GB/microSD	8GB/none	32GB/none	32GB/microSDXC
Screen size/resolution	4in/640x1136	5.1in/1920x1080	4.5in/720x1280	4.7in/1920x1080	5.7in/1920x1080
Screen type	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch	Capacitive multitouch
Connectivity	4G, HSPA+, Bluetooth, Wi-Fi	4G, Bluetooth, Wi-Fi	HSDP+, GSM, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi	4G, HSPA+, Bluetooth, Wi-Fi
Claimed battery life	10 hrs/250 hrs	21 hrs/390 hrs	Not specified	Not specified	21 hrs/420 hrs
Cameras (front/rear)	8Mp, 1080p video	2Mp, 16Mp	5Mp, 720p video	4Mp, 1080p video	13Mp, 1080p video
GPS	A-GPS, Glonass	GPS, Glonass	A-GPS	GPS, Glonass	A-GPS, Glonass
Dimensions, weight	59x124x7.6mm, 112g	73x142x8.1mm, 145g	66x130x11.6mm, 143g	68x9.3x137mm, 143g	151x79x8.3mm, 168g
Warranty	1 year	2 years	1 year	2 years	1 year
FULL REVIEW	TINYURL.COM/MZ8JHLF	TINYURL.COM/KDVCTST	TINYURL.COM/NBUTSET	TINYURL.COM/CE76X3T	TINYURL.COM/QAKOLZY

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Gaming PCs					
	1 <b>PC ADVISOR</b> GOLD	2 <b>PC ADVISOR</b> RECOMMENDED	3	4	5
	Chillblast Fusion Probe	CyberPower Infinity Perseus XT	Yoyotech Warbird RS2	Quiet PC Serenity Mini Gamer	Aria FX-Viper 8320
Price	£1,299 inc VAT	£1,499 inc VAT	£1,370 inc VAT	£1,213 inc VAT	£895 inc VAT
Website	Chillblast.com	Cyberpowersystem.co.uk	Yoyotech.co.uk	Quietpc.co.uk	Aria.co.uk
Launch date	Feb 14	Feb 14	Feb 14	Feb 14	Feb 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.4GHz Intel Core i5-4670K (OC 4.4GHz)	3.4GHz Intel Core i5-4670K (OC 4.4GHz)	3.5GHz Intel Core i7-4770K (OC 4.3GHz)	3.5GHz Intel Core i7-4770K	3.5GHz AMD FX8320 (OC 4.4GHz)
CPU cooler	Corsair H55 Liquid Cooler	Cooler Master Seldon 120mm	Corsair H80 cooler	Reeven Kelveros RC-1202	Scythe Ashura Performance CPU cooler
Memory	16GB DDR3	16GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage	120GB SSD + 2TB HDD	256GB SSD + 2TB HDD	128GB SSD + 1TB HDD	1TB SSHD	120GB SSD + 2TB HDD
Power supply	750W Corsair	750W Corsair	600W Cooler Master	650W FSP	600W Corsair
Motherboard	Gigabyte GA-Z87N-Wi-Fi	Gigabyte GA-Z87-HD3	MSI Z87M-G43	Gigabyte GA-Z87MX-D3H	Gigabyte GA-990FXA-UD5
Operating system	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Screen	23.6in Iiyama X2377HDS	23in AOC i2367fh	23in AOC i2369vm	Not supplied	Not supplied
Graphics	Palit Jetstream GeForce GTX 780, 3GB VRAM	Powercolor AMD R9 290, 4GB VRAM	Asus GTX 760 DirectCU II OC, 2GB VRAM	Gigabyte GTX 650 Ti OC Windforce, 2GB VRAM	Sapphire Radeon R9 280X Vapor-X OC, 3GB VRAM
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Connectivity	Gigabit ethernet, 802.11n	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet
Ports	6x USB 3.0, 4x USB 2.0	6x USB 3.0, 4x USB 2.0	4x USB 3.0, 6x USB 2.0	6x USB 3.0, 2x USB 2.0	4x USB 3.0, 14x USB 2.0
Optical drive	DVD±RW (Blu-ray optional)	DVD±RW, BD-ROM	DVD±RW	DVD±RW	DVD±RW
Case	Aerocool Dead Silence Gaming Cube	Cooler Master Dominator 690 III	AerocoolDS Cube Red with window	Nanoxia Deep Silence 4	Sharkoon Bulldozer
Keyboard & mouse	Gigabyte M6800 mouse, Force K3 keyboard	Gigabyte M6900 mouse, Force K3 keyboard	Powercool JM-9032U mouse, KB-768 keyboard	Zalman ZM-M300 mouse, ZM-K500 keyboard	Not supplied
Other	Optional family pack	None	None	Artisan Medium Hayabusa XtraSoft Mouse Pad	None
PC Mark 7 score	6965	6731	6424	5098	5219
Alien vs Predator score (720p/1080p)	169/93fps	172/96fps	161/88fps	54/27fps	141/79fps
Final Fantasy XIV (720p/1080p)	218/96fps	167/87fps	228/95fps	130/36fps	122/67fps
Sniper Elite V2 (Low/High/Ultra)	308/187/49fps	352/155/39fps	349/180/46fps	156/66/6fps	236/134/134fps
Power Consumption	52/407W	68/484W	81/370W	40/190W	147/657W
Warranty	2-year collect-and-return	3-year RTB (2 years parts, 3 years labour)	3-year Silver (1-year parts, 3 years labour)	2-year collect-and-return	2-year collect-and-return
FULL REVIEW	TINYURL.COM/OWQ24QQ	TINYURL.COM/NKWN7V4	TINYURL.COM/PMWPELY	TINYURL.COM/NUHFM3U	TINYURL.COM/OGA057M

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Mini PCs	 1 PC ADVISOR BEST BUY	 2 PC ADVISOR RECOMMENDED	 3	 4	 5
	Yoyotech Warbird RS4.0	Chillblast Fusion Xcalibur	Mesh Elite Mini Gaming OC	Dino PC Microraptor GTX 770	Quiet PC Serenity Nano
Price	£999 inc VAT	£849 inc VAT	£1,499 inc VAT	£999 inc VAT	£1,238 inc VAT
Website	yoyotech.co.uk	chillblast.com	meshcomputers.com	dinopc.com	quietpc.co.uk
Launch date	Mar 14	Mar 14	Mar 14	Mar 14	Mar 14
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.4GHz Intel Core i5-4670K	3.2GHz Intel Core i5-4570	3.5GHz Intel Core i7-4770K (4.3GHz OC)	3.4GHz Intel Core i5-4670K (4.3GHz OC)	3.4GHz Intel Core i5-4670K (3.8GHz OC)
CPU cooler	Noctua L9i low-profile cooler	Scythe Shuriken low-profile cooler	Corsair Hydro Series H60 liquid cooler	Corsair Hydro Series H80 liquid cooler	Noctua L9i low-profile cooler
RAM	8GB DDR3 1600MHz	8GB DDR3 1600MHz	16GB DDR3 2133MHz	16GB DDR3 1600MHz	16GB DDR3 1600MHz
Storage	128GB SSD, 2TB HDD	120GB SSD, 1TB HDD	240GB SSD, 2TB HDD	128GB SSD, 1TB HDD	120GB SSD, 2TB HDD
Power supply	Seasonic Evo 520W Bronze-rated	450W Silverstone SFX	750W Cooler Master GX RS-750	600W Corsair Builder Series CX600	FSP Aurum 750W modular PSU
Motherboard	Asus Z87I-Pro	Asus H81I-PLUS	MSI Z87I Gaming AC	Gigabyte GA-Z87N-WIFI	Gigabyte H87N-WIFI
Operating system	Windows 8.1	Windows 8.1/7 Home Premium	Windows 8.1	Windows 8.1	Windows 8.1
Graphics	Asus GTX 770 (2GB)	EVGA GTX 760 (2GB)	AMD Radeon R9 290X (4GB)	Zotac nVidia GeForce GTX 770 (2GB)	Palit GTX 770 Jetstream (2GB)
Networking	Gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet, 802.11n Wi-Fi	2x gigabit ethernet, 802.11n Wi-Fi	Gigabit ethernet, 802.11n Wi-Fi
USB ports	6x USB 3.0, 4x USB 2.0	4x USB 3.0, 4x USB 2.0	6x USB 3.0, 2x USB 2.0	6x USB 3.0, 3x USB 2.0	5x USB 3.0, 4x USB 2.0
Other ports	3x DVI (2x DVI-I), 2x HDMI, 2x DisplayPort	2x DVI, HDMI, DisplayPort	3x DVI, 2x HDMI, 2x DisplayPort, eSATA	1x DVI, 2x HDMI, 1x PS/2	2x DVI, HDMI, DisplayPort
Optical drive	Pioneer BDR-S07XLT Blu-ray writer	Optional	External Blu-ray drive	LiteOn iHAS122 DVD writer	Optional
Case	Cooler Master Elite 130	Silverstone RVZ01	Fractal Design Node 304	Cooler Master Elite 130	Cooler Master Elite 130
Keyboard & mouse	None	Logitech MK520	None	None	None
PCMark 8 score	6403	6334	6678	6861	6403
Alien vs Predator score (720p/1080p)	127/68	104/56	186/104	121/65	127/68
Sniper V2 Elite score (Low/High/Ultra)	303/161/40	263/124/31	387/169/43	313/150/38	303/161/40
Games score (Final Fantasy XIV)	200/76	155/63	183/94	220/81	200/76
Power consumption (idle/max)	49/330W	39/278W	54/548W	71/384W	49/330W
Warranty	3-year Silver (1-year parts, 3-year labour)	2-year Collect and Return (5-year labour)	3-year collect-and-return (2-year parts, 3-year labour)	3-year return-to-base (1-year parts, 3-year labour)	2-year collect-and-return
FULL REVIEW	TINYURL.COM/MQ8POPOQ	TINYURL.COM/NFQ6EGO	TINYURL.COM/PWCACV2	TINYURL.COM/MXMJ6QT	TINYURL.COM/O4QDHTY

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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
Launch date	Sep 13	Sep 13	Sep 13	Sep 13	Sep 13
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	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	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
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	✓	✓	✗	✗	✗
HDMI	✓	✗	✓	✓	✓
Media card slot	✓	✓	✓	✓	✓
Optical drive	Blu-ray combo drive	None	DVD drive	Blu-ray combo drive	Blu-ray combo drive
Other	2.1Mp webcam, wireless keyboard and mouse, dual digital microphone array	1.3Mp webcam, wireless keyboard and mouse	Wireless keyboard and mouse, CyberLink software, Kaspersky Internet Security	Webcam, Microsoft Wireless Desktop 3000	2Mp webcam, DVB-T TV tuner, wireless keyboard and mouse, CyberLink software
Operating system	Windows 8	Mac OS X 10.9 Mavericks	Windows 8	Windows 8	Windows 8
Power consumption (idle/max)	54/84/220W	53/84/243W	34/42/92W	32/40/119W	44/53/110W
Sniper V2 Elite (Low/High/Ultra)	6/25/94fps	12/54/197fps	5/5/16fps	5/7/28fps	5/6/17fps
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
FULL REVIEW	TINYURL.COM/KWZ4KLL	TINYURL.COM/A95Q9VY	TINYURL.COM/MEVSJ9D	TINYURL.COM/LQ4U8FW	TINYURL.COM/MUGFKQ7

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Business PCs					
	Aria Gladiator Logic 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
Launch date	Aug 13	Aug 13	Aug 13	Aug 13	Aug 13
Build rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Processor	3.3GHz Intel Core i3-3220 (dual-core)	3.2GHz Intel Core i5-4570 (quad-core)	3.4GHz Intel Core i5-4670 (quad-core)	3GHz Intel Core i5-4430 (quad-core)	3.6GHz AMD Trinity A8-5600K (quad-core)
RAM	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage	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 GT 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 Premium 64-bit	Windows 8 Professional	Windows 7 Professional 64-bit	Windows 7 Home Premium 64-bit	Windows 8 Professional
Bundled software	None	None	None	None	None
PCMark 7 overall score	3524	4257	5667	3458	2349
PCMark 7 Productivity score	4056	2685	5929	2529	1883
PCMark 7 Computational score	3321	21490	13651	9377	3899
Power consumption (idle/max)	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, phone support	1-year return-to-base, phone support
FULL REVIEW	TINYURL.COM/OSW55A8	TINYURL.COM/KGGE98T	TINYURL.COM/PCSKWVS	TINYURL.COM/PF8LUXD	TINYURL.COM/MQFWJ3R

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- Computer Shopper & Expert Reviews Best PC Manufacturer 2012



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**PC ADVISOR**  
Rating: ★★★★★



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Corsair 750W PSU  
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Scythe Shuriken Low Profile Cooler  
Asus H81I PLUS Motherboard  
8GB PC3-12800 DDR3 Memory  
GeForce GTX 760 2GB Graphics Card  
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120GB Samsung 840 EVO Solid State Drive  
Silverstone SFX 450W PSU  
Onboard High Definition Audio  
Windows 7 Home Premium 64bit

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Rating: ★★★★★



### CHILLBLAST MESSIAH 17"

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17.3" SuperBright LED (1920x1080) Display  
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NVIDIA GeForce GTX 780M 4GB GDDR5  
250GB Samsung 840 EVO Series SSD  
1000GB Seagate Hybrid SSD/HDD  
Blu-Ray Rewriter Drive  
Intel Centrino Wireless N Card  
9-in-1 Card Reader  
412 (W) x 276 (D) x 41.8-45.4 (H) mm  
3.9kg including battery  
Windows 7 HP 64bit or Windows 8.1 64bit

**£1799** inc VAT

**PC ADVISOR**  
Rating: ★★★★★



### CHILLBLAST DEFIANT MINI 13"

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13.3" (1920x1080 Resolution) Display  
8GB DDR3 at 1600MHz System Memory  
NVIDIA GeForce GTX 860M 2GB GDDR5  
1000GB Seagate Hybrid SSD/HDD  
802.11N Wireless  
6-in-1 Push-Push Card Reader  
2M HD video camera  
330 (W) x 227 (D) x 31.9 (H) mm  
2.1kg including battery  
Windows 7 HP 64bit or Windows 8.1 64bit

**£899** inc VAT

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Prices are correct at time of going to press (14-05-14) E&OE

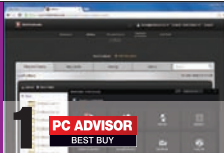
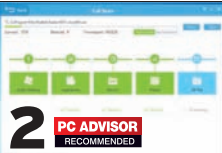
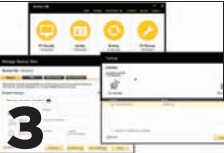
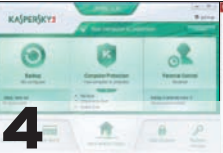

\* Chillblast won more awards in the leading IT press publications PC Pro, PC Advisor and Computer Shopper combined than any other retailer 2010-2013






\*\* World's fastest PC as tested by PC Pro Magazine - <http://www.pcpro.co.uk/reviews/desktops/371152/chillblast-fusion-photo-oc-iv>

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
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
Launch date	Jul 13	Jul 13	Jul 13	Jul 13	Jul 13
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	1TB HDD + 120GB SSD	500GB HDD hybrid SSD	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	600W C1T	Zalman ZM450-GS 450W	Corsair VS450 450W	Cooler Master 500W	Cooler Master GX 600W
Screen	23in Iiyama X2377	Not supplied	23in AOC i2369Vnm	24in BenQ GL2450E	23.6in Iiyama X2377
Screen resolution	1920x1080	N/A	1920x1080	1920x1080	1920x1080
Graphics	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
Video memory	N/A	N/A	N/A	1GB	2GB
Connectivity	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	None	None	Yes	Yes	Yes
Sound	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	Gigabyte GK-KM7580	Logitech MK260	Logitech MK330	Logitech MK260
Optical drive	LG BD-ROM/DVD±RW	Sony DVD±RW	BD-ROM, 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 V2 Elite score (Low/High/Ultra)	147/59/14fps	26/7/5fps	154/62/14fps	130/43/9fps	205/59/15fps
Alien vs Predator score (720p/1080p)	52/27fps	8/5fps	53/27fps	47/24fps	77/41fps
PCMark 7 score	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 (1 year parts)	2-year return-to-base, 1-year collect-and-return
FULL REVIEW	TINYURL.COM/KF6G3T7	TINYURL.COM/KPE3BAD	TINYURL.COM/RAGLIZ	TINYURL.COM/QHT5X2H	TINYURL.COM/NEVWQ4U






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Internet security software	    				
	1	2	3	4	5
	Bitdefender Total Security	Qihoo 360 IS 4.3	Symantec Norton 360 2014	Kaspersky Pure 3.0 TS	Gdata TotalProtection 2014
Price	£55 inc VAT	Free	£60 inc VAT	£60 inc VAT	£50 inc VAT
Website	Bitdefender.co.uk	360safe.com	Norton.com/uk	Kaspersky.co.uk/pure	Gdatasoftware.com
Launch date	Jul 13	Not specified	Oct 13	Mar 13	Not specified
Overall rating	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★★☆
Number of devices	3	Unlimited	3	3	3
Portable support	Android	Android	Android	Android	Android
Anti-malware	✓	✓	✓	✓	✓
Anti-spam	✓	x	✓	✓	✓
Firewall	✓	x	✓	✓	✓
Parental control	✓	x	✓	✓	✓
Online storage	2GB	N/A	2GB	2GB	N/A
50GB AV scan time	140 mins (1.39M files)	39 mins (68,100 files)	20 mins (176,000 files)	81 mins (334,000 files)	32 mins (8,800 files)
Scan rate (files/sec)	166	29	148	69	5
1GB copy with/without AV	41/48 secs	45/55 secs	43/69 secs	44/71 secs	52/54 secs
FULL REVIEW	TINYURL.COM/L9KNK29	TINYURL.COM/LY557M7	TINYURL.COM/LEZ8AHC	TINYURL.COM/N4ER2X2	TINYURL.COM/LZBQKEM







Antivirus	    				
	1	2	3	4	5
	Norton AntiVirus	Bitdefender Antivirus Pro	G Data AntiVirus	Kaspersky Anti-Virus	Trend Micro Titanium AV+
Price	£39 inc VAT	£24 inc VAT	£34 inc VAT	£39 inc VAT	£39 inc VAT
Website	Norton.com	Bitdefender.co.uk	Gdatasoftware.com	Kaspersky.co.uk	Uk.trendmicro.com
Launch date	Not specified	Jul 13	Not specified	Oct 13	Not specified
Overall rating	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★★☆
Licence terms	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year	3 PCs, 1 year
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
FULL REVIEW	TINYURL.COM/4P5YCX	TINYURL.COM/66SK77U	TINYURL.COM/6BFXWCS	TINYURL.COM/6HQA2WB	TINYURL.COM/4HUORV3









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Sub-£150 printers	1	2	3	4	5
					
	Samsung Xpress M2070W	Canon Pixma MG5550	Brother HL-1110	Brother HL-3140CW	HP Photosmart 7520
Price	£130 inc VAT	£80 inc VAT	£59 inc VAT	£135 inc VAT	£127 inc VAT
Website	Samsung.com/uk	Canon.co.uk	Brother.co.uk	Brother.co.uk	Hp.com/uk
Launch date	Mar 14	Apr 14	Jun 14	Jan 14	Jan 13
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Technology	Mono laser	Colour inkjet	Mono laser	Colour laser	Colour inkjet
Max print resolution	1200x1200	4800x1200dpi	600x600dpi	2400x600dpi	9600x2400
Actual print speed	B=17.1ppm	B=11.8ppm C=8.7ppm	B=16.4ppm	B=15.9ppm C=8.6ppm	B=17.6ppm C=7.9ppm
Scan/fax facilities	1200x1200 scans	1200x2400 scans	none	None	1200x2400 scans
Supported interfaces	USB 2.0, 802.11b/g/n, NFC	USB 2.0, 802.11b/g/n	USB 2.0	USB 2.0, 802.11b/g/n	USB 2.0, 802.11b/g/n, HP ePrint
Cost per page	B=3.8p	B=2.4p C=4.8p	B=2.7p	B=2.3p C=11.1p	B=2.4p C=4.8p
Media card/auto duplex	xx	x✓	xx	xx	✓✓
Input capacity	150 sheets	100 sheets	150 sheets	250 + 1 sheet	125 sheets + 20 tray + 25 ADF
Dimensions	406x360x253mm	455x369x148mm	340x238x189mm	410x465x240mm	454x551x220mm
Weight	7.4kg	6.3kg	4.5kg	17.4kg	8.6kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OYZKJKE	TINYURL.COM/LKWLJDE	TINYURL.COM/QE9GLNF	TINYURL.COM/P2P27TA	TINYURL.COM/98G9XTE

£151+ printers	1	2	3	4	5
					
	Kyocera Mita FS-1320D	HP OfficeJet Pro X551dw	Kyocera Ecosys M2030dn	Canon i-Sensys LBP7780Cx	Samsung Xpress M2875FW
Price	£176 inc VAT	£435 inc VAT	£340 inc VAT	£450 inc VAT	£210 inc VAT
Website	Kyoceradocumentsolutions.co.uk	Hp.com/uk	Kyoceradocumentsolutions.co.uk	Canon.co.uk	Samsung.com/uk
Launch date	Apr 11	Aug 13	May 14	Jun 13	Mar 14
Overall rating	★★★★★	★★★★★	★★★★☆	★★★★★	★★★★☆
Technology	Mono laser	Colour inkjet	Mono laser	Colour laser	Mono laser
Max print resolution	1200x1200	2400x2400	1800x600dpi	9600x600	4800x600dpi
Actual print speed	B=26.1ppm	B=42.9ppm C=15.8ppm	B=28ppm	B=23.2pp C=16.7ppm	B=21.4ppm
Scan/fax facilities	None	None	600dpi scans	None	1200dpi scanner, fax
Supported interfaces	USB 2.0	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, Gigabit	USB 2.0, ethernet	USB 2.0, ethernet, 802.11b/g/n
Cost per page	B=1.4p	B=1p C=4.3p	B=2.2p	B=1.3p C=7.5p	B=1.7p
Media card/auto duplex	✓✓	x✓	✓✓	x✓	x✓
Input capacity	250 sheets	500 + 50 sheet	250 sheets + 50 sheet	500 + 100 sheets	250 sheets + 1 sheet + 40 ADF
Dimensions	375x393x250mm	517x399x414mm	494x430x448mm	517x530x401mm	401x362x367mm
Weight	12kg	17.1kg	18kg	31kg	11.3kg
Warranty	2 years	1 year	2 years	1 year	3 years
FULL REVIEW	TINYURL.COM/6GG9UKV	TINYURL.COM/CZ05P65	TINYURL.COM/NRLNSZW	TINYURL.COM/CCAPAJF	TINYURL.COM/QD5V3NF

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Blu-ray drives					
	1	2	3 	4	5
	Pioneer BDR-209EBK Retail	Pioneer BDR-209DBK OEM	LG BH16NS40	LG BP40NS20	Lite-On IHES112-115
Price	£61 inc VAT	£57 inc VAT	£70 inc VAT	£90 inc VAT	£54 inc VAT
Website	Pioneer.eu/uk	Pioneer.eu/uk	Uk.lge.com	Uk.lge.com	Liteonit.eu
Launch date	Nov 13	Nov 13	May 12	Jan 13	Oct 12
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Blu-ray speeds	16x -R, 14x -R DL, 2x -RE, 12x -ROM	16x -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
FULL REVIEW	TINYURL.COM/LD47X7K	TINYURL.COM/LD47X7K	TINYURL.COM/8YTUJEF	TINYURL.COM/BS8UAF	TINYURL.COM/8SYECMW

Wireless routers					
	1 	2 	3	4 	5
	Apple AirPort Extreme	TP-Link Archer C7	D-Link N600	Asus RT-AC68U AC1900	TP-Link TL-WDR4900
Price	£169 inc VAT	£90 inc VAT	£50 inc VAT	£175 inc VAT	£80 inc VAT
Website	Apple.com/uk	Tp-link.com	Dlink.com	Uk.asus.com	Tp-link.com
Launch date	Jan 14	Jan 14	Jan 13	Jan 14	Dec 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Standards supported	802.11b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n/ac	802.11a/b/g/n
Frequency modes	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)
Antennae	6x internal	3x external, 3x internal	2x internal	3x external, 3x internal	3x external, 3x internal
128bit/256bit WEP	✓ x	✓ x	✓ x	✓ x	✓ x
Modem/Parental Control	x✓	x✓	x✓	x✓	x✓
Firewall	NAT/SPI	NAT/SPI	NAT/SPI	NAT/SPI	NAT/SPI
Ports	Gigabit WAN, 3x gigabit LAN, USB	Gigabit WAN, 4x gigabit LAN, 2x USB	Gigabit WAN, 4x gigabit LAN, USB	Gigabit WAN, 4x gigabit LAN, 2x USB	10/100 WAN, 4x 10/100 LAN, 2x USB
Average power use	Not tested	Not tested	Not tested	Not tested	Not tested
Throughput (near, far, ac)	124, 105, 578/540Mbps	110, 89, 505/468Mbps	142, 115Mbps, N/A	98, 69, 610/570Mbps	127, 111Mbps, N/A
Dimensions, weight	98x168x98mm, 945g	32.5x243x160mm, 508g	111x93x145mm, 330g	160x83x220mm, 640g	243x161x33mm, 1.1kg
Warranty	1 year	3 years	1 year	2 years	1 year
FULL REVIEW	TINYURL.COM/MFDLLSC	TINYURL.COM/KKJMPCE	TINYURL.COM/9LGFF8Y	TINYURL.COM/K4ZATKV	TINYURL.COM/MUXCBNM


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NAS drives	1	2	3	4	5
	Synology DS413j	Qnap TS-421	Synology DS1813+	Asustor AS-604T	Zyxel NSA325
Price	£265 inc VAT (diskless)	£382 inc VAT (diskless)	£775 inc VAT (diskless)	£430 inc VAT (diskless)	£95 inc VAT
Website	Synology.com	Qnap.com	Synology.com	Asustor.com	Zyxel.co.uk
Launch date	Oct 13	Mar 14	Jan 14	May 14	Jun 12
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Drive bays	4	4	8	4	2
Processor	1.6GHz Marvell mv6282	2GHz Marvell single-core ARM	2.13GHz Intel Atom D2700 dc	2.13GHz Intel Atom	1.6GHz processor
Memory	512MB DDR3	1GB DDR3	2GB DDR3	1GB DDR3	512MB DDR2
Remote access	✓	✓	✓	✓	✓
eSATA	✗	✓	✓	✓	✗
USB port	2x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0, 4x USB 2.0	2x USB 3.0, 4x USB 2.0	2x USB 2.0
Raid options	0/1/5/6/10/JBOD	0/1/5/6/10/JBOD	0/1/5/6/10/JBOD	0/1/5/6/10/JBOD	0/1/JBOD
Software	DSM 4.1	Backup Station	DSM 4.3	Asustor utilities, App Central	zPilot
Dimensions	184x168x230mm	177x180x235mm	175x340x233mm	230x170x185mm	108x205x147mm
Weight	2kg	3kg	5.2kg	3.5kg	1.8kg
Warranty	2 years	2 years	3 years	2 years	1 year
FULL REVIEW	TINYURL.COM/PL8XM8S	TINYURL.COM/MCYWUB8	TINYURL.COM/PWO4M6J	TINYURL.COM/NX5QO8M	TINYURL.COM/7B9EPW8

USB drives	1	2	3	4	5
	WD My Passport Edge for Mac	G-Technology Professional	LaCie Little Big Disk TB	Toshiba Stor.E Basics	LaCie Fuel
Price	£55 inc VAT	£250 inc VAT	£770 inc VAT	£92 inc VAT	£170 inc VAT
Website	Wdc.com/en	G-technology.com	Lacie.com/uk	Toshiba.co.uk	Lacie.com/uk
Launch date	Feb 13	Sep 13	Feb 14	Nov 13	May 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity tested	500GB	4TB	1TB	2TB	3.5
Capacity range	500GB	2TB to 4TB	512GB to 2TB	320GB to 2TB	1TB
Disk size	2.5in	3.5in	2.5in	2.5in	2.5in
Spin speed	5400rpm	7200rpm	5400rpm	5400rpm	5400rpm
Transfer speed	94MB/s (USB 3.0)	N/A	635MB/s	94Mb/s (USB 3.0)	94Mb/s (USB 3.0)
Encryption	Password protection	None	None	None	Password protection
Other interfaces	None	FireWire 800	None	None	Wi-Fi 802.11b/g/n
Software	WD utilities	None	LaCie Backup Assistant	None	LaCie utilities
Dimensions	112x83x11mm	235x130x46mm	40x140x85mm	119x79x21mm	115x115x23mm
Weight	164g	1.35kg	650g	215g	300g
Warranty	3 years	3 years	1 year	1 year	2 years
FULL REVIEW	TINYURL.COM/BMG7SW9	TINYURL.COM/NV7F32F	TINYURL.COM//KRCL3VZ	TINYURL.COM/LBHC8EL	TINYURL.COM/LK3398C






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SSDs					
	1 <b>PC ADVISOR</b> GOLD	2 <b>PC ADVISOR</b> RECOMMENDED	3 <b>PC ADVISOR</b> RECOMMENDED	4	5 <b>PC ADVISOR</b> RECOMMENDED
	Samsung 840 EVO	Crucial M500	Plextor M5 Pro	Samsung 840 EVO mSATA	Samsung 840 Pro
Price	£305 inc VAT	£185 inc VAT	£150 inc VAT	£276 inc VAT	£350 inc VAT
Website	Samsung.com/uk	Crucial.com/uk	Plextor.com	Samsung.com/uk	Samsung.com/uk
Launch date	Nov 13	Aug 13	Aug 13	Apr 14	Aug 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Capacity tested	750GB	480GB	256GB	500GB	512GB
Price per GB	41p	39p	59p	55p	68p
Memory cache	1GB LPDDR2	512MB DDR3	512MB DDR3	512MB LPDDR2	512MB LPDDR2
Controller	Samsung MEX (3-core ARM)	Marvell 88SS9187	Marvell 88SS9187	Samsung MEX (3-core ARM)	Samsung MDX (3-core ARM)
Encryption	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit
Flash	Samsung 19nm Toggle NAND	Micron 20nm MLC NAND	Toshiba Toggle NAND	Samsung 19nm Toggle NAND	Samsung 21nm Toggle NAND
Firmware updated via	SSD Magician for Windows	ISO boot disc	ISO boot disc	SSD Magician for Windows	SSD Magician for Windows
ATTO peak sequential	R: 554MB/s; W: 537MB/s	R: 539MB/s; W: 433MB/s	R: 547MB/s; W: 457MB/s	R: 554MB/s; W: 536MB/s	R: 562MB/s; W: 519MB/s
CDM peak IOPS	104k (read)	89.8k (read)	103.3k (read)	102k (read)	103.8k (read)
AS SSD (points)	1141	1038	1124	1147	1094
Warranty	5 years	3 years	5 years	3 years	5 years
FULL REVIEW	TINYURL.COM/L5EDQOY	TINYURL.COM/M2NCMJ	TINYURL.COM/PTYGG27	TINYURL.COM/MNKPM2Q	TINYURL.COM/OU4LEJG

Projectors					
	1	2	3	4 <b>PC ADVISOR</b> RECOMMENDED	5
	Epson EB-1945W	BenQ W1070	Optoma HD30	ViewSonic PJD7820HD	Dell M900HD
Price	£1,321 inc VAT	£630 inc VAT	£1,098 inc VAT	£550 inc VAT	£743 inc VAT
Website	Epson.co.uk	Benq.co.uk	Optoma.co.uk	Viewsoniceurope.com/uk	Dell.co.uk
Launch date	Mar 13	Nov 13	Jun 14	Jun 13	Nov 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Projection technology	3LCD	DLP	DLP	DLP	DLP
Resolution (pixels)	1280x800	1920x1080	1920x1080	1920x1080	1280x800
Brightness <sup>1</sup> , Contrast	4200, 3000:1	2000, 10000:1	1600, 25,000:1	3000, 15000:1	900, 700:1
Image size	280in	235in	362in	300in	80in
Supported aspect ratios	16:10, 16:9, 4:3	16:9	16:10, 16:9, 4:3	16:9, 4:3	16:10, 16:9, 4:3
Noise levels (dB)	37 (29 eco)	33 (30 eco)	26db	35 (29 eco)	38 (34 eco)
Connections	VGA, HDMI, DP, CM, USB, ET	VGA, HDMI, CM, USB	2x VGA, 2x HDMI, 3D	VGA, HDMI, CM, USB	HDMI, USB, WiDi
Lamp/lamp life	Not supplied/2500 hrs	240W/6000 hrs	240W/6000 hrs	Not supplied/5000 hrs	LED/30000 hrs
Dimensions	377x271x108mm	312x244x109mm	324x234x97mm	268x221x84mm	232x164x43mm
Weight	3.9kg	2.65kg	3.1kg	2.1kg	1.59kg
Warranty	5 years	2 years	3 years	3 years	1 year
FULL REVIEW	TINYURL.COM/CP95P7G	TINYURL.COM/LXADR7Q	TINYURL.COM/K4FA89Q	TINYURL.COM/D2HO4CV	TINYURL.COM/MAXQRG3






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Sub-£150 graphics cards	    				
	1	2	3	4	5
	MSI HD 7770	MSI R7 260X OC	Asus GTX 650 Ti	PNY GeForce GTX 650	Sapphire Radeon HD 7750
Price	£66 inc VAT	£100 inc VAT	£105 inc VAT	£85 inc VAT	£80 inc VAT
Website	Uk.msi.com	Uk.msi.com	Uk.asus.com	Pnyeuropa.com	Sapphiretech.com
Launch date	Sep 12	May 14	Aug 13	May 13	Jun 12
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Graphics processor	AMD Radeon HD 7770	AMD Radeon R7 260X	nVidia GTX 650 Ti Boost	nVidia GeForce GTX 650	AMD Radeon HD 7750
Installed RAM	1GB GDDR5	2GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5
Memory interface	128-bit	128-bit	192-bit	128-bit	128-bit
Core clock/Boost	1GHz/none	1175MHz/none	928MHz/none	1058MHz/none	800MHz/none
Memory clock/Effective	1125MHz/4.5GHz	1625MHz/6.5GHz	1350MHz/5.4GHz	1250MHz/5GHz	1125MHz/4.5GHz
Stream processors	640	896	768	384	512
Texture units	40	56	64	32	32
Power connectors	1x 6-pin	1x 6-pin	1x 6-pin	1x 6-pin	None
DirectX	11.1	11.1	11	11	11
Digital interface	DVI, HDMI, Mini-DP	2x DVI, HDMI, MiniDisplayPort	2x DVI, HDMI, DisplayPort	2x DVI, Mini-HDMI	DVI, HDMI, DisplayPort
Warranty	3 years	3 years	2 years	3 years	2 years
FULL REVIEW	TINYURL.COM/BWJ7BL9	TINYURL.COM/OZ6WUYT	TINYURL.COM/DYE3OW8	TINYURL.COM/AKT2XOM	TINYURL.COM/7ZB5OE3

£151+ graphics cards	    				
	1	2	3	4	5
	Gigabyte GeForce GTX 770 2GB	Gigabyte Radeon R9 280X	MSI Radeon R9 270X	MSI Radeon R9 290X Boost	Gigabyte GeForce GTX 780 Ti
Price	£260 inc VAT	£275 inc VAT	£170 inc VAT	£400 inc VAT	£530 inc VAT
Website	Uk.gigabyte.com	Uk.gigabyte.com	Uk.msi.com	Uk.msi.com	Uk.gigabyte.com
Launch date	Aug 13	Mar 14	Dec 13	Apr 14	May 14
Overall rating	★★★★★	★★★★★	★★★★☆	★★★★★	★★★★☆
Graphics processor	nVidia GeForce GTX 770	AMD Radeon R9 280X	AMD Radeon R9 270X	AMD Radeon R9 290X	nVidia GeForce GTX 780 Ti
Installed RAM	2GB GDDR5	3GB GDDR5	2GB GDDR5	4GB GDDR5	3GB GDDR5
Memory interface	256-bit	384-bit	256-bit	512-bit	384-bit
Core clock/boost	1137MHz/1189MHz	1GHz/1.1GHz	1030MHz/1120MHz	1GHz/1GHz	1020MHz/1080MHz
Memory clock/Effective	1752MHz/7010MHz	1.5GHz/6GHz	1.4GHz/5.6GHz	1.25GHz/5GHz	1750MHz/7GHz
Stream processors	1536	2048	1280	2816	2880
Texture units	128	128	80	176	240
Power connectors	1x 6-pin, 1x 8-pin	2x 8-pin	2x 6-pin	8-pin, 6-pin	1x 6-pin, 1x 8-pin
DirectX	11	11	11	11	11
Digital interface	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini-DisplayPort	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort	2x DVI, HDMI, DisplayPort
Warranty	3 years	3 years	2 years	3 years	3 years
FULL REVIEW	TINYURL.COM/OAG6277	TINYURL.COM/OWVAP37	TINYURL.COM/OYA2DFJ	TINYURL.COM/NPET8ER	TINYURL.COM/O29JMT3

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Sub-£200 flat-panel displays					
	1 <b>PC ADVISOR</b> RECOMMENDED	2	3	4	5 <b>PC ADVISOR</b> RECOMMENDED
	BenQ GW2760HS	NEC MultiSync E243WMI	Philips 234E5QHAW	AOC i2769Vm	Dell S2440L
Price	£194 inc VAT	£185 inc VAT	£130 inc VAT	£195 inc VAT	£195 inc VAT
Website	Benq.co.uk	Necdisplay.com	Philips.co.uk	Benq.co.uk	Dell.co.uk
Launch date	Not specified	Jun 14	Jun 14	May 14	Mar 13
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	27in	23.8in	23in	27in	24in
Panel type	A-MCA	IPS	IPS	AH-IPS	Vertical alignment
Native resolution	1920x1080 (82ppi)	1920x1080 pixels	1920x1080 pixels	1920x1080 (82ppi)	1920x1080 (92ppi)
Pixel pitch	0.31mm	93ppi	96ppi	0.31mm	0.28mm
Brightness	300cd/m <sup>2</sup>	250cd/m <sup>2</sup>	250cd/m <sup>2</sup>	250cd/m <sup>2</sup>	239cd/m <sup>2</sup>
Static contrast ratio	950:1	650:1	770:1	720:1	1200:1
Response time	4ms	6ms	5ms	5ms	6ms
Ports	HDMI, DVI, VGA	DP, DVI-D, VGA	2x HDMI (MHL), VGA	2x HDMI (1 MHL), DP, VGA	HDMI, VGA
Dimensions	472x191x623mm	558x214x380-490mm	532x213x325mm	622x213x449mm	568x191x418mm
Weight	4.5kg	6.3kg	3.5kg	5kg	3.6kg
Warranty	2 years	3 years	2 years	3 years	3 years
FULL REVIEW	TINYURL.COM/NF3WVFY	TINYURL.COM/KNCGVOU	TINYURL.COM/K969YMH	TINYURL.COM/LDTANWC	TINYURL.COM/CXWJJLM

£201+ flat-panel displays					
	1 <b>PC ADVISOR</b> RECOMMENDED	2	3	4 <b>PC ADVISOR</b> RECOMMENDED	5
	BenQ BL2411	AOC Q2963PM	Dell UltraSharp 32 Ultra	LG 29EA93	ViewSonic VP2772
Price	£237 inc VAT	£323 inc VAT	£1,995 inc VAT	£395 inc VAT	£588 inc VAT
Website	Benq.co.uk	Aoc-europe.com/en	Dell.co.uk	Uk.lge.com	Viewsoniceurope.com/uk
Launch date	Apr 14	Mar 14	Jun 14	Aug 13	Jun 14
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Screen size	24in	29in	31.5in	29in	27in
Panel type	IPS	AH-IPS	IGZO	In-plane switching	AH-IPS
Native resolution	1920x1200 (94ppi)	2560x1080 (96ppi)	3840x2160 pixels	2560x1080 (96ppi)	2560x1440 pixels
Pixel pitch	0.27mm	0.27mm	140ppi	0.26mm	109ppi
Brightness	300cd/m <sup>2</sup>	240cd/m <sup>2</sup>	350cd/m <sup>2</sup>	300cd/m <sup>2</sup>	350cd/m <sup>2</sup>
Static contrast ratio	650:1	530:1	550:1	560:1	560:1
Response time	5ms	5ms	8ms	5ms	6ms
Ports	DVI, DP, VGA	HDMI, DVI, DP, VGA	HDMI, DP, Mini-DP, 4x USB 3.0	3x USB 3.0, 2x HDMI, DVI, DP	HDMI, DVI, Mini-DP, 4x USB 3.0
Dimensions	366x555x236mm	714x214x388mm	750x214x483-572mm	700x209x387mm	643x348x470mm
Weight	6.7kg	6.9kg	9.2kg	5.2kg	8.5kg
Warranty	3 years	3 years	3 years	2 years	3 years
FULL REVIEW	TINYURL.COM/PMV5L5V	TINYURL.COM/NXDAGMK	TINYURL.COM/O4CTO3S	TINYURL.COM/CTR7AAW	TINYURL.COM/LLQRWTX

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# Why everyday tech will kill us

If you go back a few decades to a time when computers were the size of small countries, people had an optimistic view of the future. Films, books, and episodes of *Tomorrow's World* described a utopia where robots would tend to our every need, and miniscule - barely wardrobe proportioned - PCs would automate dreary domestic chores. All that would be left for us to do was sip Campari by the pool or teach ourselves COBOL as a leisurely way to pass the time. Well, we are now living in the world of Tomorrow, and it seems Maggie Philbin was a liar.

Of course, modern computers are amazing, mobile phones have transformed culture, and tablets are something akin to the ultrathin devices that Jean-Luc Picard used onboard the Enterprise. This isn't the problem... no, it's the stress involved when we have to live with them that's the issue. Take, for example, the simple thing of notifications. Once upon a time, you'd get an email only if you were at your computer, with it dialled up to Compuserve or AOL, and a Joanna Lumley voice-alike would happily inform you of its arrival. It was civilised, deferential and imbued a sense of control. This was only shattered on the moderately rare occasions when you'd been listening to a quietly recorded MP3 and forgotten to turn the PC speakers down, resulting in Miss Lumley shouting at you like a parade ground sergeant.

Now when an email arrives, it sounds like an Xbox having a heart attack. Beeps, bings and flashing lights report from several corners of the room, while not even the private sacristy of my front pocket remains unmolested, as a device inside vibrates with wild excitement. And it's not just email. Facebook alerts, texts, WhatsApp missives, Twitter mentions, FaceTime and Skype calls set off the cacophony at far more regular intervals than seems entirely necessary. In fact, Skype has brought new levels of fear due to the fact that up until very recently multiple devices would ring to warn you of an incoming call, then when you answered one... some of the others continued ringing! It poses the question, who's on the end of the line? Has Microsoft just ripped a hole in the space-time continuum? Has it teleported me into the middle of a *Twilight Zone*-style story where I'll answer another device and find myself talking to a version of me from a parallel universe? Will he know how to get Siri to understand a damn word I say?

Allied to the varied announcements, there then remains the task of clearing them all from the devices. Some will do it automatically, others will flash indignantly until you interact with it in some

way. Apple is particularly unhelpful in this area as it refuses to add the simple Clear All option that Android has as standard. Oh no, not the easy way out for you my friend. You'll have to go through and clear them manually. Maybe this is a training mode for its upcoming iWatch fitness device, or maybe it's just a few designers who really have no idea how to build something properly? It's not like I need more things to do, as I already have my hands full trying to get everything to sync.

Sure, things are much better now than they were in the past. Back then if you needed a file on your computer, you pretty much had to be sitting at it. The internet has liberated our data, and for that I'm very grateful. But there is a problem, mainly in that I'm British. You see there are so many cloud storage companies now who are only too willing to throw extravagant amounts of free space at you. This in itself is great, but I'm left feeling in someway indebted to them because of this, so I try to use them all. Well, it would simply be impolite not to. The truth is I don't even have enough data to fill half the free storage I now possess, and I have very little clue what's actually stored on any of them anyway. Looking for a file is becoming a challenge so daunting that I've actually taken to just keeping all the important things on my laptop, while inventing more and more elaborate ways to create data I don't need that I can store on the cloud drives I never use because I can't find anything due to all the random data.

All of these Sisyphean tasks bow the knee, though, when the matter of charging points enters the fray. With the addition of every phone, laptop, tablet, smartwatch, fitness tracker or ebook reader into the house, the terrible dance of the sockets begins. Trying to calculate which device will be charged in time for another to slip in so that all will reach a state of optimum readiness without passive battery drain occurring, makes me feel like I'm living in a private version of the *Crystal Maze*. It still genuinely amazes me that Richard O'Brien hasn't appeared at my door to invite me into the Dome and try my hand at catching as many gold flakes as possible in 60 seconds.

In short, it's exhausting being at the beck and call of so many tiny masters. Now, some will say 'just get rid of them, go off the grid, downsize', but those words fall on deaf ears. No, I may be under the thumb of technology but there is one thing that still keeps my ardour strong in the darkest hours. When my spirit is at its lowest ebb, and all seems futile and beyond repair, I can console myself with the knowledge that I was never married to Keith Chegwin. Take that Philbin. ☒



“  
**Tomorrow's  
World described a  
utopia where robots  
would tend to our  
every need**  
”

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